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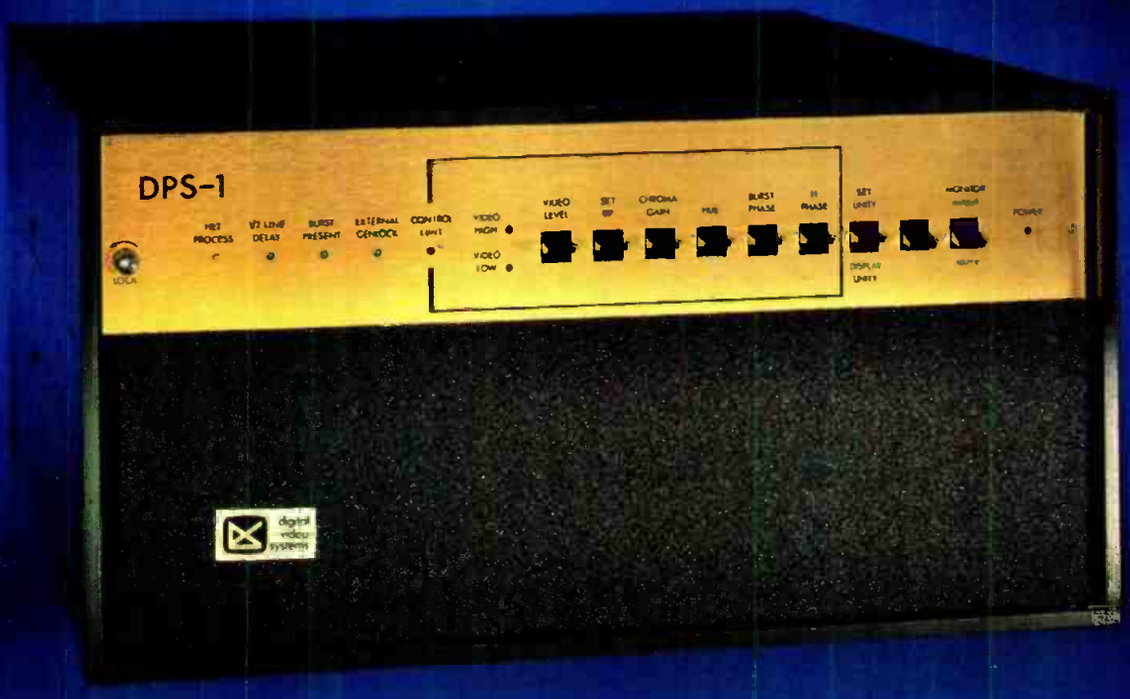

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Digital technology in broadcasting is already bringing new images to the American audience. As more digital equipment is applied to television and radio engineering, further innovations are imminent. BM/E wishes to thank EUE/Screen Gems, NY, for use of their digital television equipment in producing this month's cover.

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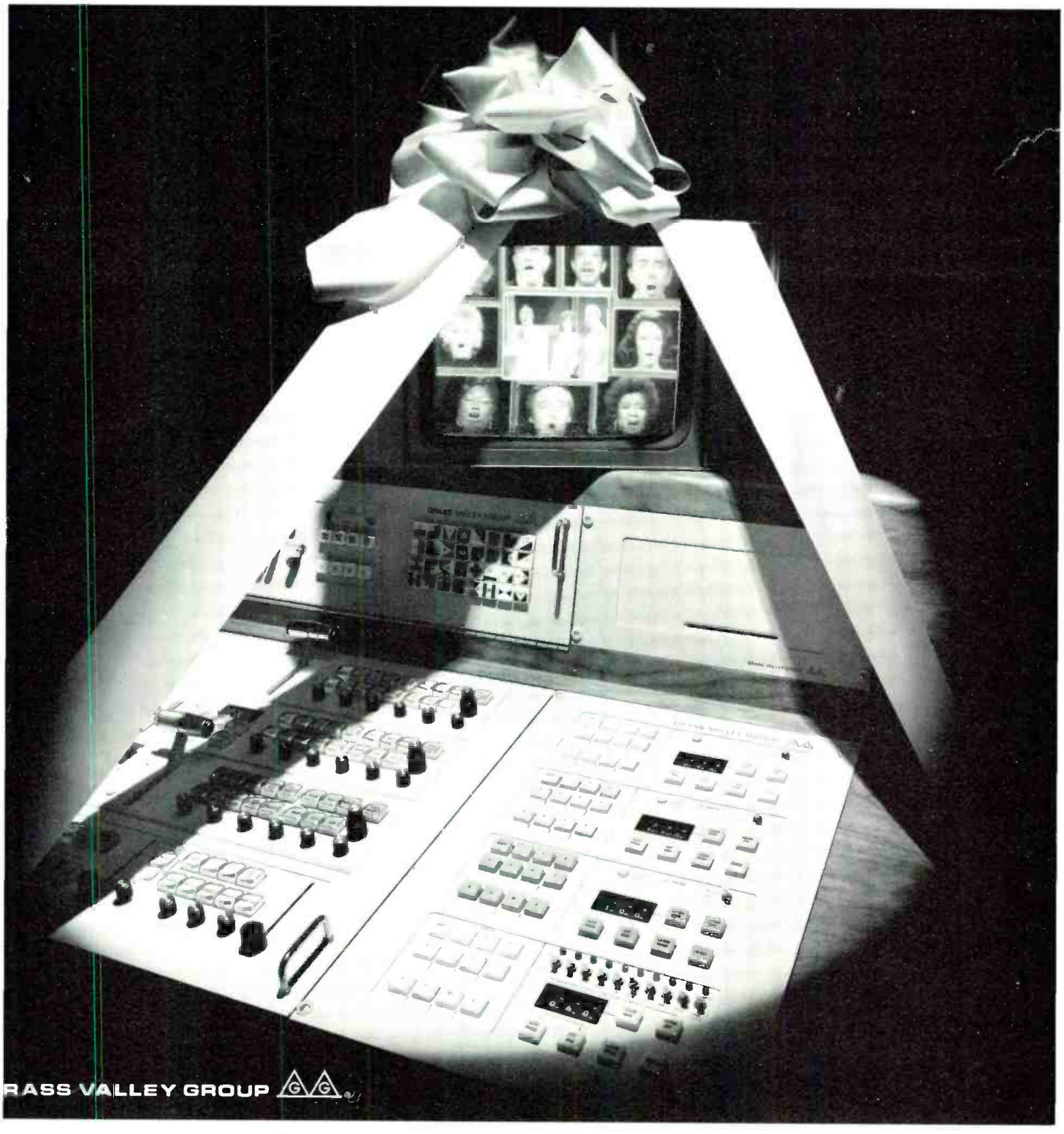

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BROADCAST INDUSTRY NEWS

FCC Grants Test Authority For AM Stereo Transmission

WSM, Nashville, and WGAR, Cleveland, have received authorization from the FCC to conduct over-the-air testing of the AM stereo system proposed by the Magnavox Consumer Electronics Co. Under the terms of the authorization, WSM and WGAR may announce the tests but may not use them for promotional purposes. During the test period, the two stations must comply with the requirements of Section 73.40 of the Commission's rules.

After completion, the two stations are to submit test results to the Commission for inclusion in the record of Docket 21313. It is expected that additional test authorizations will be granted to other proponents of AM stereo systems now under the Commission's consideration in Docket 21313.

Plans For 11th International Television Symposium Develop

Plans for the 11th International Television Symposium and Technical Exhibition continue to develop with the announcement last month by the symposium committee of topics to be discussed at the symposium and the names of more than 100 companies that have, so far, declared their intentions to present exhibits.

The Symposium and Technical Exhibition is scheduled to be held in Montreux, Switzerland, from May 27 to June 1, 1979. The event, which is held every two years, is expected to play host to more than 9000 persons intimately involved in international television, and more than 190 companies are expected to exhibit in the newly expanded convention facility.

The symposium committee, in an earlier announcement, explained that plans have been carefully drawn to insure than only the most important papers, on topics such as digital video, satellite distribution and broadcasting, cable television networks, and new uses of television receivers, be presented. Seventeen topic chairmen have been appointed to select a maximum of 45 papers from the hundred or more submitted. The symposium sessions have been designed so that "A" sessions provide the systems applications topics followed by round table discussions, and "B" sessions provide papers on hardware related to the systems discussed in "A" sessions. Scheduling of the sessions makes it possible for an attendee to follow all aspects of a topic without schedule conflicts.

Travel arrangements for interested persons going to Montreux from North America have been organized through Swissair. Air fare for persons making arrangements at least 45 days in advance of their expected departure day could cost as little as $440 roundtrip. Symposium officials recommend that interested parties contact Mr. Waldhorn at Swissair, 608 Fifth Avenue, New York, N.Y., telephone (212) 262-2041, or contact any Swissair office.

NEC's First U.S. Transmitter Airlifted To WNNE-TV Site

R. Dennis Fraser, corporate vice president and general manager of NEC's Broadcast Equipment Division, recently announced the purchase and installation of a 30 kW transmitter by WNNE-TV, channel 31, Hanover, N.H. NEC manufactures a full line of TV and radio transmitters that have been installed around the globe, but this is the company's first delivery in the U.S.

WNNE-TV's new transmitter was flown by helicopter from the foot of Mt. Ascutney to the 3320-ft. summit. Station owner Paul Taft said, "All the gear went together like clockwork, thanks to NEC factory assistance during assembly." The WNNE-TV staff was able to complete the FCC Performance Standards in two days. Taft commented, "Ease of operation and adaptability to remote control were important factors in choosing the NEC equipment for the hard-to-reach location."

CBS Submits Report To FCC Critical Of CP Antennas For TV

CBS submitted a report to the FCC in late December claiming that CP transmission technology for television could significantly increase the levels of both tropospheric and ionospheric cochannel interference on some channels throughout the U.S.

After a protracted battle before the FCC in 1976, the Commission authorized CP on a permissive basis. At that time, CBS had made it known that it opposed such authorization since it felt that insufficient testing had been done to fully assess the impact of circularly polarized transmissions.

Since the "permissive" CP ruling was issued, about 10 such CP installations have gone on the air (see *BM/E*, November, 1978). Now, however, the CBS report, "A Comparison of Cochannel Interference Effects with Circular Polarization in the Television Broadcast Service," purports to show, through the use of mathematical models and test data, that further adoption of CP systems could lead to serious deterioration in some stations' signal quality.

The report suggests that tests be continued on CP for a period of six months to a year in order to determine the effects of CP under tropospheric and ionospheric characteristics that vary with environmental conditions. CBS is willing, according to the report, to actively support and participate in any all-industry effort to perform the rec-

continued on page 8

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ommended tests before extensive implementation of CP has occurred.

FCC To Explore Deregulation Of Domestic Receive-Only Stations

The Commission has begun an inquiry to examine the costs and benefits of its domestic satellite receive-only earth station regulatory program in order to determine whether the present program can be improved or eliminated in light of the technical and policy changes that have been and will be occurring in satellite communications.

The FCC now requires a three-step process — frequency coordination, construction permit, and licensing — to be followed before putting a new station into operation. The Commission noted that frequency coordination, which assures that the station will not receive harmful interference, appeared to be the most time-consuming and perhaps the most expensive of the application procedures.

While the present regulatory program provides significant benefits, the Commission wishes to explore whether these benefits are worth the costs they impose upon both the applicant and the Commission. Possibly these benefits could be obtained at lower cost by modifying the present program. Alternatively, some users may prefer reduced benefits at lower cost.

Some of the matters on which the Commission would like comments include: the benefits and detriments of current policies; what changes should be made; should regulation distinguish between common carrier operated and non-common carrier operated receive only earth stations; and the extent to which international radio regulations affect the Commissions' flexibility to deregulate receive-only earth stations. At a later date, the Commission will release a comment and reply deadline.

More On AM Clear Channel And VHF Drop-In Proceedings

The Federal Communications Commission has adopted a further rule making notice in its ongoing AM clear channel proceeding by proposing to limit the coverage range of the existing 25 Class I-A clear channel stations in order to make room for additional AM stations. If adopted, the Commission's proposal would make room for an estimated 80 to 100 new unlimited-time stations in the Class I-A channels and some 25 additional unlimited-time stations that could be added to adjacent channels.

In opening the way for additional station assignments, the Commission hopes to settle the old issue of higher power for the dominant stations by maintaining the current ceiling of 50 kW power, and to look to additional AM and FM stations as the preferable means of providing for today's radio service needs, among the most prominent of which are enhancement of opportunities for minority ownership and operation of stations.

Chairman Ferris has suggested that new assignments be handled through either an auction or a lottery. The Commission proposes to accept applications for unlimited time facilities on the 25 clear channels which would serve either of the purposes set out in section 73.37(e)(2) of the rules, or merit waiver of those threshold requirements because they would help to remedy the dearth of minority-owned stations.

Section 73.37(e)(2) would permit the filing of applications which assure: that at least 25 percent of the area or population which would receive interference-free primary service at night from the

continued on page 10

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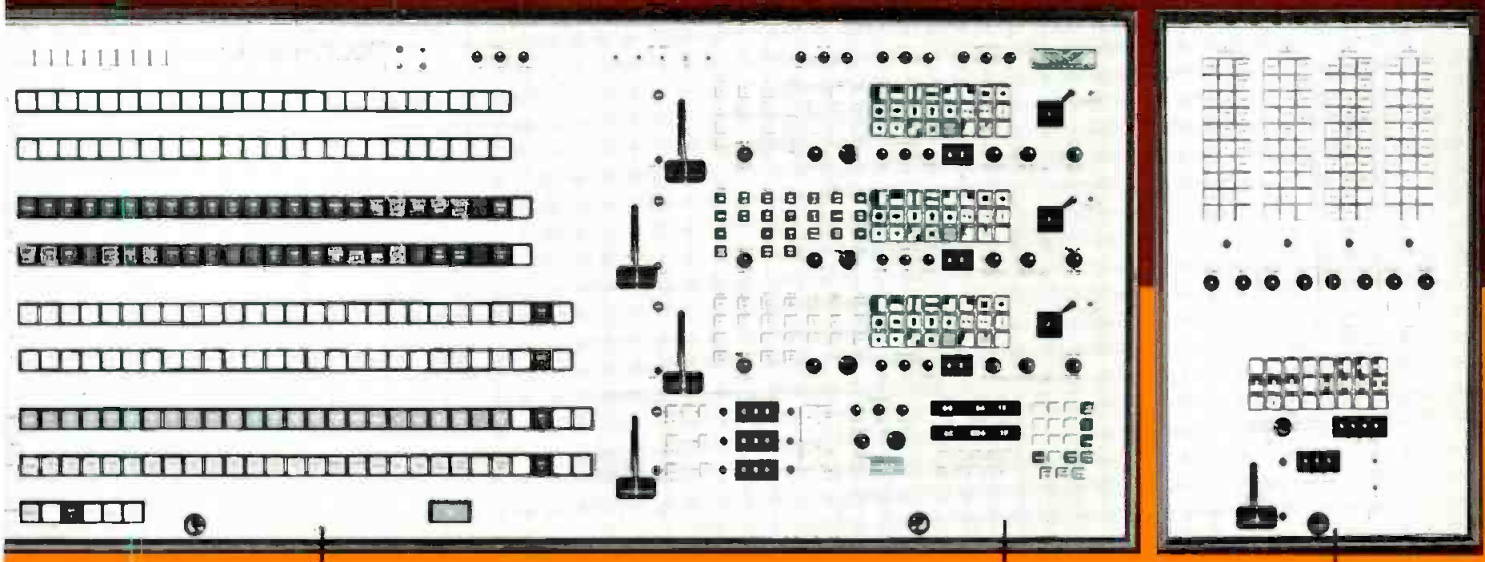

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proposed station did not already receive such service from an authorized AM station or an authorized FM station; that the proposed station would provide the community designated in the application with a first or second authorized nighttime aural transmission service, and no FM channel is available for use in the community; or that at least 20 percent of the area or the population of the community of license receives fewer than two aural services at night from authorized stations and no FM channel is available for use in the community.

In recognition of the absence of minority-owned broadcast stations and the deficiency that this condition represents in fulfilling the public interest objectives of the nation's broadcast service, the Commission said it would give attentive consideration to the merits of waiver requests by minority applicants. The Commission said that it believed this waiver process to be the method most conducive to advancing the goal of enhanced minority ownership and operation of broadcast stations, while avoiding exclusions of non-minority applicants.

Under the Commission's proposals, the clear channel stations would have their broadcast areas protected only within a certain radius — either within the 750-mile radius of their sky waves or within the 150-mile radius of their ground waves. Comments on the proposed 750- or 150-mile limitations are due April 9, 1979.

On the subject of VHF drop-ins, the FCC has instructed its staff to develop proposals for studies on the effects of terrain shielding and directionalized antennas on predicted interference losses caused by such drop-in assignments. At the same December meeting where the Broadcast Bureau argued for the clear channel rule making, they also argued to deny four VHF drop-ins on the grounds that they would hurt UHF and cause considerable interference in all proposed markets (except Salt Lake City).

Commissioners Ferris, Fogarty, Washburn, and Brown argued that the staff research did not convince them of any adverse impact. Specifically noting mountainous terrain between Johnstown, Pa., where channel eight is proposed, and Lancaster, Pa., which has channel eight, WGAL, Washburn said that the staff had not gone out to measure interference on the mountains, but rather had relied on computers in Boulder for the information.

As a consequence of the meeting, the bureau was instructed to come back in January with a proposal to make such measurements in channel eight fringe areas and to consider the impact of home directional antennas in reducing interference.

A Portable Earth Station: The First Of Its Kind

An application for the "first of its kind" portable high performance satellite earth station transmitter/receiver has been filed with the FCC by United Video, Inc. (UVI), Tulsa, Okla.

The innovative equipment will make video broadcasting available via satellite from any location to any other location and will allow producing stations or companies to telecast an event live anywhere in the world that is accessible by air, rail, or semi-trailer truck.

The portable system, the first of several to be built by UVI and contracted by Collins Division of Rockwell International, will be available to all types of networks as a truly portable high quality and economical satellite transmit/receive device. The basic system will be self-contained with collapsible dish and microwave tower. It is available in three options, depending on the user's

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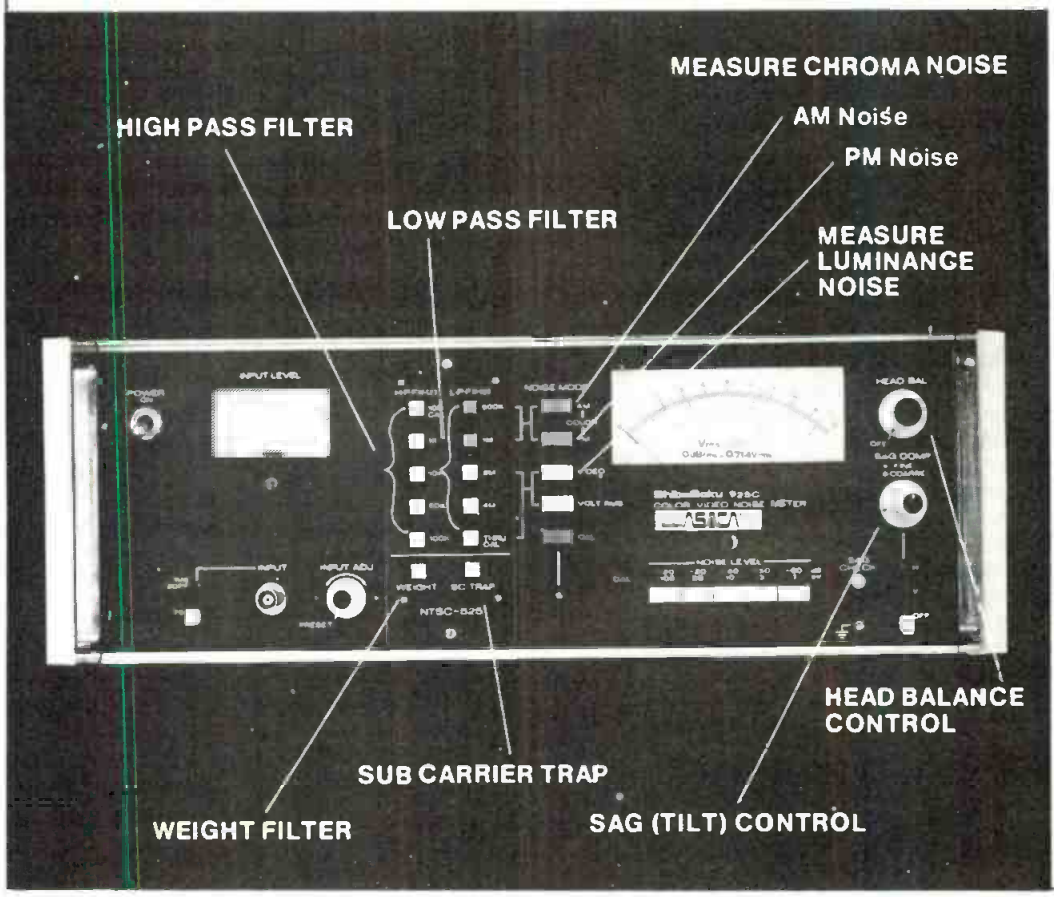

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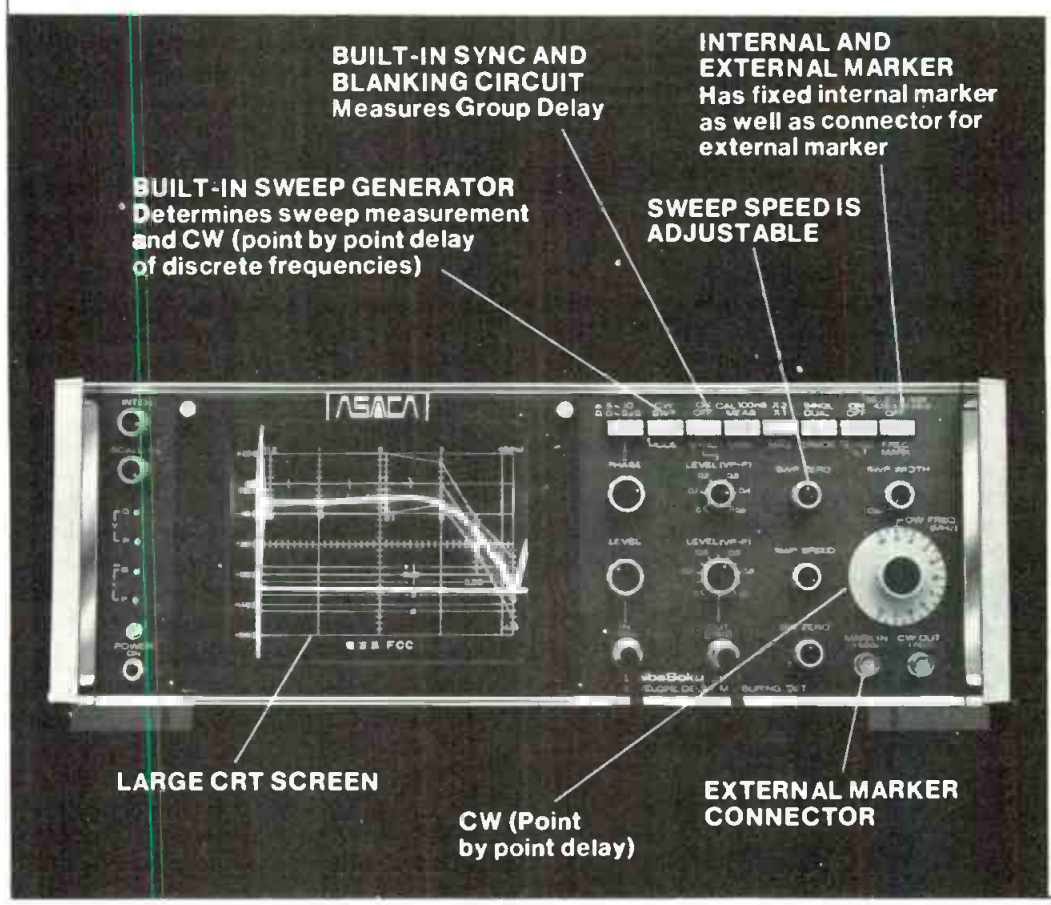

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needs.

The first option is a satellite uplink station for use in the continental U.S., equipped with a six-meter antenna and fiberglass shelter for electronics mounted on a flatbed trailer. All primary systems are redundant, including transmitters, high power amplifiers, low noise preamplifiers, and frequency agile receivers. The system also includes telephones (fixed and mobile), lighting, climate control equipment, all tools, and test equipment to monitor performance. Multiple program audio channels (up to three) will also be available.

The second option, similar to the first, is configured to be transportable by air, ship, or rail. This option also utilizes developments in antenna technology which will make the six-meter antenna compatible with all satellites in the 4/6 GHz frequency bands.

The third option is a redundant, frequency agile, duplex terrestrial microwave system for use in areas where the station cannot be located adjacent to a remote event because of frequency congestion.

UVI executive vice president Roy Bliss said that the package is "turnkey," and that his company will handle everything from transportation to turn-on and operation, including all frequency coordination, interference studies, and FCC or Intelsat approvals for each new location. Bliss also commented, "With enough of these systems, we can be practically anywhere in the nation on a 12-hour notice without the client every having to hassle arrangements with several different carriers or trying to figure out the most economical method to broadcast from a specific location." Bliss said that his company has been studying the need for such a system for two years, and a combination of upgraded technology and "very encouraging" conversations with major and special interest networks provided the incentive to develop the venture. Rates for the equipment and personnel package will vary greatly between one-time, one-location charges and multi-year exclusive use contracts.

Third Class License Exams Dropped

In a major deregulatory move in December, the FCC decided to no longer require tens of thousands of individuals who want to perform operations at AM and FM stations to take FCC examinations. The Commission's staff estimates that this move will save the FCC up to 17 person-years of effort in its field offices.

In the amendment to Part 13 of the rules, to become effective February 9, 1979, the Commission said anyone holding any class of commercial radio operator license, including the Restricted Radiotelephone Operator Permit, would be allowed to perform routine technical operations of all FM and virtually all AM stations.

Previously, most operators needed at least third-class permits endorsed for station functions, which could be obtained only after passing an FCC-administered examination. With the deletion of the broadcast endorsement, the Commission said, examinations would no longer be required and the endorsement would not appear on renewed third class permits. The FCC noted that this change did not apply to AM stations having a critical directional antenna array.

FCC Acts To Improve UHF

The FCC has issued a further interpretation of its antenna requirements for TV receivers which spells out a third condition under which a common UHF/VHF TV receiver antenna will meet the re-

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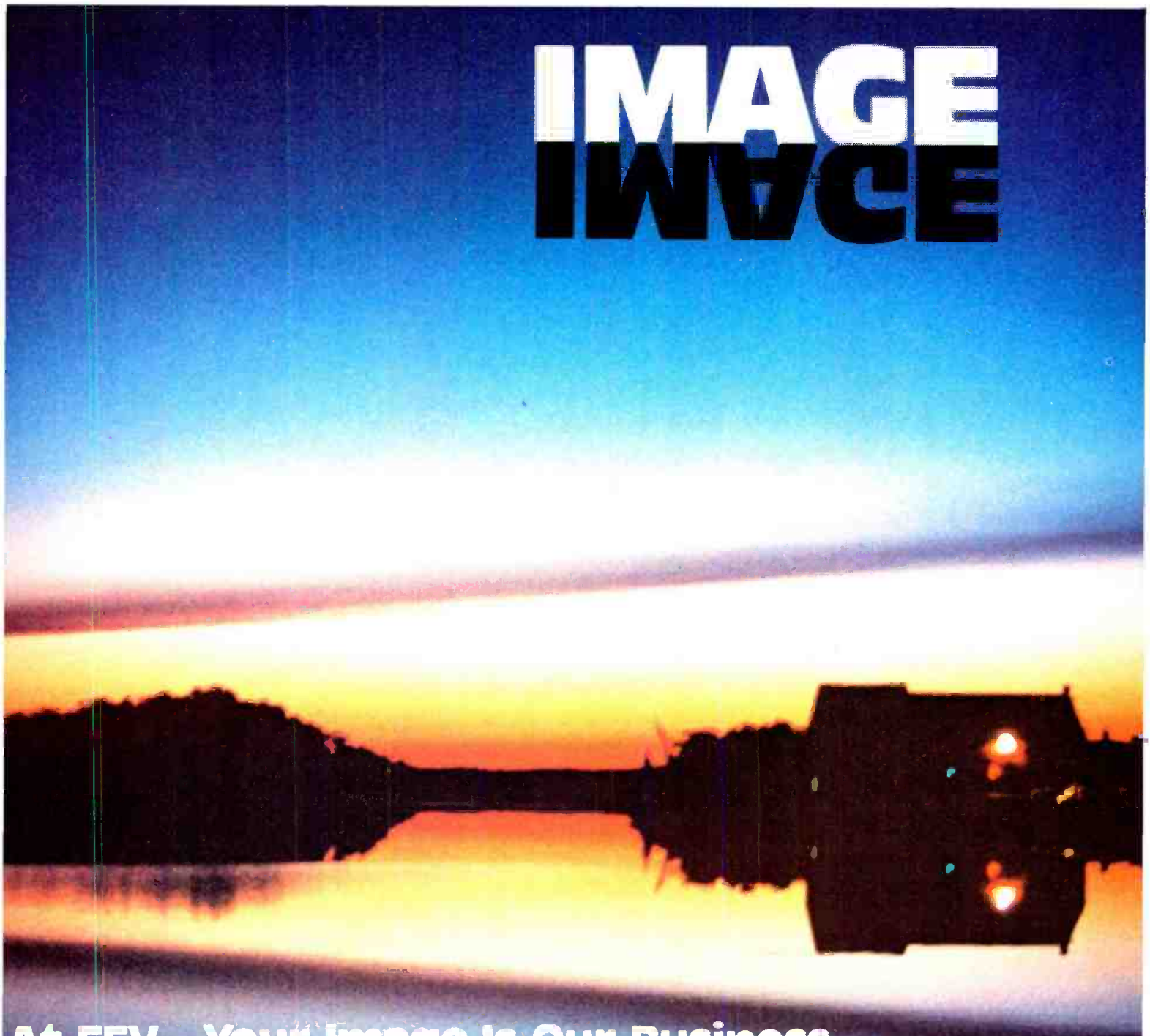
IMAGE



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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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quirements of Section 15.65(b).

The condition permits the use of a splitter external to the TV receiver provided that: (1) the splitter is permanently connected to the antenna terminals or to the terminals of the transmission line from the antenna; (2) the splitter is provided with four lugs designed to fit under the four screw terminals conventionally provided as the antenna terminals of the receiver and is arranged so that it can be connected in only one way; and (3) the splitter is arranged so that it is not possible to leave the UHF antenna terminals unconnected. Section 15.65(b) applies to all TV receivers manufactured after July 15, 1978.

The Commission has also recently terminated its inquiry to determine ways to improve the legibility of on-the-knob UHF channel displays and is concurrently adopting two inquiry notices that together will provide a more comprehensive framework for investigation of the question of UHF channel readout.

In General Docket No. 78-391 (an inquiry on improvements to UHF TV reception), the Commission will study the effect of the UHF channel readout on UHF viewing. In General Docket No. 78-392 (technical improvements to television receivers and certain transmission standards), the Commission will explore the possibility of requiring electronic tuning.

General Docket 78-392 will also inquire into the most economical way to improve television reception and to increase the use of the radio spectrum. The improvements under consideration in this proceeding have the potential for providing better reception of existing UHF TV signals and may permit the reduction of the UHF "taboos" (areas where UHF TV assignments are restricted because of interference problems). Comments are due by July 1, 1979.

In yet another action, the FCC has denied a petition by the Consumer Electronic Group of the Electronic Industries Association (EIA/CEG) for reconsideration of the Commission's August 1 order requiring reduction of the maximum UHF noise figure for television receivers from the present 18 dB down to 14 dB for all new model sets beginning October 1, 1979, and a further reduction to 12 dB effective October 1, 1982.

EIA/CEG argued that the imposition of a 14 dB limit on new models was arbitrary in view of the Commission's expressed intention to adopt new procedures for measuring TV receivers' noise figures, and that receiver man-

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Now we have two cameras that are even better: the Ikegami HL-77 and HL-37. In the HL-77 we've done away with the 26½-lb backpack and tucked its functions inside the camera body—and still reduced the HL-77's weight (less lens, but with viewfinder) to a pound less than the HL-35 head alone. The HL-77 weighs in at 13½ lb. In the HL-37 we've split the package so the head weight (without lens) is even less, and the shoulder-sling process pack comes to 6½ lb.

Both cameras use three ⅔-inch Plumbicon* pickup tubes, and f/1.4 prism optics. The viewfinder is 1½ inches. And everything else that made the HL-33 and HL-35 the real winners at the conventions is still there—just smaller and lighter.

Both the new HL-77 (the *Ike*) and the HL-37 (the *Mini-mate*) produce broadcast-quality coverage with good color, brightness, stability, high sensitivity even in low light, and reduced lag due to bias light. Both can feed video and audio to a local or remote video tape recorder, or via microwave transmitter receiver for remote pickup.

For microwave transmission from our HL-33 and HL-35 ENG cameras to a remote pickup point, we offer the Ikegami PF71 portable microwave relay system. This backpack unit transmits the video signal on the 13-GHz microwave band; audio and command signals on the 950-MHz uhf band. Maximum range is about 1800 feet with omni antenna, 3700 feet with 60-degree horn, two miles with a 20-degree horn.

For the sound portion of the program, the Ikegami PFM-091 wireless microphone system is used to transmit program audio and receive intercom audio. It includes a compact transmitter and receiver worn on the belt, a miniature condenser microphone, and a small headset/whip antenna.

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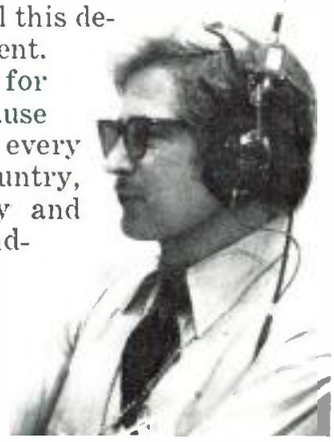

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ufacturers should be allowed one full year after adoption of such measurement procedures to comply with the 14 dB limit.

EIA/CEG objected to the ruling and argued, among other points, that the 12 dB limit was not technologically feasible and that it was not equitable from a systems standpoint, in that consideration should be given to increasing the field strength of UHF broadcasters.

The Commission said that it had noted in its report and order in this proceeding that lowering the maximum noise figure below 14 dB without reducing the selectivity would require significant new engineering work. Because of its recognition for the need of this new work, the Commission said it did not order an immediate lowering of the noise figure to 12 dB. The Commission emphasized that the 12 dB limit was essentially based on its forecast of future developments and added that in a fast-paced field such as electronics, it could reasonably expect to see improved noise figure performance without reducing selectivity — if design engineers concentrate on this objective.

NAB To Establish Investment Fund For Minorities

The National Association of Broadcasters' Task Force on Minority Ownership is seeking to establish an investment fund to assist minorities in purchasing broadcast facilities. Task Force chairman Donald A. Thurston, president of Berkshire Broadcasting Co., North Adams, Mass., stated, "By combining equity and guarantee commitments, the fund could generate transactions in excess of $300 million."

Contributions will be solicited from individuals and corporations and will be supplemented by matching funds from the Small Business Administration. Donations will be tax deductible and contributors will receive full insulation from FCC multiple ownership rules. Two types of contributions will be solicited, direct (cash) and guarantee. Cash contributions will be for immediate use as equity or low cost loans, and a guarantee would be payable only in the event of a default by a minority firm whose loan had been guaranteed by the trust.

Thurston, who is also chairman of NAB's board of directors, said, "To assure the economic viability of stations owned by minorities, the fund also plans to provide training programs, technical assistance, and other supportive activities." The fund will be under the direction of a nine-member board of

trustees to be appointed by NAB's executive committee.

New Satellite TV Service For Hawaii

Satellink, Inc., has installed a ten-meter earth station approximately 18 miles from downtown Honolulu, and three commercial TV network affiliates in Hawaii, KGMB-TV (CBS), KHON-TV (NBC), and KITV (ABC), have installed a microwave relay system from the earth station site to their Honolulu studios. All three stations will use Satellink for daily importation of network news plus numerous post-season football telecasts and special events.

Robert N. Wold, president of Satellink, said the new enterprise will enable Hawaii's TV broadcasters to collectively save at least $700,000 in the coming year, compared to current costs of utilizing satellite facilities leased by the Hawaiian Telephone Co. from international carriers. "As a result of the substantial cost saving," Wold said, "the three stations will undoubtedly increase the amount of satellite TV programming." Currently, each station expects to handle 333 hours of programming annually.

Wold said that the new earth station is equipped to receive as many as four TV programs simultaneously. During the initial months of operation, Satellink will be aimed exclusively at Western Union's Westar II satellite, although the earth station can be reoriented, when desired, to receive signals from other domestic communications satellites.

In contrast to the current telephone company capability, which is limited to one signal each from San Francisco and New York, service via Westar II can be uplinked at New York, Atlanta, Chicago, Buffalo, Dallas, Los Angeles, San Francisco, and Seattle.

News Briefs

In the first five-week period in its fourth quarter survey of four major markets, **TRAC-7** reported radio listening levels higher than those generated by the weekly diary. The reported increase reflected late afternoon and evening dayparts and male and female audiences under 25 years of age . . . . The **NRBA has filed comments with the FCC** in support of the Commission's proposal to exempt licensees from Fairness Doctrine requirements and personal attack rules resulting from "uses" by legally qualified political candidates as outlined in Section 315 of the Communications Act. NRBA argued that due to licensees' lack of control over political broadcasts, they should have "no obli-

continued on page 20

gations due to material broadcast during such a section 315 'use'."

The **Broadcasters' Rally Against Overregulation,** organized by the **NRBA** and scheduled to take place in Washington on February 28, has received full support from the **NAB.** Presidents of state broadcasting associations plan to be on hand for the rally and are working to bring sizeable delegations with them . . . . President Carter has proposed **a new shield law** designed to protect reporters, scholars, and their sources from searches by federal, state, and local law enforcement officers. If adopted, the law will, in effect, reverse last May's Supreme Court ruling on newsroom searches. The law will include exceptions in cases where a search is necessary to prevent serious injury to an individual, or when a person with protected information is believed to have committed a crime and the materials would serve as evidence.

NAB president Vincent Wasilewski criticized the FTC's intrusion into children's TV advertising and possible mandatory wording in ads for over-the-counter drugs and antacid products. Addressing the Advertising Club of Metropolitan Washington, D.C., Wasilewski said, "After many years of doubt and confusion, the constitutionally protected status of truthful commerical speech is beginning to be confirmed by the Supreme Court . . . Ultimately, the right of advertisers to communicate freely with the public — in truthful and accurate terms that it will understand — will be upheld, even if we must see it through to the Supreme Court." Wasilewski emphasized that people's rights are affected by unreasonable restrictions involving our free enterprise system, our advertising structure, or our media.

NAB has also objected to the FCC's inquiry into the airing of PSAs, which is a result of the Public Media Center's petition to the FCC to require broadcasters to air more local public service announcements. NAB noted that broadcasters had to spend hours tabulating data to answer the FCC's questions in the proceeding that ensued, and now the Commission will have to spend hours analyzing the answers. NAB suggested that the FCC should view future proceedings, inquiries, and rule makings with consideration to whether the value of the benefits obtained by the proceeding will exceed the value of the time and money spent in gathering the information . . . . NAB has submitted a study to the FCC supporting the assumption that as the number of viewers declines, so does a television station's revenue. This conclusion refutes the NCTA's contention that there is no direct audience/revenue relationship.

A one-day **Digital Microwave Transmission Systems Seminar** will be held at Princeton University on February 27. Contact Bernard DeMarinis, 201-747-9303 . . . . The fifth annual Los Angeles **Videoshow,** sponsored by *Educational & Industrial Television* magazine, will be held May 1 to 3. Contact Ellen Parker, 203-743-2120 . . . . **Gerald R. Ford** will deliver the keynote address at **Visions '79, the National Cable Television Association's 28th Annual Convention and Exhibition,** to be held in Las Vegas, May 20 to 23, 1979. The convention will spotlight the rapidly growing cable/satellite network. For further information, contact NCTA, 918 16 Street N.W., Washington, D.C. 20006.

Thomas E. Bolger, chairman of NAB's Television Board of Directors and president of **WMTV,** Madison, Wisc., has appointed a committee to coordinate plans for the upcoming NAB public affairs meeting to be held in Washington at a date to be announced in the future. **BM/E**

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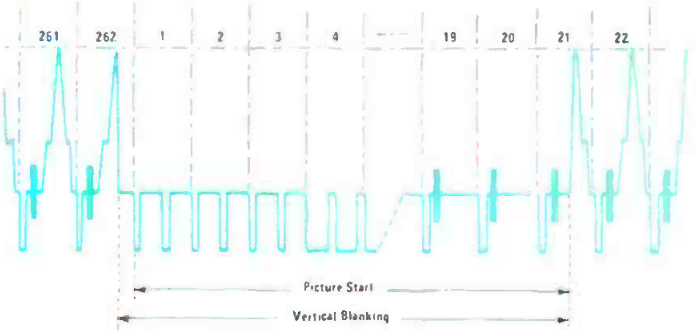

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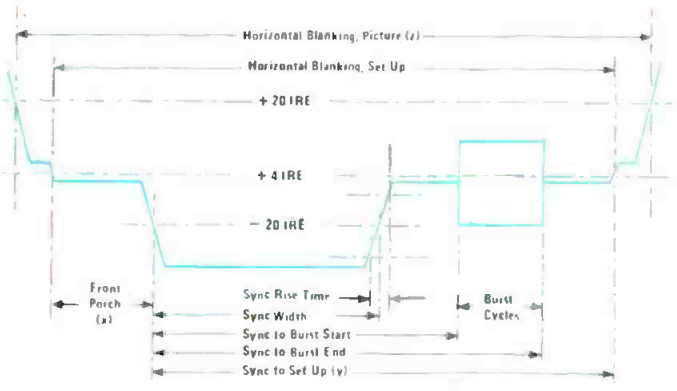

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Picture Blanking (+20 IRE), (z)
Front Porch, (x)
Sync Width
Sync to Burst Start
Sync to Burst End
Sync to Set-Up, (y)
Burst Length in cycles
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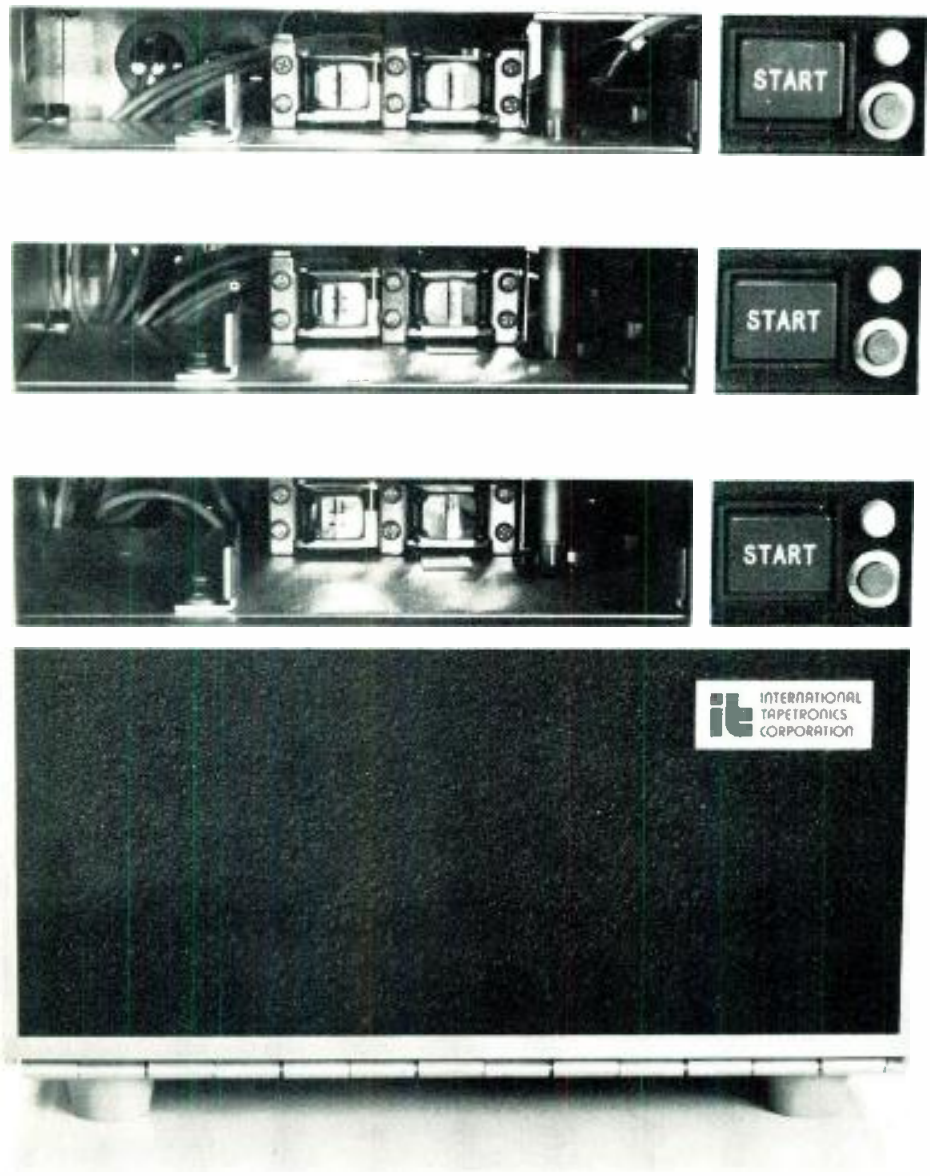

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RADIO

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There Are A Number Of Ways To Make News Pay Off — Here Are Some Of Them

A RADIO NEWS PROGRAM can succeed by selling air time, by building the station's audience, by serving the community, or perhaps in other ways. Most successful stations have put news to work in two or more of these ways.

BM/E talked with managers and news directors at a number of radio stations to find out what combination of news functions each is using and how the management chose that particular treatment of the news. This month we report on three of those stations; others will follow in future issues. Making a proper use of news has high priority for any radio management because skillfully produced news is now one of the most essential and most valuable products of a radio broadcaster.

Small town gets prize-winning news

WLON, Lincolntown, N.C., is a 1000-watt daytimer in a city of 5000, with its primary market the county of about 40,000. It is the only radio station in the market. Charlotte is about 35 miles southeast, and the radio and television stations of that city cover the area well.

But the big-city stations, as in hundreds of similar situations in the U.S., do not cover local news thoroughly. The management of WLON decided in 1967 that a local news program was needed and that it would help the station's business. As the only radio outlet in the county, WLON felt both the responsibility and the opportunity.

After a series of news directors, none of whom made a permanent go of it, WLON in 1976 hired Larry Seagle, who *has* made the program a success and a model for other small-town radio stations. In 1978 the station, an AP subscriber, won an AP award in its class for "best handling of local news."

The station's format is contemporary music. News comes on starting at 6:00 a.m. and runs for five to seven minutes every half-hour until 8:30 a.m. (drive time). From then until midday, the AP hourly newscast is used. At noon and 12:30 p.m. there are 10-minute newscasts, then AP until 4:00 p.m. At 4:00 and 5:00 p.m. there are 15-minute local roundups. That ends the news day, with the station going off the air shortly thereafter. Manager Jack Brown reports that of the total news production, some 50 percent is local, 25 percent is state, and 25 percent is AP international and national.

Seagle has established a strong "actuality" character for the local news: whenever possible he goes directly to the newsmaker with a portable tape recorder and brings the tape back for airing. He is constantly on the go to cover town and county. When there are two or more fast breaking events at one time, other members of the staff back him up in the field.

As any news gatherer in a small town must, he maintains close relations with the town government, the police department, the churches, the schools, etc. He has persuaded large numbers of local citizens to think of him instantly whenever they are involved in, or know about, a news event. This is positive for the station's identification in the community.

Does that identification extend to the listening audience in general? Has the

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All-News Is A Going Business

The series on news handling that begins in this month's column will consider stations that use news effectively as part of a mix that also includes music and other elements. The all-news station has some rules all its own; in later issues *BM/E* will study it. The number of such stations seems to have recently stabilized at a little over 100, most of them in large cities. Thus, all-news is a restricted class. When conditions are right, however, a station can do very well indeed with all-news, and the format is still attracting recruits (KRLD in Dallas, for example). *BM/E* will analyze all-news for lessons valuable to all stations.

Radio Programming

local news helped make them loyal to the station? The answers seem to be "yes," which is most important to WLON's selling job. Without regular rating from Arbitron, local advertisers go by the general feeling in the community about the station and the experiences of other advertisers.

Wayne Howard, program director, described a market survey made for the station by students at nearby Gaston College (where he also teaches a course in radio). Given the names of WLON's news director and those of anchormen and weathermen of the Charlotte TV and radio stations, respondents in the survey identified WLON's Seagle more often than any of the others. The station's news programs are certainly being listened to and are clearly building the numbers and good will of the audience. That is success for a news program.

Smart news competes for the big-city listener

WHDH, Boston, is a long-established 50 kW "clear" operating with great success in a highly competitive big-city market. The music format is "contemporary," with a tight playlist that extends to "soft" disco. The equipment for putting the music on the air is all of top quality; WHDH recently installed new consoles, all of them stereo in anticipation of AM stereo. The improvements in signal quality brought about with new audio equipment over the last couple of years have stirred widespread approval among the listening public.

A large-scale news program, with heavy emphasis on live local news, backs up the music in the maintenance of audience appeal. There is a mobile van with complete studio equipment for location shows away from the studio. Leased aircraft send in traffic reports during morning and evening drive times. Reporters on foot have hand-carried transceivers to connect them directly to the studio or to get through with the van acting as relay. All these units, connected via 450 MHz radio, allow live reports to be put on the air directly with studio quality or to be recorded in the studio for editing and later airing.

News director Dave Cooke outlined for *BM/E* the general schedule of news handling during the day. At 5:30 a.m. there is a 35-minute news show, including both local and world news, carefully edited in the WHDH newsroom. This opening show has substantially improved the station's ratings for the morning drive time, Cooke says — before WHDH put it on the air, the station had a slump in audience at that period. Through the rest of the drive time there are two newscasts an hour, five to 10 minutes each (depending on the breaks in the news). Up to midday, there is a three and a half-minute newscast on the hour, and at noon a six-minute summary. Their studies, says Cooke, have convinced them that the midday period, between morning and afternoon drive time and especially around noon, is not a time of strong listener interest in news. The pace is picked up again during afternoon drive time, and then at night goes back to on-the-hour segments of three and a half to five minutes each.

In addition to careful scheduling, Cooke and his team put large effort into making the news comprehensive, varied, and fast-paced. Their own local "live" material, with actualities of various kinds, is edited into segments that also include data and actualities from AP and UPI for national and international coverage.

Cooke is presently putting into operation a new editing room as the central facility for producing the newscasts. It is built around a large central table at which all editors and reporters working on newscasts sit. In a deck above their heads, but within easy reach, are tape machines, cart machines, scanners tuned to significant local frequencies, and supplies. Adjoining this "city desk" are tape editing booths with open-reel and cassette equipment. At the table, telephones can be punched into connnection with various dedicated lines to sources of important news around the city.

To use news in such a competitive way in a major city would be impossible without WHDH's heavy investment in equipment and highly skilled news personnel. The investment, in the view of the station's management, has been fully justified by the station's durable grasp on the top of the Boston audience ratings.

Community service needs an all-out local news program

At WELI in New Haven, Conn., general manager Frank Moore has gone all out to make his station as valuable as possible to the community. This 5 kW day-and-night AM operation concentrates on "upbeat" MOR music and has found an excellent response in the southern Connecticut/Long Island area it serves. But listeners in this heavily populated area have literally scores of other choices on the radio dial. WELI has built a loyal following in large part by identifying the station with local issues that matter strongly to the station's potential listeners.

One recent example: when the Department of Commerce announced that an NOAA weather transmitter in the area would be closed down as an

economy measure, WELI collected 22,000 signatures on a petition pointing out the tremendous value for the community of this fast local weather prediction service. WELI's management, along with other community leaders, took the petition to the assistant secretary of commerce, and the last word was that the radio weather service would be saved. WELI depends on the NOAA station for much of its own local weather news.

Another example that suggests the variety of coverage: the station broadcast live a series of public hearings at the police department at which citizens expressed unhappiness about possibly illegal police wiretaps. The hearings brought some dramatic confrontations and attracted a very large audience to WELI.

Moore summarizes it by saying his station must be "a mirror of the needs and thinking of south central Connecticut." One principal way the station keeps the road open for this is with a nightly telephone call-in program, running from 6:00 p.m. to 1:00 a.m., with listeners expressing via phone their opinions, problems, and suggestions, and station personnel replying. Many important issues turn up during these direct exchanges with the public.

WELI's handling of news is a vital element of its "community" policy. Every newscast is an "adjunct to that policy," Moore says. Bill O'Sullivan, news director, told *BM/E* about the daily scheduling of news. The station has two mobile vans with UHF radio to get live reports into the studio. The mobile equipment is used for a wide variety of remote originations: an example was coverage of a recent explosion in an apartment house in the city, which included 20 live reports from the scene with interviews from residents, firemen, police, and city officials. Regular sources of news, like the police department and City Hall, are continuously monitored. Reporters on the beat can use the 450 MHz radio or telephone lines to get reports in.

At the station there are always at least two news staffers on duty to write and edit newscasts. For state news outside of the city area, WELI uses the Connecticut State Network, an association of stations throughout the state which exchange news material.

The management's campaign to make WELI the source for "everything anyone needs to know in the area" started in 1971, when the present owners bought the station. A major move was the raising of news coverage from a few hours to 25 hours a week. The campaign has succeeded in establishing the community position of the station, and also in lifting its business status. It is a case in which service and profit come in the same package. **BM/E**

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That is the situation of James H. Joynt, owner of KYKR in Port Arthur, Texas, who has recently created a new syndication operation he calls Automated Music Unlimited. KYKR is succeeding handsomely in a highly competitive radio market (18 stations) with its mixture of old and new country music, put together with a skill that has won the approval of a large segment of the audience. Joynt decided somewhat over a year ago that his programming could be duplicated and distributed to stations in small markets at rates that small-market managers would find feasible and attractive.

Consequently, he and his staff have assembled recorded programming on reel-to-reel tape, arranged in sequences for effective and attractive variety and "air flow." Each 10½-inch reel holds 30 cuts of music. A subscriber gets music in three categories, all in stereo. There is an initial delivery of 30 reels of "gold," country hits more than two years old, and 12 reels of "recurrents," music less than two years old, off the hit lists but still popular. Each week thereafter will follow two new reels of current country hits. The subscriber sends back his two reels of currents when he gets the new ones. The current hits include voice parts supplied by Automated, but the gold and the recurrents are unannounced.

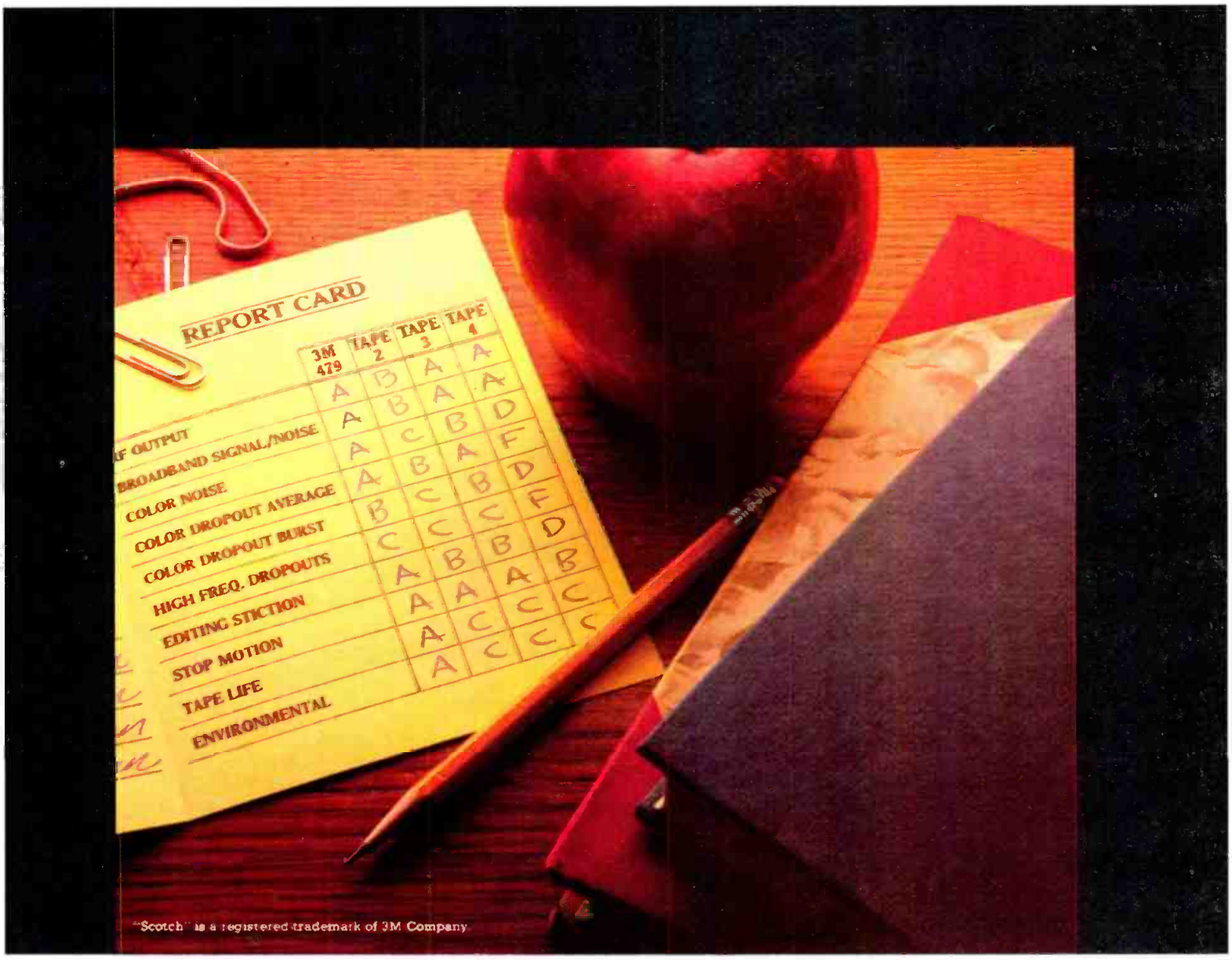
The music is designed for easy use on automation systems that include three to four reel-to-reel machines. But the user can do it "live" if he wants to. Joynt says that he will not dictate to a station management a minute-by-minute plan of action, but prefers to cooperate with the management in finding the best ways to do things. Moreover, if the management is interested, he will simply sell the music at $50 a reel and let the buyer use it in any way that appeals to him.

The regular syndication service will cost about $300 a month. Joynt sees this as attractive for small-market managements who want "successful" music but cannot afford the fees two or three times as large charged by many other syndicators. His service can be comparatively inexpensive because the major planning and assembly are done for KYKR's on-air programming. The station has both AM and FM transmitters, the AM being a 1 kW daytimer and the FM a 100 kW 24-hour operation. They have been simulcasting during the day, but Joynt will initiate a change in the AM program in coming months, with the FM continuing to use the developed country music.

Thus, Automated Music will continue to have the benefit of KYKR's program development, and can take on syndication subscribers gradually with little additional effort. The FM station is live during the day and automated from 7:00 p.m. to 6:00 a.m. (using an SMC DP-1 automation system); the programming is ready for broadcast either way.

Joynt's career in radio goes back more than ten years. He started on the engineering side, moving over to programming and then to management. Also central in the operation is Bart Evans, music director of KYKR, who collaborates with Joynt in the assembly of the programs and is the "voice" on the reels of current country hits. Evans has had a long career in radio as an announcer and programmer. Joynt holds that the skillful DJ-talk supplied by Evans is another element that the small-market station could not afford to buy on its own.

Joynt says he will not mount a major promotion campaign intended to bring in ten or 20 subscribers before the end of the year. He prefers to talk things over in a relaxed way with any small-market manager who gets in touch. If, say, five decide to join up, he can take care of them well; if most of them succeed with the format, he will later enlarge his production capacities to get ready for the additional stations that success attracts. **BM/E**



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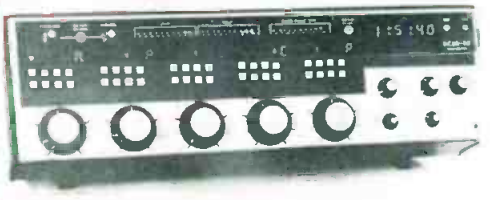

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NEW

PORTABLE CONSOLE. P5M — A full 5 mixe 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 channels equiped with Q switch & the first channels provide muting. A folding stand is pa 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 an distortion of 0.3%. Compression/limiting rang of 35dB and a slope of 50:1. 9¾" W x 9½" x 3½" H. Price — $545.

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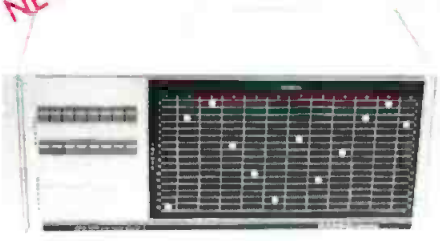

IDIO ROUTER/AMPLIFIER ARA-1612. The st versatile switcher on the market. Plug in ds for up to 16 inputs & 12 outputs. Each in- has an amplifier and level adjust for atten- tion and up to 17dB of gain. Output cards ture dual bal. 600 Ohm outputs, momentary D coded contrals (may be slaved from other ations), LED output status lights show thru front panel, and on-board mono/stereo select itch. A smoked plexiglass front panel allows operator to tell the status of any output. Also the front panel are 2 rows of silent momentary ntact switches. One row for output selection & e row for input select. Contact RAMKO for fur- r info. and specs. Price — $1,099 to $2,296.

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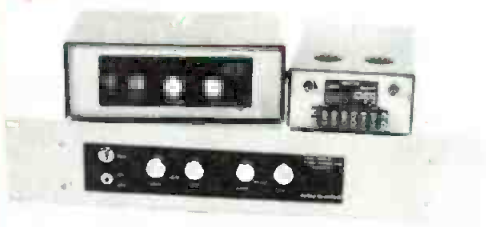
NEW



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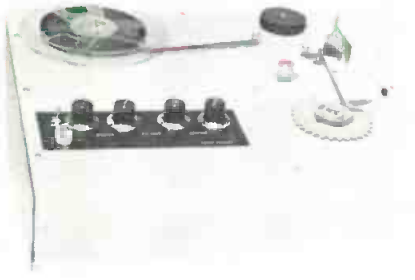

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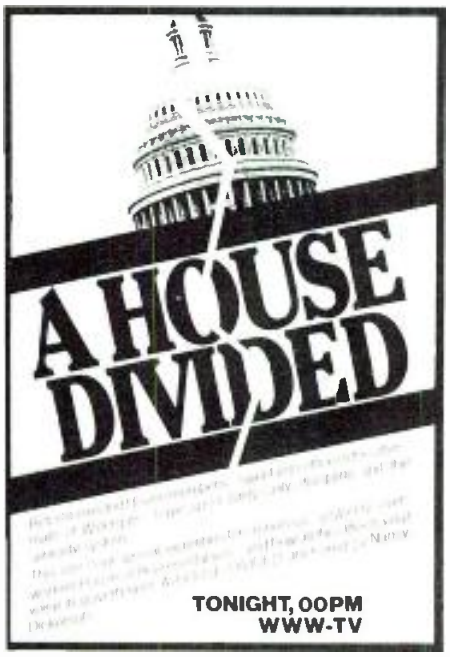
Capital Cities Productions: Groups Are Producing The Quality Programming Agencies Say Is So Hard To Find

N THE CALM BETWEEN the battles for ratings points there is room for what has come to be called "quality programming." Quality programming, in the common wisdom, means programming that a broadcaster can be justly proud of before any audience — critics, stockholders, advertisers, or the public. But where is this quality programming? Where is it coming from, and where is the venture capital to produce it?

In recent months, this column has examined many different types of programs and the techniques used to produce them. Finally, a picture is beginning to emerge that stations and advertising agencies ought to take notice of. If you are looking for quality programming for the national audience, look to the group station owners. Group W, Post Newsweek, RKO, Capital Cities, Outlet, and others are becoming major sources of programs that inform, entertain, and deliver large audiences of aware and interested people. These audiences are usually not huge, but they may be influential; they may be that important part of the American viewing public that helps shape the majority opinion.

Nancy Dickerson, a broadcast journalist with impeccable credentials, has been the correspondent for a number of Capital Cities' documentaries



A complete promotion package, both on-air and print, is provided to stations that clear Capital Cities productions

It should be no surprise to anyone that group owners are the source of such programs, since unlike other producers, they have as a major constituency local stations, licensed to serve local communities whose perception of the station can make or break a case for renewal.

It is somewhat unseemly that the conflict between advertisers and the NAB has broken into the press in a way that appears to cast broadcasters as incapable of providing so-called quality programming, programming that can make it without violence, sex, or debasing humor, when, in fact, broadcasters do produce quality programming but find that advertisers and agencies turn their backs because the crowds of viewers are not large enough.

According to Charles Keller, vice president of Capital Cities Communciations, Inc., "That's precisely the point we are trying to tell advertisers, and fortunately, there are enough advertisers who understand that to be encouraging and keep us going at it [the production of quality programming]." Keller, whose Capital Cities organization has produced a number of major one-hour documentaries in the past couple of years and is now embarked on the production and distribution of a series of half-hour dramatic family specials, points out that there are some advertisers "who really do care about these kinds of programs, do want to see them on the air, and do want to support them even if they have to take a small penalty in terms of their costs per thousand."

In a sense, the Capital Cities projects are an experiment in seeing if a professionally executed program or series of programs can find the support from advertisers that is needed to answer the advertisers' own criticism. Agencies have often remarked that they had to have the "network" structure in order to get the clearance, market by market, that they would need to justify the buy to their clients. Capital Cities' last three documentaries cleared nearly 90 percent of U.S. television households. Their first effort at putting together a national network of affiliate and independent television stations was "We Will Freeze In The Dark," which cleared 160 television markets. Their next documentary effort, "The $45 Billion Connection," cleared more than 170 markets, and the most recent documentary, "A House Divided," cleared 153 markets, including eight of the first 10. According to Keller, Cap Cities got the idea of putting together

continued on page 35

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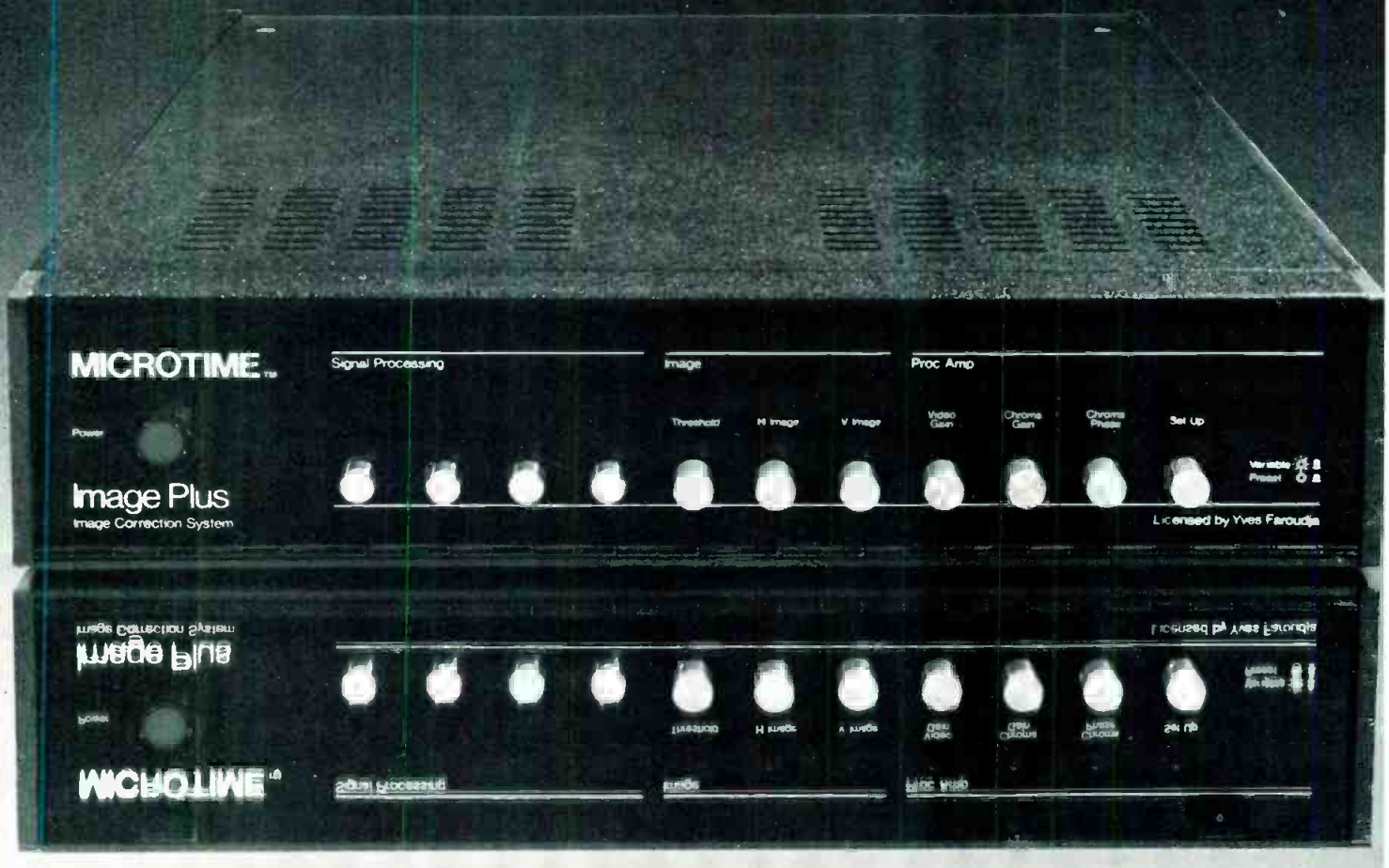

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networks back in 1976 when they discovered that 140 stations were interested in carrying, live, the Eucharistic Congress which they were broadcasting in Philadelphia. The Congress, a quadrennial event of the Roman Catholic Church, was held in Philadelphia in conjunction with the bicentennial celebration, the first time in 50 years that it had been held in the U.S.

The first two documentaries received respectable national ratings of 8.6 and 8.9, respectively. Every step was taken by Capital Cities to assure maximum clearance. The shows were broadcast from Philadelphia at 8:00, 9:00, and 10:00 p.m. over a network of telco and satellite channels set up in cooperation with the Robert Wold Co. This strategy was chosen, said William Mulvey, marketing vice president of Capital Cities Communications, to give the shows at least nine opportunities in any three-station market to get a clearance. Assuming network affiliation, a station would have a choice of any one of three one-hour blocks to preempt network programming. For independents, of course, preemption was no problem.

The documentaries are provided with six minutes of commercial time. In the first two, General Foods, Bristol-Meyers, and E.F. Hutton bought spots and the remaining three minutes were given over to the local stations. The most recent Capital Cities documentary, "A House Divided," did not do nearly as well as the first two. The show, which aired on December 28, had only one 30-second national spot sold, to J.C. Penney. Overnights from New York, Chicago, Los Angeles, and San Francisco indicated a drop from the performance of the earlier documentaries, though Mulvey cautioned that this did not necessarily mean that the national ratings would be appreciably lower.

The poorer performance of "A House Divided," said Mulvey, was more a matter of Capital Cities getting into the market too late By the time advertisers started being contacted for the show's late '78 air date, budgets had already been committed. Mulvey swears that this won't be the case next time. "We're going to be in the market a lot sooner next year," he vows.

Some of the important things to be considered about the Capital Cities series of documentaries, known as *Capital Cities Special Reports*, are that they are all of the highest quality, produced with network budgets. The first of the series, "We Will Freeze In The Dark," was produced by Av Westin, now vice president of ABC News. The correspondent for the report, Nancy Dickerson, has continued as correspondent in the succeeding two Special Reports. The last two documentaries were produced by Gateway Productions, with Dick Hubert as executive producer. As Keller points out, the choices of Gateway and Westin are typical of Capital Cities' dedication to the idea that the reports be journalistically and technically of the highest possible quality.

According to executive producer Dick Hubert, "We shot some 60,000 feet of film for 'A House Divided,' which at 400 feet a minute gives you some idea of the editing ratio." For "The $45 Billion Connection," Gateway sent its crews to Japan, Brazil, and locations throughout the U.S. to tell the story of the impending energy crisis. The family specials being produced by Paulist Productions are shot on film and completed on tape, but throughout the process, the single concern is quality.

The problem with documentaries is that they are based on current events. This means that their suitability for replay is modest, at best, as history tends to render continuously changing points of view on the topics covered. There is, however, a small after-market for

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documentaries in schools, libraries, colleges, and corporate information programs. Hopefully, this after-market will make for a break-even score on the cost of production and distribution. Nevertheless, Capital Cities is committed to the production of at least two such documentaries in the coming year. In addition, there will be a two-hour special on the civil rights era from 1954 (the *Brown* v. *Board of Education* Supreme Court decision) to 1964 (the year of the Civil Rights Act).

Capital Cities is not dedicated, however, to simply breaking even. This year witnessed the beginning of its *Family Special* series of half-hour dramatic programs aimed at the teenage audience and their parents. This series deals with contemporary problems confronting teenagers and features well known stars, top writers and directors, and first-rate production staffs.

These programs are produced by Capital Cities in conjunction with Paulist Productions of Los Angeles, which enjoys a special relationship with the artistic community in Hollywood, according to Keller. The series is currently in syndication and the first of four shows, "It Can't Happen To Me," aired in December. The series got off to an auspicious start in the ratings with an overnight in New York of 11.0, a virtual tie for first place in its 7:30 p.m. time slot.

The package of four programs ("It Can't Happen to Me," which deals with teenage alcoholism; "When, Jenny? When?" dealing with teenage sexuality; "This One For Dad," taking on the problem of the death of a parent, and "Loser Take All," which deals with character development and conflict among boys of different backgrounds) is offered to stations on a barter basis. The station gets four programs and may replay any two of the four with certain separation requirements. Stations are required to give the programs slots at prime access time or better. The series has thus far cleared television markets covering more than 25 percent of U.S. television homes.

Capital Cities is not about to sell a program and disappear. Each program is bolstered by a complete promotional package that includes 30- and 10-second promotional spots with open ends for station ID. *TV Guide* and newspaper repros are provided in different page sizes, as well as press releases, cast lists, and program digests. Black and white production stills with cut lines, color photos, slides, and numerous other materials are provided, and most recently, Capital Cities bought TV Log, the system of boldfaced listings in newspaper television program listings. Capital Cities has also made a practice of providing stations with rough cuts of its documentaries during various stages of production so that the station can get a sense of where the program is headed and also provide press screenings.

It is clear from the efforts of Capital Cities and other group station broadcasters that the quality programming agencies and "concerned" advertisers so often carp about is available and is being produced by its logical creators, broadcasters themselves. Ratings will continue to be overwhelmingly important to the members of the broadcast industry, but broadcasters at the station and group levels must convince advertisers that their complaints about program quality can be and are being answered. Perhaps, as Dick Hubert of Gateway pointed out, commercial broadcasters might learn something from the public broadcasting system, which is consistently successful at going to image-conscious advertisers, *not their agencies*, and convincing them that they don't have to hold a license to be a good citizen. **BM/E**

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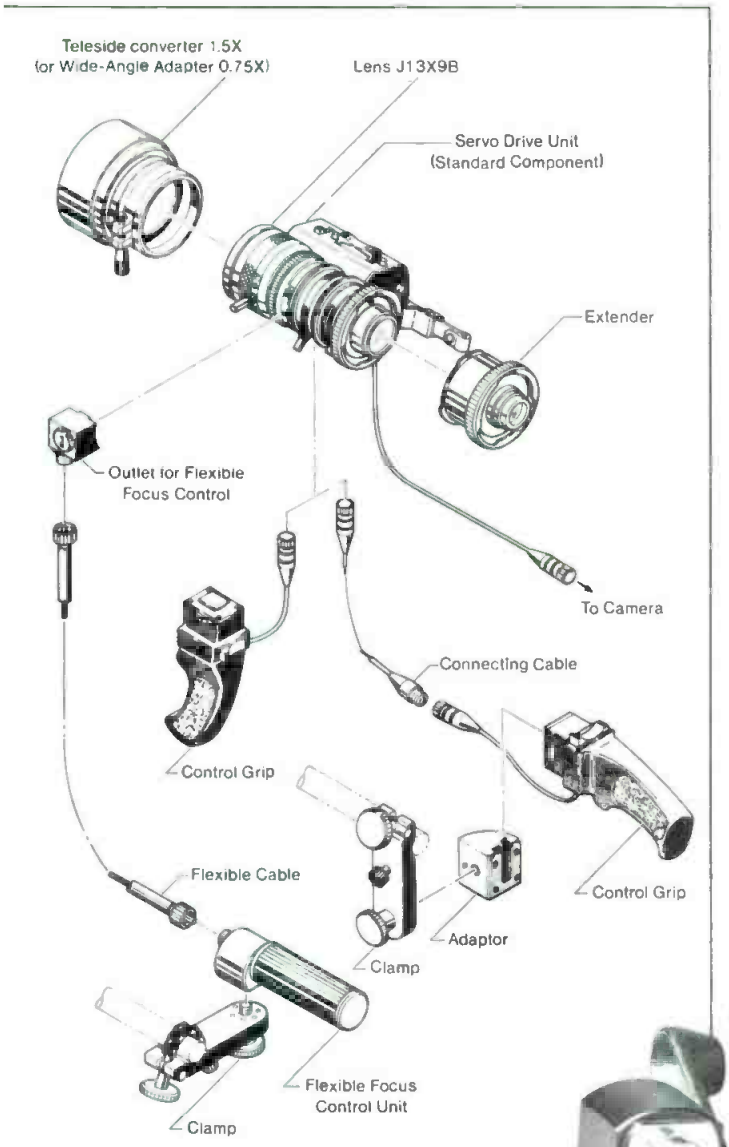

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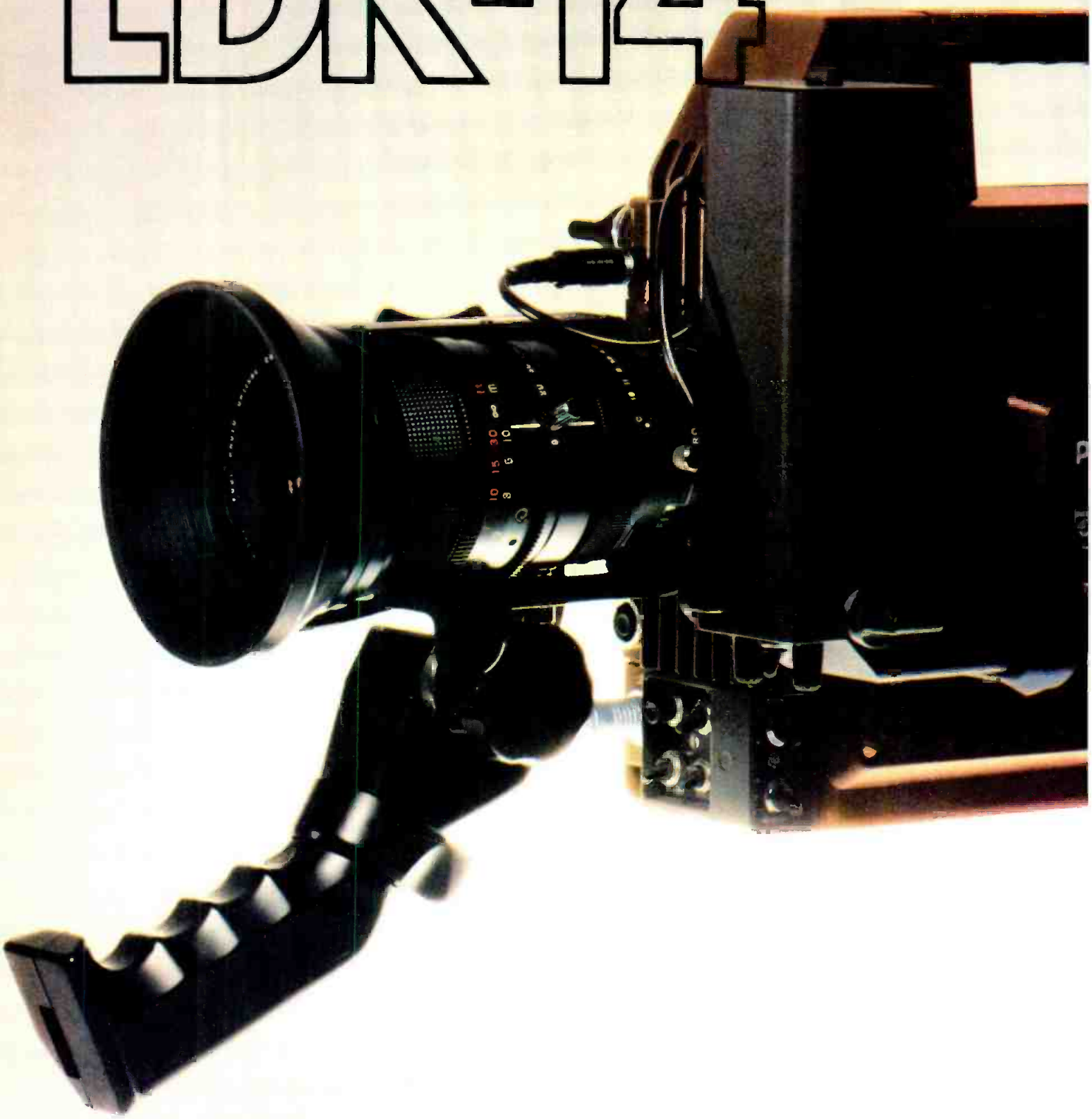

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3. *Studio*—compact, maneuverable; full broadcast quality; 5" viewfinder.

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- Only 27 watts power consumption (almost 1/3 less than the ENG-only competitive portable) gives longer continuous operation with choice of battery belt or small battery pack affixed to camera. A standby switch further conserves battery power between takes.

- Viewfinder displays include: contour enhanced camera picture or external video signal; status monitors for video level, color balance, bars on, battery discharge, VTR functioning, intercom call and camera tally.
- Automatics include: color balance; white and black level; centering; noise reduction when operating with extra gain; auto iris with set and hold facility.
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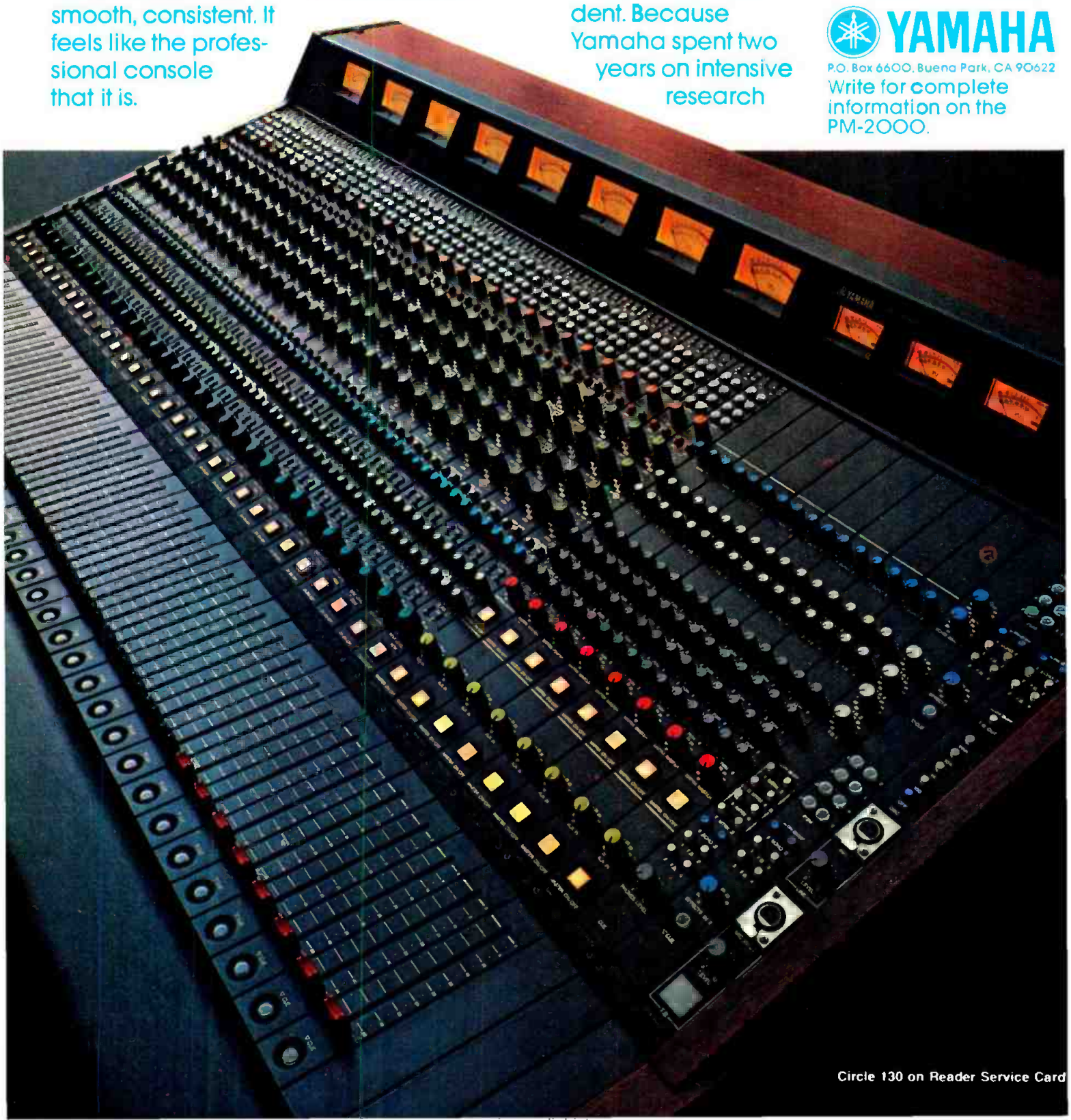

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Digital Technology In Broadcasting Begins To Look Like A System

THERE ARE NUMEROUS occasions each evening when the American television viewer is looking at a picture that exists almost entirely in the mind of a computer; in fact, it may exist in the minds of several computers. The "slide" that is keyed behind the newscaster may be the output of an electronic still storage device containing millions of bits of information that define color, border, and shapes, while the letters that provide the supered title may be only microsecond pulses of digital information and the size and position of the entire "key" may be determined not by the size and shape of the chroma key area, or even the position of the switchers' wipe controls, but instead by a continuous computation of the size and shape of the chroma key area available.

In numerous issues preceding this special report, *BM/E* has covered the subject of digital technology from primarily an "introductory" approach, with technical articles on new equipment, primers on digital theory and microprocessors, and discussions of likely areas for further development of digital technology. During this period, enough digitally based equipment has entered the routine of broadcast operations to warrant a look at how it is being applied and what broadcasters' experiences have been with the new technology. Much of what broadcasters have discovered about digital was expected — much of the equipment has performed in the way it was designed to perform — but the demands of broadcasters have also turned up a few problems and developed many applications that the digital designers only vaguely conceived.

The "black box" stage that has been the story of digital development thus far is still very much with us. As the papers that were delivered on the subject of digital technology at the recent 120th SMPTE Technical Confer-

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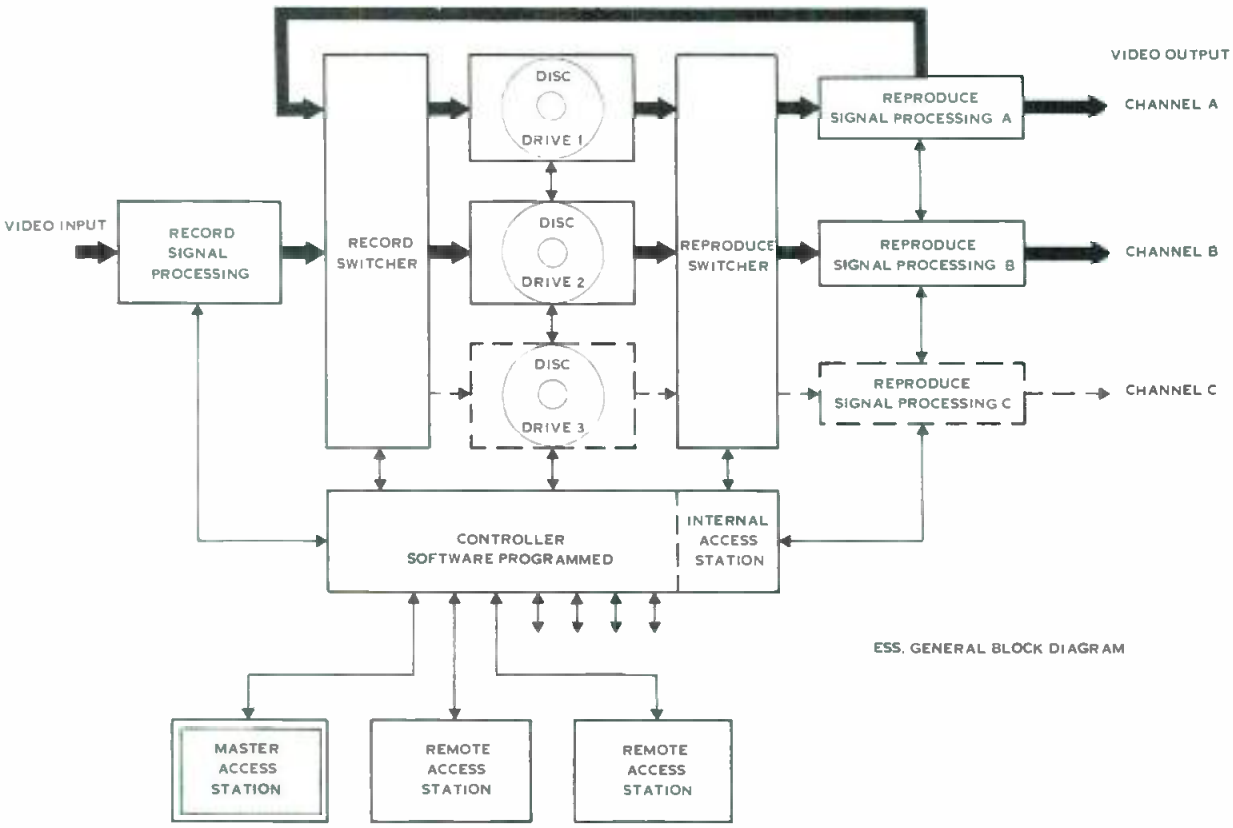

General block diagram of the ESS-2 Digital Video Production System. Although it began as a still store, the system now provides variable speed recording and playback and is used in both production and post-production modes

ence indicated, the breakthroughs necessary for the proclamation of dawn of the digital era still wait in the shadows for digital standards, more efficient memories, and more specialized solid state designs. But we are getting closer. The panel discussion at the conference on the "Near Term Future of Digital Technology" yielded the uniform opinion that the digital videotape recorder would be the true hallmark of this new era, and that the development of a practical DVTR was still some years off. Prophetically, A.A. Goldberg of CBS Laboratories said that the market would first see some special purpose digital recorders. Just weeks later, while researching this article, *BM/E* editors found at least one instance of a digital "still store," Ampex's ESS-2, being used as a digital production recorder. True, the ESS-2 is not a DVTR, but the fundamental benefits of storing images in digital form and being able to recall them at variable speeds from real time to freeze frame has led Matrix Video's director of engineering, Bob Lieberman, to utilize the ESS-2 in ways that provide a glimpse of things to come.

Matrix Video, a commercial television production house located in New York City, took delivery on its ESS-2 in early September of 1978. The system, which grew out of the CBS/Ampex joint venture on the development of a massive electronic still storage system, ESS-1, caught Lieberman's eye not as a still store but as a variable-speed video recorder. This computerized disc recorder/player has the capacity to store on a single disc pack either 814 stills or 27 seconds of real-time video. Matrix uses the ESS-2 Digital Video Production System as both a production and post-production tool. In a production mode, the ESS-2 is used to permit matched dissolves, a frequent technique in commercials. Imagine wanting to change the makeup, hairdo, clothing or some other aspect of a model's appearance as she pirouettes on screen. Matrix is able to do this during production by recording the final frame or frames of the camera's output onto the ESS-2. After the change is accomplished, the model repeats her movement while the ESS-2 playback is fed to the switcher as another source. When the action from ESS-2 matches the action from the new scene, the dissolve is effected. In essentially the same manner, Matrix uses ESS-2 to provide matched cuts and dissolves in post-production when using a single VTR as a source machine. (This is sometimes required when Matrix employs its BCN-20 VTR, since it has just the once BCN machine and many A/B cuts need to be made between different segments of the same tape.) Essentially, the last few seconds of scene A are recorded onto the ESS-2, and then the head of scene B is located. As ESS-2 plays back the segment of scene A, the edit is made to scene B at the appropriate moment.

According to Lieberman, the reason this technique is now practical — though it had been possible previously — is that there is absolutely no loss of picture quality while the video is in the digital domain. Therefore, cuts and dissolves accomplished through this technique suffer no apparent generational loss. This zero degradation characteristic of digital storage makes the digital video recorder a very versatile tool. "There is absolutely no special effect," says Lieberman, "that couldn't, in theory, be produced by using the ESS-2. One can store a frame, play it back and add to it, store again, play it back, modify it again, store it again, etc. etc."

Part 1: Digital Video Effects Provide Profound Changes

THE UNIQUE CHARACTER of video information in digital form has provided broadcasters with the power to manipulate the video image in ways never before possible. In the few short years since *BM/E* began covering digital devices in television, we have moved from the single purpose device, such as the time base corrector, through a range of products such as field and frame synchronizers, some with special options like freeze frame and compression, to very powerful digital effects devices that allow the television image to be manipulated in a completely protean fashion. Many of these effects devices have now found their way into routine broadcast applications.

Spotting images created on one of today's ultra-sophisticated digital special effects systems is simple; they inevitably contain effects that just were not possible when video was in the analog domain. For example: the screen starts out red. A full-frame image of runners in motion appears as a postage stamp-sized shape in the upper left corner. Slowly, it begins folding over itself, at the same time continually expanding in size and moving toward the center of the screen. A final flip locks it into full-frame position, the titles which have been folding over with the image finally legible. For example: A yellow star-shaped insert appears in the center of the screen. The yellow dissolves into a performer's face which talks for a second or two, then freezes. The star shape carries the face to the corner of the screen, deposits it, then returns to the center to be dissolved into another performer's face. When the screen is filled with six of these frozen star images, the star patterns dissolve into circles and the performers come to life again. For example: the chroma-keyed block behind the newscaster dissolves into a live full-frame image of a fire bordered in red, complete with one-line caption. It then wipes diagonally into a second, live image, again with caption. As the announcer begins the story, a smooth off-center zoom expands the chroma key to full-screen and wipes back to the announcer at the end.

Vital Squeezoom

"Before digital video devices," says Newt Bellis, president of Mobile Video Systems, a West Coast tele-production company, "we were basically unable to move an image after it was a composite signal on videotape and locked into the sync track. Now, with digital devices, we can move the image almost anywhere we want in almost any configuration. You can do things that, before digital video devices, were impossible."

Bellis exemplifies the experiences of not only dozens of post-production houses involved with both programming and television commercials, but of on-air broadcasters, too; the introduction of digital systems such as the Vital Squeezoom, Grass Valley Group DVE, and MCI/Quantel DPE 5000 has finally opened videotape up to the outer

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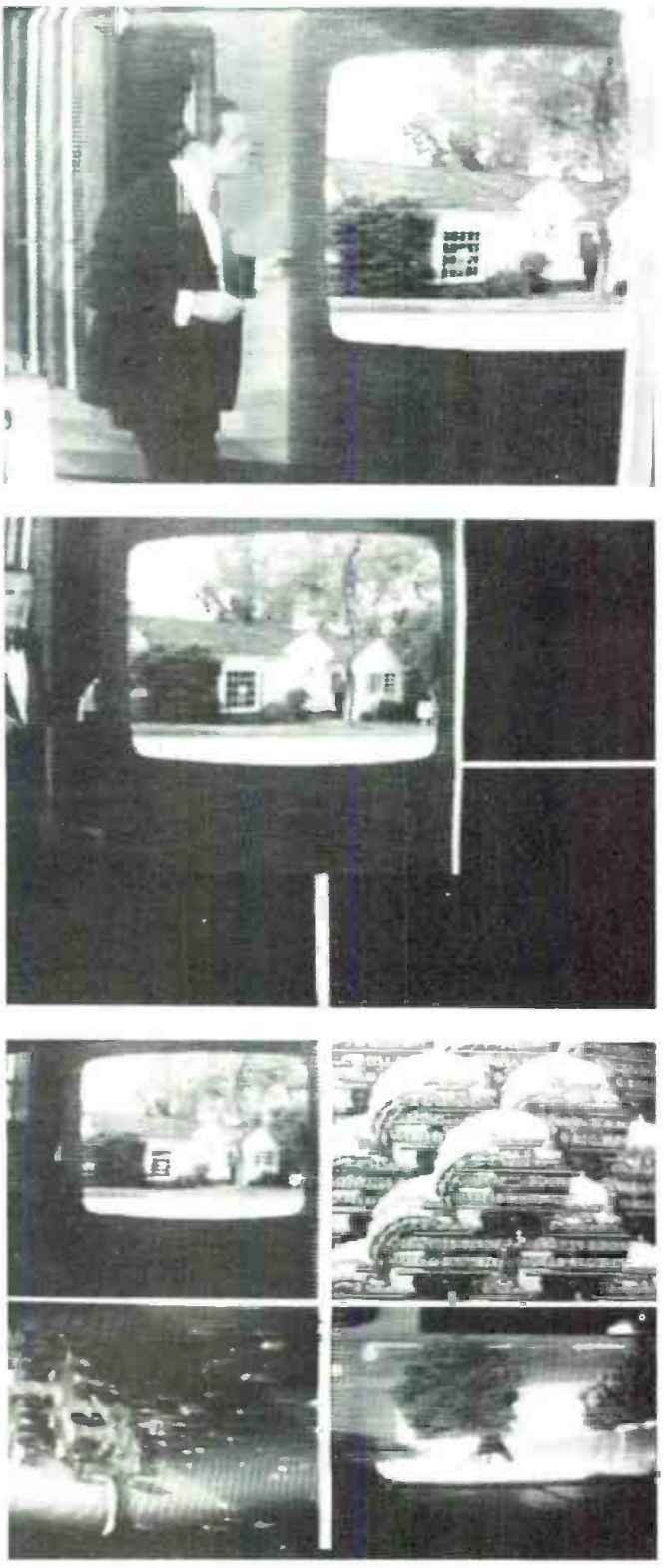
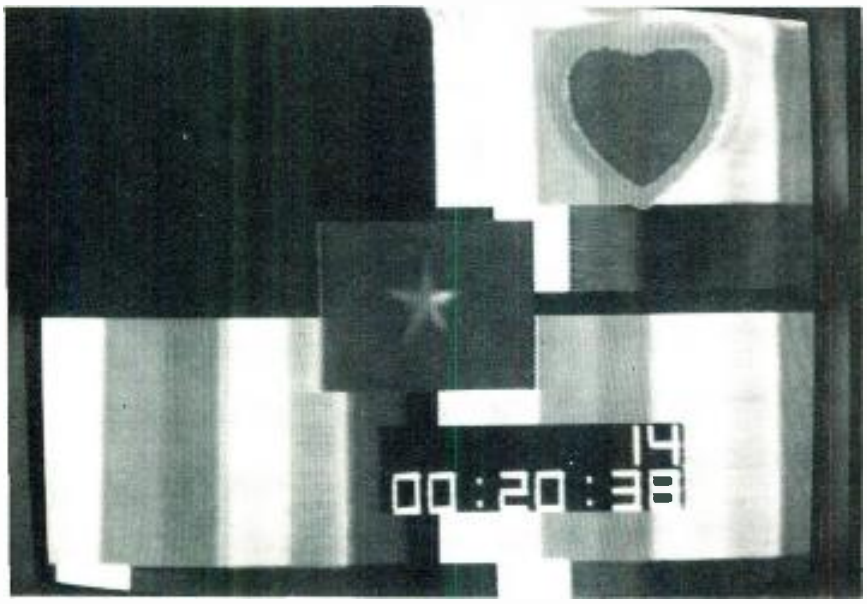


Unretouched monitor photographs of an Alan King special post-produced at Compact Video Systems on Grass Valley Group's Digital Video Effects system, interfaced with E-MEM. King first pulls out a panel with a chroma key insert that is automatically tracked by DVE. Still tracking, the DVE compresses the full frame into a corner of a quad split, then pops on three additional images



Sample effect created by Ken Zeran Productions on Mobile Video System's Vital Squeezoom system. Mobile, which has had the system for some six months, has been a proving ground for Squeezoom

limits of creative imagination previously reserved only for those willing to commit enormous budgets and extravagant time periods to produce the effects on film.

Bellis' operational experience with digital video systems can be generalized for a large segment of the broadcast industry. Mobile installed Vital's Squeezoom (a prototype model) as part of its new post-production facility which opened in August, 1978. It has therefore been a proving ground for the Vital system, which should be in a full production and delivery schedule by January, 1979. Squeezoom is interfaced with Mobile's Vital production switcher, which is equipped with PSAS, Vital's Production Switching Automation System. Thus, any effect created on the four-channel Squeezoom appears like any other switcher input, and the digital setup can be memorized along with other effects and transitions for instant recall.

Squeezoom offers a package of special effects features encountered on almost all of the digital video effects systems. One of the most important of these is the digital devices' ability to take a full frame of video and compress or expand it. Once the image has been compressed, it can be moved anywhere on the screen (or off the screen from where it can be slid into view). With the repositioning of compressed frames, it is thus possible to build up extremely complicated split-screens or graphics patterns by positioning images either in symmetrical arrangements (as in quad split or combination of multiple quad splits), or by varying the size of the panels, in arrangements giving more emphasis to certain of the images.

Similar effects possibilities open up when the frame is expanded. This is the equivalent of a zoom-in, except that it can be accomplished in post-production where, until now, one had to aim a camera at a display monitor and use the camera's zoom lens. With picture expansion, it is possible to either zoom into the image to show highlights of the action or to magnify only a portion of the frame using one of the system's pre-cut masks (circles, squares, stars, etc.) to give a "magnifying glass" effect which can, by positioning the mask, actually be moved about over the surface of the image.

Compression and expansion also make possible the characteristic "squeeze" effect in which, instead of one image wiping across another, the incoming image will actually squeeze the full frame of the outgoing image tighter and tighter until it disappears. The same concept is used to achieve flips, in which case the outgoing image is first compressed from both sides towards the center, then the incoming image expanded from the center out. Most digital devices operate on either horizontal or vertical planes, or both, so that squeeze effects can operate in all directions, including diagonally.

In addition to the compression and expansion capabilities and a variety of precut wipe and insert patterns (moveable throughout the frame), the other great benefit associated with digital effects systems is their ability to track a chroma key. If, for instance, a key insert image of a circle has been generated in the upper right hand corner of the screen and a picture of a performer chroma-keyed into it, the circle can be expanded and repositioned to fill the whole screen while the chroma key expands simultaneously. It is also possible to actually create effects within the circle while it is expanding. This chroma key tracking function is most often seen in news presentations where the on-air personality sits alongside a screen which displays slides or moving images. Traditionally, this setup has been handled either with photographic projection onto a rear-projection screen, sometimes located many feet behind the announcer to compensate for lighting conditions, or by chroma-keying the news clip into a blue matted area behind the announcer. In the latter case, of course, only the small area of the total news clip image which fell within the chroma key area would be visible until the camera zoomed into the blue area. With the combination of video compression and key tracking associated with digital effects systems, however, it is now possible to display the entire image of the news clip in the chroma key area, and then expand the chroma key area to fill the screen as the local reporter delivers the piece. Further, it is possible to actually position the on-air personalities directly in front of the chroma key without fear of their dropping out if a box wipe is used.

These digital effects systems contain digital frame stores. With this option it is possible to freeze any frame during an effect, or, in fact, to use the frame store as a blanking width corrector. The systems are also designed to work with color border generators, either integral to the effects system or part of the production switcher.

Perhaps the most significant advance of Squeezoom is its capacity to work with up to four different video channels at once. According to Bellis (who quotes Mobile's rates on the Squeezoom as $150 an hour basic, with an additional $50 an hour for each of the three additional channels), the majority of effects require two channels — for chroma key inserts, wipes, repositions, etc. However, with the four-channel option, multiple split-screen images can be quickly assembled, as can the exciting "hall of mirrors" effect in which an image is repeated in ever-increasing or decreasing size across the screen. Vital also points out the fact that up to four cameras can be fed into Squeezoom at once and recorded as a full-frame quad split. The four synchronized images can then be played back through the Squeezoom and any one of them expanded to full-screen, thus providing an exciting new multi-camera production and post-production technique.

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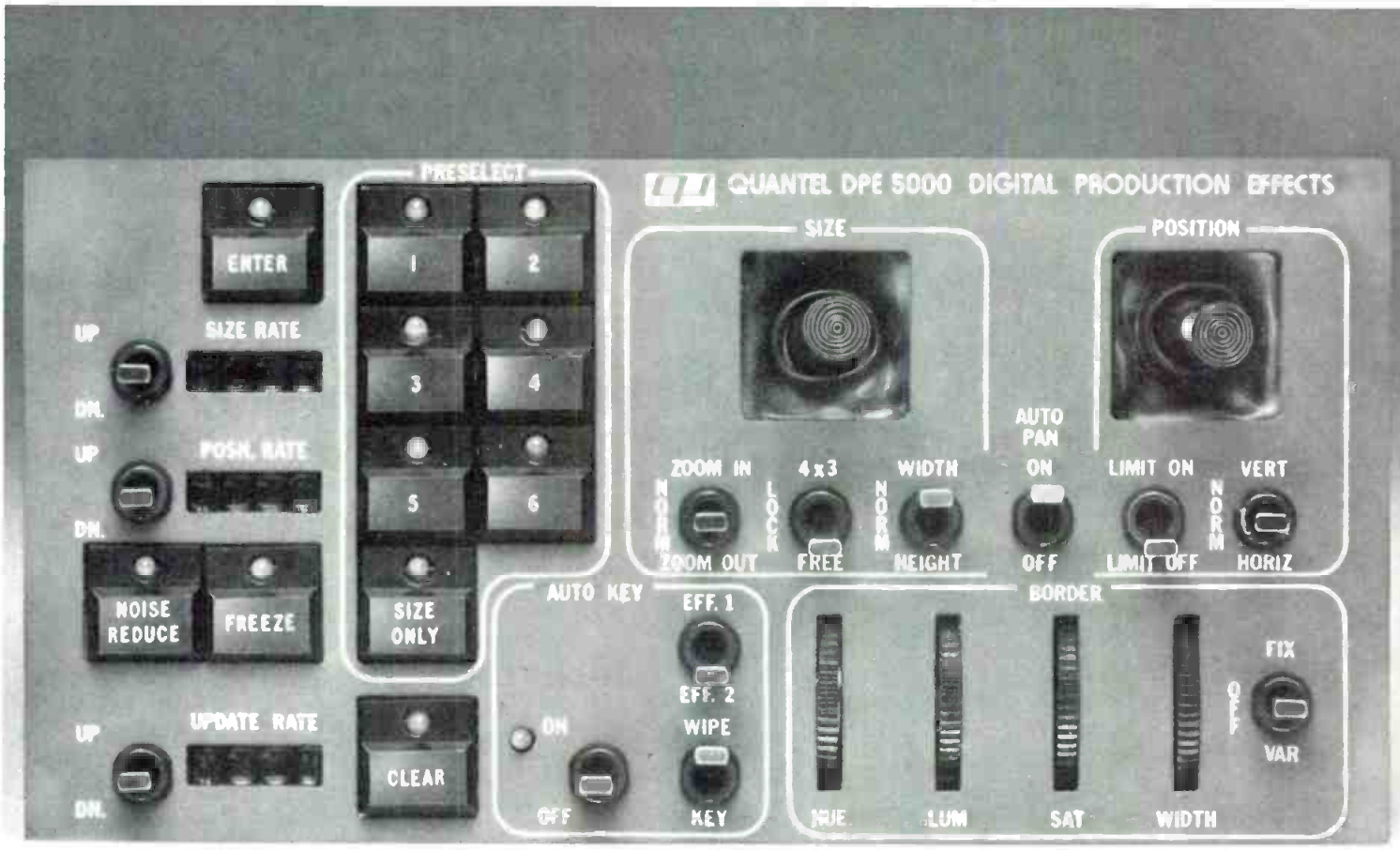

Production control panel of the DPE 5000.

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The digital video people

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No generational loss allows complex images

For some, however, the multi-channel capability is only one of many considerations in choosing a digital effects system. Jack Shultis, executive VP of operations at New York-based EUE/Screen Gems Video Services, uses a single channel DPE 5000 to "build" effects. In a recent test commercial for a national advertiser, they created a series of dazzling effects including repositions, supers, and mattes which culminated in a nine-way split screen with several of the panels containing compressed frames from the earlier effects, including the supers. Since the DPE 5000 has only one channel, the spot obviously involved the creation of many, many generations of edits; yet Shultis defies anyone to tell the difference between the finished cut and the first generation telecine transfer (the spot was shot on film).

The DPE 5000's (and other digital devices') ability to reduce noise and their extremely high S/N (typically 57-60 dB) make multiple generation editing and building of complex images a whole new tool open to the producer or director. The reason, familiar to any with experience with digital devices in either audio or video, is the difference between storing and reproducing the complex waveform signal of the analog system as opposed to the simple binary bit pattern of the digital domain. Noise and generational loss are completely overcome when a system is dealing with eight-bit binary words. Thus, image after image may be added without disturbing picture integrity.

The Quantel system, with a basic price of $125,000 when supplied with its picture expansion and noise reduction options, may seem a high ticket price for a device that will simply add to the effects repertory of a broadcast or post-production operation. On the other hand, Editel in Los Angeles, a subsidiary of EUE/Screen Gems, claims to have already paid for its Quantel 5000 by simply using the system's digital frame store to correct tapes with blanking width problems. This has, indeed, proved to be the case for several stations and post-production houses who found themselves in possession of devices which would not only guarantee that their own products would meet FCC specs, but could also provide an invaluable service for others.

Obviously, however, the real advantage of the system is its creation of the wide range of digital effects we discussed earlier — eight percent expansion (H or V), unlimited compression, repositioning, chroma key tracking, automatic masking, bordering (with the option of either allowing the border to float with the frame as it is compressed and expanded or of filling in the screen as the picture contracts), flips, etc. One of the most useful features of the effects package is its ability to remember up to seven preprogrammed effects and run them with the touch of a single button. In a typical effects setup, the TD might first use the "size" joystick to compress the frame into a small, bordered box which would be positioned off-screen with the "position" joystick (the DPE 5000 offers the option of either limiting the screen position to the standard 4 x 3 frame to guarantee against accidental "pushoffs" or allowing the position to float free on or off the screen). The size and position are then stored in the first memory bank as the initial setup. The TD would then use the size joystick to expand the image to, say, half-frame, at the same time repositioning it in the center of the field. With thumbwheels, he would indicate the rates at which the size and position were to change. All this information would then be stored in register two. He might then want to expand the image size to full frame (register four) and then make a three-second diagonal squeeze wipe (with the size and position joysticks set to control both horizontal and vertical movements simultaneously) which would then be stored in register five. After finishing the creation, it would be ready to be recorded, and all that would be required to air the sequence would be to push the register buttons at the appropriate cues. Recent PROM software developments by Quantel (available as free retrofits on existing DPE 5000s) now enable all seven presets to be programmed for size, position, and rate.

The setup at EUE is equivalent to that found in many commercial facilities using digital effects. There are four on-line editing rooms, each equipped with a cable interface to the Quantel system, which is located in a separate equipment room. EUE has only one control panel at

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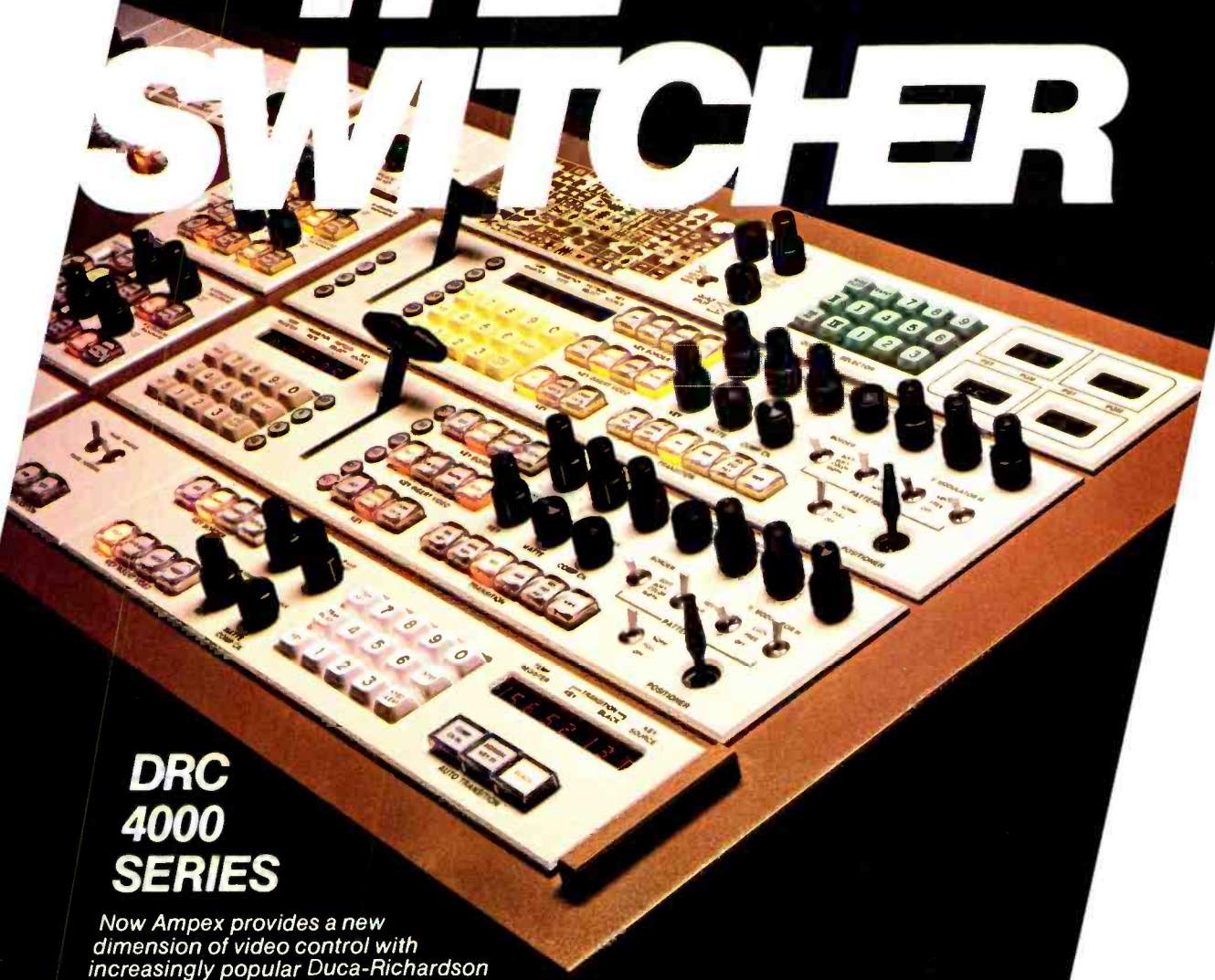
Sample commercial created by WBRE-TV, Wilkes Barre, Penn. on GVG's DVE system. Multiple image effects represent one of the significant advantages of digital. WBRE will shortly open its own commercial production company, Digital Video Productions

Scene from WNET-TV, New York's MacNeil/Lehrer Report, showing reporters seated in their New York and Washington studios. Setup maximizes the MCI/Quantel DPE 5000's compression and auto chroma key tracking capabilities

THE SWITCHER



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present, which is moved from one editing room to another as needed. Extra control panels cost $5000 each from Quantel, and Shultis finds it just as convenient to wheel the control panel about and connect it where needed.

Almost all effects possible with digital

Shultis's experience with television commercial clients who suddenly find themselves confronted with unlimited possibilities in videotape was echoed by almost everyone we spoke with about the digital effects systems. Ron Balousek of Producers Color Service in Michigan sums it up perhaps the best of all: "I'm an old optical film man myself, used to the incredible complexity of the multiple matte runs involved with creating film opticals. And I must say that there really isn't anything that we can do with film that we can't do with the Quantel DPE 5000 unit. We have done complicated seven-way split-screens, zooms into chroma keys, repositioned incredibly sophisticated graphic images — all with a minimum of expense and time."

Balousek's only question was the quality of the images, which was also pointed out by several others we spoke with. As John Godfrey, engineering supervisor of the Television Laboratory at WNET (New York's PBS station) put it, "We aren't quite at the state of the art yet as far as the quality of these units goes. Some have problems with horizontal signals, some with the vertical, some with the interfaces. Chroma noise is a continuing problem, even with the built-in chroma noise reducers found on some of these units. However, their digital designs mean that when, in a short time, the technology has come a little further along, it will be simply a matter of replacing a circuit board or two. The problems, at this point, are simply ones of program software, not inherent design."

Godfrey is quick to point out, however, that the expanded production capabilities of systems such as the DPE 5000 far outweigh any minor problems which may still remain with signal handling. WNET, which has had its 5000 for only a short time, has already found a major use for it during the nightly *MacNeil/Lehrer Report* — a live "soft" news analysis. With MacNeil in New York and Lehrer in Washington, WNET was looking for a way to get around having to shoot the newscasters off red-tinted monitors for insertion into the corresponding chroma key areas. The Quantel 5000, with its built-in frame store synchronizer and chroma key tracking, enables the process to be carried out digitally in either New York or Washington (which has an identical setup) as a round robin interconnection. Godfrey also anticipates that as directors become more familiar with the system's capability, more and more actual special effects uses will be found for the system.

WBRE opens Digital Video Productions

Experiences with the DVE system are as diverse as those with the other digital effects systems, and GVG points to sales to networks, stations, and post-production facilities alike. A station in Wilkes Barre, Penn., WBRE, has had its DVE package (interfaced with E-MEM on a 1600 switcher) since May, 1978. President David Baltimore says the station is doing a booming business in correcting tapes with blanking width problems for clients all over the East Coast, at the rate of $500 an hour for immediate service and $300 an hour for five-day turnaround. The station also maximizes the expanded effects capability of DVE for its regular programming and television commercial production. One great advantage, according to Charles Baltimore, director of engineering and production, is seen in WBRE's daily *Crossfire* program, an interview show in which the interviewer and interviewee are alternately squeezed into a corner box. With conventional chroma key, the camera had to shoot a wide shot of the person being boxed so that the image could be positioned to fall within the key area. With the DVE compression, on the other hand, the person to be boxed can be shot in close-up or medium shot and the full frame image compressed into the box.

As we have seen, the range of digital effects available with systems on the market today differs little from manufacturer to manufacturer. GVG's Digital Video Effects (DVE) system, incorporating NEC's FS-15 digital frame synchronizer and DVP-15 digital video processor, is no exception. Frame compression and expansion, automatic chroma key tracking, repositioning, quad split, hall of mirrors, and other effects can all be simply generated. Where the systems differ is in how they utilize their microprocessors and memories to achieve the effects and in their approaches to interfacing the digital effects generators with other pieces of studio equipment. Thus, while the DPE 5000 can be interfaced with virtually any switcher since it contains its own control panel and automatic sequencer, and the Squeezoom, too, can be integrated with most production switchers (though it depends on Vital's PSAS for automatic sequencing), the DVE system contains no operating controls. Rather, it relies on the levers and controls of the GVG 1600 Series production switcher and the possibilities offered by E-MEM to carry out the effects.

Located directly alongside the other switcher controls are the few simple buttons needed to interface the DVE with the switcher; four pushbuttons control the selection of digital channels (up to four, including quad split); a few other buttons control the mode — picture expansion or contraction, split screens (for squeeze wipes or regular wipes), aspect ratio, etc. Once the mode is determined, control of the effects is accomplished through the switcher with picture size and position determined by signals from the 1600 and controlled by the movement of its levers. Similarly, if the 1600's chroma key signal is used, DVE will automatically track it. Multiple re-entry for the creation of extremely complex effects is thus simply a matter of calling the appropriate signal from the 1600's source busses.

So, too, it is possible to use the effects created by DVE in conjunction with E-MEM, GVG's microprocessor-assisted effects memory system, optional on its 1600 Series switchers. E-MEM, which will, with the touch of a button, remember up to 22 effects, including extremely complex transitions and rates of change (dialed up on a thumbwheel), presents the possibility of preprogramming most of the effects for an entire news show before on-air presentation. A new development from GVG, E-CARD, even permits the storage of frequently used effects setups on a magnetically-striped "credit card." Once inserted, the card automatically transfers the effects stored on its magnetic stripes into the same registers, minimizing the number of setups needed for daily programs, especially news.

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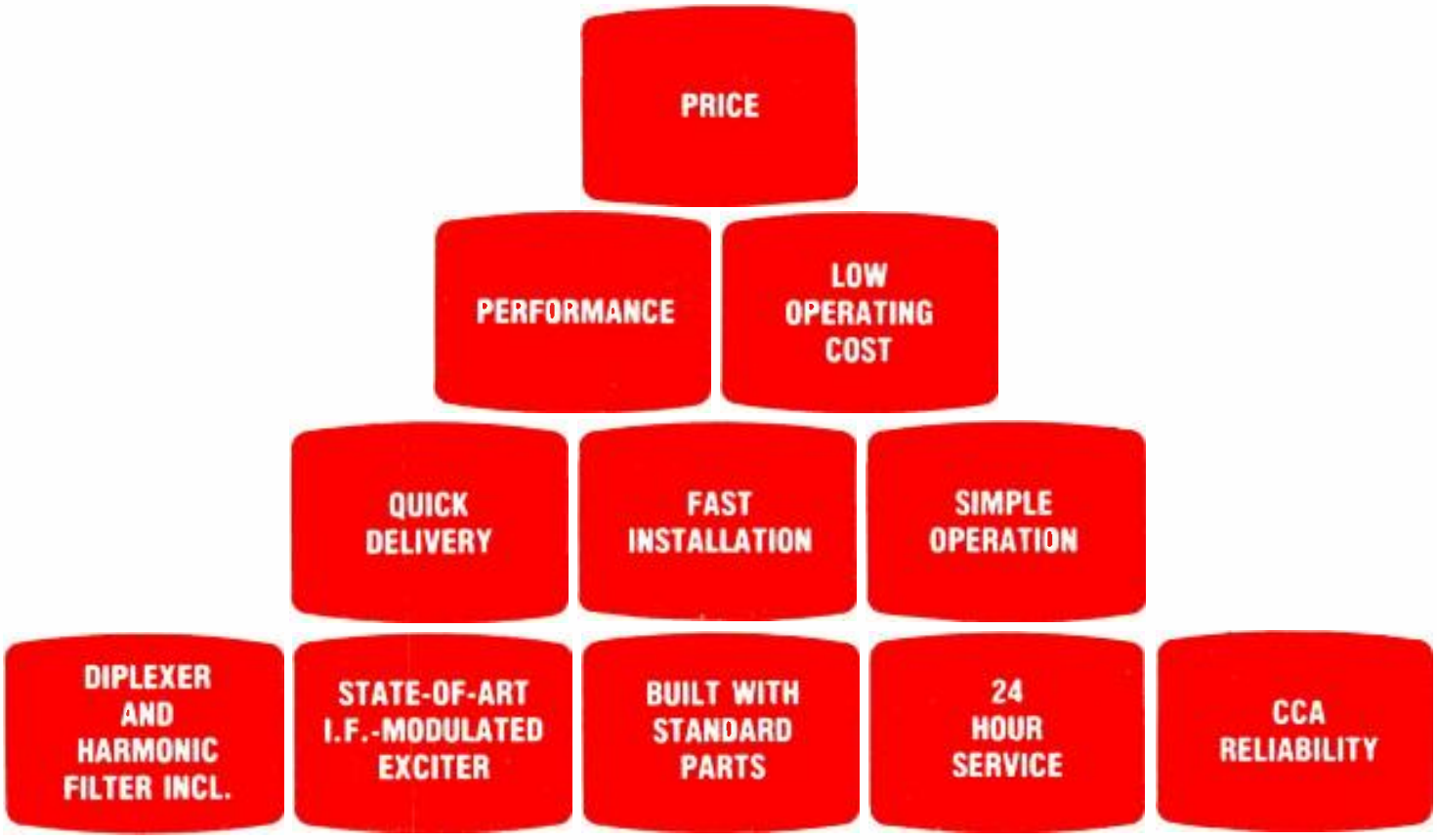

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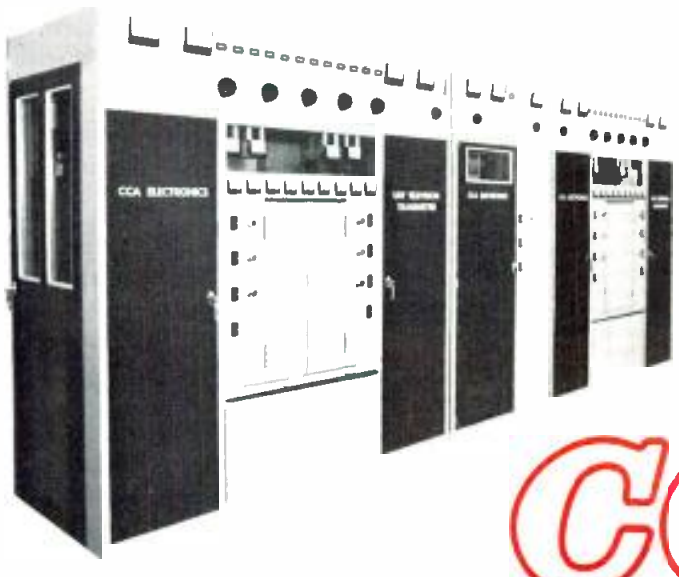

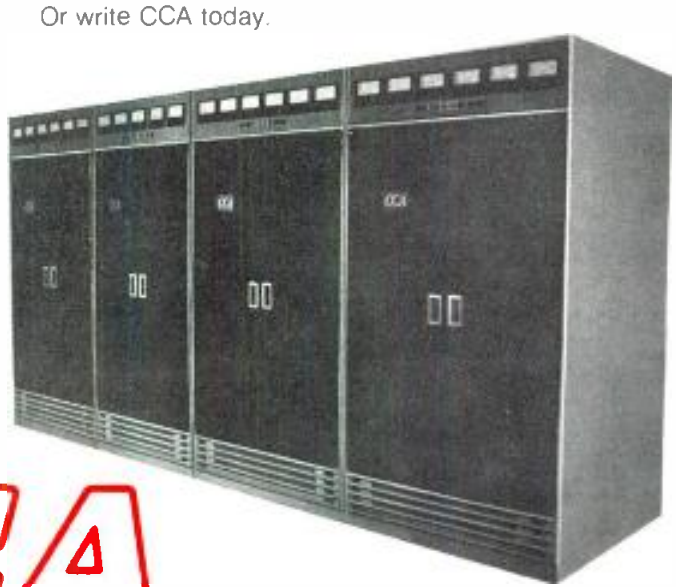

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The DPS-1 Mainframe Plus

Digital Video Systems' DPS-1 is not exactly a sophisticated digital video effects generator, but neither is it exactly a "black box" TBC or frame synchronizer. Instead, it represents a novel approach to satisfying a number of station needs using the technological ease by which digital systems can be expanded by simple read only memory modifications.

The basis of the system is a Mainframe which contains the three elements needed in any digital system: a power supply, an A-D encoder to transform the analog signal into digital bits, and a D-A decoder to transform the digital signal back into analog form for re-introduction into the television system. The $9600 Mainframe also contains a digital "proc amp," sync generator, microprocessor control, and control panel. To turn the device into a low-cost TBC, one need only add a $500 input buffer, a $900 16-line memory, and a $1500 I/P sync generator, all of which are basically plug-in modules. For a more typical TBC, a $1700 32-line memory is substituted for the 16-line version, $3,000 worth of velocity and dropout compensator circuits are added, and presto, it's a fully digital TBC. Substitute a $6,200 256-line memory and it becomes a field store TBC/frame synchronizer. Add a $2400 comb filter for handling still frames and expand the memory to 512 lines ($9000) and you have a frame store TBC/synchronizer. And so on.

It is the potential of adding a digital comb filter and control circuits to the system in order to achieve some special digital effects that makes the DPS-1 worthy of mention here. The comb filter separates the luminance and chroma components of the digitized signal before manipulation and storage. Operating at 4x subcarrier frequency, it adapts itself to changes in picture content so that the separation is almost perfect. This permits all the colorization and edging found in most digital effects systems. Horizontal effects such as pushthroughs, rotations, horizontal repositions, flipovers, page turns, horizontal squeezes, expansion, and mirror effects can be achieved with only a few lines' worth of storage in the memory. By adding a fully field memory, the same effects can be achieved on the vertical plane. Multiple microprocessors are used to control different parameters, enabling additional software to be programmed into simple read only memories.

Several stations we spoke to in connection with this article have had the DPS-1 on line for enough time to evaluate its performance, and all report fine results. WNEW in New York City has been using it for synchronizing incoming satellite feeds from England to station sync so that they can insert breaks and intros. Frank Willis at WFMY-TV in Greensboro, N.C., is also using it as a frame sync for locking in the station's two remote vans and also on election night for syncing live feeds and another station's program.

At present, the special effects capabilities of the DPS-1 are still under development, with the freeze-frame feature likely to be perfected within the next few months. According to John Lowry of DVS, as software and firmware improvements become available, they will be able to be simply and inexpensively added to the mainframe.

Further broadcast experience with the DVE system comes from KING in Seattle, Wash., where TD Bud Johnson and CE John Shawcroft have been experimenting with DVE and E-MEM on the station's news program. A typical KING setup provides a good example of just how useful this system can be. "We put a slide which we want to reduce and put into a boxed window on the news set into the DVE's Effects 1. In Effects 2, we chroma-key the live camera image from the news set and insert the slide from Effects 1 so that the talent won't drop out behind the box. On Effects 3, we lay in the announcer's name, which is generated by our Telemation Compositor I. Meanwhile, film is rolling in the chroma key. Our next setup, which follows immediately, involves our weather forecaster delivering his report in front of a large, rear-illuminated chroma key screen involving a completely new set of switcher settings. We take the graphics from the Compositor I which are in Effects 1 and put them over an outdoor slide. In Effects 2, we want to be able to mix to other sources, such as satellite pictures with wipes or dissolves. In Effects 3 we put all of the settings in Effects 1 and 2 into the chroma key of the forecaster's screen so that he is in front of it at all times and all the material in the background is controllable by dissolves. The complete changeover from the newscaster to the weatherman is accomplished by the push of a single E-MEM register button, leaving us free to cue up the A&B roll commercials and all the other things which have to be done. When the forecast is over, we can go back to the first register immediately for the next story."

Still another experience with the DVE/E-MEM package comes from Compact Video Systems, a California-based production and post-production facility which was responsible for the 25th Anniversary of Walt Disney Productions and the 50th Anniversary of Mickey Mouse shows which were seen last year; both used extensive digital special effects. Another major post-production job involved the creation of a 16-way split screen for a Cher Special. Post-production manager Steve Mitchell describes with pride the process by which six generations of multiple quad splits were laid down, each panel containing a different angle or effect of the same original action.

Mitchell is also excited about the new flurry of interest by local television advertisers in the possibilities presented by the digital effects, pointing out the parallel to the situation five or six years ago when wipes and dissolves became all the rage in the production of local spots. "It's the latest way for them to put all the whistles and bells into their minute or 30 seconds of air time," says Mitchell, "and make their spots look flashy and fancy on relatively low budgets. This really applies to record companies whose promos have traditionally been in the vanguard of presenting exciting graphics and visuals."

From all these experiences with digital effects, it should be clear that a whole new era has opened up in television, adding both to the visual appeal of regular programming such as news, and also to the special needs of television commercial production. It is also evident that the process is only just beginning, as more and more applications are found for the effects systems. Providing an almost limitless possibility for creative imagination, production people are still very much in a learning cycle, discovering just how limitless the possibilities are, as engineers and designers continue to work toward the total perfection of the systems' designs.

Part 2: Digital Graphics Systems page 53

Now. A broadcast quality TBC for heterodyne VTRs

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It's the CVS 516, first digital TBC made and priced to give users of non-segmented, heterodyne VTRs all the proven advantages of modern dig tal video processing.

The CVS 516 is ideal for ENG, teleproduction, studio VTR backup and much more because it has features that, before, you'd find only in TBCs costing up to twice as much.

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"Commercials shot with ENG/EFP equipment look better. It cleans up shots under existing light to the point where the client is happy with them . . .

"Overall, our day-to-day operations look significantly better."

— Hal Protter
Vice President and General Manager
KPLR-TV, St. Louis, Missouri

"The TDF-1 has given us a consistent air look and higher overall quality - better than network ...

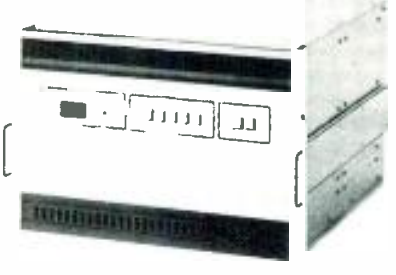
"It really makes life easier — it improves the signals that need improving and leaves the rest alone . . .

"We did a side-by-side test with a competitive unit, which we thought was pretty good, but when we brought the TDF-1 in — well, somebody had sure done their homework on it! It especially handles film grain better . . .

"It's fabulous on cartoons! By the time you run the TDF-1 up to its top correction, you end up with a signal that has no grain . . .

"I haven't seen anything it doesn't handle well."

— Jim Gonsey
Chief Engineer
KPLR-TV, St. Louis, Missouri



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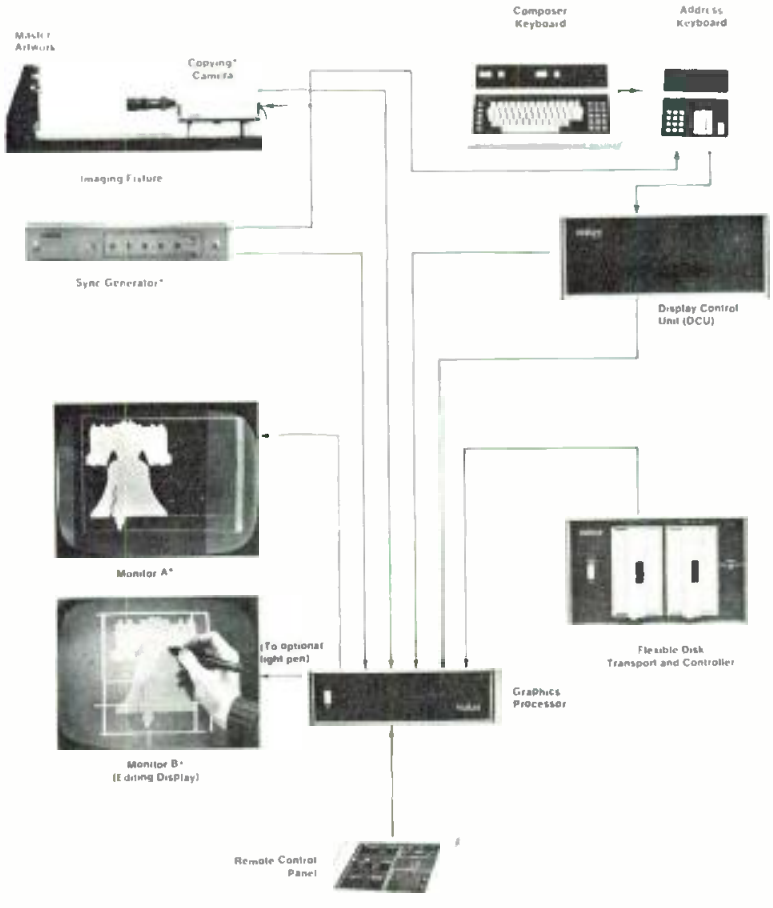
Part 2: Digital Graphics Systems Become Super Versatile

IF THE CURRENTLY AVAILABLE digital effects systems can be considered to be still in their infancy, digital graphics systems and character generators are already great-grandfathers. Very early on, manufacturers such as Thomson-CSF (Vidifont), Chyron, and Telemation (Compositor) realized that, with the relatively simple task of electronically generating and positioning graphic displays (pages), a computer technology-based approach would enable them to update programs rather than hardware. Today's ultra-sophisticated systems still rest on the same basic digital technology that was used four and five years ago when the systems were first introduced. What has evolved are some rather amazing ways of using it.

Harold Stevens, TD at WJBK, Detroit, calculates that the station uses over 50 pages of Thomson-CSF Vidifont information during the 21 minutes of news on its half-hour noon news show, and over 100 on its one-hour evening news. For the weather report, WJBK relies exclusively on Vidifont graphics, supering them over background slides. The 38 weather symbols, representing everything from sunshine to tornados, lightning, and the phases of the moon, were created on the station's font composer. The 64-line high figures, some designed to be integrated with numbers representing temperature, humidity, wind direction and velocity, etc., are stored on the font disc under letters such as *s* = sun, *t* = partly cloudy, etc. Generally, a preset sequence is composed and transferred to the second disc for on-air playback using the address keyboard located in master control. In emergencies, however, a font operator will work with the director during the actual newscast.

WTCG creates electronic scoreboard

Another station making extensive use of the Vidifont's large storage capacity is WTCG in Atlanta, which has two Mark IVs with colorizer/keyer, preview page, and second disc drive options. One of the Vidifonts is permanently installed at the station; the other travels about with WTCG's mobile truck. The station produces an enormous amount of sports programming, including 100 Braves baseball games, 40 Hawks basketball games, 25 Flames hockey games, and several Falcon pre-season football games per year, in addition to supplying all three networks and half a dozen syndicators with other college sports programming. Its Vidifonts, either working back at the station when games are being broadcast by WTCG or in the field (usually in a separate font room at the sports arena) when the program is for another station, can be supplied with any of 30 different character fonts supplied by Thomson-CSF. The most creative use of the Vidifont system, however, is seen in the station's series of 128-line high sports logos, one for each team in the baseball, football, hockey, and basketball leagues which the station



Block diagram of Thomson-CSF Vidifont Mark IV font compose system. Note optional light pen for correcting or creating graphic elements as small as 45 ms wide by 1 scan line high

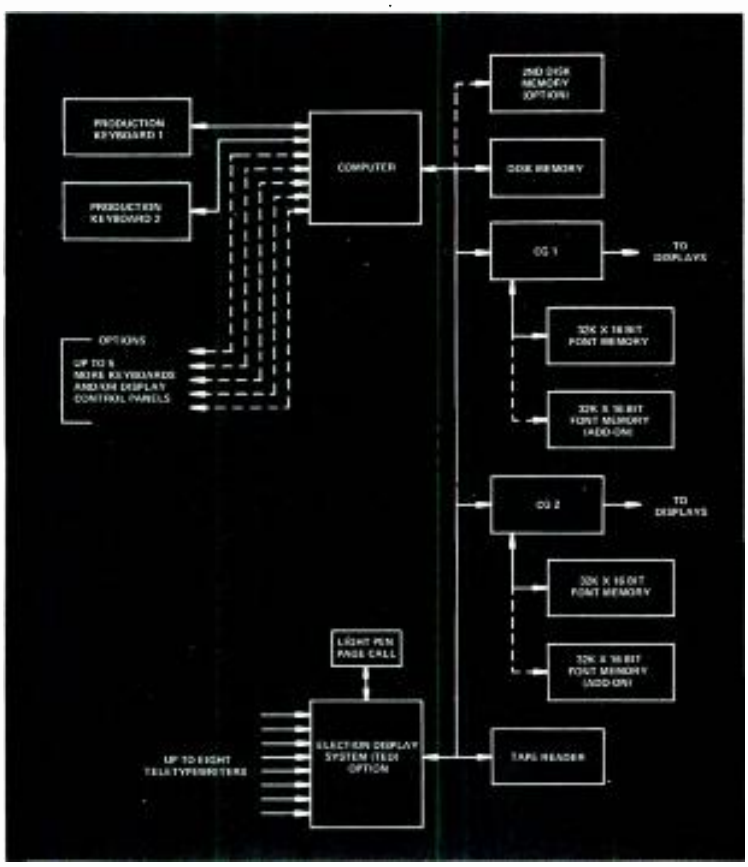
Graphics page created by Thomson-CSF for use by WTCG, Atlanta. Graphics were created from artwork supplied by the sports leagues and are used as part of WTCG's electronic scoreboard

covers. These logos, in addition to the station's own logo, were created at Thomson-CSF from artwork supplied to the station by the leagues. Thus, with relatively inexpensive software, the station is able to impart distinctive appeal to its electronic scoreboards.

Chief engineer Jack Ormond has also come up with a novel way of getting around the station's lack of a sync generator coupled with the Vidifont system. He takes the Vidifont output and feeds it through a device which rolls off the high end of the signal and then sends it as an external key input to his Grass Valley 1400 and 1500 switchers. After 260 nanoseconds, the colorized Vidifont graphics are inserted into the hole just cut out by the key source. In this way Ormond is able to handle multiple key situations which might otherwise be difficult to obtain without the rolloff and external key.

The Thomson-CSF Vidifont Mark IV, the latest in the line of Vidifont systems, now offers the possibility of using two 96-character fonts simultaneously, with a range of sizes (18 to 128 scan lines high) that can be mixed within a line, with all characters falling on the same baseline unless otherwise programmed. The key to the system's versatility is the floppy disc store, which provides random access to the two-font storage discs and the 192,000-character memory disc, capable of storing the equivalent of 6000 rows of information (averaging 32 characters per line). A second disc drive option doubles the page storage capacity, while an optional preview channel enables composition on one page while another is being used on-air.

Average access time to any stored message is .3 seconds, and switching between messages is accomplished during the vertical interval, enabling back-to-back displays. Nine roll and crawl speeds are provided. Edge position controls move characters horizontally or vertically in three positions for drop shadow effects, while the page positioner allows vertical adjustment of the page — ±16 lines in two-line increments.



Block diagram of TeleMation's Compositor I graphics system in a dual configuration with optional TED (television event display) election reporting package

Once the font discs have been loaded, message composition is accomplished through a standard keyboard. An address keyboard controls loading of fonts, storage and recall of pages, and access to the optional colorizer/keyer and preview page of memory. Thus, the composer keyboard can be located in a separate area while the much simpler address keyboard can be located in the control room for on-air displays.

As is true with the other digital graphics systems, the Vidifont is far more than simply an electronic character generator. The advanced model of the Mark IV, the Mark IVA, contains a wealth of additional graphics software. Background colors, for instance, can be chosen for a full page, full row, or partial row and recorded during composition. Color windows of any size can be randomly positioned throughout the page. Outline characters are simply created by removing the character video and leaving the character outline, which can be varied in level from white to black. Drop-shadow characters are created by edging the characters in various levels of black or white. Options on the Mark IVA include a full color preview page, a sequencer permitting automatic page playback at prerecorded rates, and an RS-232C interface.

An extremely useful addition to the Mark IV and IVA systems is the Thomson-CSF Font Compose system, which allows the creation of special, customized lettering fonts as well as graphics elements such as logos, fancy displays, etc., up to a maximum size of 11.5 μs wide by 128 scan lines high. To enter the basic image into the system, artwork is placed on a copy stand and shot by the station's own monochrome camera. An alignment grid which appears on the display monitor allows the proper positioning of baseline, height, and width. Once the initial setup is completed, the digital processor is placed in an edit mode and the frame is captured. At this point, the character or artwork appears in a digitized form on another display monitor. Any portion of the captured artwork can now be corrected or modified by means of an X-Y cursor or an optional light pen. Since the system contains a variable 10x magnification range, extremely detailed touchups can be done on video elements as small as 45 ms wide by one scan line high. It is also possible, with the light pen and the processor in the edit mode, to actually create a logo or character from scratch.

Once the editing is completed, the character is assigned an ASCII address by the remote control keyboard and memorized on the font disc for later recall.

Speed, repeatability, simplicity of operation, and flexibility — these are the hallmarks of all three digital graphics systems under discussion here. As Jack Shultis at EUE/Screen Gems puts it, "we have virtually done away with graphics cards now, and having to tie up a camera to shoot them. Gone are the days when we had to cancel an editing session because the television commercial director forgot to bring his logo; now we just keep them on file on the disc."

WNEW creates unique graphics

At WNEW, the MetroMedia flagship station in New York, VP of engineering Bill Kelly originally installed a

continued on page 56

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Here's ADDA's latest digital still storage breakthrough—priced so every station can afford superior digital picture quality without slide handling problems. The ESP-100B offers performance similar to our higher cost systems, but with a smaller, rack mounted, fixed disk storage capacity of 200 frames. You can create high resolution stills from live camera, VTR, 16mm film, network, or satellite feeds. You can program still sequences in advance and change your mind while on the air—knowing a new still can be called up at random in less than one-half second. Unlike slides, electronic stills are always easily located and instantly available. Always right side up.

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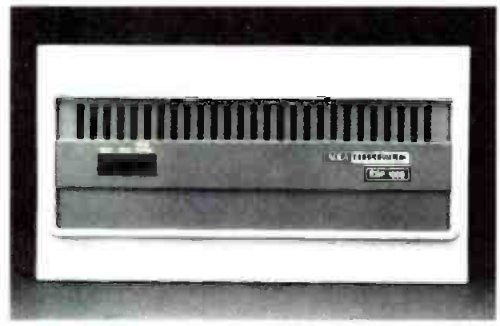

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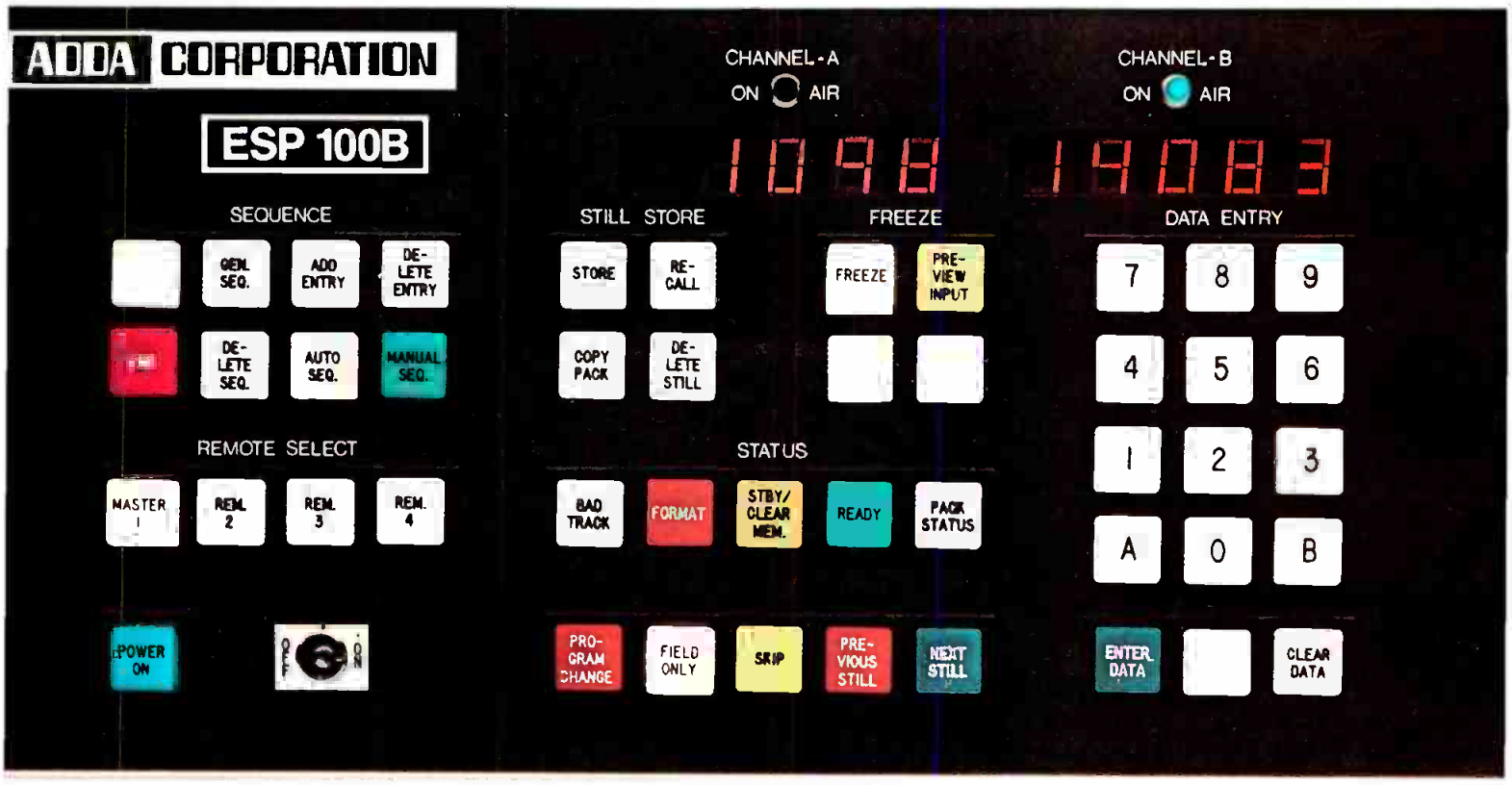

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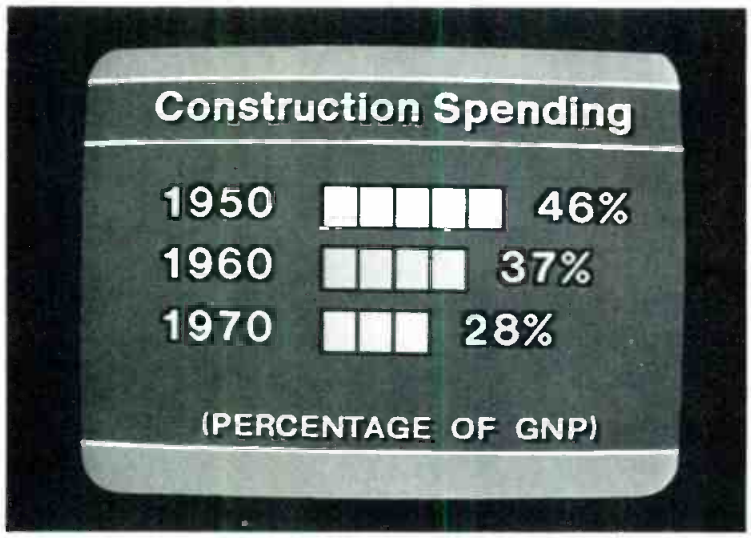
Typical local commercial message produced by Compositor I. Note the drop-shadow effect, variable baseline in the word "accident" and individual colorization of extremely small areas



A chart produced on Compositor I. Graphics displays such as this find wide application for presenting information and for logging weather and other statistics

dual Telemation Compositor I system with keyboards in the news and graphic design department offices. The 999-page storage capacity was arbitrarily divided equally between the news and production departments for shows and commercials use. Some of WNEW's graphics would not, and in some cases could not, have been prepared if conventional graphic arts cards had been required. One example was a sports story run during 1978 Derby Week which analyzed the relative performances of Alydar and Affirmed. In each finishing sequence, the horses' names were precisely repositioned in the picture to provide positive identification.

Two new applications are now being planned, according to Kelly. One requires the addition of a third character generator, a second 999-page store, and a third keyboard located in master control. These new system components will be used as a station break slide and 10-second graphic spot storage and display system, eliminating one more need for using slides in a telecine chain.

The other application is to interface the Compositor I to two Bosch-Fernseh BCN digital stores recently added to the station's BCN-50 one-inch studio editing VTRs. This VTR accessory permits transformation of single frames of any live camera, remote, or VTR feed into a random-accessible videotaped substitute for a pictorial slide. While the selected picture is frozen in the digital store, Compositor I graphics can then be added. When completed, the composite picture-graphic is stored in a decimally designated location on tape.

This TeleMation/Bosch-Fernseh system can completely eliminate a station's need to maintain a photographic slide processing and on-air display capability, with attendant cost savings. Further, image creating versatility and operating flexibility are expanded immeasurably by having image creation, storage, recall, updating, and on-air display simultaneously controllable from several locations in the station.

Skills needed to operate Telemation's Compositor I are comparable to those necessary to operate a font-selectable electric typewriter smoothly. The single character generator system is, in fact, much like such a typewriter. Its substantial added versatility comes from incorporation of techniques and functions common to graphic arts production, computer system data storage and processing, and broadcast operations.

In graphic arts production, the system features unlimited font capacity, with up to eight fonts on-line available at one time; character edging, bordering, shadowing and outlining in scores of combinations, with variables of luminace level, edge/outline width and height, and drop or slope shadowing; incremental vertical and horizontal positioning of individual characters; colorization of graphics and backgrounds individually and independently with 28 colors (7 hues at four brightness levels each); combination of internally generated and external backgrounds in the raster, in which characters can be crawled, rolled, blinked, popped in and out, and changed in color; and use of the system-controlling teletypewriter in combination with "Font Build" software which permits construction of custom fonts, logos, graphs, and other graphics from its keyboard.

Random access storage of 999 individual pages that may be called up as individual displays or automatically timed animation sequences is provided by the computer's data storage facility, along with automatic formatting of characters to be inserted in recalled, standard pages (weather maps, sports scores, etc.) including font, edging, color, background, and tab characteristics. Characters in a single or a sequence of pages can also crawl or roll.

In broadcast operations, remote control of the system is offered from any of up to seven keyboards or display-only control panels with assignable priority interrupt status, each connected to the system equipment rack through a four-conductor cable. An internal two-page memory permits instantaneous cuts from one page to another without "waterfalling" or blackouts, while variable "dwell time" (i.e., frame callup rate) permits automatic freeze frame or animation display of sequences.

Dual character generator systems permit simultaneous utilization of the two character generators in display or graphics creation operating modes from separate remote terminals, subject to selectable priority interrupt arrangements. A valuable operating mode available with dual systems is automatic full-color display of the "on-air" and "next" pages in a chained sequence, on adjacent monitors. While this "dual display mode" may take away system control and visibility from an operator at another terminal, the material on a page being composed at the

continued on page 58

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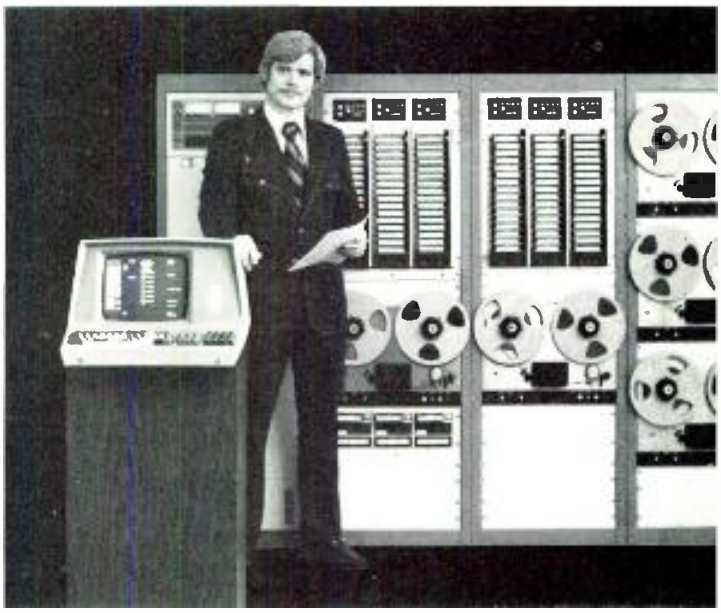

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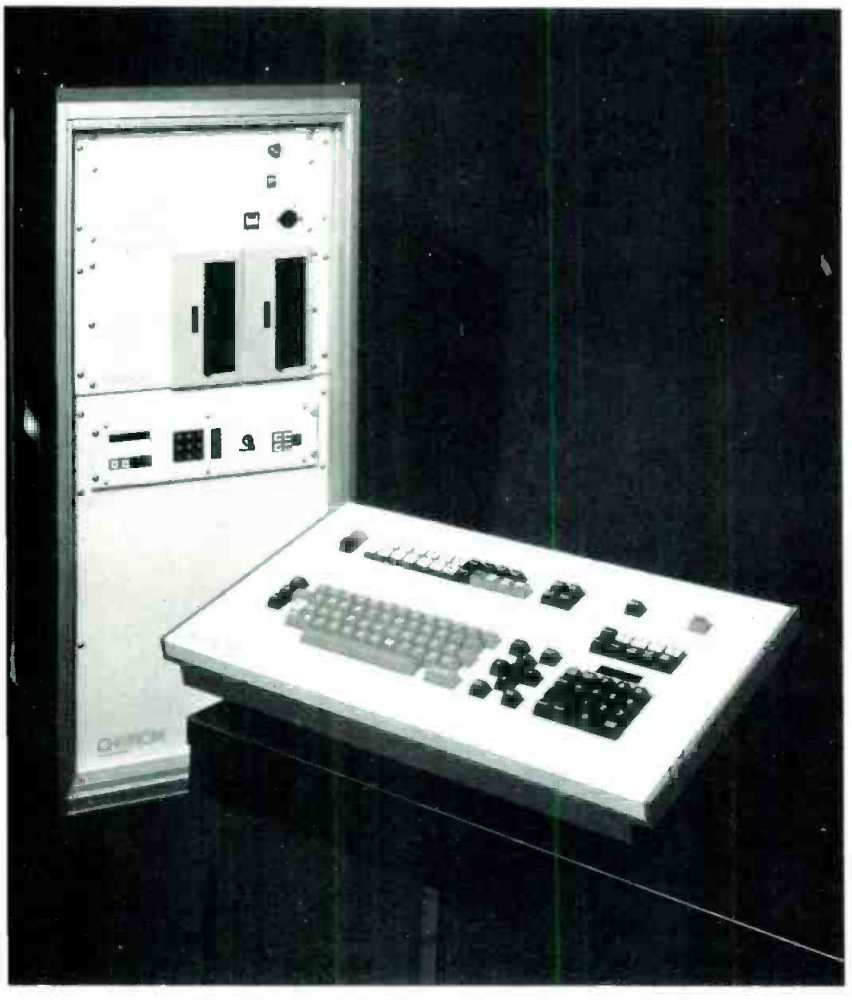
time of interrupt is automatically transferred to a scratch pad memory and returned to that terminal display when the interrupt ends.

The TED election package allows the election night program director wide lattitude in combining up-to-the-minute displays or votes counted in each of 200 races. These may be unrelated, but more commonly will include both subsidiary election district counts and grand totals for all similar districts. Displays may be arranged either by candidates' names or by their current vote totals, with counts displayed in raw votes or percentages. Races can be called up as full pages or lower half displays combined with live pictures. Software and a "housekeeping" CRT display provide instant callup of any page by operation of a light pen.

At WTEV, operations and engineering manager Lee Tanner claims that the three-keyboard dual TeleMation system "gave an immediate, dramatic new look to the station's on-air pictures, and a smoothness of continuity that hadn't existed before. The TeleMation unit is used to create visual bumpers to get in and out of station breaks, and to dramatize the key points in our in-house produced commercials. We also use it to make 'electronic slates' for our productions."

During last year's Americas Cup Races, for instance, the station created cartoon likenesses of the boats, using punctuation marks and line elements from the keyboard, and stored them as an animation sequence on the disc. When the United States finally won the competition again, they added an animation sequence that sank one of the boats.



The Chyron IV digital graphic system showing the composer keyboard console and the character generator

Chyron II monitor photograph showing a five-day forecast keyed into a shot of New York City on WNBC's NewsCenter 4. The station relies heavily on Chyron IV graphics throughout its program

"Compositor I has also helped us in our efforts to create effective special interests programming," adds Tanner. "We have a large Portuguese-speaking community which is the core of the area's commercial fishing industry. TeleMation created a Portuguese alphabet font for us shortly after the system was installed. Now when we produce our community service programs, we can add Portuguese language titles and captions and translations, either simultaneously as they are being taped or later when they play on air."

EUE Screen Gems inserts digital graphics into digital effects

When talking with stations and teleproduction facilities about digital systems, it is not at all uncommon to discover that digital graphics systems are more often than not tied into the digital effects systems. By using the output of a character generator such as Chyron as an input into the digital effects system, it is possible to create effects that not even the effects generator or character generator manufacturers dreamed of. Jack Schultis at EUE, for instance, a Chyron IV user, points out the fact that the Chyron can be used to create a wide range of insert shapes which can then be fed into his DPE 5000 as chroma key inserts. EUE, which frequently does complex graphics for industrial clients, now has the ability to not only compose elaborate graphic displays, tables, diagrams, etc., but to insert them noiselessly into another image. Schultis is also impressed with the Chyron's ability to resolve extremely fine letters such as copyright symbols, which may become lost in the low-resolution monochrome graphics camera.

The Chyron IV is the most advanced of a long line of Chyron digital graphics systems; with its optional features such as a font compose unit, colorizer/keyer, full-function second channel, right-to-left foreign language writing remote keyboards, RS-232 interface, expanded font memory, and multiple storage disc transports, it is capable of producing the enormous range of graphic displays that have come to be associated with today's high visual-impact presentations.

The font library contains dozens of styles and sizes for all types of applications. Character width, including spacing for each character, is fully proportional, with automatic character overlap. Fonts contain up to 92 characters, upper and lower case, and the 27-nanosecond increment resolution provides extremely sharp edges and good curve

continued on page 60

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definition. Up to six fonts can be stored and used simultaneously, and can be mixed in any word, row or page. Any character or combination of characters can be flashed, and any word, text, or graphic can be sloped in 14 degree increments for instant italics.

Sixty-four colors are provided in an electronic color grid system, and, when used with the optional colorizer/keyer, individual characters or complete messages can be colored from full-screen height to four TV lines, independent of character height. Characters and graphics can be edged with either symmetrical block edging or non-symmetrical drop-shadow borders in two thicknesses. Transparent characters are formed by block edging.

A number of automatic functions make Chyron IV an extremely useful production tool. The Program Sequence Controller (PSC) enables the system to produce animation-like effects. The dwell time, sequences, and changed appearance of displays are recorded, so that subsequent high-speed playback can produce smooth transitions from "frame" to "frame." PSC can also capture all system functions, including flash, color, roll, and crawl, and add them to the animation effects. Five selectable roll speeds are available (including pause) and can handle up to 2000 lines of information. Five horizontal crawl speeds are also available.

Other Chyron IV features include cursor control of horizontal and vertical positions of characters or lines to form graphs, frames, underlines, and wide characters. Character overlap is controlled with horizontal shift controls that can position characters to within 224 nanoseconds of total overlap. An entire line or page can be automatically centered with a single keystroke. Lower third displays are also automatically programmed. Still another useful feature is the ability of Chyron IV to insert or delete either characters or whole rows, making it possible to proofread and correct completed pages.

Chyron, too, offers a software program for election coverage, consisting of in-station hardware, local and remote data communications links, and software programming which ties into a national network of time-sharing computers to produce accurate, rapid election returns. The results, including analysis and display of any predetermined subsets and totaling for an unlimited number of races and candidates, are programmed through the Chyron graphics system for on-air presentation.

Though sophisticated digital graphics systems have been around several years more than their digital effects counterparts, the learning process is still going on. By expanding the software capabilities of these systems to enable them to interface with other digital data systems such as election reporting systems, weather services, stock market quotations, and so forth, a whole new area of attractive, rapid reporting can be added to a station's information presentations. Interfaced with digital effects systems, character generators have the capability of making words and graphics displays as exciting as other visuals. And, with expanded capabilities such as font composing and "animation" systems, they can be programmed to replace even the most complicated visual presentations. As is the case with any production tool with so many possibilities, the way must be left clear for those with creative talents to be allowed to experiment.

Part 3: Digital at NBC page 64

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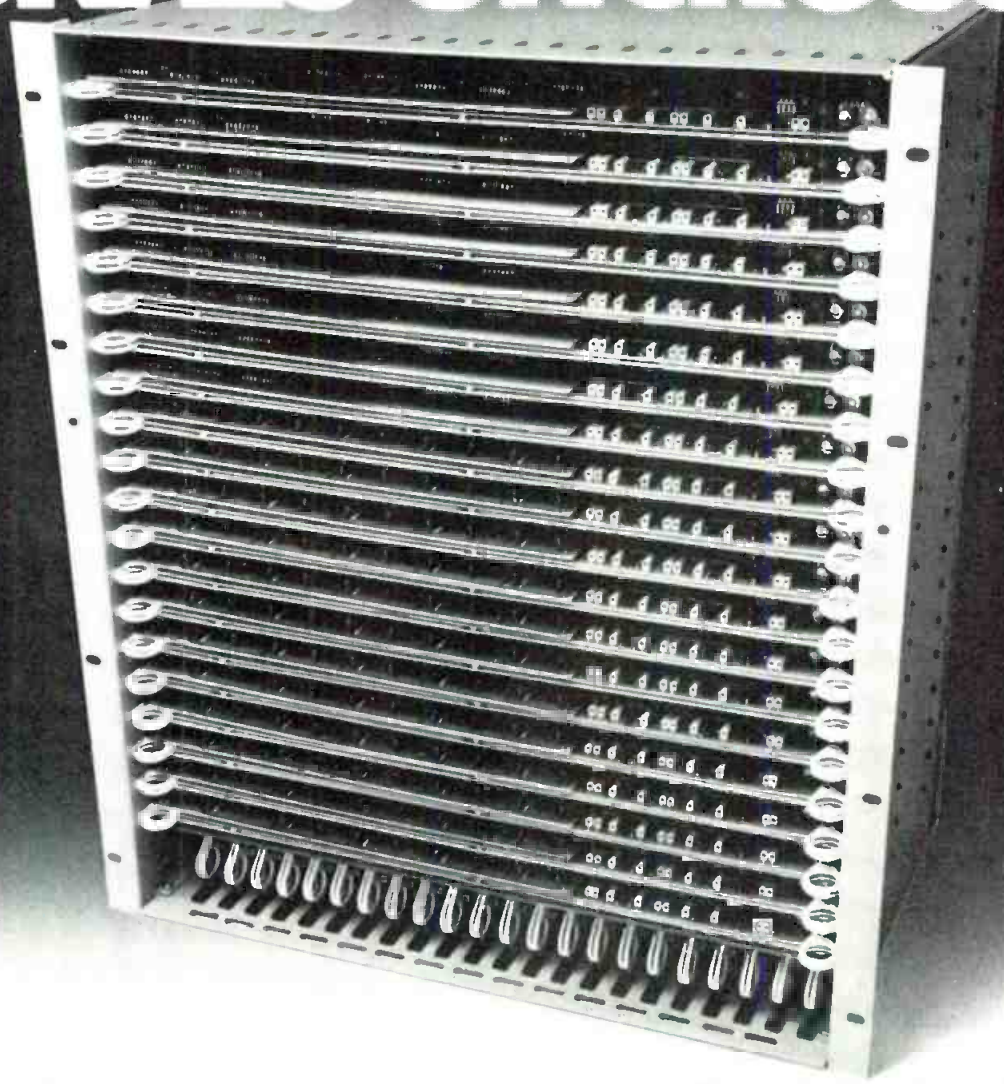

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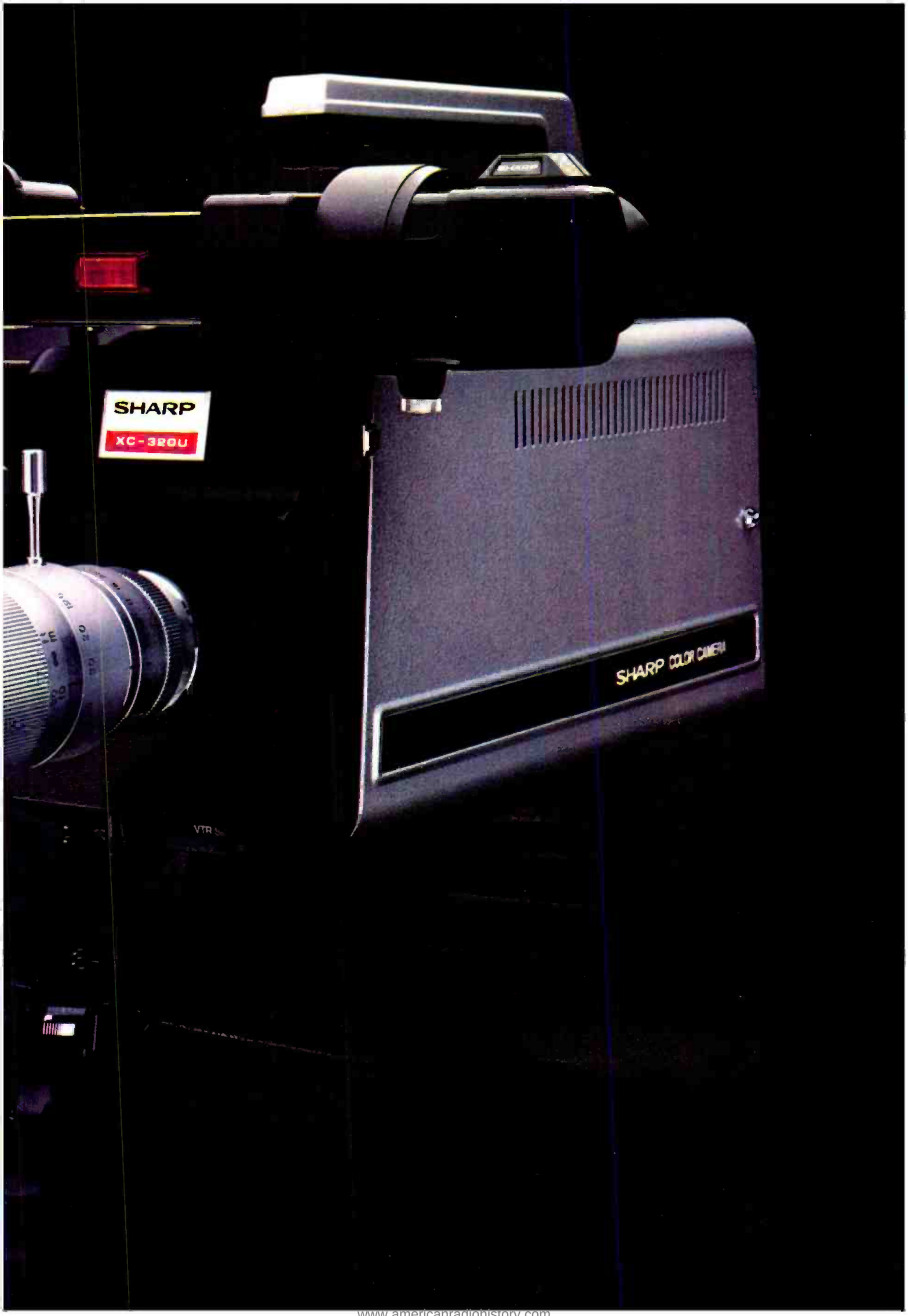


Part 3: NBC Gets Closer To A Digital System

BOB BULTER, director of technical development for the NBC television network, is reluctant to describe the system in use at WNBC's Studio 6B as a true "digital system." Technically, the system in use for WNBC's *NewsCenter 4* program is mostly analog, but what it does could only be done given the large contribution made by digital devices.

The Studio 6B installation was designed to integrate an ADDA ESP-100 system, a Chyron graphics system, and an MCI/Quantel DVP-5000. The objective of the system was to overcome a number of shortcomings in the traditional method of using slide visuals and graphics material in a newscast. "Number one," said Butler, "the light level on the screen [in a traditional setup] had to be complimentary to the light level in the studio. Number two, the depth of focus on the lens used in the studio has always been a problem," especially when, for aesthetic reasons, you want to locate the screen at some relatively great distance behind the commentator's desk. Added to these "studio" problems, there was also the desire to shorten the time between the production of a graphic slide and its use on air. Moreover, the traditional "optical" means often produced great variations in the way an artist conceived his work on the drawing board and perceived his work on the screen after several film production stages.

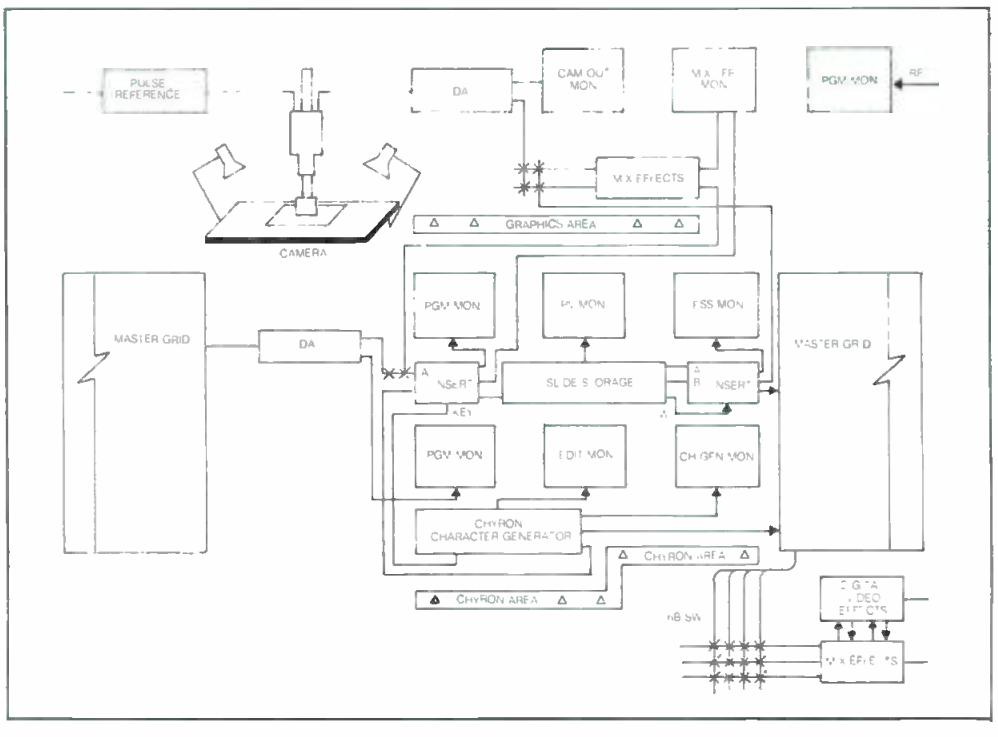
Given the problems of the studio environment and the cumbersome graphics process formerly used, the limitations that standard chroma key presentations imposed on the direction of the program led to the inevitable conclusion that the entire graphics-to-screen process needed overhauling.

According to senior staff engineer Robert Mausler of NBC's technical development department, the *NewsCenter 4* program, which airs from 5:00 to 7:00 p.m. and again at 11:00 to 11:30 p.m., may use as many as 60 to 70 electronic slides daily. The process of getting these visuals to air begins in the graphics department. After an artist completes his drawing, executed in the traditional manner, he places it on an Oxberry stand located in a nearby room. Mounted on the vertical camera support is an RCA TK-76B which functions as the primary input port for such material. The room contains, in addition to the stand and camera, two black and white monitors, a color monitor, and a control panel for the ADDA ESP-100.

The black and white monitors provide the artist with graticules outlining the safe and essential areas of the picture screen. The color monitor provides him with an immediate gauge on the electronic color rendering. Once satisfied with the composition of the picture on the various monitor screens, the artist uses the ADDA control panel to "freeze" the picture into one of the ESP's two active memories.

Once the picture is frozen in the active memory, the artist can see how the ESP unit will reproduce his picture. There is another step to the process, however, that Butler feels is all-important. The still must now be transferred from the active memory to the ESP's disc memory and then recalled to be certain that the disc memory is clear and functioning properly. If all is well, the still is returned to its permanent storage location.

The address of the storage for any particular still can be assigned by the ADDA system, which will deposit the still in the next available track and then provide a five-digit address location readout to the operator, or the operator



Block diagram shows basic concept for using the ADDA ESP system. The artwork is entered into the ESP from the Oxberry stand and TK-76B camera. Chyron II lettering can be added and the "slide" stored or composited. The output is routed through the DVP 90 percent of the time to take advantage of the auto chroma key tracking

can assign the memory location himself.

The ESP system, according to Butler, has four basic memories: two active memories which can load in one-thirtieth of a second and two disc memories that are relatively slow, requiring about a half-second to load from the disc to the active memory. To some extent, this is a limiting factor if one wishes to view the system as a two-output device for doing back-to-back cuts between slides. Back-to-back cuts are not simultaneously possible on both outputs.

Though use of the ESP as a dual output device is possible, Butler feels that it would be infinitely superior to view the device as a single output unit and add output transitional effects as required. Delivery of the second output to a remote point for preview purposes only does not justify the additional distribution cost and monitoring required.

Where NBC decided to go for the pay-off with its ESP still store system was in using it in conjuction with the Automatic Chroma Key Tracking capability of the MCI/Quantel DVP-5000 system, which is interfaced to its RCA switcher. Ninety percent of the ESP on-air output is used through the DVP device, according to Butler. Essentially, this combination has enormously simplified the matter of using graphics chroma-keyed into the *NewsCenter 4* program. With the compression and auto chroma key tracking of the device, neither the camera operators nor the director have to accomodate the use of chroma keys in their selection of shots or camera moves. The DVP will automatically position the chroma-keyed image into the available chroma key area as "seen" by the primary camera source.

"This is the really tough thing to do," said Butler. "What had to be done here, and is essential, is that the compression and position of the picture that comes from the slide store is exactly compressed and positioned to equate to the chroma key area in the scene." The question that arises, and one of the problems with auto chroma key tracking that turned up, is: From where does the DVP get its instruction?

NBC's technical development team found that after the DVP/ADDA complex was installed, they had to go back into the studio and do some hard research into the entire chroma key issue. Because the DVP reads the chroma key area available in the scene and compresses and positions the picture accordingly, spectral highlights, or blue light spill from the intended key area, would give the DVP false instructions regarding the correct location of the key area. In short, set conditions that were acceptable to a normal type of chroma key setup were intolerable in this environment.

NBC had to go carefully into the studio and assure that the best separation possible between the chroma-key area and proximate objects was obtained. Further, the flattest diffusion material available had to be used on the lighting to keep the chance of spectral highlights occurring to a minimum. Also, because the *NewsCenter 4* format called for the frequent use of a wide shot that included black and white monitor screens in the foreground, the technical development team had to go into the DVP itself and install circuitry that would provide automatic masking to areas of the picture that would contain the monitor screens.

These necessary adjustments, Butler points out, are not faults of the DVP system, but rather a case of sloppy chroma key environments that in the past did not affect traditional chroma keys noticeably.

The above title card was created by a graphic artist with news items added by the Chyron II, and stored as a composite on the ESP. Display of the composite is routed through the DVP to take advantage of auto chroma key tracking

The inset of Willie Mays is not keyed in but rather compressed and positioned to equate to the chroma key area. When the scene goes to the tape, the inset picture is automatically expanded and centered by the DVP as a box wipe

The third element in the Studio 6B setup is the Chyron II Graphics and titling system. Normally, titles are not combined with the slide information until the last minute, since, as Mausler points out, title information is often the most up-to-date and the directors prefer to use them separately. Nevertheless, the ADDA ESP system is set up so that the Chyron titling can be combined with graphic artwork and stored in the ESP in composite format. This approach has been used occassionally, especially during times when large numbers of basic composite title cards are to be used, such as during the recent elections. It is in circumstances such as this that the viewer is watching a normal television picture that is generated, stored, and projected in a nearly totally digital system. Only the routed video signals and the final display of the picture are analog.

We are still a long way from the all digital system, but as the foregoing applications show, video in the digital domain has enormous flexibility and great potential for infinite variation without loss of quality. As broadcasters and teleproducers learn more about how the power of digital technology can be applied to the creative problem of developing television images, the pressure to maintain the video information in digital form will grow. Meanwhile, ever more powerful digital tools will be introduced and broadcasters will adopt them, opening up yet newer vistas to the television audience. **BM/E**

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On The Way: Digital Audio With Great Gifts For Broadcasters

The first noticeable impact of digital recording techniques that radio is likely to feel will come from an increasing trickle of high quality recordings making their way into the market. Experts, however, agree that this trickle will be followed by new technologies such as PCM laser discs, VTR adapters, and other spectacular improvements from the digital domain.

AFTER KICKING UP A TREMENDOUS advance fuss for several years, digital audio will finally start coming true for radio broadcasting this year. The recording industry is beginning to inject digital technology into the flow of commercial recordings in the form of digital mastering of the originals. After commercial recordings, digital audio will enter broadcasting in several other forms at various times in the future. The digital parade, as it is now taking shape, has a complex makeup. Its main sections, with their present status and possible timing, are set out in the accompanying table, providing a schematic background for this discussion, which starts with details on the commercial recording scene and goes on to digital potentials still only in the talking stage. The dozen-plus experts *BM/E* consulted agreed on all major points.

Master tapes with virtually no distortion

Warner Brothers Records in Hollywood, a major producer of commercial recordings, will put to work one of the first four 3M digital mastering systems delivered to the industry at about the time this magazine is distributed. Al McPherson, studio head, told *BM/E* that the digital system, on lease for the present, would be restricted at first to music that does not need elaborate editing because editing is difficult on digital tape without electronic aid. But he said there would be "some product" from the system this year. 3M's electronic editing system, described in November at the Audio Engineering Society convention in New York (see *BM/E*, January, 1979), is slated for delivery late this year and will remove this restriction.

The situation is somewhat similar at A&M Records in Hollywood, Sound 80, Inc., in Minneapolis, and the Record Plant in Los Angeles. All have or soon will have 3M digital tape systems; all are important producers of commercial recordings.

Another digital mastering enterprise currently underway, the first to turn out commercial recordings in this country, is that of Soundstream, Inc., whose machine was the first available (see *BM/E*, February, 1977). Soundstream, as described in earlier issues, is leasing its system as part of a complete recording service that includes setting up the microphones and goes on through to overseeing the cutting of the master discs. Dr. Thomas Stockham of Soundstream told *BM/E* they had made 15 commercial recordings this way at the time of writing, with more on the way. The records have appeared under a number of labels, including Telarc, Orinda, and 2000 BC.

What are these records like? Samples of the Soundstream productions, plus two sample records produced by Sound 80 on the 3M system, all have a startling clarity well beyond that of most current commercial recordings. Some of this may have been the result of great care in other parts of production; but the total absence of tape noise, the total freedom from flutter, the sense of no-distortion, would seem to have been impossible without the digital technique. The listener is exhilarated by a feeling of ease that is combined with an accurate sharpness in the music.

Are these records important to the radio broadcaster? *BM/E* believes that for competitive reasons they will become more and more important over the coming years. When people play such records on good home hi-fi equipment — and many thousands will — their expectations about what they hear off the air will go up another few notches; home hi-fi has already pushed those expectations far above earlier levels.

Enthusiastic about the playback of a digital recording on the Soundstream machine is conductor Frederick Fennel (right). Also listening are Dr. Thomas Stockham (left), president of Soundstream, and recording engineer Jack Renner

Moreover, even people who do all their listening on small table models or car radios are not totally exempt from an upgrading effect. Much recent experience indicates that a substantial improvement in signal quality gets attention and approval from a wide spectrum of the audience. The digitally mastered recordings will add to the pressure behind the upgrading of audio in broadcasting.

Digital mastering is certainly going to spread in the commercial recording industry as the machines become available. The fact that so many of the large electronics firms are staking out a piece of this territory tells us that the industry is expecting the technique to become general. There are plenty of advantages, on top of the quality boost: elimination of generation loss, extremely precise automatic editing, elimination of most forms of tape deterioration through time, and ready adaptability to digital sound control and processing. In addition, programs mastered in digital form will be ready to play a full part in the era of the PCM laser disc, if that comes — a momentous possibility considered below.

Next on deck: VTR adapters

Just coming into use as this is written is a second type of digital audio device, an adapter to put PCM audio onto videotape recorders. The analog audio signal is fed into the adapter, which encodes it into digital form and puts it on the horizontal lines of a "pseudo-video" signal, with horizontal and vertical sync just like those of a standard video signal. The pseudo-video signal can be recorded on any VTR, b&w or color. The adapter also acts in reverse as a playback unit, with digital-to-analog conversion recreating the original analog signal.

The first two adapters on the market are the Sony PCM-1600 and PCM-1, both with NTSC format. The maker recommends using the U-Matic with the PCM-1600 because the cassette form protects the tape, but any NTSC VTR will do. According to the announced specifications, the PCM-1600, using 44.056 sampling and a 16-bit linear code, operates at the top of the current digital art: dynamic range more than 90 dB, distortion less than 0.05%, unmeasurable flutter, etc.

Moreover, with the addition of an editing console the material can be edited just as video programs are; the machines can be synced to other video machines or audio machines; with two VTRs the user can make digital-to-digital dubbings with virtually no generation loss; the system can use any form of sync code and remote control just as video systems do. And the cost is far below the projected cost of open-reel digital tape systems (none is for sale yet). At $40,000 for the PCM-1600 and $3000 or less for the VTR, this promises to be the cheapest way to get top level digital recording for a while.

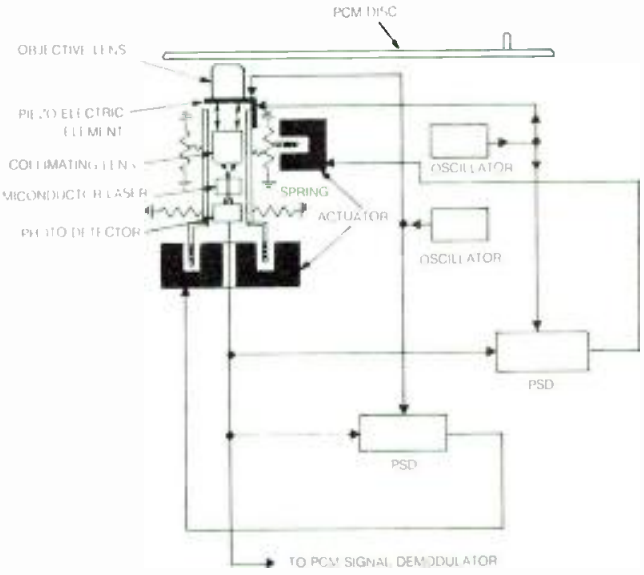
The most obvious limitation of the system is its having only two channels, which makes it unsuitable for most studio recording, since at least 8 to 24 channels are required. The 3M system has 32 tracks for the original recording. Thus, Sony suggests the following uses: for the mix-down to two tracks, producing a digital master; for synchronized high-fidelity soundtrack recording with motion picture and video programming; for mass memory applications; and for simultaneous handling of both audio and video signals in the same format. Sony points out that the pseudo-video signal can be transmitted over any system designed to handle video signals, including television broadcast transmitters!

The PCM-1, usable with Betamax and similar VTRs, is priced at $4400, operating lower in the fidelity stratosphere than the PCM-1600, but still providing, according to the specifications, audio recording and playback quality worlds ahead of anything available to the consumer before. We can speculate that a class of amateur and semi-pro recording fanatics will emerge who will be able to produce their own recorded material at considerably higher fidelity than anything the recording industry has made in the past. Sony and the other firms developing the adapters are apparently counting on this.

For broadcasting, the PCM-1600 (and similar devices to appear later) will undoubtedly be the more interesting.

Digital Audio — Present And Future Systems

Digital Audio System	Function And Characteristics	Market Status
Open-Reel Tape Mastering		
Soundstream, Inc.	Multichannel digital recording and playback	Machine available for leased recording service
3M Company	Multichannel recording (32 tracks) plus two-channel mixdown recorder	Systems available on lease
Sony Corp.	Multichannel recording (up to 24 tracks)	Prototype shown; no market date
Mitsubishi Corp.	Multichannel recording	Prototype shown; orders taken
Matsushita Electric Corp.	Multichannel recording	Prototype shown; no market date
Adapter For VTRs		
Sony Corp. PCM-1600	Puts audio into digital form and into a "pseudo-video" signal for recording on VTRs; top digital quality (16-bit coding)	On market (approx. $40,000)
Sony Corp. PCM-1	Same; slightly lower quality level (13-bit)	On market (approx. $4500)
Matsushita Electric SH-P1	Same	Prototype shown; no market date set
Mitsubishi Corp.	Adapter and VHS recorder in one unit (13-bit)	Prototype shown; no market date set
PCM Audio Laser Disc		
Teac-Mitsubishi-Denka	Records PCM audio onto spinning 12-inch disc with laser beam for recording and playback	Prototype demonstrated; no market date
Sony Corp.	Same	Prototype demonstrated; no market date
JVC	Combined A/V disc system (13-bit) with laser recording, capacitance play.	Prototype demonstrated; no market date
Philips Corp.	Laser record and play, 4-inch disc	Prototype demonstrated; no market date



Simplified playback system for Teac-Mitsubishi-Denka laser disc player uses semi-conductor laser in housing that is "wobbled" on two axes to supply error signals for servos controlling focus and tracking

Radio managements wanting to record live concerts on location for later airing will be able to reach a superb fidelity level, far above that possible with analog machines, using two easily portable units, an adapter and VTR. One radio station is considering transferring its many open-reel stereo recordings to digital form on U-Matic cassettes to eliminate tape handling and variations in replay adjustment.

Using the system for re-recording, duplication, and processing of program material could be attractive when there is a lot of this to be done and the radio management wants to avoid loss of quality. Every quality-alert radio engineer will think of other ways to put such a system to work. As noted in the table, he will be getting more choices as time goes on; the industry is committed heavily to the adapter, as it is to the open-reel machine.

Laser discs: top quality, low cost

The digital tape mastering machine and the audio adapter for VTRs are reaching us now. Somewhere behind them will come the third kind of digital machine, the PCM audio laser disc. It will bring a massive uplift of technical quality because it has the top virtues of digital audio in a playback-only system that is inexpensive, compact, and handy to use.

As described in *BM/E* in February, 1978, the laser disc uses much of the technology developed for the optical video disc, putting digital audio at its fullest in a cheap, easily-duplicated recording format. The discs are stamped out very much as phonograph records are. The system overcomes the mechanical non-precision of its stamped discs with ingenious electronic servo systems that keep the laser beam centered in the one-micron wide track, keep the beam focused through ups and downs of the record surface, and provide time base correction.

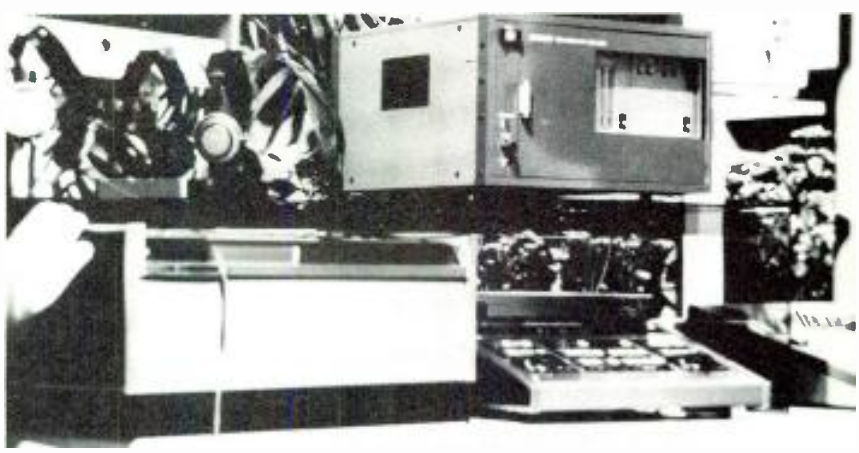
The disadvantage of this system, compared with the other two, is that the laser disc does not provide ready recording to most users; recording must be done in large central plants (at least for the present; proponents of the system have predicted that in time the recording equipment will be inexpensive enough to be owned by many organizations). The process will mimic that for analog records. The digital mastering will be done on tape, the program transferred to a digital master disc, and duplicates of the disc distributed to users and played on inexpensive digital machines in their homes. Digital form and quality will be maintained through every part of the process from original taping to home playback.

If the electronics industry puts substantial force into making a consumer success of the laser disc, there is no doubt that it will permanently change public conceptions of acceptable fidelity in recorded sound. To radio broadcasting the laser disc will bring, first, inexpensive program material at the new quality level. It will alert the consumer to expect the new quality from radio.

Beyond that, the disc will create new conceptions of how program material might be stored and used in a radio station, particularly with some form of automation. The laser disc, both video and audio, is a storage system of almost incredible density. Potentially, one side of an audio laser disc can hold one, two, or more hours of music. The servo systems controlling the laser beam will allow almost instant random access, under automatic control, to any program item on the record surface. Thus, the technology is on hand for an automation system that stores the music on laser discs. One disc could hold, for example, all the Top 100 tunes of the month, or several classical symphonies. What a leap ahead in audio quality that could bring to radio!

How do our chances look for getting the audio laser disc? How soon? Some half-dozen firms have developed prototype systems (including the Teac-Mitsubishi system that caused such a sensation in demonstrations at the Audio Engineering Society last year). Moreover, these firms are only part of those around the world who are pushing laser audio disc systems — the table includes just the firms which have indicated some intention of marketing the machines in this country. In Japan, a number of additional firms are active, and recent audio shows there have emphasized laser disc systems heavily — the Japanese industry is evidencing strong intention to develop large-scale consumer marketing.

The great barrier is the need for standardization, and several firms say they are withholding further development until there is some progress in this area. No two of the systems announced so far are compatible. There are industry reports that a meeting of all the major Japanese firms will take place early this year to try for agreement on some basic compatibility. If the firms do agree, the way might be open for marketing by early the following year, but that may be overly optimistic.



Sony's PCM-1600 adapter for putting PCM audio onto VTRs is shown (right) above a U-Matic recorder (left) and BVE-500 editing console (under the adapter). The three units together can record, edit, and play digital programs

Digital Audio

Whatever the industry's speed (or lack of it), the overwhelming logic of the laser disc for digital audio cannot be diminished. It would be a tragedy if we were deprived of so powerful a servant for a long time — or, if compatibility, cannot be achieved, perhaps permanently.

Similarly powerful logic attaches to another form digital audio could take in a radio station. This one is pure blue sky at the moment —as far as *BM/E* can determine, no firm has announced any moves toward developing it. But several of the experts we interviewed in preparing this article called it a most logical and useful thing that digital technology could do for radio.

It is the storage of all program material in digital form in computer-type memories, with instant call-up at the punch of a button or under control of a sequence in the computer memory. The advantages do not need belaboring: digital audio quality, indefinitely preserved and always instantly available, with new material entered, or old taken out, with the greatest ease. Radio automation technology is already practically there: all the control systems have been developed. The main holdup is the cost of memory, and this is on a great downcurve.

A corollary advantage is that all signal processing could be done by computer techniques. With the program material stored in a computer in digital form, an equalizer or filter, for example, could be a computer program rather than a physical device with capacitance, inductance, etc. We already have reverb, delay, and special effects systems handling the signal in digital form. These could be absorbed into the controlling computer, or interfaced with it in a simple manner.

The often envisioned prospect, in fact, is for every part of the signal handling in a radio station to be consolidated into one computer system. Noise and distortion arising from the handling would disappear. Signal processing, including level control, would be far more flexible and exact than it is with analog techniques. The technology is mainly ready. The main question now is cost. It seems probable that a technique with so many advantages will be pushed ahead until the cost is acceptable to radio.

How does it all fit together?

A final point: the various forms of digital audio technology covered here are not basic rivals. Each will play a prime part in the digital scene. Open-reel tape machines must be used for mastering of recordings. The audio adapters for VTRs will supply digital recording capability for a range of radio stations' needs, both inside and outside the studios. The laser disc will be the means for low-cost mass distribution of programming, and can supplement the computer bank as a storage system.

That computer system in a radio station can take programming in digital form from a laser disc or from a recording made on an adapter-VTR combination, or it can take analog signals, using an internal A-D converter. Programs can be shuttled back and forth among all these systems, processed, edited, and altered with no loss of quality. The fully developed digital technology will give the radio broadcaster superb control over every aspect of program handling, and this will be as important as high quality among the gifts of digitalization. **BM/E**

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"We shoot video or film, depending on what would best serve the needs of each particular project," says Dennis Burns, award-winning producer/cameraman and president of Pacific Focus. "In Hawaii, though, we produce on location almost entirely. So it's important that our broadcast-quality MNC-71CP cameras are rugged enough to take the kind of abuse that the CP-16R can take.

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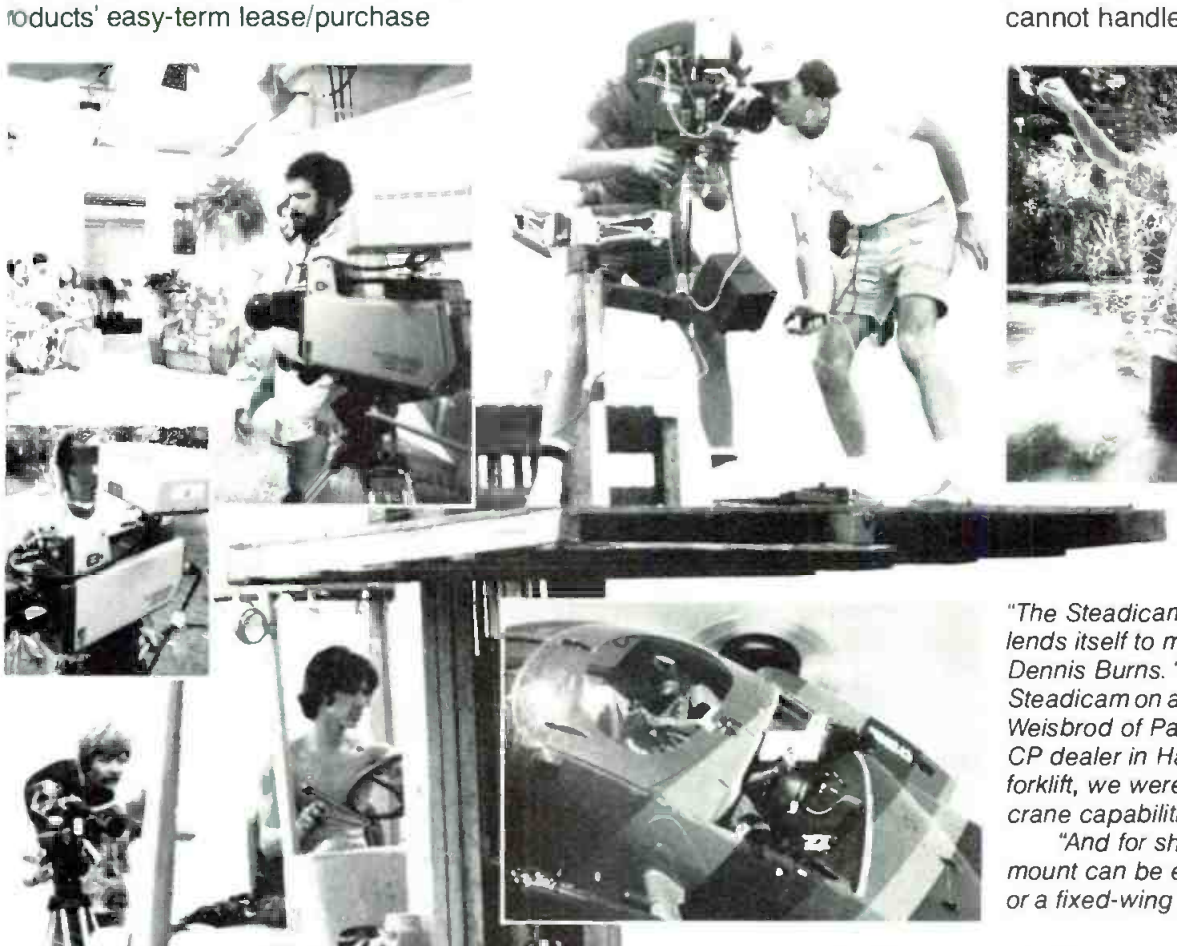

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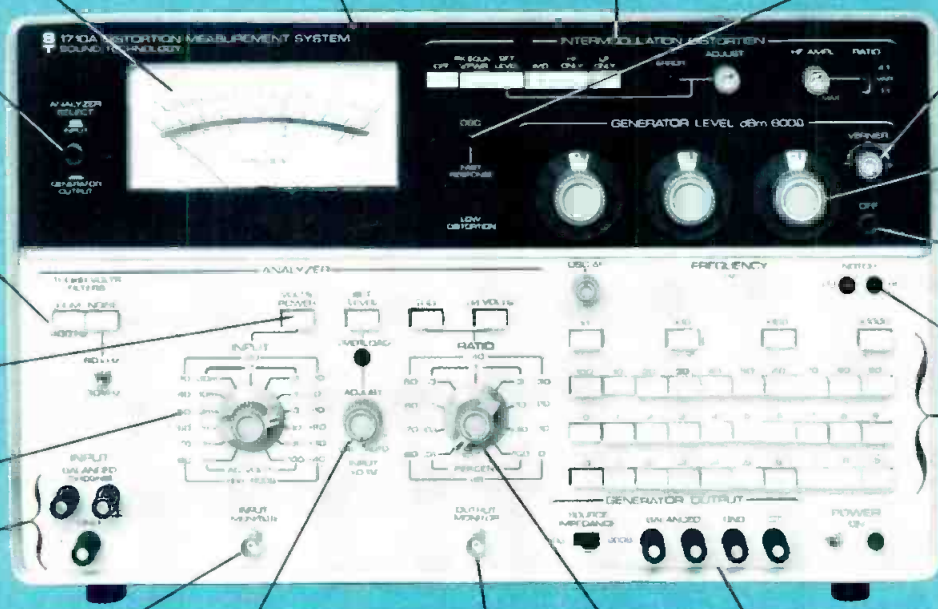

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Designing Systems Using Dedicated Microcomputers: Part 1

By Juan Rivera

The microprocessor holds great promise as an extraordinarily useful and versatile tool in the design of broadcast systems. In this, the first article of a three-part series, the groundwork is laid for the programming of a microcomputer.

Editors's Note: This is the first of a three-part series intended to give the reader an opportunity to "peek over the shoulder" as the author programs a microcomputer. Much basic information on microprocessors has been supplied in previous introductory articles appearing in the June '77, February '78, and July '78 issues of BM/E as a three-part "Introduction To Microprocessors." It is at the level of the dedicated microcomputer that most stations will find practical applications for this new technology. By going through the process of "initiating" a single board computer to do something useful, it is hoped that the reader will be able to focus on the entire process that makes the use of microprocessors such a promising extension to broadcast technology.

WHEN THE WORD "COMPUTER" is mentioned, most people think of large data processing systems, but that's only one type of computer. There are much smaller computers, some so small that they'll fit on a single circuit board. These are called "microcomputers," and while they're much too limited to perform in the stereotypical role of "number cruncher," they are ideally suited to operate as "smart" controllers, and as such, function more as very large and complex logic arrays[1]. In such an application, the computer becomes an integral and sometimes unrecognizable part of the equipment it controls. Operating from a sequence of instructions stored in its memory, and acquiring data from the host equipment and occasionally from an operator, the controller can make complex decisions and issue appropriate commands to the host equipment. This technique produces a system with performance and versatility far greater than more conventional designs.

The digital computer

Since this approach is a departure from previous techniques, some background information is necessary. Briefly, every digital computer is composed of five essential elements: storage (memory), control, arithmatic logic unit (ALU), input, and output (Figure 1).

The storage section stores data in the form of binary numbers which may be interpreted as either information or instructions[2]. There are two types of storage:

Program storage is accomplished utilizing "ROM" (Read Only Memory), which is "non-volatile" since it will retain data even after power is removed. Of the various types of ROM, "EPROM" is the most common. Since it can be erased with an ultraviolet light and then reprogrammed many times, it's ideal for applications in which some modifications are anticipated.

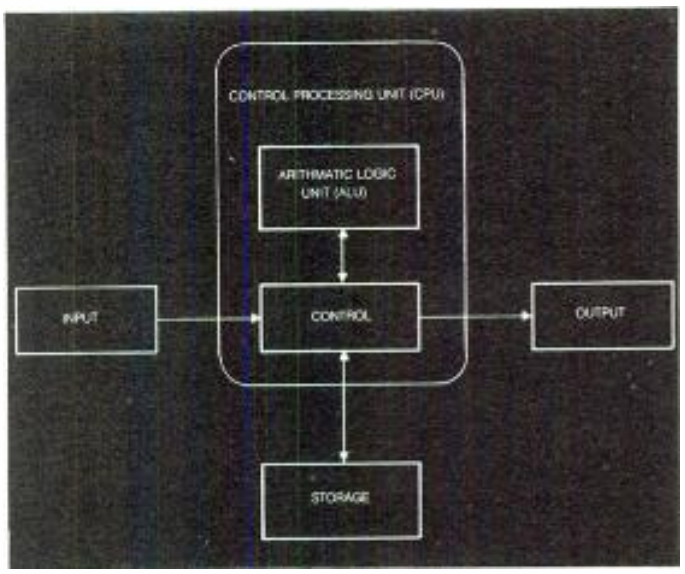


Fig. 1. All microcomputers contain these five basic elements, with the CPU usually implemented on a single chip

For the temporary storage of data, read/write memory (RAM) is employed[3]. Unlike ROM, it may be written into as well as read from, and it's volatile; to retain data, power must be applied continuously. A pocket calculator will serve to illustrate these two memory types. First of all, the program needed to perform the math is stored in ROM and can't be modified. It will always be there whether power is applied or not. Data entered by the user and partial solutions, however, are stored in RAM. If power is interrupted, that data will be lost.

Regardless of memory type, the basic function is the same. Memory consists of arrays of individual memory cells, each of which can store one bit (BInary digiT), which can be either a zero or a one. Most small computers

Juan Rivera is owner/president of Spectrum Dynamics, Walnut Creek, Calif. Rivera has an extensive background in broadcast engineering for both radio and television and is engaged in the design of microprocessor-based systems for broadcast applications.

[1]The microcomputer can be thought of as a "black box" logic array with the same number of lines connected to it as the microprocessor has I/O lines. It is capable of doing anything the black box can do, such as code conversion, timing, etc.

[2]The behavior of the computer is determined by a sequence of instructions called the program, which is written by the user, who then codes it into binary form and stores it in memory.

[3]"RAM" is an unfortuante acronym for read/write memory since it stands for "random access memory" and both read/write memory and read only memory are random access.

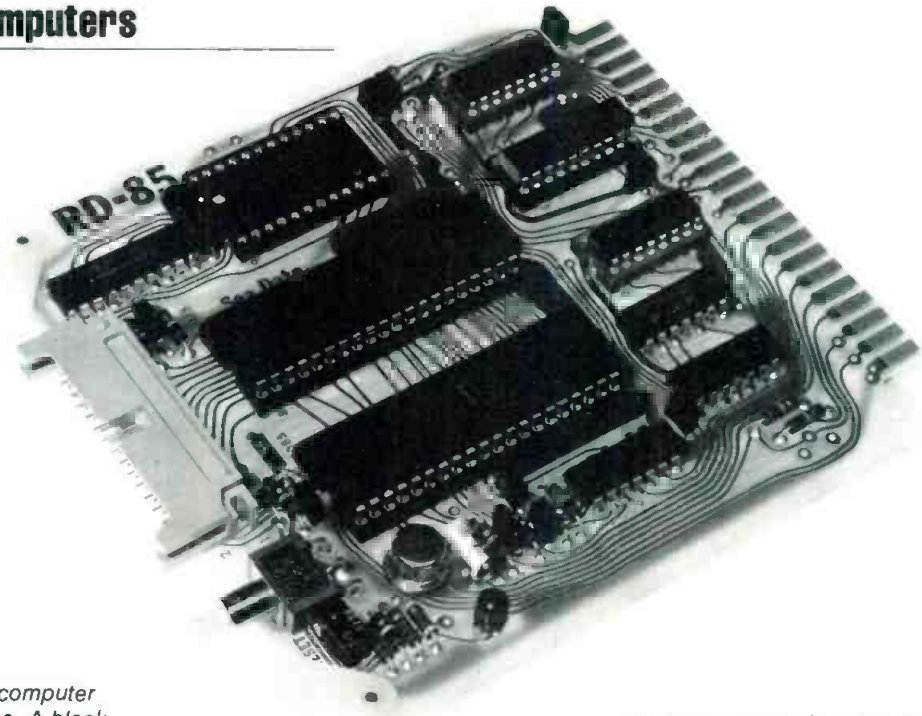
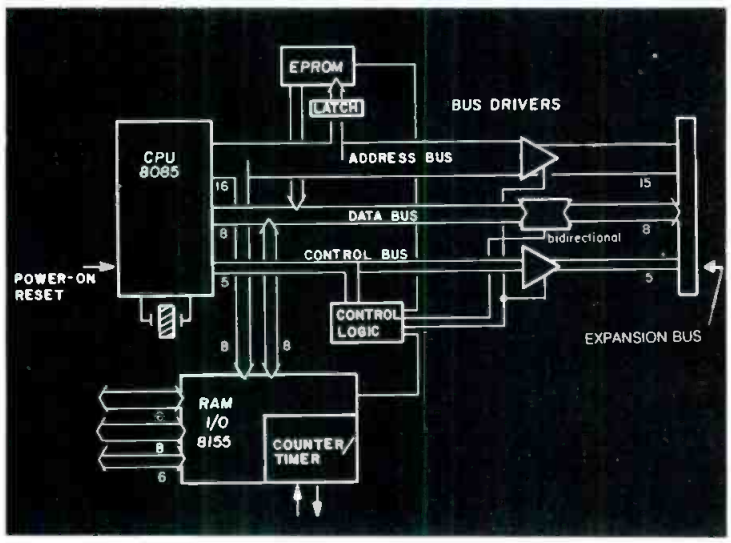
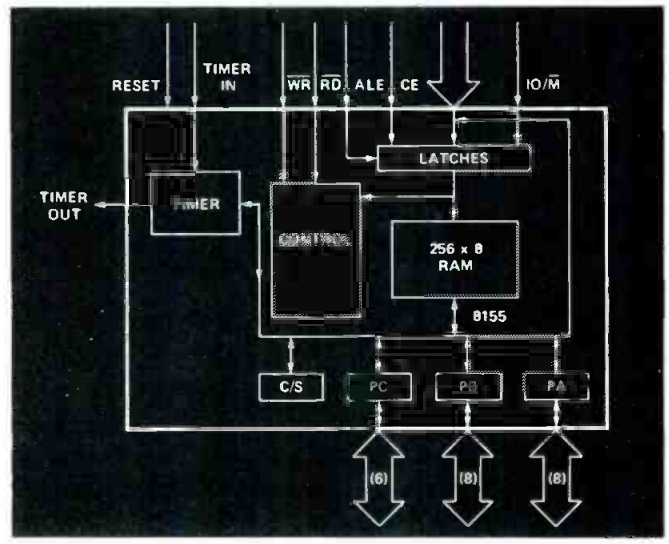


Fig. 2. The actual RD-85 microcomputer measures only 4.5 by 4.5 inches. A block diagram of the RD-85 (below) shows the basic structure of the data handling busses.

Fig. 3. The CPU of the RD-85 is an Intel 8085, but with the addition of the Intel 8155 companion peripheral IC (diagram below) numerous useful features are added to the microcomputer





process data in eight-bit computer "words" called "bytes"; therefore, memory is usually configured to allow access by the byte. Each byte-size location is accessed by its own unique address, and since most microcomputers address memory with a two-byte address (16 bits), they are capable of utilizing up to 64,000 bytes of memory (two to the sixteenth power).[4]

The control section determines what operations are to take place and in what order. It reads program instructions sequentially from the storage section, interprets them, and then performs the actions specified. (Each microcomputer can interpret only a limited number of instructions called its "instruction set.")

The ALU performs all arithmatic and logical operations, and is the data transformation section of the computer. Together with the control section, they are referred to as the Central Processor Unit, or CPU.

[4]The binary numbering system is based on powers of two. Therefore there are only two digits to contend with: a zero and a one. Since only two electrical states are required to express a binary digit, it may be stored in a flip-flop (1=set, 0=cleared), and arrays of flip-flops called registers can be used to store larger binary numbers.

In a microcomputer all these functions are implemented on a single chip — the microprocessor. One of the newer microprocessors on the market is the Zilog Z-80. The chip itself measures about 3/16 inch on a side, yet it contains 8200 transistors.

The input and output sections are specialized registers (typically eight-bit) which are accessible to the outside world. They are essential since without them there could be no communication with the outside world at all. Most microcomputers have the ability to access 256 different input/output registers, or "ports." A one-byte address is required for this.

Discrete logic vs. microcomputer

Since the old reliable discrete component designs have served us so well for years, why bother with all this? Two reasons — cost and flexibility. Since these new chips are so dense, they're able to replace whole boards filled with simple logic chips. The reduced parts count lowers costs in several obvious ways: smaller power supplies, simpler

continued on page 76

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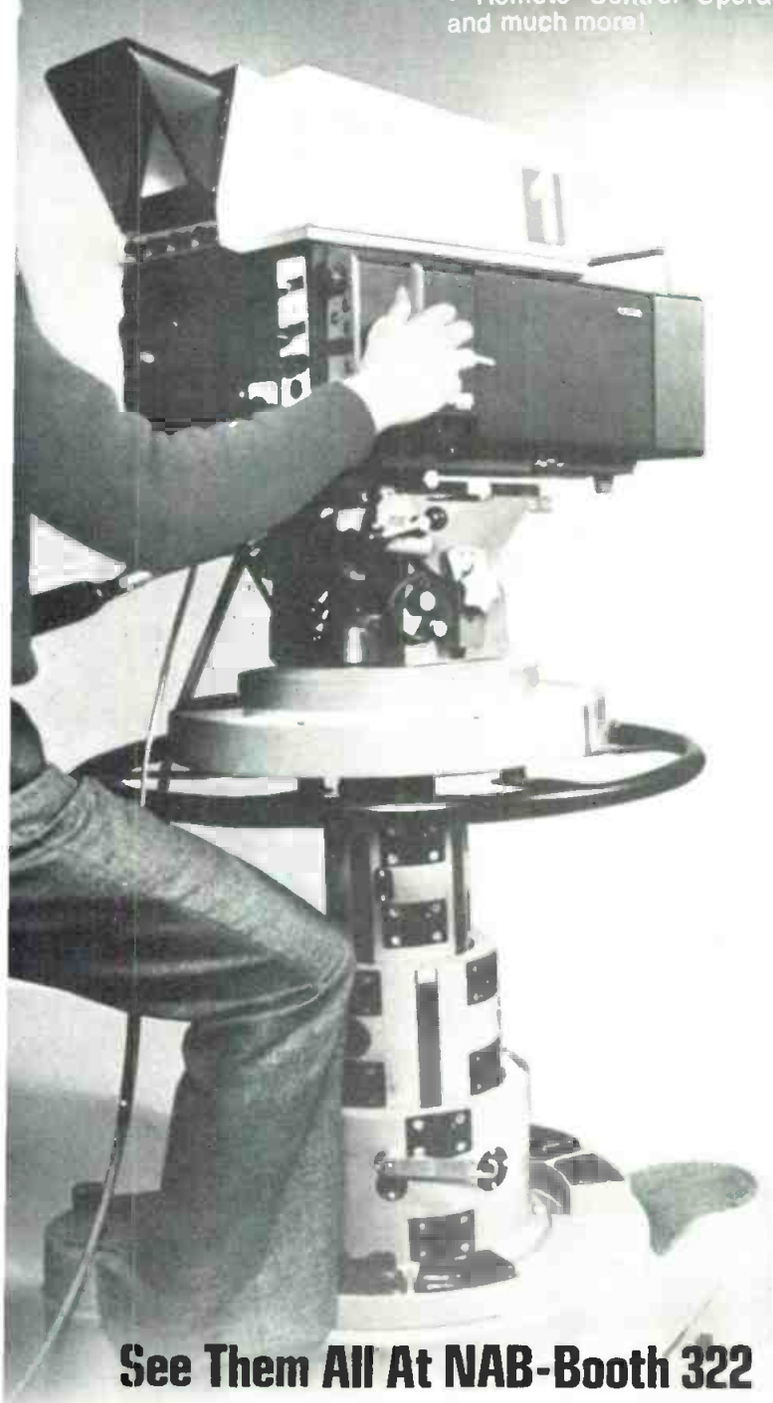

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circuit boards, and so forth. But price is also reduced in an equally important but subtler way. Since these ICs and thus the hardware built with them are so generalized in their nature, one hardware design can satisfy many widely varying applications. This in turn has encouraged the development of a wide range of general purpose hardware which is very competitively priced — priced so low, in fact, that the question is not, "What components shall I use to design a board?" but rather, "Whose board shall I buy?" A case in point is the Sea Data RD-85. The whole microcomputer is contained on a circuit board measuring only 4.5 by 4.5 inches (figure 2), and yet it's a complete digital computer in every respect. The microprocessor used in this design is the INTEL 8085. In conjunction with a companion peripheral IC, the 8155, the following features are implemented: up to 2048 bytes of EPROM (Read Only Memory), 256 bytes of RAM, a timer, and 22 input/output lines. It sells for less than $200. Since this board is so straightforward and simple, it will serve well in the examples to follow.

Define the job

Now that some of the basics are out of the way, an actual design can be explored. There are several clear-cut stages a project must pass through. First of all, as with any hardware design, you must very clearly define the task to be done. We are especially interested in establishing the number of input and output lines which will be needed by the computer for communication and control. Additionally, an estimation of memory requirements is needed (both RAM and ROM).

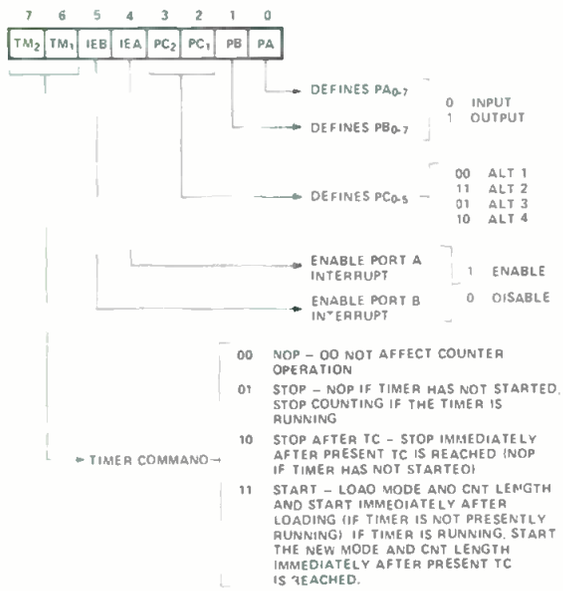
Once the project has been defined, thought can be given to selecting a microcomputer board. There are many to choose from, ranging from quite simple ones, such as the RD-85, to very complex boards containing on-board video interfaces and sophisticated operating systems in ROM.[5] Consider the power requirements of your candidates as well. One especially nice feature of the ICs used in the RD-85 is that they run on a single five-volt supply. Many others do not. Obviously, the board selection process is one of the most important steps, and since you will be selecting from a variety of general purpose boards, it may be necessary to select one with more features than you feel you require. It's certainly better to overestimate your needs than to underestimate. Leave room for expansion if possible. Remember, one of the strengths of a microprocessor-based system is its flexibility. Careful planning at this stage will make future expansion and modification a snap.

Doing it

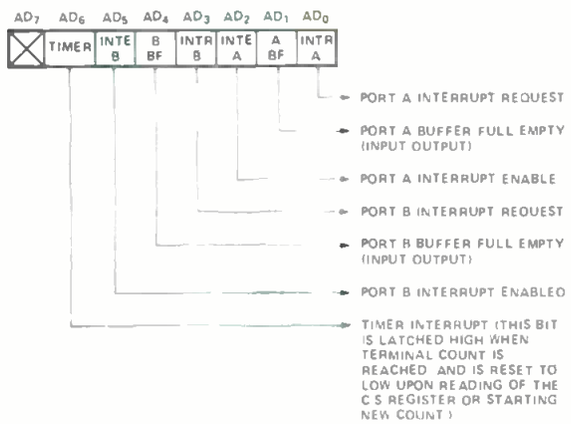
Since an entire project is not within the scope of this article, one small segment will be focused on in some detail. As was mentioned earlier, the input/output section

continued on page 78

[5] "Introduction To Microprocessors-Part 3" (July '78 *BM/E*)



COMMAND/STATUS REGISTER BIT ASSIGNMENT.

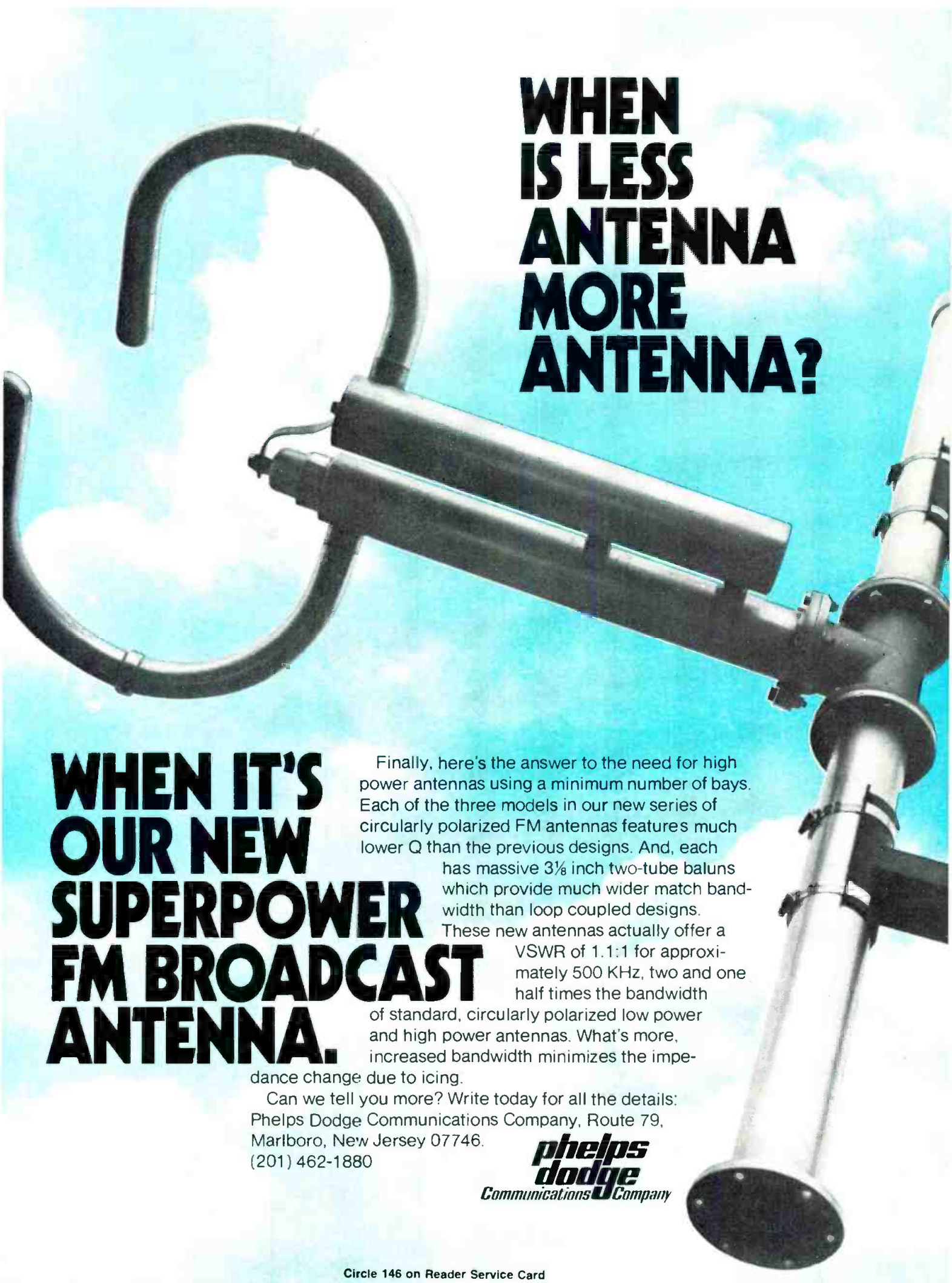


COMMAND/STATUS REGISTER STATUS WORD FORMAT.

TABLE OF PORT CONTROL ASSIGNMENT.

Pin	ALT 1	ALT 2	ALT 3	ALT 4
PC0	Input Port	Output Port	A INTR (Port A Interrupt)	A INTR (Port A Interrupt)
PC1	Input Port	Output Port	A BF (Port A Buffer Full)	A BF (Port A Buffer Full)
PC2	Input Port	Output Port	A $\overline{STB}$ (Port A Strobe)	A $\overline{STB}$ (Port A Strobe)
PC3	Input Port	Output Port	Output Port	B INTR (Port B Interrupt)
PC4	Input Port	Output Port	Output Port	B BF (Port B Buffer Full)
PC5	Input Port	Output Port	Output Port	B $\overline{STB}$ (Port B Strobe)

Fig. 4. The various operating modes are selected through the command/status register according to the big assignment chart, provided by the manufacturer of the component



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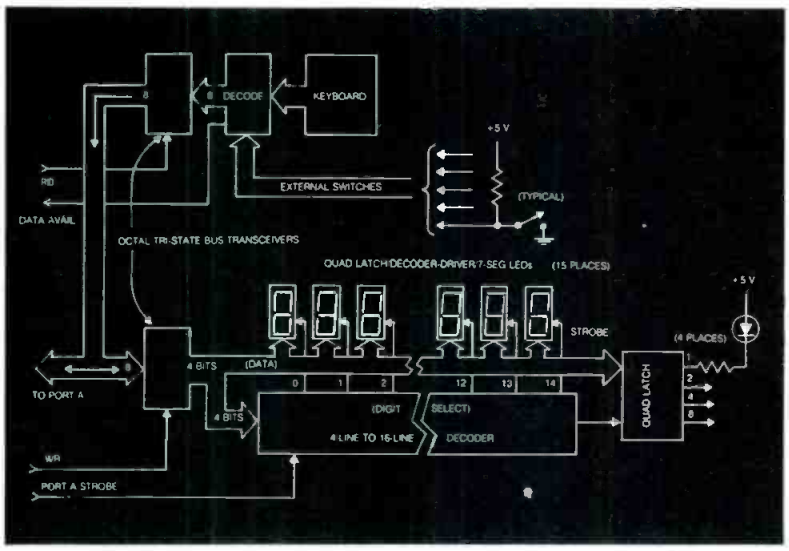

Fig. 5. A great deal of information can be passed through an eight-bit port. Notice how few ICs are required

<<*> OUTPUT BIT ASSIGNMENTS <*>>

LED ASSIGNMENT.....	DATA..... 7	6	5	4	DIGIT SELECT..... 3	2	1	0	HEX
7-SEG #0	X	X	X	X	0	0	0	0	- 0
#1	X	X	X	X	0	0	0	1	- 1
#2	X	X	X	X	0	0	1	0	- 2
#3	X	X	X	X	0	0	1	1	- 3
#4	X	X	X	X	0	1	0	0	- 4
#5	X	X	X	X	0	1	0	1	- 5
#6	X	X	X	X	0	1	1	0	- 6
#7	X	X	X	X	0	1	1	1	- 7
#8	X	X	X	X	1	0	0	0	- 8
#9	X	X	X	X	1	0	0	1	- 9
#10	X	X	X	X	1	0	1	0	- A
#11	X	X	X	X	1	0	1	1	- B
#12	X	X	X	X	1	1	0	0	- C
#13	X	X	X	X	1	1	0	1	- D
#14	X	X	X	X	1	1	1	0	- E
(X=DATA BIT)									
SINGLE LED'S									
#1	0	0	0	1	1	1	1	1	1 F
#2	0	0	1	0	1	1	1	1	2 F
#4	0	1	0	0	1	1	1	1	4 F
#8	1	0	0	0	1	1	1	1	8 F

Fig. 6. This table shows the output bit assignments to access each of the LEDs. The eight bits are labeled from zero through seven, with bit zero being the low-order bit

communicates with the outside world. Normally some I/O is used to communicate with the operator, and some to communicate with the equipment. Our attention will be focused on the operator's end, and since all I/O on the RD-85 board is implemented using the INTEL 8155, a closer look at this IC is in order (figure 3).

Like the 8055, the 8155 is a 40-pin IC. In addition to 22 I/O lines, it contains 256 bytes of RAM and a programmable binary counter/timer. The I/O portion contains four registers: two eight-bit registers (A and B), one six-bit register (C), and an eight-bit command/status register. Ports A, B, and C may be programmed as either input or output. Additionally, port C may be used as "handshaking" for ports A and B. The various operating modes are selected through the command/status register according to the bit assignment chart of Figure 4. For example, to set ports A, B, and C to output, the bit pattern "00001111" would be sent to the status/command register.

[6]ASCII (American Standard Code for Information Interchange) is an eight-bit binary alphanumeric code which is routinely used for this purpose. Bits 0–6 contain the character code, and bit 7 is an error check bit called the "parity bit" which is usually ignored in smaller systems. In addition to complete alphanumeric capabilities, ASCII includes many special codes such as end of transmission, line feed, and carriage return.

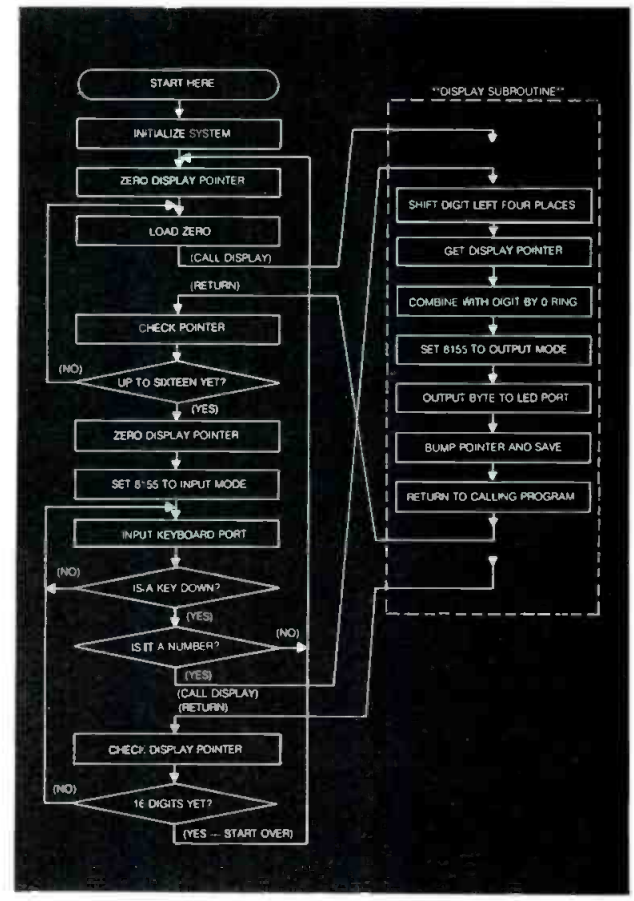

Fig. 7. The flow chart is a software "block diagram." Notice that all operations are carried out sequentially

Since there are 256 possible eight-digit binary numbers, an entire alphanumeric keyboard is easily interfaced to a single eight-bit port by coding the various keys into unique binary numbers.[6] In addition, several special purpose switches and pushbuttons could be included.

Since operator input can be accomplished with one eight-bit port, let's attempt to confine output to that same port. It would be nice to have the ability to display letters as well as numbers, but since a video display is quite complicated, let's narrow the choices to some type of segmented display. Seven segments is sufficient to display all 10 numbers as well as a few symbols, but 15 is about the minimum for alphabetic display. To eliminate the need for 15-segment LEDs, though, the non-numeric information could be displayed by using individual LEDs with labels on the front panel, and various colors could be used to enhance the appearance and clarify their meaning.

We now face the task of not only displaying a number, but of selecting the proper LED as well. Since only four bits are needed to uniquely specify one decimal digit, the remaining four can be used to point to one of 16 seven-segment displays. Or, we could choose to limit the number of seven-segment LEDs to 15, and instead decode the unused sixteenth position to drive four individual LEDs (figure 5). Fortunately, since several manufacturers now produce seven-segment displays which contain not only the binary to seven-segment Decoder/Driver, but a four-bit latch as well, all of the seven-segment LEDs can sit on the same external four-bit data bus in parallel. Here's how it works: Let us assume that a 7 is to be

continued on page 80

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displayed on LED-2. According to the bit assignment table of figure 6, the binary number "01110010" must be outputted from port A to the external circuitry. The four high order bits "0111" (decimal 7) are routed to the four-bit data bus, and the low order bits "0010" (decimal 2)) are sent to the digit select IC. After pausing a few hundred nanoseconds while the data settles, the 8155 will enable the port-A strobe line which will in turn enable the digit select IC. Its number two strobe line will then latch the data from the four-bit data bus into LED-2's internal quad latch. From there it will be converted to seven-segment code and displayed. No other displays will be effected since their strobe lines were inactive.

In order to prevent interference between the keypad and the LEDs (they share the same eight-bit port, don't forget), some means of selectively connecting either input or output is needed. This is handled by the two tri-state bus transceivers. Observe the "RD" (Read) and "WR" (Write) pins on the 8155; these are control lines from the 8085 and determine direction of data flow. They'll also be used to control the bus transceivers, and since the 8055 will never attempt to input and output at the same time, only one of the bus transceivers will be active at a time. (The inactive transceiver will go to a high impedance state.)

Software at last!

The first step in software development is to design the algorithm, the sequence of steps required to accomplish the task. The algorithm can be presented as a flow chart, and since computers operate sequentially, our flow chart must be sequential, too. The object of the flow chart is to break a complex task down into a series of small, easily comprehendable program modules, in much the same way as a complex circuit is presented in a block diagram. Each module can then be written, tested, and de-bugged individually. This modular concept produces programs which are much easier to understand, and much easier to modify and debug. If a particular program module is required repeatedly, it can be written as a subroutine and called into operation when needed by the main body of the program.

Now let's make the hardware do something (figure 7). Since the display section will come up in a random state when power is first applied, one of the first orders of business would be to initialize all digits to zero and turn off the four individual LEDs. Here we go . . .

First we have to set up the location of our stack. The stack is an area in RAM which is used by the processor as a First In/Last Out buffer (I'll explain later). Next, we'll set a single byte in RAM aside to store the current display pointer, and zero it. (This byte will be accessible to any routine in the program.) Now we'll zero out one of the processor's internal registers. Let's pick register "C" and call the display subroutine.

Now, back to the stack. The processor normally executes a program in much the same way as you are reading this article — one step at a time, top to bottom, and in sequence. It keeps track of the next instruction's location by storing it in a register called the program counter. As each instruction is executed, the number in the PC is incremented, so as always to point to the next instruction to be executed. But, when an instruction is decoded which

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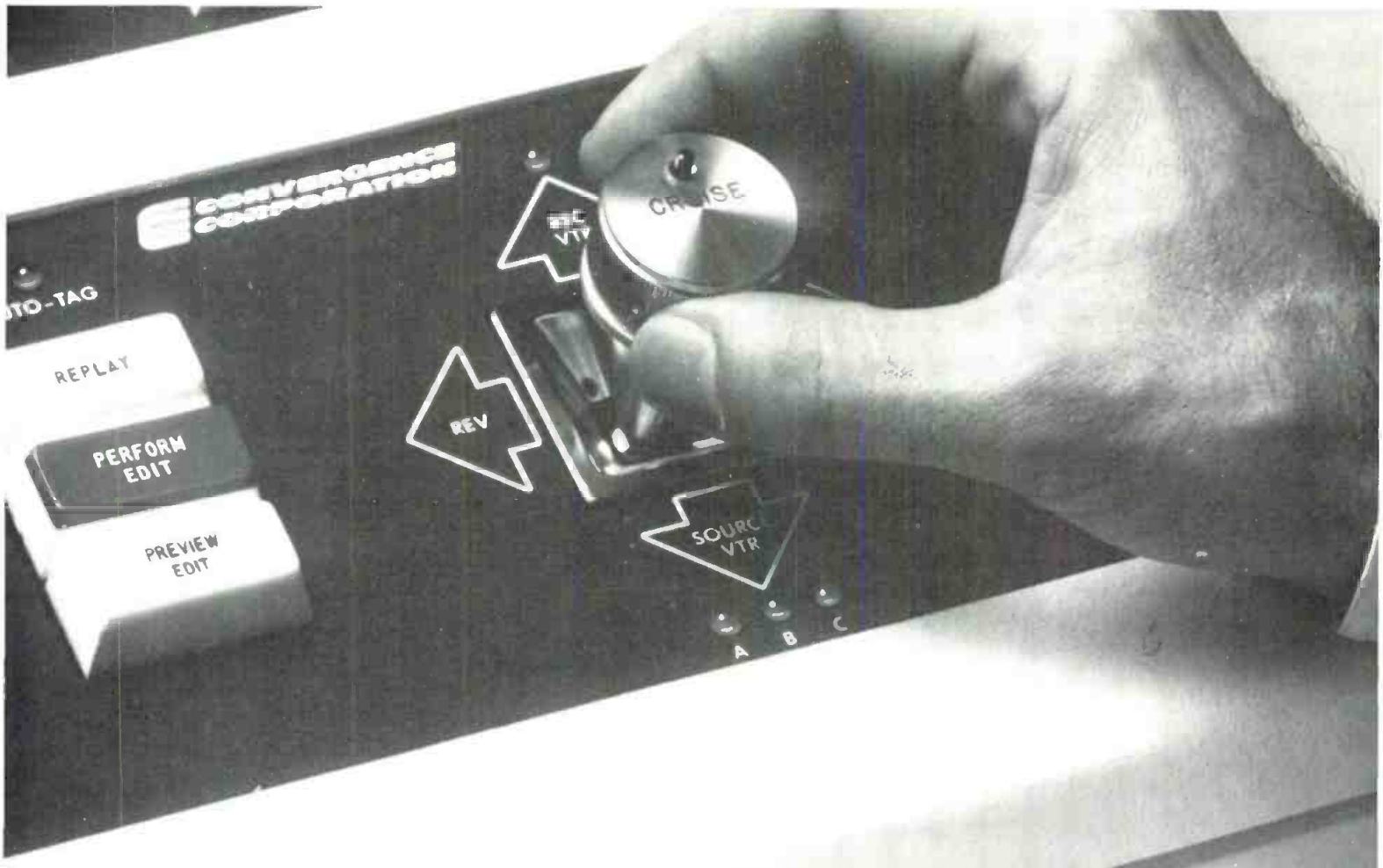

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disrupts the normal sequential flow, such as a subroutine call, some means of keeping track of the old address must be found — the stack! Here's what happens: when a subroutine call is decoded, the data in the program counter (the address of the next instruction in sequence) is copied (pushed) onto the stack, and the address specified in the subroutine call is copied into the program counter. Since the processor always gets the address of the next instruction to be executed from the PC, off it goes. It will then continue to execute the instructions in the subroutine until it comes to "Return." This instruction always appears in one form or another as the last instruction of a subroutine. When this is decoded, the address previously stored on the stack is recovered (popped), and copied back into the program counter. The processor continues to follow the address in the PC, and thus returns to where it previously left off!

Meanwhile, back at the subroutine (the processor has arrived with "00" in the register C), the computer is then instructed to shift the four low-order bits to the left four places. (Since they're all zero, it doesn't matter in this case.) Then it will go to the area previously set aside for the display pointer in RAM and copy that byte into another register within the processor. The two four-bit numbers can then be "Or'ed" to produce a byte with the four high-order bits containing the LED address (1 to 16). Next the 8155 must be put into the output mode, if not already there, and then the composite byte just constructed can be outputted to the LED port. Meanwhile, the display address byte is still intact in register C. That will be incremented by one, and the new value copied back into its location in RAM for any section of the program that needs access to it. Next the processor will hit the "Return" instruction, and immediately return to the main program.

The rest of the display initialization routine consists of checking the pointer to see if the last digit has been cleared. The program will continue to loop through the subroutine, each time incrementing one position, until it has cleared the last LED. Once this takes place, the display pointer will be zeroed, and the program will "drop" through to the keyboard input module.[7]

Look for a key stroke

The keyboard input module will return the 8155 to the input mode and enter another loop checking the keyboard port for a non-zero output. Once this condition is detected, a test is conducted to see if the character is numeric. If so, back to the display subroutine, but this time with the number to be displayed stored in register C. By now, the flow chart should be self explanatory, so I'll leave the remaining portion for your analysis.

Once the algorithm is committed to paper, it should be thoroughly examined and any necessary corrections made. (The most common problems which usually slip by are special cases which have been overlooked.) Only after an intensive review of the entire project should the process of converting the algorithm to binary machine instructions begin. This process is called coding, and since it requires an intimate working knowledge of the microprocessor to be used, it will be the subject of a future article. **BM/E**

[7]The ability to modify program execution based on the results of various tests is one of the most powerful characteristics of this type of technology.

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A Systems Approach To Transmitter Output Networks

By Grant Bingeman

There are many approaches to broadbanding AM antenna systems, but most are only partial solutions. The AM antenna system must be given a thorough examination, paying strict attention to the output network. If a systems approach is taken to broadbanding, a cleaner sound may result to give your station a real selling point.

IN HIGHLY COMPETITIVE AM markets, the importance of antenna system bandwidth becomes apparent when it is found that, in some cases, no amount of tinkering with the audio chain can produce clean and brilliant high frequencies at the receiver.

A muddy or weak audio high end is caused largely by RF bandwidth limitations in the antenna system (assuming the rest of the equipment is up to par). Contrary to popular belief, many car radios and home portable radios have relatively good high-frequency response, and an informed listener can tell the difference between a station operating into a narrowband antenna and one operating into a wideband antenna. The listener may not be able to describe exactly what that difference is, but he will have a preference, and that is the crux of the matter.

Programming may be a large percent of the battle, but a cleaner sound can be a real selling point in a highly competitive market. Of course, you still have to promote the new sound to your listeners — the new sound will not necessarily sell itself. An informed audience is a discriminating audience.

To date, many treatments of the bandwidth topic have largely ignored the exact output network of the transmitter, using a simplified model of the network instead — usually a Smith chart. A Smith chart is a model of a transmission line, and is extremely useful as such. However, there are some very important features of some transmitter output networks which are overlooked if the network is approximated by a transmission line. In fact, it is quite possible to degrade transmitter performance if a Smith chart alone is used in the analysis of a bandwidth problem.

In the following paragraphs I will show how an antenna having a 10 kHz sideband VSWR of 1.5 had an "optimized" PA sideband VSWR of 2.0. The PA load was adjusted for symmetry,[1] but no attention was given to sideband VSWR. This very significant impairment of bandwidth occurred simply because the analysis ignored the exact characteristics of the output network. Yet, when the correct model of the network was used it was found that the sideband VSWR could be reduced to 1.2 using the same adjustment technique (this paper assumes that the carrier VSWR is always 1.0).

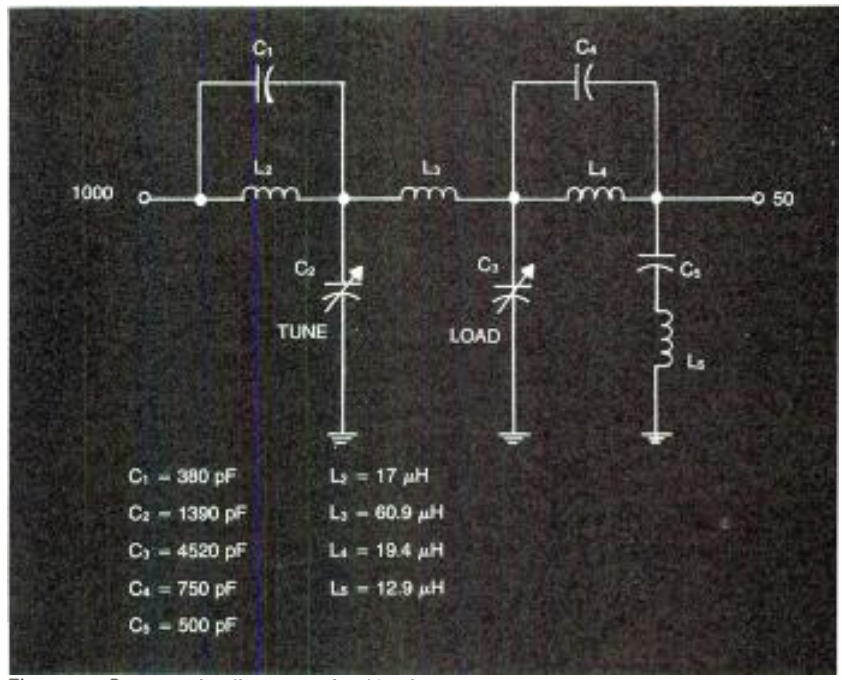

Figure 1. Schematic diagram of a Harris 600 kHz MW-50 transmitter output network

A 660 kHz Harris MW-50 output network (Figure 1) is designed to have a minimum of interaction between its PA tuning and loading controls, hence the nominal −135 degrees of phase shift between C_2 and C_3.[2] The PA Q of 5.7 (where $Q = RC_2 = 1000\ (2\pi.66)\ .00137 = 5.7$) creates a 10 kHz PA sideband VSWR of 1.3 from an initial output sideband VSWR of 1.0. PA tube efficiency is improved by the third-harmonic resonator formed by C_1 and L_2, which appears inductive at 660 kHz (+j79.3 ohms). C_4 and L_4 form a second-harmonic trap, which also appears inductive at 660 kHz (+j107 ohms). This inductive reactance forms an L network with part of C_3. C_5 and L_5 form a third-harmonic trap, which appears capacitive at 660 kHz (−j429 ohms).

Grant Bingeman is a senior engineer with the Antennas Operations group of Harris Broadcast Products.

[1] Complex conjugate sideband impedances.
[2] ±15 degrees.

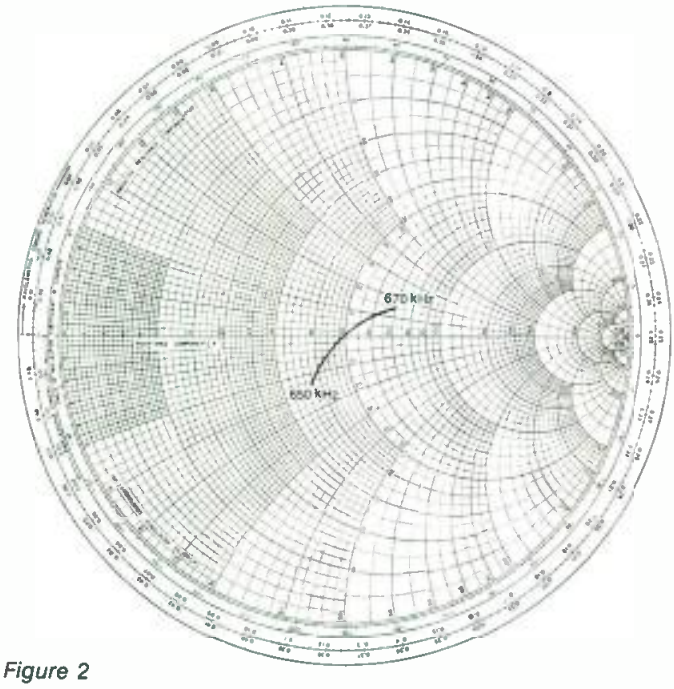

Figure 2

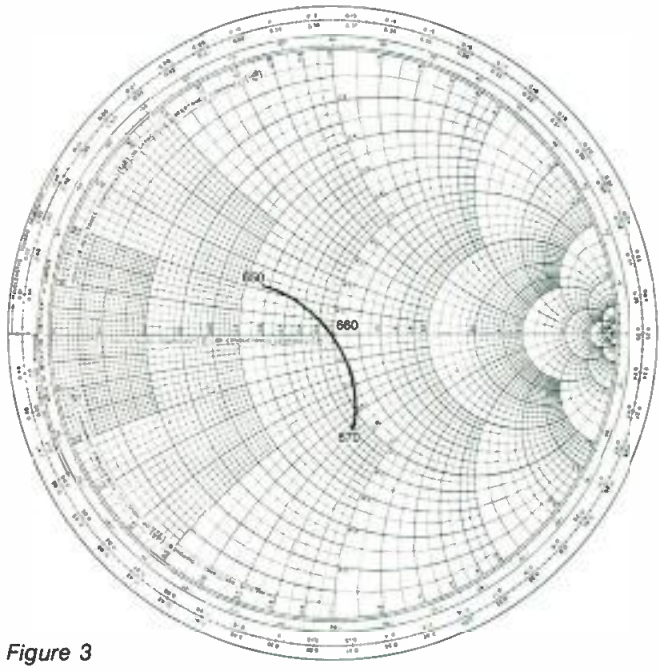

Figure 3

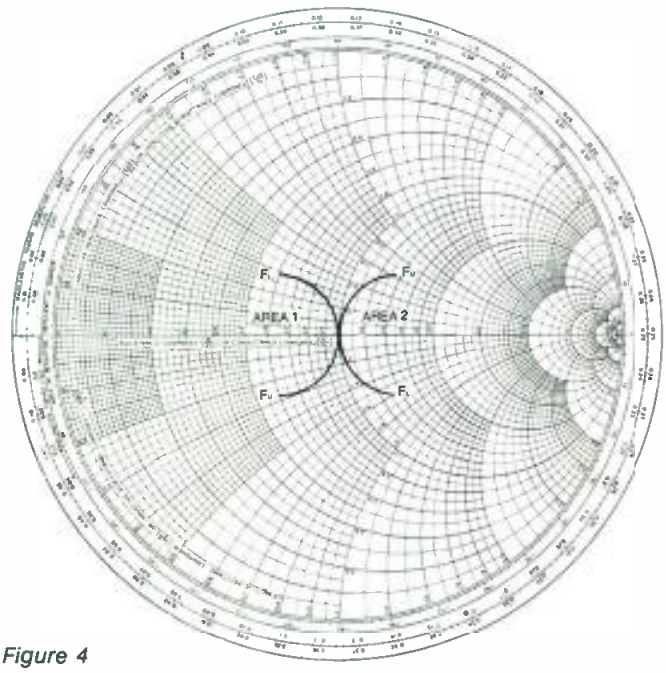

Figure 4

The initial antenna impedances seen at the output of the transmitter were (see also Figure 2):

Freq. (kHz)	Z (ohms)	VSWR
650	38 − j13	1.50
660	50 + j0	1.0
670	69 + j14	1.49

The initial load impedances seen by the MW-50 PA tube were (see also Figure 3):

Freq. (kHz)	Z (ohms)	VSWR
650	571 + j206	1.87
660	1000 + j0	1.0
670	915 − j668	1.99

Please note that a change in VSWR has occurred from the transmitter output to the PA tube. This change would not be indicated by a transmission line model of the output network. The closest PA sideband symmetry area on the Smith chart (Figure 4) is about 36 degrees away from the initial PA load of Figure 3. If we were to insert −36 degrees of transmission line between the transmitter output and the antenna, we would obtain the following impedances at the output of the transmitter (see also Figure 5):

Freq. (kHz)	Z (ohms)	VSWR
650	33.7 + j3.7	1.50
660	50.0 + j0	1.0
670	63.9 − j18.0	1.49

continued on page 88

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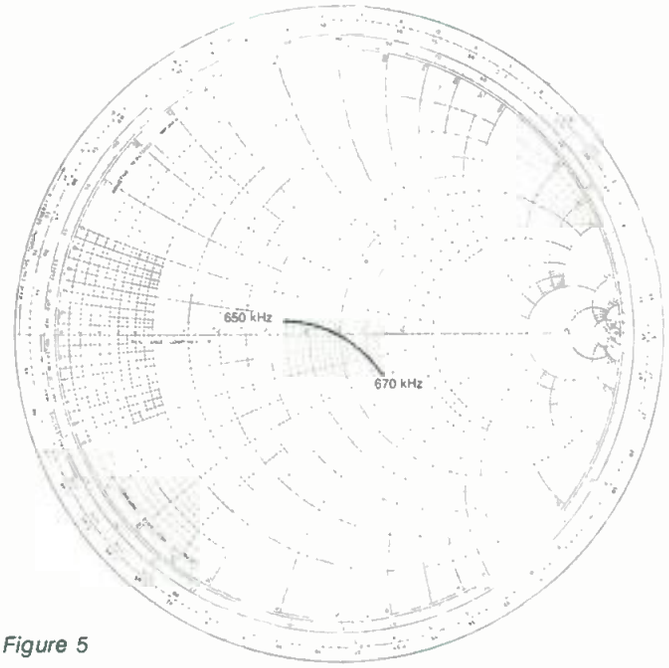

Figure 5

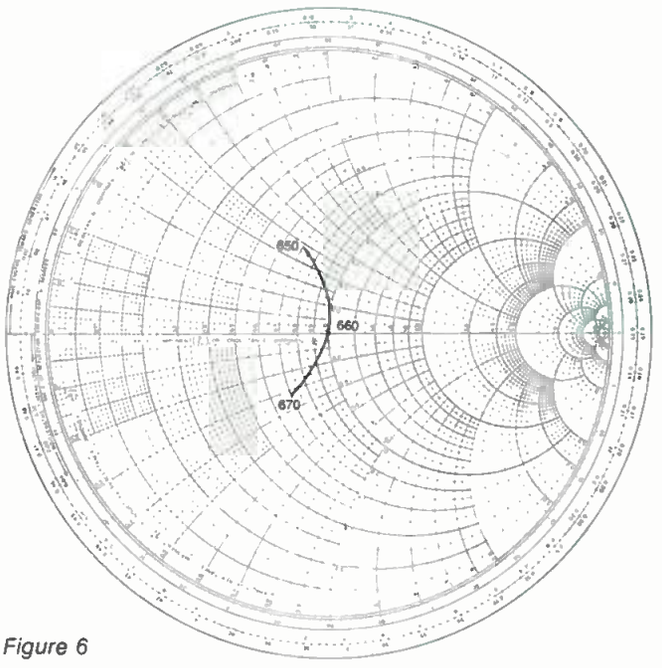

Figure 6

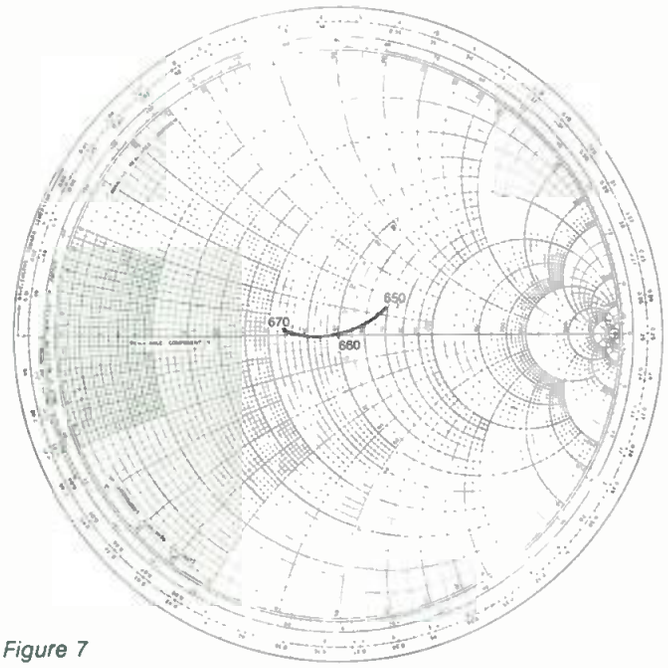

Figure 7

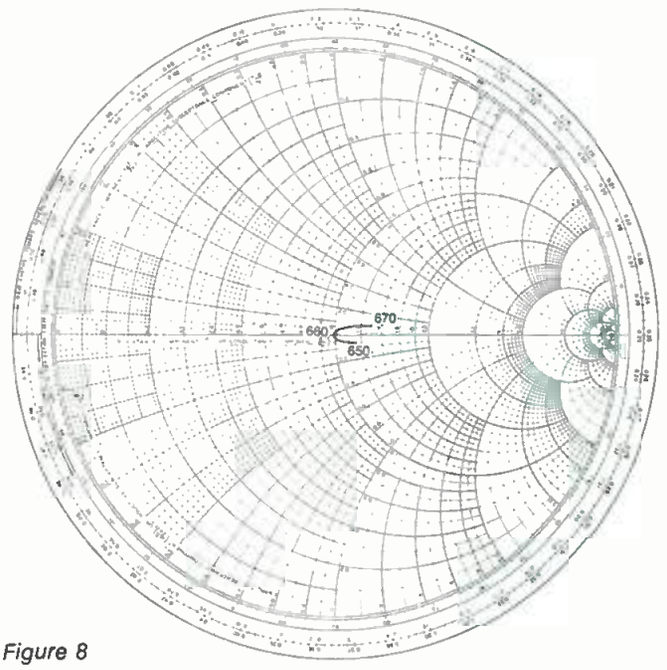

Figure 8

This would yield the following result at the PA (see also Figure 6):

Freq. (kHz)	Z (ohms)	VSWR
650	722 + j477	1.9
660	1000 + j0	1.0
670	704 − j338	1.7

Note that we are now approaching sideband symmetry at the PA, but the VSWR has increased to a very objectionable level. Thus, it can be seen that adjusting for impedance symmetry alone is not enough.

On the opposite side of the Smith chart impedance plot of Figure 6 there is another symmetry area. We can get to the other side of the Smith chart by inserting a +75 degree network in place of the −36 degrees of transmission line. The resulting transmitter output load impedances are (see also Figure 7):

Freq. (kHz)	Z (ohms)	VSWR
650	68.3 + j13.8	1.50
660	50.0 + j0	1.0
670	34.1 + j0.6	1.49

This results in the following PA impedances (see also Figure 8):

Freq. (kHz)	Z (ohms)	VSWR
650	1170 − j50	1.17
660	1000 + j0	1.0
670	1280 + j83	1.29

This very significant reduction in sideband VSWR is obvious when comparing the size of the impedance curves

continued on page 90

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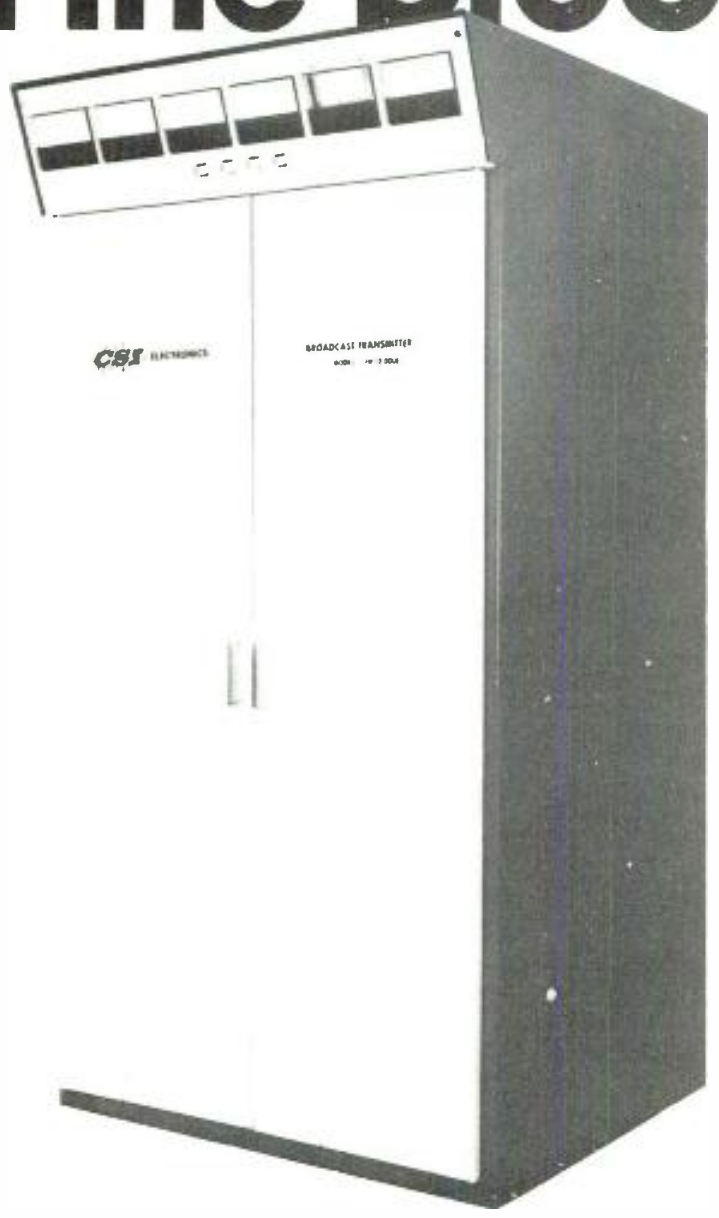

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of Figure 6 and Figure 8. It is hoped that the perceived change in the air sound will be equally dramatic.

An exact model of the output network is therefore desirable in order to take advantage of the system bandwidth improvement capability of the output network. Unfortunately, this VSWR reduction technique usually cannot be applied to output networks which have a wide bandpass characteristic.

Measurement techniques

Occasionally it is found that the PA impedances are high enough to be off the scale of the bridge. This is more likely to occur with a low-power tube-type PA than with a high-power one. These impedances can be brought within the range of the bridge by placing a resistor across the PA. However, this will endanger the accuracy of the measurement. I do not recommend this technique, but if there is no other bridge available, be sure to measure the impedance of the resistor at the generator frequency. Also, do not use a resistor value less than the impedance you are trying to measure (the lower the resistor value, the lower the accuracy).

Be sure to check the validity of your impedance measurements by plotting them on a Smith chart to see that the points travel in a clockwise direction from low to high frequency. If they do not, then there are three things you should consider:

- Was a good ground obtained so that a *sharp* null occurred?
- Was interference present? If so, did you take measurements on either side of the interfering signal, and interpolate between those points?
- Is there something loose in the antenna that could have caused a change in impedance while measurements were being made; e.g., coil clip, tower section bond, etc.?

Remember that when you correct the reactance data for frequency, with some bridges you *multiply* by the frequency in MHz while with others you *divide* by the frequency. Of course, you must correct each reactance with its appropriate frequency — do not make the mistake of correcting all of the reactance data with the carrier frequency. Be sure to use a frequency counter or some other means to determine exactly what frequency your generator is producing. By the way, if you modulate the generator you may affect the accuracy of the frequency counter.

Tone modulation can affect where the null occurs, since the generator sidebands will see impedances which differ from what the generator carrier sees. Thus, it is important to modulate with a low-frequency tone so that the generator sideband frequencies are close to the generator center frequency.

When making PA impedance measurements, leave the PA tube in the circuit. The tube has a significant amount of plate-to-ground capacitance, which must be considered as part of the output network. Keep in mind that the loading and tuning controls affect not only the carrier impedance, but also the sideband impedances. The output network controls should be adjusted to their normal operating positions before making impedance measurements at the PA. **BM/E**

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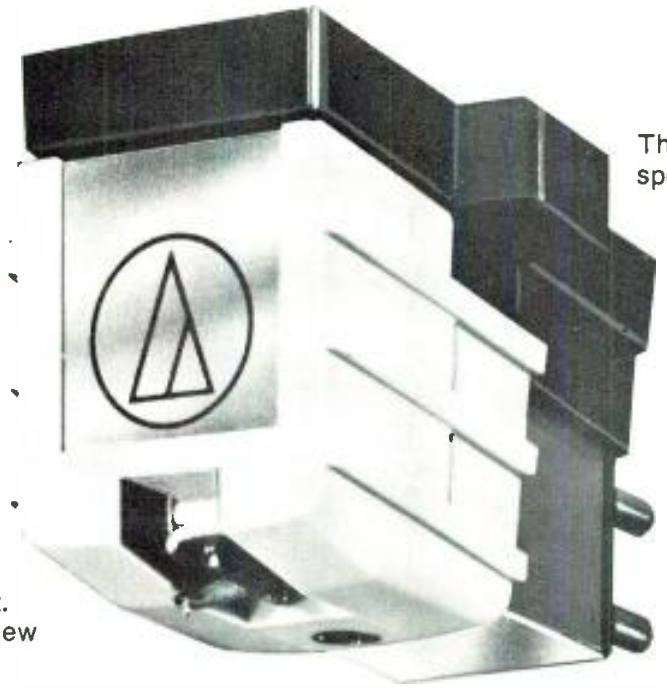

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BM/E's Panels Of 100 Survey Reveals Broadcasters' Greatest Areas Of Interest In Technology For 1979

AM stereo in all its many forms will draw close scrutiny from radio broadcasters, while television broadcasters seem convinced that one-inch VTRs will open new vistas.

THAT SPANKING NEW Texas city of Dallas will play host to thousands of broadcasters beginning March 24, and they'll be doing some very serious looking and shopping among the expected 350 manufacturers' exhibits. Radio broadcasters will be poring over any equipment associated with the promise of AM stereo and television broadcasters will swarm around one-inch videotape equipment like bees to honey.

This year, *BM/E* expanded and refined its Panels of 100 Survey of Broadcast Industry Needs and managed to achieve an even more reliable sample of opinion from radio and television engineers and management. One heartening result of the survey was the clear indication that in all but a few areas of broadcast technology, management and engineering showed a greater uniformity of opinion.

General observations about this year's NAB

Attendance of broadcasters to the Dallas NAB Convention and Exhibit will most certainly be up in all areas. More radio management and more radio engineers will attend, as will more television management and engineers.

Of those attending, most will be going to the exhibit halls with specific objectives in mind. What will be different this year from previous years, however, is that the interest is more spread out over production, control, transmission, and test and measurement equipment. While interest in production equipment still holds the highest ranking by broadcasters, the other three areas showed marked increase. In 1978, for instance, television and radio broadcasters listed production equipment as their major concern nearly twice as often as any other category. This year, there was only an 18-percentage point spread between the highest rank category, production (38 percent), and the lowest, control (20 percent).

This spread of interest seems to have led to a number of other trends. For one thing, all broadcasters say they will be visiting more booths (50-plus) than they did last year, and spending slightly more time doing it. With 350 booths expected in Dallas, however, this could present a problem and broadcasters might be well advised to pack roller skates as essential convention gear. Generally, engineers expect to spend slightly more than 16 hours visiting the exhibits while managers will spend slightly less than ten hours on the exhibit floor.

Another example of the interest spread was apparent in the ratings of specific product interests. Broadcasters were asked to check off their degree of interest (very, some, low, none) over a wide range of specific product categories. Compared to last year's results, the spreads were much closer, resulting in fewer products dominating the interest of broadcasters. This can be attributed, in part, to the increase in sample size and response — but it is also possible that broadcasters will be shopping more cautiously in 1979 than in 1978.

Radio's most wanted list

As mentioned earlier, AM stereo equipment will be high on the lists of radio broadcasters visiting Dallas. This is the only area of radio equipment where the highest interest level (very) dominated the overall statements. The types of stereo equipment that AM broadcasters are interested in, however, were probably reflected in the very high rankings of studio tape recorders (ranked number one with 79 percent of the respondents listing very or some interest) and consoles/mixers (ranked number two, with 77 percent). In fact, the interest in stereo cart player/recorders (71 percent) pushed them up in the rankings from number six last year to number four this year.

The continued strength of FM stations was reflected this year as most products associated with FM broadcasting pushed their way up in the ratings. The only FM technology that took a beating was FM quad, which was in last place in 1978 and dropped deeper into the hole in 1979. In another part of the survey, broadcasters were asked to indicate the technologies they thought would have the most impact on their operations in the coming two years. They showed their frustration with FM quad with only six percent indicating that it would have any impact on radio.

Other product categories that showed strong interest levels were audio processors, test equipment, microphones and accessories, and remote pickup and STL. Turntables and antennas both showed good improvements in their relative rankings, but ATS equipment plummeted from ninth place to eighteenth, showing only a 44 percent interest factor, compared to 55 percent last year.

As far as the near-term future goes, radio broadcasters believe that AM stereo is likely to have the most profound effect, while more reliance on computerized equipment and increased use of digital audio equipment are in a virtual tie for second place. The survey attempted to ascertain whether radio broadcasters would be using more or less audio processing in the future, but though the implication was that they would use more, no statistically valid answer resulted from the question. Interest in the further adoption of earth station equipment seemed healthy, but two years may be too short a term for most radio broadcasters' expectations.

Studio tape recorders continue to dominate radio broadcasters' interests. Scully will present its full line at NAB

Television's most wanted list

In television, product interests went through a real shakeup. There appears to be a general acceptance of the notion that one-inch VTR technology is the key to a new era in television which is likely to see broadcasters doing more commercial and field production. For the first time in several years, ENG cameras were supplanted in first place by interest in one-inch VTRs that showed a clear 90 percent interest level. ENG cameras are not far behind, however, taking second place with 86 percent.

Panels Of 100 Survey

Overall Interest In Radio Equipment

Rank '79	Rank '78		Percent Actively Interested[1]
1	1	Tape Recorder/Players (studio)	79
2	2	Consoles, Mixers	77
3	3	Audio Processors	76*
4	6	Cartridge Players/Recorders	71
5	4	Test Equipment	69
6	5	Microphones, Accessories	69
7	7	Remote Pickup & STL	62
8	8	AM Stereo Equipment	61*
9	15	FM Monitoring Equipment	59
10	12	Turntables	57
11	10	Noise Reduction Systems	53
12	16	FM Transmitters	51
13	11	AM Transmitters	50*
14	20	Antennas	49
15	18	AM Monitoring Equipment	49
16	14	Monitor Speakers	49
17	13	Automation Equipment	45
18	9	ATS Equipment	44
19	21	Tape Recorders/Players (field)	43
20	17	Business Automation Systems	36
21	19	Reverb & Special Effects	33
22	22	FM Quad Equipment	27

[1]Percentage checking very interested or some interest.
*Indicates those products which showed the greatest intensity of interest; that is, degree of interest was weighted towards the highest end of the scale by a wide margin.

Overall Interest In TV Equipment

Rank '79	Rank '78		Percent Actively Interested[1]
1	2	VTRs (one-inch)	90*
2	1	TV Cameras, ENG	86
3	4	Time Base Correctors	78*
4	5	VTRs (¾-inch)	77
5	16	Digital Effects Devices	74*
6	6	Videotape Editors	73
7	3	Test Equipment	73
8	10	Video Monitors	73
9	8	Microwave for ENG	72
10	22	TV Cameras, EFP	71
11	7	Frame Synchronizers	68*
12	12	Character Generators	62
13	17	TV Cameras, Studio	62
14	11	Electronic Still Stores	62
15	24	Image Enhancers	61
16	14	Time Code Equipment	59
17	13	Routing Switchers	57
18	20	Audio Consoles, Equipment	56
19	15	Switching Automation	56
20	9	Noise Reduction Systems	54
21	23	Production Switchers (large)	53
22	18	ATS Equipment	53
23	21	Master Control Switchers	52
24	19	Remote Control (status, etc.)	52
25	26	CP Antennas	52
26	30	Production Switchers (small)	48
27	27	Lighting Equipment	47
28	25	Film and Slide Chains	41
29	28	VTRs (quad)	37
30	31	Transmitters	33
31	29	Slow Motion Recorders	24

Connected to the interest in one-inch, however, was the astronomical rise of interest in EFP cameras, which shot up from twenty-second place last year to tenth place this year with 71 percent interest. Another big, and perhaps associated, winner, was digital video effects devices, moving from sixteenth place in 1978 to fifth place in 1979.

It may also be that television broadcasters are looking to digital video effects systems to do a lot more for them than just effects. While interest in other digital devices, such as TBCs and frame synchronizers, remains high (in fact, TBC interest is up and may be attributable to the current blanking width controversy), it is also possible that TV broadcasters are expecting to get frame synchronization, noise reduction, and time base correction thrown into the same digital effects bargain.

One-inch VTRs are most certainly going to impact quad VTRs, but the survey indicates that they probably will not affect U-type ¾-inch VTRs appreciably. In this case, broadcasters seem to feel the U-type machines still have a vital role to play in news gathering, where speed and portability are still the most needed attributes. As far as improving the on-air appearance of U-type recordings goes, broadcasters seem to be opting for more image enhancement, which showed a significant climb in the ratings from twenty-fourth place last year to 15th place this year.

Generally, most product categories on the television side showed continued strength, with few products taking nose dives. Slow motion devices slid into last place this year, and this too may be attributable to one-inch since the Type C machines are capable of providing this function. Nevertheless, equipment that has traditionally been high on the shopping lists remains there, such as microwave for ENG, videotape editors, character generators, test equipment, and video monitors. Another encouraging sign that television broadcasters are taking audio more seriously is that audio consoles moved up again this year into eighteenth place from twentieth, with a 56 percent active interest factor.

The four products this year which showed the most intense interest in terms of being weighted to the high end of the interest scale were one-inch VTRs, TBCs, frame synchronizers, and digital effects devices.

The most important short-term expectations for new technology as expressed by television broadcasters show that the next two years won't be that different from the past two. Television broadcasters uniformly noted that the adoption of more ENG equipment would be the source of greatest change in the next two years. The switchover to all-ENG will continue, but at a modest pace with no wholesale rush to reach this point. The other most important trend that television broadcasters see is an every greater reliance on computerized equipment. Interest in going to CP transmissions is considerable, though it could not be fairly described as passionate. On the other hand, television broadcasters were more interested in earth stations for satellite communications than we had expected, and the day of the "bird" might be closer than we expect.

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Editor's note: *The percentage figures given on the Panels of 100 chart indicate the overall active interest (very/some) in the individual product categories. The ranking of the products does not necessarily indicate a comparison of the products, but instead, the relative enthusiasm for each product. Since, for instance, cameras, microphones, and test equipment are relatively ubiquitous and are replaced more often than transmitters, of which there are fewer units per station, it is logical that the former products should generally outperform the latter in level of interest. The ranking does, however, provide significant information when similar classes of products are compared, such as the higher ranking of EFP cameras when compared to last year's position.*

Out in the field, we're way ahead of the field.

A pretty dramatic statement, we'll admit.

But Sony Broadcast has dramatic equipment to back it up.

What would you say to a professional U-matic color videocassette recorder, and a broadcast quality 3-tube ENG color camera, at a combined weight of under 40 pounds.

And that includes little things like camera head, and viewfinder, and lens, and videocassette, and even rechargeable battery!

Surprised? You shouldn't be. After all, portable Sony equipment has been leading the ENG revolution for years.

And combining our BVU-50 recorder with our BVP-300 camera gives you one of the most advanced news gathering and field production teams we've ever fielded.

Look, first, at our BVP-300 camera.

It's a state-of-the-art 3-tube color camera in a completely self-contained package. A camera that combines broadcast-quality pictures with the ENG advantages of extremely small size, light weight, and low power consumption.

Three Plumbicon* or Saticon** pickup tubes provide the exact pickup system that suits your needs. Extra sensitivity lets you bring your stories to light...even if you have just 2 footcandles to work with. And automatic controls make setup a snap.

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It saves space and weight by having record-only circuitry. Yet a unique video confidence head system lets you know you're getting adequate RF signal on the tape. Framing servo insures proper frame orientation. And professional picture quality makes the BVU-50 equal to any ENG or EFP situation.

Now look at them both together. And see how far ahead of the field Sony Broadcast really is.

Your BVU-50/BVP-300 system will operate for up to 74 minutes on a single BP-90 NiCd battery.

You can start and stop the recorder by the camera trigger.

At the end of each shooting sequence, the BVU-50 automatically backspaces the tape for clean scene-to-scene transitions. You get continuous usable video for the full length of your recording tape.

While you're recording, you can monitor all VTR warning functions in both camera viewfinder and earphone.

And while you're in standby mode, the BVU-50 head drum rotates at slower speed, reducing power consumption by two-thirds.

In short, you get an ENG/EFP package that gives you the size, weight, and convenience you'd normally expect from 16mm film equipment. Yet retains all the economic and electronic advantages of video.

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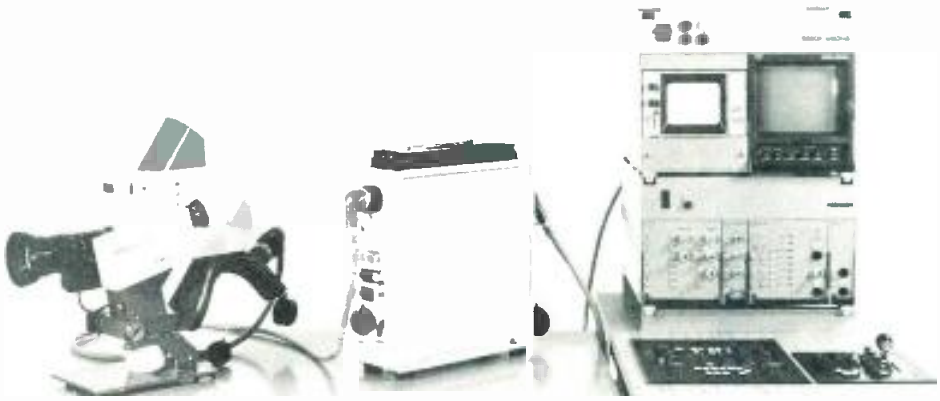
Equipment Manufacturers To Answer Broadcasters' Needs



Bosch Fernseh indicates several new developments in its camera and BCN VTR lines, including this automatic setup for its KCA-90 camera

AT THE SAME TIME that we asked broadcasters to specify their equipment needs and expectations for the coming year, we asked manufacturers to give us an early line on what they would be featuring at the NAB show. A peek behind the curtain (full details will be revealed in our March issue) reveals that manufacturers are generally on track for meeting the needs expressed in our Panels of 100 survey.

Radio and audio equipment

Radio broadcasters who indicated considerable interest in the **consoles and mixers** should find plenty of equipment on hand, particularly with manufacturers such as LPB, Micro-Trak, and Audio Designs rushing to the foreground with new stereo consoles just in time for AM stereo conversions. Other consoles will be in evidence, too, including offerings from Broadcast Electronics. QRK Electronic Products promises its six- or ten-channel Omega Audio Console, while Ampro Broadcasting will feature its Microtouch console series. Hallikainan and Friends plans to introduce its TVA142 mixer, a six-input rackmounted module with audio follow video capability.

Manufacturers have responded to the continued demand for **recorder/reproducers** with several major new product lines. 3M's Magnetic A/V Products Division will demonstrate its new Centracart system, which it promises will record and play carts with the same sound quality as open-reel decks.

Plan to see digital effects systems and character generators, such as this new desk-top model of MPB's VISTA 80, as early as possible since interest in these products runs extremely high

The 3M system will feature a newly-designed cart that it claims will maximize head/tape contact and optimize tape path alignment capability. Broadcast Electronics also promises a new 2100 Series cart machine. IGM claims to have discovered a new, off-air use for its Instacart system, and will show broadcasters how they can increase station revenues by using it.

Though not promising anything new, International Tapetronics will demonstrate its Series 99 1K automated cart player system, which will handle over 1000 carts simultaneously. Edco, too, will be offering its standard product line (including the CA-77B cart editor and production tool with dbx noise reduction, variable speed control, automatic sequencing, and stereo/mono capability).

One potentially interesting development in the **cart machine** field is United Research Lab's introduction of a self-aligning ball bearing pinch roller with an extremely durable, high friction coefficient coating.

In the **open-reel** area, Otari will be featuring its standard line of studio recorders. Gotham Audio will be showing the Telefunken M 12 A tape recorder as well as the EMT 244 digital reverb unit. There is no word yet from other manufacturers except for Scully, which hints at something new but gives no details.

The **microphone** area holds promise of several new developments. Electro-Voice continues to expand the shock-mounting capability of its mics, particularly important in ENG/EFP applications. New offerings will include the RE 18 shock-mounted variable "D" cardioid, the DO 56 shock-mounted omni, a new shock-mounting clamp for EV's other mics, and the AC 24 power supply for condenser mics. Gotham Audio will display the Neumann KMR 82 shotgun condenser, designed for boom work.

RF mics, too, should prove to be of considerable interest. HM Electronics' WM 152 Flat Pac, an extremely small, flat, portable receiver with a 95 dB dynamic range, will be on display, while Alan Gordon Enterprises will demonstrate Swintek's radio mics with their newly developed UHF/VHF antenna system and diversity receivers. Vega and Thomson-CSF are also expected to exhibit their RF microphone lines.

Those interested in **transmitters** will find a wealth of new products and developments. Bayly Engineering plans to introduce its new PDM (pulse duration modulation) transmitter line at the show, in addition to some new two-way radio communications units. Sintronics will be unveiling its new FM transmitter line, including 1.5, 3.5, 5, 15, and 27.5 kW versions. McMartin Industries, too, will be showing a new FM transmitter line, in addition to a new 5 kW AM transmitter and remote pickup and audio amplifiers. LPB will offer a new 150 W FM transmitter. In general, the large number of new FM transmitters on the market points to the continued health of FM radio for the coming years.

AM has not been forgotten. Continental Electronics will be at the show with its complete line of AM transmitters, while Potomac Industries will be demonstrating its new automatic transmission system for directional AM antenna arrays. Though not heard from at the time this report was prepared, most of the other major antenna and transmitter manufacturers, including Harris, CCA, and others, are likely to be on hand with a host of exciting products.

Remote control and STLs, in radio and television, continue to play a major role in the developing trend toward modern, sophisticated radio broadcasting. Time & Frequency Technology, for instance, will have its Model 785 single-channel FM preselector on hand, along with its system for microprocessor remote control and logging. Micro Control Associates promises a "totally new concept" in aural STLs. Moseley Associates, a long-time leader in the field, will show its MRC-1 micro-

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processor remote control system. Hallikainen & Friends, continually expanding the uses to which digital technology can be put in broadcasting, will show the new display for its TEL-171 digital telemetry adapter for the Moseley TRC-15A, and a new digital telemetry adapter — the TEL-172 — for the Moseley PBR-30.

Several companies will also demonstrate **microprocessor applications** to a wide range of other radio broadcast applications. Broadcast Electronics, for instance, has a new economy version of its Control 16 program automation system which can be expanded as the station's needs grow. The company also has a new high-speed intelligent logging system for the Control 16. Sono-Mag claims to have made substantial developments in a broadcast automation system, though details are not yet announced. Bloomington Broadcasting follows the line of most computer system manufacturers by offering increased software capabilities from year to year; in 1979 they promise enhanced software for sales, traffic, billing, general accounting, payroll, and management functions alike. Other companies, such as Groton Computer and Jefferson Data Systems, will continue to offer their standard product lines.

Finally, though interest in **audio processing** remains high among radio broadcasters, we learned of few companies who have new product offerings in this field. One exception is Moseley Associates, which will show the TAL 320 AM stereo audio limiter. Another company with an early commitment to AM stereo processing is Edco, which will again show its STE-100 stereo phase enhancer, along with its full line of Dyna-Mite pulse distribution, distortion, and equalization amplifiers. Audio and Design Recording will be featuring a new compressor/limiter/expander and parametric and graphic equalizer in addition to its new Scamp affects modules.

Television equipment

Television broadcasters are likely to find less new equipment than they might have anticipated with the current prosperity of the market. It appears that manufacturers have spent the past year in refining production techniques for getting their newly developed products into users' hands rather than investing in more R&D. Nonetheless, there are some exciting new developments, many stemming from intensive exploration of digital technology.

One-inch VTRs, which continue to dominate broadcasters' interests, will be in evidence everywhere, with both Sony and Ampex having capitalized on the SMPTE's adoption of a standard Type C format to rush units into production. They will no longer be alone in the field, however, since both NEC and Hitachi have announced plans for one-inch Type C machines. NEC claimed last year that they would have full production models of the TT-7000 unit on display at the 1979 Show. Hitachi, too, claimed it would have demonstration models of its one-inch unit in dealers' hands by the end of 1978 and would be in full production by the time of the show, though no specific details have been released yet to *BM/E*.

Other one-inch units will be on display throughout the show. Bosch Fernseh will be showing the latest lightweight cassette version of its BCN Type B system. Cinema Products will be displaying NEC's lightweight TTR-7 and portable TTR-5 one-inch helical Type D machines. Other manufacturers licensed to produce one-inch systems by Sony and Ampex, such as RCA and Philips, will expand the number of opportunities for broadcasters to look over these new machines.

Editing systems to interface these decks are also starting to appear. Convergence will again demonstrate its ECS-100 Series Superstick multiple source editing control system with special effects. Bosch Fernseh will show its EPS 70 editing system, demonstrated at the SMPTE show last year. Datatron and CMX, too, will show their lines of computer-assisted editors. A new development in editors is promised by Video Associates Labs, which will unveil its 60 Hz playback vertical lock and H lock modification for the Sony VO-2860. BTX will offer a new SMPTE time code controller to interface audio with video recorders.

ENG/EFP cameras and production tools will also once again be in evidence throughout the show. Thomson-CSF will have its one-piece Microcam, the Model 601, in a full production version, with a four-and-a-half-inch viewfinder, remote control for EFP applications, and a 2 GHz video link and 950 MHz audio link microwave system. Ikegami's HL-79A will be shown as a production model, along with the new crop of extremely lightweight cameras from manufacturers such as Philips, RCA, Panasonic, Sharp, JVC, Hitachi, Sony, Cinema Products, Bosch Fernseh, NEC, and several others. Other developments on the ENG/EFP scene include three new ⅔-inch Plumbicon® tubes from Amperex, new models of fast-charging batteries and battery packs and belts for cameras and VTRs from Cine 60, an ac/dc portable audio and video production console from Camera Mart, new zoom lenses for EFP applications from Rank Precision Industries, Canon, Angenieux and Fujinon Optical, and camera-to-RCU cable assemblies from Boston Insulated Wire and Cable.

In **microwave,** Van Ladder will offer a van-mounted aerial ladder with facilities for mounting a microwave dish. E-N-G Manufacturing will again offer some new, pioneering equipment for ENG/EFP microwave applications — this time a backpack containing both a transmitter and receiver, together with associated antennas, for relays in remote locations.

Considerable interest is likely to be generated by the expansion of digital technology into the **special effects** and **switching** areas. Central Dynamics, not to be outdone by PSAS or E-MEM, has announced plans to demonstrate a

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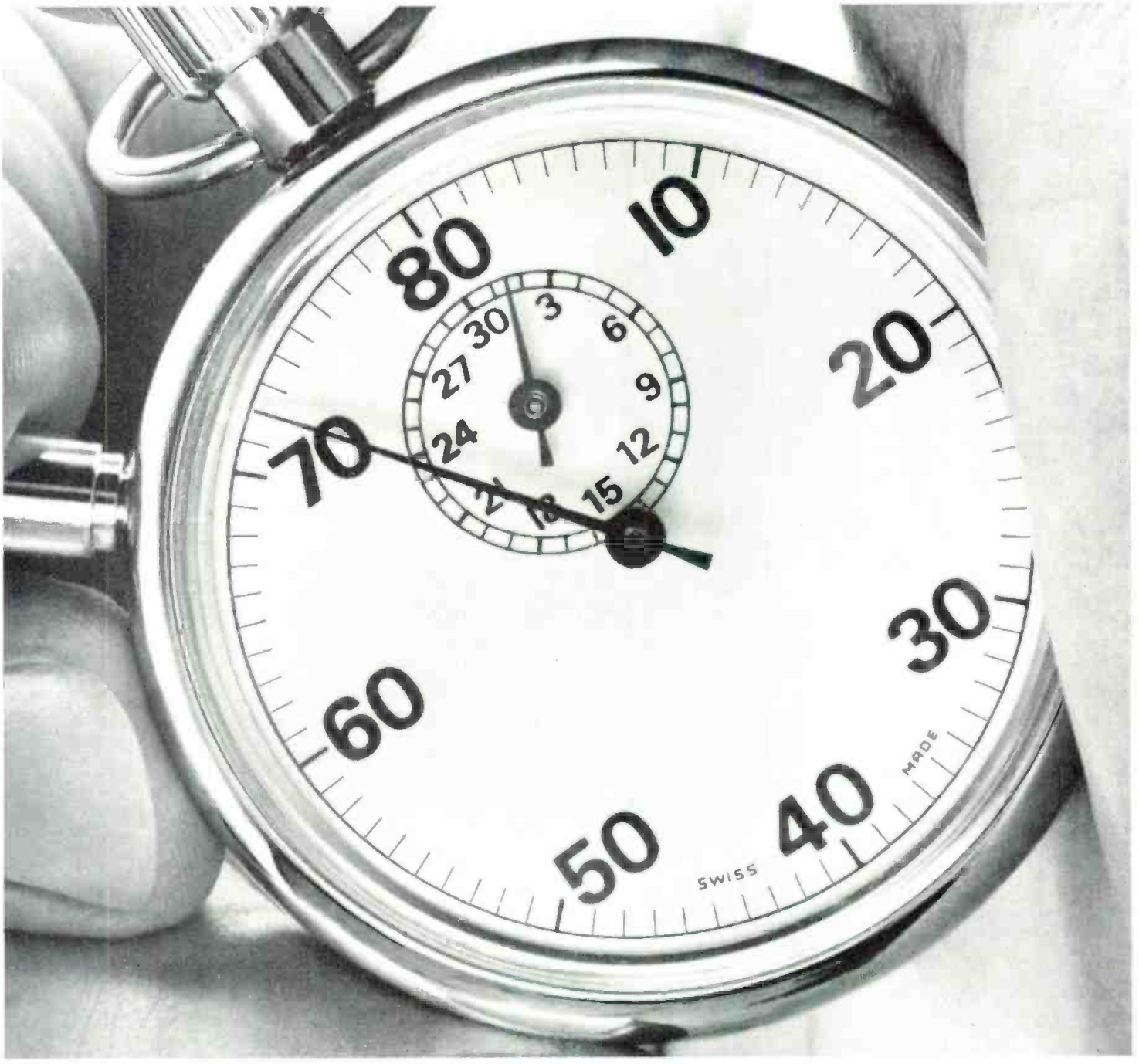
Testing and measuring continues to be important to the engineering sector of the television industry. Several companies promise new developments in this area, including QSI, which will unveil its color bar identifier at the NAB show

NEW PROCESS RVNP FROM KODAK GIVES YOU THE ONE THING EVERY NEWS DIRECTOR NEEDS:



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Panels Of 100 Survey

new system for computer memorization of complex production sequences, which it has dubbed CAP. Vital Industries will have a full production model of its Squeezoom on hand. Other manufacturers of digital effects systems, such as MCI/Quantel and Grass Valley Group, will also undoubtedly have their systems in full operation. MCI/Quantel will offer evidence of one advantage of digital as it begins supplying its first software updates to users. Other popular items are likely to be Colorado Video's new Model 274 video frame store, Bosch Fernseh's slow motion programmer for its BCN VTRs, and Edutron's new TBC with a wide window and genlock.

Electronic character generators and graphics systems manufacturers will also probably have long lines at their booths, with interest in these systems remaining extremely high. Chyron will be demonstrating its newly developed Election Reporting System, which ties into a nationwide network of time sharing computers with its in-plant hardware. MPB will be using the show to introduce a desk-top model of its VISTA 80 system. Knox Video Products, too, is working on some new developments in character generators which may be ready by March. Though not heard from by the time of this writing, TeleMation and Thomson-CSF (Vidifont) will undoubtedly have their systems in full swing at the show. System Concepts, too, will have their Q-III and Q-IV character generators with new software features on hand.

Although **testing and measuring** equipment was of less interest to management than engineering in the Panels of 100 survey, several new items are likely to catch the eyes of any broadcasters interested in maintaining the quality of their operations and images. Videotek will introduce its Model DM-4R demodulator and eight-inch portable color monitor. Lenco will have its full product line of waveform monitors, vectorscopes, waveform analyzers, high resolution monitors, and adjustable blanking width modules on display. Barco will display a very high quality color video monitor well suited to EFP applications. Video Aids of California will feature its model 4000 VIRS inserter and combination H-phase, burst phase meter. Tentel will distribute a "Tape Tips Guide" with valuable information on maximizing the use of many different formats of VTRs in conjuction with its Tentelometer, which measures tape tension. QSI Systems has a newly developed color bar identifier for instant logging and identification, as well as a full line of clocks including a backtimer. Conrac will demonstrate its full range of monitors. A particularly important new development in testing and measuring is the Tektronix tuneable down converter for its 1450 demodulator. Marconi will demonstrate its new Model 2920 television interval timer.

Based on the results of the Panels of 100 survey, a number of other units are likely to be popular on television engineers' "must see" lists. These include Cohu's new encoder/enhancer/auto balance unit and Dynair Electronics' new high density routing switcher system, which can be used with a versatile "intelligent" control system. Engineers, who traditionally have problems selling routing switchers to their managements, should also check out the Di-Tech line of audio and video routing switchers, in addition to the systems offered by manufacturers such as NEC and Grass Valley.

Lighting equipment, which continues to be of fairly low interest, nonetheless continues to demonstrate significant technological gains, particularly in the area of computer control. Kliegl Brothers plans to introduce a

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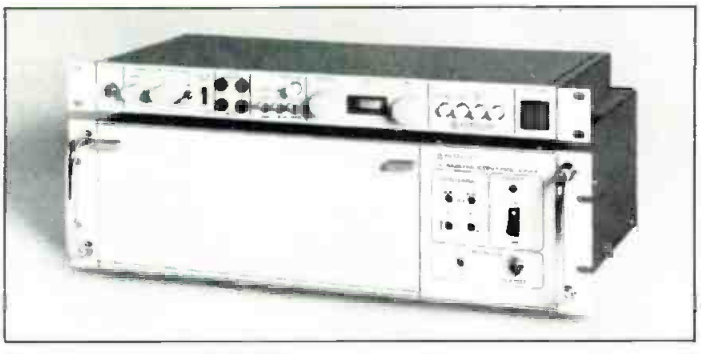
Today's Professional Studio Deserves Hitachi FP1011

Announcing a color camera that offers a rare degree of ophistication for its price. Three ⅔" Saticon tubes, proven or matchless picture quality. Tiltable and detachable 7" iewfinder. Adaptability to self-contained use for total portbility. *And*, the convenience of a true operating remote ontrol panel. With it, the FP1011 can range far and wide up to 1000 feet) through your studio or a remote location vhile all operational camera functions are controlled from central location.

Functions that can be adjusted from the R.C. panel inlude iris and pedestal...color temperature...color paint... ntercom...and automatic or manual white balance and lack balance.

The FP1011 features a compact Camera Control Unit with uilt-in color bar generator...NTSC encoder...and H-detail ircuit and vertical image enhancer. Just as important, all re incorporated as plug-in modules for easy maintenance.

Hitachi's seven regional offices stand ready to answer any questions you have about Hitachi's newest studio camera *today*. And the field engineers in each regional office will back you up with superior service *tomorrow*.



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new memory control console at the show, while Electro Controls will be featuring its Plexus 1000 modular memory control system. Berkey Colortran will again demonstrate its presettable console series.

Two companies, Electro Controls and Berkey Colortran, plan to introduce new scoop lights which are particularly suited to TV studio applications. The former will offer 14- and 18-inch 2k scoops, while the latter will offer both 1k and 2k versions. A new special effects strobe unit designed to be hung from curtains — Starstrobe — will be offered by the Great American Market.

Grip equipment has also registered significant gains, keeping pace with the new lighter weight ENG/EFP cameras. O'Connor Engineering has a new quick-release adjustable balance camera mounting platform with double handles for its Models 3, 50, 100, and 150 fluid heads. Listec Television Equipment will have a new compact fluid head. For studio applications Listec has also developed a three-stage pedestal with a 38-inch range.

For portable **location lighting,** both Lowel Light and Cine 60 offer a complete range of sun guns and other units.

The strong commitment indicated by broadcasters to **earth station** technology in the Panels of 100 survey, as well as transmitter and antenna needs, will be more than adequately met by manufacturers at the show. Scientific-Atlanta will be demonstrating its new Metsat system for weather reporting and forecasting using satellite data. Andrews Corporation, following a trend towards smaller, more efficient earth stations, will exhibit its new 12-meter receive and transmit earth station. Both Western Union and Mutual Broadcasting will be explaining how their services offer satellite programming to subscribers. TerraCom promises new developments in digital audio program channels, while RCA Americom will introduce its satellite capabilities to broadcasters.

At this point, it appears that the only new **transmitter** that will be offered at the show will be a 5000 W VHF model from Electronics, Missiles, and Communications, although Comark Industries hints at a new transmitter in the works. Varian Associates, however, will demonstrate new power grid and klystron tubes. Other manufacturers will be on hand with their standard product lines, including Collins Transmission Systems, Ceco Communications, and Cetec Jampro, which will present information on its spiral circularly polarized antennas. Also in the CP area, Micro Communications will introduce a new channel combiner and dual transmitter phase comparator. Bogner will also demonstrate its full line of TV antennas.

In conclusion, it is safe to assume that whatever your broadcast equipment needs are, there will be at least one exhibitor at the NAB show who will be showing a prototype or a production model of just what you are looking for. Many of the 350-plus manufacturers who are expected to exhibit at this year's show declined to provide details of their new products at this time, but there is an old maxim that says, "If you don't go to the NAB show with something new, don't bother to go at all." We expect that by next month, when many more companies have firmed up their plans, we will be able to give you a more complete picture of what will be shown in Dallas. The March issue of *BM/E* will provide a complete rundown of what each exhibitor is showing, and by then, new information many reveal a bumper crop of new technology. **BM/E**

"I had a second chance to build a complete remote control facility and..."

KDTV Chief Engineer George Ledoux sticks with a winner

"I ordered a second helping of TFT 7600."

George Ledoux, Chief Engineer of San Francisco station KDTV, had an idea—trade frequencies with a lower frequency educational station to provide better coverage and TV dial identity for KDTV. So, channel 60 became the educational channel for the College of San Mateo and the college's channel 14 became KDTV. Part of the trade provided, as a gift, all KDTV transmitter equipment to the college. TFT remote systems were a major part of the package. Thus, George had a second opportunity to select all new remote equipment. **HE SELECTED THE SAME TFT GEAR HE USED BEFORE!** Here are George's reasons why:

On Capability

"... The TFT systems do what they're advertised to do. They work perfectly from the first plug-in and go on working no matter what kind of data parameters I include. The instant status lights and direct ON/OFF controls are great. They give you an extra dimension of control and data assurance. Single-man calibration saves us time and minimizes the chance of error. They've also got a double-scan/compare data transmission technique that makes the system almost foolproof."

On Flexibility

"... The engineering of the gear is so clean that I can get into the equipment and customize it for my own needs... like building up audio channels, combining status inputs to trigger special alarms—whatever I want to do. TFT has always been very helpful in working with me on these things—whether or not they sell any gear as part of the deal."

On Expandability

"... The TFT 7600 system is designed to grow right along with our needs. I can add channel expanders, fail safe units, automatic path selectors, multi-site selectors, computerized monitoring, anything I want—it's all available from TFT. There's even a software package available for computations of things like VSWR.

On Service

"... I know what it's like to disconnect and code over 300 wires on other systems. TFT's detachable rear panel design is just great although I've never had to use it because the equipment has never needed maintenance."

George Ledoux and many knowledgeable engineers like him can speak from experience on the reliability of TFT remote systems. And, when it comes to quality, our specs will speak for themselves. Call or write for a set today.

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INTERPRETING THE FCC RULES & REGULATIONS

Contest and Promotion Pitfalls

By Frederick W. Ford and Lee G. Lovett; Lovett Ford and Hennessey, P.C., Washington, D.C.

ON A SEEMINGLY regular basis, the Commission assesses monetary forfeitures or short-term license renewals because of misleading or deceptive station contests and promotions. The Commission's rules and policies are clear that a station must refrain from misleading listeners and/or advertisers as to the *mechanics* or *prizes to be awarded* as part of station contests and promotions.

Almost without exception, broadcasters tagged for violating these contest and promotion policies have acted in good faith. There appears to be no intention to mislead the public or advertisers, nor to be deceptive in any manner. Nonetheless, violations continue to occur. Sometimes this may be due to the lack of knowledge about these FCC policies by new employees. At other times, the violations occur because of management failure to adequately oversee station operations.

In any event, two recent cases should emphasize to broadcasters how easy it is to violate the FCC's contest and promotion policies. The Commission issued a short-term license renewal for one station and imposed a substantial forfeiture against another station for violating these rules and policies.

Ali-Norton "knockout" contest

An FCC-conducted field investigation of the operations of a Connecticut radio station revealed that the station had aired an Ali-Norton "knockout" contest. Listeners were instructed to enter the contest by telephoning the radio station at certain times, as announced by a disc jockey. The disc jockey asked the listener calling to guess whether the listener could knock out Ali in a make-believe fight. After the caller made a guess, the disc jockey played a pre-recorded tape cartridge which simulated a one-minute fight with Ali and announced whether the listener had won or not.

The Commission determined that the contest was misleading.[1] The disc jockeys were in possession of a schedule and instructions concerning whether a listener at a particular hour would be a winner or a loser.[2] Thus, it was predetermined that, at a particular hour, the caller, whoever it might be, would automatically lose the simulated fight. At other specified hours, the caller would automatically win the fight.

The Commission determined that there was another misleading aspect of this contest. Listeners were told that the prize for a correct guess would be "tickets to see the Ali–Norton fight." Additional differently-phrased statements were broadcast. The Commission determined that these announcements misled the listening public into believing that the prize consisted of tickets to see the Ali–Norton fight in New York at Madison Square Garden. In reality, the tickets were for a closed-circuit broadcast of the fight at a local Connecticut theater.

Initially, the station personnel did not know that the tickets were for a theater presentation of the fight. The Commission could not determine from the evidence whether the promotional announcements about the tickets continued *after* station personnel discovered that the prize tickets were not for the "live" fight.

The same station ran another contest that the Commission determined was misleading to the public. In its "Morning Mayor" contest, the station would choose a local citizen on weekdays to receive gifts from local merchants. Listeners were requested to submit nominations for the "Morning Mayor." Over-the-air announcements were made and newspaper ads were run. In all types of promotional material, the station implied that the winners would be selected from listener suggestions.

In reality, the station received insufficient listener nominations to supply five "Morning Mayor" winners each week. Because of this, announcers were allowed to select winners at times when there were insufficient nominations to fill the five per week winner selections.

The Commission acknowledged that there was no "fixing" of the promotion in any manner. Rather, the Commission found that the station had failed to inform the public *accurately* as to the *mechanics* of choosing the winners.

The Commission further concluded that station management was aware that the Ali–Norton and the "Morning Mayor" promotions were not run as promoted. It noted that licensees are required to adequately supervise all contest promotions to assure they are conducted fairly and "substantially as represented to the public."

As a sidelight to its field investigation, the Commission found that the Connecticut radio station claimed in a newspaper advertisement that it had "more power and a stronger signal than the Bridgeport stations." The Commission's records disclosed that two Bridgeport stations have coverage contours greater than that of the station being investigated. In addition, a rate card of the station contained an unmarked coverage contour which exceeds the station's 0.5 mV/m contour. The Commission found the unmarked coverage contour implied that the standard contour coverage for the station was larger than in reality.

continued on page 106

[1] *Letter to Colonial Broadcasting Co., Inc. (WFIF)*, FCC 78-819, November 27, 1978.
[2] The station maintained separate "winner" and "loser" cartridge carts.

1st to use IBM card systems
1st digital logic control
1st MOS memory systems
1st INSTANT random access cart unit
1st to use minicomputers & VDT's
1st microprocessor in cartridge machine

1st microprocessors in system control
1st with color display system

with

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CULMINATION OF 25 YEARS AS THE LEADER IN RADIO BROADCAST AUTOMATION EQUIPMENT

THE COMPLETE ONE! BASIC A has ALL its marbles in one package. Nothing else to buy. Just sit down at the keyboard and pick its brains (based on 3 Intel 8085 microprocessors).

You're a HUMAN — tell it in ENGLISH. BASIC A will carry out your commands.

It's BASIC-ALLY BETTER.

- See what you're programming, what's on air too, on CRT — black & white or color.
- Push one button to operate LIVE ASSIST.
- Airing live commercials or PSA's? BASIC gives you 20 programmable descriptions to automatically log them.
- Ideal for syndicated formats, because of modular programming concept.
- Give search & delete commands without interfering with programming.
- FREE education for operator. FREE system installation.

STAY WITH THE FIRST FAMILY.

IGM A DIVISION OF N.T.I. 4041 HOME ROAD BELLINGHAM, WA 98225 (206) 733-4567

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It noted that this violated its policy requiring licensees to deal candidly with advertisers and potential advertisers, and emphasized the need for full and accurate disclosure to the general public and advertisers.

Finally, the Commission's field investigation developed evidence that a salesman for the station had called potential advertisers incorrectly claiming that he was a representative of the "Safety Council" in an effort to sell advertising time on the station. The "Morning Mayor" promotional announcements were not appropriately logged as commercial announcements for approximately a two-month period, despite the fact that the announcements contained commercial content.

In light of these rule and policy violations, the Commission granted the station a one-year renewal so that the operation of the station could be monitored and the conduct of the licensee be reviewed at an early date. The Commission stated that had the rule and policy violations occured within one year prior to the date of its letter to the licensee (which they had not), the maximum forfeiture available would have been imposed in addition to short-term renewal.

Black Book contest

A Washington, D.C., station recently received a Notice of Apparent Liability for forfeiture of $6,000.[3] The station broadcast announcements inviting listeners to call in and give their names and the names of three best friends for recording in a "Black Book." The announcements stated that the station would call friends listed in the Black Book. If the friend called was listening to the station, both the friend and the person that provided the friend's name would win a prize. No specifics about the prizes were given. In addition, the announcements stated that the winners would quality for all 1978 station contests.

The Commission found that this contest violated Section 73.1216 of the rules, which requires that a station "fully and accurately disclose the material terms of the contest." In its announcements, the station *failed* to indicate the exact nature of the prizes. (The prizes were quite legitimate — record albums and pairs of tickets to events at a Washington-area sports and musical entertainment center). The winners were informed of these prizes when they were called. Nonetheless, the Commission found that the material terms of the contest were not fully disclosed in the announcements, as required.

The Commission declared that it appeared the announcements stating that the winners in the Black Book contest would qualify for all 1978 contests were false.

Thousand Dollar Dial contest

The same station conducted another contest in which it announced that persons would be telephoned to determine if they were listening to the station. If they were, they would win $1,000.

On one announcement taped by Commission personnel, the statement was made repeatedly that calls would be placed to listeners in the Washington area. The licensee informed the Commission that contestants were chosen at random from District of Columbia and Maryland telephone directories. The Commission concluded that it did not appear that listeners in the Virginia suburbs of Washington could possibly participate in the contest, although these Virginia residents clearly fell within the listening area of the station. The Commission concluded that these announcements concerned "a material contest term since they described a factor defining operation of the contest and affecting participation therein."

The Commission also noted that it did not appear that the station used names of winners in the Black Book contest as part of the Thousand Dollar Dial contest, despite the previously announced claim that the Black Book contest winners would qualify for all 1978 station contests.

In light of the two apparent repeated failures to conform to the Commission's contest and promotion policies, the Commission advised the Washington station of apparent liability for forfeiture of $6,000.

Conclusion

Radio stations continue to create imaginative and exciting contests and promotions. Sometimes, the station personnel, in their enthusiasm, fail to insure that the contest or promotion conforms to the Commission's rules and policies.

Management personnel should make a policy of reviewing *all* contests and promotional ideas before full on-the-air development. It would be wise also to consult with your communications counsel during development of contests and promotions. **BM/E**

[3] *United Broadcasting Company (WOOK(FM))*, FCC 78-838, November 30, 1978.

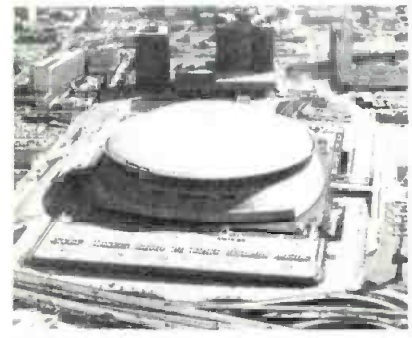
"this Auditronics 110 in the Louisiana Superdome...

...handles over 80 events a year ranging in complexity from Saints football and NBA basketball, to the Spinx-Ali fight to rock festivals and religious revivals", says WWL's Hugh Burney, Director of Technical Operations. "Its 22-in by 6-out flexibility lets us use it for on-the-air TV and radio as well as network feeds, and some commercial production."

"We needed a board to handle a great variety of tasks at the Superdome, and we checked out half a dozen different brands. The stretched version of the Auditronics 110 gave us the greatest flexibility for the lowest cost, and they customized it for exactly what we needed. With Auditronics modular design, we essentially got a custom board with the quality we required for the Superdome at the price of a standard item."

"How does it work? Well, in two years on the air, it's done everything we've asked of it, and it's never failed in use. We like it well enough that we've since bought a second Auditronics 110 that's working eight hours every day in our commercial production studio."

If you'd like to know what WWL and over 300 other broadcasters and studios have learned about Auditronics quality and reliability, circle reader service number or call us.



Louisiana Superdome, largest indoor arena in the US, site of WWL's sports broadcast studio shown above.

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SPEAK OUT

More On Blankety-Blank Blanking

Editor's note: "Blankety-Blank Blanking," the recent Speak Out authored by Gerald Evans (BM/E, December, 1978), posed some genuine questions about the FCC's concern over excessive H and V blanking widths. At the time, we called for a continued discussion by broadcasters of this important issue, and invited those concerned to write and express their views. Some of the responses are printed as this month's Speak Out.

Dear Editor:

I concur completely with Gerald Evans' Speak Out in the December, 1978 issue of *BM/E*, and I simply wish to add another perspective to the subject. The FCC is concerned with the interests of the viewing public. What the public views is, of course, the picture and not the blanking which is hidden behind the TV set's mask. Let us therefore determine if the "blanking problem" causes a "picture problem."

Using round numbers, H blanking is 10 μs wide and the picture is 50 μs wide. Hence, a 1 μs error in H blanking is a 10 percent H blanking error, while at the same time it is only a two percent picture width error. Similarly, one TV line is equivalent to about .5 percent of picture height. Thus, the "Beirut story" cited by Gerald Evans would have been killed because of a .6 percent picture width error. His rhetorical question whether this makes sense can be answered with a resounding *no*.

In view of the fact that color TV receivers have a range of 12 to 18 percent overscan (*Consumer Report*, January, 1977), the broadcaster's "blanking problem" seems to be a tempest in a teapot.

Hans Schmid
Senior Engineer
ABC-TV

Dear Editor:

May I first congratulate Gerald Evans for stating so eloquently the general attitude of the vast majority of technical and non-technical personnel in the industry concerning H and V blanking and RS-170.

The only comment I would like to add to Mr. Evans's observations is that I believe the entire blanking dilemma is merely one example of industry controlling government! By this statement, I am suggesting that someone, somewhere out there in manufacturing land, built a "black box" that would correct this comparatively insignificant problem. Then, after they started production of these "black boxes" they discovered that very few, if any, television stations were willing to make such an exorbitant capital investment for the box to correct a problem that didn't seem to bother anybody to any significant degree. They therefore had to *create* a market for the new toy. So, they probably petitioned the FCC to crack down on violations of RS-170 which would, in effect, blackmail television stations into purchasing the "black box." An analogy would be the way Detroit pawned off the infamous catalytic converter and unleaded gasolines on us (rather than building more efficient engines) to meet EPA standards. Where will these unscrupulous and insidious acts end?

I'm all for keeping the technical standards of television high, but let's put our problems in their proper perspectives. First, I think we should have finite standards defined for what we transmit *between* the horizontal and vertical sync pulses (e.g.: percent noise, percent color saturation, tolerance of color phase or hue, etc.). Then, and only then, should we concern ourselves to this degree with what we transmit off the viewing screen. I am saying this only because heretofore we have had no significant or acute H or V sync problems using contemporary state of the art sync pulse generators.

Myles H. Marks
Engineer
WIIC-TV
Pittsburgh, Penn.

Dear Editor:

I never really thought I would find myself defending the actions of the FCC. But recently there have been so many criticisms of their enforcement of blanking widths that I think it is time to bring things into their proper perspective.

Some critics seem to promulgate the idea that there is a conspiracy to do away with many wonderful and worthwhile programs under the guise of some nebulous thing called wide blanking, be it horizontal or vertical. They also think this is a newly devised scheme. It may be true that some worthwhile programs are temporarily not airable, but this will be short-lived. Several equipment manufacturers have already started to come to the rescue and soon will be affordable.

For many years the FCC has been citing stations for wide blanking violations (also serrations and equalizing pulses). These rules are not new, the enforcement is not new, and I don't understand why any knowledgeable TV engineer would think it is. The problem lies with people or companies that have not obtained the knowledge or cared enough to do the job properly. Care must be exercised in camera setup, system adjustments, system timing, and videotape setup.

Once cameras are properly set up with regard to proper pulse widths, they usually remain relatively constant unless there is a problem. Timing is a variable and should be checked at frequent intervals. Videotape machines are the biggest culprits in taking normal blanking widths and stretching them. Here the operators will also have to share part of the blame. Improper adjustments of the horizontal position control will most certainly introduce wide blanking by no more than .05 μs. Any more than this means it is time for some serious maintenance.

It is important for the VTR operator to check and double-check during editing sessions. Use the well-calibrated (we hope) scope on the VTR and make sure both the vertical and horizontal pulse widths are proper. Don't forget the video levels either. Here is where we separate the professional from the amateur. Be thorough, learn the operation of your machine, and set it up properly.

Three-quarter-inch VTRs have opened up new vistas for news coverage and opportunities for amateur TV productions. Slant track machines are capable of pictures with legal pulse widths, but here again, care has to be given to the system and equipment intended for broadcast use must be used.

It is easy to say, "Do away with the FCC rules regarding pulse widths"; I don't know if my poor old TV would agree when it is trying to provide proper aspect ratios. It is my personal feeling

continued on page 110

When you need microphones with "reach," reach for these!

CL42S Shotgun System

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

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

CH15S Hypercardioid System

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

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

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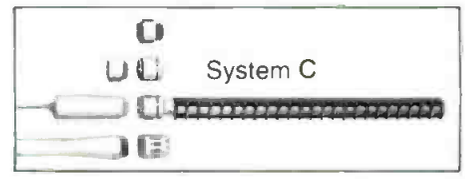
Electro-Voice backs up these two microphones with the only unconditional warranty in the business: for two years we will replace or repair your CL42S or CH15S microphone, when returned to Electro-Voice for service, at no charge – no matter what caused the damage!

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



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Speak Out

that the FCC is doing us all a favor in its enforcement of the rules. Newcomers and some oldtimers are becoming more quality conscious. This will certainly help improve TV operations.

It is a paradox that the FCC is receiving so much criticism for strict enforcement, when actually they have relaxed the rules to accommodate some substandard programs. If we care enough to do our job properly, things like pulse widths will not be a problem.

Jerry Foreman
Director of Engineering
PTL TV Network

Dear Editor:

Although I'm not an engineer, Gerald Evans's piece on H and V blanking in the December '78 *BM/E* moves me to write. You asked for additional thoughts on the matter, so here's a non-technical view.

First, I agree totally that the industry must meet minimum standards, technical and otherwise. I also agree that if these standards are not met, the FCC should take action. But I don't view the blanking thing as an "all-or-nothing" situation, and I totally disagree that the rules and regulations should keep material that's important to the audience off the air.

Example: You're in a local TV station, in a town next to a river. It's been raining hard, and the river's about to go over its banks. Your ENG crew has gotten some outstanding tape of the crumbling levees. It's 6:30 p.m.; there's a large housing tract a quarter of a mile from the river, and you know most of those homes are watching your local news. Your chief engineer witnesses a preview of the tape, and says it can't go because of RS-170. What do you do?

If you're responsible, you run the tape anyway — at least in my view. Its content is much more important than its technical quality. I admit that this may be a rather extreme example. But I submit that problems like this are encountered by broadcasters all the time.

If the FCC insists on rigid enforcement of RS-170, the result will surely be deterioration in the content of TV news programming — particularly in "emergency" situations, when content is most important. The ultimate result is that the "public interest, convenience, and necessity" will not be served as well as it could be — because some bureaucrats have decided that the rule is more important than the result.

In a larger, less "immediate" sense, Evans's argument carries much weight, in my view. An obscure, esoteric government regulation that results in less efficient public service, with no discernible public gain, is worthless. In fact, it's detrimental.

RS-170 certainly does not provide public gain; its implementation (or lack) is undetectable on the basic measurement standard for the industry — the picture on the TV sets in people's homes. Broadcasters constantly strive for the highest possible quality in this picture, with or without RS-170; they stand to lose audience (and money) if they don't.

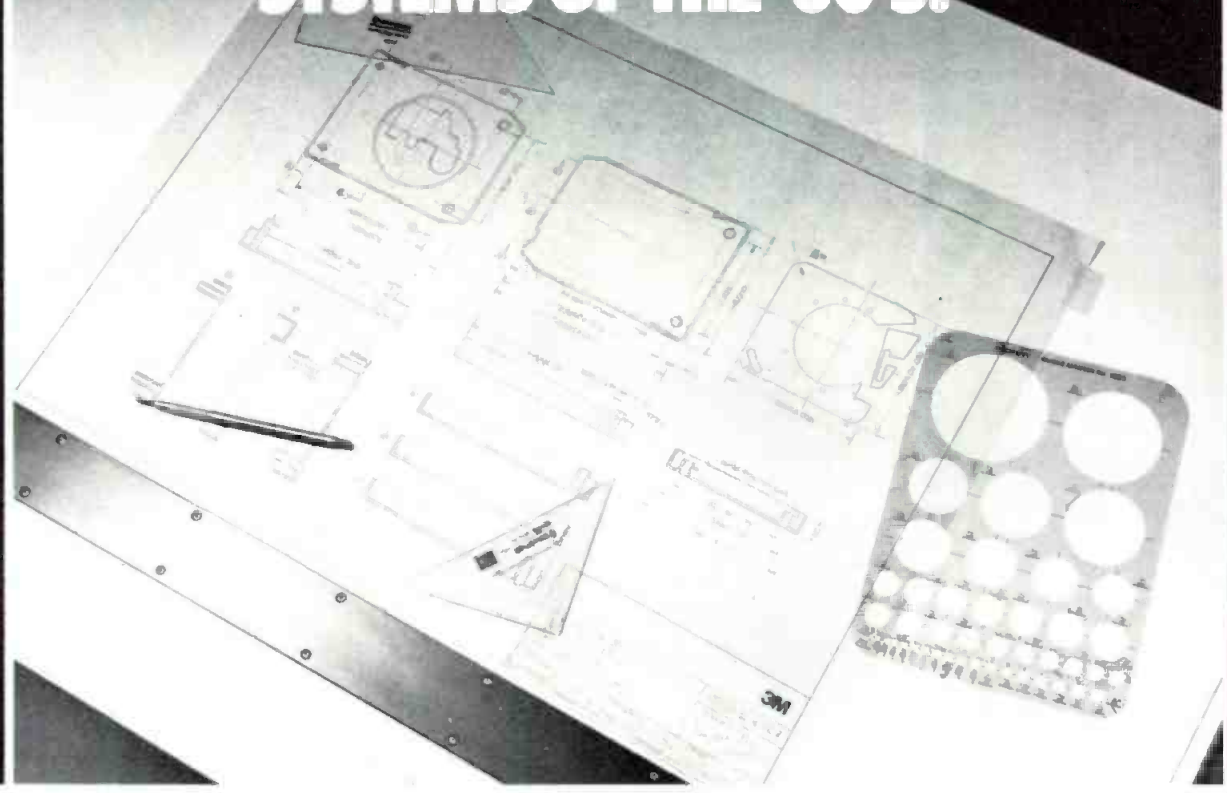
As Evans implied, I think RS-170 is an example of a government regulation that was promulgated in advance of the technology that would make it 100 percent possible. Thus, simple logic would indicate that its strict enforcement should be delayed until the technology is, indeed, there and readily available at reasonable cost.

Here in California, we're going through the results of Proposition 13. It's my view that the overwhelming public vote in favor of this initiative happened partly because people are getting sick and tired of illogical government actions that produce more cost with little or no discernible gain.

I hope the FCC will take these points into account in relation to RS-170.

Larry Martz
Sacramento, Cal.

IT'S ABOUT TIME SOMEONE REINVENTED THE RADIO CARTRIDGE SYSTEMS OF THE '60'S.



AND WE'RE ABOUT TO BE THAT SOMEONE.

While broadcasting technology leapfrogged through the '70's, one system in your station remained unchanged. Your tape cartridge system. It's almost identical to the one that hit the market in the early '60's. And that's not much help when you're programming for the '80's.

Right now, 3M's working on a completely new tape cartridge system called CentraCart™ that's designed to give you the equivalent audio quality of reel-to-reel. It's an integrated system of recorders, players, magnetic tape and a very unique cartridge. And it'll offer better phase stability, better signal-to-noise ratios and longer tape life.

You can't run out and buy one just yet. But you can see and hear one at Booth 439 of the NAB Show or in our demonstration room at The Fairmont Hotel. Come visit us. We'll show you what's in store for the '80's.

CENTRACART™

3M

GREAT IDEA CONTEST

4. Ni-Cad Battery Tester

Victor Castens, Project Engineer, KOAM-TV, Pittsburg, Kans.

Problem: To provide an accurate method for determining the life of Ni-cad batteries.

Solution: A short time after our station committed itself to ENG news operations, it became apparent that a way of determining the state of battery life was necessary. Numerous batteries were being returned to engineering with the notation, "Won't hold charge." To determine whether we had a problem with the battery or whether it had simply not received a proper charge, we constructed a battery and ENG equipment test set.

Specifications for ENG-type Ni-cad batteries list the Ah rating and state that they should be discharged to 10 volts for a 12-volt pack. The time required is noted.

A battery is first fully charged under our control, then plugged into the test set. Resistor R1, a front panel control, is set to the desired current drain for the battery under test. Switch S1 is turned on, starting the clock timer. The battery is then allowed to discharge at a constant rate until the monitor circuit senses a drop to 10 volts. Transistor Q1 is turned fully on, turning off pass transistors Q3 and Q4. The timer is also stopped, showing the elapsed time for the discharge operation.

A second useful test for the unit is to turn R1 all the way CCW. This turns off the transistors Q3 and Q4. Plug a battery or a power supply into an input jack. An ENG VTR or camera may be plugged into an output jack. The current drawn by the unit under test can then be recorded. With ENG VTRs, all modes of operation — run, load, unload — may be monitored and compared with what the unit drew when new. This is very helpful in determining defective dc motors or binding conditions.

Transistors Q2, Q3, and Q4 are mounted on heat sinks that will dissipate 25 watts of heat.

Specifications for the circuit are: Q1, Q2: 2N3053; Q3, Q4: 2N3055; Q5, Q6, Q7: 2N5088; D1: UM08; D2: IM3020; D3: IN4744; D4, D5: IN4002.

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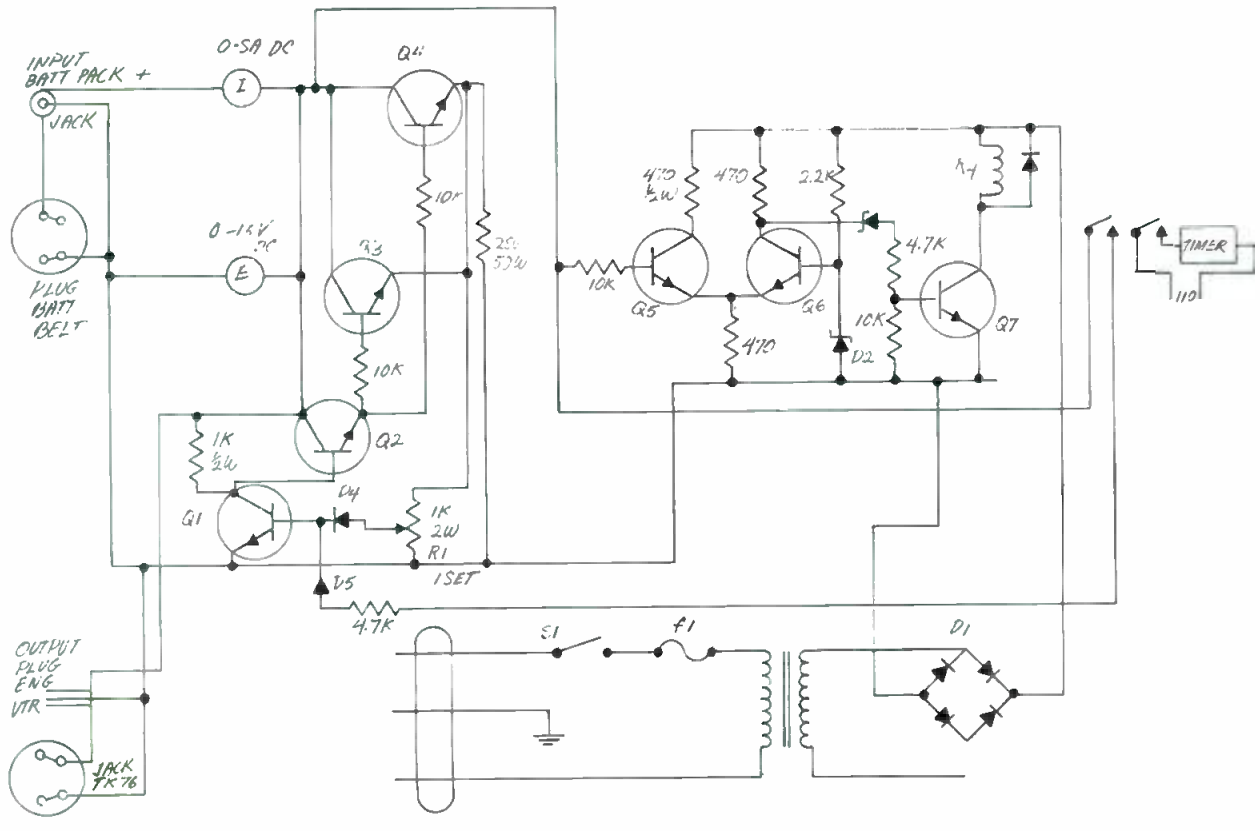
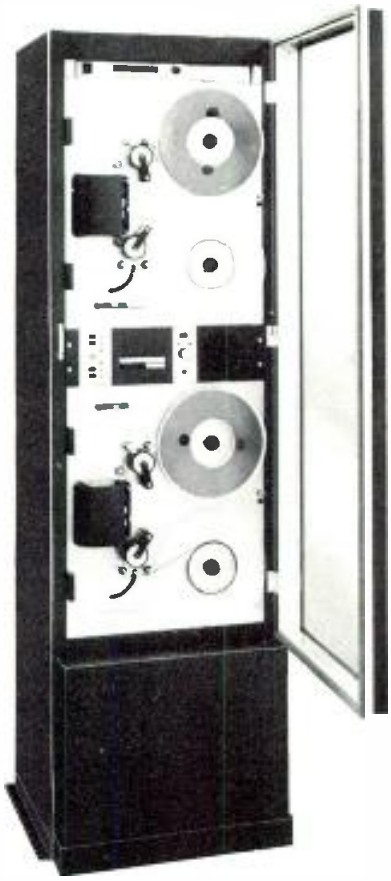


Casten's battery tester

FINALLY: A Broadcast Logging Recorder with all the features of sky-high systems at a down-to-earth price.



THE NEW-GENERATION, COST-EFFECTIVE MAGNASYNC / MOVIOLA TR-2004

Magnasync/Moviola's all new four-channel TR-2004 with time multiplexing is specifically designed for 24-hour broadcast logging and communications recording.

It offers the same high quality and reliability you've come to expect of Magnasync/Moviola's other outstanding products at a surprisingly affordable price. The TR-2004's design is based on over ONE MILLION HOURS of reliable, trouble-free operation by thousands of Magnasync/Moviola customers throughout the world under the most demanding conditions.

The following exclusive features offer higher quality performance and greater reliability than in any other system available:

- Four Channels Plus Time
- "Simul-Scan" Fail-Safe System
- Square-Wave Bias Technique
- In-Line Vertical Tape Path
- LED Audio Channel Monitoring
- Time Multiplexing with High-Speed Search

No matter what your broadcast logging application, you'll find the *cost-effective* TR-2004 the perfect choice.

Compare the TR-2004's specifications, performance and price with *any* competitive system. Find out why Magnasync/Moviola is the *only* choice.

Call or write today for complete specifications and prices.

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Dealer and representative inquiries invited

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Great Ideas

5. End Of Tape Alarm

Neil Hill, Chief Engineer, KBIQ-FM, Seattle, Wash.

Problem: To stop dead air caused by silent senses when automated music tape has run out.

Solution: Unless an extremely close visual track is kept of music tapes, the first knowledge of a tape running out is the silent sense, with its dead air time. At KBIQ we built an extremely simple end of tape (EOT) alarm that requires only a longer than usual tape (5 to 20 seconds, or more) to operate. Please refer to the schematic to follow the explanation. When the 25 cycle tone is "on," the EOT alarm needs to be supplied around 24 volts. We use IGM detectors, so C9, the capacitor that operates the pulse off relay, was tapped, but normally there are extra relay contacts somewhere that could supply this voltage. The voltage supplied to the EOT alarm input is divided by R1, R2 and fed to D1. D1 normally keeps C1 discharged through R2, but when voltage is applied C1 is allowed to charge at a rate determined by the resistance of R3, which could be a fixed resistor once its value has been determined. The time constant of C1, R3 determines the time delay of the EOT alarm. Q1 acts as a high impedance follower feeding Q2, a dc amplifier, that causes K1 to operate when voltage on Q2 reaches a proper level. Relay K1 locks on itself through its contacts and R4 and allows various alarms to be originated. We use both visual and aural alarms. Grounding the base of Q2 causes K1 to release, resetting the alarms. A lamp and reset button

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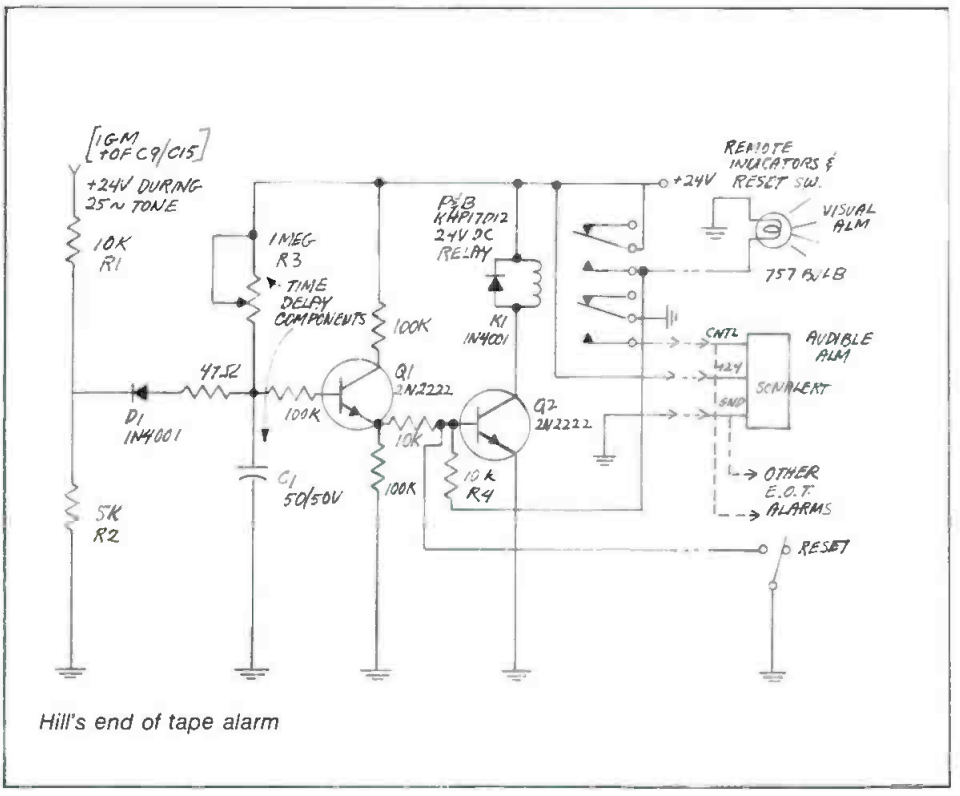

Hill's end of tape alarm

Sam VanZandt at K101 Studio A

To stay on top in San Francisco... according to Michael Lincoln, Program Director, K101,

"we've got to have the brightest, cleanest, loudest sound free of fatiguing processing side-effects.

"We feel our new OPTIMOD-AM has proven to be as lethal a competitive weapon as our OPTIMOD-FM."

Hear Optimod-AM demonstrated at Orban's Suite at NAB, Dallas. See us at Booth 429 for times and place.

Write or call for complete information about **OPTIMOD-AM** from **orban**

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are used on each of our five tape machines to show what tape has run out, but only one audible alarm is necessary. The circuit is built on a 2 by 2-inch perf board with the relay mounted upside down next to the board with double-sided sticky foam. Therefore, very little space is needed to install the alarm. The Sonalert aural alarm is mounted externally where it is out of the way, and the visual alarm and reset pushbuttons are mounted on a small relay rack panel next to or between the tape machines.

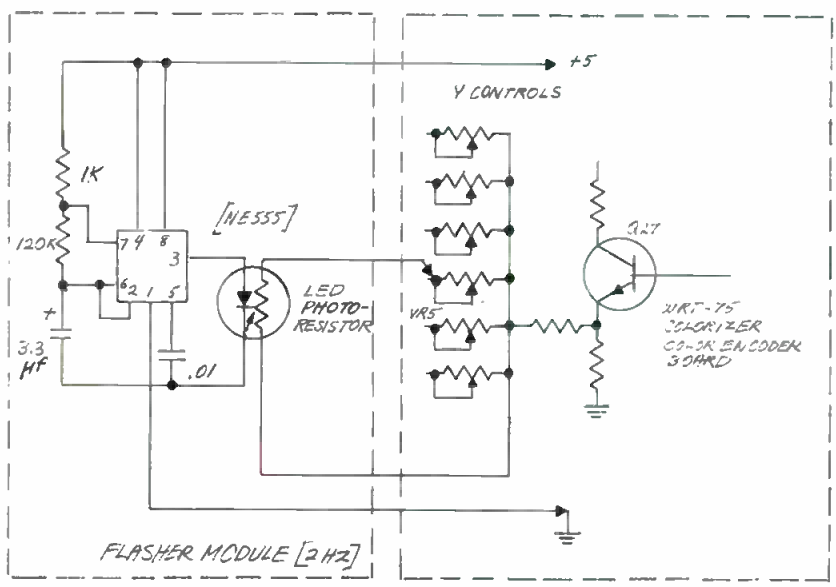
These units have been working flawlessly for several months now and have greatly cut down on operator frustration and dead air.

6. Color Weather Radar Storm Beacon

Carl Tuveson, TV Engineer, WSBT, South Bend, Ind.

Problem: To enable viewers with monochrome TV receivers to distinguish "colors" indicating weather conditions.

Solution: Our colorized weather radar uses four colors to illustrate varying levels of precipitation. This is fine for viewers with color TV receivers, but the luminance differences in black and white were not distinct enough. Red, indicating severe storms, and green, indicating moderate rain, looked almost the same in black and white. We found that by adding a simple flashing module across the red luminance "Y" control, an effect resulted which made all severe storms stand out like a beacon, even on a black and white TV set. The cicuit is simple and can be tacked on in just a few minutes.



Tuveson's storm beacon flash module

Fuji quality is now available in 1".

FUJI

Magnetic Tape Division of Fuji Photo Film U.S.A., Inc., 350 Fifth Avenue, New York, New York 10001

See us at NAB booth 402.

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BROADCAST EQUIPMENT

This month's new equipment section takes a look at a new RVNP (rapid video news process) film processor, a new type of high efficiency arc lamp, and other products significant to the industry.

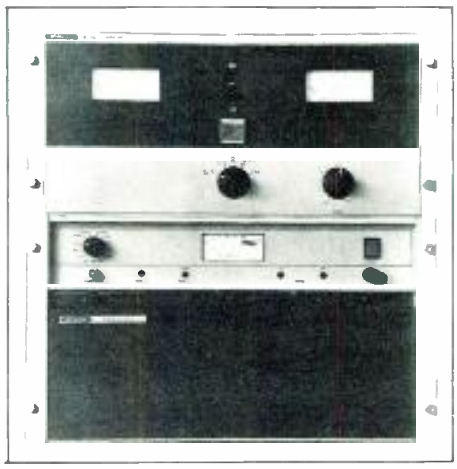
Film Processor 250

The RVNP-82, designed for use with Eastman Kodak's RVNP (rapid video new process) film, makes it possible to develop motion picture film twice as fast as previously possible. The unit is capable of processing film at a rate of 121 feet per minute with acceptable image quality, and has an average rate of 82 feet per minute. Standard features of the processor include accurate temperature controls, uniform solution agitation, a unique automatic tension adjustment film transport system, and variable speed control from 0 to 200 feet per minute. Available options include a water mixing valve, spare parts kit, mixing transfer tank, and replenishment system with flowmeters and refrigeration. ALLEN PRODUCTS CO.

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

100 W FM Power Amplifier 252

The B-9100 100 W amplifier, recently FCC type accepted, is designed to be coupled with a 10 W exciter to make a 100 W FM transmitter. The B-9100 consists of a combined two-stage solid state 100 W amplifier in which the driver output is coaxially split and used to drive two 50 W amplifiers, which in turn are coaxially combined by a hybrid combiner. A resistive reject load is used to absorb excess RF power if one of the final amplifiers should fail. The B-9100 also contains an internal harmonic filter. McMARTIN INDUSTRIES.



Noise Reduction System 253

Model 148 is designed for use in broadcast control rooms where playback only capability is required. Recommended for the playback of tapes recorded with the dbx 142 noise reduction unit, the 148 provides eight channels of noise reduction in a plug-in module. It provides 30 dB of noise reduction and 10 dB of headroom improvement. The 148 system employs two types of playback only modules, the 408, for tape playback, and the 409, for playback of dbx encoded discs. Transformer inputs and outputs (balanced) are provided for each playback channel. In the event of power failure, the system automatically switches to the bypass mode. $3000. DBX.

U-Matic Recorders 254

The VC-9207 video cassette player/recorder and the VC-9307 video cassette player are replacements for the VC-8207 and VC-8307. Common to both new machines are an improved video signal-to-noise ratio of 48 dB and a still frame adjustment for stable still picture playback. Both units include logic memory circuits that allow for direct switching between operating modes without going through the stop mode and automatic rewind and repeat. Optional remote control unit RB-801 is available for both machines. The VC-

continued on page 120

HI-BAND U-format VTR

"Quad" Quality in a ¾" Format

The model HBU-2860 (Hi-Band U-format video cassette recorder) is a modified SONY VO-2860 with Recortec electronics mounted on top of the unit. The modification provides direct hi-band video recording made possible by tripling the scanner speed and the linear tape speed.

Quality—At the 1200 ips head-to-tape speed the HBU video quality is as good as the "quad" or the new one-inch format. Professional audio quality is also obtained with this modification.

Convenience—Standard and widely available 3/4-inch video cassettes for the HBU allow for simple loading, handling and storage.

Dependability—The HBU does not alter the U-type recording format and thus takes advantage of the proven interchangeability of the U-type recorders.

Economy—Lowest cost in equipment, media and operations for any Hi-Band VTR.

Availability—Ready for delivery at the introductory price of $14,500 direct from Recortec.

RECORTEC, INC. 777 PALOMAR AVE. SUNNYVALE, CALIF. 94086 TEL: (408) 735-8821

Circle 178 on Reader Service Card

Broadcast Equipment

9207 has a built-in RF modulator for playback with any conventional TV receiver. This feature is available as an option on the VC-9307 player/recorder. Horizontal resolution for both units is more than 330 lines, monochrome, and more than 250 lines, color (NTSC). NEC AMERICA, INC.

Short Arc Lamps 255

Tin halide short arc lamps, available in 250, 500, and 1000 watt sizes, are especially suited for film, photographic, studio, and stage lighting situations where color rendering and heat dissipation factors are important. The new lamps have a color rendering index of 90 Ra and provide nearly "daylight" conditions during use. A lumen efficiency of 80 lumens per watt allows a much smaller lamp to do the job with significant reduction in power consumption. Limited infrared radiation in the lamps' operating spectrum produces considerably less radiant heat than other types of lamps. The lamps have a lifetime of 1000 hours or more, and unlike compact light sources that operate on dc current with rectifiers, the tin halides require a simple coil and ignitor and operate on normal ac current. NORTH AMERICAN PHILIPS LIGHTING CORP.

Cue Generator 256

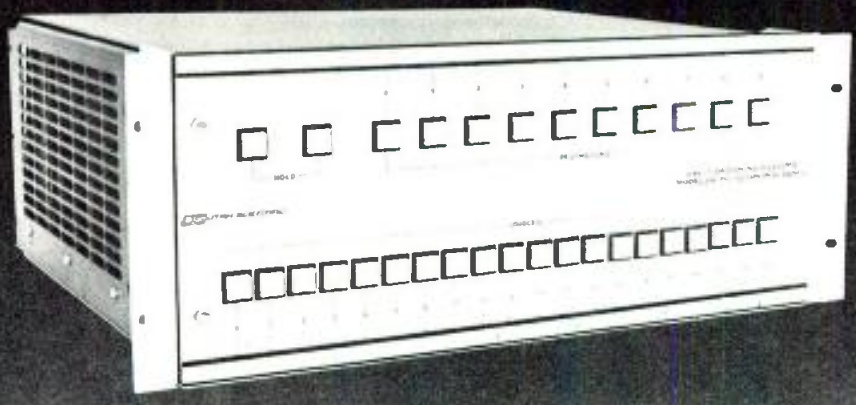
The Dynatel LPG-1 is designed to create a complete VTR leader signal automatically. The unit includes a character countdown generator, a 400 Hz tone oscillator, and a two-by-one audio-follow-video routing switcher. The unit automatically outputs 50 seconds of color bars with a steady tone, then 10 seconds of character countdown with a tone burst on the second. The count ends with an AFV switch to the program inputs. The unit also offers a five-second preroll function and full remote control. Several optional modules are available, including NTSC color sync generator, audio distribution amp, pulse and video distribution amps, stairstep generator, and screen splitter. $1745. ADCOM COMMUNICATIONS.

Video Bridging Switcher 257

The Model PSW-467 is a video bridging switcher that can remotely operate multiple audio switchers from as far away as 1000 feet using standard two-wire audio cable. The PSW-467 will switch video, audio, and SMPTE time

continued on page 122

IF YOU THOUGHT YOU COULDN'T AFFORD A PROFESSIONAL ROUTING SWITCHER. . .



THINK AGAIN!

With our new CAV-7 Series switcher you can have the same best-in-the-industry performance specifications as we give you with our larger AVS-1 switchers, but at patch panel/DA prices.

Professional features that make the CAV-7 the industry's best switcher buy —
• Remote or local control • Audio/video breakaway • Refresh memory with 24-hour memory save • Two-year parts and labor warranty • Multiple-sourced components • Vertical interval switching • Automatic statusing • Pre-wired expansion • Compact - 20 x 10 AFV in 7 in.

With the FSK CONTROL option the CAV-7 is ideal for installation at TV transmitter or microwave sites with control via an audio subcarrier channel or dedicated land line.

MATRIX PRICES

MODEL	MATRIX (IN x OUT)	VIDEO ONLY	MONO AUDIO	STEREO AUDIO	VIDEO AND AUDIO
CAV-20/10	10 x 10 20 x 10	$ 3,350 4,450	$ 3,050 3,950		$ 4,950 6,950
CV-50/10 and CA-50/10	10 x 10 20 x 10 30 x 10 40 x 10 50 x 10	3,350 4,450 5,550 6,650 7,750	3,050 3,950 4,850 5,750 6,650	$ 6,100 7,900 9,700 11,500 13,300	6,400 8,400 10,400 12,400 14,400
CV-20/20 and CA-20/20	10 x 10 20 x 10 10 x 20 20 x 20	3,350 4,450 5,250 7,450	3,050 3,950 4,650 6,450	6,100 7,900 9,300 12,900	6,400 8,400 9,900 13,900
CA-20/10-S	10 x 10 20 x 10		3,050 3,950	4,650 6,450	

CONTROL PANEL AND ACCESSORY PRICES

CPL-20/10, CPL-50/10 or CPL-20/20
Local Control Panel $1,000
CPR-20/10, CPR-50/10 or CPR-20/20
Remote Control Panel $1,500
FSK Tone Control Installed $500
BCD Interface Panel, 8-bus,
installed in remote control panel $400

BCD Control Panels and Cable — Prices on request.

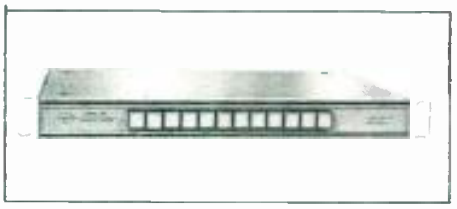
UTAH SCIENTIFIC

2276 SOUTH 2700 WEST
SALT LAKE CITY, UTAH 84119
PHONE 801-973-6840

Circle 181 on Reader Service Card

Broadcast Equipment

code at the same time, or stereo audio and time code, on ten or more Lenco Model PAF-467 audio switchers. The PSW-467 has ten inputs and two outputs. The unit switches during the vertical interval using the vertical sync derived from the video at the output stage.



There is also an external sync input for non-composite inputs or house sync timing. Power consumption of the 1¾-inch high, rack-mounted unit is less than 10 W. $795. LENCO.

FM Diplexer 258

Model 441 is an FM audio diplexer terminal designed for use in the satellite broadcast of TV-associated audio. The 441 meets or exceeds all specifications finalized by Intelsat for the simultaneous transmission of both audio and video signals through a single Intelsat IV satellite transponder. Use of the 441 will reportedly allow earth station operators to occupy less transponder spectrum and will provide cost savings in separate audio up- and downlink costs. Video filters incorporated in the 441 permit its use in either PAL, SECAM, or NTSC video formats. The unit features audio limiting and squelch. COASTCOM.

Audio Preamplifier 259

Beta III is a new audio preamplifier that uses recently developed FET technology throughout its circuitry to provide extremely fast and accurate signal reaction. The $2^{3}/_{32}$-inch high unit's EQ amplifier section consists of direct coupling and dc amplification. The first

stage is a single Cascade differential amplification system with ultra-low noise, high conductance, and dual FETs. At the second stage, a differential amplifier consisting of high voltage P-CH type FETs is employed. The final stage uses a three-parallel regulated current load source follower consisting of high-voltage N CH FETs. The Beta III also contains a tone control and filter amp sections. $399. NIKKO AUDIO.

Cue Tone Filter 260

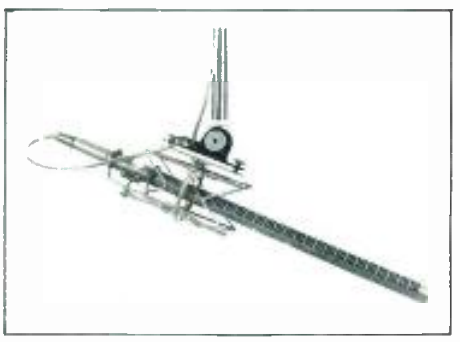
The VIF BR/25 is a new band reject filter designed to remove 25 Hz tones from outgoing signals without affecting other frequencies. The filter has a clipping level of +20 dBm and a signal-to-noise ratio of 63 dB. Typical performance measurements of the unit show 25 Hz to be 48 dB below the 1000 cycle reference frequency, 28 Hz to be down less than 4 dB, and 50 Hz to be down less than 1 dB. Optional balanced line output transformers are available. $245. VIF INTERNATIONAL.

Rotary Wipe 261

Model 360 is a new plug-in rotary wipe unit designed to operate with any video switcher. The unit is fed sync and blanking and its output is fed into the external key input of a video switcher. Fan, clock, rectangle, and bar wipes are selectable from a remote control panel that also contains ganged faders to control speed of rotation and size of pattern. The unit features a joystick positioner which enables the selected wipe to be positioned anywhere in the picture. BROADCAST VIDEO SYSTEMS LTD.

Shotgun Mic 262

The KMR 82i is an ultra-directional line condenser microphone designed as a significant alternative to many now on the market. According to the manufacturer, it displays a smooth frequency response and a "remarkable" directional pattern which differentiates pat-



tern versus frequency less severely than traditional models now available. The reported result is a microphone less susceptable to off-axis sound coloration. The unit comes with a wind screen. Accessories include elastic suspension, wind-proof blimp, and a unique "active handle" for handheld

continued on page 124

If it doesn't have an ANVIL®... you don't have a case.

It wasn't very long ago that television news reporters had to wait around for news film from a central news pool. But today's television reporters and camera crews don't wait around for anything. They're on the scene – capturing the story as it unfolds – no matter where it is. And this ever-increasing mobility has brought with it a huge demand for the best remote-equipment protection possible.

If your E.N.G. gear doesn't function when you get to the scene of a towering inferno, mass demonstration, or Super Bowl game – you don't get the shot – and the competition does. And since burning buildings, angry pickets, and last-minute touchdowns are once-in-a-lifetime events – you'll never get a second chance.

ANVIL® "A.T.A." cases combine high-impact construction on the outside with specially designed, custom-fitted foam padding on the inside. They exceed rigid Airline Transport Association specifications for reusable shipping containers.

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Circle 184 on Reader Service Card

use which contains the 9 V battery for the 48 V phantom powering converter. $795. GOTHAM AUDIO CORP.

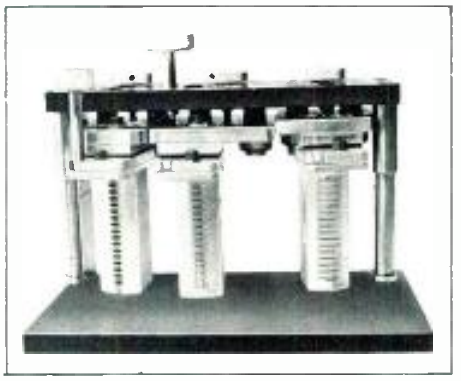
Head-Worn Microphone 263

The SM14 is a new head-worn microphone with dual monitoring capability

designed for use in a variety of studio and remote applications. The unit consists of a headband, a unidirectional dynamic microphone, and two integral earphone assemblies to permit the monitoring of separate sound sources. Each of the two earphone assemblies has its own transformer and phone plug. The complete unit is constructed of steel, aluminum, and high-impact thermoplastic. The microphone is mounted on a lightweight cushioned headband and features an adjustment knob to permit the boom to extend or pivot to fit the face and head of any user. $135. SHURE BROTHERS, INC.

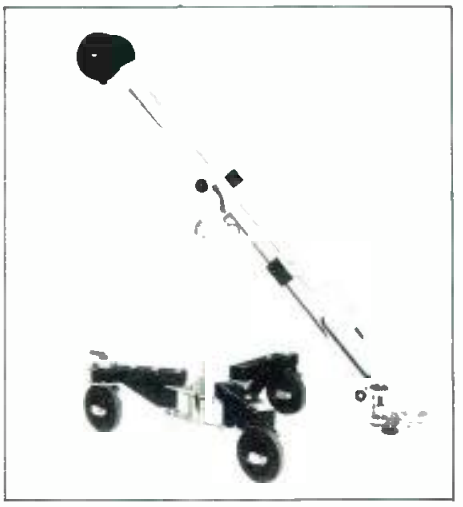
Head Assembly 264

Promix I is a new multi-track head mounting assembly designed specifically to reduce alignment time and simplify magnetic head maintenance. The unit incorporates a variety of adjustments which give the user complete control over all aspects of head alignment. A built-in head subplate enables a technician to remove an individual head to change its configuration, relap it, or replace it without seriously affecting the alignment of the head. The Promix I is designed to fit most studio recorders now in use, and can be customized for special applications. GRANDY, INC.



Camera Crane Arm 265

The Dolphin crane arm is designed for use with all types of portable and ENG cameras. It is a fully counterbalanced unit suitable for use with pedestals and tripods, particularly the Vinten Tritrack or Vinten tripods type 697 and 718. The unit offers a height range of eight to 70 inches and a full 360-degree pan range. The fully damped unit will accommodate loads up to 50 pounds. LISTEC.



Lighting Memory System 266

Up to six simultaneous, separately-timed lighting actions may be programmed in a single cue with the Light Palette. The six parts of the cue need not begin or end at the same time, but all are activated with a single push-button. The parts may consist of up-fades or down-fades with separate times, delayed fades, or individual fades, with a wide range of speeds. Two built-in screens display all infor-

continued on page 126

TECHNICAL DIRECTION MADE EASIER.

SEE OUR
DEMO TAPES AT
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A good switcher can help you make those crisp moves and subtle effects that lift an average production right out of the ordinary. And we make a line of production switchers that pack top performance in four affordable price ranges.

Take our Model 3300, for example. It's an 11-input, 5-bus switcher offering 18 popular effects. Easy to read controls let you punch up preset wipes, dissolve to effects or key, wipe behind mask key and more. Optional internal chroma key and digital effects give you all the flexibility of far more expensive switchers.

Our mid-priced switchers, the Model 3100 and Model 1114 are low-profiled, self-contained units. The Model 3100 features 11-inputs with 3-busses and 19 patterns. The larger 1114 combines 11-inputs with 4-busses, 14 patterns, and a built-in chroma keyer. They're both built with easy to reach plug-in circuit boards.

The innovative Model 9000 is a microprocessor-controlled switcher that allows you to pre-program and store up to eight production set-ups for error-free retrieval during fast-moving productions and editing. 12-inputs, 21-effects, border wipes, and 5-busses are digitally scanned and controlled for maximum operating performance.

To find out more, just circle our reader service card number.

3M Video Systems. Watch us in action.

3M

Circle 187 on Reader Service Card

mation for any cue, along with the running cue sheet and actual stage intensities. A disc-type memory is used. Light Palette can control up to 512 dimmers. STRAND CENTURY.

Video Receiver 267

The 6600 series is a fixed frequency receiver designed for use with video earth terminals. This modular unit measures 5.25 inches high in a standard 19-inch rack, and features threshold extension demodulation. The unit employs a mother board to interconnect vertically mounted circuit cards with partitions between each board and a ground plane providing isolation. The unit also offers optional conversion of baseband video and 6.8 MHz audio subcarrier and 4.5 MHz audio subcarrier (for microwave applications), and three optional audio demodulators for future audio services. SCIENTIFIC-ATLANTA, INC.

Microphone Cable 268

A new series of single and multiconductor shielded microphone cables includes two single conductor designs for outside cold-weather applications in high impedance systems. The 18 and 20 gauge neoprene-jacketed constructions feature an inner conductive-textile wrap shield and a tinned-copper serve shield for 100 percent coverage. The 20

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

and 18 gauge cables have diameters of .19 and .235 inches respectively. Nominal capacitance between conductor and shield is 55 pF per foot for both sizes. BELDEN CORP.

Fiber Optic Cable 269

FIBERdata™ series cable, an armored six-fiber, multi-channel cable for long-haul, high bandwidth applications, is now a standard product available on four- to six-week delivery. The TC-MG05-06 cable can be field-installed by crews with conventional coaxial cable pulling equipment. It can be laid and spliced in a fraction of the time required for twisted wire-pair cables and features strain-relieved subchannels for handling and termination ease, color-coded subchannels with dielectric strength members, and corrugated aluminum sheathing. The six optical fibers compare in signal-carrying capacity with 2100-pair copper wire cable, though the diameter of the fiber optic cable is only 16.5 mm. VALTEC CORP.

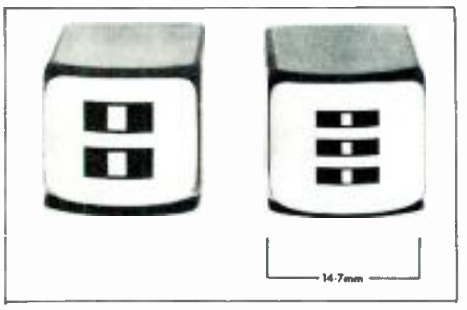
Analog Time Processor 270

The DN 34 is an audio processor designed with a compander and peak limiter to achieve desired effects. Time-related effects producible with the unit include flanging, phasing, double and triple tracking, vibrato, doppler/leslie, and chorus. All the effects can be achieved without the need for additional outboard equipment and/or mixer console facilities. The unit fea-

tures a frequency response of 30 Hz to 15 kHz, ±1.0 dB and total harmonic distortion typically 0.2 percent at 1 kHz, maximum 0.5 percent at 1 kHz, 2 dB below maximum level. Input impedence is electronically balanced (or unbalanced) 20 k ohms nominal, and output impedence is electronically balanced less than 30 ohms to drive a 600 ohm load. HAMMOND INDUSTRIES.

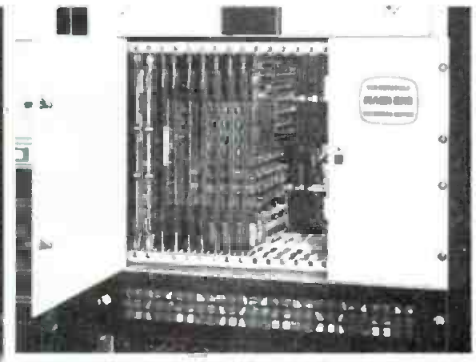
Cart Machine Tape Heads 271

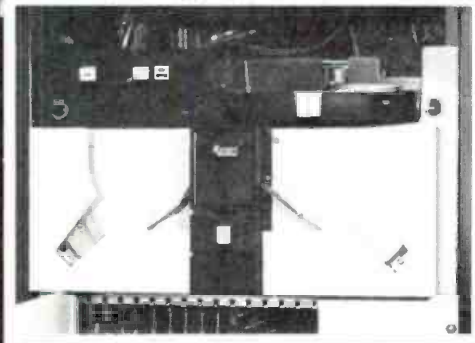
Mono and stereo versions of new audio magnetic-tape record and playback heads are reported to raise the performance of broadcast cartridge machines above that of reel-to-reel machines. After small modifications to the cart machine amplifier equipment, the heads will resolve frequencies from 40 Hz to 15 kHz at ±1 dB, compared to between +3.5 dB and −2.5 dB from



other heads and between +2.5 dB and −2.5 dB from reel-to-reel machines. The two- and three-channel heads (the extra channel, in each case, is for control) meet NAB requirements, and are mechanically comparable with other heads. The standard fully plug-compatible heads have a special profiling and lamination core for extended normal head life. MAGNETIC COMPONENTS LTD.

MACH ONE.





The Editing System for All Reasons.

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MACH ONE includes a one-year package of software updates.

To find out for yourself all the reasons why **MACH ONE** is the final solution to fast,accurate and efficient video editing, call your nearest **MACH ONE** sales and service representative:

Optek, Inc., 5526 E. La Palma Ave., Anaheim, CA 92807, 714/528-2321; *Joe Swiderski, Swiderski Electronics, Inc.*, 1200 Greenleaf Ave., Elk Grove Village, IL 60007, 312/364-1900.

Or write:

MACH ONE Digital Systems, Inc.,
3515 Cahuenga Blvd. West, Los Angeles, CA 90068, 213/851-3211.

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BUSINESS BRIEFS

Tokyo Shibura Electric Co., Ltd. (Toshiba), a respected manufacturer of broadcast equipment in Japan, is preparing to enter the U.S. market. This new division of **Toshiba International Corp.** will be named **Broadcast Electronic Systems** and will be headquartered in Sunnyvale, Calif. Former president of IVC, **Ron Fried,** is to be the vice president and general manager of the new division, which will exhibit at NAB, Dallas.

The General Services Administration has awarded **Ampex contracts valued at $6.2 million** to supply federal government agencies with instrumentation and audio and video tapes . . . . Ampex has also received an order from the **Christian Broadcasting Network** for 22 VPR-2 one-inch VTRs and associated systems worth more than $2 million . . . . Also announced by Ampex was the sale of **Duca-Richardson switching systems** to: **JSL,** N.Y.: **KOCO-TV,** Oklahoma City; **Creative Images,** Anaheim, Calif.; **KATC-TV,** Lafayette, Louisiana; **WLVI-TV,** Cambridge, Mass.; and **KGBT-TV,** Harglingen, Texas . . . . The first domestic deliveries of their BCC-10 broadcast color camera were also announced by Ampex. Two of the cameras were delivered to **Creative Images,** Anaheim. **WAGA-TV,** Atlanta, and **KOCO-TV,** Oklahoma City, have each ordered three of the BCC-10s.

Chris-Craft Industries, Television Broadcasting Division, Hollywood, Calif., will upgrade its technical facilities at **KCOP-TV,** Los Angeles, and **KPTV,** Portland, with a 50 kW **RCA** transmitter and a six-bay antenna, and a 50 kW transmitter, respectively. **RCA** valued the equipment at approximately one million dollars . . . . RCA announced that **Westinghouse Broadcasting Co., Inc.,** N.Y. has ordered transmitting systems valued at $850,000. 50 kW transmitters and associated equipment will be installed at **WBZ-TV,** Boston, and **KDKD-TV,** Pittsburgh . . . . The **Southwest Texas Public Broadcasting Council** has ordered an RCA 55 kW UHF transmitter and antenna system valued at $500,000 for **KLRU-TV,** which is scheduled to go into operation soon in Austin . . . . **WKAR-TV** and **WKAR-FM,** East Lansing, Mich., have installed RCA transmitting equipment valued at $700,000. The new systems replace those destroyed in a fire at the station's transmitting site this past August . . . . **WKRG-TV,** Mobile, Ala., is upgrading its broadcasting facilities with **RCA** television studio and transmitting equipment. The $850,000 contract calls for the supply of a 50 kW transmitter, two TK-47 color studio cameras, three TK-76s, and a TH-100 one-inch VTR. **WTOP-AM,** Washington's all-news radio station, **has announced an affiliation agreement with CBS.** The agreement enables WTOP to air CBS network news broadcasts on the hour, and selected CBS news/information features at other times. The **Outlet Broadcasting** station also announced a partial affiliation with **Mutual Broadcasting System** to carry their news on the half-hour.

Philips Broadcasting Equipment Corp. announced the sale of three LDK-25 color studio cameras to the **Radio and Television Commission of the Southern Baptist Convention,** to be used in their new production facility in Fort Worth, Texas . . . . **Utah Scientific, Inc.** has announced the receipt of orders for routing switchers valued at $330,000. The orders were placed by **J. Walter Thompson Co.,** N.Y.,; **WBAL-TV,** Baltimore; **Opryland Productions,** Nashville; and **Taft Broadcasting Corp.** . . . **Telemation** has announced the sale of a dual Compositor Graphics Generator to **KTLA-TV,** Los Angeles.

Scientific-Atlanta, Inc., has been awarded a $10.5 million contract by **Memphis CATV, Inc.,** to supply and install a cable television system in the Memphis area. When complete, the system will total 1800 miles and will be capable of providing 35-channel TV service to 275,000 homes.

Cinema Products Corp. has been appointed the exclusive U.S. distributor of the Sachtler line of fluid heads and tripods for video and motion picture cameras weighing up to 33 pounds. For further information about the Sachtler line, manufactured in Munich, Germany, contact **Cinema Products Corp.,** 2037 Granville Ave., Los Angeles, Calif. 90025 . . . . **Northport Engineering** has been appointed the **Times Wire and Cable** representative in the upper Midwest. Northport is at 2027 Grand Ave., St. Paul, Minn.

The **Outlet Company** and **Trinity Broadcasting of Oklahoma City, Inc.,** expect to petition the FCC to allow them to construct and operate, as a joint venture, a UHF television station on channel 14 in Oklahoma City . . . . **Scientific-Atlanta** has begun construction of a new 105,000 square foot manufacturing plant for its satellite communications products. The new facility in suburban Atlanta is scheduled for occupancy in late spring of 1979.

Dranetz Engineering Laboratories, Inc., New Jersey, has recently received the President's "E" award, the nation's highest award for export performance. Dranetz, a manufacturer of electronic test equipment, was selected to receive the award in recognition of its outstanding contribution to the export expansion program of the U.S.

Ikegami has announced a move to larger quarters at 37 Brook Ave., Maywood, N.J. 07607. The 35,000 square foot facility includes a demonstration studio and control room, engineering department, repair facilities, spare parts inventories, warehouse space, and administrative offices . . . . **Telecommunications Industries, Ltd.,** has moved to larger quarters at 6822 Santa Monica Blvd., Los Angeles, Calif. 90038 . . . . **Leasametric** has relocated its Houston center to 10400 West Office Drive, Suite 110, Houston, Texas 77042, and its Dayton center to 5653 Webster St., Dayton, Ohio 45414.

In the Source, *BM/E*, September, 1978, **Fujinon Optical's** address should be corrected to read 672 White Plains Rd., Scarsdale, N.Y., 10583 . . . . **Computer Image Video Controllers'** phone number in the Direct Access Guide should be corrected to (303) 935-3514 . . . . **Broadcast Automation Associates, Inc.'s** phone number should be corrected to (305) 464-5465.

Total Television Camera Support Equipment - from the Ground Up.

The ITE product line has been designed with *your* camera in mind. ITE products provide professional camera support and control for cameras weighing from 5 to 250 pounds. The ITE line is marketed by all leading camera manufacturers and distributors and is in use by stations throughout the world in broadcast, educational, industrial and closed circuit television applications. No matter what your requirements—pedestals, tripods, dollies, camera heads or accessories—ITE can satisfy them. Call or write us today for our short form catalog and the name and address of your nearest ITE dealer or distributor.

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BM/E, and its international sister publication BM/E's World Broadcast News, is seeking a junior editor for its New York office. The right person will be able to show a strong interest in broadcasting and familiarity with equipment as a result of media courses in radio and TV or direct broadcast experience. Send resume and salary history to:

James A. Lippke
Editorial Director
BM/E 295 Madison Ave.
New York, N.Y. 10017

SS8600 STEREO CONSOLE

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ONE OF FOUR NEW CHUM STUDIOS INSTALLED THIS YEAR UNDER THE DIRECTION OF GEORGE JONES, DIRECTOR OF ENGINEERING FOR CHUM GROUP RADIO

In 1958 CHUM installed the first of the McCurdy SS4000 Package Console Facilities. After twenty years of continuous operation the original package was replaced by this customized SS8600 System.

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