NOVEMBER 1978

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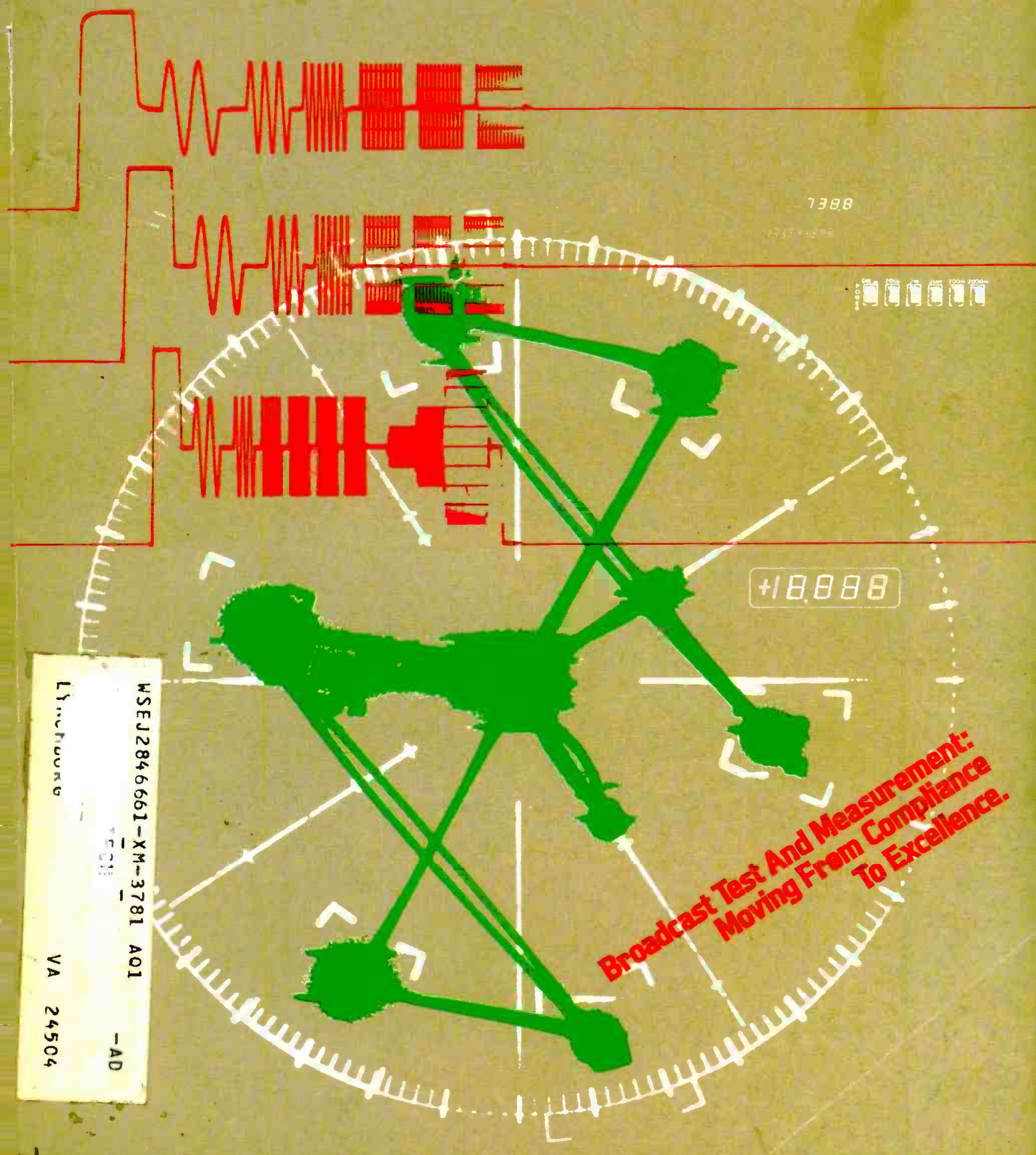

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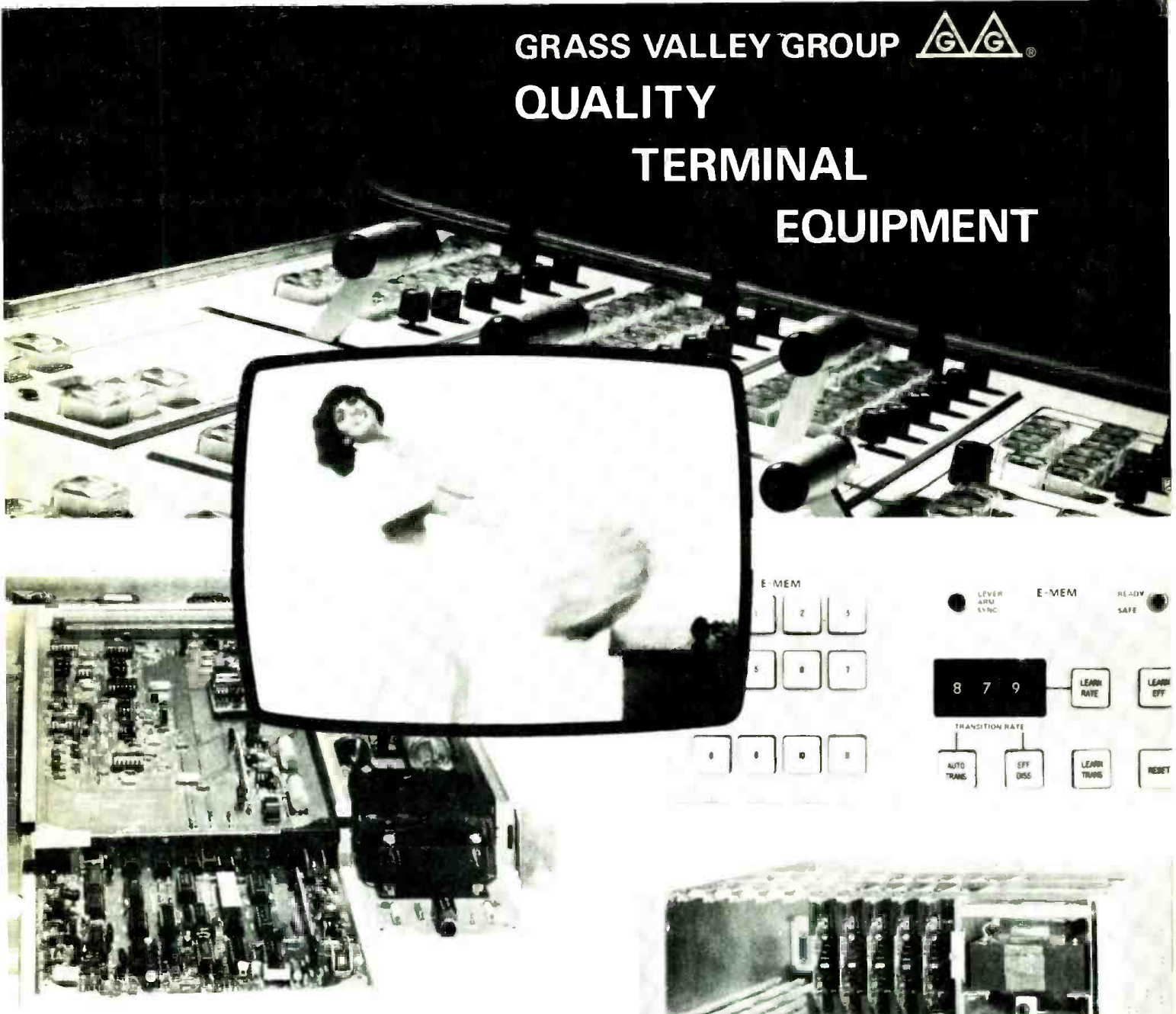

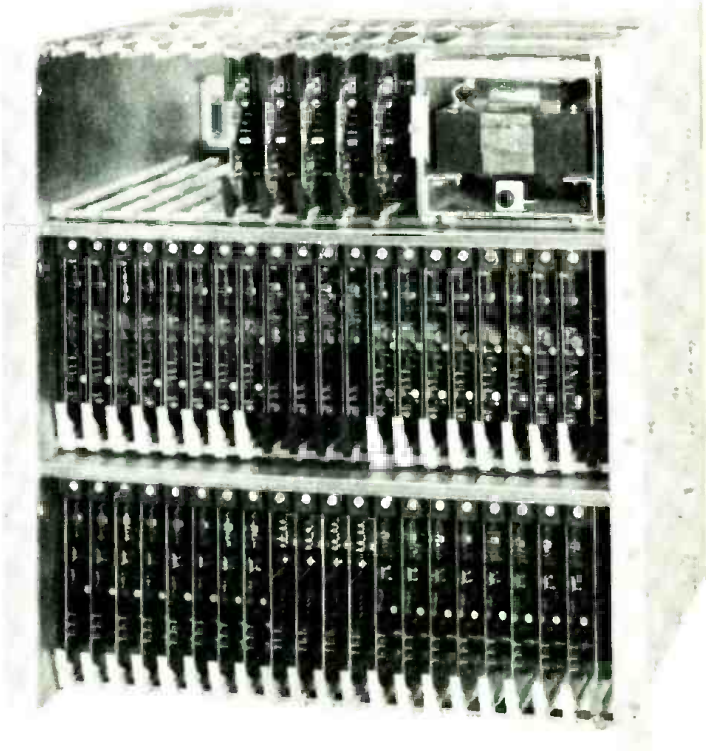

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BROADCAST INDUSTRY NEWS

U.S. Court Overturns WESH-TV Renewal

The U.S. Court of Appeals's overturning of the renewal of WESH-TV, Daytona Beach Fla., could change the FCC's comparative renewal procedure. The court told the FCC that the Commission acted unreasonably in its renewal of the Cowles Communications station over Central Florida Enterprises Inc., which had challenged the former's license.

The decision here is noteworthy because it negates a case used by the FCC wherein the Commission adjusted and defined its comparative renewal proce-

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One-Inch Type C Manufacturers On Track For Full Production

By the spring of 1979, four major manufacturers—Ampex, Hitachi, NEC, and Sony—will be in full production on the new SMPTE Type C format one-inch helical scan videotape recorders. Both Ampex and Sony will have begun delivery of Type C machines by the end of this year, and both companies' retrofit programs for converting existing one-inch recorders to the Type C format will be well underway. NEC, which has just released preliminary specifications for its TT-7000, expects to have the units in full production by the end of March, 1979. Hitachi Denshi America has also just announced plans for its one-inch Type C recorder. Prototypes will be in dealers' hands by the end of 1978, while production models will be shown in March at the NAB show. Hitachi plans to start delivery in July, 1979 of both console and portable models with digital time base correctors and editing capabilities. No other details have been announced yet.

Ampex VPR-2. With a sale of 83 VPR-2 production recorders to ABC Television (and an option for 37 more units), Ampex geared up to begin full factory production of the VPR-2 in September. Until now the VPR-2 was available only as a hand-assembled unit. Some of the ABC recorders will be delivered in late September, with the balance due to arrive throughout 1979.

According to Ampex, the VPR-2 is an expansion of the engineering designed for Ampex's VPR-1, but with additional operating capabilities for more creative freedom, such as the integral backspace editor, which provides an accuracy of ± 1 frame. Combined with the Ampex TBC-2 digital time base corrector, the VPR-2 will provide a viewable picture in shuttle modes. In addition, the optional AST Automatic Tracking System provides highly expanded editing capabilities, including manual forward or reverse jogging and variable speed playback from normal to still frame; the signal is broadcast quality when fed through the TBC-2.

Ampex is also now ready to begin its retrofit program for converting their VPR-1 machines to the Type C format. The cost will be approximately $3000 per unit, with the installation done at Ampex's six regional service centers. Ampex-type recorders are also distributed by Philips and Marconi under license from Ampex.

Sony BVH-1000. Sony began shipping its fully factory-assembled BVH-1000 recorders back in July, and is therefore slightly ahead of its competitors on getting machines out into field use. Sony's retrofit program—at a maximum cost of $1000 per unit, with all machines shipped back to Long Island City, N.Y. for servicing—is also moving ahead nicely, and, according to a Sony spokesman, "is right on schedule."

The BVH-1000 conforms, of course, to all Type C specifications, with several innovations. "Bidirex" is Sony's control dial which, in a single dial, gives control over bidirectional search operations at still, step, ¼, normal, 3x, 5x, 10x, 25x and 60x speeds with color lock maintained up to 7x normal speed and a monochrome image recognizable up to 30x normal speed. Using Sony's BVT-1000 digital time base corrector, noise is suppressed during fast search modes to enhance viewing ease. Bidirex also permits forward and reverse frame-by-frame, fully color-locked jogging. The BVH-1000 has built-in color framing and capstan override systems and an optional built-in semi-automatic pre-roll for editing and cueing.

An exciting new advance from Sony will be its Dynamic Tracking system, equivalent to Ampex's AST, according to the Sony spokesman. Dynamic Tracking is a bimorphic tracking device that will permit sync playback at continuously variable speeds from ¼ reverse to 2x normal (passing through, of course, still frame). Although the system will be specified as ¼ reverse to 2x normal, Sony engineers claim it is theoretically possible to achieve a full reverse speed. The BVH-1000 is also distributed by RCA under license from Sony.

NEC TT-7000. NEC America, Inc., has just announced the preliminary specifications for its TT-7000 Type C videotape recorder, which was first announced several months ago. This will be a studio-type machine, conforming to all IEC/SMPTE Type C standards. The TT-7000 will feature both video and audio confidence heads; still frame and slow motion (five percent and 20 percent of normal speed plus jogging) capabilities; and optional accessories including the NTC-5000 time base corrector, TEC-1 editor, monitor bridge, and video head cartridges. NEC plans to have the machines in full production by the time next year's NAB show.

Technicians perform final checkouts on Ampex VPR-2 videotape recorders. Full-scale factory production began in September at Ampex plants in Colorado Springs, Col. and Sunnyvale, Cal.

Video	
Picture Lock-up Time	3 seconds from maximum
Signal-to-Noise Ratio	48 dB
K-Factor	1%
Differential Gain	3%
Differential Phase	3 degrees
Moire	−40 dB
I/Q Delay	50 nano-seconds
Low Frequency Linearity	2%
Video Outputs	2
Audio	
Broadcast Audio Channels	3
Frequency Response	50 Hz to 15 kHz ±2 dB
Signal-to-Noise Ratio	56 dB
Wow and Flutter	.1% WRMS
Total Harmonic Distortion	1%
Audio Amplifier	Internal

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Sony has perfected a new kind of audio recording system for professional use. It's called PCM, which stands for Pulse Code Modulation. And it's part of the digital audio revolution—such a great improvement over conventional analog recording techniques, it's been called the best thing since night baseball.

It's here right now

We've taken those last important steps toward making digital audio a practical reality. And the 2-track PCM-1600 we're exhibiting at this fall's AES conference isn't just the most advanced professional digital equipment to come to the marketplace. It's an idea whose time has come.

The perfect master

Used as a Studio Master, the Sony PCM-1600 gives you true digital mastery of audio. Substantially better audio quality than is possible through even the best analog technology. It lets you record separate takes and assemble them. Make generation after generation of laquers with no sound degeneration. And distribute any number of digital masters to, say, foreign affiliates... giving France the same quality you gave England.

And you still haven't heard the best about the PCM-1600.

First, it uses a standard videotape recorder. The same kind of recorder already familiar to broadcasters across the nation. To edit, or to perform a digital-to-digital dub, you use a standard Sony video editing console—and do it all electronically.

Second, some very impressive numbers. Dynamic range greater than 90 dB. Harmonic distortion less than 0.05%. Wow and flutter so low it can't be measured. And absolutely no hint of hiss.

Third, we've solved the problem of dropouts. By introducing an error-correcting code technique originally developed for computers, we've given our PCM-1600 fail-safe signal reproduction. The kind computer applications take for granted.

And finally, Sony PCM equipment is ready to live up to the Sony name. It's rugged. Reliable. Designed to take anything professionals dish out. And once producers and artists hear the difference, conventional analog recording systems just don't sound good enough.

Now you've heard everything

Unless, of course, you haven't heard our PCM-1600 in action. In that case, we'll be glad to demonstrate...and even take your order now for fall and winter deliveries.

If you think you can wait, see our PCM exhibit at the 61st AES Convention, Waldorf Astoria, New York, November 3-6. Have a good look around.

Then have a good listen.

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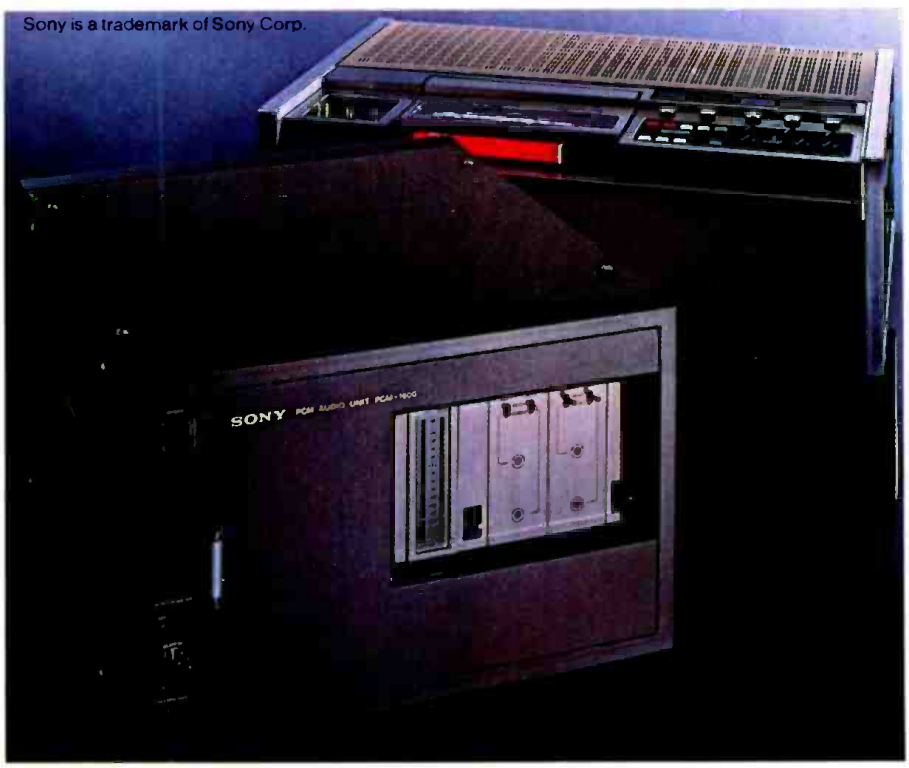
DIGITAL AUDIO



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dures in order to favor incumbents over challengers if their records were substantial. As a result of the verdict, the four to three renewal of WPIX-TV, New York, and other recent renewals may have to be rethought.

Judge Richard Wilkey criticized the agency for overlooking violations of its rules when it approved the renewal. The unauthorized relocation of WESH's main studios and allegations of mail fraud concerning printing subsidiaries of Cowles were apparently given little consideration when the renewal was granted. The bench was not satisfied with the commission's decision because although Central was favored on the issues of diversification, integration, and minority participation, these findings were apparently not incorporated in the decision process. Regarding the unauthorized move, the court said that the Commission is not free to wholly disregard violations of its rules. The court ordered the Commission to reconsider its conclusion.

The court's decision in the WESH-TV case may very well have a ripple effect on the close FCC decision to renew WPIX-TV over the challenge of Forum Communications, which is taking that decision to the U.S. Court of Appeals. Chairman Ferris was a dissenter in the WPIX decision, and a member of the minority which is apparently prepared to interpret "meritorious service" by new, stricter standards. The shift of one vote, moving the minority into the majority position, could darken the whole renewal scene.

Court Sends More Licenses Back To FCC

A decision to deny a challenge to the licenses of three Los Angeles TV stations has been remanded to the FCC by the U.S. Court of Appeals. The basis of the court's decision was that the stations' percentage of women employees is smaller than that in the L.A. work force. The petitions against KNXT, KTTV, and KCOP were filed by the Los Angeles Women's Coalition for Better Broadcasting because of underemployment of women.

The FCC denied the complaint, saying that the group raised no substantial and material questions for consideration. The court asked the commission to reconsider the denial of challenge because of a decision last May which placed an increased emphasis on equal employment as a station's public interest obligation.

In the case cited, *Bilingual Bicultural Coalition on Mass Media v. the FCC*, the court said that licensees who engage in intentional employment discrimination do not serve the public interest, and that under-representation of certain segments in a licensee's work force may result in programming that fails to adequately serve the community.

FCC Plans Refunds And New Fee Schedule

The FCC has begun an inquiry into a future fee program and a refund of fees collected between August 1, 1970 and January 1, 1977. The purpose of the inquiry is to: (1) explain the current status of the refund program and set procedure for public input; (2) lay the groundwork for a new fee schedule; and (3) consider methods for establishing spectrum usage charges.

Prior to January, 1977, the U.S. Court of Appeals for the District of Columbia ruled that the Commission was limited to assessing fees "at a rate which reasonably reflects the costs of services performed or the expense of other value transferred to the payor." The court ordered the Commission to recalculate the fees collected and make appropriate refunds.

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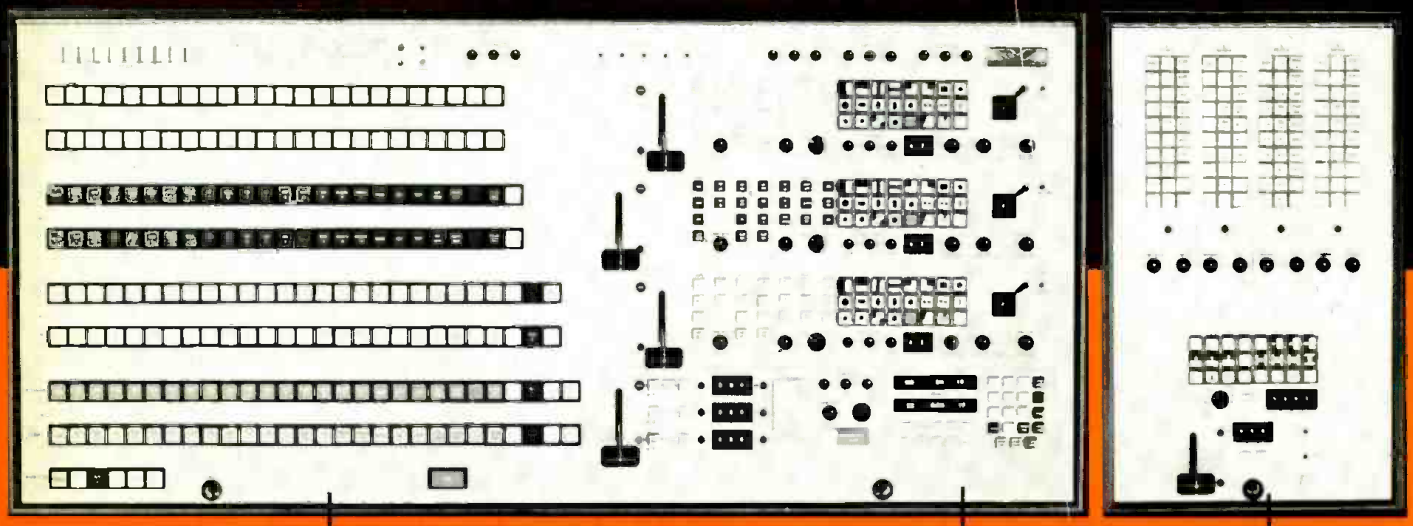

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News

The refund program will consist of Phase I, which will deal with fees greater than $20, and Phase II, which will handle fees of $20 or less. The inquiry at this time deals only with Phase I. The FCC said that approximately $90 million in fees had been collected in this category, and that it might receive as many as 300,000 claims for refunds. The Commission's preliminary estimates indicate that as much as $55 million could be refunded in Phase I of the program.

The estimated refund to broadcasters could be as much as $32.7 million. Common carriers could receive as much as $22.6 million. Cable TV would receive no refunds under the plan.

The FCC said that refunds would be made only in response to claims submitted on special forms for that purpose, and that payment would be made only to the licensee or grantee of the service for which the fee was charged, regardless of who may have actually paid the fee to the Commission. Claims would have to be filed within one year of the time the refund program begins, and would be processed in the order received. Those claimants who accept the refund amount that the FCC ultimately adopts would be required to waive any further claim to additional refund of the fees in question.

The FCC also proposed to undertake a thorough evaluation of an appropriate future license fee program to culminate in an "explicit, exhaustive categorization of services rendered" (by the agency). The Commission said that fees might be calculated using a two-part schedule which would reflect both costs and value to the recipient. Specifically, it said that the direct costs of providing a particular service could be divided equally among the recipients, while indirect costs would be distributed in accordance with value conferred.

For example, the Commission said, the value conferred on commercial broadcasters might be measured by the size of the audience which the station is technically capable of reaching by virtue of its location, transmission power, authorized operation time, frequency assignment, and other technical considerations.

In another part of the inquiry, the Commission said that if it were given legislative authority to obtain "fair market value" for spectrum use, it might collect such value through the use of spectrum fees, auctions, or some combination of the two.

The FCC said that spectrum fees could be applied to all users of the spectrum, or certain classes of users could be exempted or charged reduced rates. Similarly, the Commission said that auctions could be used for all future transmitter applications, or only for selected classes of users in selected bands, especially when there were several mutually exclusive applicants for the same channel.

In any case, said the Commission, the purpose would be to charge a price for spectrum use which would accurately reflect the value of same to the user. The Commission invited comments concerning how "fair market value" might be measured and collected through the use of spectrum fees or auctions.

Radio Listeners' News Preference

The first results of an Associated Press study conducted by Frank N. Magid Associates find that listeners show no interest in hearing *People Magazine*-type stories on the air, even though they like to read such stories. It was found that respondents were interested in stories that affected them directly, and

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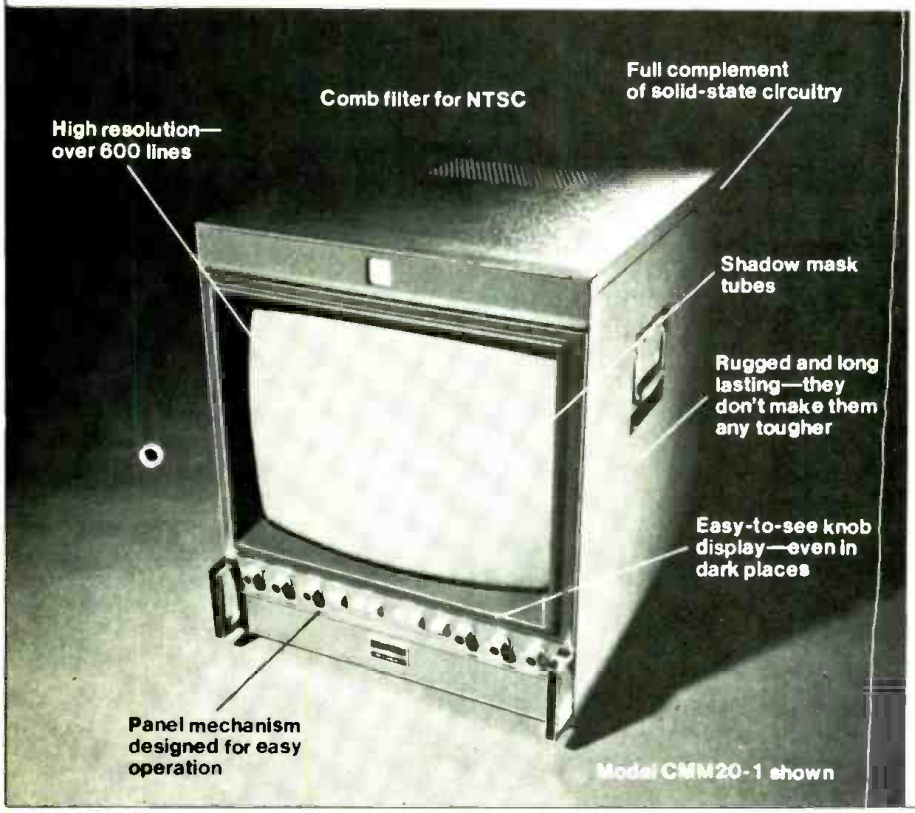
BUILT TO TAKE IT!



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Built for a long life and the ability to meet the demanding needs of professional broadcasters and production houses.

21 models: 20-inch, 14-inch and 10-inch high resolution models with comb filter for NTSC. RGB also available as are 20-inch and 14-inch PAL.

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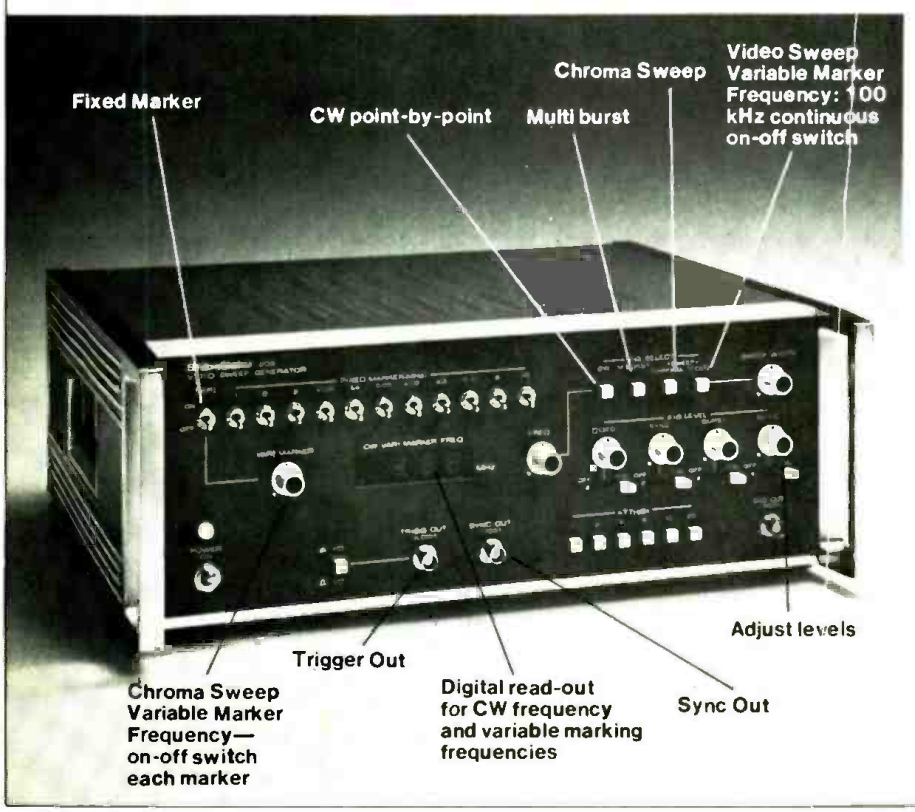

AND MAINTAIN IT!! Measures frequency response on TVs, VTRs and other video equipment.

The Asaca Video Sweep Generator 205 contains a built-in standard color sync signal generator. The color burst can be switched on and off so the 205 is ideal for oscillator comparisons to measure frequency response of color equipment.

There is a selection of output signals: video sweep (0.1 - 10 MHz), chroma sweep (sub carrier ±2MHz), CW and multi-burst.

Also, the 205 features facilities for composite sync signal outputs and trigger pulse outputs (H. D/V. D. Selectable) and so it can be used for oscilloscope triggering. Digital read out for CW frequency and variable marking.

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that news and lack of commercials have equal importance among beautiful music listeners (after music).

The most desired time to hear news was noon, and local news is preferred. Thirty percent of the respondents said they actually tuned the news in, and three percent of a national sample said they turned the radio off when the news came on. The study also revealed that the on-air announcer's style made little difference, and the highest percentage of respondents able to identify a network affiliate was 13.2 percent for CBS.

Department Of Energy Offers Solar Index

Radio and TV stations in 12 cities are reporting usable solar energy in their daily weather reports. The stations use the Solar Index, which is sponsored by the Department of Energy (DOE) and indicates how much work the sun could have done that day.

The index is a number between one and 100 indicating the percentage of household hot water that could have been supplied that day by a typical solar hot water system. The Solar Index is obtained from Solcost, a computer-based design method developed for DOE by Martin Marietta.

Federal efforts are being accelerated to promote the widespread use of solar energy for hot water as well as home heating. Under a trial program, the Solar Index information is collected and processed, using Solcost, at the Solar Environmental Engineering Company in Fort Collins, Colo. It is then released through the Solar Energy Industries Association for daily reporting nationwide.

House Communications Subcommittee Holds Public Hearings

As part of a nationwide series of field hearings on H.R. 13015, the rewrite of the 1934 Communications Act, the House Communications Subcommittee held a hearing on September 8 in Trenton, N.J. The hearing was co-chaired by Rep. Andrew Maguire (N.J.) and Rep. Henry Waxman (Cal.).

The morning session was devoted largely to discussion of Section 424(1) of the proposed act, which says, "each community in the U.S., regardless of size, [shall be] provided with the maximum fulltime local radio and television broadcasting services." Since New Jersey and Delaware are the only states in the country which do not now have any VHF allocations, the issue was of particular interest in the New Jersey area. Speakers representing a variety of citizens' groups, broadcasters, and advertisers, pointed out both the need for New Jersey news and public affairs on their own TV station and also the fact that New Jersey advertisers are forced to pay premium prices for the New York and Philadelphia markets in order to reach the New Jersey audience.

The failure of WNET (New York City's channel 13 PBS station, which used to be a New Jersey commercial station) to provide adequate service to the New Jersey audience — as specified in its license — was alluded to, as was the failure of New York City's six other VHF stations to present an accurate picture of New Jersey news with "special correspondants."

Speakers in the afternoon session tackled the larger questions of the rewrite, including its license fee structure and disparity between radio and television license terms.

FCC Steps Toward Deregulation Of CATV

In what may be seen as a step to allow CATV operators to compete more effectively with commerical TV broadcasters, the FCC voted to drop its requirement that CATV systems get prior

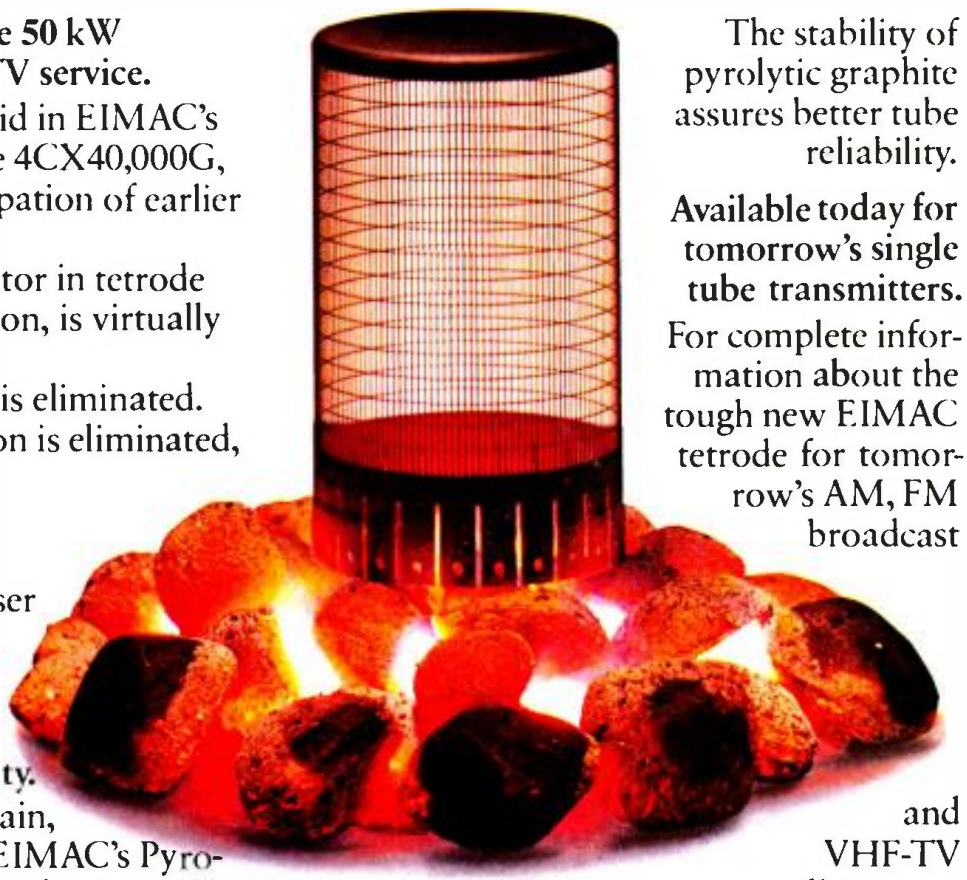
continued on page 14

EIMAC's new Pyrogrid can run hotter so your transmitter can run better.

No easier way to generate 50 kW for AM, FM, and VHF-TV service.

The pyrolytic graphite grid in EIMAC's newest tough tetrode, the 4CX40,000G, has triple the screen dissipation of earlier tetrodes. Which means:

1. A previous limiting factor in tetrode design, screen dissipation, is virtually eliminated.
2. Primary grid emission is eliminated.
3. Secondary grid emission is eliminated, improving linearity.
4. Hot and cold spacing between grids remains constant, allowing closer spacing between elements and improved performance.



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News

approval before starting or expanding service or making changes in programs offered to subscribers.

Philip Verveer, head of the FCC's cable TV bureau, said that the decision will eliminate a backlog of about 1,500 pending applications from cable companies, including some 300 applicants that have been contested by local broadcasters. Regulations governing the importation of distant signals remain intact.

Modern Talking Pictures Hosts Screening

Modern Talking Picture Service, a leading distributor of free-loan films and videocassettes to broadcasters, recently sponsored a screening of six of its latest releases to an audience in New York City. The program was hosted by Judith Crist, reviewer for *TV Guide*.

Through regional television offices, Modern provides free programming to 90 percent of American stations; over 30 percent of its bookings are in the top 20 percent of the markets. Many of the educational films provide valuable assistance to programmers in fulfilling requirements of special interest groups or in filling unsold time and difficult public service requirements. Shorts also help fill gaps in undertime shows. Modern places very few restrictions on the use of its materials. Of special interest should be Modern's Olympic series which can be used to prime audiences for the 1980 Moscow Olympics.

Modern has also announced the expansion of its free loan distribution to cable TV facilities. Beginning in January, 1979, RCA's Satcom I satellite will carry Modern's programming five hours daily to some 800 earth stations serving approximately 1000 cable TV systems and over eight million homes. At present, Modern Cable Programs reaches 1.5 million homes through 100 cable systems.

A Boost For 10-Watters

A recent FCC ruling dictates that 10 watt FM operations will have to increase power to 100 watts by January, 1980. Radio Manufacturing Co., Miami, Florida is offering the EDU-100 FM broadcast amplifier "specifically designed" for meeting those requirements. The unit uses the station's existing 10 watt unit as a driver, thus reportedly reducing the transition costs involved.

It should be noted that this amplifier, and similar ones that are likely to be offered by other manufacturers, will need FCC Type Acceptance by the time a 10 watt station applies for an upgraded 100 watt license.

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NEC'S 30 KW at "drop-in" UHF transmitter WNNE-TV

Because of the mountainous nature of WNNE-TV's northern New England market, they needed to locate their tower and transmitter on Mt. Ascutney, 2,170 feet above average terrain. It's 34 miles by road from their studio. The last mile to the transmitter site is a steep, narrow, twisting trail. Figure an hour-plus travel time in nice weather. But from November to March the site is accessible only by snowmobile and snowshoe.

Due to the remote location of the transmitter, NEC's reputation for high reliability was an important factor in weighing what brand to buy. The use of high-powered transistors and high-gain tubes have reduced the total number of tubes used. Solid-state exciter/drivers offer additional reliability and high-standard color characteristics over conventional transmitters.

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Size and service accessibility were also important to the Mt. Ascutney installation. WNNE-TV's transmitter had to fit in their half of a 42' x 24' building. NEC's plug-in modules simplify maintenance and eliminate the need for external cabinet racks. Sync/video ratio, white limit, visual and aural modulation depth and output power adjustments may be made at the front of the exciter. For reliability, performance, and price, it came down to NEC.

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News

An Engineering Lab For The NAB

The National Association of Broadcasters' executive committee has authorized the establishment of an Engineering Lab. Proposed functions and the budget requirements for the facility will be presented to the NAB's full board during its meeting in Hawaii next January.

Plans for the lab are being compiled by the NAB's engineering advisory committee, with association vice president George Bartlett coordinating. Radio Board chairman Walter May, WPKE, Pikeville, Ky., cited the need for "improved audio processing techniques" as a prime example of the type of activity that the lab might undertake.

News Briefs

As President Carter vacationed in Jackson, Wyoming, TV coverage by the major networks' "pool" was made possible by **RCA American Communications' satellite system and a Western Tele-Communications, Inc.** transportable earth station. In what has been called **a milestone in news coverage technology,** it was shown how readily earth terminals can be transported, erected, and turned on to transmit timely events or live programming from anywhere in the country via satellite . . . . **Modern Talking Picture Service,** New Hyde Park, N.Y., is **offering films of the 1976 Olympics** ranging in length from 27 to 83 minutes. Each of the official films (five in all) presented by Montgomery Ward and the U.S. Olympic Committee is available on **free loan to TV stations** . . . . **The Council of Better Business Bureaus and NBC-TV** recently completed an arrangement for the production of a series of seven 30-second **PSAs directed toward children** 10 to 14 years of age.

NAB has asked the FCC to abandon its interim policy and permit ex parte contact during informal rulemaking proceedings. Currently, the Commission requires that "all meaningful communications" between interested parties, commissioners, and FCC professional staff must be put in writing and placed on the record of the proceeding. NAB maintains that this requirement places "unwise and unnecessary restrictions on the conduct of informal rulemaking proceedings." . . . . **Richard W. Chapin,** chairman of the NAB Reregulation Committee, **has commended FCC's Charles D. Ferris** for his recognition of the importance of reducing "outdated, duplicative and

overly burdensome rules and regulations." In a letter, Chapin also asked that the FCC (1) act on NAB's request to eliminate from its rules all references to commercial time standards for radio; (2) institute monthly mailings to broadcasters of texts of new and amended rules and regulations (and include a copy of public notices explaining the changes); and (3) include broadcasters in its mailings of Action Alert, Feedback, and other publications from the Consumer Assistance Office.

On August 2, the **NAB burned the mortgage** on its national headquarters. NAB president Vincent T. Wasilewski pushed a button sending an electronic impulse to **Mutual Broadcasting System's** world headquarters just across the Potomac River in Arlington, Virginia. From there, the signal flashed to **Western Union's** earth station in Glenwood, N.J., then 23,300 miles to Westar I, the Western Union satellite, in geostationary orbit above the equator, and back to a ten-foot diameter Mutual receiving antenna at the NAB. In less than one-half second, the signal traveled some 46,600 miles and ignited the mortgage.

Sony has established 24-hour, seven-day-a-week **hot line** telephone numbers to provide owners of Sony broadcast equipment with quick and accurate parts and servicing information. In the eastern region (New York), call 212-361-0014. In the central region (Chicago), call 312-647-9596. In the western region (Los Angeles), call 213-635-6322.

WPBT-TV has been honored with the **Media Awards Grand Prize** of the **Florida Bar** for its coverage of the *State of Florida vs. Ronny Zamora* case. The award recognized the station's thoroughness of coverage including all phases of the trial, and commended the station for **opening the workings of the court to a mass viewing audience** . . . . **RTNDA** has announced the winners of its international awards. **WBAL** won the **Edward R. Murrow Award** for documentaries; **WWL** was cited for **Spot News** for its coverage of the Continental Grain Elevator explosion; and **WMAQ** was selected for a variety of submissions by editorial director **Dillon Smith.**

The Maine Public Broadcasting Network has received a minority training grant from the **Corporation for Public Broadcasting.** The grant, to span two years and to be matched 50/50 by MPBN, will be used to hire and train Marion Hale as education services associate . . . . As a tribute to the late **Ernie Crisp,** noted news photographer and educator who died in a plane crash last year, the **National Press Photographers Association** (NPPA) has renamed the award presented annually to

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News Briefs

the TV News Photographer of the Year. The **Kodak Ernie Crisp Award** will be presented this year to **Larry Hatteberg** of **KAKE**, Wichita, Kan. . . . **Home Box Office** affiliates can now make use of an optional **musical tone switching system**, according to **George W. Gilbert**, director of network operations. Precoded signals inserted into HBO's satellite and microwave transmissions can turn the systems' receivers on and off at the beginning and end of each program and can also activate VTRs and other electronic instruments. The signals cause **no intrusion on subscribers' reception.**

Business Briefs

Dynair has announced that over one million dollars in orders has been booked for their System 21 switching equipment since the NAB convention in April. . . . **Ampex** reported that an order for six 24-track MM-1200 recorders/reproducers has been placed by **Record Plant**, New York City . . . . A recently signed purchase agreement calls for **Jerrold Electronics** to supply **Teleprompter** with 2.5 million in headend, distribution and pay TV equipment.

An $11.5 million **contract with RCA Americom extends Showtime's** commitment for satellite service from six to ten years, and enables the expansion of its programming day from an average of nine hours to 12 hours per day . . . . **Showtime** also announced an **80 percent penetration rate** for its new-build system in Salem, Ore. . . . **Daniels & Associates, Inc.**, Denver, Colo., has announced the placement of a $5.2 million senior secured note on behalf of **Cablevision Industries, Inc.**, N.Y. The funds will provide refinancing for system expansion . . . . **Daniels & Associates** also closed a $1.2 million loan for the new construction of CATV systems in Fort Dodge and Webster City, Iowa. The cable operations are **Heritage Communications**, Des Moines, and **Cable Communications**, Iowa . . . . **United Cable Television Corp. (UCTC) has selected Magnavox CATV Systems** to supply equipment for a 300 mile CATV system rebuild in Abilene, Texas . . . . **UCTC** is also using Magnavox equipment to finish the last half of a 1200 mile system in Tulsa . . . . **UA-Columbia has selected Jerrold Electronics Corp.** for the complete turnkey construction of a new two-way CATV system for New Rochelle, N.Y.

Miami radio station **WKAT** has been sold for one million dollars to Nevada State Sentator William H. Hernstadt and Mrs. Judith F. Hernstadt, pending approval by the FCC. The Hernstadts currently own a Las Vegas TV station which will soon transfer ownership to a group of investors headed by NBC-TV personality Johnny Carson . . . . **WRET-TV**, Channel 36, Charlotte, N.C., has abandoned its independent status to become an **NBC** affiliate. The station will also launch its first full-fledged news operation this September, and has appointed veteran newsman Hal Suit to be news director.

Oak Industries has separated its traditional manufacturing operations from over-the-air subscription television and other communications activities, in a major restructuring of its corporate organization . . . . **Time and Frequency Technology** has moved into new facilities in the Oakmead Village Industrial Park at 3090 Oakmead Village Drive, Santa Clara, Calif. 95051.

CFI (Consolidated Film Industries) has signed a million dollar-plus, multi-year videotape agreement for the purchase of "Scotch" brand video products from **3M Corp** . . . . **Rupert Neve, Inc.** announced the sale of several of its Neve recording consoles. **Electric Lady Studios** of New York City purchased a Neve equipment package, including the NECAM computer-assisted mixing system, for $400,000. **The Village Recorder** of Los Angeles purchased a Neve Model 8078 with NECAM for $200,000, and **The Caribou Ranch**, a Rocky Mountain recording studio, purchased another 8078 with VCA subgrouping for a reported $140,000.

Ampex has announced a seven to eight percent increase to affect all professional audio and open reel videotape, effective September . . . . **Fuji announced a price increase** of three to seven percent on all videotape products, effective January 1, 1979.

RCA announced an average 8.1 percent price increase for its broadcast equipment, effective August 15, 1978 . . . . RCA also announced sales of $1.2 million worth of studio and transmitting gear to **Nationwide Communications, Inc.**, which will use the equipment to upgrade its television stations in Richmond-Petersburg, Ga., Knoxville, Tenn., and Green Bay, Wisc.

Uher Werke, Munich, Germany, has named **Mineroff Electronics, Inc.** to be its Eastern regional distributor and **Walter Odemer Co., Inc.** to distribute its line of audio recording equipment in the Western region . . . . **Sansui Electronics Corporation** has announced the formation of a new Professional Products Division to market its products to the broadcast, recording, sound reinforcement, and discotheque markets.

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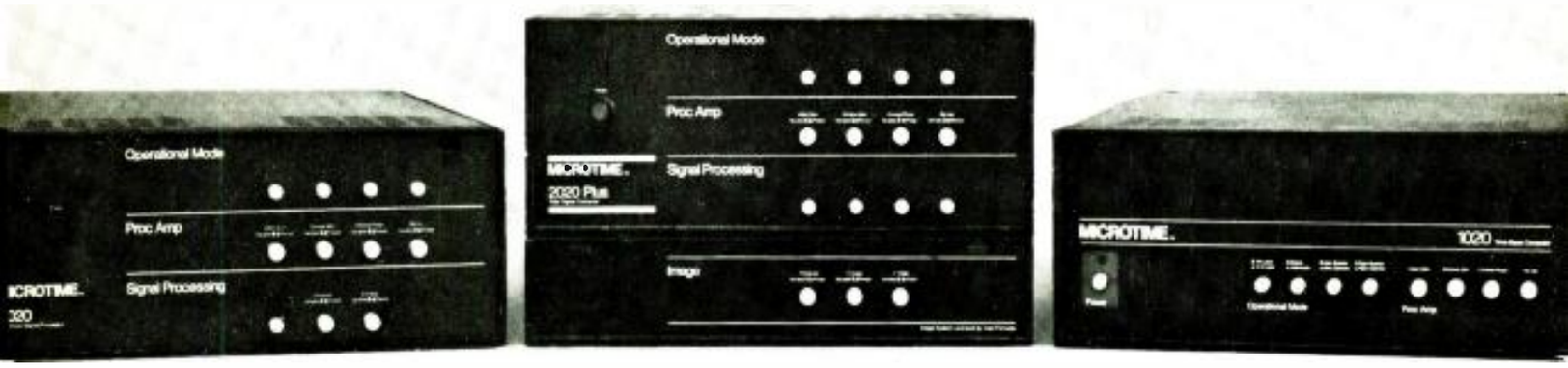

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Take Your Choice...

HERE ARE THREE MORE SERIES of short programming items, each one different from the others, that may fill some air slots and add variety to radio programming. One series is humor, one is "public service," and one is a glossy "big name" interview with strong spill-over from the top of the television talk-show circuit.

"Captain Kremmen" ribs Star Wars, etc.

God knows *Star Wars* can take it. In fact, strength is likely to flow both ways between the current science-fiction blockbusters and clever humor that pokes fun at the extravagences of that genre. An outfit in Los Angeles calling itself "From Studio B" turned up at the NRBA convention with material on a series called "Captain Kremmen of the Star Corps." There are 130 episodes, each two minutes long, involving Captain Kremmen and his "buxom assistant, Carla" in such Woody Allenish adventures as a "battle with giant fruits and vegetables in outer space." From Studio B seems to be on solid ground in postulating that people who love *Star Wars* will get a warm chuckle out of some less-than-reverential commentary. And people who think the whole outer-galaxy theater is a grand bore will also welcome some rib-tickling shafts.

From Studio B describes some other humor series as well. "Year I" consists of 260 comedy interviews, each 90 seconds long, with Alan Barzman as "a guy who mumbles a little and listens a lot," learning about the life styles of such characters as a "hump dryer in a camel wash" or the "promoter of an airplane demolition derby." There are some other series that also seem intriguingly wacky.

Radio managements who would like samples of the humor of From Studio B should write to Merril Barr at From Studio B, 506 N. Larchmont Blvd., Los Angeles, Ca. 90004.

Skillful public affairs programs

For a total 180-degree phase shift, consider the Public Affairs Broadcast Group, also based in Los Angeles. They have put together several series consisting of interviews (actualities) with experts on important topics like government, health, transportation, crime, etc., with the interviews interwoven into commentary to make informative public affairs "specials." The series "In Depth" consists of half-hour programs, two of which are sent out each week on discs. The shows can be used all in one piece or broadcast in segments three or 10 minutes long, giving the radio management flexibility in assembling the programs with other material, including commercials. The series is sold to the station for a flat fee based on the station's spot rate.

Another series is "In Brief," which consists of one-minute features of similar character. Sixty of these can be supplied each month. Also comprising 60 one-minute spots a month is "From A to Z," which covers new developments in science, space psychology, and technology, to help the listener "know what things will be like tomorrow." There is also a health series, and a consumer advice series. There are now about 200 subscribers to one or more of the programs. Radio managements can get a free sample of one month's programs by asking for it. For the sample and full information, contact Public Affairs Broadcast Group, Box 48911, Los Angeles, Ca. 90048.

Will listeners who love Lucy love Lucie?

The developers of a series of 26 five-minute programs titled, "Tune In With Lucie Arnaz," obviously hope so. The series is put out on behalf of Agree hair care products, and is free to the radio station. Each episode includes a 30-second spot for Agree, and room for front and back spots which the station can sell to any non-competing sponsor.

Lucie, instantly recognizable as the daughter of Lucille Ball and Desi Arnaz, is going to have on her show such really big ones as Liza Minelli, Burt Reynolds, Valerie Harper, Carol Burnett, Donny Osmond, her mother, etc. She asks each guest to tell how he or she copes with the pressures of constant public attention, and asks them, "What is happy?"

Radio managements who believe their audiences will be fascinated by the names and who are willing to take a chance on the life guidance that may emerge should get in touch with Carl Byoir and Associates, 380 Madison Avenue, New York, N.Y. 10017, telephone 212-968-6100. **BM/E**

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Syndicators For Radio

KalaMusic

Industrial State Bank Bldg., Ste. 334
Kalamazoo, Mich. 49007
Tel.: 616-345-7121

WHAT IS "BEAUTIFUL CONTEMPORARY"?

It is what KalaMusic calls their one and only format. And it reflects an ongoing trend in beautiful music, which has been noted in several earlier columns as characteristic of other syndicators. For the broad-spectrum demographics that many stations need, beautiful music today must have a more contemporary feel than the traditional format did. That means bringing in currently popular artists and current hits, strong in the present-day charts, with material carefully selected to "flow" with older music in the classical beautiful music manner.

The point the syndicators make is that a large segment of the 18 to 49 audience, which must be the main target for success in many medium and small markets, has grown up with popular music, and insists on hearing the current names and music. A large part of this audience in many cities can be won to lasting station loyalty with the special qualities that have made beautiful music such a success on the radio air, if the contemporary "feel" is skillfully added.

KalaMusic is supplying an outstanding example of the force of this proposition. KalaMusic's material started as the programming of one station, WQLR in Kalamazoo. It still is the programming of WQLR, and is highly successful in that role. In fact, it was the idea's success in raisingWQLR from near the bottom of the heap to the very top in many demographics that gave the programmers their early impetus toward syndication. That, and the desire to spread out the very high cost of beautiful music programming today, led the principals of WQLR to set up KalaMusic.

For the whole story we must move back a little bit. Stephen Trivers and William Wertz were, respectively, general manager and program director of WSBA in York, Penn. It was there they first showed their ability to zoom a station up from "nowhere" in a medium-sized market to a very profitable spot near the top. WSBA was part of the Susquehanna chain of stations. Trivers and Wertz were active in directing the acquisition of other stations in the chain, and in supplying their own brand of beautiful music to the whole chain.

Then, in 1975, they struck out for themselves by buying WQLR in Kalamazoo. The station was doing badly in a very competitive market which included not only the eight stations in Kalamazoo, but several powerful stations in Grand Rapids and Battle Creek that put city-grade signals over the Kalamazoo metro.

The strength of the Trivers-Wertz programming ideas got another spectacular demonstration. WQLR began to climb, and by the 1978 April/May Arbitron, was at or near the top in nearly all adult categories and in almost every day-part, the station's best showing to date. The relevance of the "contemporary" flavor is clear in the fact that 63 percent of the WQLR listeners are in the 18 to 49 age group.

Making the material available to other stations was initially a response to specific requests for it from other managements. But the idea had enough logic to start on its own; the high cost of beautiful music suggests a group approach to underwriting. Trivers and Wertz added Terry Armbruster as operations manager, and began to seek subscribers. At the time of the 1978 NRBA Convention in September (at which they were interviewed), there were 25 stations on the list.

The list then included one Canadian station, since KalaMusic has been able to include the proportion of Canadian material required by the Canadian broadcast authorities. Several other Canadian stations are strong prospects.

The programs are mastered and duplicated on KalaMusic's own equipment, set up for the highest possible technical quality. Master tapes are made at 15 ips; copies are made one-to-one at 7½ ips. The material is issued on reels each holding one-half hour of music, consisting of two quarter-hour

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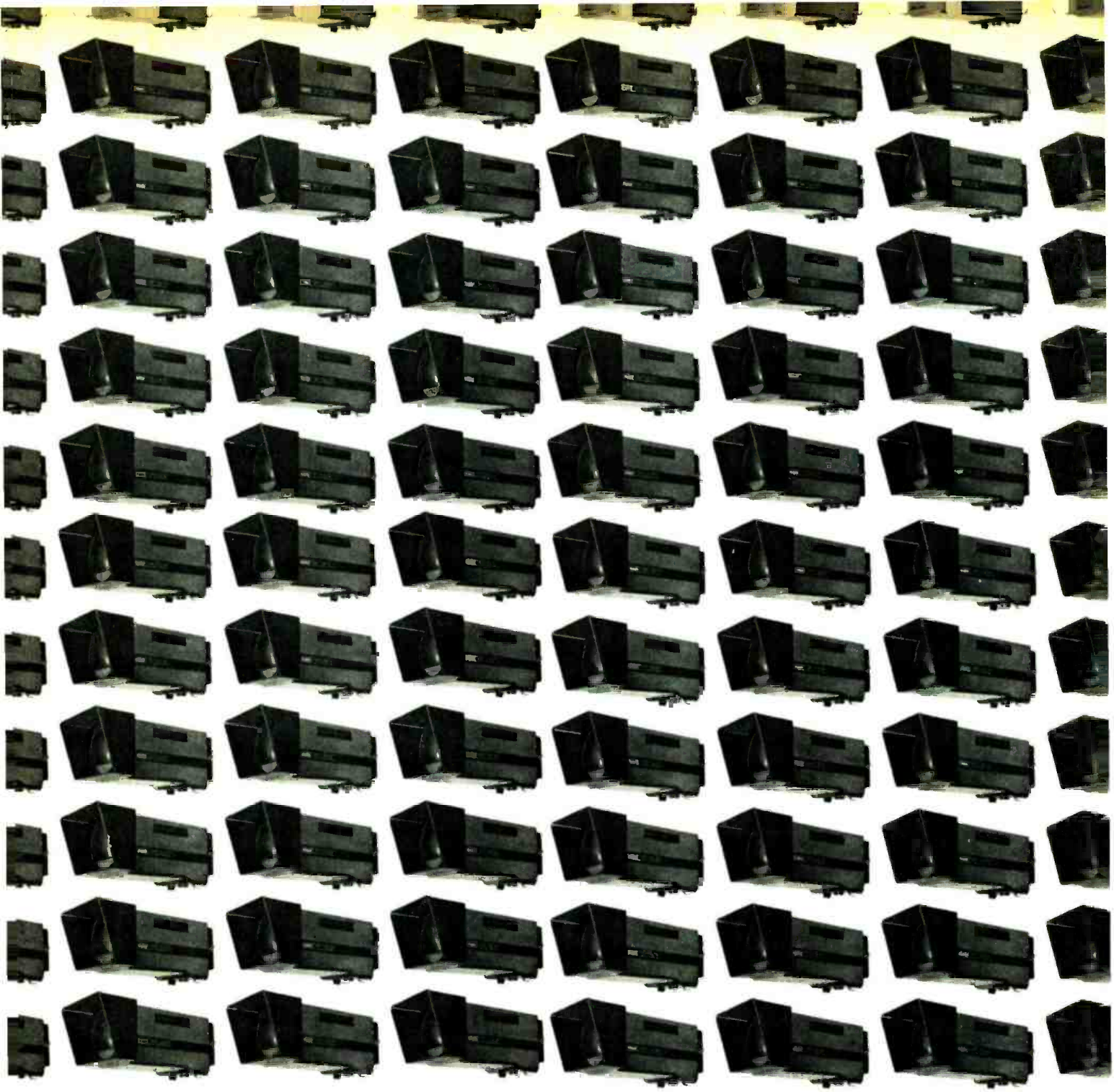

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segments, plus fill music. The reels are assigned to day-parts, and are played in "straight" order. About 600 reels are initially supplied (300 hours of music). Updating is frequent and usually adds up to at least 200 new reels a year.

The value of a syndicator to a beautiful music station goes far beyond the expert assembly of the programs. Getting the music together in the first place is becoming nearly impossible without the investment of really large amounts of time and money, far outside the resources of a station in a medium or small market. Bill Wertz spends a large proportion of his time scouring the market for suitable material, a process made difficult by the almost total disinterest in beautiful music on the part of the American record industry. In addition, of course, KalaMusic must be supplied with the "contemporary" material that is an important part of the mix.

The most expensive part of the supply process, however, is the custom recording that many of the syndicators in the field now find necessary. KalaMusic is underwriting a continuing series of original recording sessions. Some of the groups engaged for these sessions are George Greeley, the Fairfield Orchestra and Singers, Frank Chacksfield, Johnny Gregory, and the entire Canadian Talent Library. This operation will expand. It obviously brings radio stations music they could never get on their own.

Putting the music together in pleasing playing segments is obviously a matter primarily of personal talent, but it is aided for KalaMusic by a computer that stores all titles and other data on the music and can be called on to supply a list of titles sequenced in the right general way. The computer is a great aid toward finding the optimum rotation, balance, and control of repetition.

The KalaMusic programs are not announced: Trivers and Wertz believe that the station must do that part, for the convincing "liveness" that is essential. But the programs can be used by either automated or non-automated stations. They insist they don't dictate in any way to a subscriber, but are ready with a rich body of advice on programming, sales, technical operations, promotion, etc. This advice can be used or not as the station management sees fit.

The Kala operators are convinced that their programming gets much of its quality from the fact that they are actively operating a radio station and adapting the programming to its day-to-day needs. Thus they are up-to-the-minute on audience trends, and can keep their subscribers fine-tuned for today's markets. BM/E

CBS Sports Makes Big Splash Underwater With Video

SHARK! THE VERY WORD IS ENOUGH to strike terror in the hearts of millions, a certain sign to get out of the water — fast. For the 150 people involved in the production of the *CBS Sports Spectacular* "Professional Underwater Sportsman's Competition," however, the sighting of a shark was the signal for everyone to get *into* water.

The program brought together a team of engineers and production people who shared two common interests, both critical to the success of the show: a deep love of the sea, and an interest in expanding the horizons of the video medium. It represents the first time that television cameras have been used beneath the water for a documentary-like sports program. Producer Stuart Goodman (Stuart Goodman Productions) had been a staff cameraman for ABC Television for 14 years; *CBS Sports Spectacular* executive producer/director Bernie Hoffman had been influential in CBS's decision to use tape whenever possible for all its sports shows; facilities and technical director Frank Celecia (ENG Productions) was a veteran TV cameraman and engineer with extensive knowledge of the perils of electronic field production; and cameraman Pierre Bonnescuelle de Lespinios headed his own Miami-based underwater photography company. Together, they formed a team in which the traditional boundaries between engineering and production were limited more to job titles than what they actually did.

Portable equipment a must

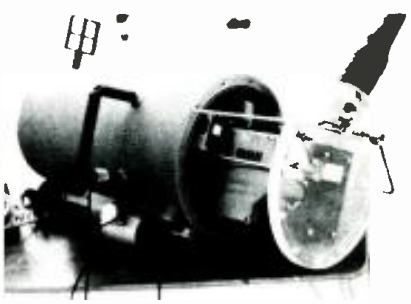
The first decision to be made by the team was which camera to use. They looked at Compact Video's AquaPak, a PCP-90 mounted in a special underwater housing and connected to a topside CCU. It was felt, however, that for the documentary-type situation they were anticipating, as much control as possible would have to be given to the cameramen since the action would be fast-paced and dramatic. Although Hoffman expected to be able to closely monitor the action from the 89-foot cabin cruiser Pelorus Jack, which was to serve as the mobile production center, he felt that only the cameramen or their cable tenders would have the 360-degree angle of vision suddenly opened up underwater. For these reasons, focus and zoom controls on the camera itself were considered critical.

Another factor dictating the use of ENG rather than EFP cameras was that, with cameramen, cable tenders, competitors, shark cages, and Paul Tzimoulis (competition director and editor of *Skin Diver* magazine) underwater at the same time, not to mention the sharks, it was felt desirable to have as little camera-to-surface cabling as possible. An ENG camera could be connected with a thin coax to the surface recorders. By attaching tennis balls to the coax, they were able to float the cables almost directly vertically to the ship, keeping underwater cable to an absolute minimum.

Everyone's experiences with the RCA TK-76 camera in a variety of demanding situations suggested that this was the way to go, and Jon Wood, a mechanical engineer, was commissioned to construct a special underwater housing for it. The housing had to accommodate not only the camera head, but also a 12-to-one Fujinon zoom lens and internal batteries that could be quickly replaced; obviously, with sharks, no one wanted to chance an electrical cable being bitten through.

Wood's first job was to move the viewfinder monitor as far towards the back of the camera as possible, taping it to the camera's side so it could be seen through the back port. A special corrective lens had to be made for the front port to account for the different refractivity of water from that of air. This proved to be less of a problem than originally anticipated since, with TV's narrower aspect ratio, no edge beveling was required (as is the case with underwater housings for film cameras). Mechanical levers, within reach of the cameraman's fingers while supporting the camera with two handles on the bottom of the housing, were required to connect the lens's zoom and focus barrels. The housing had to have a pressure inlet for the 5½ pounds of air that would be required to offset the effects of the 100-foot depths it would be subjected to. And it had to have a bleed valve to let out the air quickly so batteries could be changed.

Cameraman lines up shot during rehearsal for "Professional Underwater Sportsman's Competition." Note rod linking lens barrel to cameraman's fingertips



Jon Wood's custom-designed housing for RCA TK-76. Sighting device at front end is for rough alignment only since camera's viewfinder monitor was plainly visible

The 100-pound camera and housing were first tested in a heated swimming pool (to simulate the conditions in tropical waters) at a Long Island high school. Using the swimming lane lines as a reference, camera, lens, and housing checked out beyond anyone's wildest hopes; in a one-hour test period,

continued on page 28

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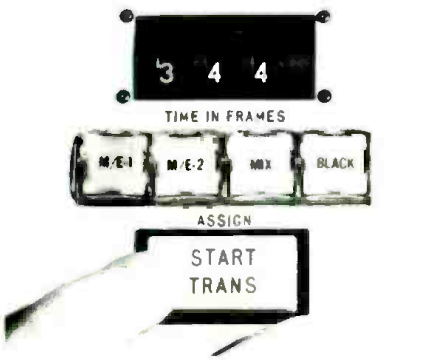

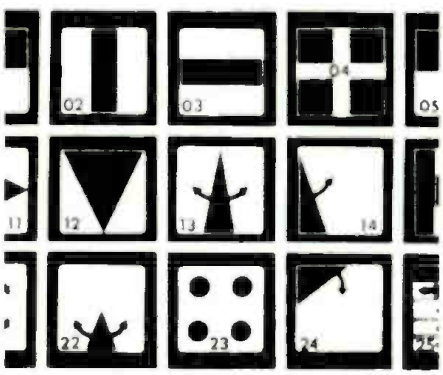

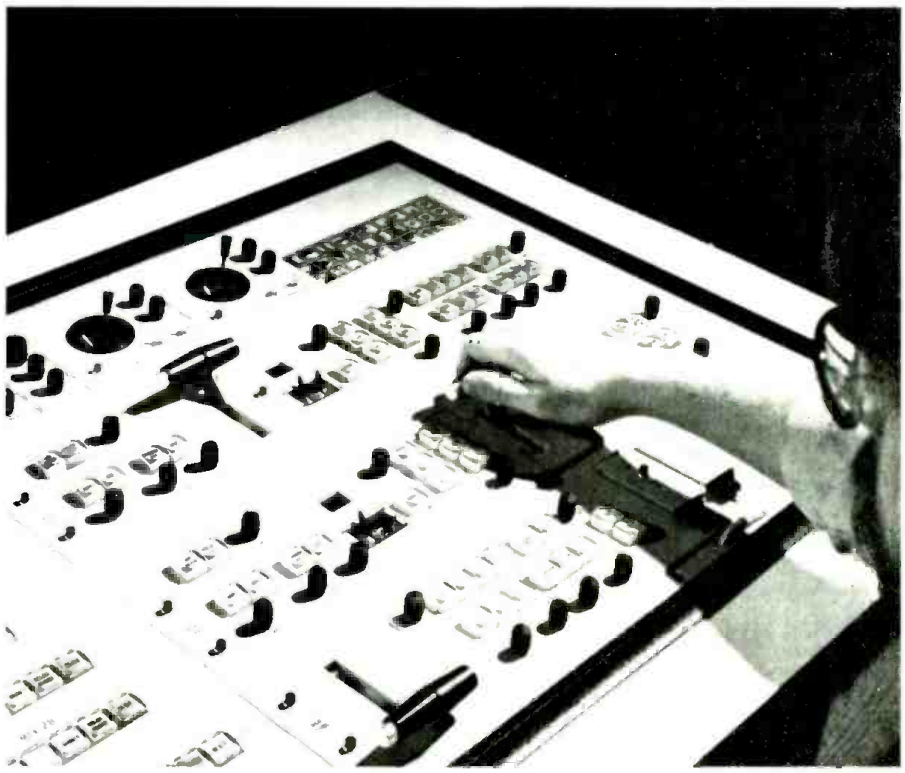

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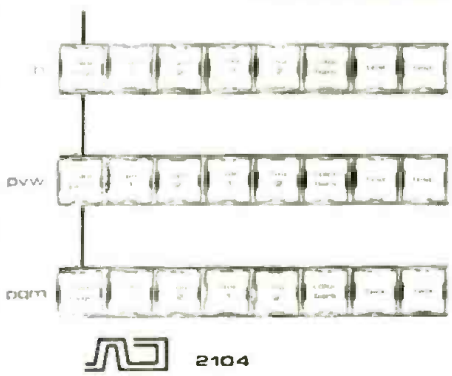

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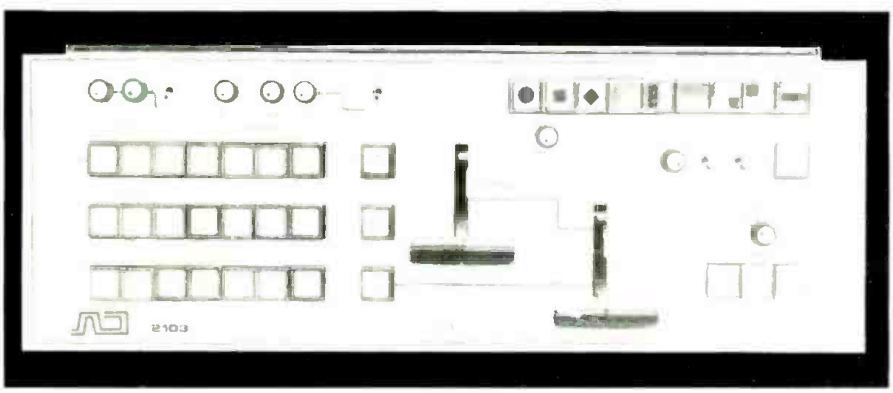

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there was less than a 10 degree signal drift!

For recorders, Ampex VPR-1s were chosen (one for each of the three cameras). The decision was based on the team's desire to have optimum signal quality and to use the most modern equipment available. Since the entire control room and video operations had to be housed in the cabin of the Pelorus Jack (air-conditioned to provide some degree of protection against the marine environment, not known for its kindness to video equipment), size was also a factor, and two-inch recorders were therefore ruled out. Hoffman estimates that the one-inch equipment cost an extra $7,000 over U-type VCRs. For video's first major excursion underwater, he considers the investment to have been worthwhile. Fortunately, as we shall see, they also brought along Sony BVU-100s as backups.

Underwater communication presented another set of problems. Director Hoffman wanted to be able to have two-way communication with his cameramen. This would enable him to cover all bases, for although the cameramen would be given a game plan in which one underwater camera would always be on the sharks, the second underwater camera on the two-person contestant team, and the third camera topside to cover the three teams as they prepared to dive and interview them after the ten-minute competition periods, Hoffman wanted to be able to change things around in emergencies. If a cable tender saw a shark coming at the camera from behind, Hoffman would know that they were leaving their position and get the second crew to cover the action. Hoffman also wanted two-way communication with the competition director, who would be watching the contestants from below and scoring them based on whether the identification tags were attached to the sharks' dorsal fins or other parts of the body. Hoffman wanted to be able to record Tzimoulis's voice for the track, as well as find out about any problems that were developing.

The solution was found to be the Wetphone unit manufactured by Sound Wave Systems — a transducer, functioning in much the same way as a CB radio does on land. Each cameraman was fitted with a special combination face mask/two-way communications device, while Tzimoulis used his own muzzle-like face mask with built-in radio. During rehearsals, however, it was found that the cameramen had enough problems regulating their pressure and keeping up with the action without having to deal with the bulky face masks; they were abandoned in favor of conventional face masks and auxiliary listening devices. It also turned out that, during the actual competition, Tzimoulis forgot to plug in his mic in his excitement to get underway. Thus, the production was actually carried off with only one-way communication, and apparently did not suffer as a result.

Competitors with shark-tagging devices, competition director with score pad, and cameraman. During actual production, tennis balls were attached to coax cable to float it directly up to the surface. Cameramen also held their breath as much as possible to avoid air bubbles interfering with the shots

Good picture quality at 30 feet — with no lights

On May 30, 1978, some 150 people gathered on St. Thomas (U.S. Virgin Islands) for the week-long production. Among them were shark experts Ron and Valerie Taylor, Gordie Waterman, and Howard Hall, all of whom had been involved in the spectacular *film* photography seen in shark films like *Jaws I* and *II*, *Blue Water White Death*, and *The Deep;* together with two local divers, they would form the contestant teams who would participate in the bold experiment of *video* underwater. For although the show had been cast into a sports format, with the teams each given ten minutes to attach as many Marine Fisheries identification tags to as many sharks as they could, everyone was aware that the real competition was the video equipment vs. the elements.

Installation of the video equipment in the Pelorus Jack control room went smoothly, especially since, with recorders for each camera, no switcher was needed. A portable generator for recharging the batteries, which had to be purchased in the U.S. since one could not be located on St. Thomas, was also installed and checked out. After a day of orientation, the first full underwater rehearsal arrived.

The first problem to be solved was how to set white balance on the cameras, since the automatic circuits could obviously not be used once they had been sealed into the housings. To approximate the light conditions that would be found beneath the surface, Celecia took the cameras into a darkened cabin aboard the yacht and set the white balances there. This proved an almost identical match to the light levels underwater, and no further balancing was required.

The second problem that became immediately apparent was that the camera batteries, with a rated life of two and a half to three hours, never lasted more than an hour underwater, usually starting to drop in about 45 minutes. This meant that, during the competition, the cameras would frequently have to be surfaced to have their batteries changed, and the team seriously wondered whether the decision to not run power through a cable from the surface had been a wise one. However, the design of the competition meant that there would be ample time to "reload" between each contestant team.

Other than the problems noted above, the rehearsal went extremely smoothly, with footage of the vivid colors of marine life "putting film to shame," according to Hoffman. One pleasant surprise turned out to be the ability of the camera/lens system to faithfully reproduce even the color red

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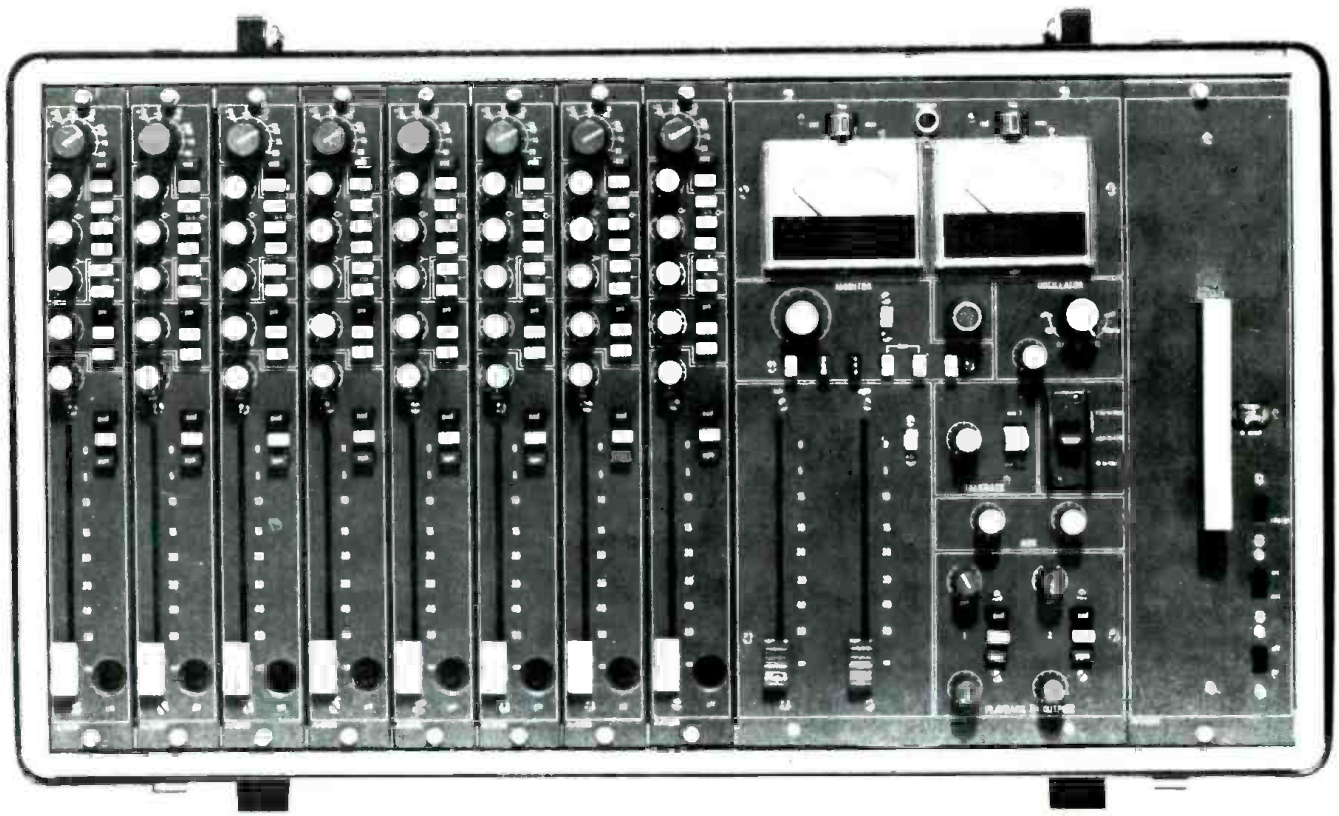
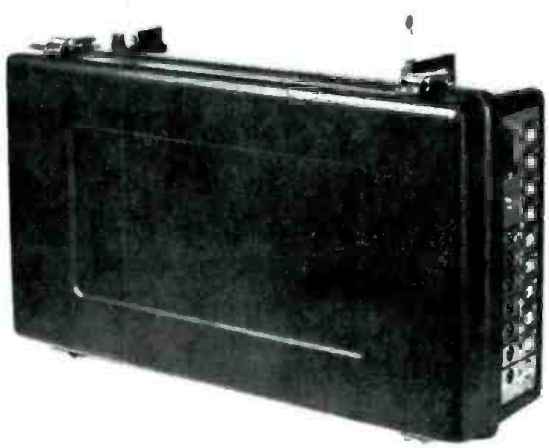
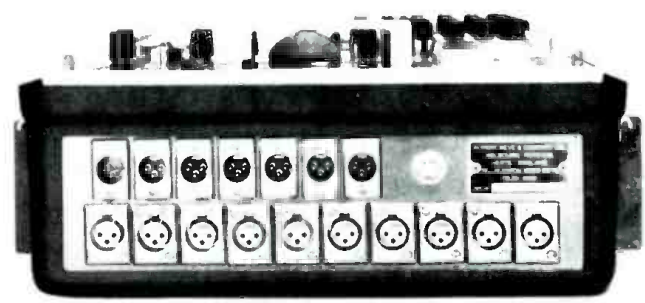


The all new Neve Model 5422 Suitcase Sound Mixer is designed to provide the broadcast, sound recording and film industries with a high quality portable mixer. It features 8 inputs with equalization, 2 main outputs, 2 auxiliary outputs and a lot of other facilities. External mains supply and rechargeable battery pack are available.

This high quality "location" sound mixer is ideal for ENG and other remote use. Battery pack is $130. External power supply is $550. Please call or write





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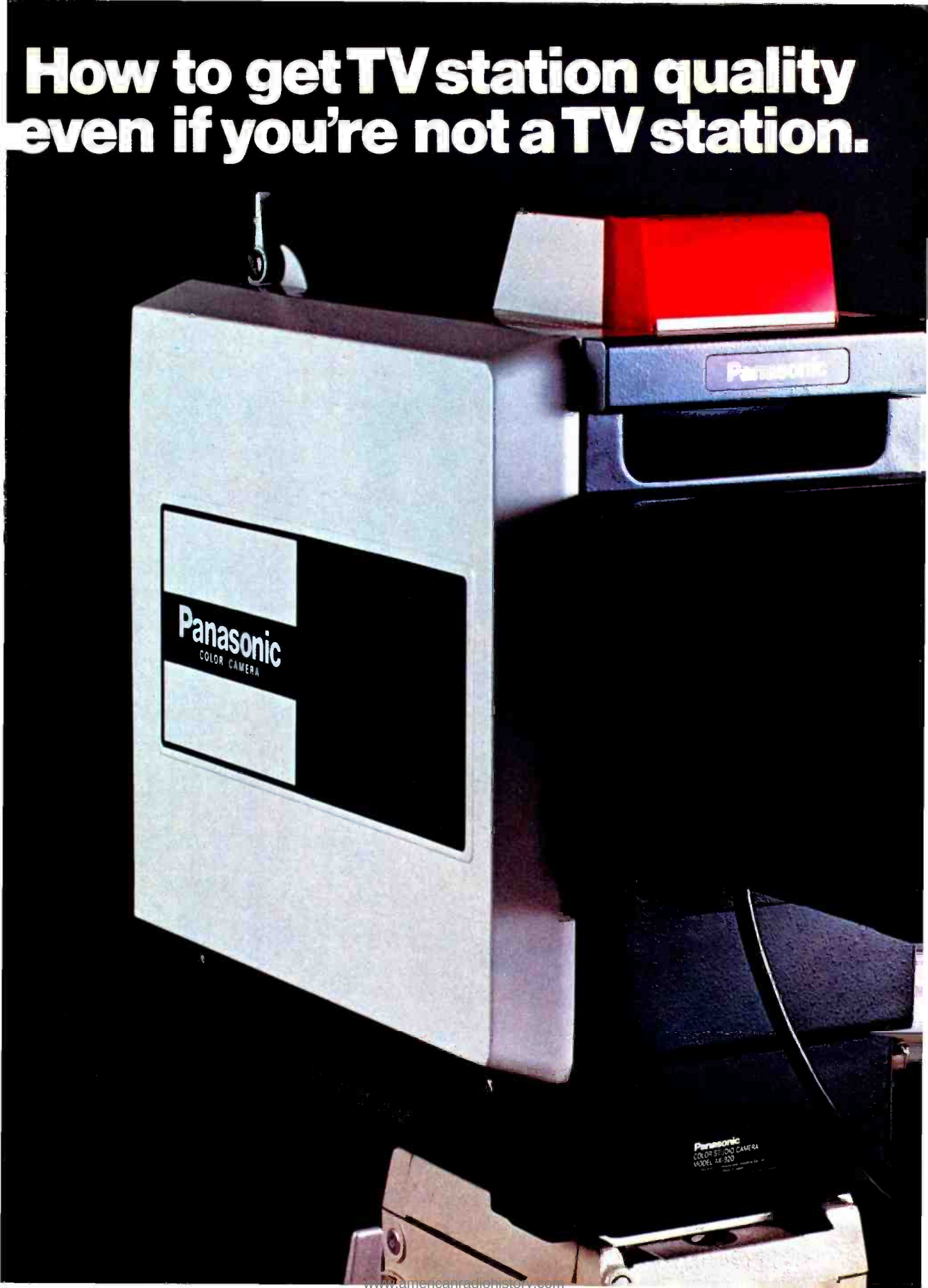
How to get TV station quality even if you're not a TV station.

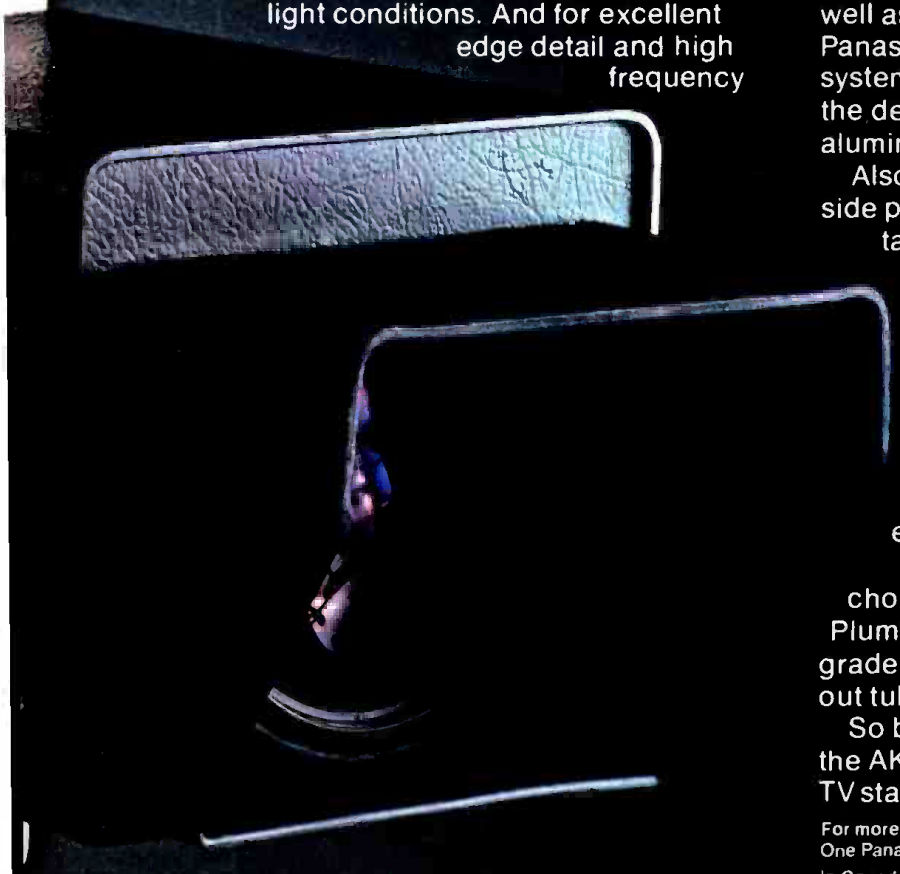


Introducing the Panasonic AK-920.

There are many ways of getting TV station quality from a Plumbicon® color camera. You can either own a TV station. Own a lot of money. Or better yet, own Panasonic's new Plumbicon color camera, the AK-920.

Not only does it give you TV station quality in the studio, it gives you TV station quality almost everywhere else. That's because it's fully self-contained, with the YI/Q encoder and the RS-170 sync generator built into the camera head.

But perhaps the best part about the AK-920 is the technology that has been put into it. Like a new color-trap circuit in the encoder and level-dependent circuit for reduced color noise, which is particularly important under low-light conditions. And for excellent edge detail and high frequency response, there's an adjustable horizontal aperture circuit built into the camera head.



And since the AK-920 is a Plumbicon camera, you get performance that's hard to beat. Like low noise, low dark current and lag, high sensitivity, as well as the capability to reproduce high brightness details without burn-in or blooming.

The result of all this very impressive technology is equally impressive performance. Like horizontal resolution of more than 500 lines at center. A S/N ratio of 48 dB with recommended illumination of 150 footcandles at F/4. And a +6 dB gain switch for minimum illumination of just 15 footcandles at F/1.8.

You also get precise stability of alignment as well as the reliability that you expect from Panasonic. Because the prismatic optical system, the three one-inch pickup tubes, and the deflection coils are mounted on an aluminum die-cast chassis.

Also included are removable camera head side panels for easy maintenance. A self-contained, multi-function viewfinder. Color bar generator. And focus-wobble and sawtooth-generator test circuits. Plus some rather impressive options. Starting with the AK-9220 remote control unit. To a 10:1 zoom lens with built-in 1.67X and 2.5X lens extenders for versatility in location shooting. To a vertical aperture corrector, AK-9620. To the AK-9720 cable equalizer for the RBG signals.

There are also three different versions to choose from. The AK-920ST with studio-grade Plumbicon tubes. The AK-920IT with industrial grade Plumbicon tubes. And the AK-920 without tubes.

So before you buy any color camera, audition the AK-920. It's Panasonic's way of giving you TV station quality, even if you're not a TV station.

For more information, write: Panasonic Company, Video Systems Division, One Panasonic Way, Secaucus, N.J. 07094.

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down to a depth of 30 feet with no artificial lights and no "painting" whatsoever. (Lights had been sacrificed both because they might have interfered with the competition by scaring the sharks and for budgetary reasons.) With film, red disappears quickly in water since its wavelengths are absorbed more rapidly than those of blue. Without heavy filtration, adding further to the lower light levels found underwater, film is unable to record reds below 15 to 20 feet.

Camera . . . action . . . where are the sharks?

With the amount of pre-planning and rehearsals, it seemed that a model shoot was in progress, and when the Pelorus Jack anchored at the competition area on the first actual shooting day, it seemed as if they might actually be able to wrap it up in one day. Unfortunately, Murphy's Law, as always, proved operative. Competitors and crew bobbed at anchor all day without a single shark being sighted in the area — though they had been abundant two days earlier during the rehearsal. The following day, which had been set up as a backup competition day with plans for shooting marine life and coral landscape cut-a-ways, also passed without a single shark entering the competition area.

In a total quandary, Goodman and Hoffman were faced with the prospect of having thrown the entire $100,000 budget down the drain since, with the exception of the on-land "island hopping" and aerial shots done earlier in the week, they did not have a minute of useful footage. A local fisherman suggested that they had been overbaiting the competition area and that the sharks were probably overfed; he suggested an alternate location near a small neighboring island.

The decision to move was not an easy one. First, it would involve hauling up the shark cages that had been tied off around the competition area, transporting them to the new site, and reanchoring them. There was, of course, no guarantee that sharks would be present in the new area, either. Most importantly, however, it would mean that the Pelorus Jack, with all its air-conditioned comforts, could no longer be used since it would be too large to maneuver safely near the island. If the production moved, it would have to rely on the BVU-100s.

Nonetheless, the next morning (the day originally allocated for transporting the equipment back to the mainland) found a slightly stripped-down production unit aboard a 40-foot wooden boat

bobbing at anchor at the new location. Besides having lost their one-inch recorders, they had also lost their air conditioning, and a jury-rigged system of portable fans, hair dryers, and whatever else could be found were run off batteries to cool the equipment and keep it dry.

It seemed, during the long, long day, that nothing was going to happen again. They watched the sun, ideal for underwater shooting when it is almost directly overhead, slowly begin to sink. It was not until 3:30 in the afternoon that a lookout called out the magic word everyone had been waiting to hear for almost three days — "Shark." Everything sprang to life. Tzimoulis and the Taylors (the first team) got into the water and were all set to begin when one of the cameramen sprang a leak in his SCUBA gear, forcing the cameraman who had originally been assigned to cover the topside activities to quickly suit up and replace him. This delay, in turn, meant that camera batteries began to run low after the Taylors (who, by the way, won the competition) had completed their ten-minute period, and had to be replaced. The third team did not actually get into the water until 5:30 p.m. With the sun almost setting and the diving team in 100 feet of water, the cameras and lenses were able to deliver recognizable pictures of the whole action. The shoot had been saved.

One-inch post production

Post production, too, added its share of the Murphy's Law quotient. Again desiring to use the most modern, sophisiticated equipment available, it was decided that post production would be done on a one-inch on-line CMX system at Off Line Editing in California. The 36 half-hour cassettes were dubbed up to match the Ampex-format one-inch material. However, a chance conversation between Goodman and the editing facility a few days before the sessions were to begin turned up the fact that Off Line's system was set up for Sony rather than Ampex one-inch. The tapes had to be dubbed to the Sony format almost overnight. Four video editing days and one audio mixing day (at Reeves/Teletape's Sound Shop) later, the show was in the can. As you watch it (early next year), you might note that the image at the end of the show of the last competition team was shot in 100 feet of water at 5:30 p.m. on ¾-inch cassettes with no signal processing or painting and edited through five generations!

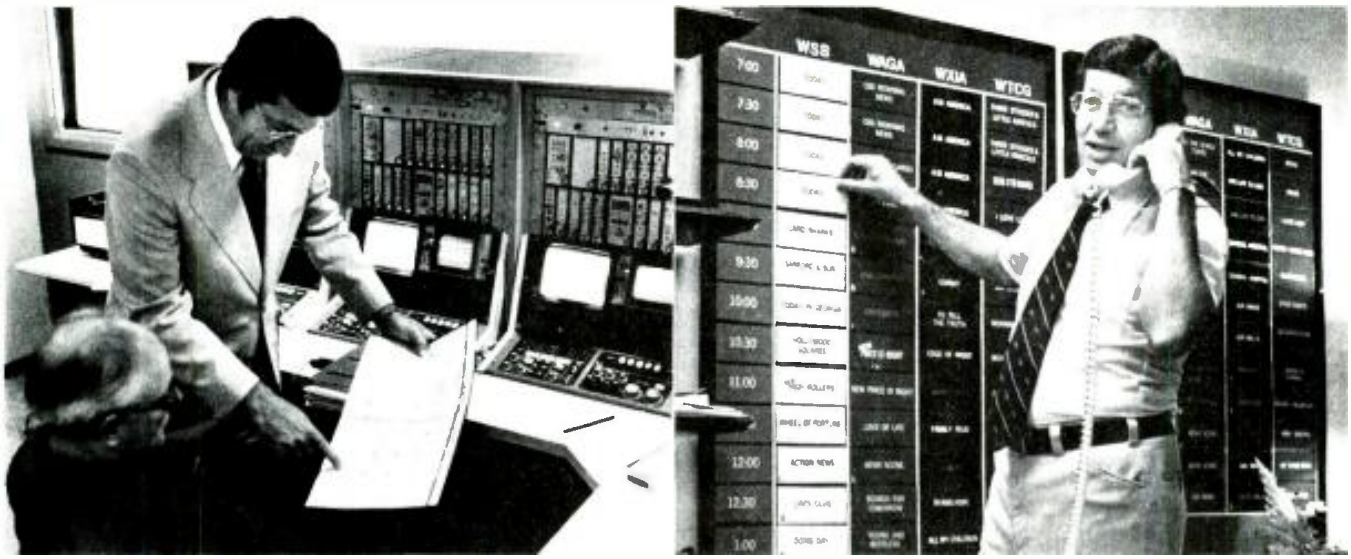
Video to explore the jungle

Have all the problems encountered by the production and engineering team soured them on video? You'd better believe this isn't the case. Stu Goodman and Frank Celecia recently completed a six-day shoot for ABC's *All My Children* down on St. Croix involving 46 setups. For the underwater sequences they went to the same camera and housing they had used for the shark tagging competition. Pierre Bonnescuelle de Lespinios, meanwhile, is working with a Hitachi SK-70 camera in an effort to see if an EFP camera—one that offers greater control to the topside director in the way of colorizing and iris control—will not prove to be more suitable for underwater applications. One thing of which both the engineering and production teams are convinced is that power should be supplied from topside rather than from internal batteries; the amount of time lost in having to bring up the cameras, depressurize them and replace the batteries was a major problem in their underwater shoots.

For Goodman, Bernie Hoffman, Celecia, and Bonnescuelle, the constant expansion of video into remote and normally unaccessible places by no means stops with the ocean. A short while ago they came across what may ultimately prove to be one of the most significiant archaelogical discoveries of the 20th century, a satellite photograph of an area in Peru revealing, in the middle of the jungle, outlines of what many consider to be funerary pyramids like those of the Yucatan peninsula. According to the group's research, the area has never been explored and the mounds never opened. Together with a team of archaeologists, explorers, and video engineers, they plan to make that exploration—almost in the style of the photographic team which explores the island of King Kong. Helicopters will drop video equipment and engineers into the jungle near the site, where they will set up a base camp complete, it is hoped, with a microwave earth station. As the party of explorers debarks from their boats only a few hundred yards from the pyramids, hacks their way through the jungle, comes upon the pyramids with their alleged pre-Incan inscriptions and opens them to discover what they hope will be a immense treasure-trove of gold and artifacts, the world, linked through microwave, will watch every event through the eyes of the explorers—live!

"This is what television always had the potential to do but is only now becoming sophisticated enough to handle," concludes the team. "We are opening the world up to the eyes of our television audience—taking them where they could never go themselves, and where even our television cameras have never been before. We're taking television out of the studio—making it part of the adventure of life." BM/E

VAN CANTFORT



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

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

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

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

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

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

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

"If I were just starting out, I would look into the feature area. I would think of becoming a consumer reporter, an ecology reporter or a specialty reporter. You can't just say, 'I want to work in TV.' Too many people want the same thing. You have to develop a skill or a specialty.

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

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Test Your Radio Broadcast Plant For Signal Quality, Not Just For The FCC

Of course you have to pass the FCC's Proof of Performance tests with flying colors. But that will not come near assuring you that your signal has the high quality needed in today's competitive radio market. In this article, several experts describe the additional tests you must make to find out how your signal really sounds to listeners.

YOU HAVE SUCCESSFULLY RUN the Proof of Performance tests on your FM station. That means, doesn't it, that you are in shape to put a high-grade signal on the air?

Wrong! — unless you have also completed a whole series of additional tests that the FCC says nothing about, and have adjusted your broadcasting plant to meet certain standards in the characteristics covered. This article will consist of advice from a number of experts on what really constitutes proper testing of an FM transmitter, and particularly the audio line, to make sure the signal quality is up to today's standards. The need to expand the testing routine well beyond that in common use five to 10 years ago is becoming more compelling as the standards of quality for broadcast sound go higher and higher.

Before getting into the specifics of the tests, we emphasize the obvious fact that they imply the use of test equipment of absolutely top grade. Fortunately, the last few years have seen an upsurge in the number of high quality test units on the broadcast market. We will return to this topic later with some suggestions on the kinds of test equipment the broadcaster really needs from among the many systems now available.

James Loupas of James Loupas Associates noted that the proof of performance is non-indicative not only for quality but also for *efficiency*, certainly one of the aspects of performance that every station management wants to know about. Tests for efficiency are well understood by radio engineers.

For quality the effort of course focuses strongly on the audio line. Loupas notes that every unit in the line, and the line as a whole, must be checked for all the traditional audio qualities at "hi-fi" levels: frequency response, harmonic and intermodulation distortion, signal-to-noise ratio, etc. Any distortion in the line above 0.5 percent must be run down, its cause identified, and means of reducing it sought out.

Ballantine frequency counter is typical of systems with extremely high accuracy on both AF and RF

A good rule, says Loupas, is to maintain a *minimum* of 15 dB of headroom in every element of the line, and in the line as a whole. This implies not only high-grade equipment, properly maintained, but the *right interface levels between units*. Is the new super-fidelity turntable preamp overdriving the console input? Both preamp and console could be super-right, but the combination might produce very high distortion.

A characteristic vital in a stereo plant and often overlooked is differential amplitude, that is, the amplitude balance between the two channels. This must be tested at every point along the audio line, right up to the modulator in the transmitter. Obviously, any unit in the line can upset the channel balance. One good way to make the check, says Loupas, is to put a disc with a continuous standard tone on the turntable and feed it to both channels, with phase reversed in one. That makes adjustment a nulling operation because the combination of the two channels must be zero at every point. Program material, Loupas points out, is useless for the differential amplitude checks.

Ray Harrison, of Harrison Engineering Associates, makes a detailed plea for *repeating* all the checks in a regular maintenance program. He calls essential the installation of monitoring equipment that will show day to day changes. The monitoring equipment must be absolutely high grade and chosen with care. You should know the specs of a monitor speaker, for example, and listen to it carefully before you buy it — many of your basic decisions about the quality of your signal will depend on what comes out of that speaker.

Minor deterioration that may not be serious enough to cause audible trouble often signals larger deterioration on the way. It is easier and usually cheaper to correct faults in their early stages. Complementing this regular monitoring is regular preventive maintenance, which means regular cleaning of contacts in jack fields, for example. Very important, says Harrison, is regularly listening to the program at every point down the line.

It is particularly necessary, says Harrison, to check the settings and performance of audio processing equipment on a regular basis. Make sure compressors, limiters, etc. are handling the signal in the way you intended. Slight misadjustments can make big changes in quality.

continued on page 39

What's 5'7"...22" wide... delivers up to 3000 watts... and is priced under $10,000?

CCA proves good things do come in small packages.

Our new CCA FM2500R FM transmitter is compact. Trim. Attractive. And FCC type-accepted up to 3000 watts. We call it The Little Rascal.

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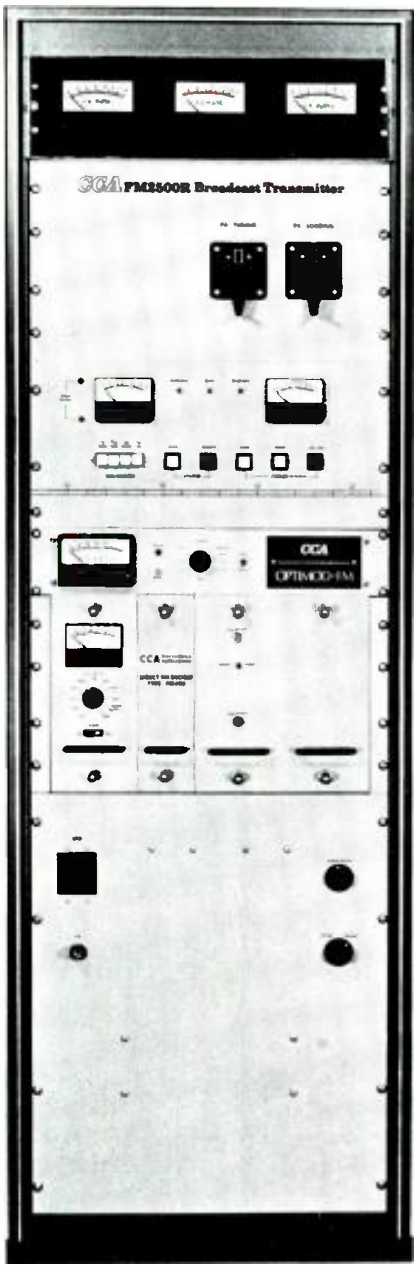

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On a recent visit to the U.S., Sadayuki Ikeda (right), Supervisor of NEC's Video Development Dept., Broadcast Equipment Division, and Cinema Products' Chief Engineer Robert Auguste exchange views on ENG/EFP practices and equipment requirements.

Ideally suited for American television industry needs, the MNC-71CP incorporates many design features based on CP inputs gathered from our extensive experience in the TV-news/documentary field. The MNC-71CP is so rugged and reliable, it is covered by the standard Cinema Products full one-year warranty (unprecedented in the broadcast industry!).

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At the recent NAB Conference, Ed DiGiulio (right), President of Cinema Products Corp., and R. Dennis Fraser, Vice President and General Manager, Broadcast Equipment Division, NEC America, Inc., display the Oscar and Emmy awards won by their companies for their respective "state of the art" contributions to the motion picture and television industries.

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When using program material in a listening check, it is a good idea, says Harrison, to go away from your regular format. If you normally play AOR, for example, it may be difficult to hear long-term deterioration with totally familiar music. Try a symphonic recording: unfamiliar instrumental ranges may tell you something about the performance of the audio equipment you didn't hear with the other music. Harrison emphasizes, as did all the others interviewed, the essentiality of top-grade equipment.

Dave Harry of Potomac Instruments restates the fact that meeting FCC quality requirements is totally inadequate to putting out a competitive signal today. The last decade of improvements in every part of the FM plant has made it possible to put a high-quality signal on the air, so the emphasis in well-run FM stations is shifting on a large scale from the old loudness concept to that of a clean signal with low listener fatigue factors. The listener, educated by his home high fidelity equipment, is becoming more and more selective as far as signal quality is concerned.

Management will tell the chief engineer to make the signal sound "less mushy." To identify the "mush" and control the fatigue factors, the chief engineer must have the tools and the skills to find the slippages in his plant. (See "Banish Listener Fatigue," by Harvey Rees, in the August issue.)

Harry enumerates some of the main kinds of trouble that testing must be directed to uncover. Cart machines, tape machines, and turntables wear their bearings, producing low-frequency noise and spurious frequency modulation of the signal (one of the most offensive forms of distortion, as Richard Sequerra pointed out in the August issue). Faders on consoles are most likely to get noisy from dirt, coffee, or physical damage unless carefully maintained. Telco lines can upset the balance between channels and the equalization. Head alignment in cart and tape machines is, of course, a major focus of proper test and maintenance. Transmitter tubes deteriorate, exciters drift.

Dave Harry emphasized the necessity of keeping a written record of the test results for every unit under test, particularly to characterize all aspects of operation when the unit is in proper trim. Only with such a record can the beginnings of deterioration be spotted before the unit is in serious trouble. Early diagnosis leads to easy cure — and prevention of noticeable degradation of the signal.

Harmonic and intermodulation distortion are familiar ideas to all radio engineers. What may be unfamiliar are the limits of what is acceptable by today's developing standards. As far as the audio line is concerned, no electronic unit should show harmonic distortion above about 0.5 percent, and less is better. Although the transmitter may have a somewhat higher distortion level, the point is that distortion may be cumulative. Adding together several units in the audio line with the transmitter may end by putting three to five percent or more distortion on the air, reaching levels that begin to be objectionable.

A form of distortion to which strong attention has very recently been directed is transient intermodulation distortion (TIM), distortion occurring on the leading edge of very steep wavefronts, which is often not uncovered in the tests long used for intermodulation distortion. Audio professionals are somewhat divided as to how to measure it, how much is too much, etc. (See report on audio consoles at NRBA, in this issue.)

Walter Jung of Pleasantville Labs, who, with his associates, recently reported to the Audio Engineering Society a comprehensive series of tests on amplifiers for "slewing induced distortion," related to TIM but a more general description, told *BM/E* that measuring the performance of an amplifier at the highest operating frequency and at high level is a good way to test for this form of distortion. This produces very steep wavefronts, and it is the steep waves that cause the trouble if the amplifier's "slewing rate" is not fast enough to keep up. The slewing rate is the rate at which the amplifier can change level, and good figures range from about 0.5 V/μs to five V/μs. Engineers who are interested in a comprehensive study of this topic, with careful measurements correlated with listening tests, are strongly advised to get a copy of Mr. Jung's paper. It is Preprint No. 1252 of the Audio Engineering Society, 60 East 42 Street, New York, N.Y. 10017.

If the new higher standards of testing and performance seem to broadcast engineers to impose a heavy burden, they should recognize that the new generation of test equipment has greatly lightened that burden with much higher accuracy, and much more automation of operation than we had in test equipment a few years ago. Running a series of harmonic distortion tests at various levels, for example, can be done at least ten times as fast as it used to be, and with far higher accuracy, using such aids as automatic nulling, meter autoranging, etc., available today in the advanced testing units. **BM/E**

The Test Equipment An FM Station Must Have For Efficient Assurance Of Audio Quality

With the help of suggestions from Eric Small, Eric Small Associates; William Busiek, chief engineer of WGBH-FM; and Lawrence Solow, of the CBS radio engineering department, *BM/E* has assembled the following list of test equipment an FM station needs to do an accurate, efficient job on audio signal quality.

- Audio generator with residual distortion below 0.01%.
- Harmonic distortion and noise analyzer.
- Frequency counter reading both audio and RF to high accuracy.
- Wow and flutter test system, which includes the analyzer and signal generator with standard 3120 Hz signal, plus both tape and disc with the 3120 Hz signal.
- Dual-trace oscilloscope, to 10 MHz, with provision for switching the traces to the X-Y mode with the two channels having identical characteristics.
- Test tape with 100 Hz, 1000 Hz, and 10,000 Hz signals at controlled levels for checking adjustment of cart machines.
- Dual ac voltmeter, with two identical meters, for monitoring amplitude of the two channels on a continuing basis.
- Dual ac voltmeter, with two identical meters, for monitoring amplitude of the two channels on a continuing basis.
- Intermodulation distortion test system.
- Spectrum analyzer, covering the baseband to 100 kHz (an RF spectrum analyzer will not show audio range signals clearly enough; better resolution is needed for tweaking stereo generator, for example).

Note: Greatly increasing efficiency and accuracy, of course, are the automated, multi-test systems now available. A series of harmonic distortion tests at progressive levels, for example, can be made at least 10 times as fast on automated test equipment as on "manual" equipment.

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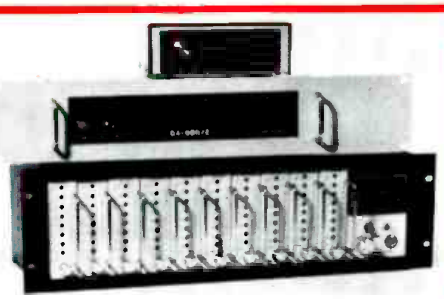
ESP-38 — Bal. out; 0.03% distortion; S/N, —85dB down referred to 12mv in @ 1kHz and +8dBm out; ±0.5dB RIAA; remote & local scratch, brilliance, rumble filter and mono activation; +8dBm out (+21dBm max.), +60dB gain. Left & right Hi/Lo equalization trimmers and recessed level controls. Built-in turntable remote start/stop relay. Stereo only. Price — $325.



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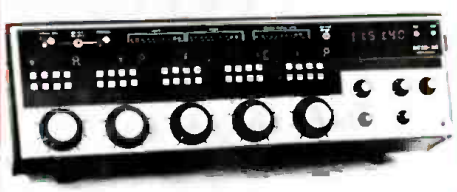

DC38 SERIES AUDIO CONSOLES. Outstanding versatility and advanced technology. Unparalled features such as 4 inputs per mixer, high Z balanced bridging inputs accept mic level thru high level, patch-panel input gain select, DC control of all audio, back lit alpha numeric readouts above each mixer, solid state LED VU meters, dual channel (plus mono mixdown channel on stereo), solid state switching and muting for noiseless operation, selectable muting, plug in electronics, and optional built in Clock/Timer. Available mono or stereo and 5, 8, or 10 mixer versions. 4 year warranty with 2 week trial period. Price — $2,400 to $4,980.

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PORTABLE CONSOLE. P5M — A full 5 mixer audio console in miniature. Bal. in & out, 8 inputs, 3 of which are mic/line selectable & individual compressors on mic channels #1 & #2. Tone gen., cue and monitor feed with gain controls & phones select with gain control. Last 3 channels equiped with Q switch & the first 2 channels provide muting. A folding stand is part of the unit and may be removed for rack mounting. +8dBm out nominally (+18dBm max); ±2dB, 20Hz to 20kHz; S/N —75dB high level and —62dB mic level. Max gain of 90dB and distortion of 0.3%. Compression/limiting range of 35dB and a slope of 50:1. 9¾" W x 9½" D x 3½" H. Price — $545.

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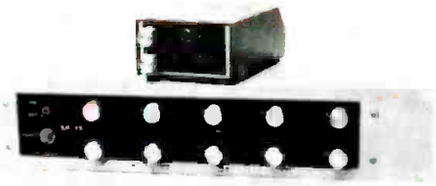

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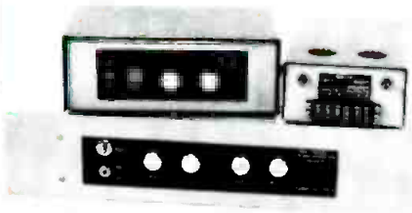

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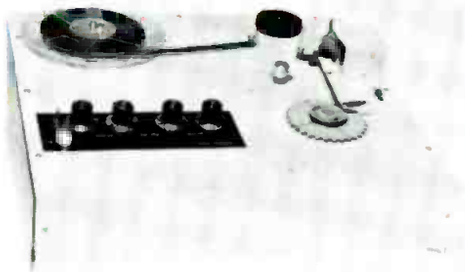

AUTOMATIC CARTRIDGE & CASSETTE LOADER. Precision wind your own carts and cassettes and save up to 40% on reloading costs. The ACL-25/E is simple to use, just dial in the time desired and push the run switch. The ACL stops automatically, precisely to —0, +1 second of playback time. The exclusive playback speed selector ends mental gymnastics figuring tape length versus playback speed. Simply set the selector to 1⅞, 3¾, or 7½ i.p.s. and the ACL does the rest. An optional cassette adaptor enables you to wind both carts and cassettes on the same machine. An optional pancake adaptor is also available. The ACL-25/E has a nominal winding speed of 30 i.p.s. Price $325.

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Vertical Interval Test Signal Measurement and Analysis

A healthy dose of VITS can help keep your signal strong and healthy, while automatic VITS analyzers pave the way for objective, accurate, labor-free testing and measurement.

THE CURRENT STATE OF TESTING AND MEASURING procedures and hardware can be stated quite simply: the technology exists today by which a station, production company, or equipment manufacturer, no matter how large or small its operation, no matter how complex its feed or transmitter system, no matter whether it employs dozens of digital devices or is still working with tube amplifiers, can produce a highly sophisticated broadcast signal which can be calibrated and monitored to conform to extremely tight tolerances. Unfortunately, few broadcasters or producers, at this point, are willing to spend the extra bucks required to purchase the technology.

The technology to which we are referring is, of course, Vertical Interval Test Signal (VITS) analysis, which is the U.S. standardization of the internationally-developed Insertion Test Signal (I.T.S.) procedure. The theory is that if a standardized test signal can be inserted on one or two unused lines of the video signal and then monitored at different downstream locations for degradation in the signal quality, then one can get a good idea of what the overall video quality is as it moves through the system. Thus, if the signal leaving a camera is supplied with a VIT signal and an analysis of the VIT signal leaving the studio shows the signal to have degraded, there is a problem somewhere in the studio or switching center. If the VIT signal is then stripped off and a new one inserted as the signal leaves the studio, and this signal is monitored at the transmitter input, performance of STLs can be monitored. Similarly, if a VIT signal is added at the transmitter input and the signal is demodulated and analyzed after transmission, transmitter performance can be checked. And so on.

VITS were first introduced, in a limited form, in monochrome transmissions during the 1950s. However, it was not until about four years ago, when VITS became a de facto part of network operations, that testing and measuring techniques were able to take the quantum leap forward that is finally bearing fruit in the automatic VITS analyzers on the market today. VITS provide two key advantages for testing and measurement. First, they offer the potential of an industry-wide standard of reference which can be applied to every phase of video from cameras and VTRs through satellites and longlines and, finally, transmitters. A program supplier has the option of literally "certifying" his tapes before network presentation. The network can assure its affiliates that, if there is a signal problem, it is not in their transmission but probably in the telco lines. And if a transmitter's output shows distortion, it becomes simply a matter of reading VITS to prove whether the transmitter or the longlines are at fault.

The second key advantage to VITS is their ability to measure *in-service* signal quality. Ask an engineer who must come in at 3:30 a.m., after the last late movie, to run the transmitter maintenance checks by feeding out-of-service test patterns through the system and measuring the results on a scope, or a station trying to evaluate which half of its parallel transmitter is faulty or whether, in fact, it is not the video feed itself, and you will get an immediate idea of the value of in-service test signals. VITS provide a continual, standard means of picture monitoring, so clearly defined that an affiliate can snap an instant picture of his received VIT signal, mail it back to the network, and not even have to bother reading the waveform monitor. In fact, in its most extreme application, a network could run checks on its entire transmission and linkage process, longlines, and local affiliate performance by having unskilled personnel send back an assortment of snap shots!

VITS standardization: FCC vs. NTC 7

The actual development of VIT signals occurred in Europe and, not surprisingly, three of the four companies which manufacture VITS testing and measuring equipment (Marconi Instruments, Philips, and Rohde & Schwarz — Tektronix is the exception) are European-based. There are several national standards, all based in turn on the EBU VITS signal which calls for a white reference bar, 2T sine-squared pulse, 20T composite sine-squared pulse and six-level staircase on line 17; positive and negative peak reference bars and a multiburst on line 18; white reference bar, 2T sine-squared pulse and six-level staircase with chroma on line 350; and one- or three-level chrominance bar on line 351. The U.K. standard, for instance, calls for a white reference bar, 2T sine-squared pulse, 10T composite sine-squared pulse, and five-riser staircase with chroma on line 19 and a chrominance bar and extended burst on line 20.

As is typically the case with the free-market approach in American broadcasting, the U.S. has only one official standard which very few use and another set of VITS which everyone uses but which is not the government standard. Our standard "FCC VITS" have been mandated by the FCC for use with remotely-controlled transmitters since the early 1970s. In a classic example of what most consider to have been putting the cart before the horse, the FCC adopted as its standard VITS for remote transmitters (paragraph 73.699 — based on an EIA Broadcast Equipment Section Recommendation) the two-line signal which was then available through a single manufacturer's test line generator. The signal consists of a white reference bar and multiburst on line 18, field I; color bars preceded by white reference bar and followed by black reference on line 18, field II; and a composite signal consisting of a five-riser modulated staircase, 2T sine-squared pulse and a 12.5T composite sine-squared pulse on line 19, field I. Line 19, field II was left available for other types of test signals, including the option of check-

ing STL distortions by either re-inserting the composite test signal at the input of the STL as in line 19, field I, or by adding an additional VITS signal at the STL output, stripping the signal coming up on line 19, field II. The FCC VITS signals are shown in Figure 1. Broadcasters are required to make some 18 measurements (including the amplitude response of the six frequencies in the multiburst).

Most broadcasters now agree that the FCC's decision was premature and ill-advised and that the industry should have been given the opportunity to formulate its own standards. And, indeed, the industry did take such an action. In a rare show of unanimity, the four networks met together with AT&T under the auspices of the Network Transmission Committee, which eventually drafted Report #7, first published in June, 1975. Revised in January, 1976, the Report (commonly known as NTC 7 VITS) established the standards under which telco and the

NTC 7 VITS And What They Measure

Parameter	Test Signal	Definition
1. Luminance Bar Amplitude (Video Gain)	Line Bar	Difference in amplitude between midpoint of line bar and 100 IRE nominal amplitude.
2. Line Time Waveform Distortion (Bar Tilt)	Line Bar	Peak-to-peak change in amplitude of line bar top with center of bar at 100 IRE ignoring first and last microseconds; expressed in IRE.
3. Short Time Waveform Distortion and Pulse/Bar Ratio	2T Pulse, Line Bar	Peak-to-peak variations within one microsecond on either side of T-step transitions relative to amplitude of line bar set to 100 IRE two microseconds from bar edge.
4. Chrominance/ Luminance Gain Inequality (Relative Chroma Level)	12.5T Pulse	Amplitude of chrominance pulse when line bar is set to 100 IRE.
5. Chrominance/ Luminance Delay Inequality (Relative Chroma Time)	12.5T Pulse	Time relationship between chrominance and luminance of chrominance pulse, expressed as number of nanoseconds delay between the two.
6. Gain/Frequency Distortion	Multiburst, color burst	Amplitudes of 0.5, 1, 2, 3, 3.58, and 4.2 MHz multiburst frequencies and color burst.
7. Luminance Non-linearity	Unmodulated 5-riser staircase	Difference between largest and smallest step amplitudes of luminance staircase.
8. Chrominance Gain Non-linearity	3-level chrominance	Difference between amplitude of middle subcarrier and amplitudes of smaller and larger subcarriers.
9. Chrominance Phase Non-linearity	3-level chrominance	Phase deviation of each chrominance level from 0 degree color burst.
10. Differential Gain	Modulated 5-riser staircase	Difference between highest and lowest subcarrier amplitudes with luminance amplitude in staircase held constant.
11. Differential Phase	Modulated 5-riser staircase	Peak-to-peak change in subcarrier phase with luminance amplitude in staircase held constant.
12. Chrominance/ Luminance Intermodulation	3-level chrominance	Change in amplitude of luminance pedestal during 3-level chrominance signal.
13. Relative Burst Gain	Modulated 5-riser staircase	Amplitude of color burst with blanking level burst of staircase exactly 40 IRE.
14. Relative Burst Phase	Modulated 5-riser staircase	Change in phase of color burst signal relative to phase of chrominance subcarrier.

EXPLANATION:

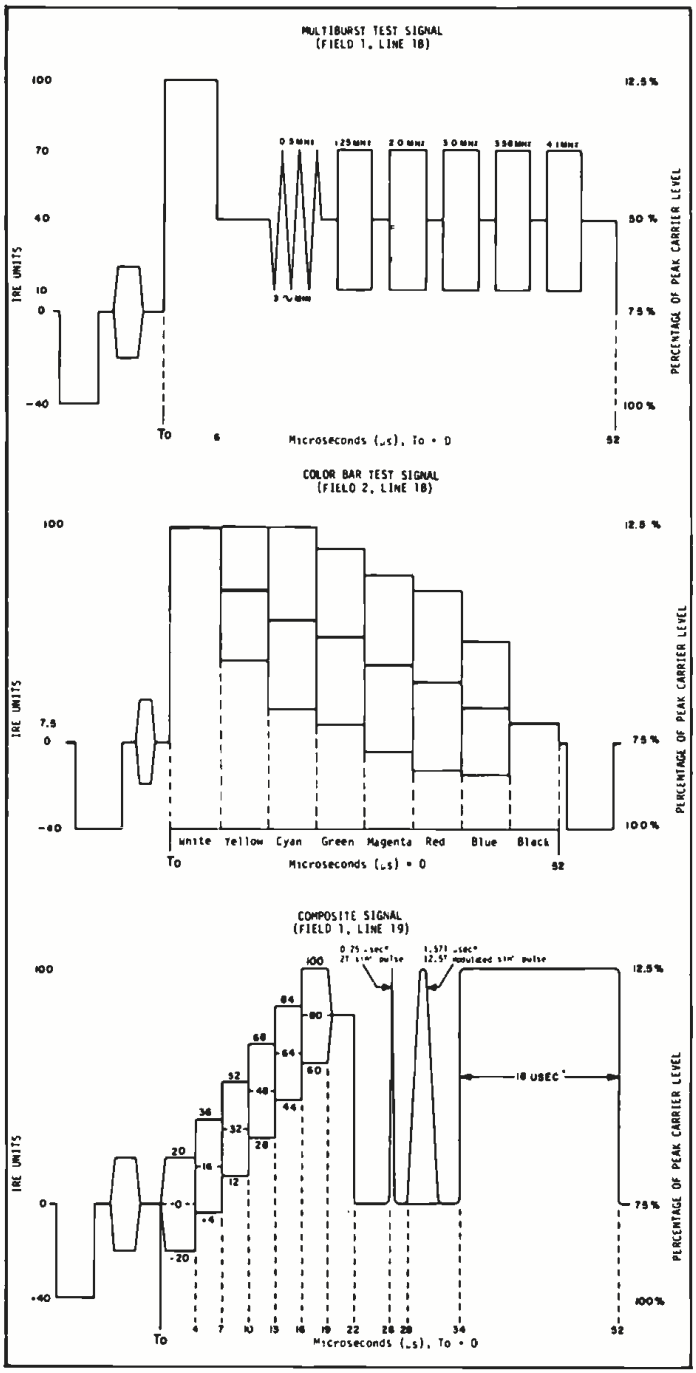
The above description is based on the January, 1976 revision of the Network Transmission Committee Report #7, first published in June, 1975. We have listed here only those parameters which can be determined from the recommended line 17, fields I and II signals described earlier. However, in addition to the parameters listed, the NTC 7 report also specifies other measurements which should be made in order to insure optimum picture quality. These include field time waveform distortion, dynamic gain distortion, signal-to-weighted noise ratio, signal-to-impulsive noise ratio, signal-to-periodic noise ratio, crosstalk, impedance, signal amplitude, signal polarity, and return loss. A flat field signal is used for many of these measurements, while an unused line in the vertical interval is suggested for measurement of the signal-to-noise ratio.

In practice, the networks often use different forms of evaluating the data supplied by these VITS signals from those called for in the report. Most frequently this takes the form of using percentages rather than IRE figures to express the various distortions. Thus, for example, the report calls for line time distortion to be expressed as the number of IRE units the bar deviates from its nominal 100 IRE unit setting; networks are more apt to express the distortion as a percentage of deviation. Many network engineers also agree that the multiburst, though useful as a technician's tool for such functions as aligning picture monitors, tells little about signal quality and, more often than not, multiburst frequency analysis will be omitted from the network report. Still another difference between the report and standard network practice is that, while the report contains no mention of it, sync pulse amplitude can, and most often is, measured from the VITS signal. Yet another difference is that though the report classifies both amplitude and ringing distortions of the 2T pulse under the short time waveform distortion parameter, you will most often find the two measurements broken out into the separate parameters of short time waveform distortion (ringing) and pulse response (amplitude). The IEEE is currently formulating Standard 511, which defines measurements of waveform distortion and will probably call for an electronically-generated graticule to measure 2T pulse ringing ("K" factor) and provide alarm and printouts whenever pulse distortions exceed the recommended parameters. In the same way, color burst, peak white, and reference black amplitudes are most often listed as separate parameters to be measured.

Vertical Interval Test Signal

networks would insert VITS into the signals, measure, and report them — and what the signal parameters would be for telco performance.

NTC 7 VITS are inserted on line 17, fields I and II. Line 17, field I consists of a composite test signal made up of a line bar, 2T sine-squared pulse, 12.5T composite sine-squared pulse and five-riser staircase with chroma. Line 17, field II consists of a combination test signal made up of white reference bar, six-frequency multiburst and three-level chrominance signal (see Figure 2). It is commonly felt throughout the industry that the NTC 7 VITS provides a far more suitable test signal, and one that reveals far more useful information, than the FCC VIT signal — one that is practical not only for measuring telco performance, but for all applications such as monitoring studio operations or equipment manufacturing or even checking remotely-controlled transmitter operations. ABC Television, with the endorsement of other networks, has petitioned the FCC to change its VITS standard to the NTC 7 VITS, and a ruling is due shortly. The parameters which can be measured by the NTC 7 VITS are outlined in the accompanying chart and explanation.



FCC VITS signal for remotely-controlled transmitters, inserted on line 18, fields I and II and line 19, field I

Based on their ability to provide more measurement parameters, their more space-efficient nature, and their widespread adoption throughout the industry, it seems to be only a matter of time before the NTC 7 VITS are accepted as the actual standard. It is noteworthy to point out, however, that not all broadcasters are 100 percent enthusiastic about all phases of the NTC 7 report. The controversy centers around the multiburst. The question is whether frequency analysis, in general, and VITS multiburst in particular, provides useful information to the engineer. As Hans Schmid of ABC has so often pointed out, the multiburst, with its 0.5 to 4.2 MHz frequency range, comes nowhere close to the midpoint of that response range. Many engineers also argue that while frequency response is useful as a technician's tool for aligning monitors and so forth, it provides no information on waveform signal quality that is not more efficiently and perhaps more accurately available in some other portion of the test signal. The IEEE is currently formulating Standard 511 on waveform distortion which will finally standardize its measurement. Most broadcasters also agree, however, that the current NTC 7 VITS, even with their redundancies, must become at least the starting point for any future government or industry standardization.

Automatic VITS analyzers

The international standardization of I.T.S., and the American standardization of VITS (albeit a double standard at present), have led in turn to the interest of both equipment manfacturers and broadcasters in developing automatic systems to measure and log them. The use by the networks and AT&T of VITS is only the first step towards a uniform, high quality, perfectly attuned production or broadcast signal; the next step is its accurate and objective measurement.

In remote transmitter operations, the use of automatic VITS analyzers to measure the various parameters for distortion and transmit the data back to the operations center where it can be monitored and logged is an obvious boon. The continual checking required in this type of operation — not only of the main transmitter but of standby transmitters and sometimes multiple video feeds — becomes a virtual full-time job for the engineer. Automatic VITS analyzers, programmed to continually monitor and log the parameters and sound an alarm only when a parameter is exceeded and the signal needs attention, free engineers' time for potentially far more useful projects. Since remotely-controlled transmitters are on the increase, it seems likely that within a few years automatic VITS analyzers will become an indispensable part of remote transmitter operation.

Automatic logging, however, is only one of the advantages of the automatic systems; the other prime advantage is that automatic VITS analysis provides a completely objective and highly accurate approach to VITS measurement, one that is free from operator fatigue or subjectivity. A deviation of 0.5 IRE per day may not be spotted

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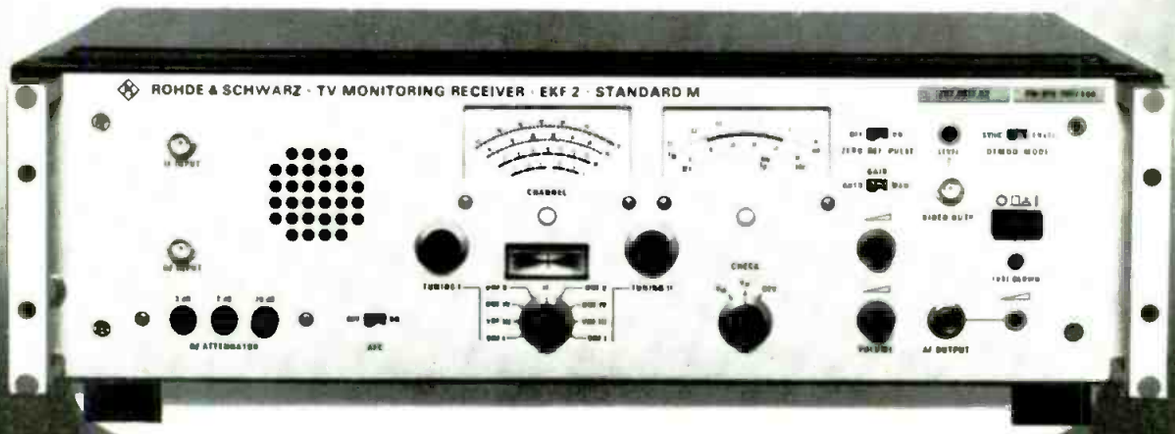
IT STANDS ALONE



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The Technics ST-9030 tuner. Purists would feel better if it cost over $1,000.

To some, tuners that offer 0.08% THD, 50 dB stereo separation, a capture ratio of 0.8 dB and waveform fidelity should demand a price tag of over $1,000. But with the ST-9030, this performance can be yours for under $450.

That's quite a feat for a tuner. But then the ST-9030 is quite a tuner. It has two completely independent IF circuits: A narrow band, for ultra-sharp selectivity. And a wide band, for ultra-high separation and ultra-low distortion. It even selects the right band, depending on reception conditions, automatically.

Both bands give you the same extended flat frequency response. Because, unlike conventional tuners, the ST-9030 utilizes an electronic pilot cancel circuit that cuts the pilot signal, without cutting any of the high end. It's ingenious. And a Technics innovation.

The Technics ST-9030 has one of the quietest, most sensitive front ends of any tuner. With an advanced linear frequency 8-ganged tuning capacitor and 3 double-tuned circuits, plus dual gate MOS FETs in the 2-stage RF amplifier and balanced mixer circuit. What's more, there's a servo tuning circuit that locks into the tuned frequency, regardless of minor fluctuations. The result: Negligible drift distortion and maximum stereo separation.

Technics ST-9030. Compare specifications. Compare prices. And you'll realize there's really no comparison.

THD (stereo): Wide—0.08% (1kHz). Narrow—0.3% (1kHz). S/N: 80 dB. FREQUENCY RESPONSE: 20Hz—18 kHz + 0.1, − 0.5 dB. SELECTIVITY: Wide—25 dB. Narrow—90 dB. CAPTURE RATIO: Wide—0.8 dB. Narrow—2.0 dB. IF, IMAGE and SPURIOUS RESPONSE REJECTIONS (98 mHz): 135 dB. AM SUPPRESSION (wide): 58 dB. STEREO SEPARATION (1 kHz): Wide—50 dB. Narrow—40 dB. CARRIER LEAK: Variable − 65 dB (19 kHz). Fixed —70 dB (19 kHz, 38 kHz). SUGGESTED RETAIL PRICE: $449.95.*

Technics ST-9030. A rare combination of audio technology. A new standard of audio excellence.

*Technics recommended price, but actual retail price will be set by dealers.

Technics *Professional Series*
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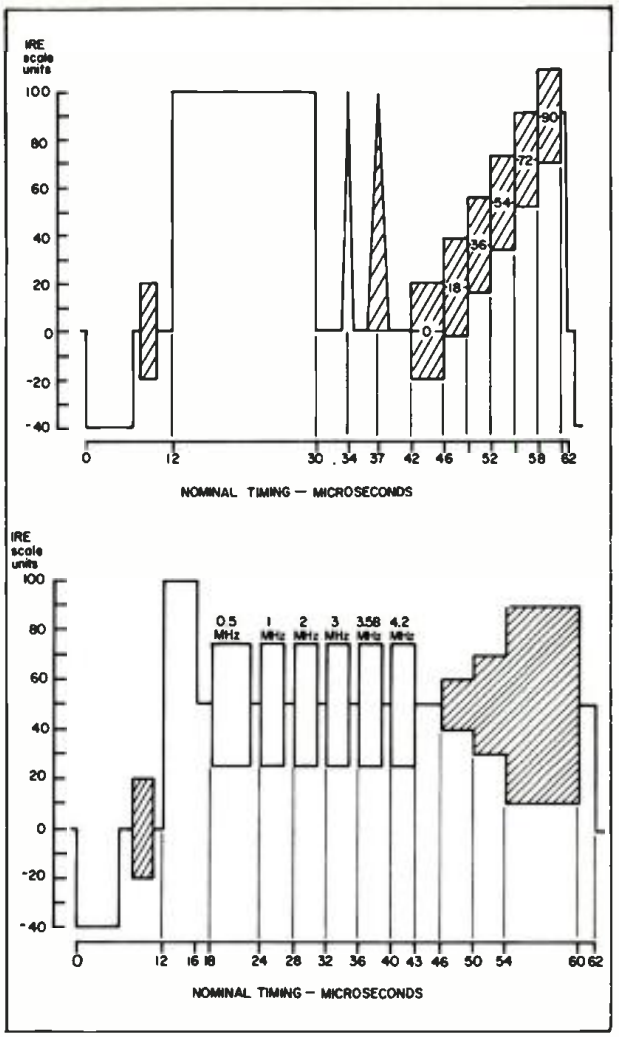
Circle 128 on Reader Service Card

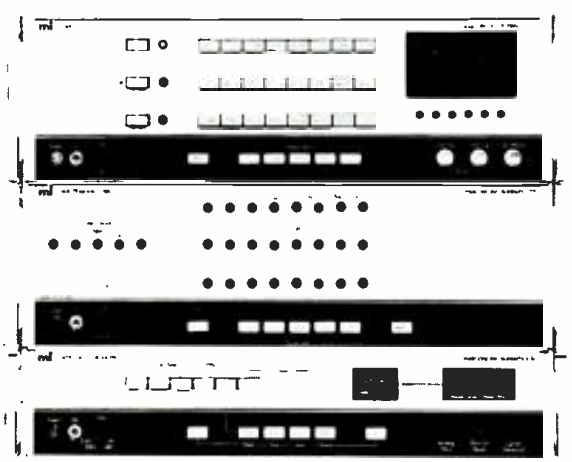
for a week; however, by the end of the week there is a 3.5 IRE deviation and the situation is worsening. An analysis of printout logs and transfer of the data to charts can provide a way of pinpointing developing trends before the situation becomes critical.

Yet, despite their obvious usefulness, automatic VITS analyzers have been extremely slow to be accepted in either broadcast or production facilities. None of the networks is currently using an automatic VITS analyzer (though they have explored the possibilities); their reasoning is that it is the local affiliates' responsibility to insure the soundness of the signal, their only responsibility being to see that the outgoing waveform conforms to specifications. None have, to date, taken advantage of the fact that a VITS system, installed in a studio, can provide the possibility of tracing an out-of-limits parameter to a particular location within the facility. Thus, VITS analysis has been passed along mostly to local affiliates and stations who must insure the performance of longlines and their transmitters. And, at this level, the immediate question of cost arises. With a price tag of around $20,000, an automatic VITS analyzer may seem an extravagant luxury when the station has been making do with a waveform monitor, vectorscope, and high-speed oscilloscope (this in spite of the fact that a new set of test gear for measuring the VITS parameters manually would cost in the neighborhood of $15,000, without any of the skilled labor needed to operate it). Local stations, without a mandate from the FCC, cannot see the economic justification of spending $20,000 on a piece of gear whose only advantage may be to insure the quality of their signal; and it is undoubtedly easier for management to justify spending the money on a new audio console or production switcher with which it can make fancier commercials. Even the possibility for a station to be able to test automatically not only its transmitter output but also network feeds, microwave links, and studio switching almost simultaneously has not yet made a significant impact on station operations.

Of course, the problem is not all at the broadcast level. Suppliers of programming and television commercials must be required to maintain the same standards as the stations themselves, and here, again, VITS analysis must become a key factor. One local station in Washington, D.C., recently cited by the FCC for blanking width violations, offers suppliers of sub-standard programs or commercials the option of either withdrawing them or, if time does not permit, having them re-shot off picture monitors. Poorly maintained rental-house equipment can often be the cause of the problems. But lack of knowledge on the part of producers is most often to blame. Automatic VITS analyzers cannot make the sloppy producer a pro; but they can at least provide even a non-technical person with a sign that something is wrong.



NTC 7 VITS signal inserted on line 17, fields I and II



Marconi Instruments' TAME system including Insertion Signal Analyzer, Data Monitor, and Data Selector

Four manufacturers currently offer automatic VITS analyzers — Marconi Instruments, Philips Test and Measuring, Rohde & Schwarz, and Tektronix. The Rohde & Schwarz UPF Video Distortion Analyzer, because it is programmed only for CCIR test signals (used extensively in Europe) rather than NTC 7 or FCC VITS, is not discussed.

Automatic VITS analyzer analysis: Marconi's TAME

Though its individual components — the TF 2914A Insertion Signal Analyzer, TF 2915 Data Monitor, and TK 2917 Data Selector — have been around for some four years, Marconi Instruments' TAME (Television Automatic Measuring Equipment) system has been available to American broadcasters for only a short time in this packaged configuration. One of its most noteworthy fea-

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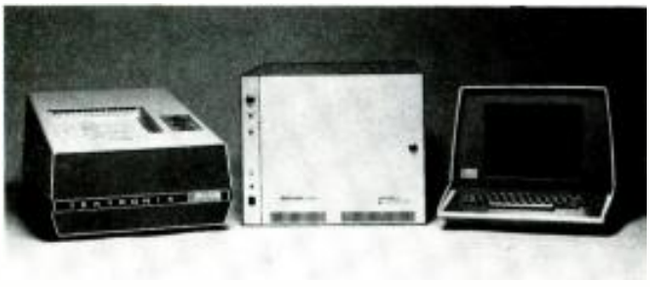
Vertical Interval Test Signal

Interior view of Marconi's Data Monitor showing system for presetting inner and outer upper and lower VITS parameters

Self-contained Philips VITS analyzer



Tektronix digital Answer II VITS analyzer showing printer, microprocessor, and entry keyboard

tures, as we shall see, is that its modular design makes possible interfacing with a station's already existing computer system.

The Insertion Signal Analyzer can be set up for either FCC or NTC 7 VITS analysis and will measure all parameters of the NTC 7 VITS outlined in the accompanying chart, except for chrominance gain non-linearity, chrominance phase non-linearity, burst gain, and relative burst phase. In addition, it will measure sync pulse amplitude, low-frequency error, flag, signal-to-noise ratio and voltages on three auxiliary dc inputs (for checking mast lights, de-icers, etc.). Each parameter is provided by the station with two sets of upper and lower limits — "caution" and "urgent" — against which parameter values on any or all of five video inputs can be measured. When used to monitor transmitter sites, the Data Monitor — generally connected to the main and standby video feeds, the two individual transmitter outputs, and the combined transmitter output — is programmed to continuously check the combined output parameters. When a parameter exceeds its "caution" limits, an alarm sounds in the operation center, alerting engineering to the problem. When the "urgent" limit is exceeded, the monitor scans the parameters several more times to determine whether the problem is genuine or transient. If the number of times the parameter is exceeded proves it to be a genuine problem, the information is entered into a memory and the system automatically switches over to monitoring the two video feeds, again entering into its memory out-of-limits parameters. TAME than automatically scans the separate transmitter outputs, once more entering the out-of-limits parameters. The memory is then used to activate executive decisions, such as providing a signal to switch video feeds or shut down half of the transmitter, depending on where the problem lies.

In its other mode, "continuous scanning," the monitor automatically cycles through all five inputs, checking each of the parameters in turn. In this mode, up to 30 samples are taken of each parameter which is considered to be faulty if it exceeds the preset limits a given number of times in the 30x sample. This setup is of most use in control rooms, studios, and switching facilities where various components of the signal must be monitored simultaneously — such as cameras, network feeds, microwave relays, etc.

When used with the Data Selector, which provides a data interface between the measuring instrument and a digital data acquisition terminal, the TAME system becomes completely automatic and suitable for remote operation. Digital output is in ASCII. When the selector is used in combination with the monitor and analyzer, the full range of TAME's measurements, including out-of-limits parameters, can be transmitted to a distant control center for automatic teletype or strip printer logging. The selector can, however, take the signal directly from the analyzer for transmission to a remote location for analysis of out-of-limits parameters by an engineer or by the station's own computer.

The costs for the various units are: Insertion Signal Analyzer, $11,500; Data Monitor, $5,900; and Data Selector, $5,500. Total system price is therefore $22,900.

Philips Test and Measuring Instruments

Though not provided with a system name such as TAME or ANSWER, the Philips Test and Measuring PM 5578M VITS Analyzer and PM 5579 Automatic Printout Unit provide the same completely objective, standardized, automatic analysis of VITS as the other systems. The VITS analyzer is an analog device programmed for NTC 7 VITS.

The instrument will measure all parameters of the NTC 7 VITS outlined in the chart with the exception of chrominance gain non-linearity, chrominance phase non-linearity, relative burst gain and relative burst phase. It does not provide a means of measuring short time waveform distortion (2T pulse ringing), though it does provide pulse-to-bar ratio. In addition, the analyzer measures sync pulse amplitude, luminance bar undershoot, luminance bar overshoot, signal-to-noise ratio, modulation depth and three auxiliary dc circuits.

The unit can be manually operated through the front panel, with the operator selecting which parameter of five video inputs he wants to read. In this mode the parameter value and the units being read are shown on an LED digital display, while another display indicates which parameter is being read. If the parameter value is out-of-limits based on the station's preset values, the light indicating the parameter will flash. Another alarm indicates a drop in VITS voltage below six dB of normal. Still another alarm indicates loss of sync pulse. The analyzer can also be set to cycle automatically through the parameters of any particular input at an operator-determined rate, and to switch

continued on page 50

cetec broadcast group

Cetec Sparta Showcase:

First-quality broadcast components joined in a first-quality studio system

That's a Centurion II 12-mixer stereo console up front, the centerpiece of a custom Sparta grouping that's handsome, functional, and compact.

Start with Centurion II — more than 200 stations have already. One great reason is that when AM stereo arrives, you're ready right now. If 12 mixers and 36 inputs aren't enough, you can add one or two extender panels of 6 mixers each — to a maximum of 24 mixers and 72 inputs! You can have either rotary or slide pot controls — or even some of each. And of course Centurion is solid state all the way.

Put it in its place — along with Sparta's fine family of turntables, tape cart and remote control equipment — and complement it with sleek, low-profile furniture designed just for broadcast operations. And there you have it — a custom studio system at less than custom prices.

Of course, you can mix and match. That's the beauty of the big Cetec Sparta line — multiple choices in equipment and studio layout.

Outstanding full-color Sparta catalogs are just off the press. Write for them today, or telephone Andy McClure (805) 684-7686.

Cetec Broadcast Group

Circle 129 on Reader Service Card

The Broadcast Divisions of Cetec Corporation
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from input to input automatically or by pushbutton closure.

Although the Philips system is programmed for NTC 7 rather than FCC VITS, it is provided with a complete set of automatic monitoring and remote control functions through the RS 232-compatible ASCII output. When the analyzer is connected to a teletype it will provide a continuous stream of data printouts. With the Automatic Printout Unit, however, the data stream can be controlled to provide printouts at specified time intervals or for specific reasons, such as when an out-of-limits parameter alarm starts or stops, when the VITS voltage alarm starts or stops, etc. The APU also formats the information, adding parameter headings, date, and time.

Data output from the analyzer can also be transmitted to a central operations center for monitoring, logging, and emergency action if necessary. By using a dataline-controlled text inserter located at the transmitter site, "apologies" can be automatically inserted based on the problem (loss of audio, temporary video loss, etc.), or transmitters or video feeds juggled.

Prices are $17,000 for the VITS Analyzer and $3,000 for the Automatic Printout Unit, making the system price $20,000.

Tektronix's ANSWER II

Unlike the three other systems discussed above which are analog measuring devices connected to an A/D converter at or shortly before their outputs, the Tektronix ANSWER II automatic VITS analyzer employs all digital circuitry. Although it has an eight-bit memory providing .025 percent resolution, its sampling frequency of four times subcarrier and signal averaging and dithering give it the equivalent of a nine-bit memory and yield a 15 dB improvement in the instrument's S/N ratio.

The digital circuitry provides the unique advantage of being able to measure a number of different parameters very efficiently by simply including extra program read only memories (PROMs) whenever necessary. Thus, a flick of a switch will convert ANSWER II from FCC to NTC 7 VITS analysis. It will measure all the NTC 7 VITS parameters outlined in the chart along with sync pulse amplitude, average program level (APL), reference black, mains hum, field time distortion, long time distortion, dynamic gain, reference white, blanking level, and digitally-computed signal-to-noise ratio in which all filtering for normal 4.2 MHz bandpass and five MHz long distance radio relays is done with digital circuits so no analog filters or signal re-routing is required.

ANSWER II also incorporates a sophisticated system for measuring blanking interval timings either to FCC specifications or to the EIA Recommended Practices read in nanoseconds at half amplitude points as recommended by the Broadcast Television Systems Committee, again simply by using different PROMs. In addition to H sync width, H blanking width, breezeway width, front porch distortions, vertical blanking width and several other measurements (see accompanying chart), ANSWER II will also analyze the extremely critical SC-H (subcarrier horizontal) timing. Although current FCC drawings do not define it, the EIA's RS 170/170A drawing shows that a signal is SC-H timed if the time between the 50 percent point on the leading edge of H sync and the zero crossing of the color sync burst which follows a 50 percent burst amplitude is equal to the period of 19 ±⅛ cycles of subcarrier. At 3.8 MHz, this requires a timing accuracy of ±35 nanoseconds, much too fast for a waveform monitor. However, because of ANSWER II's 4x subcarrier frequency sampling, half of the samples occur at zero crossings of the color sync burst. Having evaluated the sample immediately preceding the zero crossing which exceeds half of burst amplitude, ANSWER II checks back in its memory 72 samples earlier and evaluates sync at that instant. If the sync amplitude in the memory equals the sync amplitude at that instant, ANSWER II will indicate no timing error; if the two are not equal, a timing error is indicated.

Naturally, ANSWER II provides all the features common to the VITS analyzers we have been discussing, including GPIB or ASCII output terminals for connection to teletypes or other digital devices. The data stream can be selected to print out continuously, or when "inner" and "outer" parameter limits are exceeded and/or at fixed time intervals. In any case, no matter how complex the measurement, a parameter can be measured in one second or less.

The final analysis

In the end, the responsibility for proper maintenance of signal quality becomes the joint responsibility of all concerned with producing it — from the equipment manufacturer to the local station. Already it appears that two links in the chain — the equipment manufacturers and AT&T — have made commitments to both the use of VITS and also automatic analysis as "insurance" procedures. Now it remains up to the rest of the industry. The premiums may seem high; but as the standards actually become standardized, automatic test equipment manufacturers become convinced that the industry is ready, producers become responsible for the quality as well as content of their programs, and stations recognize the advantages (economic as well as ethical) to be gained, VITS and their automatic analysis could well become as synonomous with the broadcast process as 525 line scanning. **BM/E**

Blanking Interval Timings Measured Automatically By ANSWER II

Timing	From	To
Front Porch*	+ 4 IRE	– 20 IRE, leading edge sync
Sync Width*	– 20 IRE	– 20 IRE, across sync pulse
Sync to Blanking End*	– 30 IRE	+ 4 IRE
Burst Width*	0 IRE 0 IRE	(following that ≥50% burst) (following that last peak ≥50% burst amplitude)
Breezeway*	– 20 IRE	0 IRE burst start point
Sync to Burst End*	– 20 IRE	0 IRE
Color Backporch*	0 IRE	+ 4 IRE
Blanking Width*	+ 4 IRE	+ 4 IRE

*Measured in nanoseconds.

For you, the new breed of video professional, the new breed of professional video from JVC.

If you're a video professional today, you're a tougher customer than ever.

So JVC's rugged professional line delivers the quality and features you demand at prices you want to pay.

We know you've got a lean new attitude about the video equipment you buy, no matter how long you've been in the business. Or whether you're in broadcasting...a sophisticated corporate A/V operation...a top production house...or building your first video capability.

And that attitude is, with all the people vying for your video dollar, you want more state-of-the-art technology in equipment that costs you less to own and maintain.

JVC's attitude is basic too. We build in engineering innovations—we don't add them on later. And we do it first. Which means you enjoy better picture and sound quality, easier operation, and sophisticated features you may not even find in equipment selling for twice the price.

For instance:

You wanted faster performance and greater accuracy in 3/4-Inch video editing.

And JVC's new CR-8500LU Recorder/Editor System offers bi-directional fast/slow search from approximately 10 times to 1/20 time, with editing accuracy to ±2 frames.

It's a new generation of ¾-Inch VCR editing— the fastest, surest way to get the frame-by-frame accuracy you need.

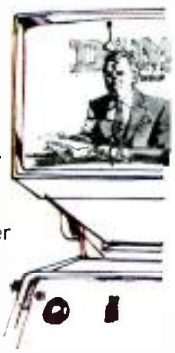
But JVC's CR-8500LU is still priced well below its closest performing competition.

With a single unit, you can edit with full functions and broadcast quality. Even if you don't happen to have special technical knowledge.

With a complete editing system of two CR-8500LU units and the new RM-85U Control Unit, you can perform the most advanced editing feats at approximately 10 times actual speed, then stop **on a single frame.**

Here's how the CR-8500LU gives you that kind of precision:

- **Frame to frame editing** is made possible with the capstan servo/built-in rotary erase head/blanking switcher frame servo design. A design that also ensures true assemble and insert editing with no distortion at the edit points. Plus horizontal sync phase compensation to minimize timing error at the editing points.
- **Variable speed auto-search** lets you perform both high speed and low speed search. You can search at approximately 10 times in fast forward or reverse to find edit points faster. Or slow speed search at 2 times, 1 time, 1/5 time and 1/20 time. Or use the special auto-speed shift feature to automatically slow you down from 2 times, real time, 1/5 time, 1/20 time.
- **Automatic pre-roll** enables you to pre-roll tape between edits, with an automatic on/off switch. Which can come in especially handy during successive assemble edits using camera signals.
- **Self-illuminated control buttons,** allowing easy identification of the operation mode.
- **Full logic control** for direct mode change without pressing the stop button.
- **Remote control** of all operations, with the optional remote control unit RM-85U.
- **Audio level control with meters,** preventing over-level recording without audible distortion, with attenuator. Also, manual audio level controls let you adjust the audio recording level by checking the level meters.
- **Auto/Manual selection for video recording level control,** adjustable by the automatic gain control circuit or manually by referring to an independent video level meter.
- **RF output** to connect an external drop-out compensator.
- **Patented color dubbing switch** for stable color multi-generation dupes.
- **S.C./sync input connector** allows connection of time base corrector and allows for two second pre-roll.
- **Chroma level** can be controlled manually for convenient connection to an external system.
- **Built-in comb-filter** for playback (switchable on-off).
- **Servo-lock indicator** to check the tape transport condition.
- **Counter search mechanism,** permitting Auto-Search of a particular section of the tape.
- **Solid construction for easy maintenance:** both side panels, top and bottom panels are detachable for easy access to the inside.



- **Tracking control meter** for maximum tracking adjustment.
- **Heavy fan motor** for better circulation.

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

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

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

• **Lap time indicated** for each insert edit length by LED display.
• **Edit preview mode available,** for "rehearsals" of actual edits.
• **Edit-in point search mechanism.** After each edit, a Return button rewinds the tape automatically to the edit-in point, so it's easier to check edit conditions.
• **Auto-shift search mechanism** to step down the tape speed automatically, and ensure quick and accurate location of the editing point.
• **Tape safety guard circuit.** Because leaving the unit in the still-frame mode can eventually cause damage to tape or video heads, a tape safety guard circuit places the unit into the stop mode automatically if it is left in the still-frame mode for more than 10 minutes.
• **Selective editing modes**—assemble editing, insert editing for audio channel-1, audio channel-2 or video.
• **Versatile editing capability** offering techniques like "edit-in/out," pre-roll, and automatic pre-roll.

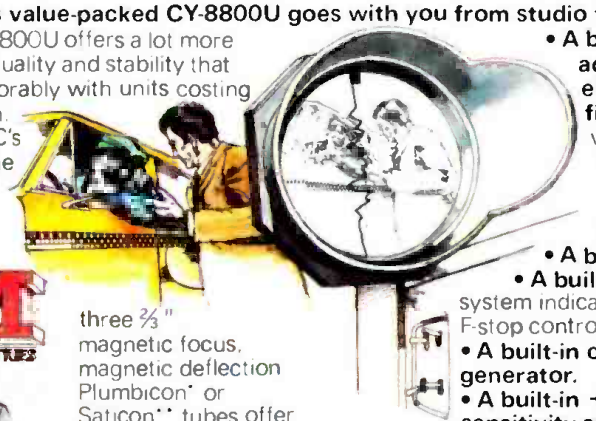
You'll find that nothing in its price class performs anywhere near the CR-8500LU/RM-85U videocassette editing system. And that you'd have to spend a *lot* more on the competitive unit that offers many of the same features.

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

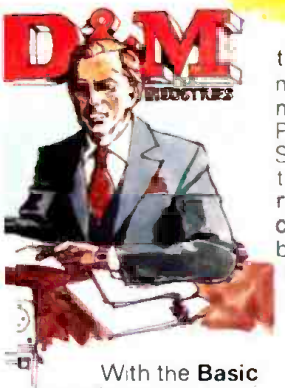
You demanded more versatility in a moderate-priced, broadcast-quality camera.

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

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



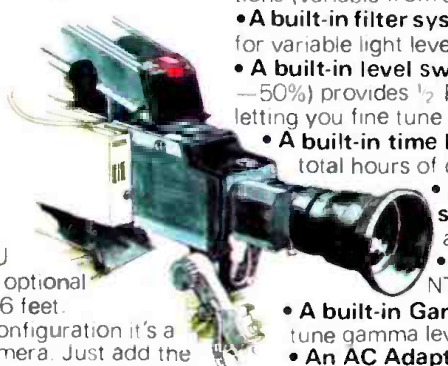
three ⅔" magnetic focus, magnetic deflection Plumbicon* or Saticon** tubes offer total flexibility. And a rugged die cast chassis in front and back to hold up under the toughest conditions.



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

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

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



• **A built-in 1.5 Inch adjustable electronic viewfinder** for the convenience of the operator.
• **A built-in battery warning system.**
• **A built-in tally light.**
• **A built-in VSI**—video system indicator for precision F-stop control.
• **A built-in color bar generator.**
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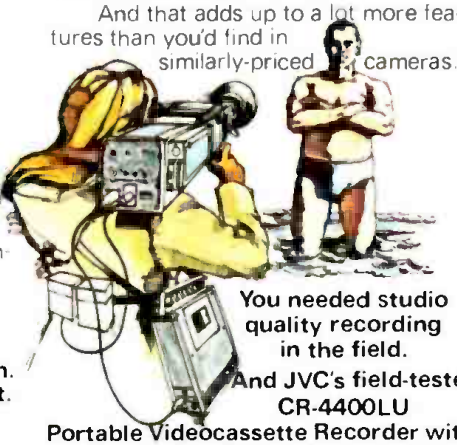

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Test And Measurement In The Digital Era

By Tom Meyer

More and more equipment in the modern broadcasting facility is the product of digital technology. Though highly dependable, anything man has put together, Murphy can put asunder.

AS BROADCASTING ENTERS THE DIGITAL ERA broadcasters must prepare to monitor and troubleshoot a new technology that may be beyond the ken of many of today's technicians. Technician training is important, but even a technician educated in things digital may find that he has few, if any, of the necessary tools currently on hand. Moreover, digital technology is so complex and refined that practical troubleshooting may be limited to "pointing at the trouble" rather than getting in there and "fixing it" in the analog sense.

The first line of defense for today's broadcaster is to demand from the manufacturers of digital equipment well thought out, on-board diagnostics. The second and third lines of defense are tools designed for the digital era, and the trained technicians to use them.

Diagnostics — what to ask for

Diagnostics ought to be an essential element of any digital system using microprocessor or computer-based technology. After all, the manufacturer who built the system is undoubtedly the best informed source on how the system is supposed to work.

There are at least two common approaches to providing diagnostics. One is to provide the user with diagnostics as part of the operating system, that is, on a special PROM or on punched tape or disc. This method usually involves having a technician specially trained in the use of the diagnostics by the manufacturer. Some digital systems provide diagnostics by telco lines over a modem. Though this approach will provide the factory with vital information regarding system function, it does little to help the local personnel understand what is happening with their system. The modem or remote diagnostic method is also slow since the telephone network for an off-line system is limited to only about 300 baud if routed through the dial-up telephone system. An on-line system, on the other hand, can probably run diagnostics at 1200 baud, but this is still agonizingly slow if the malfunction is keeping you off the air.

The on-board diagnostic approach seems to be the best all-around for reasons of speed and confidence. The only danger in this approach is that if a system is functioning properly there may be no need to run the diagnostics, and when something does go down, the factory trained technician may have forgotten how to use the diagnostics. It is recommended, therefore, that diagnostics provided by the factory be run occasionally for the main purpose of keeping the responsible technician current. Diagnostics, except in the case of systems using large MOS memories, will not tell you very much about impending failures. Just as the foundation of digital technology relies on a binary state, off or on, it is also largely true that it either works or it doesn't.

Adequate diagnostics should be able to point the technician at least to the board level of the system. This is, of course, part of the common wisdom regarding digital equipment: Given the complexity and cost of digital components, it pays to replace parts (boards) rather than fix them. The problem with this panacea is that nobody tells you which parts ought to be kept inventoried. In complex systems, this could theoretically lead to a complete stocking of an entire replacement system. This is not a practical approach since (a) it is too costly and (b) there is no guarantee that some parts will fail less frequently than others. Manufacturers of complex systems, like TeleMation's Compositor I graphics system, do supply a recommended parts list, and this is a practice that should be used by other suppliers.

In systems that use a great deal of MOS memory the

continued on page 56

One new piece of test equipment likely to find its way into broadcast operations as the digital era progresses is the Logic State Analyzer. The one pictured above is the Model 532 from Paratronics, of San Jose, Cal., and sells for $1800. This type of LSA uses a typical scope for its major display purposes. It will capture up to 250 words in either binary or hex. The 32 channels associated with each word can be operated together or functionally split into "A" and "B" groups, each 16 bits wide and each separately clocked. One application of this approach is the support of systems designed around the latest generation of microprocessor chips which use different clocks to multiplex address and data on the same pins

Tom Meyer is product manager for Dynair Electronics, Inc. He has been active in television engineering for twenty years, and entered the broadcast industry twenty-five years ago as a combo engineer for a small AM station. During the last eight years, Meyer has specialized in the application of the computer to the needs of the television industry; he participated in the design of a computer-based broadcast character generator and an election reporting system for use in broadcast stations.

diagnostics should be complete enough to get past the board level to the chip level, since bad chips are one of the most common sources of problems. Other less complex systems will be adequately protected by diagnostics designed to "point at bad boards," or perhaps get the technician within reach of a "group of chips."

The on-board diagnostics used with the Dynair digital routing systems, for instance, consist of two levels. The first level is called "self check" and it requires the CPU to output a word to a failsafe timer while the system is in operation. If this word should fail to appear at the timer on cue, the system is programmed to shut down and alert an operator to the condition. The second level of diagnostics involves a complete check of the memory and serial data ports. A single button marked "test" is engaged to begin the run of the diagnostics. A numeric LED displays a series of numbers as each element is checked. If any component should malfunction, its number is held on the LED display to indicate the source of the problem.

Protection at the station level

Even with diagnostics there is no assurance that you are in good hands. Many microprocessor-controlled systems will simply be supplied without diagnostics. Other digital equipment may not be of sufficient complexity to require diagnostics. Added to this, there is always the problem of confidence and the time-honored "do-it-yourself" make of equipment.

To be in a position to live in the digital realm, stations ought to consider three tools basic to the digital world. First, a 100 MHz oscilloscope with dual trace capability; second, a logic probe; and third, a Logic State Analyzer. These tools are generally available in a wide price range with a wide variety of capabilities. There is no need to go for the Cadillac in each instance, since you may be buying a device useful only to a designer or manufacturer when something less costly will meet the needs of the end user. Remember, in the digital era, you won't fix much. The problem is to quickly identify what is wrong and, most often, replace it.

It is in this area that additional demands need to be placed on the manufacturer. First, a manufacturer should supply you with sufficient information about his system that your technician will know what it is he's looking for. Supplying such information is an area of concern to many manufacturers. To some degree, they are concerned that too detailed an explanation of their system might give away proprietary information to the benefit of competitors. Another concern is that improperly prepared technicians might cause more harm to the system. Nevertheless, it is to both the manufacturer's and the broadcaster's benefit to reach some reasonable agreement on what is needed to keep the equipment up and running.

Many manufacturers offer factory courses with their digital systems and stations should take advantage of these whenever possible. Moreoever, when something does break down that is beyond the capability of the station technician to repair, it is a great time and money saver for both broadcaster and manufacturer to have a factory service technician talk to a knowledgeable and competent station technician.

But this brings us back to the tools the station should have on hand in the digital era. The logic probe is a fairly simple and inexpensive device that can pinpoint 60 percent of common board level problems. The probe will go pin for pin on an IC and tell the technician the state of each pin. The probe will also tell you whether a pulse train is present or not, and it will capture infrequent, or random, pulses which are sometimes beyond the reach of far more sophisticated and expensive devices. Pulses of as short a duration as five ns can be captured by the logic probe with greater certainty than provided by many scopes.

The presence or absence of various pulses is a funda-

The Model 532 can interface to various output devices such as teletypes, modems, computer control devices, and scopes. Most stations will find the scope interface most useful since it provides readouts in hex or binary

100MHz scopes with dual trace capabilities, such as this Philips Model PM3262, will be making their appearance at broadcast stations as more of the broadcast plant becomes digital. Scopes of this speed manufactured by Tektronix, Hewlett-Packard, and others have found general applications in manufacturing and computer fields

mental question in digital technology to which the majority of malfunctions can be traced. The second level of difficulty, however, grows out of timing problems. The logic probe will tell you if pulses are present but the next question is frequently, are they happening at the right time and in correct relation to one another? To answer this question, the technician needs a 100 MHz scope, such as the Tektronix 465. Though more expensive than ordinary scopes common to broadcast facilities, a 100 MHz scope with dual trace capabilities is a very useful tool. Slower scopes simply do not operate at sufficient speeds to adequately provide insight into what is happening inside digital devices. Though many managements may balk at spending between $5000 and $6000 on a 100 MHz scope, it is helpful to point out that whereas a scope of this character is able to perform many useful though less demanding jobs around the station, the slower scope is not capable of providing the accuracy demanded in the digital realm.

A good 100 MHz scope will help pinpoint problems such as improper propagation rates or timing errors, and can show you when triggered events are out of relation. Further use can be gotten from the scope if utilized as the display device for another important tool, the Logic State Analyzer.

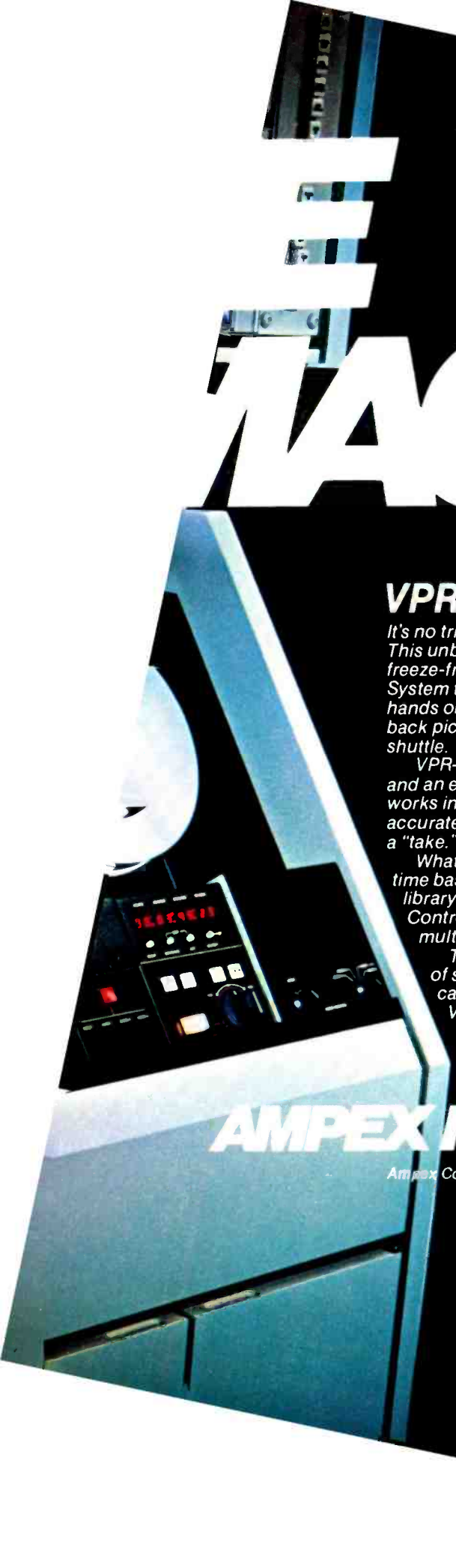
The Logic State Analyzer (LSA) lets you take any group of signals that are appropriate and see a predetermined number of events prior to or following a selected trigger condition. For instance, the LSA can be given a particular trigger condition and instructed to display the 32 events preceding the trigger. As the device monitors a data stream, it remembers each transaction until the trigger condition is encountered. At that point, it will then begin to display, at some clock pulse, each of the thirty-two preceding events. These devices are available in a price range from about $500 to more than $5000. An adequate LSA will probably come in around $1500 and will be of the type that uses an outboard display device—typically, any decent oscilloscope.

The LSA is particularly valuable for seeing what is actually going on in interfaces such as the IEEE 488 or RS 232 and for monitoring internal data busses. Typically, an LSA is a 16-channel device that will provide for octal, hex, or numerical readouts. The need to monitor interface transactions is a growing requirement at modern broadcasting plants as more and more digital devices are added. The LSA can take hours out of the problem of pinpointing just where a problem is. Anyone with a formal automation system ought to seriously consider having an LSA on the premises.

Assuming that you are willing to go ahead and acquire the basic test and measurement equipment for the digital era, and that the manufacturers you choose will supply the diagnostics and training to use them, there is one more investment that every station should make — training. Numerous courses are offered around the country at community colleges, university extensions, and through companies like Heath that will prepare your technical staff to handle digital equipment.

Though digital equipment holds out the promise of greater flexibility and reliability, the responsibility for maintaining it will ultimately rest with the broadcaster. In this sense, the more things change, the more they stay the same. **BM/E**

MAGICIAN



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Taming The Common Point

By John H. Battison

This article discusses factors affecting common point impedance (Z_{cp}) in DAs, and base impedance (Z_{base}) in non-DAs.

THE TERMS OF AN AM STATION'S LICENSE call for RF output to be maintained at a specific value stated within upper and lower limits. This is the licensed power that was requested in the application for a construction permit, and is produced by the product of two variables — the common point impedance and the common point current. Both of these are determined during antenna tune-up, and are adjusted at that time to produce the authorized power. For the purpose of discussion we consider Z_{cp} and Z_{base} as being the same. When considering non-DAs, those features peculiar to DAs should be ignored.

The RF current (I_{cp}) depends on the amount of power that the transmitter is capable of producing, and the value of resistance (real) that the common point presents. Within limits, a well designed transmitter is sufficiently flexible to develop the licensed I_{cp}, even when Z_{cp} has increased abnormally. If these conditions occur, perhaps as the result of an operator raising power output to maintain licensed I_{cp} (when, unknown to him, the Z_{cp} has increased), the station will be operating with excessive power. This will probably be accompanied by overloaded PA tubes and power supply, and in extreme cases by component failure. An interesting consideration is that in "complying" with the FCC's rules and maintaining the licensed I_{cp}, the station is actually radiating excessive power and may technically be in violation.

Common point impedance is not normally measured every time that an I_{cp} reading is made or a maintenance inspection is performed. In fact, one could venture a guess that in many stations it is not read from one annual proof to the next!

It has long been a mystery to the writer why the FCC has never seen fit to monitor this important parameter in DA operation. Practically all the other important parameters such as I_{cp}, I_B, current ratios and phase monitor points, etc., are checked and recorded at regular intervals. But Z_{cp} and Z_{base} are apparently presumed never to change — and yet all engineers know that there are quite often appreciable changes in Z_{cp}, especially when the weather changes. But it is not yet a required routine measurement.

The introduction of the operating inline bridge (OIB) a number of years ago made it possible to measure Z_{cp} under operating conditions. Previously it had been necessary to shut down the transmitter, disconnect the common point and insert an impedance bridge. This was usually a tedious process involving the balancing of bridge, signal generator, and detector in a frequently very inconvenient area. The measured results were not made under operating conditions, and sometimes a "hot" measurement made just after shutting down was not repeatable when the system was cold. This was actually helpful, because it was a good indicator of "something changing value" when power was applied. However, this change was often not apparent because only "cold" measurements were made.

Nowadays, the fortunate station engineer has an OIB in circuit at the common point all the time, or at least a quick connect jack, so that one can be inserted whenever desired. A change in Z_{cp} in damp weather is a pretty good indication of changing system values — possibly a capacitor ready to fail, or a deficient ground system whose members have corroded away with the passage of time. In each case the warning is there for the alert engineer.

If an OIB can be left in position permanently, or inserted at will, it is an excellent idea to keep a record at convenient intervals. This can be another entry in preventive maintenance records, and may save an "air-time" outage.

Factors affecting common point impedance

Let us consider Figure 1. This represents a three-tower directional antenna system. Major points where changes can affect Z_{cp} are indicated and discussed in the following paragraphs.

1. Phasor Controls. The phasor input circuit is very important in maintaining the desired common point impedance. This is the last link between the antenna system and the transmitter output. Almost any changes made to the system on the antenna side of this circuit will change Z_{cp}. If the phasor input circuit is properly designed, it is a simple matter to reset Z_{cp}. Shown in Figure 2 is a phasor input circuit that is typical of some older installations. There are probably very few unmodified phasor input circuits still in use because of the difficulty in obtaining the desired impedance when antenna system parameters change. This type of circuit can be changed to Figure 3,

continued on page 63

John H. Battison, a consulting radio engineer, has been in the broadcast business for twenty years. He recently advised the Lebanese Ministry of Information on two 700 kW and one 100 kW directional medium frequency AM radio stations.

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Taming The Common Point

current phase to the respective tower, the loading on the power divider (PD) network comprised of L1 through L6 and C1 will change. This changes the impedance of the PD at Z_{PD} (Figure 1) and this in turn changes Z_{cp}. Correction of this change is accomplished by adjusting the appropriate leg controls.

2. Ground Systems. An appreciable change in Z_{cp} in wet weather is generally an indication of a deteriorated or inadequate ground system. If the system was installed many years ago it is possible that the copper has corroded away, leaving short or broken radials, and a ground system whose resistance varies considerably with moisture content. The answer, of course, is to replace the system. Before rushing off to order miles of copper wire and strap, however, go over your whole ground system and connections very carefully to ensure that there are no breaks or loose connections that could cause the variation in Z_{cp}.

3. Antenna Systems. Under this heading we include a very wide range of faults that can change Z_{cp}.

A quarterwave isolation stub, or transformer, used to bring FM, TV, or other lines onto a series-fed tower is a potential source of unexpected changes in Z_{cp}. Grounding straps can slip — or loosen — or corrode and introduce mismatch or high resistance connection between stub and tower. Any of the above is sufficient to upset the antenna system tuning which is reflected in Z_{cp}.

Base insulators that are dirty or filled with water because the drain hole is plugged are another source of trouble. Dirty, cracked, or even broken wire insulators, especially those at the top of the tower, can have effects on Z_{cp}. In extreme cases an insulator can disintegrate and "top load" the antenna by "connecting" a piece of guy wire. This is fine — if it is an NDA operation with a short tower, the connection is tight, and the transmitter can stand the load — because in that case returning I_{cp} to licensed value will raise the power due to the lengthening effect of the guy. An increase in signal strength may actually be noticed on a low power, low efficiency station. But is is technically and legally wrong.

4. Tower Lighting Circuits. Sometimes lighting chokes develop shorts, or bypass capacitors fail, resulting in a gradual or sudden change in operating conditions across the tower base. An Austin type lighting transformer, if not properly installed, can work loose, resulting in a partial or complete ground or change in base capacity. Again, this will be reflected in a change in Z_{cp}.

5. Sampling Circuits. Sampling loops sometimes develop grounds to the power, as do sampling lines. Insulators may break and open or short circuits occur. This type of trouble generally announces itself by a change in operating antenna monitor readings. Isolation chokes or tuned coils carrying sampling lines across the base may become detuned, with similar indications.

6. Miscellaneous. Look out for unusual objects hanging onto the antenna system. Instances of small animals getting across base insulation have occured. In the spring, watch out for kite strings across guys, especially near the tops of short towers. A wet kite string can have a surprising effect on Z_{cp}. You may even find metal braided string or wire on your tower.

Heavy vegation is a "no-no," not only because the radio inspector will give you a citation, but because it can have a very noticeable effect on antenna performance. Dense vegetation around tower bases in effect reduces the base height above ground — hence the change in operation. In a very critical array, heavy vegetation between towers can put monitor points out with or without Z_{cp} changes being noticeable. Beware of sloppy maintenance that allows vines to attach themselves to the RF lead from the ATU to the antenna.

7. Transmission lines. Station engineers sometimes forget about transmission lines because they are often out of sight, underground, or high in the air on supports. Coaxial cable can be an unsuspected source of trouble. If high VSWR exists (and it does in many apparently "clean" DA systems), it can produce arc overs and carbon deposits inside the line. If these carbonized areas spread to the dielectric or spacers carbon tracks, subsequent Z_{cp} variation (not to mention the likelihood of burnt-out line sections or the puncture of the outer conductor) can occur. If the outer conductor is punctured the pressurizing agent is lost and moisture can enter with the results we all know about. A few of the older, higher power stations have used open wire lines. Anything that changes the line characteristics may change Z_{cp}. If the conductors sag, or swing, the characteristic impedance will change, as will Z_{cp}. In an installation with wooden crossarms lacking a cross connection between the metallic insulator mounting studs, moisture on the wood will result in VSWR changes in the line.

8. Measurements and Adjustments. A very important FCC requirement is properly authenticated common point or NDA base impedance measurements. Producing acceptable measurements requires the use of properly calibrated equipment. The line of GR RF bridges has long been known and used for highly accurate impedance measurements. These bridges are normally checked against the "standard" 50 ohm resistors before use.

The impedance thus measured is under cold (non-operating) conditions and may not reflect the situation when the system heats up. In order to use OIB for FCC-acceptable measurements, the instrument must be calibrated by the manufacturer. This is quite inexpensive and very worthwhile. Earlier, we mentioned an occasional difference between hot and cold measurements. If both types of instrument are in calibration and properly, and similarly, inserted into the common point, and the measurements made carefully, the results should be comparable. But sometimes they are not, and the question then is, "Why?" Generally the answer is, "Something changes under power." It may be a capacitor check for heating (with tramsmittor off), or a loose or oxydized coil clip. Again check for hot spots, and clean and tighten all connections. Or it may indicate general antenna and ground system looseness — again check, clean and tighten.

If the difference is small until it rains, you probably have bigger troubles. The odds (provided that the system is otherwise in good condition) are that the ground system has deteriorated. Properly interpreted changes in Z_{cp} can be a very useful operating tool. You aim for very slight, or no changes. The changes you get can tell many things about the system.

Finally, if you *must* readjust your Z_{cp}, be sure to note all control settings (this includes coil tapcount turns). Don't rely on nail polish or pencil marks; these sometimes are cleaned off. Make very small adjustments. Remember that the series leg controls resistance and the shunt leg adjusts reactance. **BM/E**

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Part 2: New Testing Methods Yield AM Transmitter Improvements

By Greg Kornides and Chris Hood

This article concludes the in-depth analysis of testing methods for AM transmitters that began in the October, 1979, issue. Here, the authors describe their procedures for determining transient response and modulation capabilities of low frequencies and intermodulation (IM) distortion, and how modifications were made based on the results. The procedures were carried out at WTAE, Pittsburgh, but have applications to many AM operations.

AFTER THE HIGH FREQUENCY TESTS described in Part 1 were completed and corrections made, low frequency pulse tests were begun. The setup procedure used previously remained the same for these tests. The frequency chosen was 50 Hz, to indicate a worst case condition for testing. As with the high frequency tests. the low frequency tests were set up for two successive "bursts" of the square-wave, with a ⅓ second "off" time. The initial results can be seen in Figure 1. The amount of waveform "tilt" seen here was thought to be caused by a combination of three factors: (1) the audio input transformer; (2) coupling capacitors of an insufficient value in the modulator section; and (3) a low reserve capability in the high-voltage power supply.

Each of these three factors was investigated to locate the source of the "tilting" problem. The output of the modulator (which is low level) was left in circuit and tested with the transmitter plates off and no RF feedback returning from the PA stage. Because the input sensitivity of the modulator was increased by several dB when feedback was removed, the input level to the modulator was decreased proportionally to maintain correct modulator output voltage levels, thus simulating actual operating conditions. The "tilt" observed at the output of the modulator was less severe, but still evident. Next, the oscilloscope was moved to the secondary of the input transformer, where insignificant "tilt" was observed. The scope was moved from stage to stage towards the audio output of the modulator. After each coupling capacitor, the "tilt" was noticeably worse.

At this point, calculations were made to determine the low frequency time constant of each stage's coupling circuit. Once these were obtained, new increased capacitance values were calculated that would provide a flatter square wave response at low frequencies. Premium quality, high temperature electrolytics were chosen for high reliability under continuous service. After the new capacitors were installed, a substantial improvement was observed in the square wave pulse response. The modulator was then reconnected to the transmitter and RF feedback reapplied. The low frequency pulse test was run again and the results appear in Figure 2. Also, the common point (antenna system input) RF sample waveforms were similar to those of the dummy load.

The negative peaks through the transmitter were now flatter than the positive peaks, even though the output of the modulator had shown identical results for positive and negative peaks. The reason for additional "tilt" on the positive peaks was determined to be high-voltage power supply "sag" under high demand condition. The effects of this "sag" gradually disappeared with increasing frequency, having no effect above 500 Hz. As in the high frequency tests, the input waveform to the transmitter was perfectly flat, clean, pulsed square waves. It was decided that only a small improvement in response would occur if the power supply was supplemented, so no changes were made.

The modifications made to improve the low frequency performance did not appreciably extend or alter the low frequency response of the transmitter. The changes observed were actually the result of a low frequency phase shift correction. Since there were no frequency response changes, and the transmitter remained within the original manufacturer's specifications for FCC Type Acceptance,

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

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these modifications were also within the category of "Class I Permissive Changes."

The greatest benefit from the low frequency adjustments was in the perceived "on-air" sound. The apparent low bass became much "tighter" and better defined, and "boominess" was reduced. Another improvement was the added benefit of over five percent increased average modulation because waveform "tilt" no longer caused unwanted modulation peaks on low frequencies. This type of overmodulation is most evident on heavy bass music with fast transients, such as a drum or short bass guitar chords, and also on heavy male voices.

The low and high frequency improvements made resulted in at least a 10 percent (one dB) increase of average continuous modulation capability, with a similar reduction in unwanted peak modulation transients. Because of the additional modulation capability, the "on-air" loudness increased, while also sounding cleaner.

Tone-bursted waveforms were used instead of steady state, or continuous, tones because the overshoots or "tilting" become more severe on bursted material. If steady state tones were used for the transmitter tests, the compensation schemes would have been inadequate. As a result, the additional modulation gain and sound quality improvements would not have been as dramatic. There is a "settling" effect of the overshoots or "tilting" caused

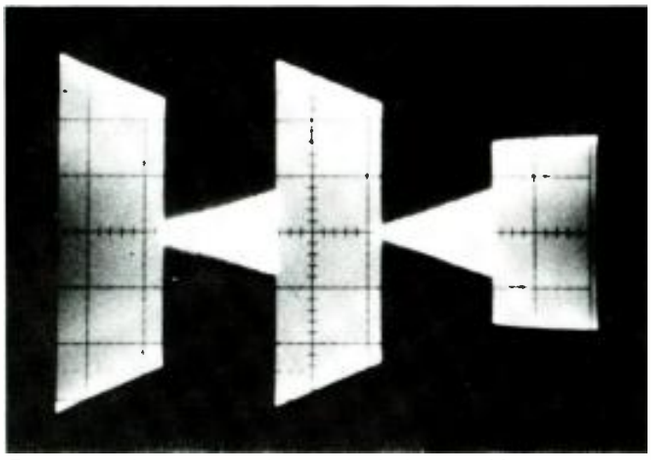

Fig. 1. Low frequency pulse results before modification

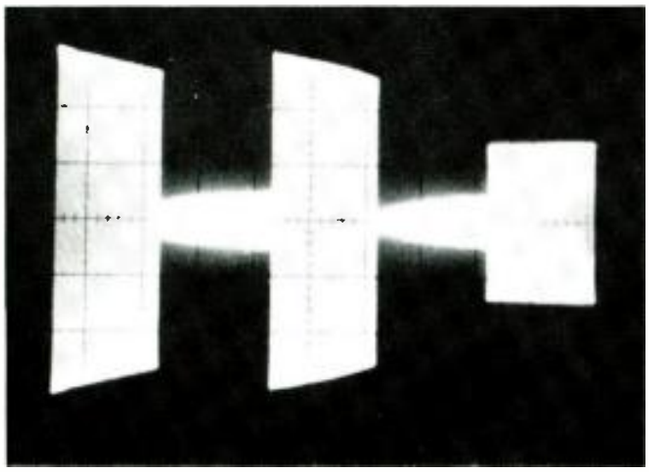

Fig. 2. Low frequency pulse results after modification

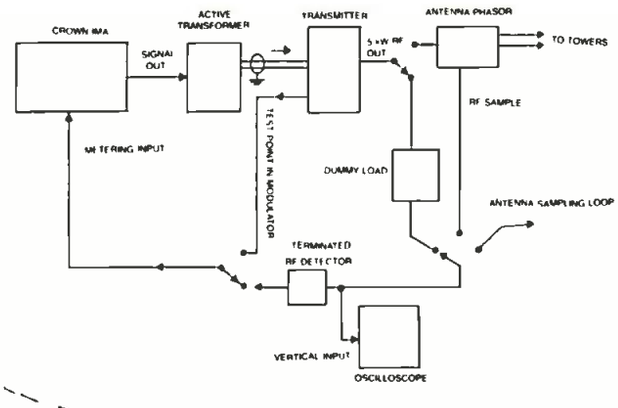

Fig. 3. Diagram of test hookup for IM distortion tests

Tone Source	Modulator Output Without Feedback	Transmitters Before Modification: Without RF Feedback	Transmitters Before Modification: With RF Feedback	Transmitters With Feedback: After Tuning	Transmitters With Feedback: After Bias Circuit Modification
60 Hz/ 7000 Hz IMD	5%	12%	7.5%	5%	3.5%
1 kHz THD	—	4.5%	1.9%	1.9%	1.7%

Fig. 4. Results of IM distortion tests

by transmitter interaction as the burst period becomes longer and longer, approaching that of a continuous waveform. This is why steady state square waves do not present a complete analysis of such transmitter problems. Short duration, bursted square waves are the most ideal for testing of this type.

Intermodulation distortion tests

The next step undertaken in WTAE's testing program was the measurement and minimizing of intermodulation distortion (IM) in both AM transmitters. This setup procedure involved using a Crown IMA intermodulation distortion analyzer set up for 60 Hz and seven kHz tones at a four to one ratio (the SMPTE standard). The unbalanced output of the IMA was fed to the active transformer, then to the transmitter audio input. The transmitter output was on the dummy load, with the RF sample from the dummy load terminated into a low distortion RF detector, the output of which was fed back to the metering input of the IMA. It is very important to use a low distortion RF detector when doing IM tests to prevent erroneous readings caused by detector non-linearities. Figure 3 illustrates the IM testing set-up.

All tests were performed with and without RF feedback, and with input audio levels adjusted to maintain consistent modulation. Most of the tests were taken at various modulation levels in both transmitters, with the exception of the modulator-only tests which were performed only on transmitter number two. It was felt that these results would be similar on transmitter number one.

Not surprisingly, the IM distortion was highest at 100 percent modulation, and decrased as the transmitter input

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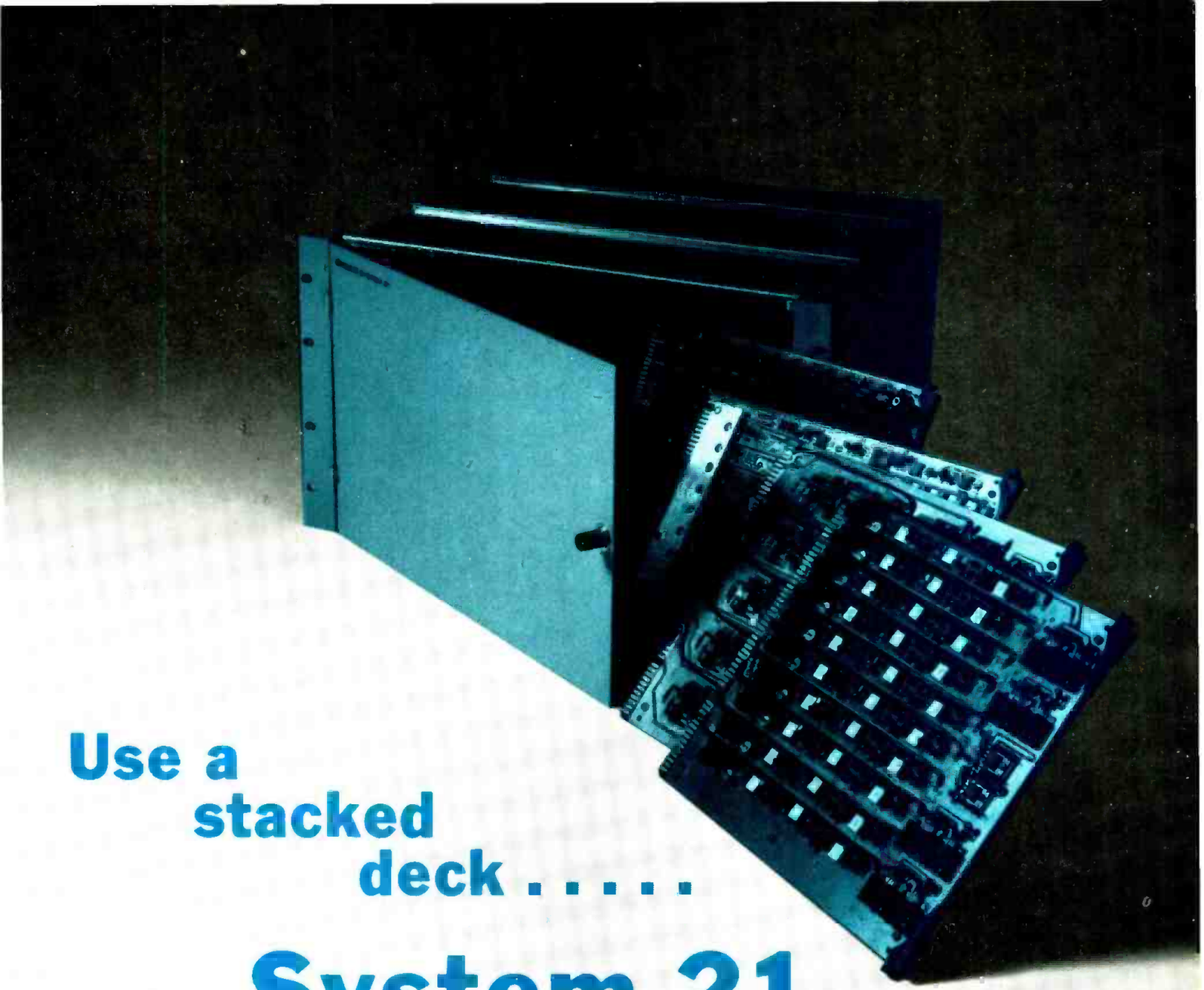

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level was reduced. A minimum value of IM distortion appeared at 50 percent modulation, slightly increasing at 25 percent. No tests were done below 25 percent modulation, as the results would have been useless. All the IM tests were conducted with steady-state (continuous) tones. Results of the initial tests are shown in Figure 4.

The audio section of the modulator in transmitter number two was tested first. The modulator was left "in circuit,"

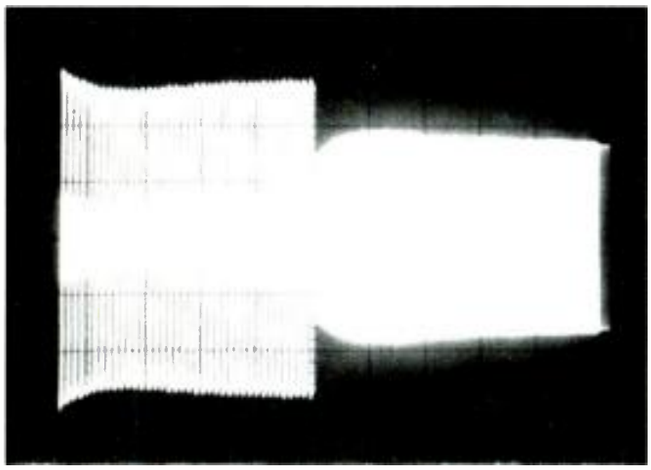

Fig. 5. Amplitude stability before modification

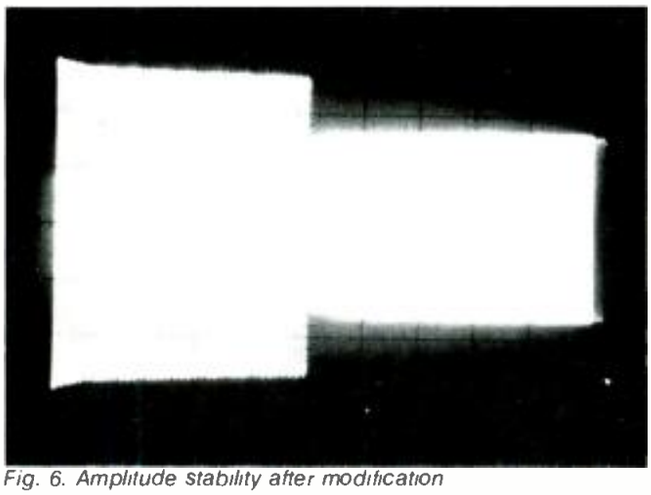

Fig. 6. Amplitude stability after modification

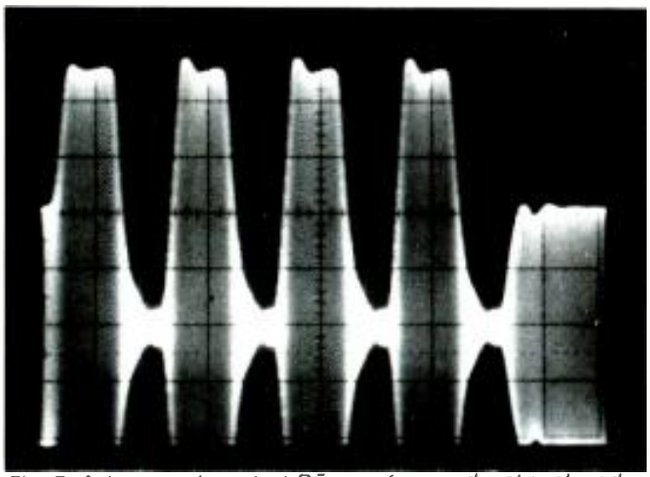

Fig. 7. Antenna pulsing test RF waveform in directional mode without additional compensation

with the transmitter plates *off*, and tested for IM distortion at the *audio* output of the stage, with no RF feedback applied. With the input level adjusted for the equivalent of 100 percent modulation, the initial IM distortion was measured as five percent. The transmitter was then turned on *without* RF feedback, and the IMA input was moved to the dummy load sample line. Transmitter modulation was checked for 100 percent and the IM distortion was measured as 12 percent. Total harmonic distortion (THD) was measured to be 4.5 percent at one kHz. RF feedback was reconnected and the IM distortion was then 7.5 percent. THD was also remeasured, and found to be 1.9 percent at one kHz.

It was felt that the IM distortion could be reduced through careful retuning of the transmitter. The IMA was left connected and the modulator tuning controls carefully adjusted for minimum IM while the transmitter was operating on the dummy load. The controls interacted with each other and also affected positive peak capability, as well as THD. A compromise was arrived at to maximize positive peaks and to minimize IM distortion to five percent (from an initial value of 7.5 percent). The THD remained very close to its original value of 1.9 percent at one kHz.

The transmitter was pulsed once again with low frequency square waves. Using the oscilloscope, it was discovered that when a high amplitude, low frequency audio wave occurred at the input to the second stage of the modulator, the stability of that stage's bias regulation network was affected. As a result, a momentary modulation of the bias voltage occurred. This problem is common on some varieties of transistorized audio power amplifiers, and causes additional IM distortion. A larger filter capacitor was added to the network to help stabilize the bias. As a result, the IM distortion dropped to 3.5 percent without any further changes or adjustments to the transmitter.

An added benefit was increased bias regulation, providing a more consistent audio signal voltage and consequent modulation. This stability problem is illustrated in Figure 5, with the improvement shown in Figure 6. The tone-bursted signal for this test was 40 sequential bursts of a 250 Hz square wave, with a one-second "off" time between groups. Because this modification to the bias circuit did not change the transmitter's performance beyond the rated limits established for FCC Type Acceptance (and actually reduced distortion), it qualified as a "Class I Permissive Change."

The overall results of the IM adjustments were a reduction in SMPTE IM distortion from 7.5 percent to 3.5 percent *and* a slight reduction in THD from 1.9 percent to 1.7 percent at one kHz. The audible results on the air were greater than the measurements would indicate. There was an overall increase in transparency, the highs seemed clearer and less strained, while the bass became less fuzzy and better defined. The relationship between IM distortion and THD in the transmitters was easy to pinpoint. When the tuning adjustments were made for minimum THD, the IM distortion increased significantly. When the adjustments were made for minimum IM distortion, the THD rose only slightly.

Additional tests

A few additional "on air" tests of the system were performed. Following the previous changes for better

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Testing Methods - Part 2

pulses, the transmitters were now able to accurately produce a square wave RF envelope on the dummy load and at the antenna system input. The sampling line from the loop of the day/night common tower to the antenna monitor was disconnected from the monitor, properly terminated, and fed to the oscilloscope. It was observed that no appreciable low frequency "tilt" was occurring in the antenna system; however, slight overshooting was noted on the high frequency pulse tests, as shown in Figure 7. This overshooting was more severe on the directional night pattern. The non-directional day pattern observations were very similar to dummy load and antenna input results. If observed before transmitter compensation, the overshooting on both patterns would be much greater. With modified transmitters, additional compensation is required to completely eliminate this overshoot *for the night pattern only*, as seen in Figure 8. The sampling loop was also used to test IM distortion through the antenna system. The RF detector used previously was connected to the sample line for this test. Generally, the IM values measured one percent higher than those through the dummy load or antenna system input—for the night pattern (DAN) only. Day pattern (NDA) measurements remained about the same. The tests using the sampling line do not necessarily indicate actual antenna performance in the field, but showed different characteristics than antenna system input RF samples would.

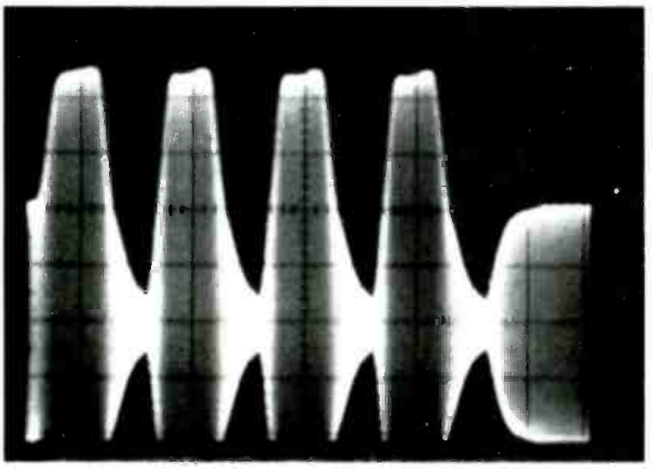

Fig. 8. Same antenna test as Fig. 7 but with additional compensation to reduce overshoot. This was the same as the non-directional test, but with no additional compensation

Conclusion

The modifications and adjustments made on the WTAE transmitters resulted in an audible improvement to the station's "on-air" sound. The benefits were increased loudness and clarity, along with improved modulation control. Testing of this type is not commonly used, but can show hidden deficiencies in a transmitting system. The tests conducted at WTAE can also be applied to other brands of transmitters with positive results. Transmitter modifications necessary to reduce overshoot, "tilt," and IM/THD distortion require a thorough knowledge of circuit theory and pulse techniques. The transmitter(s) must be completely checked for any unwanted side effects. Also, current FCC regulations concerning such modifications must be completely understood and adhered to. **BM/E**

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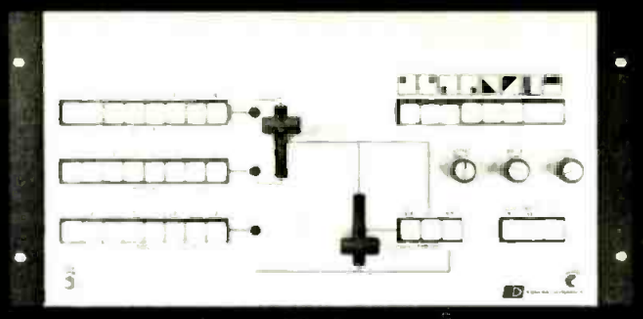
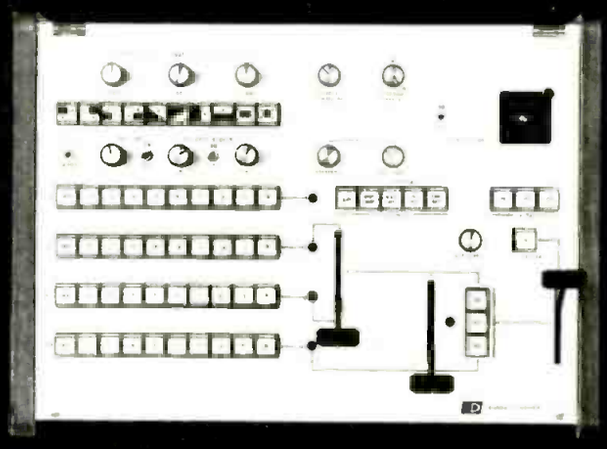


VS-10



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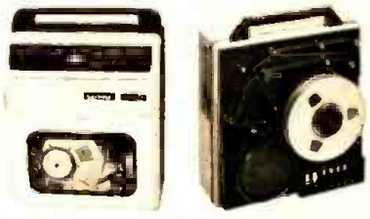

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NRBA Convention, 1978: Optimism Makes San Francisco Meet Another Step Forward For Radio Association

Radio broadcasters came to the City By The Bay with a good year behind them and expectations for a better year ahead. What was heard in meetings and seen on the convention floor and hospitality suites confirmed that this optimism was well founded.

AM STEREO, THE COMMUNICATIONS ACT, and prosperity dominated the conversations in the meeting rooms and hallways of the Hyatt Regency Hotel in San Francisco, where radio broadcasters gathered for this year's convention. More than 3600 people attended the four day convention (September 17 through 20), nearly 1000 more than attended last year's meeting in New Orleans.

The program, exhibits, and speakers offered this year's attendees (1685 paid registrants) a wide variety of ways to enhance their professionalism. The NRBA officers managed to bring together a truly fine technical program that addressed topics such as "Engineering Your Way to Number One," "AM Stereo," and "Satellite Communications." There was also an inside look at one of the FCC's mobile monitoring units. Sales and management sessions drew good attendance as panelists discussed ratings, promotion, and programming. If there was a sour note to the convention at all it was the difficulty of the hotel's elevator system in handling the crush of convention crowds during peak periods. The architecturally stunning Hyatt Regency has a woefully inadequate system for handling traffic.

Communications Act gets considerable attention

The current rewrite activity on the Communications Act got considerable attention during the convention. Rep. Lionel Van Deerlin (D-Cal.), chairman of the House Subcommittee on Communications, addressed the Monday luncheon meeting via live satellite hook-up from Washington, D.C. Over the Mutual Broadcasting System's satellite feed, Van Deerlin exhorted radio broadcasters to "take the lead" in pressing for the proposed legislation. Said Van Deerlin, "I am more convinced than ever that the time has come for radio deregulation — now, not in ten years — and in all markets, not just the major ones."

While Van Deerlin's general theme of deregulation for the radio industry met with the enthusiastic approval of his audience, he expressed some concern about the resistance to change exhibited by other segments of the industry. Van Deerlin cautioned the audience that the diversity of the radio industry was both a strength and a weakness. While diversity makes the concept of deregulation feasible, it also makes it difficult for radio broadcasters to speak with a single voice, said Van Deerlin. In what appeared to be a slap at the NAB, Van Deerlin said, "It [diversity] is a situation which is exploited by those who purport to represent you as *broadcasters* and not as *radio* broadcasters." Van Deerlin went on to say that the proposed act, H.R. 13015, recognizes that the radio and television industries are different and should be treated differently.

Van Deerlin recognized in his speech that despite the promise of deregulation, radio broadcasters had expressed doubts about several elements of the proposed act, including the fee schedule, group ownership limitations, and the elimination of the "public interest" standard. Van Deerlin, though standing firm on the elimination of the public interest standard, did say that the Communications Act of 1978 was still a first draft and that perhaps the "numbers" and fee schedules ought to be gone over again.

In a later session entitled, "The Proposed Communications Act of 1978 — Ask the People Who Wrote It," radio broadcasters showed far more caution concerning the bill than seemed apparent in their reactions to Van Deerlin's speech. The panel consisted of staff members of the House Communications Subcommittee, including "Chip" Shooshan, majority counsel, Ron Coleman, minority counsel, Edwina Dowell, Toby Harder, and Chuck Jackson.

As the various staff members fielded questions from the floor, several of the issues concerning radio broadcasters surfaced. Doubts were voiced over what the act held for owners of combo stations who fear forced divesture of one of their licenses under the new act. Limitations on the number of stations that can be owned by a group, the impact of a diversity standard on format choices, and a host of other doubts seemed formidable enough to prevent radio broadcasters from jumping aboard any rewrite bandwagon at this time.

Virtually all important manufacturers of radio broadcasting hardware were on hand with representative units from their lines. Radio station managements could find out, in one fairly small area, about practically every item the hardware industry has for them.

The visiting managements did not see any radically new devices or systems, but they did see some improvements in automation systems, some better consoles, new audio processors, and improved transmitters. In addition to the excellent coverage of the industry's hardware, there was also a comprehensive showing of software, mostly in the hospitality suites on upper floors in the hotel. Again, practically all important producers were on hand, with high-grade tape playback systems to demonstrate their music to radio managements.

Most of the hardware was displayed in two adjoining exhibit areas on the hotel's lower floors. (Many exhibitors reported some dissatisfaction with the location since it was far from spacious and the ceilings were so low, particularly in the area which normally serves as the Hyatt Regency's garage, that many booths had to be trimmed down to

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FCC Notice Of Rulemaking Triggers Fight Among AM Stereo System Proponents

The FCC Notice of Rulemaking, issued on September 14, was a timely backdrop for the AM Stereo panel held on September 18 at the NRBA Convention in San Francisco. The notice, which called for comments on the five proposed AM stereo systems by December 29 and replies by January 31, 1979, also contained clear reservations on the part of the Commission regarding the technical aspects of the proposed systems. The notice said that it "should not imply that it (the Commission) was totally committed to adopting standards for AM Stereo transmission." Instead, the Commission posed several questions that it said needed to be answered before standards could be adopted.

These questions touched off a lively, and at times heated, debate among the panelists representing each of the five proposed systems. Clearly, the FCC's Notice of Rulemaking has triggered a campaign by each of the five proponents to win adherents to his own system as the clock winds down towards a Commission decision.

Harold Kassens, chairman of the National AM Stereophonic Radio Committee, proved to be a provocative moderator for the discussion, telling the audience that packed the meeting room that they were to be the "jury" and that they would "decide" which of the systems ought to be selected. He told the panelists, by way of introduction, that the FCC, "in its infinite wisdom," has posed some serious questions about the technical quality of the various approaches and that they should address themselves to these issues.

The areas that the FCC claimed had not been adequately addressed were the effect of AM stereo signals on adjacent channel protection ratios, skywave service, out-of-band emissions, directional antenna operation, and the compatibility of AM stereo signals with existing monophonic receivers.

The panelists were Irving Kahn, representing the Kahn/Hazeltine position; Arno Meyer, representing the Belar position; Norman Parker, representing the Motorola position; Robert Streetor, representing the Magnavox position; and David Hershberger, representing the Harris position.

From the outset, it was clear that the various participants had arrived prepared to do battle with one another. The lines were clearly drawn. The Magnavox, Motorola, and Belar systems are fairly similar schemes for using quadrature techniques to transmit stereo AM. The Kahn/Hazeltine approach uses an independent sideband technique that carries the L-R on the lower sideband and the L+R on the upper sideband, and is phase insensitive. The Harris system is another quadrature scheme, but is a linear approach rather than non-linear as are the Motorola, Magnavox, and Belar systems.

After a fairly calm series of introductory remarks by each of the participants outlining their various respective systems, things got off to a good start as Kassens asked each to comment on their systems regarding different forms of interference. What broke out at this point was a series of remarks by each participant variously disparaging either the data or testing methods of the other participants. Kahn began by stressing the virtues of the independent sideband technique, and pointed out that no new receiver technology was needed. Use of two conventional AM receivers would yield the desired stereo performance which would give broadcasters a stereo audience immediately upon switching over from monaural. Eventually, said Kahn, a special receiver would be developed and marketed, but this was not required as a precondition for stereo broadcasting. Magnavox, Motorola, Harris, and Belar all stressed their compatibility with mono receivers, and at least Magnavox showed slides of an AM stereo receiver it would offer to the market. Another aspect of the Magnavox system which its spokesman, Bob Streetor, pointed to was the use of a pilot tone indicator that would, said Streetor, help consumer acceptance of the Magnavox system.

Harold Kassens (left) moderates panel on AM stereo. Participants are (left to right) David Hershberger of Harris Corp., Robert Streetor of Magnavox, Norm Parker of Motorola, Arno Meyer of Belar, and Leonard Kahn of Kahn Communications

Co-channel interference, said Kahn, was not a problem for his system but would be for the other phase sensitive systems. Parker, Meyer, and Streetor all cited data that showed their systems to be not particularly bothered by co-channel interference, though each of the phase sensitive systems did show some degradation in signal-to-noise where adjacent channel interference was concerned. None of the proponents of the various systems went so far as to say that any of the proposed approaches were "bad." In fact, Arno Meyer of Belar said that they "were all pretty much the same." This statement was one of the few made that received any endorsement from fellow panel members.

The real bloodletting began as Motorola and Magnavox ganged up to challenge the Harris report, which was based on computer simulations of the various systems. Parker delivered a slide show and played an audio tape that purported to show "serious flaws" in the Harris study. The tape that Parker played was an A-B comparison of the Harris and Motorola receivers as recorded off the air in Chicago. Essentially, the Parker test involved recording monaural signals alternately through the Harris and then the Motorola receiver. The tape was a very unfavorable comparison for the Harris system. When Hershberger got his chance to respond, he pointed out a number of deficiencies in the testing method used by Parker. With no clear winner between the Harris and Motorola outbreak, Kahn spoke out to call the audience's attention to what he thought was a weak showing for both of the systems.

As the debate wore on it became increasingly clear that all of the systems had things to recommend them and all had deficiencies. The mire of comments that the various proponents presented to the FCC since the July, 1977 Notice of Inquiry became crystal clear to the audience, which could have made no more Solomon-like a decision than could the FCC.

What broadcasters should realize is that the AM stereo battle is really over a much richer pie than the broadcast market. The consumer market is where manufacturers will make the real money in supplying new AM stereo receivers. This is the issue that will decide AM stereo, and broadcasters will be asked to live with any system that holds the richest promise for the receiver manufacturer. The FCC notice recognized that there was considerable interest on the part of broadcasters to have AM stereo, and gave a nod to the interest of many consumers now living in all-AM markets with no stereo service. Added to this, the FCC recognized that AM stereo may hold promise for improved stereo reception in automobiles, and noted that FM radio was no longer threatened by an enhanced AM service. But underlying all of this is a much richer pot — the potential sale of millions of new radios. With such a market at stake, the likelihood of a surrender on technical grounds, or any grounds for that matter, by any of the proponents is very slight.

fit.) Nevertheless, attendees got to see a vast collection of radio hardware, though there was not much in the way of major new technology. Many manufacturers came to the show with production models of products which they had introduced earlier (particularly at this year's NAB; see *BM/E*, May 1978). Still other manufacturers arrived with exhibits intended to display their company's full line capabilities. What follows is a roundup of just the new product introductions and reports on some of the systems introduced earlier but either refined or further developed. Many of the exhibiting companies that did not bring new products to this convention reported that new products are waiting in the wings for next year's NAB show in Dallas.

Program automation

The Harris System 90, one of the resourceful microprocessor-controlled systems, appeared with an enlargement and rearrangement of the memory allowing a full section of memory to be dedicated to specific parts of the job. There are five sections of this "multiple memory" in the standard configuration. Each is assignable to whatever job the operator chooses. Harris notes that this raises the efficiency of operation and takes some of the burden off the operator.

Harris also introduced a switchable "highlight" system on the CRT readout, so that any class of upcoming items (all commercials, or all news items, for example) can be made to stand out with a higher light intensity. Another helpful convenience: the readout for the on-air item switches from white on black to black on white at ten seconds before completion. Combined with a new count-down timer for on-air items, this provides a double alert for the operator.

IGM showed their MARC VII DJ-assist system, introduced two years ago, in a new role: controlling audio sources in a production studio. The production use of the MARC VII was pioneered at KYYX, Seattle, where the setup is said to have led to operator time savings and more precise timing of audio elements. The exhibit showed the MARC VII in use with a Ramko audio console. The setup allowed multiple audio elements to be sequenced precisely by the MARC VII so that as they were needed at the console they rolled in with no further machine instructions from the operator.

Cetec Broadcast Group unveiled Level II for their System 7000 automation. The new high level language offers extremely compact English language instructions to the operator. Ac-

Ramko audio router-amplifier is demonstrated

cording to Hugh Wilcox, the language is especially designed to provide the operator with "broadcast oriented instructions." Another feature of Level II is the use of a special department code that opens the program list to only those areas that the operator wishes to change. For instance, if a program director wanted only to change certain music selections, he would enter a key word that would cause the system to present only the music sections of the log on the CRT, thus avoiding the change modification of non-program material. On the other hand, if the commercial portion of the schedule is to be modified, another key code would be entered to make those elements accessible. Given the capabilities of the Level II language, some consideration is being provided to the possible inclusion of a business automation function for the System 7000.

Sono-Mag's moderate-cost ESP-1 controller ("extremely simple programmer") introduced in prototype at NAB in April, was present in production form and in operation in the exhibit. Microprobe Electronics had a new version of their very simple, inexpensive controller, the thumbwheel-set 100B, which controls eight sources, presets 24 events, and has a 25 Hz sensor, adjustable deadroll, overlap audio, and other control features. It is available in complete systems with tape machines from Scully, Otari, or Revox; cart machines from Ampro; processors from Orban; etc.

Another firm showing their own moderate-cost control system with tape, disc, and cart machines of other makes was VIF International. Their exhibit was in their van, which acts as a mobile showroom. The automation system is set up in operating form in the van for demonstration to radio stations around the country. Parked near the hotel, the van also had on display audio and transmitting equipment of many brands that VIF distributes.

A firm new to the NRBA was Automated Broadcast Controls of Rockville, Md. They have taken over automation units from the line formerly marketed by Control Design Corporation, and added some of their own, for assembly into automation systems covering a wide range of capacities. Included are controllers, rotary cart machines, cue-tone generators and sensors, loggers, and many others.

In sum, the automation systems at the show strongly continued the trend toward easier, more nearly foolproof operation, and toward almost total flexibility as to levels of operation, costs, etc.

Audio processors

The new audio processors also marked a trend toward flexibility in costs and adaptation to the job. Harris brought the new MSP-90, available with either an AM or FM module, and with an AGC module which can be combined with either one. The main frame includes a power supply which can run two or three modules. The system has the low-distortion approach to audio processing of the new generation of systems, using much of the technology of the Harris MSP-100, but without the very elaborate adjustment system of that more expensive system. The MSP-90 can save money when the adjustability of the MSP-100 is not needed.

Inovonics also had a new audio processor, the MAP-II, for AM broadcasting, which replaces the firm's earlier Model 230. MAP-II, like the 230, is an eight-band system, with a separate compression circuit for each band. Inovonics says the MAP-II incorporates the basic design of the earlier unit, with some new "second generation" features. Some of them are: monitor circuits from each compression band to the others, so that none gets more than a certain "distance" out of the general line; feed-forward gain control for a gradual knee in the compression curve, to minimize operational noise; and an integrated peak controller, with a peak limiter followed by a hard clipper that feeds back information to keep the limiting/clipping ratio constant. Inovonics also said that an FM version of the new processor will be ready soon.

Transmitters

Most transmitters on the floor were familiar. CCA had the production version of the new 2.5 kW FM transmitter, Model FM2500R, which is now in fact widely sold as "The Little Rascal." It is all solid state up to the final, a grid-driven 5CX1500A pentode that does not need neutralization for stable operation. It has a 40-watt, frequency synthesized exciter with digital control. Harmonics and other spurious emissions are rated 80 dB below the carrier; harmonic distortion at 100 percent modulation less than 0.5 percent, 50 to 15,000 Hz; FM noise more than 65 dB below 100 percent modulation.

The FM2500R is, in effect, the CCA 20 kW FM transmitter, Model FM20,000E (also on display), minus

continued on page 80

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NRBA Convention, 1978

Pacific Recorders had test gear connected to consoles

the final amplifier. The IPA of the bigger transmitter is very much like the final of the smaller one.

RCA introduced a new all solid state exciter, the BTE-115A, which has been incorporated into their line of FM transmitters, from three kW to 40 kW. All FM models with the new exciter will include the letters "ES" in model numbers. The BTE-115A succeeds the BTE-15A. RCA says that compared with earlier systems, the new exciter has improved signal-to-noise ratio, reduced distortion and intermodulation, lower cross-talk, and greater separation.

New FM antenna

RCA also brought their new circularly-polarized FM antenna, Model BFM. It has four ring-shaped dipoles, each 36 inches in diameter, in each bay. RCA says power-handling capacity is substantially up over earlier models, and sensitivity to icing is reduced.

Consoles

A new idea in consoles is the 2001SD (for "split desk") from Automated Processes. It has a flat area about three feet across in the center, with all the controls in two areas at the ends. Automated Processes says they made the console because a number of broadcasters have told them they wanted a unit with a center area on which the operator could put down all his program directives, background information, advertising copy, coffee cups, etc., without interfering with the controls in any way.

A specialized control system of another type was the "Sport," a three-channel portable mixing desk, brought by Micro-Trak. It is designed for feeding remotes onto telco lines, has a flat surface and linear faders, can switch headphones to a "split" so that cues come on one phone and program on the other, and has a number of other control features.

LPB had a new series of consoles, the Monogram Series, somewhat simpler than this firm's Signature Series and less expensive. The Monograms are starting with five-channel stereo and mono versions; eight-channel models will be ready in a month or two. They are designed primarily for production, remotes, and new operations.

Pacific Recorders and Engineering brought a new version of their BMX-12 broadcast console, with two channels added to the 12 of the model introduced at the NAB in April. The 14 channels will be standard; they are a response to a series of queries to broadcasters on console requirements.

Pacific and Ward-Beck were both demonstrating the actual performance of their consoles with test equipment set up in their exhibits. Pacific showed the console's excellent handling of square wave signals. Robert Ward of Ward-Beck told *BM/E* his firm was concerned with the present controversy about transient intermodulation distortion (TIM) — how important it is, how to measure it, which systems have it and which don't — on all of which the audio profession is somewhat divided. Ward-Beck had a test, using the method most widely accepted, showing the very low level of TIM in their consoles.

A new console from QRK is the Omega, which has ten stereo channels; four switchable inputs to each channel; digital switching with no audio on front panel; programmable gain select on 16 inputs, allowing mixing of high and low level inputs on the same channel; alphanumeric readout on master bus; programmable muting; and numerous other advanced control features.

Collins/Rockwell showed the new Mark 8 console, which has eight mixing channels with 26-input pair capacity. It is all-modular plug-in for easy maintenance. Transformer coupled inputs match either 150 or 600 ohms. Nominal input level is -20VU/-10 dBm. The power supply is external. Program output is +18 dBm nominal, at 600 ohms; monitor output 25 watts into 8 ohms. Noise is rated -127dBm, distortion less than 0.5 percent, IM less than 0.25 percent. Many operational features give it great convenience.

Tape recorders

Otari showed the MX-5050B, a new version of their MX-5050. Some of the conveniences the new unit adds are: TTL/IC control logic; three speeds; 24 dBm headroom at 28 dBm output; capstan servo with ± 7 percent speed control in play and record; peak-reading LEDs plus VU meter; and return to zero memory for mixdown.

Stanart Corporation, not on the exhibit floor but in a hospitality suite, introduced their playback-only ASR-100 tape deck. This unit incorporates the transport mechanism of the Ampex ATR-100, with playback electronics designed and built by Stanart. All controls, servos, etc., are digitally operated. All signal-handling electronics are on one plug-in card, which takes the signal from playback head to line. Stanart points out that the system has half as many amplifiers between head and line as the Ampex ATR-100, in playback. The specifications are at the extremely high level now associated with the top tape machines. For broadcast stations needing a playback-only deck, the ASR-100 seems worth investigating as a cost-effective choice.

Turntables and preamps

Ramko brought a new turntable preamp, a new miniature portable five-input mixer, and an audio router/amplifier. The preamp, Model ESP-38, is a stereo unit for which Ramko claims SNR of 90 dB at eight dBm out (weighted); distortion of 0.03 percent maximum; 60 dB gain; ± 0.5 dB of RIAA curve; switchable equalization of ± 6 dB at 30 Hz and 15 Hz; and remote turntable start-stop relay. The portable mixer, Model P5M, has two inputs for mic only, with built-in compressor on each, and three inputs switchable to either mic or line. Built-in tone generator at 800 Hz aids setup. Output is +8 dBm, frequency response ± 2 dB, 20 Hz to 20 kHz; SNR 75 dB. The audio router, ARA-1612, accepts up to 16 inputs with plug-in cards, routes any one or a combination to any of 12 outputs, with switching all done through CMOS solid state units, and buffer amplifiers. Switching can be remote. Front panel indicator lights show which inputs are going where. Frequency response is stated as ±0.5 dB, 20 Hz to 20 kHz; distortion 0.3 percent maximum; SNR 85 dB. This struck *BM/E* as one of the most useful audio-handling units introduced at the show.

QRK showed a new turntable with 16-inch platter, the 16-SA, with hysteresis synchronous motor. Robert Sidwell, new principal in this firm (see May report on NAB), told *BM/E* he will soon introduce a turntable with dc direct drive, digital speed readout. Related to the turntable and others in the QRK line is a new unit for variable-speed drive of an ac motor.

Computer mail preparation

Automation Electronics showed a new "word processing" computer system for form letter preparation, which they call "Ultra-Text." It can be programmed to prepare and print out at high speed any kind of mailing. The firm also introduced a computer storage system, the "Music Library," for keeping on file titles of musical numbers, cross-referenced as to composer, type of music, length, and other charac-

continued on page 82

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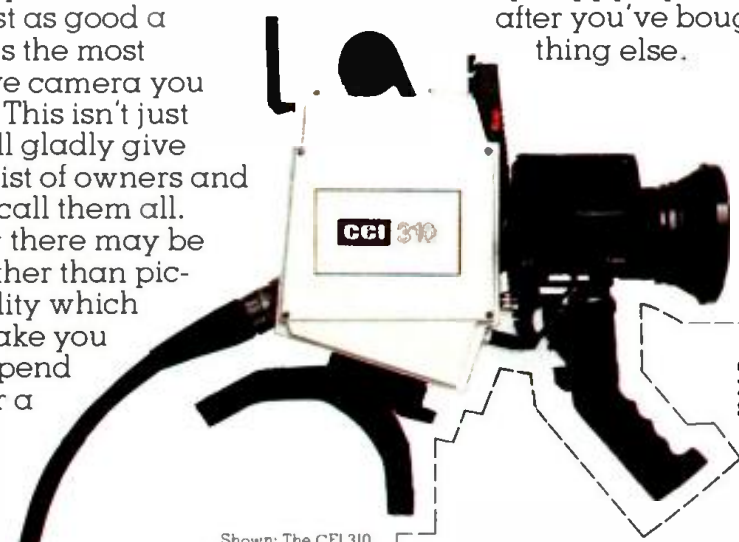

Shown: The CEI 310 in field configuration

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teristics. The program director has immediate call-up of all titles in any class of music, sequenced to avoid repeats, etc. The firm, active for a couple of years with in-house computerized business systems, told *BM/E* they have a program automation system in development that will mate with their business systems.

Expanded service on SCA

McMartin brought a new system, called "SCA-Plus," which puts both aural information and data on a single FM SCA channel. The two channels split the available bandwidth on SCA. The system is simple, consisting of an encoder for the transmitting end and decoding filters (which are added to an SCA receiver) at the receiving end. The system is intended to let FM stations get more income by selling transmission of data simultaneously with rental of program services on SCA. The pressure for data transmission facilities has been growing rapidly in the last few years and promises to get steadily larger.

McMartin also showed a system called MAP (for Multiple Access Processing) for distributing audio and data signals via low-frequency carriers on internal ac electric wiring. The system uses FM modulation on 150 kHz, 200 kHz, and 250 kHz carriers, which are switch-selectable. A CM-1 modulator generates and modulates the carriers, and a CD-3 demodulator recovers the program; both units simply plug into any wall outlet. The system will handle up to six simultaneous channels of aural or data material, the exact number depending in part on the arrangement of the house wiring.

Remote control

As noted in the story on the microprocessor in radio in the July issue, Moseley Associates is incorporating the microprocessor into many of their important systems. Introduced at the show was their new Model MRC-1 remote control system, which has a master control terminal that can operate up to nine remote terminals. It replaces the DRS remote control systems. Each remote can handle, in any combination, up to 32 command channels, 32 telemetry channels, and 32 status channels. The microprocessor and the digital transmission allow large improvement in error detection for messages travelling in both directions. As with other microprocessor-controlled systems, the MRC-1 gains great flexibility from the shift to software-established functions. The use can set up almost any function wanted, without changing a wire: random assignment of functions, setting of alarm tolerances, cross-functioning for indirect power calculation, programmable muting, latching/momentary control, and many others.

Studio-transmitter link

Time and Frequency Technology had production models of their new Model 7700 STL, an automatically redundant system, shown in prototype at NAB in April.

A miscellany of new devices for radio

Cart test tapes. Fidelipac introduced their "Gold Standard" series of test and alignment tapes for cartridge machines, all mounted in gold-colored cartridge shells. Included are a wow and flutter test, spot frequency calibration tape, a fast-sweep calibration tape, cue and logging calibration tape. Arthur Constantine of Fidelipac pointed out that cart-test tapes in run-of-the-mill shells are most likely to be useless, because shell construction for test tapes must be even more precise than that for music, to provide reasonable accuracy.

Digital on-air delay. Ampro had production models of their "Time Machine" six-second digital delay system for controlling obscenity, etc., on the air. The signal is stored digitally in a CCD memory and the unit has convenient controls allowing the operator to "kill" unwanted material before it comes out of the memory.

Another on-air "kill" system was shown by the Ken Schaffer Group, a firm at the NRBA for the first time: the Eventide Model BD-955 Broadcast Delay Line. Also handling the signal in digital form, this unit stores six seconds worth and jumps immediately into real time when the "Dump" button is pushed. Then the unit gradually reinserts the delay, in pauses between words, until the six seconds has been re-established.

Broadcast-quality wireless microphones. Ken Schaffer also displayed their Vega-Schaffer wireless microphone systems, marketed for several years to recording studios and concert music groups, but not shown to broadcasters before. Schaffer claims top audio quality, fully up to broadcast standards; the microphones are in wide use by rock bands for recording and concerts.

Remote control for tower lights. Flash Technology introduced their Model SC205A controller, which is both a remote control and a monitoring system for flashing tower beacons. Using digital signals, it will set and synchronize the flash rate, indicate failure of any light or combination of lights, give alarms for all classes of failure, automatically adjust intensity for day, twilight and night requirements, and display status of all control input and output functions.

Monitor speaker with built-in drive. James B. Lansing brought a new version of their Model 4301 monitor speaker, the 4301E, which is self-powered: the audio power amplifier is part of the assembly. The speaker can be bought from JBL, but is also distributed (like other JBL equipment) by McCurdy Radio, Harris Corporation, Pacific Recorders and Engineering, and other broadcast hardware makers to be announced later by James B. Lansing.

Switch and "Sniffer" for coaxial lines. A system for switching signals up to high RF power levels, from one coaxial line to another was introduced at the show by Dielectric Communications. The system is available in both motor-driven (remotely controllable) and manual versions; it is compatible with all standard coaxial equipment.

Another related item from Dielectric is a coupling, called the "Sniffer," that allows the user to tap easily into a coaxial line for frequency counting, amplitude testing, spectrum analysis, etc. The maker says the Sniffer has extremely low VSWR and is virtually transparent to RF in its frequency range of two to 1000 MHz, and at power levels up to 1000 watts.

Another coax switching system was shown by Micro Communications of Manchester, N.H. Their Series 61000 claims switching times of 60 ms in the 1⅝-inch size, 150 ms in the 3⅛-size and 300 ms in the 6⅛-inch size. Rotary solenoids drive the primary switch action, which can switch two sources between two loads or act as an SPDT switch. Independent interlock circuits, isolated from the main switching power, serve for transmitter blanking, logic input, and position indication.

Tape tension gauge. Tentel added to its series of gauges for measuring tape tension a new one, the TN-H15-UM, for ½-inch and ¾-inch videocassette machines, including the Beta, VHS, and U-Matic formats.

Tape loggers. Telex had a new logging tape recorder, Model 230L. It uses seven-inch reels and has two speeds, $^{15}/_{16}$ ips and 1⅞ ips. Flutter is rated 0.5 percent at 1⅞ ips, frequency response 20 Hz to 10 kHz, ± 3 dB. At $^{15}/_{16}$ ips, the frequency response is shown as 20 Hz to five kHz, ± 3 dB.

Business automation

The business automation field continued to pick up new participants at the NRBA. The latest trend seems to be business automation systems developed by broadcast groups being offered to other broadcasters. Two new systems shown on the exhibit floor were the Bonneville Data Systems BTA-101 and the Bloomington Broadcasting Corporation's Broadcast Computer Systems. Another system that

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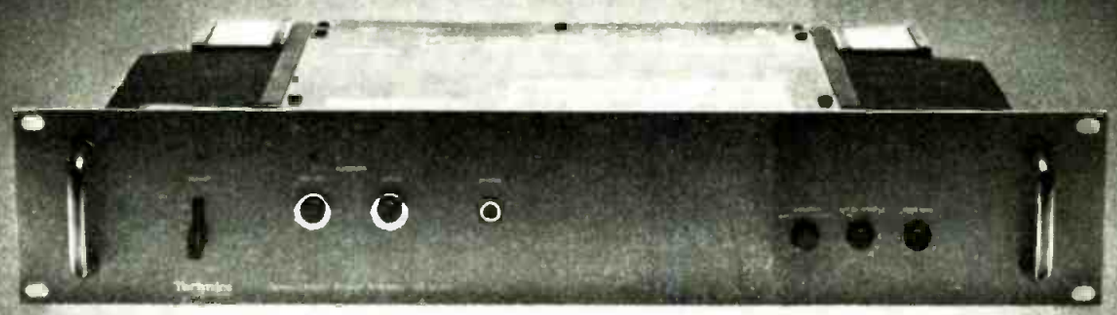
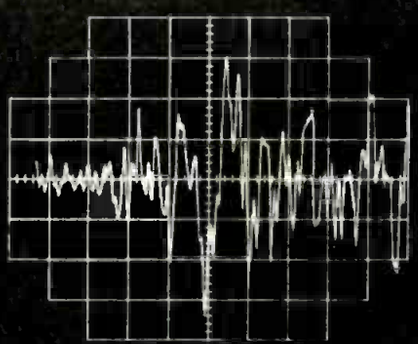
What 0.02% THD doesn't tell you about the SE-9060, waveform fidelity will.



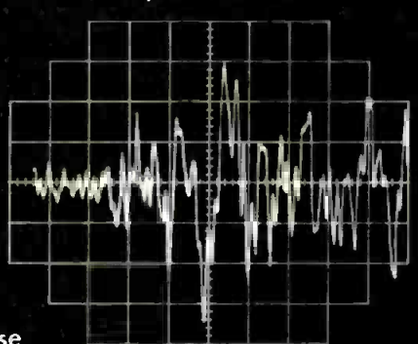
THD as low as 0.02% says a lot about any amplifier. But oscilloscope readings show it all. Look at the wavefarms. The output waveform of the SE-9060 is virtually a mirror image of the input.

One way Technics achieved this goal was with dual FETs in the differential amplifier. They give the SE-9060 the DC stability necessary for the highest gain in the crucial first stage. While the canstant current load and current feedback used in the voltage amplifier keep distortion to a minimum.

And since the SE-9060 is a DC amplifier, each amplifier section and the NFB loop are directly coupled without the use of any capacitors. So the SE-9060 not only has virtually nonexistent phase shift, it also boasts flat frequency response from DC to 100 kHz. And with completely independent power supplies for each channel, Technics eliminated all signs of transient crosstalk distortion.



Input Waveform.



Output Waveform.

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was demonstrated in a hospitality suite was the BIC Computers from KWIX Radio, of Moberly, Mo. The BIC system uses a B-80 Burroughs computer and a software package for accounting and sales developed by KWIX Radio and intended for small or medium size market stations. The system is expected to cost $49,000 and is supported for service by the Burroughs Corp., through their nationwide service centers.

The Bonneville Data Systems BTA-101 comes with two 10-megabyte disk drives, three video terminals, and the General Automation Control Processor, GA-16/440. The BTA-101 software was developed by Bonneville International for use by its own broadcast operations. It is a complete accounting and sales package and is suited to AM, FM, and TV stations. The basic "in-house" configuration of the BTA-101 is priced at $74,900. There is a monthly fee of $200 per station for continuous consultation, and on-going research and program development to meet the changing needs of broadcasters.

The Bloomington Broadcasting system uses a Nova 3 Central Processor and other Data General hardware and peripherals. The software, which includes sales, accounts receivables, billing, general financial, payroll, and payables, was developed for use in Bloomington Broadcasting's facilities. The system is priced at $40,500 for a single station system and $43,500 for an AM/FM combo. Discounts are offered to purchasers of multiple systems for group stations.

The other big news in business automation at the San Francisco conclave was the new Station Business Systems, which is the creation of the recent marriage of Control Data Corporation and Paperwork Systems, Inc. The new operation will be headed by Joe Coons, formerly president of PSI. The result of this joint venture is a very diversified business automation corporation. PSI, which has been a major factor in the in-house radio station business computer field, now will offer the on-line computer system capabilities as well. The on-line system being offered was formerly the product of Compu/Net, a subsidiary of CDC. The Compu/Net name has now been dropped and PSI clients as well as Compu/Net clients will do business with SBS.

Jefferson Data and Kaman Sciences were among the other business automation systems which exhibited at San Francisco, but some others didn't show since the BFM (Broadcast Financial Management) Convention was playing host to financial people in Las Vegas. Some of the systems people expressed dismay that they had to choose between two very important audiences, and wondered if future conventions for the BFM and NRBA could be scheduled at different times.

Weather radar

One company, Broadcast Consultants Corporation, came to the show with a new idea as well as new equipment. David Green, president of BCC, has for years offered a cooperative equipment buying service for small and medium market stations. But this year, Green introduced BCC's "first product," a weather radar system, manufactured by the Sperry Division of Sperry-Rand Corp. Green sees the Sperry Radar as the first practical and economical opportunity for radio stations to become the keystones of local emergency preparedness programs. The 10 kW radar system is intended to give the local radio station in small and medium size markets much greater capability for spotting and reacting to weather emergencies in its coverage area with greater accuracy than is provided by the NWS system. The radar system will be made available on a one-system-per-market basis for about $163 per month with an $1100 downpayment. FCC type acceptance for the system is pending. **BM/E**

RTNDA's Largest Conference Focuses On Professionalism And First Amendment Rights

More than 1,000 persons attended the 33rd annual Radio and Television News Directors Association International Conference at the Atlanta Hilton, September 20 to 22. The organization's active membership of 779 is up by 124 over last year, and its commitment is stronger than ever to improve the work and professionalism of its members. The convention had a record number of exhibitors, up from 39 last year to 46 in Atlanta.

In a telegram to RTNDA's immediate past president, Ernie Schultz, President Jimmy Carter praised the association's leadership for its "strong tradition of fighting to protect the First Amendment rights of all reporters, including broadcasters." The news reaching the conventioneers, however, was not all positive. When the news reached Atlanta that the New Jersey Supreme Court had upheld the contempt citation against New York Times reporter Myron Farber and ordered him back to jail, Shultz issued a statement deploring the ruling. He said, "RTNDA believes most strongly that Farber was protected by the First Amendment, and we believe that such judicial decisions do more than chip away at constitutional guarantees in this country . . . they seriously erode the rights of all of us." He went on to say, "If reporters cannot promise confidentiality, news sources will dry up and the important task of learning and reporting what is going on in our government and elsewhere will become infinitely more difficult. When that happens, the entire nation suffers."

Harry Reasoner delivered the keynote address, commenting, "We've developed . . . the best mass journalism in the history of the world but I don't think we have completely accepted the responsibilities of our success." Regarding the use of ENG, he said, "A live eye is no good if the reporter on the story can't make a quick and accurate news judgment." Reasoner also commented that too much Washington coverage has bored the public. He said that Washington is easy to cover; it's easy for a newsman to wait for a senator to hand out a release. The result is that a reporter gets lazy. The point here is that emphasis should not simply be on reporting, but should be given to investigating.

NBC News president Lester Crystal addressed the relationship of the courts and the press. Allowing cameras in the courts was a great stride in his opinion, and he said, "This is one place where pooling may almost always be necessary," and although it may have been viewed as anti-competitive in the past, "it will certainly be no obstacle in this situation." On the darker side, Crystal cited the rulings of courts that could have a devastating effect on journalism, broadcast and other. A recent federal court ruling allows government investigators to obtain a subpoena to examine records of all telephone calls into and out of a newsroom, without informing those who are being investigated. The Supreme Court's *Stanford* decision "allows police to obtain secret search warrants so they can barge into a newspaper office or broadcast news room to rummage through their files at will, while looking for evidence in a case," stated Crystal.

Max Robinson, ABC News's national deskman, speaking at one luncheon, took the opportunity to say that although broadcasters had won public acceptance through the influence of the medium, the battle for respectability is being won through the caliber of their reporting. Robinson commented that technology has given the newsman mobility for on-the-scene news reporting, but it has also made it tougher to be an unnoticed observer.

Discussing the challenge for more respectability, Robinson referred to ABC's *World News Tonight* and credited the regional bureau concept with increasing the diversity of input that shapes a newscast. Robinson also said that "the presence of blacks, women, and minorities in the ranks of television reporters is a hopeful sign that the interests of many groups are being represented in television news coverage." He expressed the belief that diversity on many levels in the ranks of broadcast journalism is the best insurance that TV news covers a broad range of issues and reflects the country in which we live.

CBS news president, Richard Salant, in addition to comments on the First Amendment, addressed the "responsibility" of newsmen, and asked whether news should provide audiences with what they are interested in, or with what they ought to know. Admittedly, it is not an easy question to answer. Salant said, "Certainly none of us follows — nor can we follow — our choice between the conflicting concepts of what journalism is all about so rigidly that we include only the important to the invariable exclusion of the interesting — or vice versa." Salant quoted ABC News's Roone Arledge who said he opts for "what people are interested in," rejecting the notion that "it is our responsibility to . . . determine what people must see for their own good." Salant went on to say that whatever philosophical difference he may have with Arledge, ABC News does give priority to the important. He cited a

continued on page 88

Imagine an EFP system with one tape format for field and studio —and a proven track record worldwide

The Bosch Fernseh KCA-BCN lets you shoot in the field and play back in the studio *without changing VTR formats*

Here is a remarkable electronic package from Bosch Fernseh that is on the job right now in working applications in the U.S. and around the world:

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- The KCA 90 color camera, providing ENG mobility without a backpack and EFP versatility in a C.C.U. mode.

The system begins with the SMPTE Type B tape format (see diagram), a development of Bosch Fernseh research that made it possible to put 2-inch broadcast quality on a 1-inch format. We introduced it in 1975 on the Bosch Fernseh BCN 50 studio recorder.

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No need to switch formats

The secret was in the scanner. Its small diameter (50mm), short track length and 190° wrap made it perfect for mobile applications: The result was the Bosch Fernseh BCN 20.

With the 48-pound BCN 20 you can tape up to 65 minutes in the field and edit or even broadcast in the studio without switching formats—without losing a generation.

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KCA ideal for ENG or EFP

The versatility of the BCN 20 tape format is matched on the camera side by the Bosch Fernseh KCA 90.

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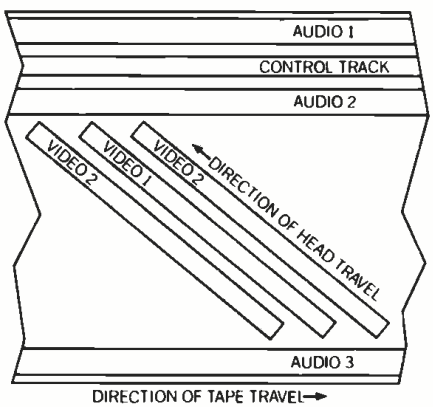

Segmented audio and video tracks of the BCN format. Tape crosses the scanner at a 14.3° angle.

The basic mobile unit is completely self-contained, save for the battery belt and charger. You can shoot for 1½ hours without recharging.

All the electronics of the KCA 90 are in the camera head. This does away with the usual backpack associated with "portable" cameras. The entire KCA 90, including its standard 1.5-inch viewfinder, weighs less than 19 pounds.

On production jobs—either in the studio or with an O.B. van—the KCA 90 has even more impressive advantages. You can replace the standard viewfinder with an optional 5-inch screen. And the camera can run in a C.C.U. mode giving you a full range of remote control adjustments, including chroma key signals and RGB monitoring.

The KCA 90 is a camera system, not just an ENG unit. Other features include: automatic sync-timing, iris and b/w balance; flare compensation; and genlock facility for easy matching with other cameras.

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RTNDA Conference

recent example where CBS devoted three minutes to a contestant in the Miss America pageant who never made it to the finals. That same night, ABC devoted more than three and a half minutes to a "fine, timely interview of the Shah of Iran by Barbara Walters." Salant said that the point here is "that whatever basic concept is subscribed to, often close judgment calls remain to be made in each specific case."

Radio workshops at the conference were conducted on topics including: "All News 1978," "Why Rock and Roll Program Directors Hate News and What You Can Do About It," and "Election Night Ideas for Radio." TV workshops on TV news promotion, the electronic news room of the future, and use of investigative teams all drew their share of attendees. Although there didn't seem to be much happening that was truly new, the conference did provide a meeting place for professionals to exchange ideas with other professionals who were faced with the same problems. The Association's membership presented themselves as serious individuals dedicated to providing their audiences in radio and television with the news and information that they ought to know.

In the business meetings at the conference, the association passed resolutions that: (1) condemned the judicial approach in the *Stanford Daily* case which approved unrestricted searches of media and citizen alike; (2) deplored the ruling of the New Jersey Supreme Court, both for its assault on the First Amendment and for its sweeping away of the New Jersey shield law, and commended Farber for his stand in support of essential constitutional freedom; (3) urged the U.S. delegation to the UNESCO conference to oppose a resolution which would declare mass media throughout the world the responsibility of the state; (4) commended the Conference of State Supreme Court Justices for its recommendation that cameras and microphones be permitted in state courts; and (5) urged the FCC to reevaluate its stated intention to strictly enforce the blanking interval standards on videotapes of newsworthy events.

As the conference ended at a dinner in the Atlanta Hilton's Grand Ballroom, Bill Monroe, NBC News, Washington, received the Paul White Award; Paul Davis, news director, WCIA-TV, Champaign, Ill., took over as the association's new president; Curtis C. Beckman, WCCO, Minneapolis, was elected vice president/president elect; and Ed Godfrey, WSB, Atlanta, and Jack Hogan, Grand Rapids, were elected to the association's board of directors. **BM/E**

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IEEE Sponsors 28th Annual Broadcast Symposium

A total of 15 papers, and addresses by FCC Commissioner Joseph Fogarty, George Jacobs (Board for International Broadcasting), and Paul Bortz (National Telecommunications and Information Administration), marked the two all-day sessions of the IEEE Broadcast Symposium in Washington, D.C., September 21 and 22.

A major emphasis was on the electronic environment, and the whole of the September 21 morning discussion was devoted to an earnest discussion of non-ionizing RF radiation at broadcast frequencies — particularly FM. It appeared to be the consensus of the speakers (Richard Tell, Office of Radiation Programs, and Ralph Smialowicz, Health Effects Research Lab) that RF radiation is the least hazardous of all, at least at power levels generally encountered in broadcasting. Some in the audience, however, questioned why Soviet standards are so much tighter than our own.

In the afternoon session, Oscar Reed, Atlantic Research Corporation, discussed some of the considerations in planning a low frequency broadcast system for the U.S. This was followed by a presentation by Glen Clark (Smith and Powstenko) of a new computerized system for AM allocations which takes account of factors such as ground conductivity and previously-assigned allocations. Grant Bingeman of Harris Corporation then presented some simple, non-reportable alignments that can be made to optimize a narrow band AM load, expanding on some of the ideas he presented in his article, "Solving AM Bandwidth Problems" (*BM/E*, June, 1978). The afternoon session concluded with CBS Television's Frank Davidoff's survey of television blanking width problems. Besides providing an invaluable overview of the situation, Mr. Davidoff was able to show that the problems are cumulative throughout a television system.

On Friday, September 22, four papers dealt with TV problems, while interest in FM was maintained by three papers. Alan Christman, a geology major turned electronics engineer at West Virginia University, gave much food for thought in his unusual paper, "Lightning Performance of Vertical Antenna Ground Systems." The title was actually a misnomer, since he talked mainly about methods of measuring ground resistance and conductivity using 11 Hz square waves. However, the topic generated considerable questioning from the audience, including Dr. Andrew Alford, who pointed out that RF methods have been used by prospectors since the 1920s.

Hans Schmid (senior engineer at ABC Television), trying to "hit the donkey over the head," aroused much skepticism from an AT&T representative with his paper, "Waveform Equalization of Video Network Facilities." Mr. Schmid's contention was that sloppy performance by AT&T personnel resulted in severe network waveform distortions and could be corrected by observing waveform rather than frequency response when using the A2A equalizer.

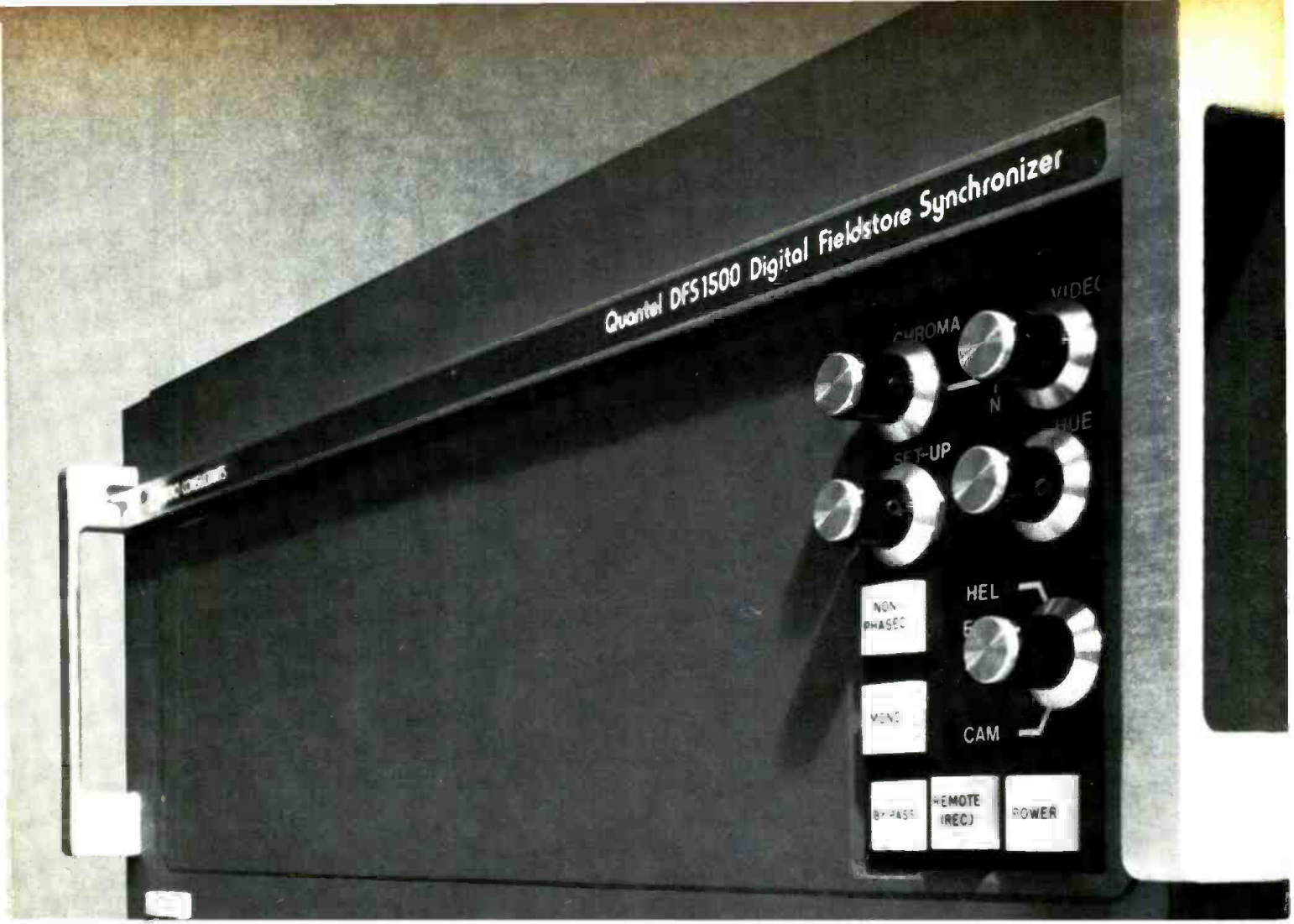
It appeared from T.M. Giuyas's paper, "Measurement and Evaluation of TV Signal Reflections," that the use of circular polarization in receiving antennas could give up to 14 dB improvement in ghosting; little improvement in multipath problems was noted from either horizontal or vertical polarization alone.

"The Need and Way to Control Incidental Carrier Phase Modulation in Transmitters" was presented (in absentia) by Charles Rhodes of Tektronix. A number of sources of this problem were described, and its major effect on viewers (carrier buzz) was emphasized.

Tom Vaughan of Micro Communications talked on FM blanketing. This problem, which is becoming more and more apparent as FM powers increase, is not yet the subject of much official FCC interest. The Canadian Radio Commission and the DOC have ruled that stations in Canada must make a population count within the 100 mV/m contour (measured). This could very well become an FCC requirement, although the Commission does not presently require (except in extreme cases) any RF measurements from FM stations. The effects of FM antenna gain, antenna design, and the vertical radiation below the radiator were discussed.

RCA's Donald Hymas described his company's new high-powered circularly polarized FM antenna, Model BFM, evolved from the earlier BFC antenna. The demonstrated radiation patterns, both horizontal and vertical, were highly circular, and the Smith charts showed excellent bandwith. The antenna features 18 kW-per-bay power rating.

The symposium concluded with an excellent paper by G.W. Collins of Harris Corporation in which "The Effects of Reflecting Structures on Circularly Polarized TV Broadcast Transmissions" were described. It was shown that the amount and degree of reflection depends on the nature of the reflecting surface, with a large difference between rough and smooth surfaces. The paper also suggested that a future development might be towards elliptical polarization, since the effects of the vertical component sometimes can become very large after reflection of a circularly polarized signal.



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INTERPRETING THE FCC RULES & REGULATIONS

Two Federal Agencies Agree On EEO Enforcement Against Broadcasters

By Frederick W. Ford and Lee G. Lovett:
Pittman, Lovett, Ford and Hennessey, Washington, D.C.

THE FEDERAL COMMUNICATIONS COMMISSION (FCC) and the Equal Employment Opportunity Commission (EEOC) have entered into a Memorandum of Understanding concerning exchange of information about broadcast employers' employment policies and practices, and the processing and disposition of discrimination complaints. This is a landmark example of cooperation between federal agencies. It has immediate implications for operating broadcasters who are or may be subject to employment discrimination complaints by present or past employees.

The FCC made clear that the agreement relates *only* to broadcasters and *not* to cable television system operators or common carriers. This does not constitute selective regulation against broadcasters. When the Congress established the FCC, it charged the Commission with the responsibility of regulating interstate commerce to establish a communications service to *all* U.S. citizens.[1] The FCC can only grant a broadcast license when it has determined that grant will be in the public interest, convenience, and necessity. As a predicate to making this finding, the FCC must assure itself that the broadcast applicant will present diverse views, *including minority views,* in its programming and programming decisions.[2] On this basis, the FCC appears to be well grounded in enforcing equal employment opportunity policies against broadcasters, but not other communications entities coming within the general regulatory power of the FCC.

Prior to the Memorandum of Understanding, the FCC and the EEOC maintained informal cooperation in investigating and enforcing equal employment opportunity laws and policies. Sometimes, one agency would submit information to the agency undertaking an EEO investigation. But, more often, the FCC appeared to hesitate to investigate EEO complaints directed against broadcast licensees. This apparently happened for two reasons. First, the FCC staff is extremely limited due to budget constraints. Second, it became apparent to both the FCC and EEO staff that duplicate investigations were not in the public interest and wasted tax dollars. Thus, the FCC often refrained from investigating EEO complaints until EEOC investigations and conciliation efforts were completed. Under the new procedures, that may change.

The Memorandum of Understanding entered into by the FCC and the EEOC can be broken down into four major parts: (1) exchange of information, (2) discrimination complaints, (3) processing discrimination complaints, and (4) action on discrimination complaints.

The basis for the Memorandum is the common goal of the EEOC and the FCC — to eliminate discriminatory employment policies and practices at *commercial* and *non-commercial education* broadcast stations.

Whenever the FCC investigates the employment practices of a broadcaster, the EEOC will make available for inspection and copying information in its files regarding the broadcaster's employment policies and practices. This information may include files on conciliation efforts undertaken among the complaining party, the broadcaster, and the EEOC. It may also include compliance agreements between the FCC and the EEOC.

Similarly, when the EEOC is investigating a discrimination complaint against a broadcaster, it may go to the FCC and review and copy files relating to the broadcaster including: (1) the broadcaster's affirmative action program, (2) the Annual Employment Reports (FCC Form 395), (3) complaints sent to the FCC, and (4) the FCC investigative file.

As part of the Memorandum of Understanding, the EEOC has agreed to send the FCC quarterly reports detailing for the FCC all charges brought against broadcasters at the EEOC. The FCC has agreed to preserve the confidentiality of information received from the EEOC.

The EEOC, which has primary responsibility for investigating discrimination charges, designates the FCC as an *agent* of the EEOC for the purpose of receiving discrimination charges against broadcasters. What does this mean to the broadcaster? Previously, if a disgruntled past employee filed a complaint at the FCC, but failed to file a similar complaint at the EEOC before the filing "deadline," the EEOC would not investigate the charges. Now, the date that a complaint is received by the FCC will be deemed to be the date that it is received by the EEOC.

When the EEOC receives an employment complaint against a broadcaster that does *not* fall within the EEOC's jurisdiction, it will forward the charge to the FCC for processing. If the FCC so requires, the EEOC will provide technical advice and guidance in investigation of the complaint. When this occurs, the EEOC will notify the broadcaster against which the complaint has been filed.

When the FCC receives a complaint against a broadcaster which falls within its *own* jurisdiction *as well as* the jurisdiction of the EEOC, it will refer the complaint to the EEOC and ask that the EEOC keep the FCC informed of

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[1] 47 USC §151 (1970).

[2] The U.S. Supreme Court pointed this out in *NAACP v. FPC*, 425, U.S. 662, 670 n. 7 (1976).

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FCC Rules & Regulations

the results of the case processing. The FCC may investigate a broadcaster because of the FCC's mandate to assure that all broadcast licenses are awarded based upon a public interest finding. Thus, the FCC may undertake an investigation to determine whether or not revocation proceedings should be initiated against the licensee.

When the EEOC receives a discrimination charge against a broadcaster which is within its jurisdiction as well as the jurisdiction of the FCC, the EEOC will process the charge pursuant to its normal procedures. As part of the Memorandum, the EEOC will make a "reasonable effort" to investigate the employment complaint *prior* to the broadcast station's license expiration date. (Note that this target is the license *expiration* date rather than the date upon which petitions to deny must be filed.)

Whenever an EEOC investigation results in a "reasonable cause determination" finding that a broadcaster has undertaken discriminatory hiring practices, the EEOC will notify the FCC by letter. If the FCC requests additional information, the EEOC will provide it. Some broadcasters have expressed the fear that this will effectively force a licensee to enter into an EEOC conciliation agreement to avoid a costly and time-consuming FCC investigation of the same matter. The FCC has stated that nothing in the Memorandum is to be construed as requiring or forcing a licensee to enter into a conciliation agreement.

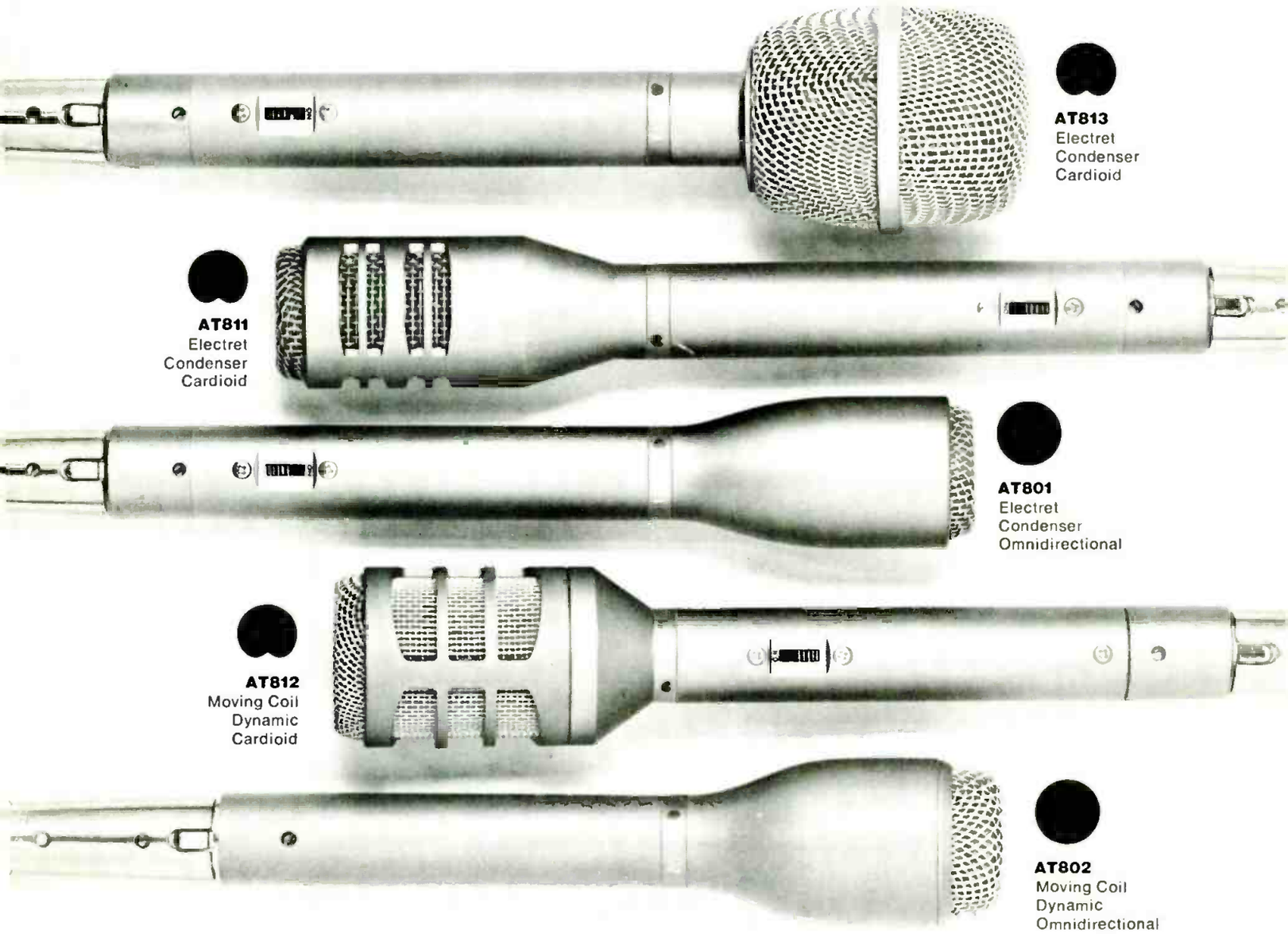
Oftentimes, when the EEOC makes a "reasonable cause determination," conciliation efforts ensue between the broadcaster and the complaining party, but often fail. In such instances, the EEOC will submit a notification to the FCC. The FCC will submit a letter to the broadcaster requesting comments on particular areas of the matter which are pertinent to the FCC's duty to assure that all licensees serve the public interest, convenience, and necessity. The FCC will then review the broadcaster's response and other information available to it. Thereafter, the FCC will decide to undertake one of the following courses of action: (1) If a license renewal application is pending, grant the application for a *full three years;* (2) If a license renewal application is pending, grant renewal for a *short term period;* (3) If a license renewal application is pending, grant renewal subject to *conditions* with concomitant FCC monitoring; (4) If a license renewal application is pending, grant renewal for a *short term period* subject to certain *conditions* with FCC monitoring; (5) Impose a *monetary forfeiture* against the broadcaster[3]; (6) If a license renewal application is not pending, *designate* the broadcasters's license for hearing. The FCC will notify the EEOC of how it disposes of each case.

If either the EEOC or the complaining party initiates an action in federal court based upon a failure of conciliation, the FCC emphasizes that it may defer consideration of the case until the court has made a final determination. With delay in court dockets around the nation the norm, this type of an FCC deferral may last a year or more.

At first glance, the Memorandum of Understanding places additional regulatory burdens upon broadcasters. But, in many instances, a broadcaster that is subject to a discriminatory employment complaint may save some time and legal expense because of the cooperative information sharing efforts. **BM/E**

[3] 47 USC §503b.

Audio-Technica introduces five new microphones... and a pleasant surprise.



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SPEAK OUT:

Dick Block Calls For Renewed Commitment To UHF

Dick Block is chairman and founder of the Council for UHF Broadcasting (CUB). CUB is a broadly based informal coalition of television broadcast organizations dedicated to promoting UHF technical comparability with VHF. CUB's participants include the Corporation for Public Broadcasting, the Public Broadcasting Service, the Association of Maximum Service Telecasters, the National Association of Broadcasters, the Association of Independent Television Stations and the Joint Council on Educational Telecommunications.

FROM DE TOQUEVILLE'S TIME to the present, Americans have been noted for their fascination with innovation. In no field is this trait more apparent than communications. Sometimes, however, this trait leads us to walk away from prior innovations after they have lost their novelty but before their potential has been fully realized, in order to pursue still newer innovations.

Over 15 years ago, governmental interest in and commitment to UHF television reached its high water mark with the passage of the All Channel Receiver Act. By requiring all receivers manufactured after spring 1964 to be equipped with UHF reception capability, Congress and the FCC thought they were assuring a system of television service to the American public that would be provided by 82 channels (UHF and VHF intermixed), not simply the 12 VHF channels. Such a system, it was hoped, would provide greater diversity of service, more opportunities for blacks, other minorities, and women, more public television outlets, and greater encouragement to new networking arrangements.

The goals and expectations for UHF were great. But UHF did not become fully grown overnight and interest turned to other "innovations." Instead of remedying the numerous, cumulatively important factors which comprised the remaining UHF handicap, the FCC, Congress, the executive branch, and communications theorists turned their attention to the glamorous blue-sky prospects of CATV, the wired nation, satellite-to-home broadcasting, fiber-optics, video discs, and short-spaced drop-ins.

Nothing was done about UHF indoor and outdoor antennas, lead-in line, or the enormous disparity between the amount of noise or snow permitted on UHF as opposed to VHF, and little was done about UHF tuning disadvantages. Meanwhile, the seven lowest UHF channels were taken from the American viewing public for land mobile use in the larger cities under an FCC "sharing scheme," and the top 14 channels were taken away altogether. There were other signs that the FCC had given up on or forgotten UHF.

Yet, UHF was destined to live up to the great expectations set for it. Always it had more potential for serving the public interest than the new, gaudier innovations that fascinated the policymakers. And slowly it began to approach that potential.

Now, the reality can no longer be denied. On the public television side, two-thirds of the stations are UHF and their viewership is increasing dramatically. A month ago, applications for 158 new commercial UHF stations were pending, compared with 35 just three years earlier. Commercial UHF stations are becoming profitable, and frequently lead their markets in particular time slots. Prices paid for UHF stations are skyrocketing.

When we started the Council for UHF Broadcasting (CUB) four years ago, one of our principal goals was to get the FCC's attention. We've succeeded to a degree—a lower UHF noise figure, a requirement for affixed UHF antennas, and a promise of a group within the FCC committed to UHF development. But there is still a complacency, a disturbing tendency at the FCC and elsewhere to be diverted by newer issues like spectrum reallocation, the Texas Instruments prototype receiver which some claim would make it possible to give television frequencies to other users, and the Communications Act rewrite.

What remains to be done?

The UHF noise figure must be lowered further. Even the new permissible UHF noise figure of 12 dB far exceeds the six to seven dB average VHF noise figure in today's receivers.

Receiving antennas must be improved. CUB is engaged in research now, and the FCC should also promote technological improvements in this area. Another step which we have sought at the FTC is to require labeling of antennas so that consumers can select the most effective equipment. Labeling may also promote the use of better lead-in line and receivers. Tuning devices must be improved so that the existing UHF handicap in this area is eliminated. UHF transmitters' grossly inefficient use of large amounts of energy must be cured by technological advances.

Public education, such as the PBS UHF Guide distributed to some 1,000,000 people, must be promoted, and the service industry should be encouraged to pay more attention to assuring good UHF reception.

MATV systems, which provide television service to millions of Americans who live in apartment complexes, must be required to carry UHF stations.

A full system of UHF and VHF television, side-by-side, was a gleam in our national eye 16 years ago. Though clearly more close to realization today, it still must be achieved by rule changes here, technological developments there, effective consumer education in other areas. There needs to be a comprehensive plan, a systems approach and a stick-to-itness heretofore lacking in government policy with respect to UHF. And there must be a commitment to UHF that is not forgotten as each innovation, new issue, or new claimant of spectrum space comes along. **BM/E**

Lenco's VNM-428 Video Noise Meter ...Only if You *Really* Care About Noise.

Some people think that video noise is a bore. They just couldn't care less about it. They figure that if they ignore it, it'll go away.

On the other hand, there are some forward-thinking, dedicated video engineers who are vitally concerned about their signal quality.

If you belong to the former group, you can stop reading this ad.

However, if you're interested in making fast, accurate signal-to-noise measurements of *any* composite video signal — no matter what the source — check out our VNM-428 Video Noise Meter.

The VNM-428 is specifically designed for the video S/N measurement requirements of TV studios, CATV, satellite or microwave systems. It utilizes a tangential noise measurement technique which overcomes the problems associated with oscilloscope measurement of Gaussian noise in video waveforms.

It's a small, rugged and stable unit, with a built-in calibrator that ensures an accuracy of ±0.5 dB throughout the range of 20-55 dB. Three precision filters, conforming to EIA/CCIR standards, are built in. The large, easy-to-read LED display can be seen from across the room. And it's priced at a comfortable $1,495.

So if you're *really* concerned about video noise, call your nearest Lenco sales office today. We'll be happy to give you a no-obligation demonstration.

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Want to know more about noise measurement? Write on your letterhead for a FREE copy of "Television Signal-To-Noise Measurement — A NEW APPROACH".

Circle 154 on Reader Service Card

GREAT IDEA CONTEST

52. Inexpensive Count-up Clock.

Craig S. Butler, Chief Eng., WGGG, Gainesville, Fla.

Problem: To provide announcers with a timing device for judging the intro and outro of songs that could be connected to the starting operation of several different makes of machines.

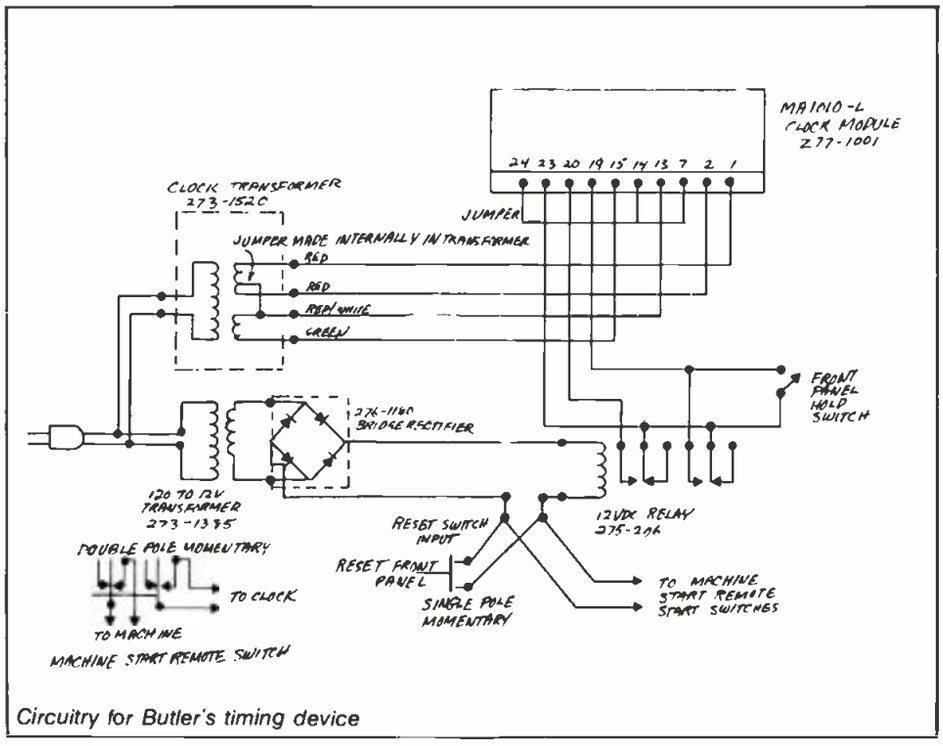
Solution: Last fall, WGGG's programming department decided to go to carted music for on-air programming. It was necessary to provide announcers with some sort of timing device judging the intro and outro of songs. At the same time, the device would have to be inexpensive and connectable to the starting operation of several different makes of machines. The situation was hampered by the fact that most clocks and clock kits used in broadcasting were either expensive (in excess of $75.00), required a great deal of construction time, or would need a complex interface with our equipment.

While buying some parts at a local Radio Shack, I stumbled across the Realistic MA 1010-L clock module. After examining its specifications, I decided that it could be made to do what we wanted. The unit itself was a complete twelve-hour digital clock and had an LED display already mounted and installed on the top of the circuit card. The clock had a row of 24 pins which control its various functions. These included snooze, alarm, and seconds. The only external requirements needed were a power supply, jumpers, and switches.

Construction was simple. A jumper from pin 7 to pins 14 and 24 locked the clock in seconds mode. Power was supplied from a special clock transformer and connected to pins 1, 2, 13, and 15. That transformer was a Radio Shack 273-1520 and is depicted with its wiring color code in the schematic. Reset to zero was accomplished by momentarily supplying source supply voltage (Vss) at pin 23 to pins 19 and 20. For counter stop/hold function, Vss at pin 23 is supplied to pin 19 only.

For control and interface with our machines, we decided on another simple, inexpensive method. Stop/hold was controlled by an spst switch on the front panel of chassis. Reset to zero operated in conjunction with double-pole momentary switches used for our remote machine starts. We decided upon this after looking at each of our machines and considering that the announcer might want to audition one cart while playing and timing another. This way, a cart can be started on the air by the remote switches which activate the machine and reset the clock; however, the announcer can listen to another cart by starting the other machine manually and not disturb the count on the clock. The Vss at pin 23 is supplied to pins 19 and 20 through a 12-volt double pole relay, controlled by the remote start switches for the machines. Power for the relay comes from a second 12-volt transformer and a bridge rectifier. The reset switch input comes in series with the coil circuit to the relay. On our model, we added a front panel reset switch so that an announcer could operate the clock without affecting a machine.

This clock module can probably be modified and used in many more ways. However, let me say two things . . . one bad, one good. First, be very careful in wiring and soldering on the module. The pin holes are small and very close together. Large wire will not fit at all. Use small size wire. Also be careful in soldering. A huge joint can short pins together. Now, the good news . . . our clock, including all parts and interface, cost only $35.00!



Circuitry for Butler's timing device

53. Automation System Interface With EBS Encoder.

George Werl, Jr., Chief Eng., WCMB/WSFM, Harrisburg, Pa.

Problem: To interface an SMC DP-1 automation system with a TFT 760 EBS Encoder in order to have the automation run weekly EBS tests, using a totally TTL approach to the circuitry.

Solution: First of all, the TFT Encoder must be modified according to the manufacturer's bulletin 75-02 for automatic reset. Following this, only two connections to the TFT (and power) are required by the interface circuit. Otherwise, the TFT Encoder and the SMC automation are unmodified.

Looking at the schematic, when the DP-1 puts a source "on line," pin 10 (channel on) of the SMC switcher for that channel goes high for the duration of the source, and pin 11 (start) momentarily goes low. This start pulse is buffered and appears on one input of a 7400 NAND gate. Note that with lap-switching, this start pulse is sent to both the present and next event on the start bus in the SMC switcher; therefore, the other gate input is held low during the following interface "aux" pulse, to inhibit a false second start of the encoder. The output of this gate is connected to the TFT Remote Command terminal, and goes low to start the encoder.

When the tones end, pin 8 of Z1 in the TFT unit goes low, triggering the 555 timer, which outputs a positive

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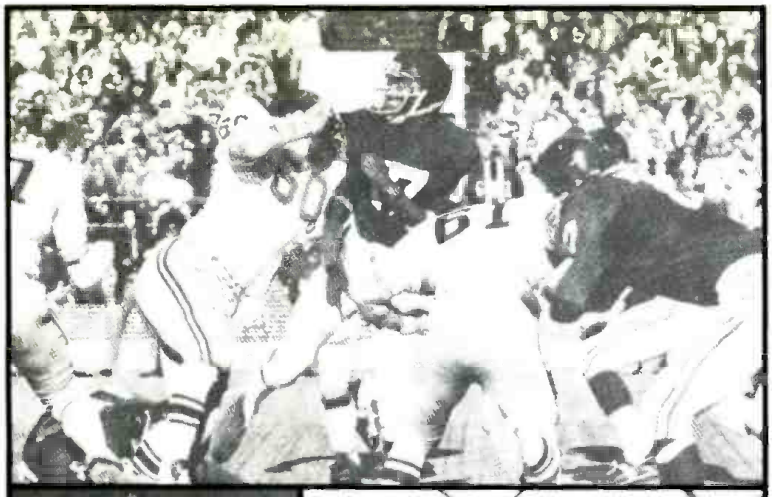

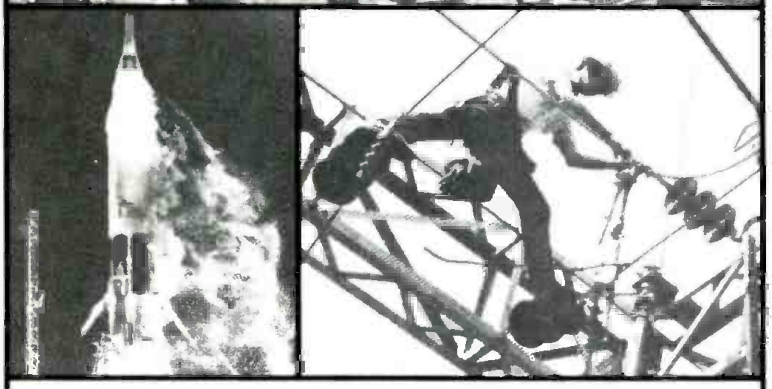

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High technology in camera design is Hitachi's business. And the phenomenal SK-90 shines among Hitachi's previous successes.

With the comfortably balanced, self-contained SK-90, you can go on location and shoot action features, documentaries, commercials, training and sales tapes—without worrying about complex equipment, tripping over bulky cords, or staggering under heavy loads—and always producing an image truly worthy of broadcast transmission. The SK-90's sophistication makes it easy for you. Anyplace, anywhere from sub-zero to over 100° F. operating temperatures.

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Options include a built-in linear matrix masking amplifier for high fidelity color rendition and a complete remote operating unit which lets the camera range up to 1000 feet away on standard camera cable. For an even greater working range of over 3000 feet, a Digital Command Unit/Triaxial Cable System is also available.

Remarkably, the Hitachi SK-90 may be the first affordable, self-contained portable that doesn't compromise. Contact your Hitachi dealer for more details.

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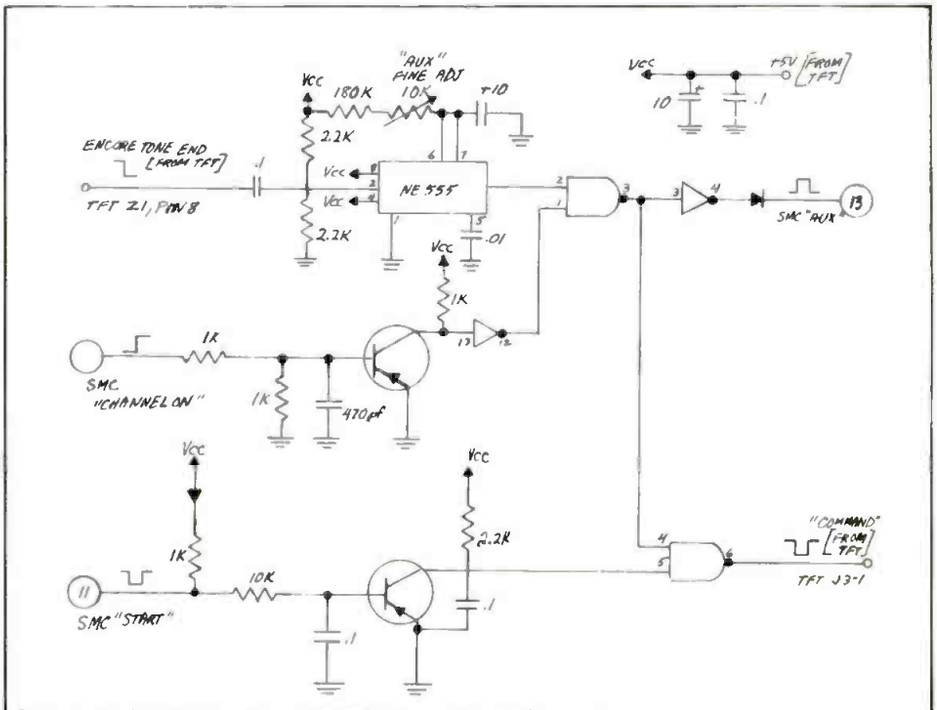
Circle 155 on Reader Service Card

pulse of about ½ second with the values shown. Since the switcher AUX bus is always open to receive pulses on all inputs, this pulse is inhibited by the NAND gate unless the encoder is "on line" and the "channel on" pin is high. Otherwise, off-line testing of the unit would produce aux pulses to the switcher and the starting of additional sources, resulting in more than one source on line at one time. These inhibiting features were incorporated so that our non-technical operators would have more of a foolproof system, and so that engineering could periodically check the encoder without removing it from the system.

In our unit, we made up a cable to plug directly into the automation switcher, carrying audio, start, aux, and channel on pulses for one channel. We built the interface on a piece of perfboard and mounted it in the TFT Encoder cabinet. The TFT, by the way, also supplies the +5 V power. The interface looks exactly like any other source to the SMC automation.

Once per week the traffic department schedules the required test, consisting of three program steps for cart open, encoder tones, and cart close. The text logging identifies the test, the source number for the tone encoder, and the duration of the test tones. Since the EBS encoder is under the control of the automation system, the tests run like clockwork, and there are no relay contacts to get dirty and cause problems as in other approaches. Since its installation some months ago, the interface has been trouble free.

Granted, this solution is tailored to interfacing an SMC DP-1 system with the TFT 760 encoder, but the concept is general in nature, and should be adaptable to other TTL-based automation systems and EBS encoders with a little tinkering.



Schematic for Werl's automation interface with EBS encoder

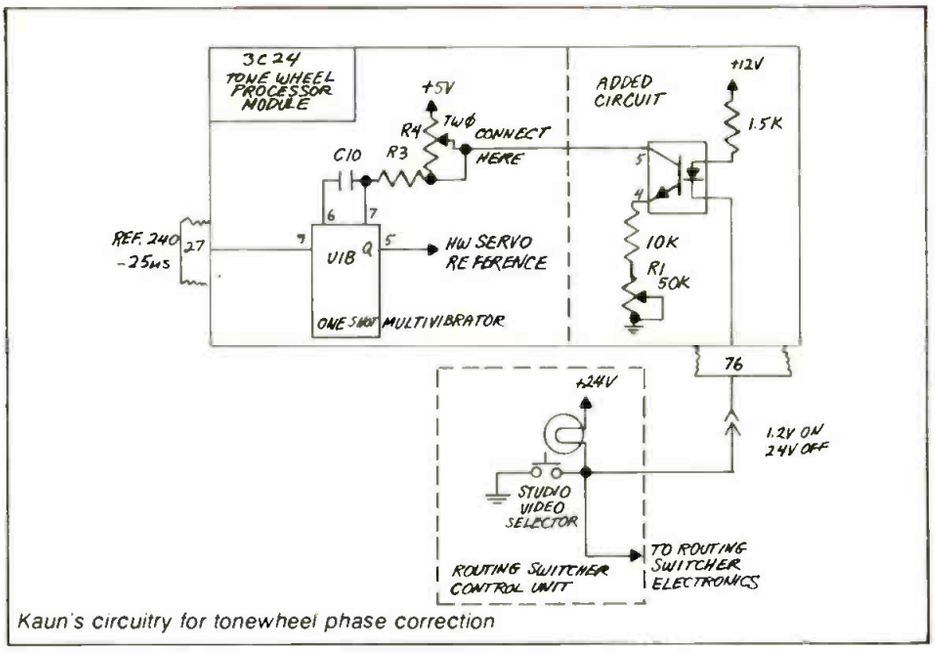
54. Auto-Record TW Phase Correction For Untimed Video Source.

David H. Kaun, Engineering Supervisor, University of Wisconsin-Stout, Menomonie, Wis.

Problem: To provide tonewheel phase correction in the record mode of an RCA TR-600 video recorder following the selection of an untimed video source on the VTR input routing switcher.

Solution: The TR-600 allows selection of fixed tonewheel (TW) phase and a user-variable TW phase control for recording. It was desired to adjust TW phase each time the untimed (delayed) video source is selected. This delayed source in our plant is the video feed from the production switcher, having a delay of one field plus 1.3 ms as compared to all other video sources on the routing switcher.

This new TW phase adjustment was accomplished by installing an additional TW phase adjustment potentiometer (R1) on the tonewheel processor board (3C24) and controlling it with an opto isolator (4N27). The LED in the 4N27 is energized by the lamp driver circuit of the routing switcher, thus providing complete circuit isolation. Manufacturer's TW phase setup should be followed, adjusting original TW phase control first.



Kaun's circuitry for tonewheel phase correction

A small portion of the existing and added circuitry is shown in the accompanying figure. This modification could probably be added to other machines with slight modifications. The VTR always uses external sync as its reference in the edit mode. It is for this reason the VTR must use external sync reference during normal record, thus assuring correct TW phase.

VOTE NOW!
GREAT IDEA CONTEST BALLOT ON READER SERVICE CARD

Circle 157 on Reader Service Card

BROADCAST EQUIPMENT

In keeping with the focus of this month's special report, the new products listing is devoted entirely to test and measurement instruments.

Audio Analyzer 250

The RTA 2 is a real time audio analyzer designed for audio spectrum analysis in ⅓ and full octave bands. The unit features its own five-inch scope, lighted graticule, and a pink noise generator. Specs include a 60 dB dynamic range and a 16 Hz to 20 kHz bandwidth. CROWN.

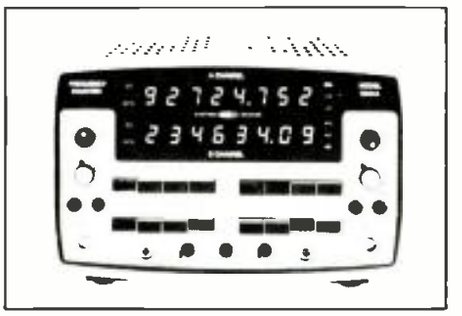
Audio Analyzer 251

The T-100 audio analyzer is a nine-pound portable unit featuring a built-in low-distortion oscillator that provides 21 frequencies from 20 Hz to 20 kHz. A pink noise generator is also provided.

Metering functions include level indication (peak or VU, in volts, watts, and dB), speed/wow and flutter, and 400 Hz THD. NAKAMICHI.

Frequency Counter 252

Frequency counters: The 6361A is a 100 MHz, 10 ns time interval/period,



ac/dc coupled universal counter that employs a pair of LSI chips enabling it to make simultaneous dual channel measurements. SYSTRON DONNER.

For more information circle bold face numbers on reader service card.

Frequency Counter 253

The HP 8901A combines the capabilities of a modulation meter, frequency counter, and power meter into one instrument, and characterizes all types of AM-FM-OM signals in the 150 kHz to 1300 MHz frequency range. The microprocessor-based unit can be part of a fully automatic system, used manually, or used in combination. HEWLETT-PACKARD.

Frequency Counter 254

The model 5722A is a lightweight (under three pounds) portable eight-digit frequency counter that combines the very high frequency range of a microwave counter (1.25 GHz) and the resolution of a high quality low frequency counter (0.01 Hz) with a low power consumption of only eight watts. BALLANTINE LABORATORIES INC.

Frequency Synthesizer 255

Model SI-102 features five and a half digits of resolution from 0.1 Hz to 16 MHz providing 0.00001 Hz frequency resolution from 0.1 Hz to 1.0 Hz and 100 Hz resolution from one to 16 MHz. A high stability internal reference oscillator, ±10 PPM over the temperature range of 0 to 50 degrees C, assures accuracy. The synthesizer TTL output is continuously adjustable into a 50 ohm load. SYNTEST.

Frequency Synthesizer 256

Model 1488A-12 bus compatible interface is designed for incorporating the Rockland series 5100 frequency synthesizers into automatic, computerized

continued on page 104

UN-CAN IT.

The tape cartridge is a handy little device. Unfortunately the sound quality of programming varies noticeably between "live" and "canned."

dbx has overcome this problem by developing a tape noise reduction system especially for broadcast use. It provides 30 dB noise reduction and 10 dB headroom improvement. This dbx system offers the same benefits as the dbx tape noise reduction system used by recording studios.

The new dbx 148 provides 8 channels of playback (decode) noise reduction in a plug-in modular chassis (space is provided for a spare module). There are two modules available—the 408, for tape playback, and the 409, for playback of noise-free dbx-encoded discs. Typically, the 148 is used in the control room to play back tapes recorded in the production studio with the dbx 142, a 2-channel, switchable (encode-decode) tape noise reduction unit.

Besides "un-canning" carts, the dbx system extends the useful life of old reel-to-reel machines, quiets audio tracks on VTR's, and even cleans up full-frequency telephone lines and microwave links. Because it prevents noise from coming between you and your listeners—and you and your advertisers—it just may be the most important investment you will ever make.

dbx, Incorporated,
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Newton MA 02195
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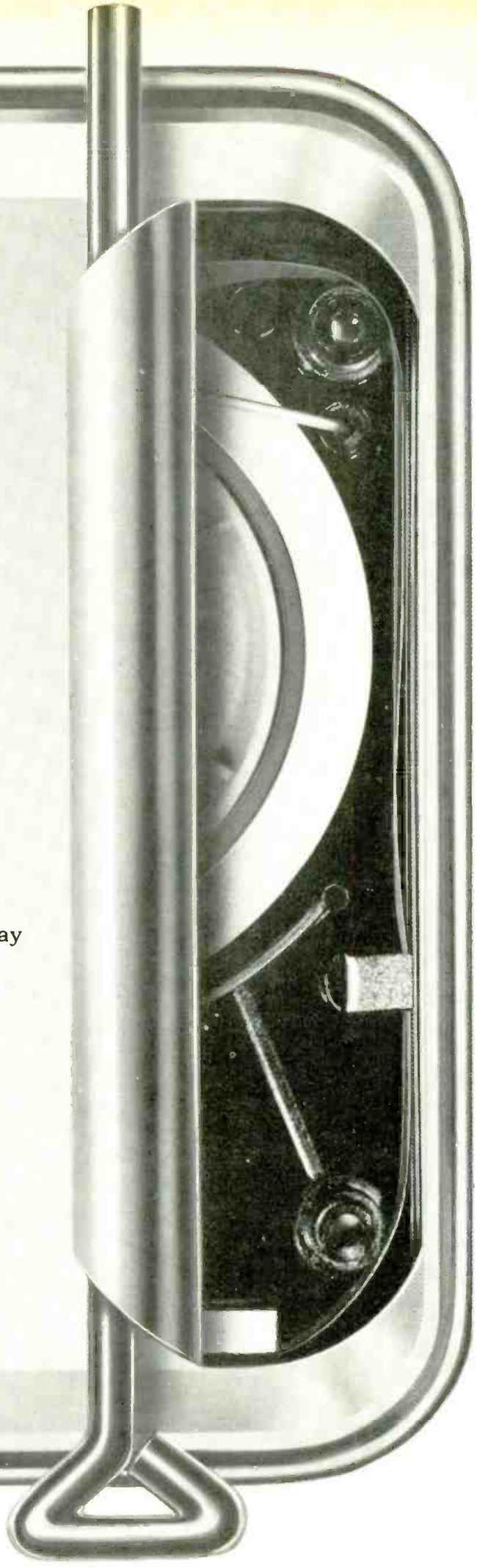
UNLOCK YOUR EARS



Circle 160 on Reader Service Card

Broadcast Equipment

or microprocessor-controlled systems employing the IEEE 488/1975 GPIB. It may be field installed with the 5100 series of programmable instruments. ROCKLAND.

D/A Converter Tester 257

Model 1262 DAC Tester is a microprocessor-controlled instrument capable of testing DACs with either BCD or any of several binary input formats of six, eight, 10, or 12 bits. Absolute and differential linearity and monotonicity are tested and displayed on the front panel. ELECTRO SCIENTIFIC INDUSTRIES, INC.

Logic Tester 258

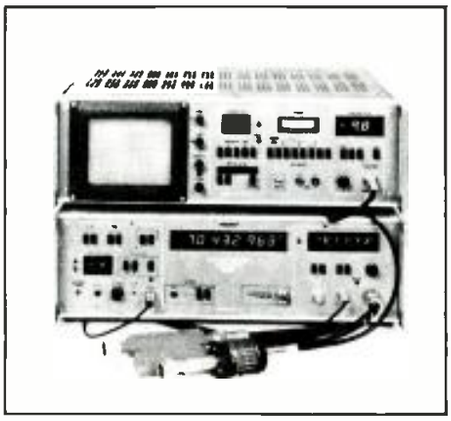
The LTC-1 standard logical analysis kit includes an LP-1 logic probe, a DP-1 digital pulser, and an LM-1 logic monitor. The LP-1 offers 0.1 megaohm input impedance and can catch pulses as narrow as 50 ns. The DP-1 kicks out either single pulses or 100 Hz pulse trains with a push of its buttons. The LM-1 clips onto any standard 14 or 16 pin DIP IC. The state of each pin is indicated with 16 LEDs. The kit comes with an assortment of adapters and complete manuals and application guides. CONTINENTAL SPECIALITIES CORP.

Logic Tester 259

Model 5700B is designed to simplify debugging and circuit fault analysis in digital circuitry down to the component level. The instrument features a built-in dual threshold high speed logic state analyzer, a DVM, and a universal logic pulser. INFORMATION SCAN TECHNOLOGY.

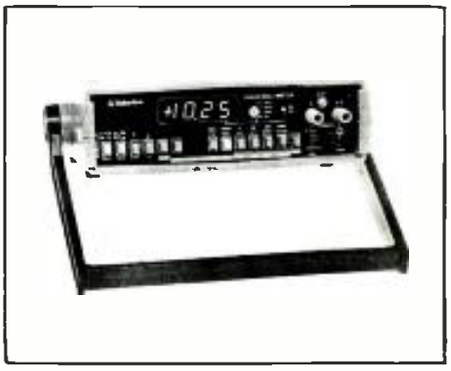
Microwave Repeater Analyzer 260

Model 4655 performs the testing necessary for routine maintenance of four, six, and 11 GHz message radio systems. The unit has IF spectrum analyzer and RF return-loss capabilities, and added versatility with an optional RF frequency counter. Also featured are CRT and digital displays. SCIENTIFIC-ATLANTA INC.



Digital Multimeter 261

Model 3030A is a universal seven function 3½-digit meter offering 10 milliohm, 10 microvolt, and 10 nanoampere resolution. Additional features include full EMI shielding and advanced ohmmeter circuit. Bandwidth is 50 Hz to 110 kHz, and dB range is -50 dB to 10 dB. BALLANTINE LABORATORIES INC.



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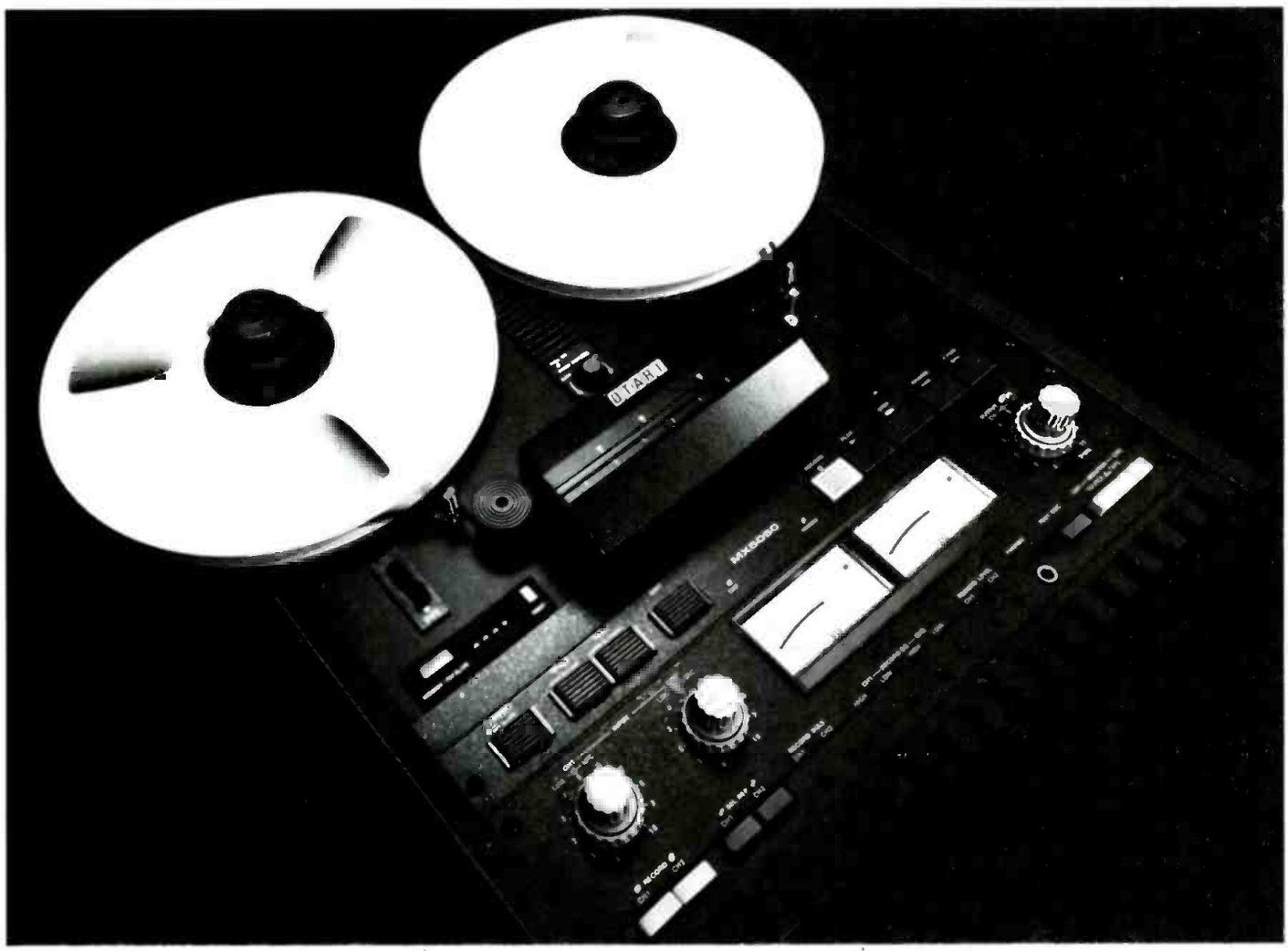
Birth of the two-track masterpiece. Otari MX5050-B



The new Otari two-track machine is designed for discriminating recordists. Built with inside-out improvements over our long succession of compact professional recorders. With built-in operation ease and better serviceability. With fidelity, reliability and professional functions indispensable for every critical application you have in mind.

DC-servo direct-drive for minimum wow/flutter and speed deviation. With ±7% pitch control for variable speed record and playback. Foolproof motion-sensing control logic. Optional remote control for all transport operating functions. Minimum −15dBm input and three calibrated switchable record levels of 185/250/320 nWb/m. 600ohm +4dBm or −10dBm switch-over output with XLR connectors. Frontpanel edit and cue, test oscillator, stepless bias and NAB or IEC equalization. Full professional four heads with quarter-track playback. And it's designed for both vertical and horizontal operation.

Resultant performance: click-free punch-in/punch-out mastering at 63dB s/n, 55dB crosstalk and 70dB erase with 30Hz—20kHz (±2dB) response. It's the latest and wisest choice for your 15/7 1/2 or 7 1/2/3 3/4 ips masters. For the full story about the new generation recorder/reproducer, contact your nearest Otari dealer and see why we call it the masterpiece.

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981 Industrial Road, San Carlos, California 94070
Phone: (415) 593-1648
Japan: Otari Electric Co., Ltd.
4-29-18 Minami Ogikubo, Suginami-ku, Tokyo 167
Phone: (03) 333-9631

Circle 162 on Reader Service Card

Broadcast Equipment

Digital Multimeter 262

The PDM 35 is a pocket-sized unit with LSI circuitry utilizing BIFET technology. It measures dc voltage in four ranges to one kV and ac voltages to 500 V at an accuracy of one percent, and features LED display. SINCLAIR RADIONICS.

Digital Multimeter 263

Model 462 is a 3½-digit meter which gives the user the option of automatic or manual range selection of ac and dc voltage ranges between two and 1000 volts, as well as resistance ranges between two kilohms and 20 megaohms. SIMPSON ELECTRIC CO.

Digital Multimeter 264

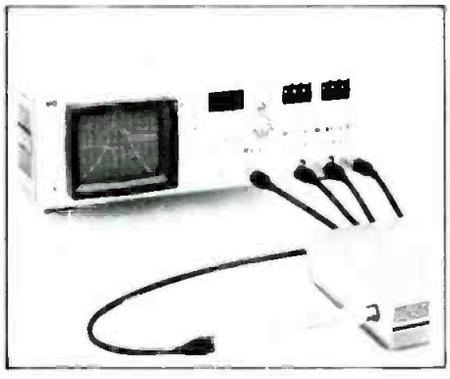
Model 2830 is a 3½-digit ac powered unit featuring LED display and a dc accuracy of .5 percent, and auto zeroing on all ranges. Its voltage measurement capability extends to 1000 volts dc or 750 volts ac, and up to 40,000 volts with optional PR-28 probe. The unit also has a 10 ohm range and is capable of 0.01 ohm resolution. B&K PRECISION, DYNASCAN CORP.

Digital Multimeter 265

Calcumeter 4100 is a handheld 3½-digit multimeter fully controlled by a CMOS microcomputer chip. It operates in six ranges: 10 microvolts sensitivity through 1000 volts dc, 750 ac; 10 microamps sensitivity up to 200 milliamps (extended to 20 amps with accessory shunt); 0.1 ohms resolution through 20 megaohms. It has a basic accuracy of 0.25 percent dc V. ELECTRO SCIENTIFIC INDUSTRIES, INC.

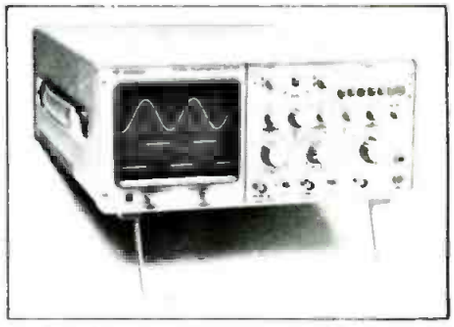
Network Analyzer 266

The 8754A network analyzer measures magnitude, phase, absolute power, and polar reflection coefficient from four to 1300 MHz. The instrument includes a built-in source, a three-channel 80 dB dynamic range, a spurious free receiver, and a CRT display, in a 5¼-inch high cabinet. HEWLETT-PACKARD.



Oscillscope 267

The OS255 is a portable, 15 MHz dual trace/x-y oscilloscope featuring an eight by 10 cm CRT. Specs include



dc-15 MHz bandwidth (-3 dB), 2 mV/cm vertical sensitivity over the full bandwidth, and timebase speeds to 500 ns/cm (a 5X expand button gives an effective maximum sweep speed of 100 ns/cm). Triggering modes include ac and dc coupling plus TV — all with plus or minus slope selection. GOULD INC.

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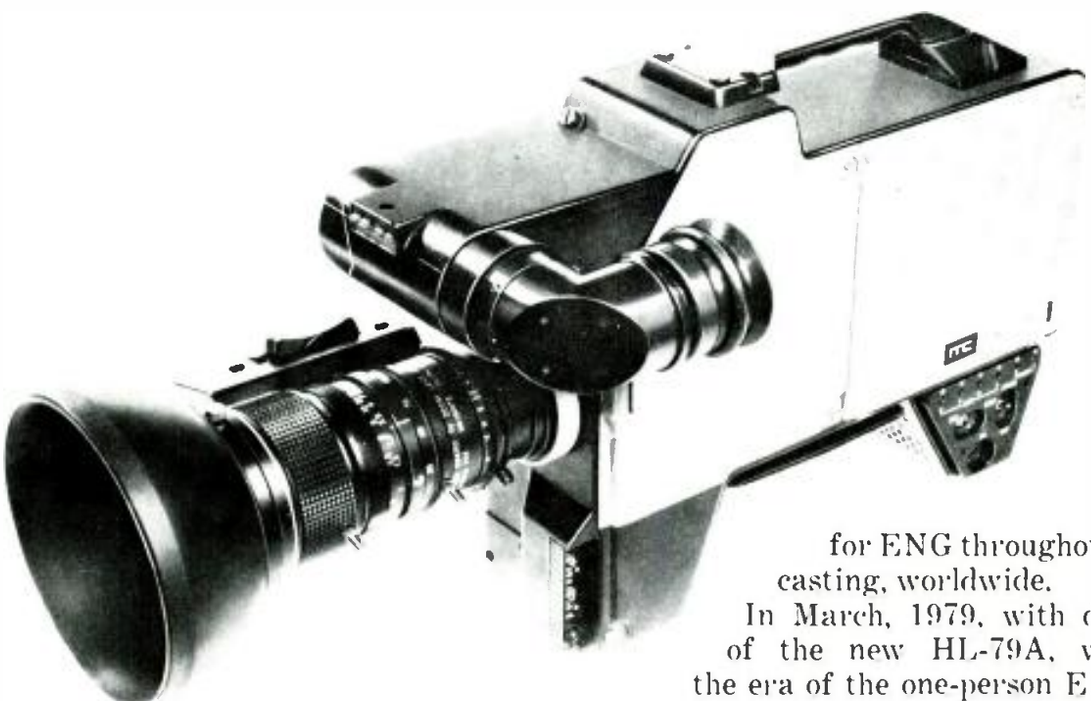
Ikegami inaugurates the era of one-person ENG camera crews.



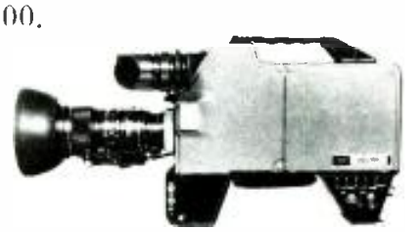
A remarkable new television camera is ready for ENG broadcasters, a new-generation camera significantly more compact, yet higher in performance than any prism-optic ENG camera now offered.

The new HL-79A is like other Ikegami cameras in its performance and reliability. This tradition is well-known in the industry. It dates back some six years to the pioneering HL-33 head-plus-backpack camera that first made broadcast-quality ENG truly feasible. The HL-33 and its successor, the HL-35, carried on this tradition of reliability. And the current HL-77A head-plus-battery camera is today's standard for ENG throughout broadcasting, worldwide.

In March, 1979, with deliveries of the new HL-79A, we enter the era of the one-person ENG camera crew, for this new camera is an all-in-the-head design – fully integral, with no power cord to a separate battery. Its reduced weight and size enable the camera-person to slip solo in or out of vehicles or through crowds, unhampered as never before. In performance and reliability it is the ENG camera of tomorrow in the authentic lineage of Ikegami cameras of yesterday and today.

Ikegami Electronics (USA) Inc., 37 Brook Ave., Maywood, N.J. 07607, (201) 368-9171; West Coast: 19164 Van Ness Ave., Torrance, Calif. 90501, (213) 328-2814; Southwest: 330 North Belt East, Suite 228, Houston, Texas, 77060, (713) 445-0100.

Circle 164 on Reader Service Card



Ikegami HL-79A

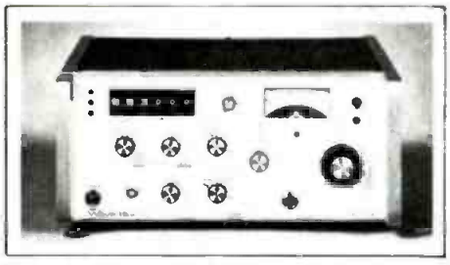
Broadcast Equipment

Oscilloscope 268

Model 1742A is a 100 MHz scope featuring built-in dual channel and delta time (time interval). In the delta time mode, the unit measures time between two events on either channel A or B, or between an event on one channel and an event on the other. Specs include 40 MHz bandwidth. An optional DMM is available to provide display of time in seconds, milliseconds, or microseconds. HEWLETT-PACKARD.

Signal Generator 269

Model 3003 is a new one to 520 MHz signal generator featuring 0.001 percent accuracy and 0.2 parts per million



per hour stability. The unit offers present modulation frequencies between 100 Hz and 10 kHz and internal modulation frequencies of 400 Hz and one kHz. Options include a high stability reference for improved stability and accuracy and a low level leakage option for testing sensitive receivers. WAVETEK.

Multiple Frequency Synthesizer 270

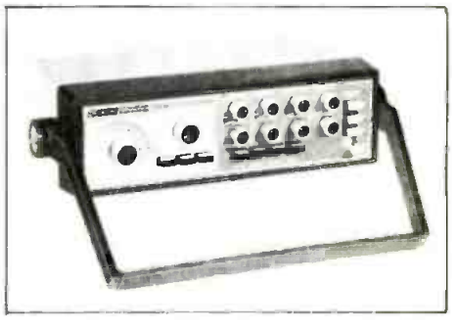
Model SI-880 is a multiple frequency synthesizer that provides up to four independently selectable signal outputs within the range of 0.1 to 16 MHz with a resolution of five and a half digits. Non-harmonic spurious signals are no greater than -60 dB. Optional internal XTAL reference oscillators provide either ± 10 PPM or ± 1 PPM accuracy over the temperature range of zero to 50 degrees C. SYNTEST.

Sweep/Function Generator 271

Model 3325A is a programmable synthesizer, function generator, and sweeper that can be manually or automatically controlled to generate sine waves, triangles, square waves and ramps including sweep. Ten different instrument settings may be stored in separate memory for later recall. These include: frequency, function, amplitude, dc offset, phase offset, sweep start/stop frequency, sweep time and marker frequency for each storage register. Standard features also include am and pm modulation and sync output, as well as phase lock input. HEWLETT-PACKARD.

Sweep/Function Generator 272

Model 3020 can reportedly replace a function generator, sweep generator, pulse generator, and tone burst generator, and can generate almost any



wave shape. The instrument's frequency coverage spans from 0.02 Hz to two MHz in seven ranges, each of which provides linear 1000 to one frequency control. The 3020 is suited for a

continued on page 110

when cost is more important than price

Value conscious broadcasters specify the Studer B67 because it outperforms its competitors on the really significant broadcaster criteria:

- Studer state-of-the-art quality
- Long service life with low failure rate
- Speed and ease of user maintenance

If you're more concerned with *total* cost than just initial price, write to us for complete information on the superiority of the Studer B67 Broadcast Recorder/Reproducer. We'll show you why it's your best tape recorder investment.

Circle 166 on Reader Service Card

STUDER

Studer Revox America, Inc., 1819 Broadway, Nashville, Tenn. 37203 / (615) 329-9576 • In Canada: Studer Revox Canada, Ltd.

Broadcast Equipment

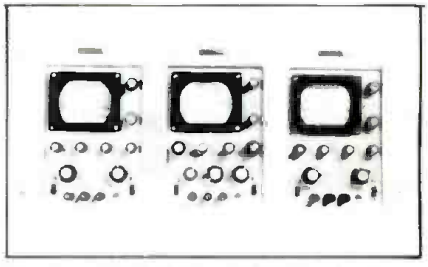
host of lab audio measurements. It features dc offset and built-in amplitude modulation capability. B&K PRECISION-DYNASCAN.

Spectrum Analyzer 273

Model 3582A can measure and display amplitude spectra, phase spectra, the magnitude and phase of transfer functions and the coherence function. It is compatible with HP-IB (IEEE-488). The instrument covers the frequency range from 20 millihertz to 25.6 kHz, and features a microprocessor which executes the fast fourier transform (FFT) to measure signals that have long measurement times. HEWLETT-PACKARD.

Vectorscope 274

The VS310 is a standalone NTSC vectorscope that requires no external decoding and presents the standard vector



display of full field or NTSC color bars. The unit accepts external 3.58 for camera encoder matching, and offers a test circle display for calibration. The unit also has a waveform display of full bandwidth and chroma only exhibition, plus a complete servicing test scope capability. ULTRA AUDIO PIXTEC.

Video Noise Meter 275

The VNM-428 is designed specifically for video signal-to-noise measurement requirements of TV studios, CATV installations, and microwave system users. The meter has a built-in calibrator that ensures accuracy of ±0.5 dB throughout the range of 20 dB to 55 dB. The signal-to-noise ratio is calibrated to EIA standards and is shown on an LED display. The unit has three built-in precision filters that conform to CCIR/EIA standards. LENCO.

For more information circle bold face numbers on reader service card.

continued on page 112

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Everytime you look up, more comes down. Sports. Syndicated shows. Live events from around the world. All via satellite. Isn't it time you got your own dish, and fattened up your ratings.

Scientific-Atlanta stands ready to help you as only a company that's built over 350 television earth stations can. From the icy reaches of Alaska to the hot deserts of Africa, we're number one.

The extent of our product line is one reason nobody on earth knows more about earth stations. We make the antenna itself, the automatic positioning equipment, the video receivers (multi-channel or single channel), the transmit exciters, the up/down converters, the automatic protection switches. And so on.

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Telephone Sunbury on Thames 89751, Telex 896015

Circle 168 on Reader Service Card

Circle 169 on Reader Service Card

Broadcast Equipment

Tape Tension Gauge 276

The T2-H15-UM is designed for use with ¾-inch U-matic video cassette machines. The unit measures dynamic tape tension while the machine is in operation. It can be used with all ½-inch and U-matic machines. TENTEL.

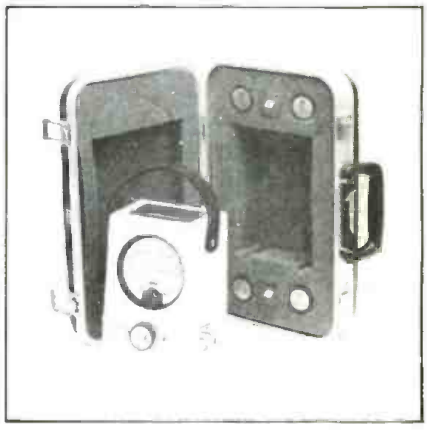
Digital Voltmeter 277

The 8502A features a dc accuracy of 6 PPM in addition to ac volts, ohms and basic ac/dc current measurement capability. The instrument is microprocessor-based and has memory functions which allow the user to pro-

gram basic functions and enter data for production testing such as limit (high-pass-low display) and percent error. Five math functions of the unit include the processing of input data to readout in direct usable data, including percentage of error. The unit has three systems options available, IEEE, RS-232, and Duplex Parallel. JOHN FLUKE MFG. CO.

Wattmeter 278

Watt-Kits allow for the measurement of 100 watts full scale from 25 MHz to one GHz. The kit includes a type 1000 RF



directional wattmeter and plug-in elements including UHF connector and two-foot patch cable. DIELECTRIC COMMUNICATIONS.

continued on page 114

Station Master.

You can virtually drive coast-to-coast without leaving the sound of a radio station using a Shure microphone. In fact, you'll encounter almost as many different models of Shure microphones as you will srates.

Case in point: the Shure SM7. It features a wide-range, ultra-smooth frequency response with show 'n' tell switches that allow the user to select any of four microphone response curves: (1) flat response; (2) presence boost; (3) bass rolloff; and (4) presence boost with bass rolloff.

The SM7 also uses an innovative "air suspension" integral shock mount for super-isolation against mechanical and shock noise.

Ask your Shure dealer for a demonstration of the show 'n' tell SM7. It's one Shure "show" worth telling everybody about.

Shure Brothers Inc.
222 Harrrey Ave., Evanston, IL 60204
In Canada:
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TECHNICORNER
The Shure SM7 is a unidirectional dynamic microphone with a 40 to 16,000 Hz frequency response. Noise reduction systems cut mechanical noises, breath "pop," wind, and electromagnetic hum. "Add-on" filter devices are unnecessary. The SM7's integral foam wind/"pop" filter reduces even difficult close-up breath sounds. Impedance is rated at 150 ohms for microphone inputs rated from 19 to 300 ohms. Output level: −57 dB (0 dB = 1 milliwatt per 10 microbars); open circuit voltage: −79 dB (0 dB = 1 volt per microbar).

SHURE®

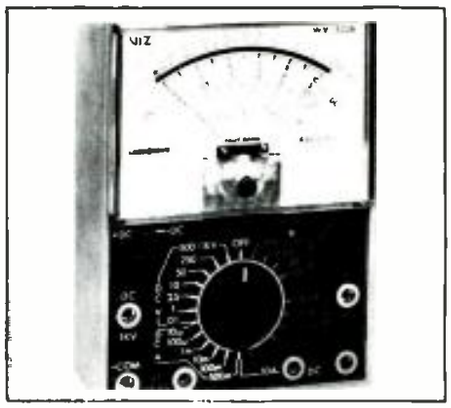
MANUFACTURERS OF HIGH FIDELITY COMPONENTS, MICROPHONES, SOUND SYSTEMS AND RELATED CIRCUITRY.

Circle 170 on Reader Service Card

Broadcast Equipment

VOM 279

The WV-520B is a general purpose 100,000 ohm/Vdc meter that is fuse and relay protected against overload on all ranges and functions. The unit has an easy to read taut band meter with



color coded scales. It measures dc voltage as low as one mV and up to 1,000 V in eight ranges; dc current from .1 μA to 10A in seven ranges; resistance from .25 to 20 megohms in four ranges; and decibels from -20 to +36 dB. VIZ MFG CO

Waveform Monitor 280

WM310 is suited for budget-conscious applications including ENG, U-matic tape editing, and dubbing. The unit displays TV lines or fields at full bandwidth, luminance only or chroma only. An unclamped display position allows the user to check the clamping of incoming video. The WM310 displays video sync pulses and decodes VITS for exhibition on an external scope. A&B inputs and acceptance of external sync are included. ULTRA AUDIO PIX-TEC.

Audio Test Set 281

The TM 500 is a complete family of plug-in test and measurement instruments. The heart of the system's portable unit is a 600 ohm low distortion oscillator which generates square or sine waves from five Hz to 500 kHz (0.0035 percent THD 20 Hz to 50 kHz). Combined with a TM 500 multimeter with ac, dc, current, temperature, and resistance readings as well as dB capabilities; a TM 500 counter with measuring capability to one GHz; and a TM 500 oscilloscope in either five, 15, or 80 MHz varieties, the result is a complete portable test set. Add-ons for the bench system include pulse and function generators, calibration instruments, power supplies, and digital delay and logic analyzer. TEKTRONIX.

You were so impressed by the RS-1500 you asked for a studio version. Introducing Technics RS-1520.

The RS-1520 has all the performance of the award-winning RS-1500 plus the features you need in a studio deck. Like bias and equalization fine adjustments for each channel to optimize any tape formula. A 1kHz/10kHz test-tone oscillator for accurate equipment checks. The precision of ASA standard VU meters with a +10dB sensitivity selector. A Cue/Edit switch for quick, safe edits. And balanced, low-impedance, XLR-type output connectors to match other widely used broadcast and studio equipment.

To match the performance of its predecessor, the RS-1520 features the "Isolated Loop" tape transport with a quartz-locked, phase-controlled, direct-drive capstan. By minimizing tape tension, it virtually eliminates all signal dropout. While reducing modulation noise and wow and flutter to a point where they are barely measurable by conventional laboratory equipment.

Electronically too, Technics RS-1520 provides professional control. A separate microphone amplifier. Record amplifier. Mixing amplifier. An IEC standard playback equalization selector. While IC full-logic function permits absolute freedom in switching modes.

Compare studio features. Compare specifications. TRACK SYSTEM: 2-track, 2-channel recording, playback and erase. 4-track, 2-channel playback. FREQ. RESP.: 30-30,000Hz, ± 3dB (—10dB rec. level) at 15ips. WOW & FLUTTER: 0.018% WRMS at 15ips. S/N RATIO: 60dB (NAB weighted) at 15ips. SEPARATION: 50dB. RISE TIME: 0.7 secs. SPEED DEVIATION: ± 0.1% with 1.0 or 1.5 mil tape at 15ips. SPEED FLUCTUATION: 0.05% with 1.0 or 1.5mil tape at 15ips. PITCH CONTROL: ± 6%.

Technics RS-1520. A rare combination of audio technology. A new standard of audio excellence.

Technics
Professional Series

Circle 173 on Reader Service Card

Corrections and Additions to "The Source'78"

Make these changes to your copy of "The Source '78," *BM/E*'s September guide to broadcast equipment.

Changes to the Instant Source Locator:

References to **Commercial Telecom** should be changed to read **Collins-Rockwell** (see Audio Consoles, RF/Transmitting/Receiving Equipment, and FM Antennas).

I. **Audio Equipment**
Amplifiers, add RAM 3, 5, 6
Disc Playing Equip., add RAM 3

II. **Video Equipment**
Pulse & Dist. Amps, delete Recortec 3
Auto Master Control, delete Recortec
Routing Switchers, delete Recortec
Sync Generators, delete Recortec
Synchronizers, delete Recortec 3
Videotape, delete Recortec, 1 add 2
Videotape Accessories, delect Recortec 6

Changes in the Alphabetical Listing:

Name of **Commerical Telecommunications Group of Rockwell International, Collins Broadcast Products** should be changed to **Collins Broadcast Products, Commercial Telecommunications Group of Rockwell International.**

P. 111 correct company name to:

3M Co. Magnetic Audio/Video Products Div.
3M Center Bldg 233-5N St. Paul MN 55101
612 733-1662

P. 111 telephone correction:

3M Co. Mincom Div.
612 733-7603

P. 122 add:

RAM Audio Systems
17 Jansen St. Danbury CT 06810
203 748-7698

Audio pre-amps, monitor and power amps, stereo pickups

P. 124 correct product listing should be:

Recortec Inc.
Videotape cleaning and evaluating, tape evaluators and rewinders, helical recorders/players, machine rebuilding, two VTR editor-controller.
Delete previous product list.

P. 127 telephone correction:

Saki Magnetics Inc.
213 450-1551

Good FM sound is good FM business.

Dolby Laboratories Model 334 FM Broadcast Unit is the only station equipment needed for Dolby FM

More and more FM listeners these days are sensitive to good sound. If you have any doubts, just take a look at the sales of quality home and automotive stereo equipment. For these listeners, *signal quality* could well be a significant factor in distinguishing your station from the run of the mill.

Signal quality is what Dolby FM is all about. The Dolby FM process incorporates a reduction of pre-emphasis from 75 to 25 μs, along with B-type Dolby encoding. That gives you about 8 dB more headroom at 10 kHz – just the thing for today's program sources that are rich in high frequencies. Limiting can go back to doing what it was originally designed for – handling the occasional difficult peak – rather than filtering out the highs most of the time.

Listeners with receivers equipped for Dolby FM reception* have the opportunity, for the first time, to recover your signal in virtually the same form it left the studio. Your FM signal can sound as good as the high quality records and tapes your listeners play at home. At the same time, listeners with conventional receivers aren't penalized, because 75 μs de-emphasis subjectively complements the Dolby encoded 25 μs signal for compatibility.

Attracting new listeners to your FM station is one thing; keeping today's sound sensitive listeners happily tuned in is another. That's where signal quality – and Dolby FM – come in. If you would like to find out more about how the good sound of Dolby FM can be good for your business, please contact us at the address below.

*There are now more than 80 consumer product models equipped for Dolby FM reception, including several new car stereo systems.

Visit Dolby at the NRBA convention, Booths 122-3, Hyatt Regency, San Francisco, September 17-20.

DOLBY FM™

'Dolby' and the double-D symbol are trademarks of Dolby Laboratories

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Test and Save.

A simple philosophy? Yes. But, one that can save you and your clients many dollars.

Consider this:
You're recording an exciting, new spot for a new client. The musicians and vocalists are set. You're getting noise on the tape and you can't find it anywhere. Testing with a TM 500 audio test set before recording could have saved time and money.

Or; does this sound familiar?
You're midway through an important broadcast. You've sold every commercial minute allowable, when your audio fuzzes out. During a commercial minute a make good is in order. A quick check through your basic frequency/response levels with a TM 500 Oscillator/dB reading meter combination could have saved that minute.

Try this:
You're engineering a big theatre production. It's opening night with a full house attending. The curtain goes up while your audio stays down. Troubleshooting with a TM 500 test set before the show could have found the problem.

In this world of sound, time is money. TM 500 is a collection of modular test and measurement instruments from Tektronix that can save you plenty of both.

The heart of our TM 500 Audio Travel Lab is our 600 Ω low distortion audio oscillator, which generates square or low distortion sine waves from 5 Hz to 500 kHz (0.035% THD 20 Hz to 50 kHz).

For general troubleshooting combine this compact oscillator with a full function TM 500 Multimeter with ac, dc, current, temperature and resistance readings as well as dB capabilities. Add one of our TM 500 Counters (measuring capability to 1 GHz) with a TM 500 Oscilloscope (5 MHz, 15 MHz and 80 MHz varieties), you've got a complete, portable TM 500 audio test set.

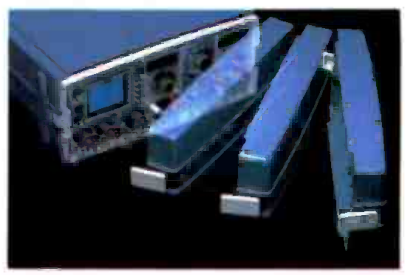
Or if you're in need of a signal source, try our 40 MHz function generator capable of tone bursts, 20 Hz to 20 kHz log or linear sweep, and amplitude modulation.

TM 500 even has a tunable bandpass filter which selects narrow bands for selective frequency tests and a hi-gain differential amplifier with hi or lo filter capabilities.

These versatile plug-ins can be mixed, matched and packed in any one of 6 portable, benchtop, or rackmount TM 500 Mainframes to make a test set that suits your measurement needs.

The Traveler Mainframe is on the move with you.

When you're in and out of a lot of studios our TM 515 Traveler Mainframe is your number. The TM 515 carries up to five TM 500 plug-ins, looks like and acts like carry-on-flight luggage. A rear interface circuit board in the TM 515 Traveler Mainframe lets you interconnect the plug-in instruments to make gain, loss or response measurements — at the touch of a pushbutton.



TM 500 Designed for Configurability

For additional information on TM 500 Audio Labs, call Tektronix' automatic answering service (toll free) at 1-800-547-1512. Oregon residents call collect on 644-9051. For even faster service, call your local Tektronix Field Office.

In Europe write: Tektronix Limited, P.O. Box 36, St. Peter Port, Guernsey, Channel Islands.

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