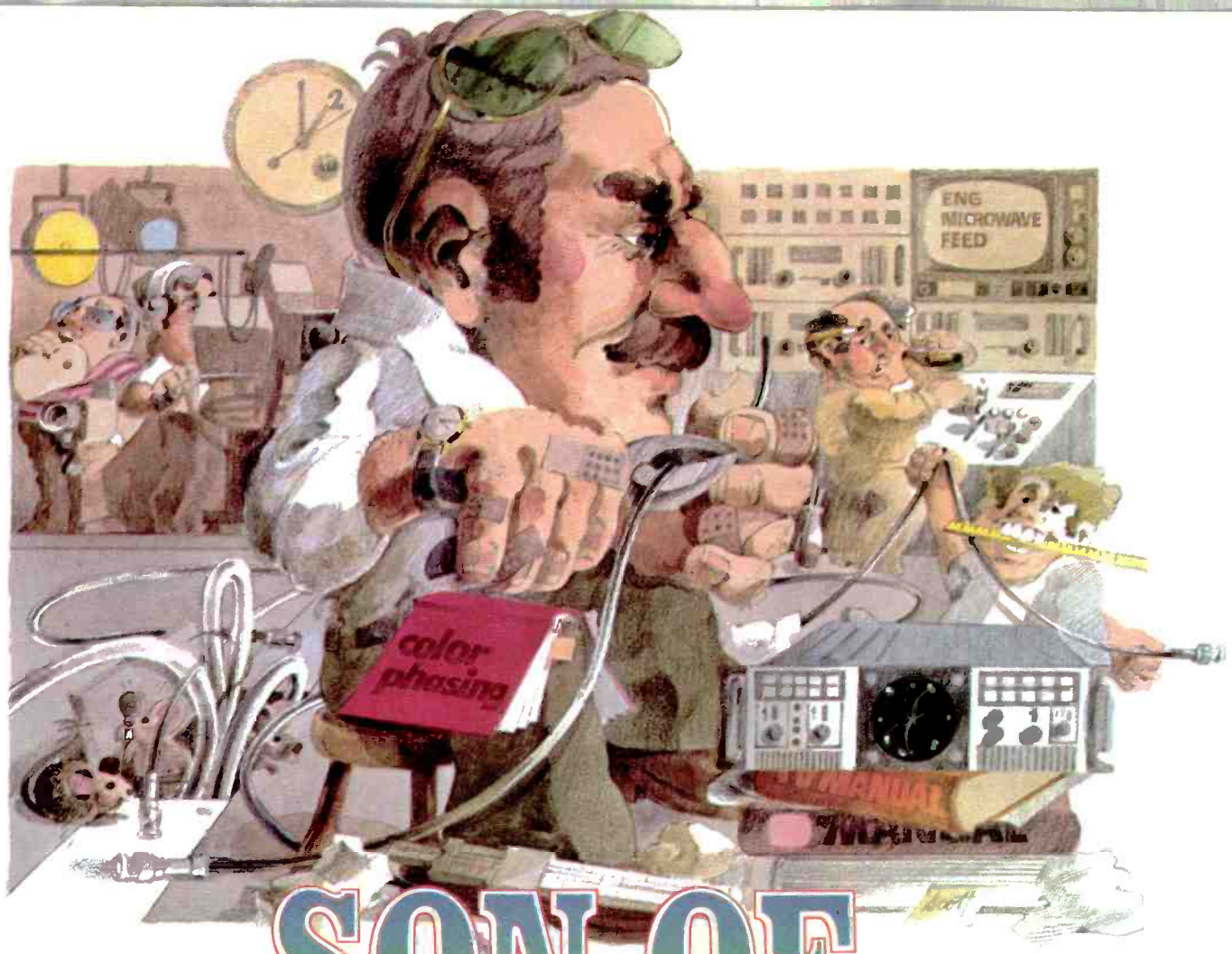
BROADCAST® ENGINEERING

August, 1979/$2.00

WABC/WPLJ: Case study

Pre-NRBA emphasis

Digital & station operations



SON OF A SWITCH

As any engineer knows, the unholy marriage of dissimilar equipment in studio and field operations often results in color phasing of questionable integrity. To solve the problems of ENG cameras used next to studio cameras, and the resulting varying cable lengths, you no longer have to resort to cable cutters and slide rules.

The NEC TVPC-16 (Television Phase Corrector) gives you 360° color correction in the vertical interval of a switch. It automatically adjusts color phase over a ± 180° range. Phase control incorporates burst AGC and a reference subcarrier limit during the vertical blanking period so that equipment will function with stability despite signal level change.

In addition, the TVPC's zero-hold circuit automatically switches to an internal fixed delay line when the input signal is monochrome or the input video signal and reference sync signal are not synchronized. NEC's application of LSI technology makes room for 2 TVPC-16's in 1-3/4" of rack space.

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Stop cursing under your breath about color phase problems. Get the Son of a Switch from NEC.

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Free 18 x 22 inch "Son of a Switch" poster available upon request.

NEC

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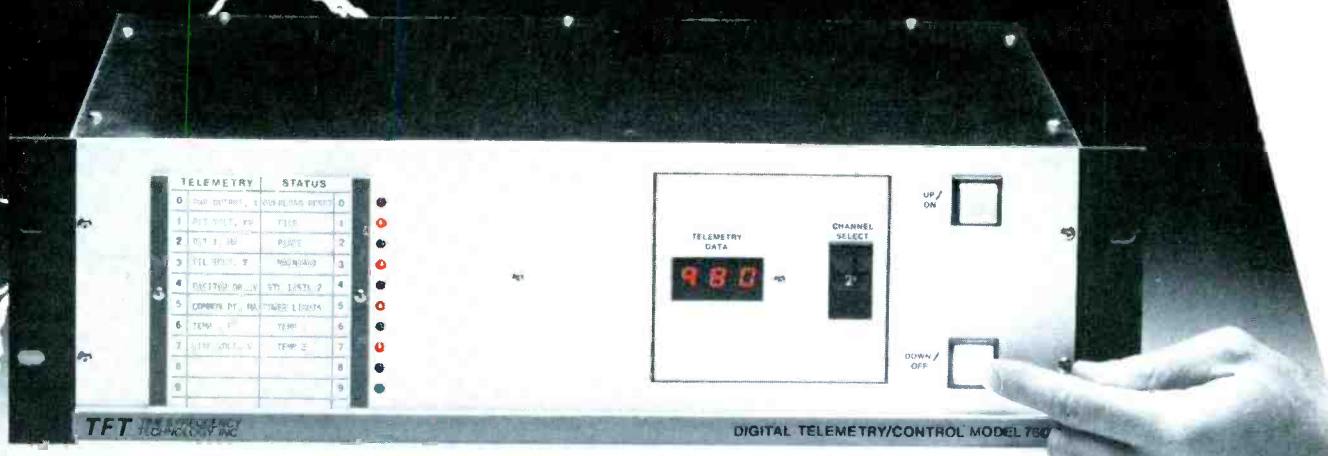
INSTANTANEOUS Digital Command



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TFT Model 7601 represents a major breakthrough in remote control systems. Now, you can get 10 channels of digital command functions plus 10 channels of digital telemetry functions for less than $2200! And it's the same high quality, reliable design that has made TFT equipment a standard in the broadcast industry. Just check this line-up of features:

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Full command-code redundancy, *plus* odd/even parity check, makes digital data errors virtually impossible. A TFT proprietary feature. Even lightning induced noise has no effect on integrity of command functions.

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Broadcast engineering

The journal of broadcast technology

August, 1979 ☐ Volume 21 ☐ No. 8

THE COVER

The WABC/WPLJ studios in New York have been undergoing extensive remodeling and upgrading for more efficient operation and improved stereo performance. This special camera view shows their latest studio arrangement. In an article beginning on page 48, engineers Robert Deitsch and Winston Loyd describe how WABC/WPLJ accomplished its goals and how they have guided the effort.

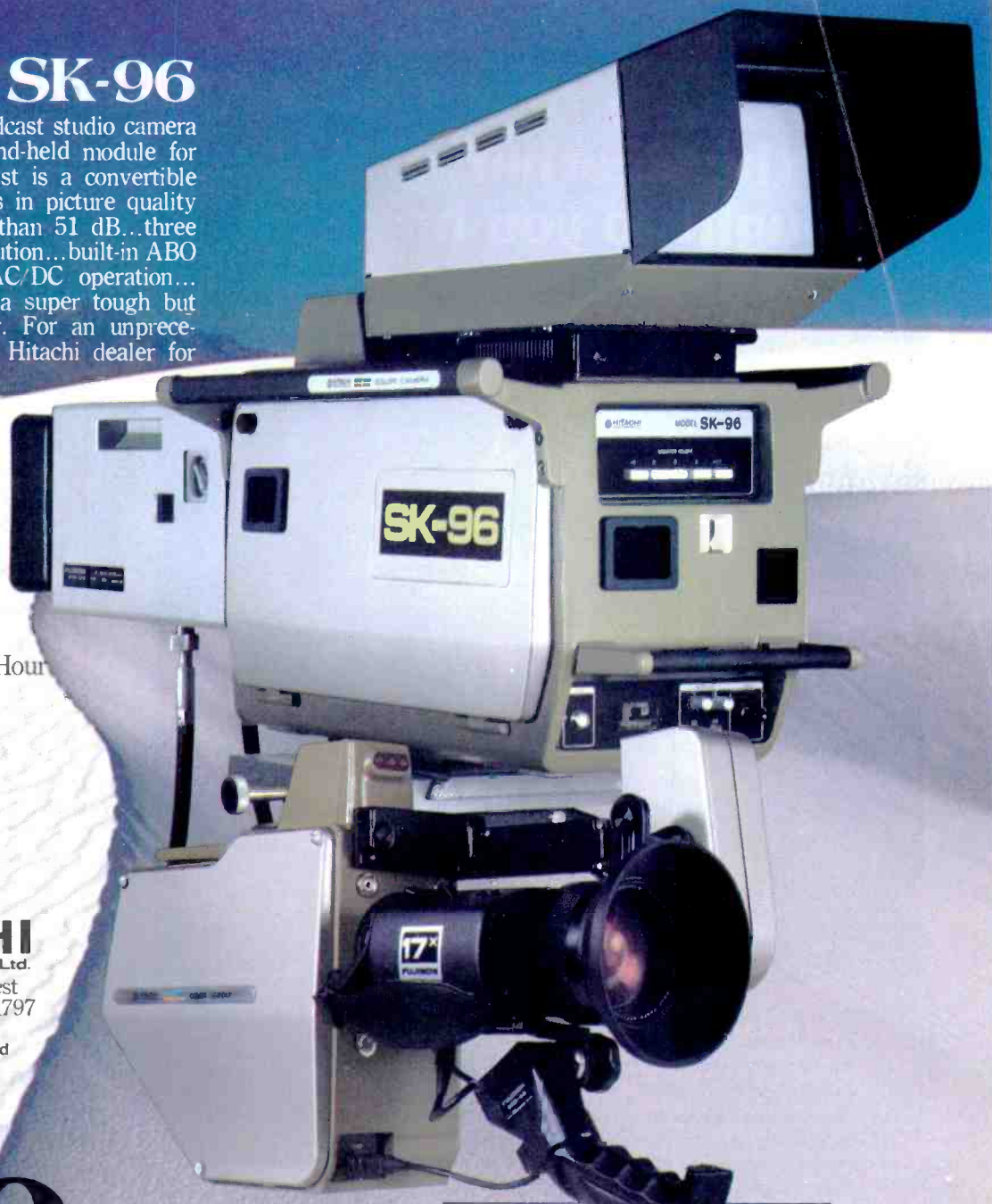
NEXT MONTH

The September issue, traditionally, is the **BE** Buyers' Guide—the industry's comprehensive product directory. But, it will contain some important feature articles as well, including:

- Digital basics, Part 2
- Technical achievements in producing *Live From Lincoln Center*

HITACHI SK-96

Inside this superlative broadcast studio camera lives an equally superb hand-held module for field production. Here at last is a convertible that makes no compromises in picture quality ...with S/N ratio of better than 51 dB...three 2/3" Saticons...500-line resolution...built-in ABO ...internal triax adapter...AC/DC operation... and more. All wrapped in a super tough but lightweight diecast housing. For an unprecedented low price. Call your Hitachi dealer for more details.



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Camera Control Unit

The Hitachi Hard-to-Top Convertible.

BROADCAST ENGINEERING

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"We evaluated all carts and have standardized on the Audiopak® AA-3"

—Bob Kanner
Chief Engineer
KRTH, FM 101
KHJ, AM 93
Los Angeles

"Our test results show that the Audiopak® AA-3 holds stereo phasing better than any other cart on the market."

"The excellent phase stability of the AA-3 will be of major importance as AM stations convert to stereo."

"The High Output, Low Noise (HOLN) tape in the AA-3 gives us excellent frequency response combined with 6db more headroom."

"The AA-3 maintains excellent tape motion with low wow and flutter."

"We had had previous cart pressure pad problems with our multiple playback machines — these have been resolved by the durability of the AA-3 pressure pads."

"The AA-3 is the 'state of the art' in cartridges — it meets or exceeds the specifications of the current NAB standards."

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A Division Of Capitol Records, Inc.
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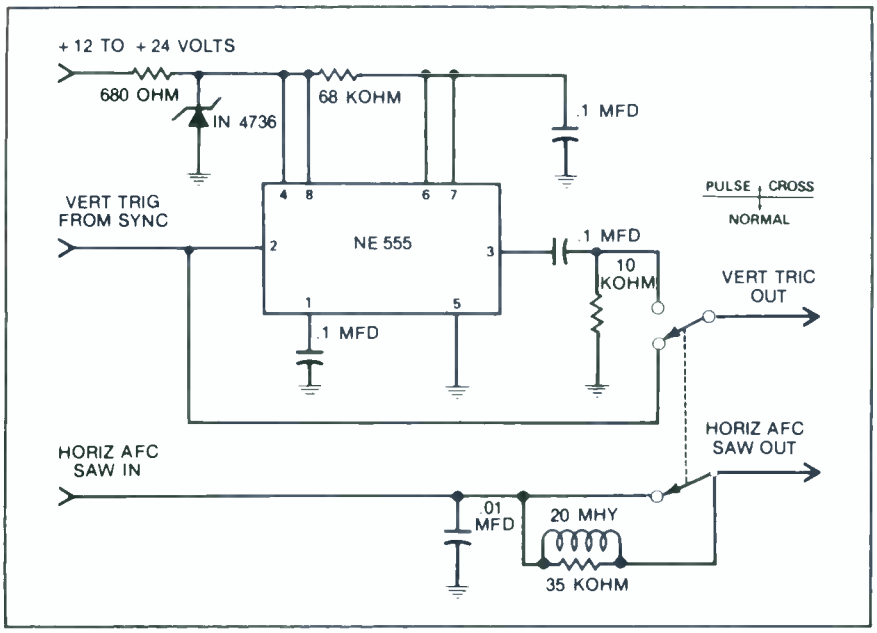
New Audiopak® AA-3 Broadcast Cartridge

Circle (206) on Reply Card

Address letters to go in this column to Feedback Editor, P.O. Box 12901, Overland Park, KS 66212.

The April issue of **Broadcast Engineering** contained an error in the article, "Description of the dropout indicator in a playback videotape," page 80. A schematic was shown with it which belongs with another article by the same author. The schematic is reprinted below, along with the correct text and our apologies to J. Mitch Hopper.



Converting a monochrome monitor to a pulse cross monitor

Almost any Conrac monochrome monitor may be modified for pulse cross operation, using this schematic and circuit description.

The one shot operation of most pulse cross vertical modifications can be replaced very simply by using an NE-555 (Signetics) IC operating as a MSMV. The vertical trigger from the monitor sync separator starts the timing of the 555. The output pulse length is set to approximately one half the vertical scan by the 68kΩ/.1mfd R/C combination on pins 6 and 7 of the IC. The 68kΩ can be replaced by a series 1kΩ and a 100kΩ pot to make the vertical delay position variable. The output pulse is differentiated by the 10kΩ/.1mfd on pin 3 of the IC. The negative pulse will trigger the vertical oscillator in the monitor, one half the vertical raster rate.

The horizontal AFC sawtooth is delayed by the 20mhy/.01mfd IC combination. Twenty mhy was found to delay the horizontal by one third

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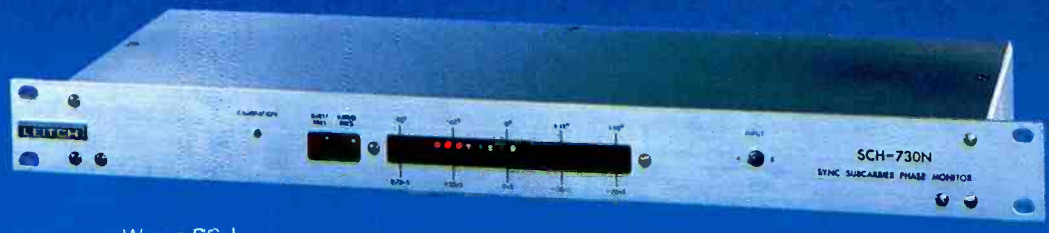
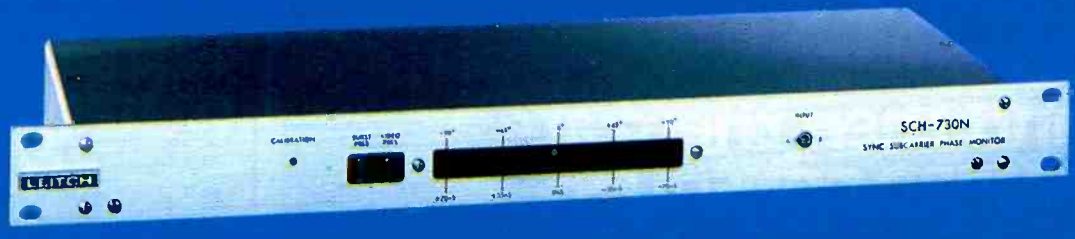
IS IMPORTANT FOR PROGRAM INTEGRATION.

The SCH-730N Sync/Subcarrier Phase Monitor permits fast, accurate measurement, adjustment and continuous monitoring of this elusive parameter . . . simply and inexpensively!



Wrong SCH



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Two bridging inputs for
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Monitor range: ±90° (±70 ns)
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of the line.

Simple output switching will facilitate operating the monitor in normal or pulse cross. The IN4736 will allow this modification to operate on nearly +Vcc available within the monitor.

J. Mitch Hopper
Illinois State Board of Education
Springfield, IL

20th Anniversary Issue (May) draws avid response

Farnsworth credits

In your 20th anniversary (May) issue, it was most interesting to read of the rapid advances in broadcasting in such a short time.

In the article on page 108 titled "Television Pioneering," it was great to see more credit given to Philo Taylor Farnsworth for numerous contributions to electronic television. He was a man to whom much more credit should be given for his works with electronic television.

The trip to the Farnsworth laboratory made by Dr. Zworykin was April 10-12, 1930. Zworykin remarked that "I wish I could have invented this myself." Also, the original Zworykin patent application on the Iconoscope was not issued until 1938, some eight years after the Farnsworth patents were issued. This seems to be one date that almost never sees print.

Stephen F. Hofer, Ph.D.
WELH, Eastern Illinois University
Charleston, IL

Changing the name

I noted in your anniversary (May) issue FCC article that the Office of Engineering is now the Office of Science and Technology and that the heretofore Chief Engineer is now Chief Scientist.

How about an anniversary change of name for **BE** to *Broadcast Science and Technology* to keep pace? And, instead of staff writers, editorial directors, etc., let's have information scientists generating the *BSTs* monthly.

Nothing like a new suit of clothes for a new age—the Information Age. That raises the old question: "Do the clothes make the mag, or does the mag make the clothes?"

Ken Marsh
Technisphere Corporation
New York, NY

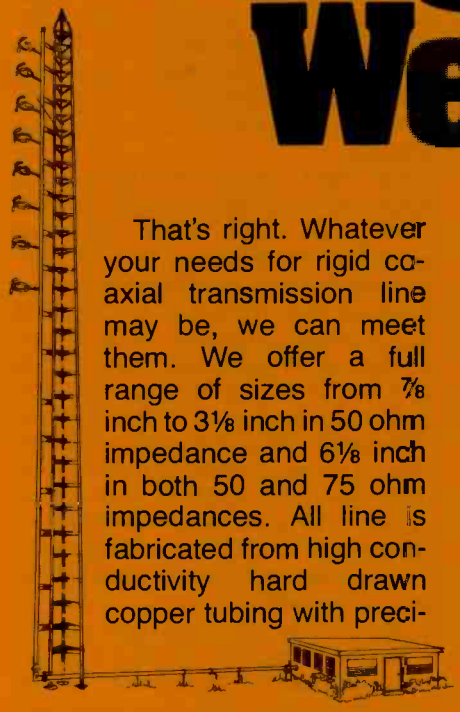
Major omission

Your recent issue dealing with the history of and major milestones in radio and TV was quite enjoyable. There was, however, one major omission.

In 1959, a concept was developed at WJBC in Bloomington, IL, that changed the sound of radio forever. It was the tape cartridge system developed by Automatic Tape Control and marketed at that time by Collins Radio Company. Of course, ATC went on to become a leader in broadcast automation as well, before being purchased by Gates Radio. But, for the wisdom of Vern Nolte and the engineering genius of Ted Bailey and Jack Jenkins, radio as we know it today might not exist.

At present, Nolte owns and operates the WROK stations in Rockford, IL. Ted Bailey is taking it easy these

Rigid line? We have it.



That's right. Whatever your needs for rigid coaxial transmission line may be, we can meet them. We offer a full range of sizes from 7/8 inch to 3 1/8 inch in 50 ohm impedance and 6 1/8 inch in both 50 and 75 ohm impedances. All line is fabricated from high conductivity hard drawn copper tubing with precision machined, pin-type Teflon dielectric insulators. EIA bolt type flanges and connectors are fabricated to EIA standards and US Mil specifications. You have the option of ordering in 20 foot sections or any special length with flanges on both ends, one end or without flanges. A full line of matching components, hardware and installation accessories are also available.

Special assemblies? Absolutely. We design and build rigid line terminations, power dividers, FM Broadcast antennas, low pass filters and directional couplers.

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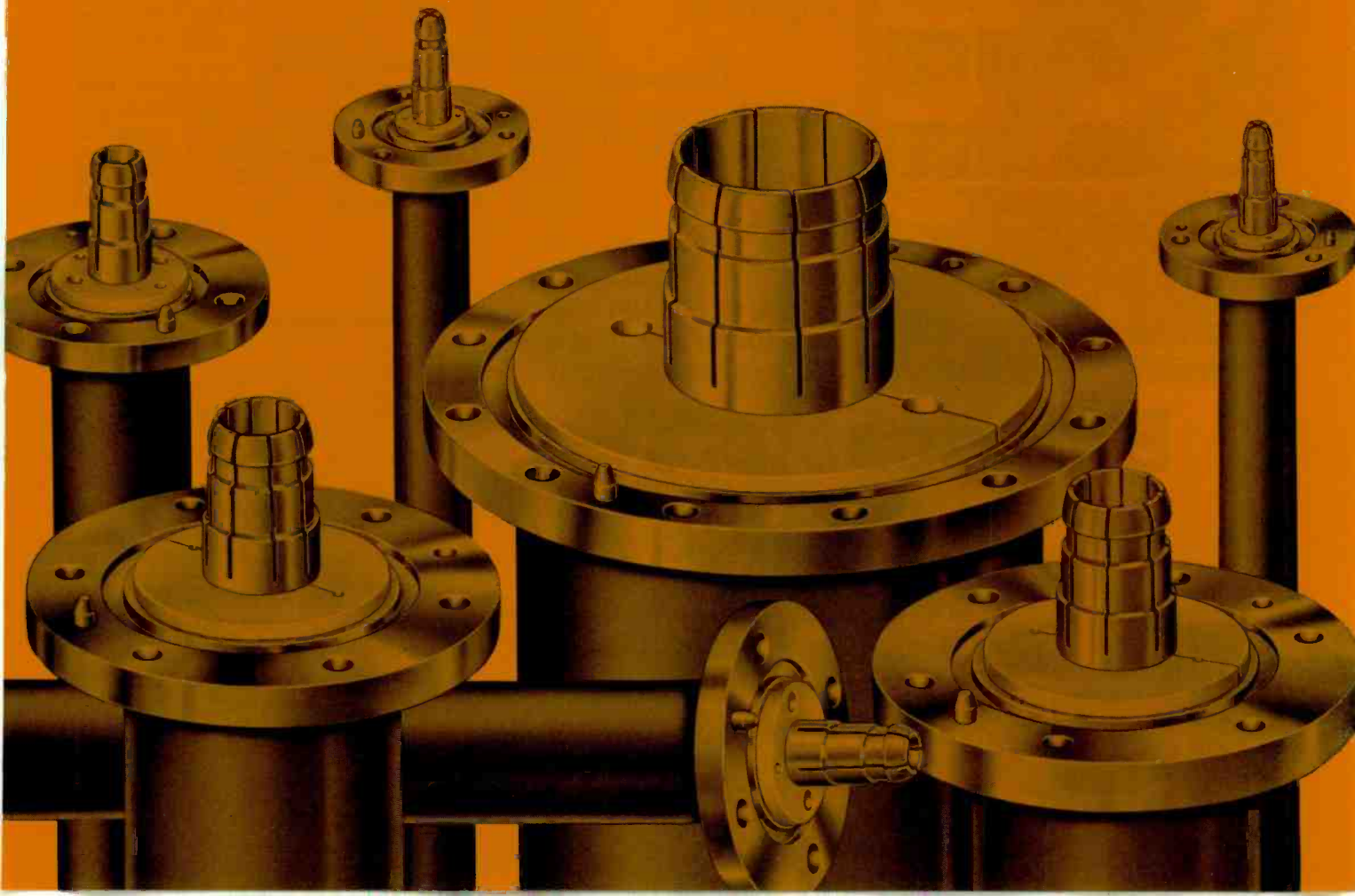

days, and of course, Jack Jenkins is president of ITC, where many of the former ATC crew still are turning out high-quality tape machines.

David S. Wolfenden
WJBC-WBNQ
Bloomington, IL

Who invented regeneration?

I have found your anniversary issue extremely interesting. However, the chart on pages 60 and 61 notes that "DeForest and Armstrong independently discover regeneration." I believe that records are in error on this point.

It may be a small matter, but I believe the facts are that DeForest was not even aware of the principle of regeneration when Howard Armstrong applied for patent rights in 1913. Historically, I believe that DeForest attempted to acquire the rights of this invention and fought to do so in many years of litigation. *The truth of the matter is that Lee DeForest did not even understand how a triode tube operated.* He was unable to make the thing amplify without it "howling," and when Armstrong discovered the principle of feedback (regeneration) he was able to give to the world its first tube amplifier. He also gave the world its first tube oscillator. These are the only two circuits that are possible. Lee DeForest was unable to give the world either of the circuits.

The first correct explanation of detection and amplification in the Audion or triode tube was first published in *Electrical World*, December 12, 1914: "Operating Features of the Audion," by Howard Armstrong. Another article appeared in *Proceedings*, Radio Club of America, April, 1915, titled "The Regenerative Circuit," by Howard Armstrong. The first full explanation of regenerative-oscillating circuits was published by Armstrong under the title "Some Recent Developments in the Audio Receiver," *Proceedings*, Institute of Radio Engineers, September, 1915.

Apparently, the pressures of the DeForest litigation, the RCA Company acquiring his "invention" of the superhetrodyne, and unlicensed use of FM patent rights became too much to bear. The pressures may have pushed him off the 13th story floor on January 31, 1954, when he committed suicide.

Best documentation shows that regeneration, superregeneration and superhetrodyne, and FM (with all the associated circuits of amplifiers and oscillators) belong to Howard Armstrong!

Stanley Adams
WLJT-TV
Lexington, TN

Historical photo sources

I don't know when I've enjoyed a magazine as much as your May 1979 issue with all the historical articles. Just fascinating!

I'm in the process of putting together a book on the early days of radio and TV in the Pacific Northwest and am looking for illustrations. Most are available locally, but I would like to ask **BE's** sources for help.

Thanks very much. By the way, I've been a reader of **BE** since 1960 and in broadcasting since 1943.

David Richardson
Eastsound, WN

Editor's note: Sources for May issue sent separately to you. Good luck on your book. □

For KVII-TV in Amarillo and KVIA-TV in El Paso ... the ideal choice was MNC-71CP!

Marsh Media Ltd. looked long and hard when they set out to outfit their local ABC-TV affiliates in Texas with lightweight, portable ENG/EFP cameras. No simple task, considering the many video cameras currently on the market and the numerous claims made on their behalf.

In the final analysis — as Marsh Media Ltd. management well knew — dependable dealer service and full manufacturer/distributor support, with readily available parts and liberal warranty terms, were just as important as the particular features of the camera.

Marsh Media chose to go with Victor Duncan, Inc., the regional dealer for Cinema Products' line of *NE*C portable ENG/EFP video cameras.

"From an engineering standpoint, Cinema Products' backup program and Victor Duncan's dependable service completely free our hands from what has previously been a problem area," says Bill Canady, Marsh Media's Director of Engineering.

KVII-TV and KVIA-TV got MNC-71CP reliable, broadcast-quality performance at a reasonable price, backed by an unprecedented one-year warranty and round-the-clock service.

Can you afford less?

"Our MNC-71CP cameras have seen considerable action since we've taken delivery of the three cameras initially ordered by Marsh Media," says Dan Garcia, Assistant News Director, KVII-TV. "The problems have been virtually nil, and with a little proper training, adjustments can be made in the field with the greatest of ease."

Alan Sheffield (right), Victor Duncan's Director of Video Sales and Rental, seen with Dan Garcia of KVII-TV during a recent video equipment seminar held at Duncan's Dallas headquarters.

"User training and preventive maintenance programs are the backbone of Victor Duncan's total commitment to the video industry," says Sheffield.

For further information, call toll-free: 800-421-7486.

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FCC update

August, 1979/By Howard T. Head
A.D. Ring & Associates

More radio stations--One way or another

The FCC is studying a wide range of proposals all aimed at making room for more radio broadcast stations. Comments have just been filed in the Clear Channel AM Case (which with its predecessors goes back to 1945) in which the commission is considering establishing a 50 kW power limitation on the clear channel stations while adding secondary (Class II) stations which would be permitted to operate during nighttime hours, protecting either the groundwave or the skywave service area of the clear channel stations.

Other approaches being studied are a possible upward extension of the AM band to either 1800 kHz or 1860 kHz, as well as a possible reduction of the carrier frequency separation in the AM band from 10 kHz to 9 kHz. Although this latter step would increase the number of assignable frequencies by about 10%, it would increase adjacent channel interference and would require the readjustment of large numbers of directional and non-directional antennas.

In FM, attention is being concentrated on proposals to reduce the present 200 kHz carrier frequency separation to 150 kHz or 100 kHz. Proposals also have been made to simply relax allocation standards to provide increased channel loading. The proposal to reduce channel frequency separation is critically dependent on the adjacent channel performance of receivers, and the commission is preparing to award a contract to study FM receiver response.

Commission to study television horizontal and vertical blanking problems

The FCC has instituted a detailed inquiry into the problems arising from an increasing amount of television program material in which both horizontal and vertical blanking exceeds that permitted by the television technical standards. Attention was attracted to the problem primarily as a result of the use of lightweight cameras and tape recorders for ENG operations, but troubles also have appeared in the use of other program material.

Two fundamental problems are presented. First is the need to assure that nothing happens in the horizontal and vertical intervals which might impair picture quality, and second is the matter of wasted picture space of the underscan, which is substantial.

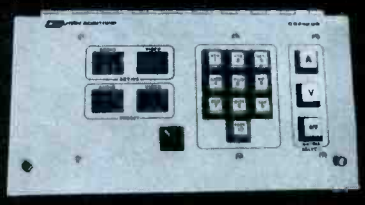
SWITCHERS DON'T MAKE MISTAKES...PEOPLE DO

That's why we've designed a whole new series of human-engineered control panels that are setting new standards for goof-proof switching.

Once you've designed audio and video routing switcher matrices as transparent and reliable as ours, there's not much room for further improvement at that end. However, there has been a need for improvement in the control end--particularly where operators must make accurate, quick-decision source selections. The panels described below are designed to eliminate the confusion too often associated with routing switcher control, while providing the control flexibility so important to present-day signal routing requirements.

For installation simplicity, each of these new panels connects directly to the system party line via loop-through coax connections. They provide continuous status readout and can be encoded to permit each input (or output) to be addressed by its name (VTR-2, CAM-4, etc.) rather than by an arbitrary matrix number.

We are also prepared to supply custom variations of these panels to suit your exact requirements.



CSP-200

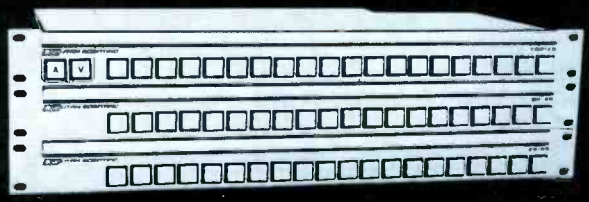
Permits audio and/or video selection--including simultaneous A/V switching from different sources--on a single output bus. Available in recessed mount, one unit per rack panel and two units per rack panel versions

CSP-300/R

Full Matrix Control Panel. Permits audio and/or video switching on any selected bus. Encoded version can be restricted to switch only on specific pre-assigned busses. Rackmount or recessed.

CSP-10

Controls and statuses ten busses (20 with Program Select switch installed). Provides separate audio and video switching and statusing.



CSP-20/CX-20

Permits button-per-source input selection on assigned bus. Basic panel accommodates 20 inputs. Expansion in 20-button increments is provided by adding CX-20 slave panels. Permits fast single-stroke selection of any input. Button lamps provide both audio and video status from refresh memory while *Only* buttons permit selective audio or video switching.

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The commission has invited comments on all aspects of the problem, but in the meantime has suspended the enforcement of the rules relating to the horizontal and vertical blanking until the matter is finally resolved.

"New improved" television receivers in the works

The commission has awarded a $350,000 contract for an improved television broadcast receiver intended to provide improved noise figure and reduce spurious responses. This represents a further extension of similar work undertaken by Texas Instruments (TI) and reflected in a prototype receiver delivered by TI to the commission about a year and a half ago.

The TI receiver got rid of IF related spurious responses by changing the intermediate frequency from the present 45.75 MHz to 346.125 MHz. New devices and circuits were employed to improve selectivity and reduce intermodulation, but the commission concluded that still further improvement was desirable. The new contract also places emphasis on reducing the noise figure, especially in UHF where a value less than 10 dB is sought.

Delivery of this second generation improved receiver is expected near the end of next year for the commission's laboratories to evaluate its performance.

Commission studies proposals for low power television

The FCC is considering various proposals to permit television transmission with as little as a few watts of radiated power. In some instances the proposals would amount to little more than permitting VHF and UHF television translators to originate their own programming, while in other cases operation with substantial powers and heights are involved. A number of questions are presented by these proposals, including facilities for programming origination and possible interference to existing regular stations. The commission's rules now permit regular station operation on assigned channels with radiated powers as little as 100 W (no height limits are specified), but little advantage has been taken of the facilities now provided by the existing commission's rules.

Short circuits

The FCC is preparing to institute "instant licensing" by mailing a restricted permit application to the commission...The commission has authorized tests of AM stereo by four more stations...The commission has received a report from Georiga Tech recommending substantial reductions in the commission's day-to-day technical regulation of broadcasting...Tests are disclosing fairly substantial image interference to television reception on Channels 55-69 from land mobile operation in the 806-890 MHz band, formerly assigned to television channels 70-83...The commission has authorized five special 1000 W UHF television translators to rebroadcast Spanish language programming...Dr. Nina Cornell, chief of the FCC Office and Plans Policy, and Dr. Stephen Lukasik, chief scientist, have proposed to a congressional committee that the radio frequency spectrum be sold at auction.

NOW HEAR THIS! IT'S NEW! IT'S FABULOUS!

Listen to what's missing from TerraCom's new digital program channels.

The noise is missing. Now, with TerraCom's THP-2T20 you can send high fidelity digital program channels without the noise and crosstalk of analog systems. And none of the "sizzling" sound caused by digital companding (because the THP-2T20 uses analog companding).

Send stereo or up to four highest quality channels simplex — or four channels duplex. They can go on either a T1 line or can be multiplexed above video baseband in a microwave link — such as our TCM-6 series all-bands tunable microwave radio.

These four channels are provided in a 1.544 Mbps digital data stream. They have a signal-to-noise ratio of better than 75dB at full output. Interface options are available to meet individual requirements. And for portable or restoration uses we offer a weatherproof enclosure.

Another version, the THP-2T25 provides six simplex channels, or four duplex channels, at a 2.048 Mbps data rate . . . with the same high quality performance.

So hear what you've been missing with your own ears. Call us at TerraCom (714) 278-4100, or write 9020 Balboa Avenue, San Diego, CA 92123

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DIGITAL PROGRAM SYSTEM

the noiseless revolution

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industry news

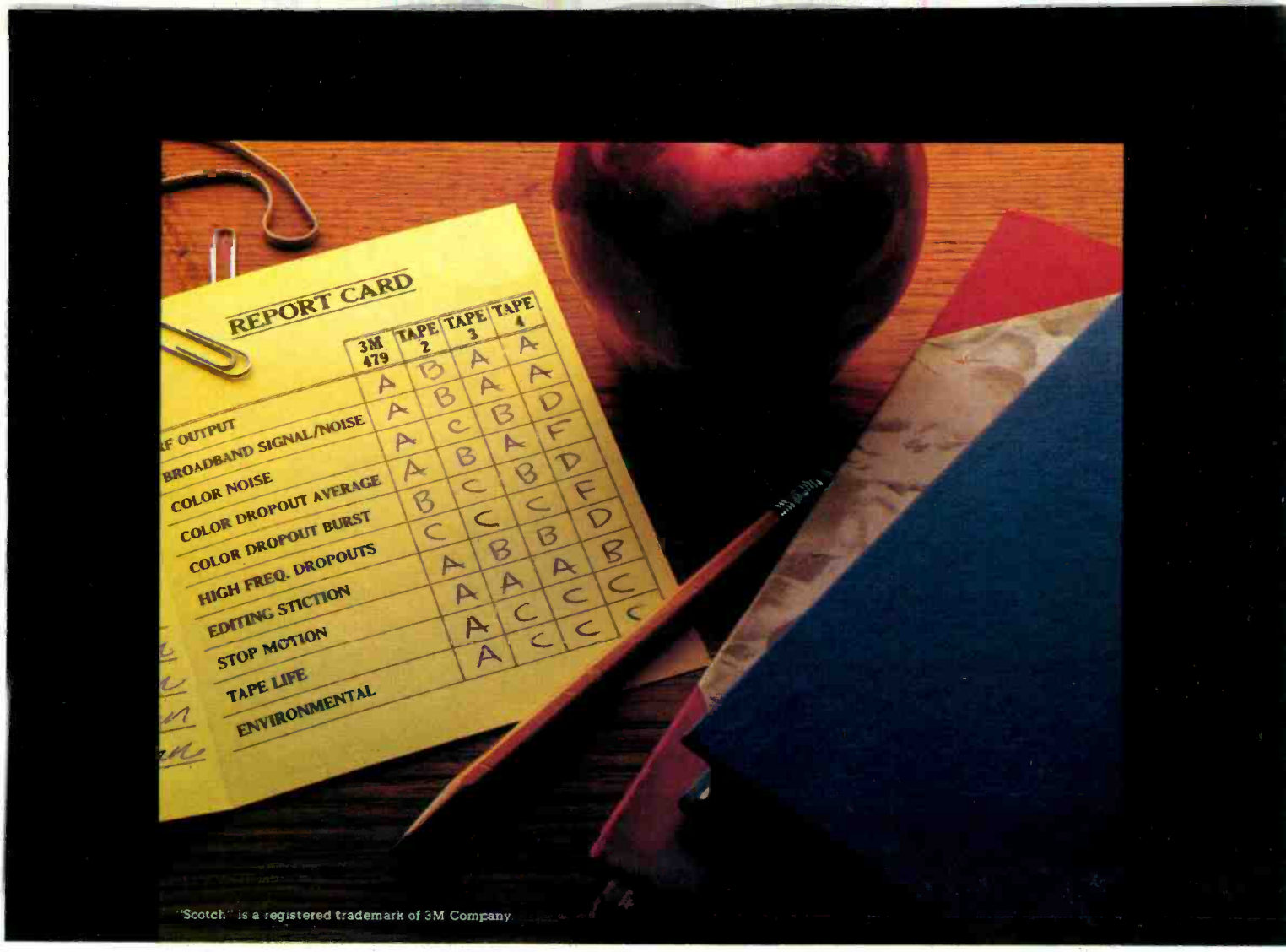
August 3 was the 50th anniversary of the passing of Emile Berliner, who invented the microphone in 1877.

FCC refuses to conduct AM stereo studies

Belar's motion that the FCC Office of Science and Technology conduct the further studies and tests of the five AM stereo systems under consideration has been denied by the FCC. Belar (manufacturer of one of the systems) made the motion on November 24, 1978.

Magnavox and Motorola (manufacturers of two of the other systems), and the National Association of Broadcasters filed comments on Belar's motion. Magnavox agreed with Belar in principle and added several specific requests; Motorola and the NAB opposed Belar's motion.

"It is our view that this (expeditious conclusion) may be best accomplished if the proponents conduct the various tests and furnish the requested information rather than encumbering the FCC's Labora-



IN A TEST OF ONE-INCH VIDEO TAPES, WE ACED OUT THE COMPETITION.

When we tested the top four brands under strict lab conditions, the overwhelming performance leader was Scotch 479 Master Broadcast Video Tape. In fact, we came out on top in all ten performance categories.

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3M

"FINALLY THERE'S A ONE-INCH AS WELL UPSIDE DOWN

VIDEO RECORDER THAT WORKS AS IT DOES RIGHT SIDE UP."

DAVID HALL, OPRYLAND PRODUCTIONS

Opryland Productions is one of the largest video production houses east of the Mississippi. The company's facilities have been used for shows as varied as "Nashville on the Road," "Big Ten Basketball," and "Dance in America."

David Hall, General Manager of Opryland Productions, has been using the Sony BVH-1000 video recorder for close to two years and two BVH-500 portable recorders for about six months.

"Sony one-inch equipment has expanded our capabilities considerably," says Hall. "With a BVH-500, we were able for the first time to get broadcast quality tape on a roller coaster for an upcoming special.

"We also took the BVH-500 on a ferris wheel and in a helicopter to tape 'Superstars at the Ohio State Fair.' It performed as well as they did.

"Now we're using Sony on almost all shows we tape in the field. The big advantages are portability and cost. Durability, too. Sony even bailed us out when we were taping a quad production and our equipment broke down. We used Sony to finish the job, then transferred the results to quad. The client was more than satisfied.

"And when the Dominican Republic asked us to tape the visit of Pope John Paul II, we couldn't have done it without our Sony video recorders," Hall adds.

"Because they travel so well, we could get down there fast and do a professional job."

Of course. Sony makes a full line of one-inch broadcast equipment, all of it backed by state-of-the-art technology. We have video recorders, cameras, editors, and the BVT-2000 digital time base corrector.

For information, write Sony Broadcast, 9 West 57th Street, New York, N.Y. 10019. Or call us in New York at (212) 371-5800; in Chicago at (312) 792-3600; or in Los Angeles at (213) 537-4300.

Like David Hall at Opryland, you'll be impressed. Even if your productions don't have you going around in circles.

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tory with this additional workload," the FCC said.

The deadline for filing replies to comments on the proposed rule making to permit AM stereophonic broadcasting was June 15.

Engineering Emmys

The Academy of Television Arts & Sciences is soliciting nominations for Outstanding Achievement in Engineering Development. The Blue Ribbon Engineering Panel, headed by C. Frederick Wolcott, is obligated to consider all engineering developments in the transmission, recording or reception of TV which have proven their efficiency during the awards year. Individuals and companies wishing to submit nominations for consideration should write to Richard Krafsur, Awards Administrator, Academy of Television Arts & Sciences, 4605 Lankershim Avenue, Suite 800, Dept. BE, Hollywood, CA 91602.

S-611, S-622 hearings focus on spectrum use

In hearings before the Senate Subcommittee on Communications, FCC Chairman Charles D. Ferris endorsed key broadcast and cable provisions of Senate Bill 611. Ferris said that unlike H. R. 3333 or S-622, S-611 retains fundamental public interest safeguards, "Fairness, political access and equal time obligation are maintained for both radio and television," he said, "and the FCC would continue to promote equal employment opportunities within the broadcast industry."

Ferris said he favors S-611's spectrum fee proposal and its recognition that more flexible tools are needed for assigning the spectrum to individual users.

Nina W. Cornell, chief of the FCC'S Office of Plans and Policy, also commended S-611 for its recognition of the importance of spectrum management and the "need for new tools." In a speech before the subcommittee, Cornell said she felt that most users of the spectrum should pay something for a public resource which was available to some, but not to others.

In other news concerning spectrum use, the US Department of Commerce has requested the FCC's assistance concerning 9kHz channel spacing in preparation for the upcoming Region II (Western Hemisphere) meeting to plan the use of the AM band in the hemisphere. The FCC has issued a notice of inquiry on the subject.

The subcommittee has been holding the hearings to study the merits of Senate bills S-611 and S-622 which are designed to revise the Communications Act.

FCC advised to stop regulating daily how-to

Dr. Richard Moss of the Georgia Institute of Technology recommended that the FCC should stop regulating many of the day-to-day "how-to" technical aspects of broadcast station operations in a presentation before the commission. Instead of regulating logging, performance checks and the qualifications of technical personnel, it should place more emphasis on the actual characteristics of the signals stations broadcast (frequency and effective radiated power), he said.

The recommendations were in-

cluded in a report prepared by the Communications Technology Group of the Electronics Technology Laboratory at Georgia Tech under FCC contract. Contact Karl Brimmer, FCC, 1919 M St. NW, Washington, DC 20554, (202) 653-5940 for copies of the report.

ARC petition denied

Atlantic Research Corporation's (ARC) petition for amendment of the rules to permit the transmission of digitally coded program related information in the visible portion of broadcast television signals has been denied by the FCC.

Given the appropriate terminal equipment, ARC's system concept claims to provide for a variety of ancillary program services, including widespread printing of subtitles for those with hearing difficulties, educational and instructional involvement, and supplementary information on performers, news items and advertisements. To utilize the "Data-Dot" system, a detector and other terminal devices must be used. The detector is a photo-transistor enclosed within a case about ¾-inch in diameter. A detector is attached and held on the television screen by a small suction cup connected to the detector case and can be used on standard size TV screens.

The Association of Maximum Service Telecasters (AMST) and CBS opposed the petition, contending that the proposed system would result in picture degradation.

The FCC said that in addition to the annoyance factor of the blinking dot image to viewers not equipped with a decoder, it was brought out that the deleted portions of the video program signal, caused by Data-Dot, might contain essential information including that of superimposed titles or captions.

CBS pointed out that the system's proposed transmission rate of 60 bits per second was relatively low and inefficient compared with the megabit per second rates of other systems under development for ancillary signals, which additionally would not cause picture degradation.

FCC field operations move to Maryland

The Washington, DC, field office of the FCC Field Operations Bureau has moved to The Presidential Building, 6525 Belcrest Road, Box 1789, Suite 901-B, Hyattsville, MD 20788, (301) 436-7590.

TDS-ETC acoustical measurement method

Synergetic Audio Concepts recently sponsored a 4-day seminar at the Filmways-Heider Studio B in Hollywood on the TDS-ETC method of acoustic measurement; TDS standing for a view of energy vs frequency (normal frequency response) and ETC standing for a view of energy density vs time. The technique allows real time viewing of the anechoic frequency response (direct sound), the frequency response of the individual reflections, the direction from which each spectrum came, its time smear, time interval and total density. The final day of the seminar included a trip to Chips Davis's Live End-Dead End (LEDE) control room in Las Vegas.□

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See what you're programming, what's on air too, on CRT — black & white or color.
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business news

Making moves: Siegel, Singer, Hitachi

Siegel Electronics has moved from their New York location to San Diego. The new address is P.O. Box 33421, San Diego, CA 92103, (714) 295-4995.

Singer Products has moved to 875 Merrick Avenue, Westbury, Long Island, NY 11590. Major sales divisions to be located in the new headquarters include automotive, gas and industrial; industrial and consumer electronics; communications and broadcast systems; special products/purchasing division; and battery division.

Hitachi's new national headquarters and eastern regional office opened June 1. Ryozo Nagahama, president, was on hand for the open house celebration. The facilities were designed to accommodate the rapid expansion of Hitachi in the US video market. The 11,000 sq ft facility is a part of a 7-region system, each with its own warehouse and engineering facility. It is located at 175 Crossways Park West, Woodbury, NY 11797.

WQXR first to broadcast with digital audio

WQXR Radio, New York, made broadcast history June 7 when it became the first US commercial station to broadcast using a digital audio source. Using a Sony PCM-1600 Digital Audio Processor, four digitally recorded arrangements were played from 10:05—11:00 AM.

"In digital recording," Schulhof explained, "the sound signal is sampled almost 50,000 times a second and then broken into a computer code. This computer code actually represents the music in numbered information instead of sound wave patterns used in conventional analog recordings. Because of this digital technique,

ADDA Corporation sold its 100th VW-1 Digital Frame Synchronizer to NBC. Marking the occasion are (from left) Michael W. Tallent, vice president/engineering; Jesse Blount Jr., vice president/marketing; Aman Khawaja, manufacturing manager; and William B. Hendershot III, president. David Reeder, final test technician, is checking out the VW-1.

when the computer is set for playback, the numbers are translated back to music and information is heard exactly as it was first recorded, without tape hiss or distortion. The Sony system has been designed specifically for music, and we can expect a dynamic range almost 200 times better than the best tape recorders available."

Zaven "Doc" Masoomian, chief engineer for WQXR, described the sound as fantastic. "Digital is the way to go, there's no question about it. The digital system exceeds the performance of any FM transmitter. This new technology is definitely the wave of the future."

Roger Pryor, general manager of the Sony Digital Audio Division, helped implement the WQXR experiments and reflected on its significance. "I think the future of the broadcast market," he said, "is ready now to upgrade its audio processing—and the natural upgrade is to digital. The interest is just starting to form as the whole system is upgraded to handle the increased audio capability. We would like to be at the beginning of this formation of high audio quality; we're planning tests through FM and television simulcasts to prove that digital recording can be advantageous to TV and FM audiences. We are now analyzing the major markets to continue digital broadcasts to let the public experience digital sound in their own homes."

SALES/CONTRACTS

Ampex

ABC Sports will utilize Ampex professional video equipment worth more than $5 million during its coverage of the 1980 Winter Olympics at Lake Placid, NY. Approximately 21 cameras will be used to provide coverage.

Bosch Fernseh

Sales of Bosch Fernseh's BCN range of 1-inch VTRs continue to rise rapidly. In April over 100 orders were received for BCN units ranging from fully equipped BCN production VTRs down to BCN 5 portable cassette machines. The fully automatic random access 32 cassette studio machine, the BCN 100, has been in strong demand since its introduction at Montreux.

Carnaby Square

Carnaby Square Teleproduction announced the completion of construction on their second mobile videotape production vehicle. The 28-ft Winnebago houses one of the two RCA TH-100s Type C format 1-inch) video recorders. The second 1-inch machine is stationed in the Carnaby Square studio/post production facility along with the 2-inch recorder.

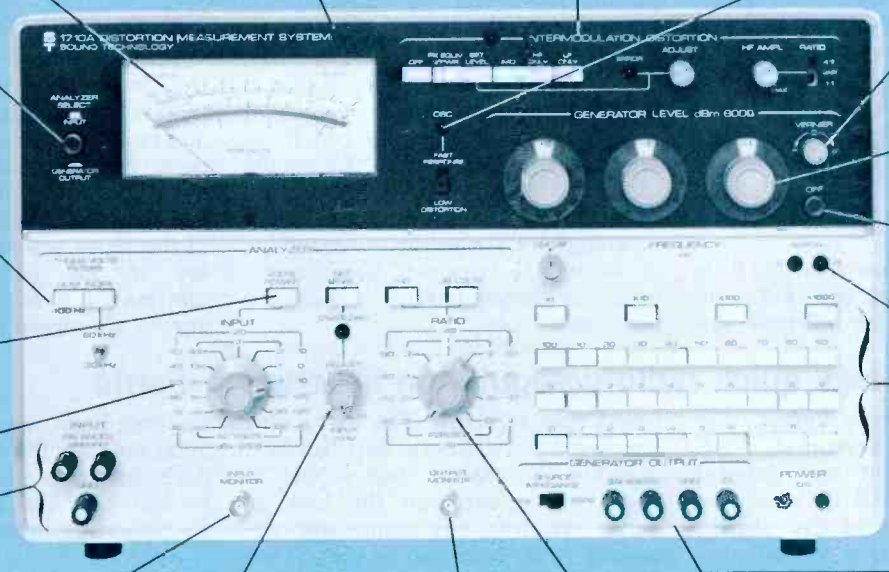
Gannett

The acquisition of Combined Communications by Gannett has been approved by the FCC. The transaction is the largest in broadcast history.

MCI & EMI

MCI and EMI have entered into a licensing agreement under which MCI will manufacture digital tape recording equipment, based on technology developed by EMI. A prototype of the first machine, the MCI JH-220 was shown at the Association of Professional Recording Studios Exhibition in London. □

Here's how useful a distortion analyzer can be



Two of the above features are so outstandingly valuable that we especially invite your attention to them.

One is the fast, easy measuring you get with pushbutton-selected distortion-measuring circuits (signal source and measuring circuits are simultaneously selected with the **same** pushbuttons). Pushbuttons make it so simple to measure quickly and to repeat measurements.

Secondly, you can drive virtually any type of circuit from the signal source output — whether balanced, unbalanced, off-ground or whatever. That's because the signal source output circuit is fully **isolated and balanced.**

There is no output transformer to introduce noise or distortion.

Besides these outstanding conveniences, you can have the Sound Tech 1710A with an option that enables you to measure **intermodulation distortion.**

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association news

National Association of Broadcasters

1771 N Street, NW
Washington, DC 20036

Full-time AM service study urged

The NAB has urged the appropriation of funds in fiscal 1980 to enable the FCC to conduct a study on ways to expand full-time service to all AM radio stations. The appeal was made by Donald Zeifang, NAB senior vice president for government relations, in a letter to Ernest Hollings, chairman of the Senate Subcommittee on State, Justice, Commerce and Judiciary.

Zeifang noted that the NAB is committed to assist the FCC "in pursuing the goal of full-time authorization for all AM stations, thereby ending the perplexing dilemma presented by daytime-only stations that are authorized to operate only between dawn and dusk." The NAB is concerned that if funding is not provided soon that valuable time will be lost which "is particularly critical since the results of the study will no doubt be essential to the development of a meaningful US position at meetings of Region II (western hemisphere) countries scheduled to commence next year."

NAB opposes AM-FM divestiture

The NAB has asked the FCC to rescind the provision of possible divestiture on its approval of all applications for new and transferred AM-FM station combinations. The action affects applications filed after June 7 and makes the grant of these applications conditional on the outcome of a rulemaking proceeding not yet begun.

CB retransmissions

The National Association of Broadcasters (NAB) has asked the FCC to permit Citizens Band transmissions to be rebroadcast or at least those containing emergency, traffic, weather or road information vital to public safety. The relaxation of the rules would allow broadcasters to air current and timely information to avoid potentially dangerous situations in a community.

Krasnow requests quick radio deregulation in letter to Ferris

In a letter to Charles Ferris, FCC chairman, Erwin Krasnow, NAB senior vice president and general counsel, stated "NAB believes the commission possesses the ability and knowledge to issue immediately a radio deregulation notice of proposed rule making." The letter also expressed the concern that the FCC expedite the matter and noted "it does not appear that the task at hand...requires any significant degree of new discussion or associated delay. By now the commission and the broadcast industry have well in mind not only the areas where radio deregulation is needed most urgently, but also the procedural means for achieving these goals."

Thurston says informed broadcasters need not fear new technology

In an address before the Television Public Affairs Programming Conference held recently in Washington, DC, Donald Thurston, board chairman of the NAB, told television executives that new technologies pose no threat to the informed broadcaster. Thurston noted that television sets of the future will be all-purpose home terminals and that this "marriage of communications and computers" will pose a threat only to those who make no attempt to comprehend technological advances of the future.

The conference was designed to help television broadcasters improve their public affairs programming and included sessions on scheduling and promotion, attracting large audiences, ascertainment, public broadcasting, future technology, networks and public affairs programs, and special interest and minority groups.

NAB responds to NTIA cable retransmission petition

Responding to a petition filed with the FCC by the National Telecommunications and Information Administration, the NAB said it could not support or oppose that proposal until the FCC included the retransmission consent requirement that could consolidate major cable petitions and proceedings at the commission. The NTIA petition asks that the FCC amend its rules relieving cable TV operators from all regulations governing retransmission of non-network broadcast programs by subjecting such retransmissions to a consent requirement.

Popham speaks on off-air taping for educational purposes

James Popham, assistant general counsel of the National Association of Broadcasters (NAB), remarked at a conference on off-air taping for educational purposes that not enough attention has been given to the protection of the local television stations when off-air recording has been discussed.

Popham said there is an increase in educational taping of local programming. Broadcasters are concerned about off-air taping because of their need to retain control of the uses of their works, to protect themselves against misuses of their programming and to maintain the rights of their employees and other parties connected with their programming. □

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The CL42S reaches farther and rejects more ambient noise than any other shotgun of its size ever made. Our exclusive line bypass port makes it more directional at low frequencies so you won't have to sacrifice frequency response when you use it on a boom. Diffraction vanes maintain high-frequency directivity to preserve uniform frequency response if the "talent" gets a little off-mike.

Phantom or AB powered, the CL42S comes complete with windscreen, shock mount, carrying case and handle for hand-held applications. And it's rugged.

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The CH15S is actually more directional than a mini shotgun mike – in a package that's only 4 inches long that weighs less than 6 oz. Specially designed for boom and fishpole use in TV and motion picture studios, but equally at home wherever working space is small and you have need for a compact, highly directional microphone.

Compatible with phantom or AB power, the CH15S comes complete with windscreen, shock mount and carrying case. And, this microphone is rugged.

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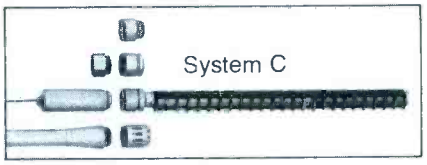
Electro-Voice backs up these two microphones with the only unconditional warranty in the business: for two years we will replace or repair your CL42S or CH15S microphone, when returned to Electro-Voice for service, at no charge – no matter what caused the damage!

We can do this because we build these microphones to meet our standards for performance, ruggedness and durability. We accept nothing less, and if you're a professional, buying a professional quality microphone, you shouldn't either.



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association news

NRBA

National Radio Broadcasters' Association

1705 De Sales Street, NW
Washington, DC 20036

Gabbert says Senate bills are too weak

James Gabbert, president of the NRBA, in comments made recently before the Senate Communications Subcommittee hearings said that communications bills S-611 and S-622 "do not go far enough to take the government out of the day-to-day regulation of radio." Gabbert restated the association's objection to any form of fee or tax on broadcasters, calling it a "dangerous principle which can be perverted...to bring pressure on the industry if broadcasters are not hewing to a particular party line." Though government regulation of the technical aspects of broadcasting is "appropriate," Gabbert urged the subcommittee to "address itself to a Bill which would completely deregulate radio."

NRBA convention set for Washington

The sixth annual conference and exposition of the NRBA will be held October 7-10, 1979 in Washington, DC. Workshop sessions include ton, DC. Workshop sessions include management, programming, engineering, sales and promotion. More than 90 suites as well as a large exhibit hall will contain the latest broadcast products and services. For further information, contact the NRBA at the above address.

Trivers award goes to Syracuse student

The 1979 Julian N. Trivers Internship Program, sponsored by the NRBA, has been awarded to Susan Stolov, a broadcast journalism/political science honors student at Syracuse University's SI Newhouse School of Public Communications. Stolov produces a weekly program for the campus radio and cable television stations. The award was established by the NRBA in memory of the late Trivers who was instrumental in the founding days of the association when it was known as the National Association of FM Broadcasters (NAFMB).

NRBA releases comments on HR-3333

The NRBA recently released comments on HR-3333 in which six important points were made:

- NRBA is in favor of the overall approach of HR-3333, with certain exceptions and wholeheartedly supports the passage of the proposed rewrite bill.
- NRBA is absolutely opposed to a spectrum fee. The attempt to make this a trade-off for the deregulation of radio is a highly dangerous principle.
- NRBA is against the principle of unlimited ownership of broadcast properties by a single owner as the policy would provide the basis for possible misuse of economic strength by a broadcast monolith.
- That part of HR-3333 which deals with license revocation for violation of federal laws seems to us to be a form of double jeopardy.
- NRBA strongly urges that the petition to revoke clause in HR-3333 be revised to establish "strict governing standards" to be applied to petitions to deny in order to eliminate harassment, frivolous petitions and purely self-serving attacks against radio broadcasters by irresponsible groups or individuals.
- NRBA is opposed to non-commercial educational stations selling commercial time.

The association believes that a new communications act will enable broadcasters to deal more objectively and more powerfully with any ill-founded station proliferation proposals. □

meetings, events&seminars

August 20-21—The Society of Cable Television Engineers will hold a technical meeting (with exhibits) at Logan Airport Hilton Inn in Boston. Registration includes the sessions, workshops and a certificate of completion for attendance. Advance registration is $75 for SCTE members, $100 for non-members. For more information, contact the Society of Cable Television Engineers, Dept. BE, 1100 Seventeenth Street Northwest, Washington, DC 20036, (202) 659-2131.

September 9-12—The NAB will sponsor a radio programming conference to be held at Stouffer's Riverfront Tower, St. Louis.

For more information, contact: NAB, Dept. BE, 1771 N Street NW, Washington, DC 20036.

September 10-12—Engineering/management directional antennas seminar will be held in Cleveland, OH. For more information, contact NAB, Dept. BE, 1771 N Street NW, Washington, DC 20036, (202) 293-3533.

September 24-November 30—The World Administrative Radio Conference (WARC) will open on September 24, 1979. Organized by the International Telecommunication Union, it will last 10 weeks and will be held at the Geneva International Conference Center and in the ITU headquarters building. The purpose of WARC-79 is to revise, harmonize and bring up to date the international regulations applicable to all radio communication services. As a governmental conference, the decisions made will have the force of a treaty. For more information contact Union Internationale Des Telecommunications, Place des Nations, 1211 Geneve 20, (022) 99 51 11.

October 7-10—The National Radio Broadcasters Association (NRBA) will hold their Sixth Annual Conference and Exposition at the Washington Hilton hotel in Washington, DC. For more information contact the National Radio Broadcasters Association, Suite 500, 1705 DeSales St., NW, Washington, DC 20036.

October 21-26—The 121st Technical Conference and Equipment Exhibit of the Society of Motion Picture and Television Engineers (SMPTE) will be at the Century Plaza Hotel in Los Angeles, CA. The conference will feature five days of technical sessions on motion pictures and television. The SMPTE equipment exhibit, beginning Monday, is expected to have more than 250 booths of equipment with many of the major film and video equipment manufacturers participating. For additional information write SMPTE Conference, Dept. BE, 862 Scarsdale Ave., Scarsdale, NY 10583.

October 27-November 3—Telemark '79, the 2nd Exhibition of Installations and Equipment for radio/television stations and the 2nd Borsa Programmi for producers and distributors of programs for radio/television will take place at the Exhibition Park of Novegro, Airport Milan/Linate. For more information, contact COMIS Lombardia, Via Boccaccio, 7 - 20123 Milano, Italy, Telephone (02)80 92 81.

October 29-31—Scientific Atlanta's 5th annual Satellite Earth Station Symposium will be held at the Marriott Hotel in downtown Atlanta. The meeting is offered to executives and technical managers of cable

Meetings, events & seminars

systems, broadcasters and other communications firms. The symposium will feature the experiences of communications firms now receiving satellite-relayed programs and signals by the use of satellite earth terminals. For additional information contact Kenneth F. Leddick, broadcast marketing manager, Scientific-Atlanta, Dept. BE, 3845 Pleasantdale Road, Atlanta, GA 30340.

November 2-5—The 64th Technical Meeting and Exhibits fall conference of AES will be held at New York City's Waldorf-Astoria Hotel. Convention chairman is Eric Porterfield, Columbia Records, 51 West 52nd Street, New York, NY 10019, (212) 975-4461.

November 11-15—The National Association of Educational Broadcasters will hold their *55th Annual Convention* at the Conrad Hilton in Chicago. Highlights include the 2nd Annual Video Fair, a preview of programs being distributed to public broadcasting.

For more information, contact: National Association of Educational Broadcasters, Dept. BE, 1346 Connecticut Avenue NW, Washington, DC 20036.

November 26-27—Video Rights '79 is being held at the Cafe Royal, London, under the chairmanship of John Johnson, program consultant, and professional broadcaster in sound and vision. It was designed to examine the solutions to the rights tangle. For more details, contact Agneta Moe, Nord Media Ltd., Dept. BE, 37 New Bond Street, London W1Y 9HB, England, 01-629 9381., telex 25567.

November 27-29—The National Telecommunications Conference will be held at the Shoreham-Americana Hotel in Washington DC. NTC '79 is co-sponsored by the Communications Society, Aerospace and Electronic Systems Society, and Geoscience Group. For more information contact Dr. Thomas P. Quinn, chairman, Technical Program NTC '79, Dept. BE, P.O. Box 31031, Temple Hills, MD 20031.

April 13-16, 1980—Las Vegas will be the site of the 1980 convention of the National Association of Broadcasters. For additional information contact NAB, Dept. BE, 1771 N St., NW, Washington, DC 20036.

April 28-30, 1980—ISCAS/80 will be held at the Shamrock Hilton Hotel, Houston, TX. Workshops will be conducted by various technical committees of the Circuits and Systems Society immediately preceding the symposium on April 27. The symposium, sponsored by the IEEE Circuits and Systems Society, will be the 13th annual international conference devoted to all aspects of the theory, design and application of circuits and systems. Authors may contribute either a full paper, summary or abstract for presentation at the symposium after July 1, 1979, to the technical program chairman, Professor T. A. Bickart. For additional information contact T. A. Bickart, Dept. of Electronic and Comp. Engineering, Dept. BE, Syracuse University, Syracuse, NY 13210.

September 20-24, 1980—The 8th International Broadcasting Convention, IBC 80, will be held at the Metropole Conference and Exhibition Center, Brighton, United Kingdom. Further information can be obtained from the IBC Secretariat, Institution of Electrical Engineers, Savoy Place, London, United Kingdom WC2R OBL. □

people in the news

Radio/Television

The board of directors has named **Frank W. Baker** general manager of Sioux City, IA, public radio station KWIT, FM 90 and director of broadcasting for Western Iowa Tech Community College. Baker had served as operations coordinator for KOSU-FM, a public radio station at Oklahoma State University.

Michael S. Czuczor has been named senior director of New Jersey Nightly News. Czuczor was producer/director and production operational supervisor at WSMW-TV channel 27, Worcester, MA.

Richard Gingras has joined the staff of KCET, channel 28, in the newly created position of director of telecommunications. Gingras was a consultant to the National Telecommunications and Information Administration (broadcasting policy office for the White House).

Gregory Robinson has been appointed production/programming coordinator for the Wisconsin Educational Television and Radio Networks. Robinson was formerly operations manager for WTMJ-TV in Milwaukee.

Joe Young has been appointed sales manager, KARD-TV3 and the Kansas State Network. Young was formerly St Louis Branch manager of TeleRep, a television station representative.

Two pioneers of modern audio recording, **Harold Lindsay** (left) and **Jack Mullin**, got together at the AES convention in Los Angeles. It was Mullin's demonstration of a captured German Magnetophon in 1946 that convinced Lindsay audio recording held the key to Ampex Corporation's survival and growth.

Agencies/Associations

Randolph H. Payne (Australia) has been elected chairman of the board of governors of INTELSAT. Payne, who is director of the overseas Telecommunications Commission in marketing, has been involved with the activities of the board since 1974.

George A. Lawler has been appointed assistant general manager of marketing in COMSATs international communications division. Before coming to COMSAT, Lawler spent five years with IBM as a special marketing representative.

Dr. John L. McLucas, executive vice president for International Communications and Technical Services, COMSAT, has been elected chairman of the board of the Armed Forces Communications and Electronics Association. Prior to his present position with COMSAT he was president of COMSAT General Corporation, a COMSAT subsidiary.


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VPR-2

It's no trick at all to get special video effects from the Ampex VPR-2. This unbelievable helical delivers broadcastable slow motion and freeze-frame pictures with an optional Automatic Scan Tracking System that makes noise bars disappear. Drop in a tape, put your hands on the shuttle knob, and you'll be in total command of the play-back picture, continuously variable from a dead stop to maximum shuttle.

VPR-2 is the second generation of Ampex broadcast helicals and an end product of 20 years of helical recording development. It works in SMPTE Type C format and comes with a built-in, frame-accurate programmable editor that lets you rehearse before doing a "take."

What's left? On-the-air time base accuracy, with the TBC-2 digital time base corrector. No other TBC can put the VPR-2 special effects library on the air. And you might want the SMC-60 Slow Motion Controller with remote tape timer, 60-second clock display and multiple cueing versatility.

The joystick control, bidirectional jog controls and three levels of slow motion range help you squeeze the last ounce of capability from your VPR-2 with AST or your shuttle-equipped VPR-1.

VPR-2. A whole show in one compact one-inch helical VTR. Packaged any way it suits your needs. A magician of a machine for exciting video productions.

AMPEX MAKES IT EXCITING.

Ampex Corporation, 401 Broadway, Redwood City, California 94063 415/367-2011

Circle (230) on Reply Card

People in the news

The FCC announced it has appointed **Edward Luton** as an FCC Administrative Law Judge. Luton has served as an attorney on the Atomic Safety and Licensing Board Panel of the Nuclear Regulatory Commission, where he was chairman of various safety boards considering applications for construction permits and operating licenses for nuclear power plants.

Douglas W. Webbink has been appointed deputy chief of the office of plans and policy where he has been serving as an economist.

Manufacturers/Distributors

Ed Pessara will serve as national video product manager, TDK Electronics. Pessara previously held the same position with US JVC.

Two vice presidents have been elected at Bell & Howell Company: **Robert B. Pfannkuch,** president of the Video Group, and **Jack K. Hudson,** general counsel and corporate secretary.

Stuart Gray is now staff vice president of RCA's SelectaVision VideoDisc Program Research. He was previously vice president of research planning for NBC.

Philips Test & Measuring Instruments has named **Robert Hynes** national sales manager. Hynes was most recently eastern regional sales manager. Also at Philips, **Albert Katz,** vice president and general manager, has resigned.

Sony Video Products has named **Mathew S. Ceterski** national field sales manager for VTR sales and service. He was northwest regional sales manager for the past three years. Also at Sony, **James Coleman Guthrie, Jr.,** has joined the Professional Audio Division as technical field sales manager. Guthrie was manager of the professional products division at Paul Seaman Company.

Sharp Electronics Corporation has named **Elizabeth Sauter** sales administrator of professional products. She will handle sales administration for both Professional Video and Audio/Visual Products.

John A. Poserina has been named controller of Chyron Corporation. Poserina was previously controller and manager of financial analysis at Plessey and is a certified public accountant.

ADDA Corporation's new manager of Technical Service is **Joe Hanf.** He was formerly eastern regional manager, technical service.

Richard Moscarello will be responsible for all sales and service activity at Convergence Corporation as the new vice president of marketing. Moscarello has been northeast regional manager for the past two years.

Paul F. Bugielski has been promoted to microphones and circuitry product manager at Shure Brothers. Bugielski joined the company in 1976 as technical coordinator. □

Digital electronics in broadcasting- a perspective

By Donald L. Markley, BE facilities editor and consulting engineer

Digital is making progress in the broadcasting industry, and both radio and television are feeling its impact. The author assesses this trend and puts digital advances and remaining problems into perspective.

Like a new elixir, digital electronic circuitry and digital devices were first envisioned as a magic cure for the ills of broadcasting. Now it is possible to look at the growth of digital electronics with the wisdom of 20/20 hindsight. This reflection reveals that digital electronics creates new problems even as it solves some significant old ones.

One of the first obstacles to adopting digital circuitry was the limited understanding of its theory by broadcasters. It seemed as though the change from filaments to transistors had barely been completed when new fields of digital and integrated circuitry technologies were introduced for technicians and engineers to master. One now has to think more in terms of systems than individual circuits when working with new broadcast equipment where individual circuits are, to a large extent, contained within ICs.

Digital: low cost and reliable

Other fields found digital technology more applicable than the broadcast industry did—at first. In some cases, for example in computer technology and machine controls, these fields were new themselves and did not require the redesigning of existing systems. In the dynamic field of electronic instruments, digital found ready acceptance as manufacturers created new products and users began to appreciate digital readouts over analog.

Digital electronics also found a ready home in such areas as telephone switching systems, telemetry and control systems in industry and other multiplex-oriented systems. Broadcasting's problem of requiring wide bandwidths and information storage were not limiting factors in other industries. The first wide use of digital electronics in the broadcast industry was simply in control systems for individual pieces of equipment.

Digital control systems have the great advantage of low cost when compared to the old relay logic. While somewhat more difficult to design, they are highly reliable, simple to manufacture, fast acting and extremely versatile. The large percentage of broadcast equipment now controlled in this fashion rather than by relay logic extends from transmitters through tape decks and audio consoles.

The use of digital systems in audio has long been predicted but is still not extensive. Again, basic control systems are in widespread usage. Some audio processors are being used or introduced which use digital technology, and delay devices have been around for some time which provide very short delay for reverberation effects or longer delays for talk shows. Again, the problem in this type of system which slowed its development was the availability of inexpensive, large capacity memory which could be addressed at a fast rate. The currently available RAM systems have solved that problem.

While digital recording of audio signals is being introduced rapidly into the marketplace, the largest area in which audio systems have utilized digital electronics is in program automation systems. The very early systems used relay logic with switches for memory. This progressed through diode pins and tape memory to the current crop of highly sophisticated programmers, controllers, etc. This new generation of equipment is microprocessor controlled and utilizes the latest in PROM technology for hard storage of programs and RAM storage for the portion which is station programmable. It is even possible with some systems for the program automation to obtain its data directly from the station's business/bookkeeping computer.

It is in television that digital technology has found its widest acceptance in the broadcast industry. The sophistication of the digitally controlled cameras was almost beyond imagination five years ago. Now, relatively simple cameras have digitally controlled white balance systems, black level controls, enhancers, etc. At the top of the lines, new cameras completely adjust themselves automatically. This same technology has found a home in video switchers with the digital effects providing new dimensions to broadcasters. Digitally controlled vertical interval switching is now considered "old stuff," and is relatively inexpensive.

It is widely accepted that the introduction of the digital videotape recorder will produce a new level of color TV performance. While long discussed, it does not appear that the digital VTR will be available until the mid-1980s.

It has been found that a new generation of problems will accompany this new level of performance. For example, at the recent International Conference on Television Measurements held by the Institution of Electronic and Radio Engineers in London, a paper was presented by M. O. Felix which discussed the difficulty involved in determining the necessary measurements to evaluate the digital systems. The new video and audio recorders will utilize a density of signals on the tape of from ten to

fifty times more bits per square inch of tape than currently used for computer tape systems. Felix demonstrated that the digital signals then appear as, and must be treated as, analog signals. The old problems of differential gain and phase in the digital system are found to be caused by quantizing error which causes a degree of error large enough to make it the primary problem for those two quantities.

It has also been demonstrated in England by the Independent Broadcast Authority that a new class of problems is caused by determining the sampling rate for generating the video signal. To further complicate the problem, the choice of sampling rate will have a significant impact on the performance of the standards converters used to convert between 525 line NTSC and 625 line PAL signals, etc.

Another interesting system has been developed by IBA which combines digital signal processing and television receiving antenna systems. This system cancels out unwanted co-channel signals arriving at the receiving antenna. It was originally developed to eliminate co-channel interference for the translators used by IBA in England but promises to offer a great deal of help to CATV operators.

A final area of digital technology from England is the Teletext system. Currently being tested on a very limited basis in the US, the Teletext transmits a large number of pages of information on two lines of the vertical blanking interval. This signal is processed by a microprocessor system either built into the television set or by an external *black box* added to existing sets. The viewer selects the desired page by a key-pad and then reads the information at his leisure. The individual pages are updated at the originating facility as necessary. This excellent system is purely a result of digital technology and is eagerly anticipated by many in US.

The area of transmitters has not been heavily involved in digital technology outside of control systems. Digital techniques are widely used in FM and television exciters and in stereo generators. Other than those uses, purely digital circuitry is really not applicable yet to high power signal generation. A few circuits are found, such as multivibrator circuits used for oscillators, but analog systems still prevail.

In remote control systems and ATS, however, digital technology is rapidly replacing all analog systems. Many broadcasters are replacing their old analog remote control systems with digital units that are more stable in their calibration and very positive in their control functions. Of course, ATS systems are all digital systems and probably will become more widely used in the future.

There remains only an enormous group of clocks, timers, do-dads and gadgets which digital technology spews forth. Many of these are highly useful devices that save users time and energy. Others are virtually useless—but a lot of fun to play with, and for that reason will be around for a long time.

Broadcasters at NAB in Dallas and at Montreux saw the latest equipment utilizing microprocessors and digital techniques. Some of these systems, introduced as prototypes this year, are expected to be available as production units when NAB/80 convenes in Las Vegas. □

Broadcasters descend on Montreux

Part 2

*This concludes **BE's** coverage of the '79 Montreux International Television and Technical Exhibition. Part 1 appeared in the July issue.*

Marconi exhibits cameras & instruments

Marconi Communication Systems featured the Mark IX family of color television cameras. Over 40% of the production of these cameras is now going for export, just over a year after they were first introduced.

Circle (1) on Reply Card

The latest in 1-inch helical VTRs from the Marconi MR series are also being shown. The MR2 and MR20, both SMPTE Type C format recorders, are designed to overcome many problems encountered with earlier recorders.

Circle (2) on Reply Card

Marconi Communications Systems also offers broadcasters a range of high medium and low power video and audio broadcasting transmitters, complete studios, mobile ENG units, and complete antenna systems.

Circle (3) on Reply Card

Marconi Instruments highlighted its family of TV monitoring instruments. Key instrument in this family is the TF2914A Insertion Signal Analyzer that allows the TV engineer to select the appropriate video channel and carry out 20 or more measurements, the answers being displayed digitally.

Circle (4) on Reply Card

Other instruments can be added to the TF2914A to provide varying degrees of automation. The TF2915 Data Monitor adds automatic parameter cycling and pre-set limits comparison while the TK2917 Data Selector enables the user to interrogate the measuring instrument either locally or from a remote terminal.

Circle (5) on Reply Card

The TF2920 Interval Timer provides an easy method of measuring the stringent timing intervals specified by the FCC. Simple push-button operation gives a direct digital readout. This too, can be automated with the addition of the appropriate versions of TF2915 or TK2917.

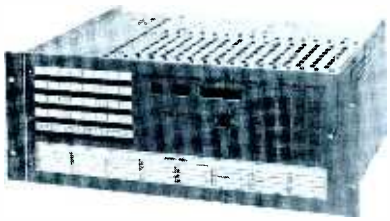
Circle (6) on Reply Card

A TF2904 color gain and delay test set for measuring inequalities in gain and delay between the chrominance and luminance channels of color video systems was also displayed, together with a TF2910/4 Non-Linear Distortion Analyzer designed for measuring differential gain, differential phase and line time non-linearity.

Circle (7) on Reply Card

Marconi also unveiled its new digital television field synchronizer, B3565, designed specifically for the 625 line PAL standard (claimed to be the first field synchronizer so designed). The equipment is an interfacing device which is employed to bring local and remote pictures into synchronism so that they can be mixed freely. The B3565 overcomes the many disadvantages inherent in the current system of genlocking the local studio synchronizing pulse generator to the remote input.

Circle (8) on Reply Card



MRC-1 microprocessor remote control

Moseley introduces remote control system

Moseley introduced internationally for the first time its model MRC-1 Microprocessor Remote Control System. The new system incorporates the advantages of microprocessor-based technology and revolutionizes the concept of remote broadcast transmitter operation. Specifically designed for multi-site operation, the MRC-1 utilizes all common radio and telephone circuits. As an intelligent system, it simplifies a number of functions at the remote transmitter site location, including the possibility of executive action.

Circle (9) on Reply Card

Moseley also exhibited its model TAL-320 audio limiter designed to provide a means of cleanly maximizing the modulation of a standard AM broadcast transmitter. Highly refined program-operated recovery timing minimizes the audible and measurable by-products commonly associated with audio processing.

Circle (10) on Reply Card

AM stereo operation is easily accommodated utilizing two model TAL-320 audio limiters and a third unit specifically designed for FCC approval. The TAL-320 will accommodate line voltages of 120 or 240 Vac at 50 or 60 Hz and occupies one rack unit.

Circle (11) on Reply Card

Moseley's model TGR-340 audio gain rider, also shown, is designed

to automatically ride gain on a program line, providing maximum modulation on a long-term basis with a minimum of audible or measurable by-products. A switch-defeatable multi-stage allpass network is provided to increase signal symmetry.

Circle (12) on Reply Card

RCA highlights TV transmitters & cameras

International broadcasters at Montreux witnessed the first European showing of RCA's new line of VHF television transmitters, as well as advances in TV cameras, videotape recorders and telecine systems. The new TTG series of Band I and Band III VHF TV transmitters shared the spotlight with the TK-47 automatic studio and field camera in RCA Broadcast Systems' exhibit.

The TTG transmitter uses only two tubes in the entire transmitter, one video and one sound. Broadcast techniques used in the transmitter eliminate all tuning requirements except for the output amplifier. The new transmitters will be available for operation on worldwide color broadcast standards, including NTSC, SECAM, PAL-B and PAL-M.

Circle (13) on Reply Card

RCA's TK-47 fully-automatic color television camera demonstrated at Montreux was initially shown at the 1978 NAB, and deliveries now have begun.

The TK-47 automatics extend to the camera setup procedure where microprocessor-controlled systems provide computer-aided, semi-automatic setup of the camera (or, optionally, fully automatic setup and pre-operational check) at the touch of one pushbutton. The system automatically adjusts more than 80 control functions, cycling through the complete camera setup sequence without operator involvement.

Circle (14) on Reply Card

RCA also demonstrated for the first time in Europe the new TK-76 C lightweight portable ENG/EFP camera, and enhancements to the TK-76B ENG/EFP camera and to the TK-760 studio/field production camera. The technical and operational improvements include a new system

When does a portable color camera become an affordable studio camera?

Optional studio configuration.

When it's a Panasonic ENG/EFP camera.

Now you can stop admiring ENG/EFP color cameras, and start owning one! The surprisingly affordable Panasonic AK-750. Thanks to its impressive list of options, our three-tube Plumbicon® portable camera doubles as a studio camera.

In the field it's a fully self-contained portable camera that weighs only 20 lbs. (with our optional 12:1 zoom lens shown), so it's easy to handle. It's just as easy on the power, using only 23 watts. You can interface the AK-750 with any EFP system, because it can be externally synchronized with a single cable. Timing and phase adjustments are built right into the camera head. Or connect it to any studio system, simply by adding the optional Remote Control Unit and studio viewfinder.

Indoors or out, you can look forward to impressive performance: With an S/N ratio of 49 dB, and horizontal resolution of 500 lines center at the recommended illumination of 200 footcandles at f/4. There's even a +6 dB gain for a minimum illumination of just 15 footcandles at f/1.8.

Some impressive circuitry was built into the camera: Like a Y I/Q encoder, an RS-170A sync generator with genlock for studio or EFP use, and a color bar generator. It also features an optical black, and automatic white balance. And there's electronic color conversion, as well as a filter wheel behind the lens.

Horizontal and vertical blanking are both adjustable to meet a variety of recording or playback requirements. And your picture is always crisp and clear thanks to horizontal aperture correction and 1-line vertical aperture correction built right into the camera head.

Not only do you get a long list of standard features with the AK-750, there's also a long list of camera options available. Such as 2-line vertical aperture correction, a chroma key unit, and more.

So if you're pricing both studio cameras and portable cameras, price one camera that can do both. The Panasonic AK-750.

Plumbicon is a registered trademark of N.V. Philips of Holland for TV camera tubes.

For more information, write Panasonic Company, Video Systems Division, One Panasonic Way, Secaucus, N.J. 07094. In Canada, Panasonic Video Systems Department, Mississauga, Ontario.

Panasonic.
just slightly ahead of our time.

Circle (237) on Reply Card

for comet tail suppression, extended remote control capabilities, reduced power consumption, contrast compression and high sensitivity/low noise operation.

Circle (15) on Reply Card

Broadcasters at the Montreux exposition also saw demonstrations of RCA's new TH-200 high-performance 1-inch helical scan videotape recorder and the companion digital time base corrector. The new TH-200 recorder features previewable automatic editing, operational "dynamic tracking" for broadcastable slow-motion, fast-motion and still pictures, and simultaneous playback for record confidence.

Circle (16) on Reply Card

The TR-600 quadruplex videotape recorder was also demonstrated operating with the built-in AE-600 time code editing system.

Circle (17) on Reply Card

In film equipment, RCA demonstrated the new FR-16 16mm projector, along with the TK-28 telecine camera, the FR-35 35mm projector and the PM-86SL magnetic sound recorder.

Circle (18) on Reply Card

Sondor features dubbing & mixing

Sondor's effort at Montreux included papers and exhibits covering its line of modern equipment for dubbing and mixing for TV productions on film or videotape. Included were their sprocketed magnetic tape recorders, vidicon film scanner, high-speed interface, SMPTE/EBU time code lock, and offset controls.

Circle (19) on Reply Card

Studer International hits Montreux hard

The Studer A800 professional multichannel tape recorder features a diecast chassis and stainless steel headblock according to Studer tradition. Its 14-inch reel capacity, fast reaction time and winding speed match a modern VTR. Microprocessor controlled transport electronics process all commands received from local controls, remote controls, peripheral equipment or information received via the studio bus.

Circle (20) on Reply Card

A800 tape recorder

TLS 2000 sync & edit system

The Studer remote broadcast console model 069 contains all equipment required for outside broadcasting activities assembled in a compact metal case. The package allows a 1-man operation by a reporter alone as well as a 2-man operation with technician and reporter. It is also possible to run two programs simultaneously. The mixer offers two microphone/line inputs, one high-level input and two master outputs with built-in limiters. The PPM and limiter instrument are switchable to output 1 or 2. The case contains two micro/headphone sets, two microphones with tripods, one headphone; one speaker box, and all necessary cables.

Circle (21) on Reply Card

Autolocator

069 remote console

The Studer TLS 2000 synchronizing and editing system has now been adapted to the new Studer A800 multichannel recorder. The TLS 2000 has 23 major features, including synchronization to any SMPTE-code source; operation at all existing frame standards; and SMPTE-code generator built-in. The TLS 2000 reportedly represents the most advanced synchronizing and editing system for audio post-productions in film and video.

Circle (22) on Reply Card

The new Studer Autolocator can

be used with the Studer recorder models A800, A80 VU, A80 RC, A80 R and A81 with no modifications of the recorders required. The Autolocator is realized with a microprocessor and offers separate displays for actual tape position and locate position indicating in H-Min-Sec; 20 memories to store tape addresses; cue store possibility for automatic storage of cue points on the fly (10 memories); and many additional features.

The new Autolocator consists of two units: the control unit with all operational controls, (keyboard, display); and the electronics (microprocessor, interface).

Circle (23) on Reply Card

Thomson-CSF concentrates on the 1980 Olympics

At Montreux, Thomson-CSF emphasized its participation in the 1980 Olympic Games in Moscow, not only as a large-scale supplier of equipment, but as the official supplier for these games. In particular, Thomson-CSF is constructing the world's largest switching system, with 150 inputs and 299 outputs. Owing to its modular structure, part of the system will be used separately at the July, 1979, Spartakiads in Moscow.

The following equipment was shown for the first time.

- A new TTV 1518 color camera, an offshoot of the world-famous TTV 1515s, incorporated developments in the field of highly advanced automatic operation.

Circle (24) on Reply Card

- A microcam compact camera was designed for electronic journalism and outside productions.

Circle (25) on Reply Card

- A 35mm compatible 16mm flying spot telecine was exhibited.

Circle (26) on Reply Card

- An electronic editing system with the possibility of mixing sequences from several videotape recorders of different standards, enables broadcasters to order new products while using existing material.

Circle (27) on Reply Card

- Mixers were available which,

Montreux

linked to a control room, provide a wide variety of effects (zoom, mirror effect, freeze, pattern multiplication) and miscellaneous measuring equipment, encoders, decoders, noise suppressors.

Circle (28) on Reply Card

• Television transmitters and rebroadcasting transmitters (2 kW UHF, 10 kW and 20 kW VHF transmitters, 12 GHz transmitters, 1 kW and 10 W transmitters and LGT 2000 rebroadcasting transmitters) were shown. The latter, designed to serve small communities at low cost and easy maintenance give comparable picture quality of higher-power transmitters.

Circle (29) on Reply Card

Unitel stresses character generator & Textel

Montreux was this year's red letter day for Unitel as it introduced new equipment.

The Scriptel "P" microprocessor controlled digital character generator for titling and subtitling video screens is designed around a modular concept and is microprocessor controlled to offer a wide range of applications. And, it's designed for NTSC, PAL and SECAM.

Circle (30) on Reply Card

The companion Scriptel "V" character generator is designed for portable use in vans and studios.

Circle (31) on Reply Card

The Scriptel "RWR" character generator is designed for titling and subtitling video programs by superimposition in both Arabic and Latin script. Its multi-unit organization allows exact fitting of the system to a broadcaster's requirements.

Circle (32) on Reply Card

The Textel is a Teletext editing unit primarily designed for the Antiope system, but it can be software programmed for all other video text systems. The generated images include alpha-numeric text in all forms plus simple graphics. □

Circle (33) on Reply Card

NRBA 6th Annual Conference & Exposition focuses on...

- **Latest developments in engineering for radio**
- **The fast-moving world of radio programming**
- **Radio sales and sales management**

Washington Hilton
Washington, DC
October 7-10

The nation's radio engineers, managers and manufacturers are getting ready to descend on Washington because that's where the action is: deregulation, legislation, FCC, rulemaking...NRBA '79 will bring the issues into focus October 7-10.

With expanded convention facilities in the Washington Hilton, the 6th Annual NRBA Conference and Exhibition anticipates shattering all previous records for registration, attendance and participation. Exhibitor sign-up already is ahead of former years.

The NRBA '79 program spotlights Washington-oriented issues, but the entire spectrum of radio station operation will be on the busy agenda, with close-up looks at engineering, programming, sales, promotion and business management. Special emphasis will be on probing new methods, concepts and technology to aid radio broadcasters. The result is three active days of powerful, productive workshops and roundtable discussion packed with profit-building ideas and information.

The agenda for NRBA '79 still is being finalized as **BE** goes to press. The preliminary plans call for coverage of the following topics:

Engineering
- New digital technology
- Tower power
- New concepts in audio
- Staying on the air...regardless
- AM stereo and FM quad status report

Management
- Maximizing cash flow
- Organization of time
- Motivation maximizers
- EEO
- Paper flow systems

Sales
- True confessions of a street fighter
- Women: A vital force in radio sales
- Selling against newspaper
- Gold in the co-op hills
- Telling media buyers what they need to know

Programming
- America's leading air personalities sound off
- Ratings: A programmers' friend or foe?
- Making the most out of research data
- Happy and productive P.D. and management co-existence

Promotion
- Promotion: How to do without it
- Contests! Effective or a self-hoax?
- Cost-free promotions
- Getting full mileage with public service
- Individual sessions for small, medium and large markets.

Special feature for programmers

A special feature of NRBA '79 will be a block-buster line-up of moderators and discussion leaders who have assembled workshop panels loaded with America's most talented, most successful programmers:

Lee Adams, Buzz Bennett, Kent Burkhart, George Burns, Jerry DelColliano, Bill Gavin, Doug Hall, John Pearkhal, Jim Schulke, Marlin Taylor, Bill Tanner and many others.

They will highlight new trends in radio programming: what to expect in the future, an up-to-date analysis of every format for every size market, how to choose a format and rise to the top, how and why program directors and management should work together to make their station number 1, and much more.

Exhibits for radio

The exhibitor registration for NRBA '79 is still growing, and most of the nation's major vendors for radio equipment and programming are expected to be represented with either booths or hospitality suites. The following is the registration for NRBA's 6th Annual Conference and Exposition as of June 25.

American Quotation System
Ampro-Scully
Andrew Corporation
Audio Design Recordings
Auditronics
Automated Broadcast Controls
Automated Music
Automated Processes
Automation Electronics

Belar Electronics Laboratory
Bloomington Broadcasting Corporation
Bonneville Broadcast Consultants
Bonneville Data Systems
Broadcast Consultants Corporation
Broadcast Electronics
Broadcast Programming International
Bureau of the Census

CCA Electronics
Cablewave Systems
Capitol Records
Cavox Stereo Productions/ Tape-Athon
Century 21 Productions
Cetec
Computer Concepts
Computers & Peripherals Unlimited
Comrex Corporation
Concept Productions
Consolidated Electronic Ind.

Delta Electronics
Dolby Laboratories
Drake-Chenault

Fidelipac
From Studio B

Groton Computer

Harris Corporation

IGM/NTI
International Business Services
ITC
Irv Joel & Associates

Jennings/McGlothlin
Johnson Electronics

NRBA conference

Kahn Communications
Kaman Science Corporation

LPB

McCurdy Radio Industries
McMartin Industries
3M-Magnetic
A/V Products
Microprobe (MET) Electronics
Micro-Trak
Money Machine
Moseley Associates
Musicworks
Mutual Broadcasting System
Motorola Comm. & Elec.

Fred A. Nudd Corporation

Orban Associates
Otari

Phelps Dodge
Philadelphia Resins
Progressive Radio Network

QEI Corporation
QRK Electronics Products

Ramko Research
RCA
RCA Americom
Rockwell International/Collins

Sharepoint Systems
Sintronic
Sono-Mag
Stainless
Station Business Systems

Tangent Communications
Telex Communications
Time & Frequency Technology
Torbet Radio

UMC Electronics
UPI
US Tape & Lapel

Thomas J. Valentino
Versa-Count

Wang Laboratories
Wang Voice Communications
Wearhouse
Weather Services
The Welsh Company

BE will replay this year's NRBA Conference as a special feature in the November issue. Watch for this special replay to request the latest equipment information and to obtain highlights of the show.

For further details on NRBA '79, or to pre-register, contact the 6th Annual NRBA Conference, National Radio Broadcasters Association, 1705 DeSales St. NW, Suite 500, Washington, DC 20036; (202) 466-2030. □

19th Annual Broadcast Financial Management Conference

Waldorf Astoria/New York
September 16-19, 1979
Tentative agenda

SUNDAY, SEPTEMBER 16

4:00 PM-4:30 PM	**Board of directors meeting**
6:30 PM-8:00 PM	**Opening reception**

MONDAY, SEPTEMBER 17

9:00 AM-9:15 AM	**Opening meeting**—Introduction, conference briefs, etc.
9:15 AM-10:15 AM	**General session** *Technology and Software for the 1980s* a) VHF/UHF TV—Transmission/Studio/ENG developments b) AM/FM radio—Clear channels/AM Stereo/New frequencies c) Cable—System expansion in the 1980s/Pay cable/STV d) Satellites—Product distribution/Satellite to home TV
10:15 AM-10:30 AM	**Coffee break**
10:30 AM-11:30 AM	**General session**—(continued) e) Teletex/Viewdata services/Closed captioning f) Videocassette/Discs g) TV program sources & distributions in the 1980s h) Q & A
11:30 AM-12:15 PM	**Open time**—Visit exhibits
12:15 PM-1:15 PM	**Luncheon**
1:15 PM-2:00 PM	**Luncheon speaker**—Major network executive to speak on news or programming developments
2:00 PM-2:30 PM	**Open time**
2:30 PM-3:45 PM	**General session** *Regulation/De-Regulation for the 1980s* a) Communications Act rewrite b) Current license renewal atmosphere c) FTC/Program content regulation d) Q & A
3:45 PM-4:00 PM	**Coffee break**
4:00 PM-5:15 PM	**General session** *Bottom Line—Broadcasting Industry Economics for the 1980s*

a) National economic outlook
b) Advertising expenditures share of GNP, TV and radio shares
c) Effects of news technology on the broadcasting industry (cable, STV, superstations, satellites, videodiscs/cassettes)
d) Wall Street overview
e) Q & A

7:00 PM-8:00 PM **Reception**
8:00 PM-12:00 PM **Banquet, presentation, dancing**

TUESDAY, SEPTEMBER 18

8:45 AM-9:15 AM **Membership meeting/BCA update**
9:15 AM-10:45 AM **General session**
Earnings Per Share Don't Count
Joel Stern—President Chase Financial Policy
10:45 AM-11:00 AM **Coffee break**
11:15 AM-12:15 PM CONCURRENT SESSIONS
1. Internal controls—Applications for the smaller stations. Chairmen: Seaver/Cutler
2. Taxation—78 Revenue Act. Chairman: Vowel
3. What the business manager should know about credit & collections. BCA
4. EDP Update. Chairman: Frommel
5. Canadian Broadcasting. Chairman: Ihnat

12:15 PM-1:15 PM **Luncheon**
1:15 PM-2:00 PM **Guest Speaker**—Major NY financial community figure
2:15 PM-3:15 PM CONCURRENT SESSIONS
1. TV program costs. Chairman: Rajewski
2. Wage/Price controls. Chairman: Kingston
3. How to use a bank to obtain credit information. BCA
4. Cash management/Investments—Large or small stations. Chairman: Gabert
5. Public broadcasters

3:15 PM-3:30 PM **Coffee break**
3:30 PM-4:30 PM CONCURRENT SESSIONS
1. Internal auditing-financial/controls, Chairman: Seaver
2. Radio music license, Chairman: Steinberg
3. The new Bankruptcy Act & how it relates to broadcasters. BCA
4. ROI analysis—Acquisitions & capital expenditures
5. Ratings & demographics

4:30 PM-6:00 PM **Free time to visit exhibits**

WEDNESDAY, SEPTEMBER 19

9:00 AM-10:15 AM **General session**
Budgeting and Financial Planning—Organizing and Improving the Process
10:15 AM-10:30 AM **Coffee break**
10:30 AM-11:30 AM CONCURRENT SESSIONS
1. Accounting standards/Replacement costs. Chairman: Harris
2. Union negotiations—Management demands. Chairman: Benyi
3. Credit co-op advertising
4. Insurance. Chairman: Lucke
5. EEOC record keeping requirements. Chairman: Johnstone

12:15 PM-1:15 PM **Luncheon**
1:15 PM-2:00 PM **Guest speaker**
2:15 PM-3:15 PM CONCURRENT SESSIONS
1. TV music license. Chairman: Steinberg
2. Long range—Capital budgeting
3. Impact of the Donovan System (Processing of broadcast payments for agencies). BCA
4. Financing your next station acquisition. Chairman: Farnsworth

3:15 PM-4:15 PM **Sign-off**—Closing comments, previews of 1980 conference—*A Taste of California*—wine, cheese and fruit (spouses invited).
4:15 PM **Adjourn**

Case Study:

Designing and rebuilding for stereo WABC/WPLJ

By Robert L. Deitsch, assistant chief engineer; and
Winston H. Loyd, chief engineer WABC Radio, New York

In 1966, WABC and WPLJ (then WABC-FM), the ABC owned and operated radio stations in New York City, moved into the new Corporate Headquarters Building at 1330 Avenue of the Americas. The new studio complex was equipped with Gates (now Harris) consoles, Ampex reel-to-reel tape recorders, ATC tape cartridge machines, and Gates turntables. The installation was essentially a Gates-provided package.

A 7- to 8-year rebuilding program to redesign and re-equip the technical facilities of both radio stations, including control rooms and transmitter plants was begun in 1973. To date, control room modifications have been completed in four areas, two of which are on the air and two are in production. Three basic criteria were used in the selection of equipment: technical performance; reliability; and ease of maintenance.

Although broadcasters often are limited by the specifications of both transmitters and receivers, it was decided that the WABC radio studio equipment should be capable of "recording studio" performance. Such parameters as distortion (total harmonic and intermodulation), frequency response, and headroom should never be limited within the control room. A state-of-the-art design was set as the rebuilding objective.

A control room which often breaks down is of no use. Although an excellent maintenance staff is employed at WABC/WPLJ, the programming people should not be hindered by the technical plant. Thus, equipment was chosen which, with a pre-determined amount of routine maintenance, would be as close as possible to failure-free. All equipment was selected with the advice of the maintenance staff, and many items were chosen only after thorough *in-house* testing of one or more components.

Engineering management specifies technical equipment, but it is the programmers who must create their product using it; in WPLJ's case, the staff engineers had to deliver the desired product by thoroughly understanding all problems before reaching a logical decision on how best to facilitate programming aims. Also, features were added that would assure that the equipment would not, in its useful lifetime, become the limiting factor on creative ideas.

Finally, the maintenance staff also was consulted to determine how easy it would be to work on the equipment purchased. Accessibility of parts, use of plug-in boards and components, internal diagnostic aids, quality of technical manuals, and availability of factory support were some of the factors considered.

Choosing the equipment

Whenever possible an attempt was made to use the same equipment in each control room to provide interchangeability, reduce spare parts stock, and improve familiarity with the equipment by both operating and maintenance staffs. These criteria are met, for the most part, by careful selection. Only when an obviously superior component became available was it chosen for the *next* installation.

There may well have been equally good equipment choices; indeed for specific station needs there may be better ones. Therefore, the following is not a list of recommendations. Also, this is not an exhaustive list of the equipment purchased or that may be needed in other stations. It only deals with what WABC/WPLJ believed to be the most important areas. Also, no conclusions should be drawn from the order of discussion.

Tape cartridge machines

ITC (SP & RP series) machines are used throughout WABC/WPLJ. These are equipped with azimuth adjustment motors for the record head. All are stereo. In fact, since WABC has been testing one of the five proposed AM stereo systems, no new equipment acquired since 1976 has been monaural. Because monaural recording is deficient in both phase stability and signal-to-noise ratio, Eventide Monstermat Matrix/DBX encoding is used on all cartridges. Before these were available, a custom unit was used.

Turntables

Until recently EMT 930 units were used; now, Technics SP-10 packages in a McCurdy housing is specified. The EMT units had the operational features needed, but were not as rumble-free or speed-stable as desired. The Stanton 681 SE cartridges, with dust brush removed, provides the ruggedness needed in daily operations. The tracking force is quite high (3.5 grams), but records are treated with Sound Guard preservative at WPLJ where they are used on the air and are replaced frequently. At WABC all music is transferred to tape cartridge, thus reducing record wear.

Reel-to-reel tape recorders

Studer A-80 recorders are used throughout; some are A-80 VU, others are A-80 RC.

Consoles

All post-1973 consoles have been custom built by Rupert Neve and designed by WABC/WPLJ to meet the needs of specific control rooms. The WABC and WPLJ main air consoles are identical with the exception of the engraved legends.

Peripheral equipment

Limiters, compressors, and equalizers are UREI. Special effects equipment and digital delay is Eventide. Power amps are Crown. Speakers are ESS and an occasional AR used for cue. Mics are AKG and Sennheiser. Reverb is AKG.

The new studios

The first and most obvious feature of the WABC main air studio-8A, see Figure 1, is that the DJ and engineer are in the same room. (An overhead view of the main studio is shown in color on the cover of this issue. Floor plans cannot be shown for security reasons.) WABC has operated this way since the early 1960s. All commercials, news actualities, jingles, and music are played back from tape cartridge. There are seven playback machines located to left and right of the console.

Figure 1 The WABC main air studio 8A, as seen from the engineer's side, is operated with DJ and engineer in the same room for maximum efficiency.

Figure 2 The studio 8A console close-up view reflects maximum simplicity in design for the WABC air board.

Maximum simplicity for the air boards was considered essential. This is reflected in the closeup of the console in Figure 2. All unnecessary input switching has been eliminated. The first 10 faders are dedicated: numbers 1-3 are mics; the next four are for the cart machines to the left of the engineer; the next three are for those to his right. Only the last two faders are switchable and are used infrequently to access other control rooms, the ABC Radio Network, or remotes.

The upper right portion of the console contains monitoring selectors for each set of headphones or speakers, with corresponding level controls. The centered VU meters are switchable to AIR, PROGRAM, or CUE. The ones on the left are dedicated to "AIR." The switches on the left control a relay air switcher that determines which control room is on the air; they have Cape Canaveral type guards to prevent accidental activation. The center eight indicators show such things as BULLETIN, EBS ALARM, CARRIER OFF and PROGRAM OUTAGE. The overbridge has clock, timer, telephone lamps, end cue indicator, and mic on lights.

Figure 3, from the DJ's side, shows indicators, clock and timer similar to those on the engineer's side but arranged differently to allow announcer comfort. All furniture is custom designed and built in ABC's carpentry shop.

WPLJ main air studio: FM-1

Figure 4 shows the WPLJ air control room from the engineer's side. The console is identical to that in 8A, but faders 8-10 are used for turntables. Furniture is somewhat different to allow the DJ to pass records to the engineer. Speakers are hung from the ceiling above the console for excellent imaging.

Figure 3 The studio 8A controls, as seen from the DJ's side, shows similar design to that of the engineer's side, but differences exist for announcer's comfort and efficiency.

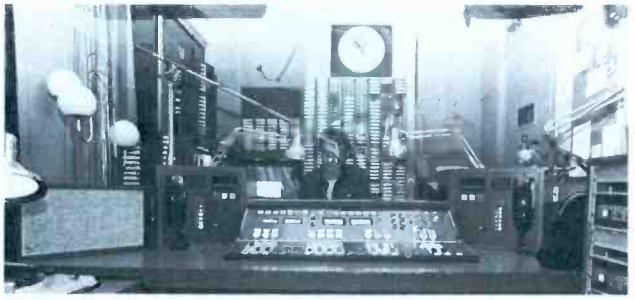


Figure 4 The WPLJ main air studio (FM-1), as seen from the engineer's side, is similar to that of 8A, but faders 8-10 are used for turntables.

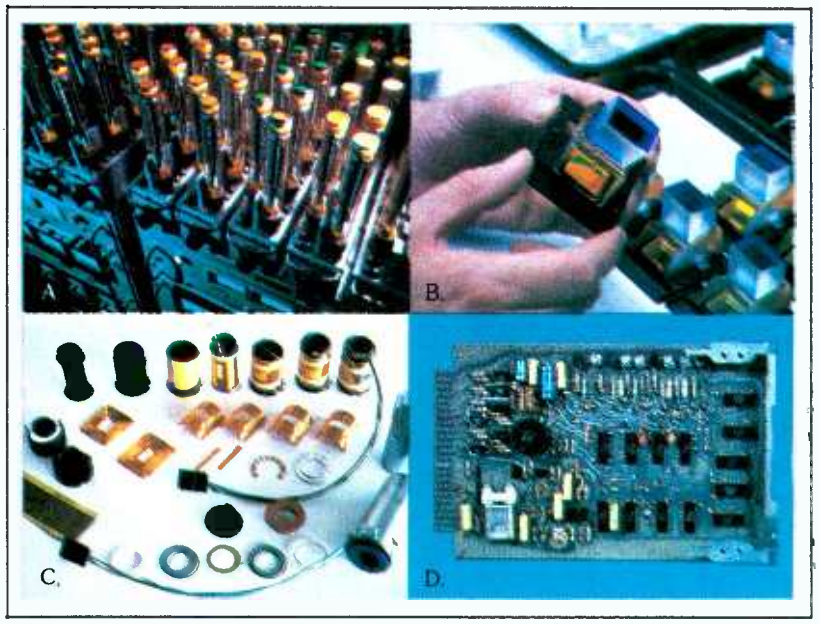
Figure 5 The WABC production control room 8X facilitates transfer of records and tapes to cartridges.

WABC production control rooms

Figures 5 and 6 show the 8X facility in which records and commercial tapes are transferred to tape cartridges. The console is more complicated than the air boards but maintains the same operational layout so that it is easily learned. It also illustrates the concept of providing dedicated faders for frequently-used inputs. From left to right it contains four mics (in this case with equalizers); four cart playback faders; two reel-to-reel playback faders; four switchable high level faders (the last with equalizer) for in-room equipment; and two switchable faders for out-of-room feeds.

All faders have outputs switchable to AUDITION, PROGRAM or both. The console has full talkback

Family Technology



A. Plumbicon™ Tube Technology
B. Prism Technology
C. Yoke Technology
D. Electronic Circuitry Technology

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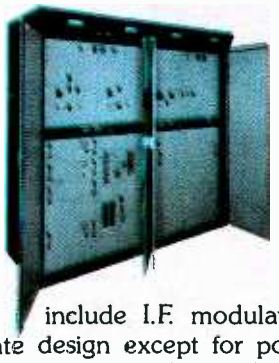
LDK-14—Newest technological breakthrough. ⅔-inch ENG/EFP/Studio broadcast camera with picture quality and features of Philips larger studio cameras. Lightweight, rugged, one piece with the look and feel of a film camera. Low power consumption; high sensitivity; dynamic beam control (DBC); fully automatic operation including auto-centering, and switchable black stretch. Available with simplified remote control or full facility control unit with full bandwidth chroma key.

LDK-25 Family with ACT or new 1-inch 73XQ Diode-Gun Plumbicons and camera circuitry for higher resolution and lower lag than 30mm cameras. With better than 65% depth of modulation at 400 lines! Makes the finest, state-of-the-art multicore studio and field camera ever produced better than ever. And Philips exclusive rear-loading design delivers the maximum out of this new Diode-Gun technology.

Rounding out the LDK-25 family are: the LDK-5, a digitally controlled triax version for remotes and modernized studio operation; and the LDK-15L, an LDK-5 in a self-contained mode or can be used with the LDK-5 or 25 CCU in system configurations.

VIDEO 80... innovative convertible camera system for multi-use applications. Unique, three ⅔-inch Plumbicon camera head converts in seconds from studio mode (available with optional, multi-position, tiltable viewfinder) to new, lightweight EFP field production mode with 1½" viewfinder to totally self-contained ENG portable. Even to special application modes for telecine, microscopy, endoscopy, etc. Easy set up and operation by non-technical personnel and automatic features for total mobility. VIDEO 80 also offers a complete expandable production system for start up or expansion of existing systems.

I.F. Transmitters... Philips is also the recognized world leader in transmitter technology, now with the fastest growing UHF/VHF transmitter line in North America. Output ranges up to 110kW. Equally suited for single or parallel operation with automatic or remote control for unattended operation.



Features include I.F. modulation, solid state design except for power stages, high stability and ease of installation and maintenance. SAW filter, reducing number of controls to achieve proper group-delay. Small size and minimum floor space made possible by the advanced design and a unique common exciter that can be retrofitted into earlier competitive systems.

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Figure 6 The control room 8X console is more complex than the air board but maintains a similar operational layout so that functions are easily learned.

Figure 7 The WABC production control room 8C console, shown during installation, is used to make pre-recorded shows and promos.

facilities as well as tone slate (33 and 400 Hz mixed to allow it to be heard at normal or high speed). It also allows voice slate through the attached microphone. The AUX meters, switchable to all board outputs, are actually distribution amplifiers to allow dedicated, isolated feeds to all lines and equipment. These meters are also switchable to allow L&R and L-R display for phase checking. A complete patch bay is also provided.

Figure 7 shows the 8C production console, the facility used for making pre-recorded shows and promos. It is also used for *Conference Call*, a live weekly telephone talk show. It is the most complex of all, but is true to the design criteria already delineated. There are eight equalized mic channels, one dedicated beeper channel, 12 dedicated high level channels, two switchable remote channels, and four sub-groups. Each of the fader outputs is switchable to any or all of PROGRAM, AUDITION, and the four sub-groups. Each fader has echo send, mics have pan pots, the sub-groups have panorama controls. The first two of these sub-groups have equalizers and compressor/limiters built in. Talk back and slating facilities are similar to 8X. Again, a complete patch bay is provided, but not shown. At the time the photo was taken, timers, air switchers, and indicator panels had not been installed, but they are now.

WABC/WPLJ intended to build the finest technical facilities possible, and progress is well along in accomplishing this task. □

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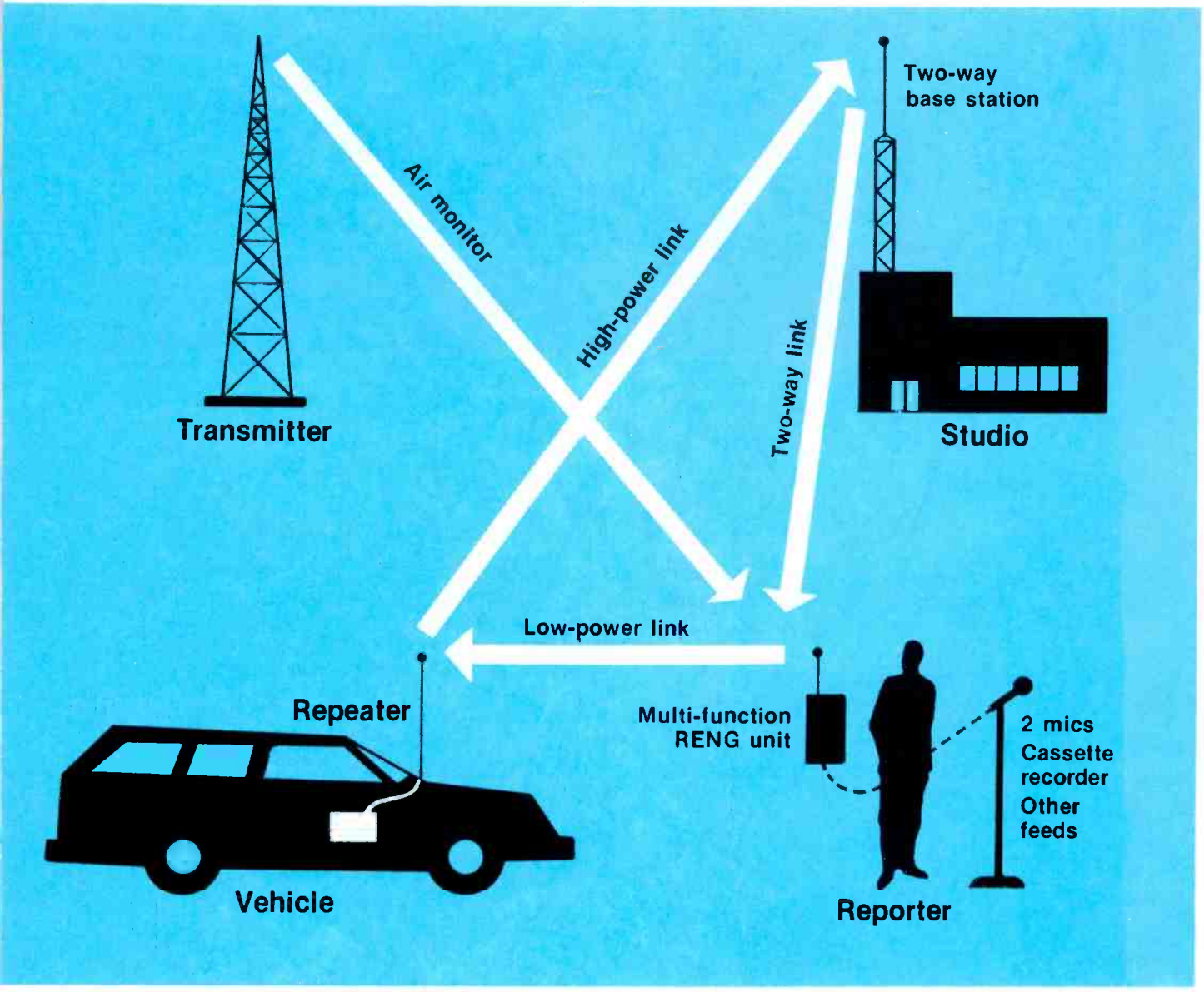
Circle (243) on Reply Card

RENG: A system's approach

An RENG system must be custom tailored to meet each station's special needs. Guidelines to choices available and equipment resources are provided in this article.

By Gary A. Breed, D. L. Markley & Associates, Peoria, IL

RENG (Radio Electronic News Gathering) is a technology of growing importance, even though it's as old as Roosevelt's "fireside chats," the Hindenberg disaster, and uncountable live broadcasts of major events before television was out of the laboratory. What was missing,



An RENG system may be designed in any one of several ways to provide the flexibility, portability and capability needed by a particular station. Equipment can be chosen to mold a system that meets exact needs and yet be flexible enough for future expansion.

With the WMAL/AM-63 special van, engineer sets up for a remote pre-game broadcast from RFK Stadium. The WMAL van is ideal for remote broadcasts and spot news coverage. (Photo by WMAL).

of course, in the early days, was the ability to cover an event on a moment's notice with portable equipment. Modern RENG technology has made this possible.

A minimum system

The minimum RENG equipment is an audiotape recorder, and even these have some new wrinkles: automatic gain control, selectable frequency response curves, high speed cueing, variable speed controls (so weak batteries won't ruin another scoop), and more. A tape recorder is rarely considered enough for any news department, and the next step is usually remote pickup equipment of some type. Telephone couplers and RPU (Remote Pickup Unit) transmitters are a simple reliable way of getting a live feed to the studios. They are also multi-use equipment, as programmers can use them for remote commercial broadcasts. Typically, RPU transmitters and receivers with broadcast quality audio have at least 7500 Hz bandwidth. For telephone hookups, Telco can supply a plug-in telephone with built-in voice coupler to feed from a mixer or microphone preamp.

Equipment also is available to enhance the voice quality over telephone lines for remote news coverage. A recently developed system is a frequency expander for use on dial-up telephone lines to improve the voice quality in 2-way communications.

2-way systems

The next step up the RENG ladder is a full *2-way communications* system from studio to a newsperson's vehicle. This can be done by adding a receiver to an RPU transmitter and wiring in the proper control functions for a smooth operation. The studio-based transmitter does not need to be full broadcast quality, since only the news staff will be hearing that part of the communication. This arrangement provides high quality audio news feeds, and it offers remote feeds, other than for news, where quality is very important.

Another option is standard 2-way radio gear available from several manufacturers. Disadvantages of this system is the poorer audio quality due to a narrower communications bandwidth in the normal business band channels, and lack of compatibility with broadcast equipment as regards interconnection, external inputs, microphones, etc. Some of these can be overcome with extra-cost options and custom modifications by the manufacturer or dealer. The advantage of using this type gear is lower cost, service

Auxiliary broadcast frequencies for remote pickup use

Band 1: 25.87 to 26.47MHz
Twenty-six channels are available for broadcast use in this band. With the increasing sunspot activity, "skip" interference will be a problem, and its adjacency to the Citizens Band frequencies can cause problems with interference.

Band 2: 152.87 to 153.35, and 161.64 to 170.15MHz
There are nine channels shared with the Industrial Radio Service that are usable for cues and broadcast coordination, and seven exclusive broadcast frequencies. This band is probably the best choice for remote and 2-way use, but it is almost saturated with users. It may be impossible to locate an unused channel.

Band 3: 450.01 to 455.99MHz
Fifty-six channels are allocated for broadcast use in this band. Due to its higher frequency, coverage is more dependent on line-of-sight transmission, limiting range. It is, however, the best available frequency in terms of building penetration, making it useful where another frequency may not work. In most areas, plenty of space is available, making it the most likely choice for new remote broadcast licenses.

RENG Equipment

As noted in the accompanying article, an RENG system must be custom tailored to each radio station's needs. **BE**'s Annual Buyer's Guide (September, 1978) serves as a source to equipment for such a van, and may be used to obtain data. However, it is recommended that regional sources be considered, especially for 2-way radio equipment, for best servicing.

Alternatively, the table at right and the reader service card may be used and BE will pass the inquiry along to appropriate vendors.

Microphones, wireless (35)
Portable antenna systems (36)
RPU systems (37)
Remote broadcast cue systems (38)
Remote pickup receivers (39)
Remote pickup transmitters (40)
Repeaters (41)
Telephone voice enhancers (42)
2-way communication systems (43)

RENG

availability, and less effort by the station engineer to make it work (if a local dealer supplies the equipment). Since the equipment is designed for mobile use, the installation usually looks better than a system of RPU equipment.

A good 2-way communications system generally is considered the heart of an efficient RENG system. A rule of thumb might be to use RPU equipment if it will be shared for remotes other than news, or use business band 2-way equipment for communications exclusive to the news operation.

Correspondent Sharron Lovejoy prepares for a spot news broadcast from the floor of a convention center. With light and portable RENG equipment, KCBS in San Francisco receives live reports whenever and wherever news breaks. (*Photograph courtesy of KCBS Newsradio 74*)

Wireless mics

One method of gaining additional freedom is a wireless microphone. Audio quality is very good, and they can be used for remote broadcast work other than for news. There is a limit on range of about 150 ft, depending on the crowd and location. Signal reflections can be a problem unless diversity reception (multiple antennas) is used. Of course, a feed from the wireless mic's receiver to the studio via RPU or 2-way equipment is required.

A walkie-talkie eliminates another problem with wireless mics: no cue provisions without extra equipment. Walkie-talkies are available from numerous 2-way equipment manufacturers, and can be a real asset to RENG, but they suffer range and audio quality problems.

Repeaters

The solution to a walkie-talkie's range limitation of only a few miles is the use of repeaters. The repeater could be in the news reporter's vehicle, relaying the low power walkie-talkie signal to the studios via the higher power unit in the vehicle. Or, repeaters can be located at strategic sites as needed to cover areas desired. For example, a station with studios on the edge of town may install a repeater in the central business district where a reporter can cover governmental and business news with only a walkie-talkie or low-power, portable RPU transmitter.

Another possible solution to the same situation is a remote controlled 2-way system rather than a repeater. The 2-way equipment could be located in the downtown area, and operated via telephone lines. This would save on congestion of the broadcast RPU frequencies since repeater systems require different input/output frequencies. At this time, repeater systems are special-order items, although the major 2-way manufacturers may have a model that can be used with a minimum of modification. Systems of remote-controlled communications increase the technical complexity of RENG, but that is expected for the quantum leap in coverage capability by a reporter.

Cueing

Another necessity in the freedom of movement category is getting cues to the reporter. A walkie-talkie is a 2-way device and works well for cues until the reporter starts talking! The next step is an off-the-air receiver so the reporter can confirm being on the air, and so an anchor man can converse with the reporter. Portable radios with earplugs work well for this purpose, as do the radios built into a headset. At least, one vendor has put nearly everything together into an ultimate package for the RENG reporter: a repeater in the news vehicle, a low power transmitter with extra inputs for additional microphones or cassette recorder, two receivers for 2-way communications plus off-air monitoring, all in a compact beltpack. The accompanying sketch shows this type of system.

Plan thoroughly

To do more with RENG, first assemble the news, engineering, and management personnel and lay out the objectives, purposes, and desired capabilities of an RENG system. Set cost figures and examine optional ways to get the job done. There isn't much available in the way of complete packages, so it will be the chief engineer's job to make it all work as envisioned. Plan carefully to put the station among the leaders in radio electronic news capabilities. □

Low frequency extenders

A typical problem with voice transmission systems—such as dial telephones used for RENG—is the cutoff of low frequency components (below 300 Hz). Equipment is available which overcomes this inherent problem through the use of *low frequency extenders*, encoder/decoder systems designed to retain the natural voice quality important to broadcasting.

These extenders operate in a straightforward manner. The input audio is shifted upward in frequency by 250 Hz transmitted, and then downshifted by 250 Hz at the station. In bypassing the cut-off deficiency in transmission systems, the program material is received as if it were transmitted over circuitry capable of fidelity down to 50 Hz. At the same time, inherent line noise is downshifted by 250 Hz and then filtered to enhance the transmission.

Setup is simple. The field operator uses a mic or recorder plus a portable encoder connected to a telephone line. The station uses a coupler, fader and decoding system connected to the studio audio network. No tuning or adjusting is required at either end of the system.

This system will be displayed at the NRBA convention in Washington, DC, on October 7-10. Those attending can see the system first hand. Others may read about it in the November issue.

Case study:

WDUX reaches out with RENG

BY Dan Hansen,
WDUX Radio, Waupaca, WI

Reaching out with RENG depends on making the best use of available equipment. Modernizing equipment and using a custom-built remote antenna system has allowed WDUX to reach out in remote news coverage.

Radio stations, whether large or small, can profit from RENG. The same electronic news gathering equipment that puts listeners at the scene of a fast-breaking news story also can be utilized for a variety of commercial remotes.

While some broadcasters still rely on telephone lines for remote broadcasts, the advantage belongs to those stations with RENG-type equipment. Less lead time is needed by the sales department, and a remote can be bought one day and aired the next. Stations with RENG tend to do more remotes simply because the equipment is readily available. And the remotes they broadcast are generally of higher audio quality than can be obtained with phone lines.

From an equipment standpoint, radio stations have never had it so good. Several manufacturers can supply remote pickup unit (RPU) systems, complete with hand held transmitters and repeaters. Having the most equipment, however, is not as important to success as is getting the most from the equipment you have.

Although the smaller and lighter transmitters have helped make RENG more versatile, it remains a short-range proposition for many broadcasters. And that's they way it was at WDUX until last spring.

Broadcast-quality remote pickups have been made for over 12 years from WDUX's 5 kW AM and 3 kW FM stations with a 30 W VHF system to air some 300 live remotes each year. In fact, the RPU transmitter had been to news events long before this station had heard the term RENG.

While the majority of the WDUX remotes were aired from approximately 15 small cities within a radius of 25 air miles of Waupaca, the practical range of the remote pickup equipment was limited to around 10 miles and covered only six cities.

Attempts to increase the range of the remote pickup system included a push-up mast mounted on a 2-wheel trailer and two sections of TV antenna-type tower mounted on a van. The practical antenna height of 25 ft limited the effective broadcast range to around 15 air miles. Thus, both systems were discarded.

The receiving antenna was considered adequate. A Marti RA-4 was mounted 185 ft up on one of the 260 ft broadcast towers. The receiver was coupled to it with

Weighing under 500 pounds, the WDUX portable tower can be easily towed to remote sites,...

...the antenna attached,...

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thin 35 air miles of the
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The rig, custom-built, is mounted on a boat trailer-type chassis with two telescoping 22 ft tower sections. The tower sections rest on a steel brace and ride forward above the towing vehicle, which can be virtually anything because the tower and trailer weigh only 490 lbs.

A pair of winches and steel cables make setup fast and easy. The antenna is attached to a 12 ft pushup mast. Both sections are cranked to a vertical position and a bolt secures them. Then the inside section is cranked to the desired height, with the locking gears of the winch holding it in place. For longest range shots, the pushup mast is extended. Two T-bolts hold the mast in place, yet are easily adjusted by hand. One person can put a yagi 50 ft high and be ready to broadcast less than 10 minutes after arriving on a news scene and takedown is just as easy.

Present cost of this tower is in the $1500 range. With the amount of money saved on phone charges for remotes, the system pays for itself. Since the crank-up tower became fully operational, WDUX has almost eliminated phone line drop ins for broadcasting live remotes.

It is in play-by-play sports broadcasts where the portable tower is most useful and profitable. With broadcasts generally ranging from 1½ to 3 hours, WDUX has saved more than $60 per game in line charges.

For sports remotes, the trailer is attached to a van and the tower is set up outside the gym or pressbox. The RPU transmitter remains inside the van, coupled to a yagi antenna by 70 ft of ½-inch heliax. To reduce weight on the antenna connector, the heliax is secured to the push mast with plastic-coated wire about two feet below the antenna.

A Sparta RA-4 Amplifier is taken inside and connected to the microphone input of the transmitter via a 150Ω bridging pad and mic cord. The remote amplifier has four dual inputs, allowing the use of taped interviews or other cassette feeds in addition to sportscaster headset microphones.

The majority of WDUX's remotes are pre-sold. However, the remote pickup equipment also is used extensively in daily coverage of area news, sports and live reports (along with actualities) from court trials and county board meetings.

RENG equipment gives stations an added dimension and sets them apart from the competition. And, it puts listeners right in the middle of an exciting sale or grand opening, or on the action scene of a sports event or late-breaking news story.

In short, RENG can help boost revenues and public image. And the ability to reach out with RENG can help in obtaining optimum efficiency from remote pickup units. □

...the tower hoisted,...

...the antenna raised,...

...and the RENG system is ready for action.

Videotape editing: A status report

By Tom Werner, R&D director, One Pass Video, San Francisco, CA

Videotape editing has undergone several significant changes. The author reviews the historical evolution of tape editing, discusses the status of current technology and equipment, and speculates on what future equipment may feature.

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- **Two VTR machines-to-machine editors:** They usually use control track pulse count for indexing, are hardware controlled, and are the least expensive.
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Manufacturers tend to blur the distinction between the "low cost" and the "high cost" editors. For instance, almost all top-of-the-line systems have added joystick or knob type controllers, and smaller systems are sprouting computers and CRT displays.

The editing accessories category is exemplified by Datatron and CMX. The CMX Videola, developed by Jack Calaway at Vidtronics, is connected to an inexpensive controller to log edit decisions on a floppy disc as they are made. The Datatron Edimate serves a similar function. It uses liquid crystal displays and stores the information on punch tape. The Edimate also can support hand logging. Trace computer programs v Bargain of Boulder, this process. Trace allo by taking the edited m generations, a far easi than edit list manipulation is the list cleaner which overlaps and restructures ed lays to make reel sequential linear) automatic assemblies p ble.

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Many attempts have been made to improve the human interface between operator and VTR. The two general approaches are first, systems needing minimum keystrokes, spread out control panels, and optimum speed; and second, interactive systems with prompts and guidance, using keyed-in mnemonics for some functions. Generally, experienced editors desire the first group, and beginners prefer the second. Some systems emphasize isolating the editor from numeric type activity. These systems tend to have primarily joystick or knob type controls.

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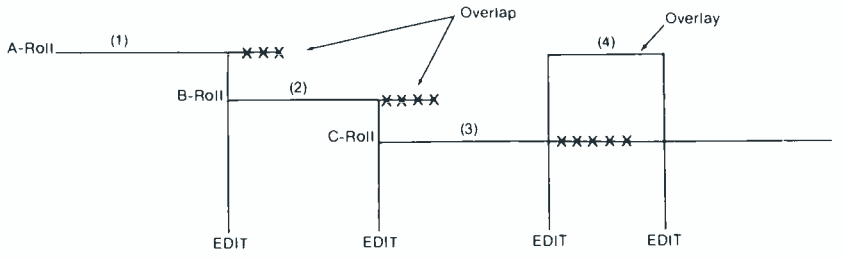
Automatic assembly

One computer control feature is automatic assembly. There are two kinds of automatic assembly, usually called *Mode A* and *Mode B*, as shown in Figures 1 and 2. Mode A is linear assembly. Edits are performed as they are encountered in the edit list. Since edits are usually in execution order (the order they were initially made), there are numerous reel changes and VTR setups.

Mode B is reel sequential assembly. Edits are scanned in the list, and only those edits with reels currently mounted on VTRs are executed. This kind of assembly requires two things. First, the record VTR must make good *out*



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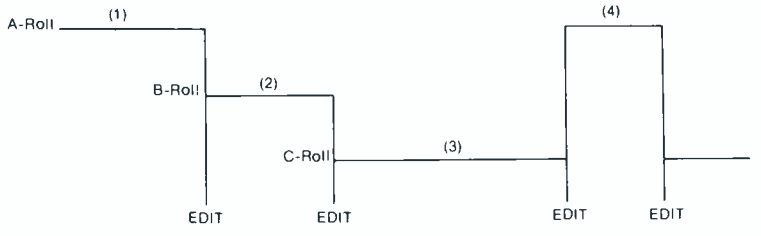

Figure 2 This edit flow diagram shows edit points without overlap or overlay. These edits can be performed in any order with acceptable results. Mode "A" or mode "B" methods of auto assembly can be used under this arrangement.

½-inch insulated heliax.

In February, 1978, engineer Steve Knopka updated the system with a new Marti transistor model R-30/150 receiver. The signal quality immediately improved and the effective range was increased to nearly 15 miles with just a yagi on a micstand.

Portable tower

Even with the new receiver, WDUX still depended on telephone hook-ups for nearly half of its remotes. Then, a custom-built, portable, crank-up tower mounted on a 2-wheel trailer was purchased and, for the first time, WDUX was able to reach out with RENG. Now a broadcast-quality signal can be transmitted from virtually any location within 35 air miles of the receiving antenna.

The rig, custom-built, is mounted on a boat trailer-type chassis with two telescoping 22 ft tower sections. The tower sections rest on a steel brace and ride forward above the towing vehicle, which can be virtually anything because the tower and trailer weigh only 490 lbs.

A pair of winches and steel cables make setup fast and easy. The antenna is attached to a 12 ft pushup mast. Both sections are cranked to a vertical position and a bolt secures them. Then the inside section is cranked to the desired height, with the locking gears of the winch holding it in place. For longest range shots, the pushup mast is extended. Two T-bolts hold the mast in place, yet are easily adjusted by hand. One person can put a yagi 50 ft high and be ready to broadcast less than 10 minutes after arriving on a news scene and takedown is just as easy.

Present cost of this tower is in the $1500 range. With the amount of money saved on phone charges for remotes, the system pays for itself. Since the crank-up tower became fully operational, WDUX has almost eliminated phone line drop ins for broadcasting live remotes.

It is in play-by-play sports broadcasts where the portable tower is most useful and profitable. With broadcasts generally ranging from 1½ to 3 hours, WDUX has saved more than $60 per game in line charges.

For sports remotes, the trailer is attached to a van and the tower is set up outside the gym or pressbox. The RPU transmitter remains inside the van, coupled to a yagi antenna by 70 ft of ½-inch heliax. To reduce weight on the antenna connector, the heliax is secured to the push mast with plastic-coated wire about two feet below the antenna.

A Sparta RA-4 Amplifier is taken inside and connected to the microphone input of the transmitter via a 150Ω bridging pad and mic cord. The remote amplifier has four dual inputs, allowing the use of taped interviews or other cassette feeds in addition to sportscaster headset microphones.

The majority of WDUX's remotes are pre-sold. However, the remote pickup equipment also is used extensively in daily coverage of area news, sports and live reports (along with actualities) from court trials and county board meetings.

RENG equipment gives stations an added dimension and sets them apart from the competition. And, it puts listeners right in the middle of an exciting sale or grand opening, or on the action scene of a sports event or late-breaking news story.

In short, RENG can help boost revenues and public image. And the ability to reach out with RENG can help in obtaining optimum efficiency from remote pickup units. □

...the tower hoisted,...

...the antenna raised,...

...and the RENG system is ready for action.

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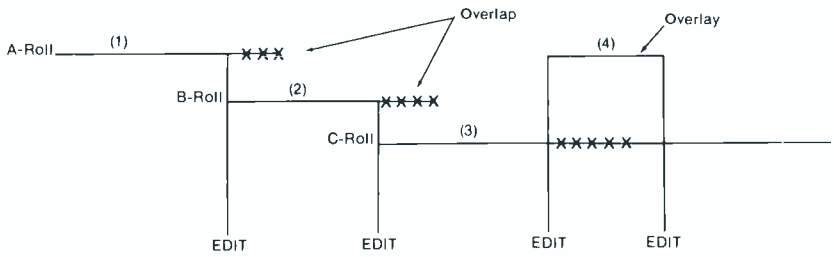

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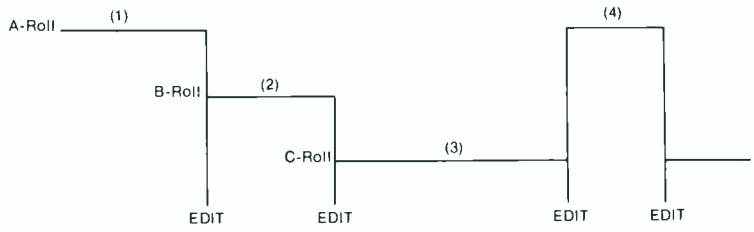

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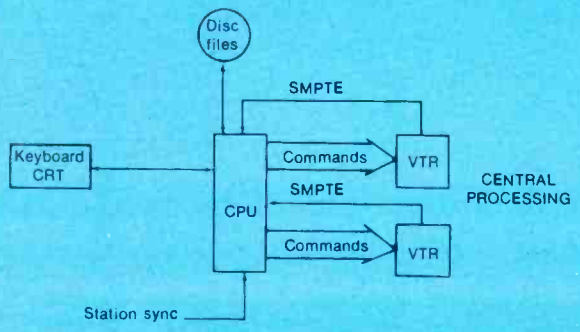


Figure 3 Units using central processing techniques incorporate all machine control functions into the CPU. Signals are multiplexed within the CPU and only commands are sent to record and playback VTRs.

Videotape editing

edits (some older quad VTRs have trouble with out edits). Second, the list must contain no overlaps or overlays because it will not be assembled in the same order as was done off-line.

The new concept is *look ahead* assembly. Most edits are cut-type edits. In the past, when a VTR was not used in an edit, it was left alone. With look ahead the unused VTR is searched to the next edit, rolled and synchronized, and the next cut, or whatever occurs, using the switcher. It is possible to assemble a program in real time, but it's unlikely because there usually isn't time to search the idle VTR, or the next element is on the same reel as the current edit. Look ahead is often an extra cost feature of an edit system.

Editing techniques using a central processing unit (CPU), as shown in Figure 3, incorporate all machine functions into the CPU. Signals are multiplexed within the CPU and only commands are sent to record and playback VTRs.

Some systems provide distributive processing (see Figure 4). This arrangement provides microcomputers at each VTR. There can be two rationales for this: one uses the microprocessor to replace logic functions and the other provides intelligence at the VTR. Some possibillities include sensing the size of reels mounted on its VTR. Generally, distributive processing will allow more VTRs to be used simultaneously. Current edit systems are interrupt driven and do not poll any hardware. Translated, that means that the computer does not spend any time waiting for something outside it to happen.

List handling

Low cost editors do not have any event memory. Those with computer

control tend to support edit lists, though not all do. Buzzwords connected with this facility include the following:

• **Active List:** This means that the internal connection between the event memory and the mark table is close. Generally, the event currently accessed, and the two or three events preceding and following in the list, are visible in the CRT display.

• **File Management:** Some systems access events in memory via its sequence number. This number generally indicates its order during the decision-making process. Other systems provide additional means of access which include reel number, scene number and unique character strings in the comments (notes).

• **List Management:** This function modifies the list to delete an event; to change the order of events; to change the edit parameters such as reel number, or edit mode (audio only, video only, or both). Some systems allow the movement of groups of edits, or to divide the list into blocks. These functions allow the editor to retain several versions for later selection.

• **List Rippling.** To change the duration of an edit in the middle of a production sequence in videotape requires re-recording subsequent edits. This function adjusts the record times in the event memory to accomplish this task. A subsequent automatic assembly will then replicate the change on the videotape.

• **Notes:** This function allows plain language comments. Some systems interleave notes with edits and others store the notes together. Some don't store them at all and simply transfer them to external storage media.

• **Scrolling:** This refers to the ability to review the events in memory on the CRT display.

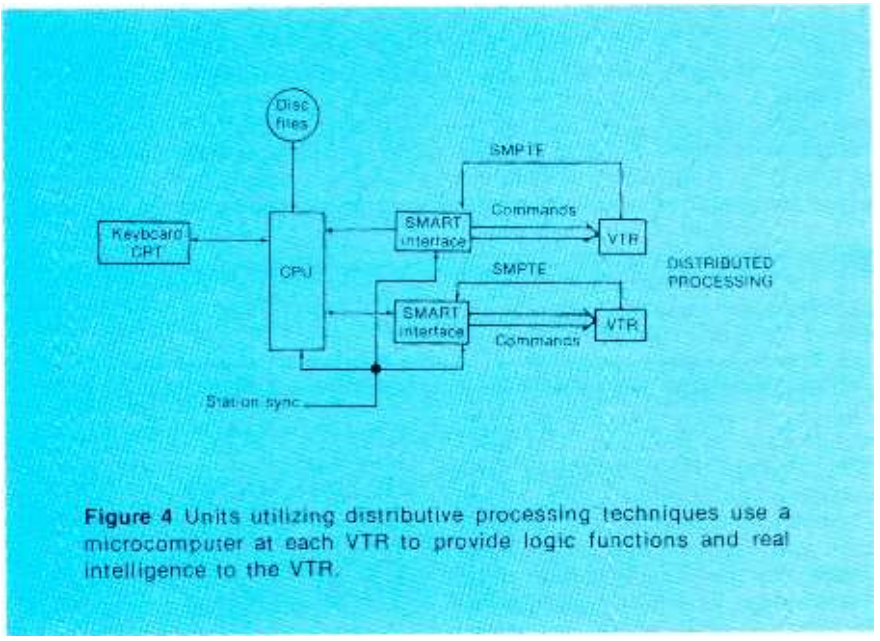


Figure 4 Units utilizing distributive processing techniques use a microcomputer at each VTR to provide logic functions and real intelligence to the VTR.

Available systems

Tables I and II illustrate some of the choices and capabilities in comparative form. Table I consists of two VTR controllers which are often considered ENG systems. Table II consists of large systems in which some features are universal and not listed. These include use of SMPTE code, computer control, and use of three or more VTRs. The rest are self explanatory.

In general, the manufacturer's choice of computer is of little significance to the user. The large CPU vendors have extensive field service organizations, and microcomputer components are now, or soon will be, available everywhere. There are claims regarding 16-bit versus 8-bit processing directly affecting execution speed in editing systems, but experience does not bear this out. An older tape cueing system used a 4004 4-bit CPU and still managed to do a creditable job of handling SMPTE code. The full code work is 64-bits (including user bits) wide and even 16-bit processors have to assimilate these data in four separate iterations.

Data on currently available videotape editors may be obtained using the manufacturer list included in this article and the reader service card.

What's new

At NAB/Dallas'79 new features were introduced by many manufacturers to update their editing systems to better serve the industry. These features were covered in detail on pages 106-107 of the June issue of **Broadcast Engineering**. In summary form, these features are listed here:

CMX: (a) GISMO offering tactile control primarily for 1-inch continuous field formats; (b) PALETTE for removing many computer-operator dialogs by providing separate key functions;

Convergence: ECS-100 series, now in production, with tactile *super-stick* controller;

CVS: Epic, now in production, with interesting SMPTE code processing;

Datatron: 2000 system in production, with impressive switcher handling;

EMS: RES-Q, a pulse count editor, no backspace, and directly indexes the tape from pulse counts;

Mach One: User-changeable arithmetic conversion program for editing on foreign standards and in the film/video 24 fps standard;

Sonn-Roy: Features extreme simplicity; and

Videomedia: Z6 with *micro-lock* tape indexing.

Features still desired

There remain problems in the post-production area which editing controllers could resolve, and perhaps these may be addressed by manufacturers in the near future.

One area is a color correction, or control of one or more color corrector devices and processing ampli-

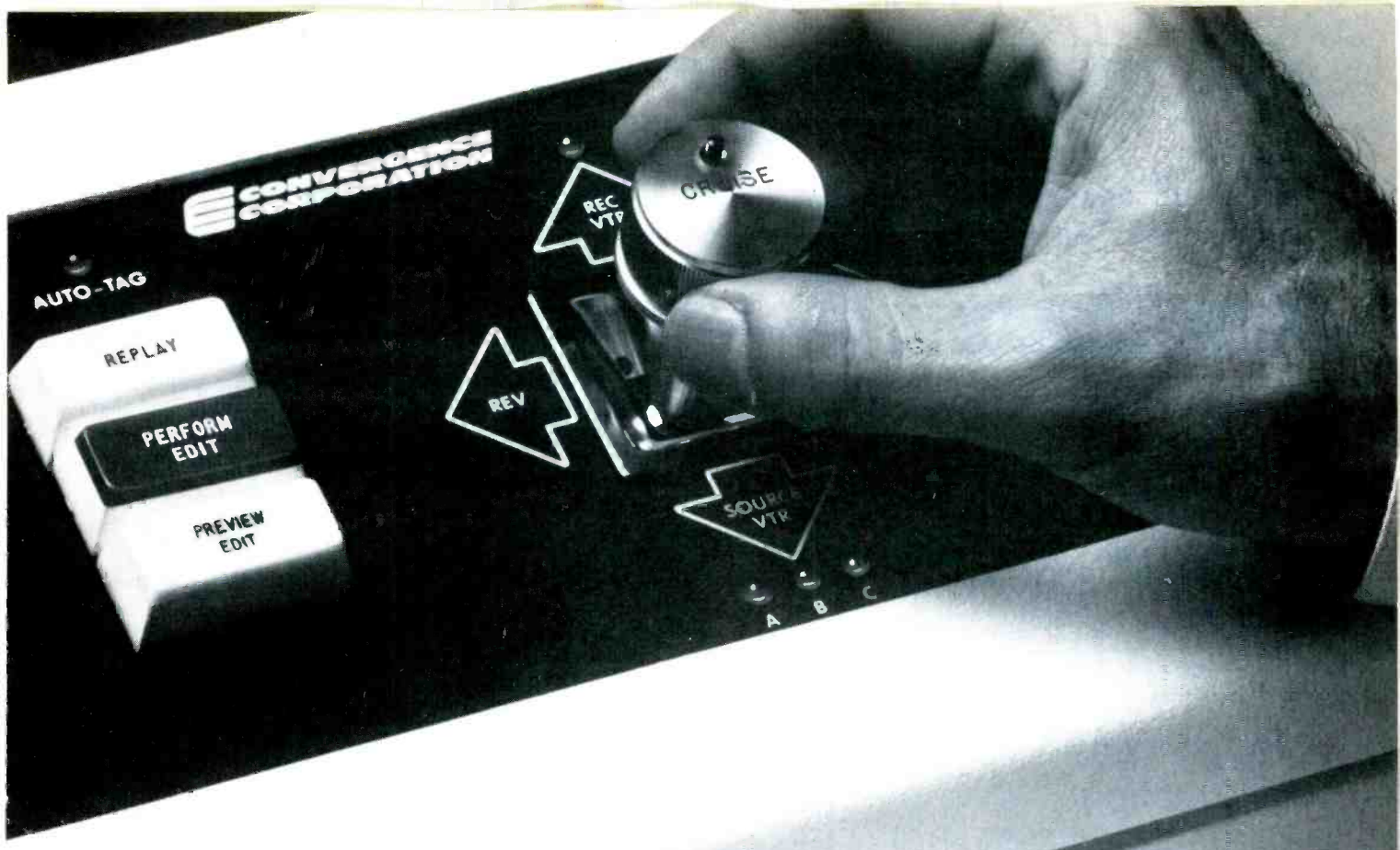
VIDEOTAPE EDITORS

For more information, circle the boldfaced number on the reader service card

AMPEX **(119)**
CMX ORROX **(120)**
CONSOLIDATED VIDEO SYSTEMS **(121)**
CONVERGENCE **(122)**
DATATRON **(123)**
DYNASCIENCES **(124)**
EMS **(125)**
JATEX **(126)**
JVC **(127)**
MACH ONE **(128)**
NANOTEC **(134)**
RCA **(129)**
SERVO **(130)**
SONN-ROY **(131)**
SONY **(132)**
VIDEOMEDIA **(133)**

TABLE I. Features of videotape editors

System	Features				
	Type VTR	Changeable software	Tape indexing methods	Max. number of VTRs	Tactile control
AMPEX RES-1	1", 2"	no	SMPTE code	4	key
BOSCH EES-9	SMPTE Type B 1"	no	tape timer/ SMPTE	2	key
CONVERGENCE ECS-10B	¾"	no	pulse count	2	joystick
DATATRON TEMPO-76	¾", 1", 2"	no	SMPTE/pulse count	3	slider (Varascan)
DYNASCIENCES 1034	¾", 1", 2"	no	real time	2	knob
DYNASCIENCES 104-BA	¾", 1", 2"	no	real time	4	knob
DYNASCIENCES EJ-104	¾", 1" 2"	no	real time	2	knob
EMS RES-Q	¾"	yes	pulse count	16	lever
JATEX VSEC-42T	½", ¾", 1"	no	SCENE-DEX time code	2-3	key
JVC	¾"	no	pulse count	2	key
NANOTEC 376	¾"	no	pulse count	2	key
SERVO 712	¾"	no	SMPTE code	2	lever
SONY BVE-500	¾"	no	pulse count	2	knob
SONY RM-430	¾"	no	pulse count	2	key
VIDEOMEDIA Z-6	¾"	yes	modified pulse count	3	lever



Creative tape editing simplified.

Superstick gives you complete creative control. Superstick—a Convergence exclusive—makes videotape editing as easy as working with film. Without taking your eyes off the monitors, this single control lets you switch between scenes and move tape forward or backward at any speed you select. It's that simple.

Liplock® makes sense out of fast talk. Our "Liplock" audio control delivers accurate sound at regular, fast and slow speeds—no more "Donald Duck" or "growl." You can select audio cues in record time with Liplock.

Cut/Lap™ produces deceptively simple "dissolves." This Convergence breakthrough simulates dissolves quickly, economically. Viewers like what they see, and you'll love the low cost.

Ask for a demo—no cost or obligation. See for yourself how Convergence videotape editors let you concentrate on the creative, instead of fighting with the equipment. You'll get the results you want quickly, precisely, and economically. Write or call for details. We'll send information by mail and call you about a demo, at your place or ours.

Editing means Convergence.

CONVERGENCE CORPORATION

17935 SKY PARK CIRCLE, IRVINE, CA 92714
(714) 549-3146 TWX: 910-595-2573

For information Circle 246
For demonstration Circle 247

Videotape editing

fiers. Changeable corrections should be stored in the edit list and linked to edits. Color framing is another unsolved problem. Actually, any frame cannot be edited to any other frame; the NTSC color frame sequence must be preserved. Although a 1-frame adjustment usually works with video, audio needs finer control. Thus, the VTR audio editor should have field rate (60 Hz) resolution and be independently controlled from the color frame rate (15 Hz) video editor.

Finally, switcher control is still relatively poor. With post production frame re-positioning and fully controllable switchers, graphics should now be fully replicated in automatic assemblies from off-line edits. Split screens and mixes should also be off-lined and auto assembled. Experience has indicated that producers and directors still don't trust automatic assemblies in video, and the temptation to re-edit a production again during auto assembly is great. □

TABLE II. Features of videotape editors

System	Features								
	¾-inch VTR	1-inch VTR	2-inch Quad	Audio recorder	Switcher	Type CPU*	Auto assembly	Active list	Tactile control
AMPEX EDM-1	no	yes	yes	yes	yes	distributed PDP-11 / 6800	yes	no	no
AMPEX HPE-1	yes	yes	no	no	yes	6800	no	no	yes
CMX 340X	yes	yes	yes	yes	yes	distributed PDP-11 / PACE	yes 2 modes	no	yes
CONVERGENCE ECS-100 series	yes	yes	no	no	yes	6800	no	no	yes
CVS EPIC	yes	yes	yes	yes	yes	NOVA	yes	yes	yes
DATATRON 2000	yes	yes	yes	yes	yes	distributed NOVA / Z-80	yes	yes	yes
DATATRON TEMPO-7650	yes	yes	yes	yes	yes	PACE	yes	no	yes
DATATRON 7640, 7630, 7620	yes	yes	yes	yes	yes	PACE	yes	no	yes
MACH ONE	yes	yes	yes	yes	yes	LSI-11	yes 2 modes	yes	yes
SONN-ROY SRS-1	no	yes	yes	no	yes	Z80	yes	no	no
SONY BVE 5000	yes	yes	no	no	yes	8080	no	no	yes
RCA AE-600	no	no	yes	no	no	8080	no	no	no
RCA SE1	no	no	TR-600A only	no	no	PDP 1802	no	no	no

*Equipment manufacturers use a variety of CPU/microprocessor/minicomputer systems in their design. Those noted here include 6800 by Motorola; PDP/LSI series by Digital Equipment Corp.; Z80 by Zilog; 8080 by Intel; PACE by National Semiconductor; and NOVA by Data General.

new literature

Technical and professional books

Hayden—Titles in computer science, electricity, electronics, engineering, mathematics and mechanical technology can be found in Hayden's 1979 catalog. Short descriptions and prices at a cost less than the national average are included.

Circle (69) on Reply Card

Cases

Platt—Specification sheets describing Platt business and trouble-shooting cases are available. Prices and photographs are included.

Circle (70) on Reply Card

Digital video

SMPTE—Digital Video, Volume 2 has been published by the Society of Motion Picture and Television Engineers. The book, edited by M. Carlos Kennedy, Ampex, contains 13 chapters plus the transcriptions of two panel discussions. The papers are intended to bring the broadcaster up to date on the progress of digital video technology. The material comes from papers presented at SMPTE's 120th Conference in New York.

Circle (71) on Reply Card

Tower accessories

Sabre Communications—A technical catalog on the company's line of towers accessories and services includes information on base section design, concrete foundations, anchors, wind loading, specific data and dimensions.

Circle (72) on Reply Card

Saticon camera brochure

Sharp Electronics—The company's line of 3-tube ⅔-inch Staticon bias-lighted color cameras is featured in a color brochure. It explains and illustrates features of the XC-530, a self-contained portable ENG/EFP camera, and the XC-500, a multi-function studio camera. A list of available accessories also is included.

Circle (73) on Reply Card

Capacitors

Surcom Associates—The January price lists contain the latest details on prices and ordering of all types of capacitors, including cast epoxy transmitting mica, medium power upright transmitting mica, vacuum fixed and vacuum variable.

Circle (74) on Reply Card

Product catalog

Trompeter Electronics—Sections on patching, connectors and cable assemblies are included in a 40-page catalog T12. Products are illustrated in standard, miniature and subminiature coax, twinax, triax and quadrax. Also included is a treatise on noise in cable systems.

Circle (75) on Reply Card □

new products

Cameras

Hitachi has introduced the SK-96 studio/convertible camera and the SK-100 automatic studio camera. The SK-96 features an internal head module which can be converted to a hand-held EFP head. A die-cast-housing and small CCU makes the unit ideal for remote field production. Performance specifications include a resolution of 550 lines, 51dB S/N and sensitivity of 200fc at F4.

The SK-100 is a computer controlled studio camera which accepts a variety of pick-up tubes including 30mm Plumbicon, 25mm Diode Gun and 25mm Saticon. Features include ABO (automatic beam optimizer), tiltable and rotatable viewfinder, an enhancer which automatically adjusts detail according to picture pattern, genlock, VIT color bar generator, H&V sweep inversion LSI processing and triax control.

Circle (60) on Reply Card

Edit controller

Convergence is delivering the ECS-103 Multi-Source Superstick Editing Control System. With the ability to mix ¾-inch and 1-inch formats, the unit features special effects switching, A/B rolls, SMPTE time code, tape search, split video and audio, store and recall and status display. Other optionally available features include Liplock audio pitch control, edit decision listing, automatic dialogue replacement and animate remote control.

Circle (61) on Reply Card

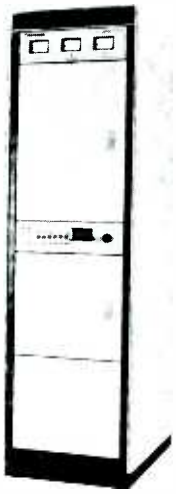
250W AM transmitter

Wilkinson Electronic's new AM transmitter, the model AM-250SS features solid-state electronics and compactness. Drawer mounting permits easy accessibility to circuitry. Extra cabinet space allows expandability to 500W, but a 125W version is available at cost savings. Further specs include low operating costs, high efficiency, 115 or 220Vac input; and 125% modulation capability.

Circle (62) on Reply Card

Transmitter

The S1-A-1S 1 kW AM transmitter from *Sintronics* is a solid-state unit



which is said to be exceptionally well metered. The transmitter features a neat and clean design for ease of operation and maintenance.

Circle (63) on Reply Card

Audio/router/amplifier

Ramko Research has introduced the model ARA-1612 audio/router/amplifier for stereo or mono stations. The unit is capable of local and remote access to all station audio sources simultaneously and individually. As many as 16 sources to 12 different locations can be fed at once with expansion capabilities to 45 in and as many out as necessary.

Additional features include local and remote lighted output status displays; individual, gain adjustable, input amplifiers; programmable output cards for stereo and/or mono feeds; dual, instantaneous switch over, power supply for 100% on air reliability; and balanced in and out.

Circle (64) on Reply Card

Van towers

A series of towers, designated Mobile Van Towers, have been introduced by *Aluma Tower Company*. The tower, which is mounted on a standard ladder rack on top of a van, is suitable for signal communication work; all types of test work including radio signals and air sampling; Civil Defense mobile communications and ham radio. A sliding track design enables the operator to move the tower from the horizontal to the vertical position with a minimum of effort. Three standard duty models, 35, 50 and 60 feet; and two heavy duty models, 35 and 50 feet, are available.

Circle (65) on Reply Card

ENG camera

A 3-tube prism-optics ENG color TV camera from *Ikegami*, the HL-79A, is an all-in-the head camera. Weighing 11.2 lbs for camera and viewfinder, the HL-79A has an auto-iris closure at shutoff for protection of the pick-up tubes. The camera delivers standard level chroma key RGB output signals, as well as two NTSC encoded outputs.

Circle (66) on Reply Card

Triax studio camera

Marconi Electronics has announced the Mark IX studio remote color camera with triax cable instead of multicore. The triax version can work with up to 5000 ft of 13mm triax cable.

All the facilities available on the standard Mark IX camera also are available on the triax version, including RGB chroma key.

Circle (67) on Reply Card

Battery sequencer

A battery sequencer by *Frezzolini* will, automatically and in sequence, charge five or less battery packs or belt battery packs (intermixed in any way).

The system is designed for fixed-station or mobile applications and is built into a standard relay rack mount. Input is 120 V, 50/60 Hz. □

Circle (68) on Reply Card

professional services

advertisers' index

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classified

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TRAINING

ELECTRONICS DEGREE by correspondence. Earn A.S.E.T., then B.S.E.T. Free brochure. Grantham College, 2550 South La Cienega, Los Angeles, California 90034. 2-79-tfn

FIRST PHONE through cassette recorded lessons at home plus one week seminar in Boston, Philadelphia, Detroit, Atlanta or Seattle. Our twentieth year teaching FCC license courses. Bob Johnson Radio License Preparation, 1201 Ninth, Manhattan Beach, Calif. 90266. Telephone 213-379-4461. 8-78-tf

REI has over 5,000 successful graduates and over 95% pass the FCC 1st Class exams on first try. New FCC exams are on the way. Better not take a chance—learn electronics and pass exams too. 5 week course. Rooms at the school. Call or write for information. R.E.I., 61 N. Pineapple Ave., Sarasota, Fla. 33577. (813) 955-6922.7-79-tfn

SERVICES

ONE STOP FOR ALL YOUR PROFESSIONAL AUDIO REQUIREMENTS. Bottom line oriented. F.T.C. Brewer Company, P.O. Box 8057, Pensacola, Florida 32505. 7-71-tf

HELIAX-STYROFLEX. Large stock—bargain prices—tested and certified. Write for price and stock lists. Sierra Western Electric. Box 23872, Oakland, Calif. 94623. Telephone (415) 832-3527. 1-73-tf

TRANSMITTER TUBES REPROCESSED—Save 40 to 50%. 3CX2500, 4CX5000, 4CX15000 and many others. Write for details. FREELAND PRODUCTS CO., 3233 Conti St., N.O., La. 70119, (504) 822-9222. 6-79-tfn

TOWER SERVICE: Erection. Sales. Service. Painting. Inspections. Maintenance contracts. Pioneer Tower Service, P.O. Box 253, Carrollton, Missouri 64633, (816) 542-0840. 8-78-tf

VIDICOM TO NEWVITRON—We'll update your Panasonic WV-2100P to WV-2150 quality with new Newvitron tubes. LIVE-VIDEO, Parcel 8, Suite 3A, Farmington, CT 06085, (203) 673-4611. 7-79-3t

COMPLETE E.F.P. MOBILE UNIT—3 color cameras with experienced engineer. Geared for the budgeted production. LIVE-VIDEO, Parcel 8, Suite 3A, Farmington, CT 06085, (203) 673-4611. 7-79-3t

EQUIPMENT FOR SALE

GE PE-350 COLOR CAMERAS: Excellent condition, 3 available, $8,000 ea. **RCA TR-4 Hi-Band VTRS.** New heads, good condition, 2 available, $16,000 ea. **GE 12KW UHF Transmitter:** Ideal for new station, good condition, $14,000. **GE-PE-250 Color Cameras:** Includes lens, cables, CCU's, 2 available, $3,000 ea. **IVC 500A Color Cameras:** With all accessories, excellent shape, $7,000 ea. **RCA TK27B Film Camera:** Available with TP15 Multiplexer, $22,000. **RCA TP66 Projectors:** Good condition, $10,000 ea. **GE PE 240 Film Camera:** Excellent condition, $8,000. **New Lenco Terminal Equipment:** Discount prices, fast shipment. We will buy your used TV equipment. To buy or sell, call Toll Free (800) 241-7878, Bill Kitchen, Quality Media Corporation. In GA call (404) 324-1271. 6-79-tfn

RCA VTY MODIFICATIONS KITS for TR4/22/50/60/61/70. Splicer (single-frame), TEP Interface, Time Code Edit Interface Kit, Audio Splice Timing Mod (Audio Insert Editor), Wideband Audio Amplifiers, most mod kits, some modules available. LAWHED, LTD., 388 Reed Road, Broomall, Pa. 19008, (215) 543-7600. 4-78-tf

TELEVISION EQUIPMENT FOR SALE: TR5 HI-Band Color Recorder, new head. Best offer or will trade for any TV equipment. Call Jim Nelson (312) 236-5535. 7-79-2t

EQUIPMENT FOR SALE: HITACHI FP-1020 SATICON ENG camera. New, factory warranty. $12,995 ($17,115 list). Soundesign, Box 921, Beverly Hills 90213. 7-79-2t

FOR SALE: ONE RCA FIELD INTENSITY METER, type WX2D, frequency 540 to 1600. Call 916-233-2713 or write to P.O. Box 1650, Alturas, CA 96101. 8-79-2t

USED FIDELIPAC TAPE CARTRIDGES: $35.00 per hundred as is. New pressure pads, $28.00 per hundred. Freight prepaid, check with order. Cart Mart, Box 3066, Fort Worth, Texas 76105, (817) 536-6437. 8-79-3t

BROADCAST CRYSTALS for AM, FM or TV transmitters, frequency change, repair or replacement of oven types. Also vacuum types for RCA, Gates, Collins, etc. transmitters. Quality products, reasonable prices and better delivery! Don't be without a spare crystal. Frequency change and service for AM and FM monitors. Over 30 years in the business. Eidson Electronic Co., Box 96, Temple, Texas 76501. Phone (817) 773-3901. 12-74-tf

FOR SALE: 16 SANYO #8410 V-CORD VIDEO-TAPE PLAYERS, some slightly used, most never used. $200 each or make offer for all. Javelin time-date generator, almost new, $225. Memorex UCS-20 cassette videotapes, slightly used, $10.00 each. Call Blair Posten in California, (408) 448-1700. 7-79-1t

FOR SALE: 75 foot steel broadcasting tower, condition good. Please contact Tom Kunes, S & S Inc., 21300 St. Clair Avenue, Cleveland, Ohio 44117 or call 1-216-383-1880 for information. 7-79-1t

HEWLETT PACKARD 335B FM MONITOR $400.00. (206) 242-2508. 7-79-1t

AUTOMATION EQUIPMENT made available by format change. Schafer system CU8-T, three SCM Model 250 carousels, Schafer audio clock TM-8, and Schafer 25 Hz generator TRU-8. Also, cart recorder SCM590. Contact John Bennett, Chief Engineer, WLIX, 138 W. Main St., Bay Shore, NY 11706, (516) 666-2200. 8-79-2t

TWO MICROTIME IMAGE PLUS IMAGE PROCESSORS. Will retrofit to any model 2020 TBC. One used eight months; one not used at all. New price $7,295. Will sacrifice for $5,100 each. Call Joe Stroebner at OMF AUDIOVISUAL INC., Bismarck, North Dakota, (701) 258-6360. 8-79-1t

EQUIPMENT FOR SALE: For Philips PC70 color camera, Angenieux 10:1 zoom lens with servo iris, mechanical zoom and focus. Complete with hand controls and cables. $5,000.00 complete. Lens in like-new condition. Controls and cables are new. Power-Optics, Inc., 1055 W. Germantown Pike, Fairview Village, PA 19409. Phone (215) 539-5300. 8-79-1t

EQUIPMENT FOR SALE (CONT.)

MINI COMPUTER—BARGAIN PRICE. Are you looking for a way to increase your station paper work efficiency and lower costs at the same time? KEZY has, for immediate sale, a three year old Nixdorf 840 mini computer and ALR with all radio station software. Make us an offer. Call Dan Mitchell, 714/776-1191. KEZY, Anaheim, CA. 8-79-1t

IGM RAM AUTOMATION: 4K with Rampart. Includes 5 Scully reel decks, 4, 25o Series carousels, BPI programmable clock, racks and many extras. This is a functioning system currently in use at WNNR, New Orleans. $26,000 or best cash offer. Contact Ken Devine, (504) 581-5777. 8-79-1t

3CX10000A3 (one G.E., 4CX3000A (two) G.E., never used, for CCA 10,000D AM transmitter and others. $1,875 plus shipping F.O.B. Tucson. M. P. Brown, KTKT, P.O. Box 5585, Tucson, AZ 85703, (602) 622-6711. 7-79-2t

FOR SALE: Ampex VR2000A - Amtec, Colortec, ProcAmp, VHO, Vel-Comp, 3M DOC, Electronic Editor, Venturi Air System, new reel turntables, excellent condition - used in videotape production facility. $35,000. Dept. 467, Broadcast Engineering, P.O. Box 12901, Overland Park, KS 66212. 8-79-1t

CETEC CENTURY II mono record-play two-speed cart machine, like new—$600. Ampex 350-1 record/play stereo reel tape machine. Good—$950.00. Much more. Philada Sound, P.O. Box 162, Oak View, CA 93072. 8-79-1t

WHILE WAITING FOR DIGITAL VIDEO, get one of these. One Ampex VR1100 hi-banded with VR1200 and Allen parts, has Ampex 790 TBC with AVR1 velcomp and DOC, $27,000 with used head. One Ampex VR1100, same as above less 790 TBC, with MKII editor, $17,000. Also available—one or more Ampex VR1100's hi-band, record only, with demod out, $15,000 without head. Assorted VR1100 b&w signal systems, b&w proc amps, also amtechs. Call (812) 934-2004. After Labor Day, (617) 254-9115. 8-79-1t

HELP WANTED

TELEVISION HELP WANTED—IMMEDIATE OPENINGS. Experienced in maintenance of professional closed circuit systems for N.Y. company. Looking for persons with supervisory potential. Many benefits including paid medical and pension plan. Send resume to Technical Operations, P.O. Box 268, New Hyde Park, N.Y. 11040, or call Personnel Mgr., (516) 352-2238. 5-79-tfn

LICENSED TV TECHNICIAN experienced in operation and maintenance of studio and transmitter equipment for commercial midwest market. Latest equipment, pleasant environment, full benefits. NBC network/heavy local production. Write Jerry Merritt, WICS-TV, 2680 E. Cook, Springfield, Ill., 62703 or call (217) 753-5665. 7-79-2t

HELP WANTED (CONT.)

OETA

PRODUCTION ENGINEER

Oklahoma ETV/PTV Network expanding into new engineering and production facility. Position open for two production engineers. RCA Quad machines. Editing and CCU experience with FCC First Phone. Good benefit package and paid retirement and hospitalization. Send resume and salary requirements to:

Personnel Director
OK Educational TV Authority
Box 14190
Oklahoma City, OK 73113

NONBROADCAST TELEVISION TECHNICIAN—University of Illinois seeking maintenance technician for small format television equipment. Starting $13,270, raises to $17,035 over two years, plus annual increases. Two years electronics study, two years electronic maintenance required. Contact: Don Swift, Personnel Services, University of Ill., Champaign, IL 61820, (217) 333-3109. Affirmative Action, Equal Opportunity Employer. 8-79-3t

ENGINEER I—Television, closed circuit system. Responsibilities: Operation, preventive maintenance, and repair of television and related equipment, including quad and helical VTRs, broadcast, and CCTV cameras. Requires: BSEE and experience in television, or minimum two (2) years electronics training beyond high school and three (3) years television experience. First class FCC license desired. Salary: $13,000 and benefits. Affirmative action employer. Contact or send resume to: Jim Kirklin, Division of Instructional Communications, Western Michigan University, Kalamazoo, MI 49008. 8-79-1t

IMMEDIATE OPENING for AV technician w/strong video repair background. Contact A. Zand, (219) 283-6423. AV, Box 542, Notre Dame, IN 46556. 8-79-1t

TV MAINTENANCE ENGINEER, AND EDITOR/TECHNICAL DIRECTOR NEEDED. Philadelphia's oldest and largest independent teleproduction facility. Maintenance Engineer, for RCA cameras and quad VTR's on six camera mobile van. Editor/Technical Director, experienced with Grass Valley switchers and CMX Editor in studio. E. J. Stewart, Inc., 388 Reed Road, Broomall, PA 19008, (215) 543-7600. 8-79-2t

FIELD ENGINEER: Immediate opening. Secure employment opportunity with good benefits; fully equipped van provided for travel. Requirements: FCC 1st class; minimum two years experience with and skill in maintenance of TV electronic equipment; knowledge of computerized control system desirable. Send resume to: James Potter, Indiana Higher Education Telecommunications System, 1100 West Michigan, Indianapolis, Indiana 46223. EOE/AA employer. 8-79-1t

MAINTENANCE ENGINEER: Position available in the Blackhills of South Dakota. An opportunity to be directly responsible for color Broadcast and Production Facility. Including Quad and Helical equipment. Good position if you're looking for more responsibility. Requires First Class License. We're a 100 Plus Market. A growing new facility. Call Chief Engineer, (605) 394-7762. 8-79-1t

COMPUTER ANIMATION PRODUCTION FACILITY based in Hollywood requires video systems technician experienced in maintenance of VTR (2" quad & Helical) video camera, and over-all video systems. Production experience is asset. Send complete resume, including references to: Image West, Limited, 845 North Highland Avenue, Hollywood, CA 90038, attention Mr. Russ Maehl. 8-79-1t

HELP WANTED (CONT.)

CHIEF ENGINEER: Top salary and benefits for right person. Video production company New York City, seeks top drawer energetic management level E/E. Must have minimum 10 years experience as supervisor of engineering-production, maintenance and design. Experience with quads, IVC 9000's cameras, and knowledge of computer animation equipment valuable. Send full details in confidence to President, Dolphin Productions, Inc., 140 East 80 Street, New York, N.Y. 10021. 8-79-1t

MAINTENANCE, OPERATIONAL ENGINEER: WPAT has an opening for a maintenance/operational engineer in leading, good music radio station in New York Metropolitan Area. Excellent benefits and compensation for the right person. First phone and heavy maintenance experience necessary. Call Ken Stout, (201) 345-9300. AN EQUAL OPPORTUNITY EMPLOYER. 8-79-1t

ENGINEER FOR TWO PTV STATIONS. You'll handle master control, VTR and film projection. An opportunity for diverse work and strong benefits. You'll need a First Class Radio-Telephone license, two years in TV technical operations, plus an associate degree in electrical technology. No calls. Send resume to Daniel Kuemmel, Employee Services, WMVS/WMVT, 1015 N. Sixth Street, Milwaukee, WI 53203. 8-79-1t

HELP WANTED/TECHNICAL: Beautiful seacoast town 1½ hours from N.Y.C. New FM Stereo station seeking Chief/Production engineer, knowledge of FM automation stereo, transmitter, and studio maintenance essential. This is a growth opportunity. Send resume to: General Manager, WSBH, 91 Hill Street, Southampton, New York 11968. Starting salary $10,000 with periodic reviews. 8-79-1t

CHIEF ENGINEER for South Florida group owned TV station. Must be a hands-on man knowledgeable in RCA equipment and SONY ENG. Resume to Box Dept. 468, Broadcast Engineering, P.O. Box 12901, Overland Park, KS 66212. 8-79-tfn

AUDIO TECHNICIANS

One of the country's most important national noncommercial broadcast organizations is looking for broadcast/recording technicians and master control operators. If you're quality-conscious, and you have had both recording studio and broadcast experience and are creative and a professional, then join our staff to make it happen, where it happens. If you wish to apply, be sure you have a strong background in news production, and that you know audio processing equipment from the inside out. You should also feel as at home on a remote as you are in the studio. Individuals interested in being master control operators should be experienced in automated audio switching systems and computer terminals. You should also be familiar with Telco and microwave interconnection systems. We offer excellent company benefits which include paid hospitalization and vacation. Please send resume, including salary history, to:

DeNise Johnson
NATIONAL PUBLIC RADIO
2025 M St., NW
Washington, D.C. 20036

NPR is an Affirmative Action/ Equal Opportunity Employer

EXPERIENCED SALES ORIENTED STATION MANAGER for 25 year old daytimer, also need PD. Southern state. Dept. 461, Broadcast Engineering, P.O. Box 12901, Overland Park, KS 66212. 7-79-2t

TELEVISION MAINTENANCE ENGINEER: Expansion of facilities at One Pass, Inc. in San Francisco has created several openings for experienced engineers familiar with all phases of video production and post-production. Candidates should be capable of maintaining and troubleshooting state of the art equipment from cameras, monitors and switchers to complex editing systems, type "C" "1" and quad VTR's. Send resumes with salary history to: Rich Stephens, One Pass, Inc., 900 Third St., San Francisco, CA 94107, (415) 777-5777. 8-79-1t

HELP WANTED (CONT.)

MANUFACTURERS REPS WANTED

RAMKO RESEARCH, MANUFACTURERS OF ADVANCED BROADCAST AUDIO EQUIPMENT IS SEEKING EXCLUSIVE REPRESENTATION IN: NEW ENGLAND, NEW YORK, ILLINOIS, WISCONSIN, MINNESOTA, IOWA, NORTH AND SOUTH DAKOTA, KANSAS, MISSOURI, NEBRASKA, COLORADO, ARIZONA, NEVADA, CALIFORNIA, WASHINGTON, AND OREGON.

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(916) 635-3600

ASSISTANT CHIEF ENGINEER for South Florida group owned TV station. Must be a hands-on man knowledgeable in RCA and SONY ENG. Resume to Dept. 469, Broadcast Engineering, P.O. Box 12901, Overland Park, KS 66212. 8-79-tfn

TELEVISION BROADCAST TECHNICIAN: Baltimore television station has an opening for a technician. Must have FCC 1st class license and technical school education. Send resume to: Chief Engineer, WMAR-TV, 6400 York Road, Baltimore, Maryland 21212. E.O.E. M/F. 9-79-tfn

TELEVISION CHIEF ENGINEER (CHIEF INSTRUCTIONAL MEDIA OPERATIONS ENGINEER) University graduation with a degree in Radio, Television, or Electrical Engineering **OR** graduation from a recognized electronics institute **and** three years of experience in one or a combination of the following: multi-media systems engineering and operations or radio/television systems engineering and operations. Three years of administrative or supervisory experience. Salary: $1225-$1535 per month.

TELEVISION TECHNICIAN (CLOSED CIRCUIT TELEVISION TECHNICIAN) High school graduation. Two years of training in electronic theory and two years of technical experience in closed circuit television work. Salary: $965-$1045 month. Send resume to Fred Blakey, Personnel Office, Northern Illinois University, DeKalb, IL 60115; phone (815; 753-0455. AN EQUAL OPPORTUNITY/AFFIRMATIVE ACTION EMPLOYER. 6-79-3t

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It's no mistake. Here's your chance to buy brand-new 3M video gear at prices you may never see again. And each of these surplus pieces comes with full manufacturer's warranty.

Production Switcher MODEL 812
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For more information call toll-free 1-800-328-1656.

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HELP WANTED (CONT.)

VIDEO TECHNICIAN FOR L.I. COLLEGE

Fully experienced in color studio maintenance. Full time position in a relaxed atmosphere of a college campus. Full tuition, medical & dental coverage, also pension plan. Experience & qualifications. Write to:
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P.O. Box 12901,
Overland Park, KS 66212

Affirmative Action
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ASSISTANT CHIEF ENGINEER with knowledge of UHF transmitters. FCC rules and TV studio operation. Resume to Chief Engineer, WJCL-TV, P.O. Box 13646, Savannah, GA 31406. 7-79-2t

ENGINEER WITH THE HIGHEST LEVEL OF TECHNICAL EXPERIENCE needed by Major Production Facility. Work with state of the art equipment; Vital Squeezezoom; Datatron Computerized Editing; etc.; for a top salary and enjoy South Florida living. All applicants must have heavy digital experience. Call: Mike Orsburn, Chief Engineer at: (305) 587-9477 or write: Video Tape Associates, 2351 SW 34th Street, Ft. Lauderdale, Fla. 33312. 7-79-2t

TELEVISION ENGINEER—Major market midwestern network affiliate accepting applicants. Must be strong in theory and have an excellent background in television engineering. FCC first class license essential. ENG remote van experience helpful. An AA/EOE. Send resume with salary requirements to Dept. 460, Broadcast Engineering, P.O. Box 12901, Overland Park, KS 66212. 7-79-2t

OPERATING TECHNICIAN for Washington, D.C. area production company. Must be familiar with audio pickup and recording techniques and have a good working knowledge of television audio systems. Reply Dept. 465, Broadcast Engineering, P.O. Box 12901, Overland Park, KS 66212. 8-79-3t

TV BROADCAST TECHNICIANS. Established public television station moving to new color facility. West Virginia University and WWVU-TV has vacancies for persons experienced in master control operations, production and maintenance including all phases of transmitter and/or microwave transmitting/receiving maintenance. Send resume of qualifications and salary history to: Jack Podeszwa, Personnel Officer, West Virginia University, Morgantown, WV 26506. An Equal Opportunity/Affirmative Action Employer M/F. 8-79-2t

ELECTRONICS TECHNICIAN WANTED for electrical engineering firm on Maryland's Eastern Shore. Person must be honest, of good character and able to work on their own or with a team. Two years experience and familiarity with communications equipment required. First or second class radio engineers license desired. Send resume to Downes Associates, Willards, MD 21874. 8-79-1t

CHIEF ENGINEER for a large, modern well-equipped, AM carrier broadcast system. Must have experience in AM and have strong performance in audio and studio maintenance repair and construction. Supervisory and carrier current experience highly desirable. Will supervise 1-2 student assistants and be responsible for 6 studios and 13 transmitters. This is a full-time year round position. Starting salary $12,000 or more depending on qualifications and experience. Good fringe benefits package. Reply to: B. Eft, All Campus Radio, Room 8, Student Service Bldg., East Lansing, MI 48824. An Equal Opportunity Employer. 7-79-3t

HELP WANTED (CONT.)

LeSEA MINISTRIES TELEVISION STATIONS need qualified Engineers. 1st Class FCC License Required. Chief, Maintenance Supervisors, Technicians. Miami/Midwest locations. An Equal Opportunity Employer. Send Resume to: Larry Scott, WHFT-TV, P.O. Box TV 45, Miami, Florida 33169. 8-79-1t

BROADCAST ENGINEER: Experienced in directional antenna systems, FM Stereo, Harris Automation and studio maintenance. Salary commensurate with experience. Write WFGL/M-104, P.O. Box 960, Fitchburg, Mass. 01420. 8-79-1t

MAINTENANCE SUPERVISOR for large Washington, D.C. area production company. Technical school plus minimum 5 years experience. Must be familiar with all types of studio broadcast equipment. Reply Dept. 464, Broadcast Engineering, P.O. Box 12901, Overland Park, KS 66212. 8-79-3t

WANTED

UHF CHANNEL 40 TRANSMITTER (USED) wanted by non-profit midwest organization. We get on air: you get substantial tax write-off, through donation or discounted price. Reply to Broadcast Engineering, Dept. 463, P.O. Box 12901, Overland Park, KS 66212. 8-79-1t

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 Thorncliffe 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

LOOKING FOR OLD TRANSCRIPTION LIBRARIES: Capitol, Associated, Thesarus. Write or phone: Don Kennedy, Georgia Network, 1800 Peachtree, Atlanta, Georgia 30309. (404) 355-8686. 6-79-2t

SITUATION WANTED

FIRST PHONE NEEDS A CHANCE. Willing to learn. Full or part time. Some experience. Resume available. Dept. 462, Broadcast Engineering, P.O. Box 12901, Overland Park, KS 66212. 8-79-1t

BROADCAST engineering

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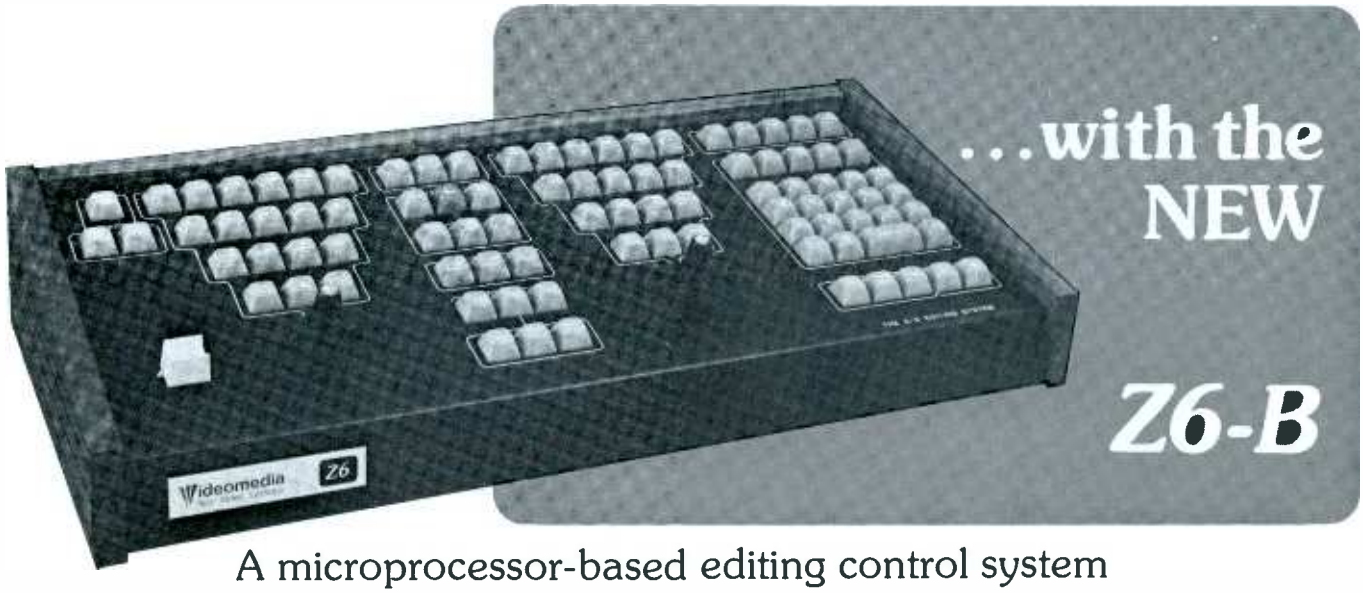

A microprocessor-based editing control system

Who more than you, deserves all this?

The Z6/B has all of the outstanding features of its predecessor, the Z6/A plus . . .

- **Auto Edit** — any or all 99 events can be performed at the push of a single button.
- **Sync** — a Z6 exclusive, keeps both tapes synchronous with respect to each other. Move either tape in either direction and the other transport will move the exact number of frames.
- **ADR** — Automatic Data Replacement, when activated, sends the editor in a "looping" condition. The operator can replace data numerous times until it is a "take."
- **Auto Cal** — automatically assigns the proper number to the proper frame of video on any new tape. No longer do known locations or SMPTE addresses need to be referenced.

The Z6 data display is a continuous readout of all edit parameters, including operator prompting messages.

Z6/B standard features include . . .

- Bi directional joystick shuttle
- Auto search
- 99 event memory
- Full status display
- Cruise control
- Rehearse, perform, review edit
- Error and prompting message
- Programmable Pre and Post rolls
- Single glide ballistics
- NO mechanical mods to VTR's
- SMPTE or Micro-code display
- Return to "in" or "out" points
- Micro-loc*— frame accuracy
- Consecutive non stop mode change
- Full VTR remote control
- A/B monitor select
- Tag functions

Z6/B options include . . .

- Drop frame/Non drop frame readout
- Dump — an exclusive Z6 feature which records all memory on the video tape itself
- Line Printer — allows a hard copy read-out of all edit decisions and parameters

Z6 is truly the most powerful video tape editing system available. Call Videomedia or your local dealer for more information.

*pat. pend.

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