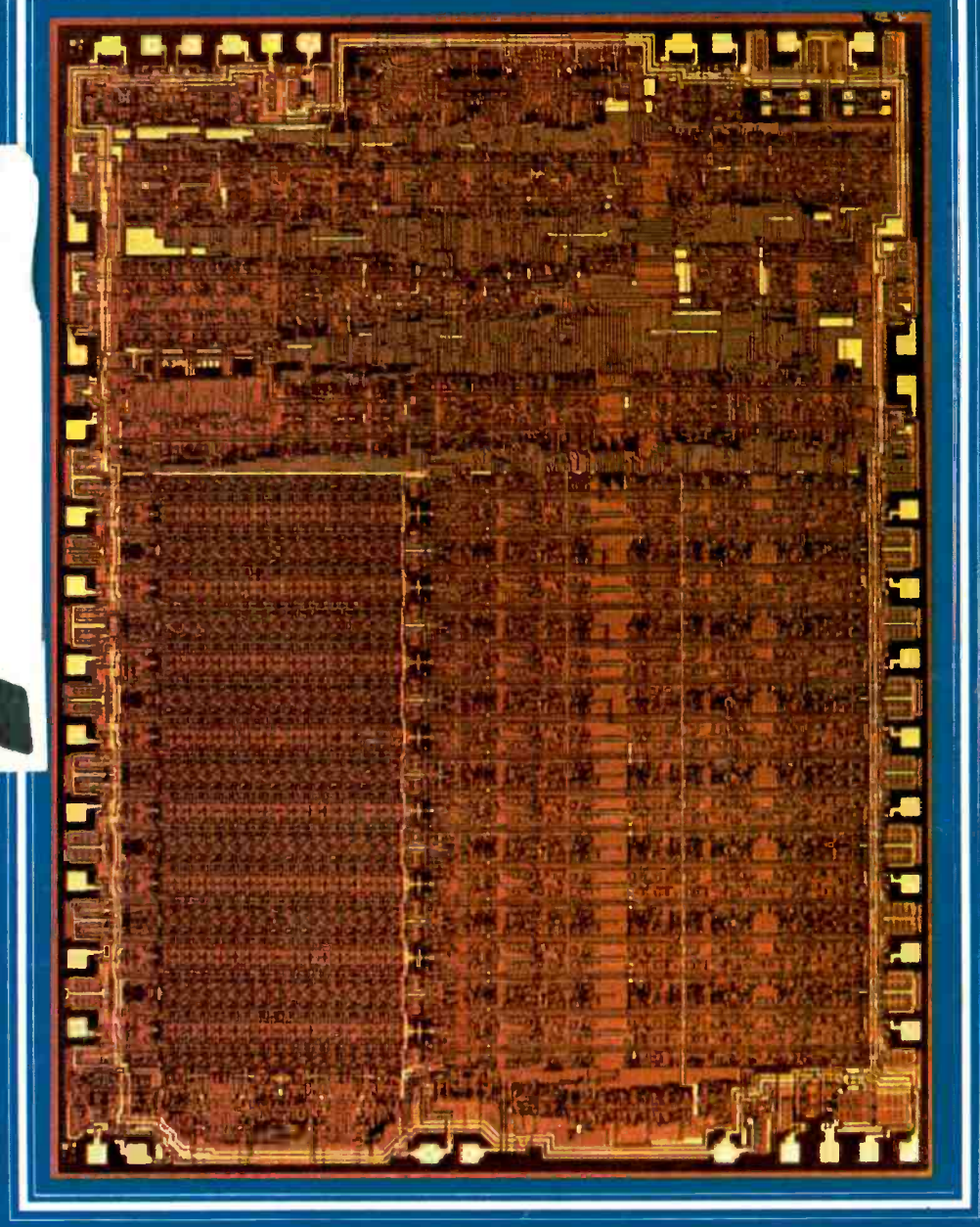
JULY 1978

BM/E

BROADCAST MANAGEMENT/ENGINEERING



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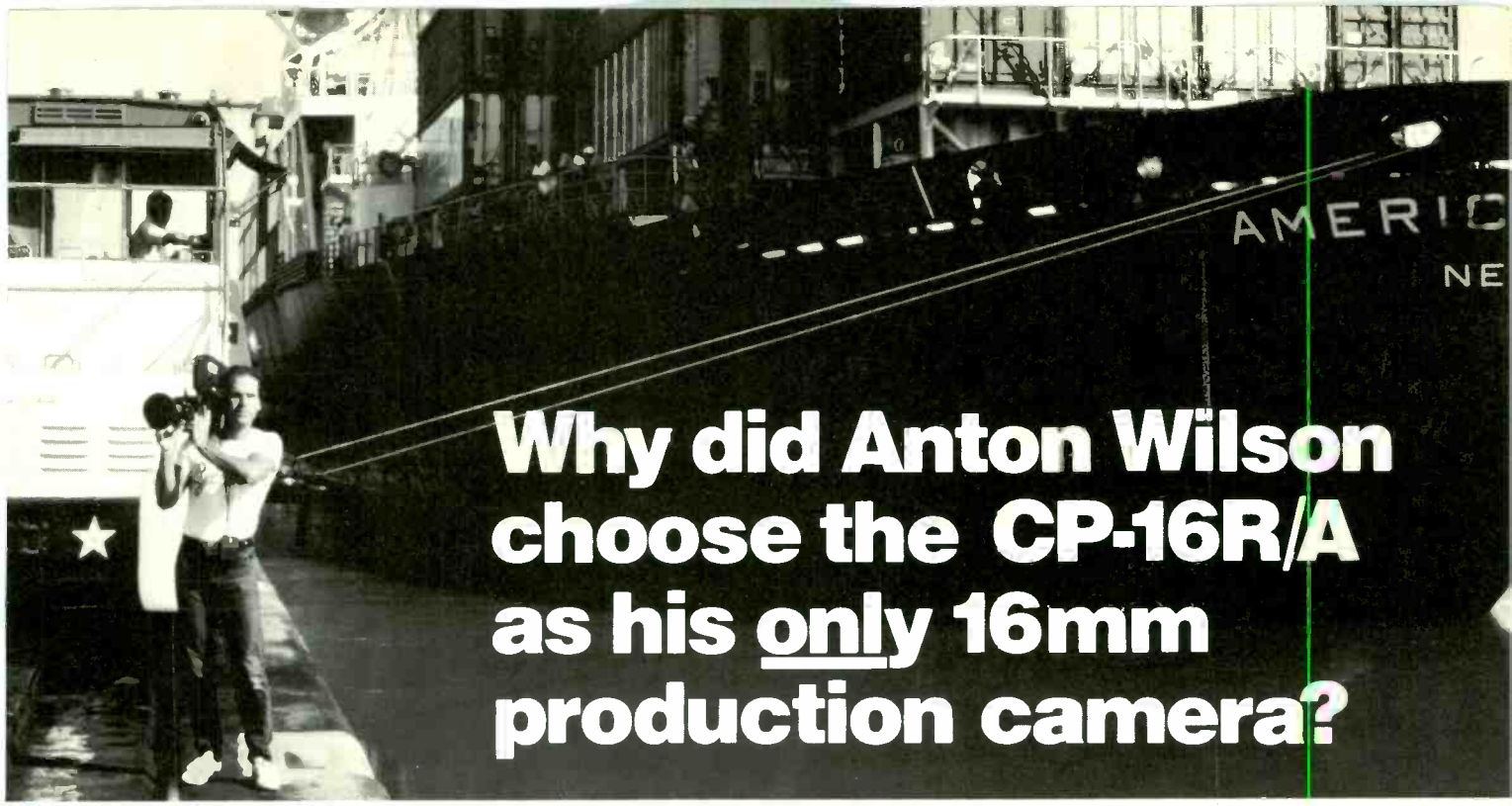

Why did Anton Wilson choose the CP-16R/A as his only 16mm production camera?

Known for his daring and inventive camera work, independent producer/cinematographer Anton Wilson has done it all: documentaries, special feature stories for television, industrials ... most notably for ABC-TV's *Good Morning, America* and for industrial giants like AT&T, among others.

A former technical director for Arriflex, with a background in mechanical engineering, Wilson is also an authority on motion picture production techniques and equipment design. He is vice-president of Anton-Bauer, manufacturers of power supplies for film and video use, and a contributing editor to the *American Cinematographer* magazine.

"The quietest 16mm camera I've ever owned."

"I first started out with an Arri 16BL, followed by an Eclair ACL," says Wilson. "Eventually I gave them both up. For various reasons, they just failed to satisfy my particular filming requirements.

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"CP-16R/A is the only game in town!"

"The studio-silent CP-16R/A is ideal for all double system work. Yet it is lightweight, compact, and has all the sophisticated features and accessories I consider indispensable: variable speeds, behind-the-lens metering, orientable viewfinder... you name it.

"Most important, the CP-16R/A also has a high-quality single system sound capability that is integral to its original design — not a modification, or an afterthought.

"When I add it all up: CP-16R/A is the only game in town!"

Modern production techniques require high-quality single and double system sound.

Says Wilson: "Single system capability is essential these days for most documentary, industrial and PR films, as well as TV commercials. Because modern production techniques frequently call for the editing to be done on videotape, and single system sound makes video transfer real easy.

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"Occasionally, we want the quality of double system sound *as well as* single system sound backup and editing ease. So we shoot both ways *simultaneously,* running an additional feed from the mixer into the CP-16R/A built-in amplifier, and recording single system sound on striped film. Incidentally, on a recent documentary shot this way, the single system sound quality was so outstanding that we never even used the sound from the Nagra tape!"

(Above) *Anton Wilson at the Panama Canal. "Filming an in-depth feature story about the upcoming canal treaty and its implications, we were able to move fast and reliably with the CP-16R/A, covering what would normally take two months in just ten days!*

"The camera functioned flawlessly, even in the torrential rain that overtook us when we followed General Torrijos into the Panamanian jungles.

"This documentary was so successful it aired both as a two-part series on Good Morning, America *and as a five-part series on the* ABC Evening News."

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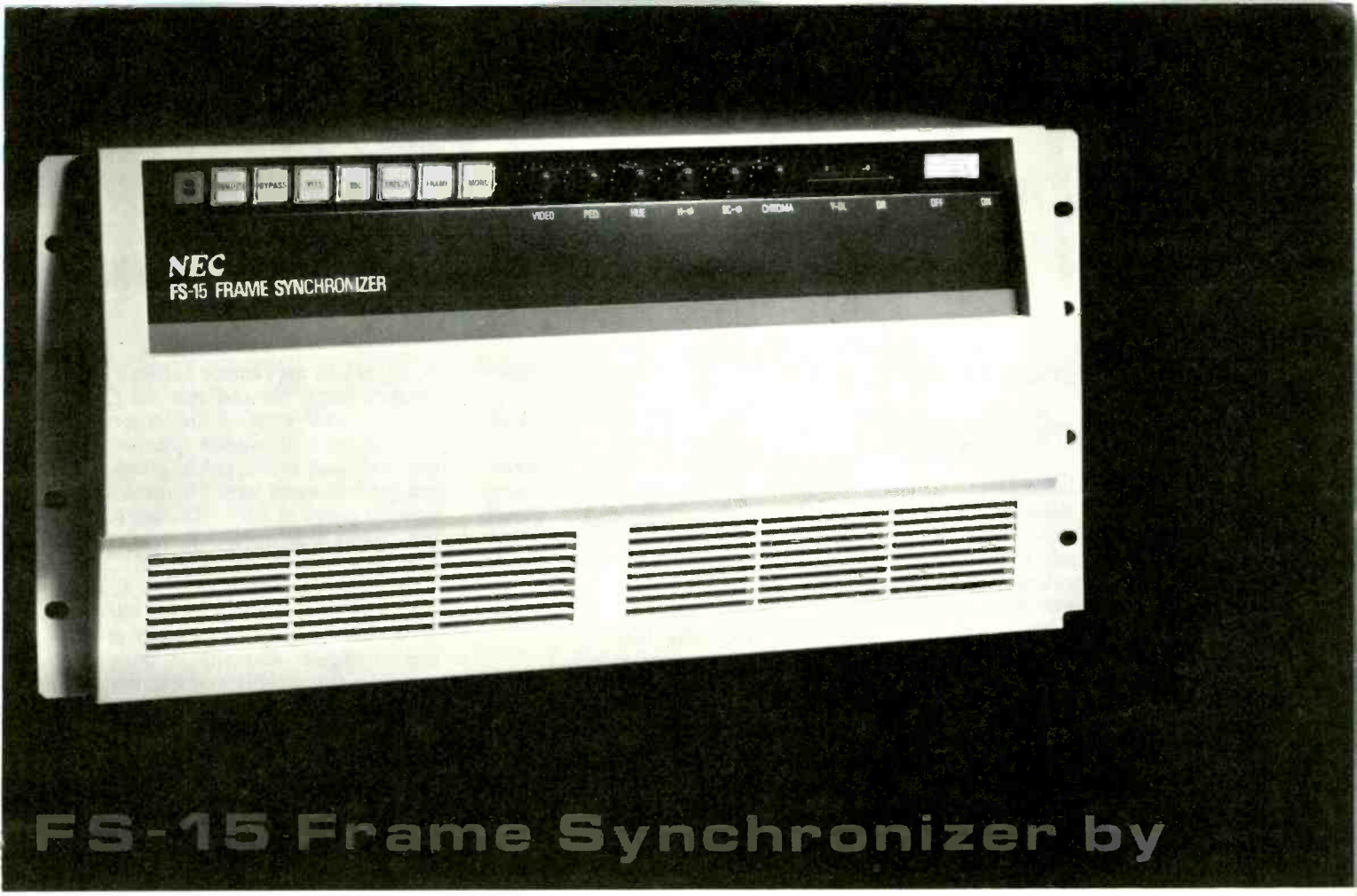

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BROADCAST INDUSTRY NEWS

IBC '78 Reports On Latest Broadcasting Developments/Techniques

The International Broadcasting Convention, IBC '78, is this year's international forum for the broadcast industry. Engineers from around the world are expected to gather to keep current on the latest developments in radio and television technology. IBC '78, bigger than ever, has moved to expanded headquarters in London's most modern conference hall, the Wembly Conference Center, and will convene from September 25-29. The convention has two major parts, an exhibition and a technical program.

Careful scheduling of IBC '78 places the event six months away from NAB '78 and on alternate years with the International Television Symposium in Montreux, Switzerland, the other major international industry event (also biennial). These international events make it possible for U.S. broadcast engineers to keep tabs annually on technical developments abroad as well as at home.

The exhibits — 83 in all, from over 50 different countries — are expected to draw keen attention. Among the smaller companies exhibiting this year are AEG Telefunken, Aston, Digivision, Dynamic Technology, EMI, Electroimpex (picked by the Soviet Union as the official audio supplier for the 1980 Olympics), NTP Electronik A/S, System Video Ltd., and others. Of course, the giant firms well known to U.S. broadcasters, such as Ampex, Bosch Fernseh, Marconi, Pye/Philips, and Thomson CSF, will be represented.

The technical program will concentrate on new techniques, systems, and developments in audio and television broadcasting, both analog and digital. Included will be reports on microprocessors and mini-computers in broadcasting; low-budget broadcasting systems; studio lighting technology; transmitters/antennas; lightweight program equipment; stereo and quadraphonic sound systems; TV cameras, electronic graphics, visual effects and other studio equipment; video and audio recording and storage; new broadcasting systems (e.g., teletext and traffic information); audio and video measurement technology; and future possibilities in receiver design.

In addition to the exhibits and the technical program, plans include a reception and a special ladies' program. For information on registration, contact The Secretariat, International Broadcasting Convention, IEE, Savoy Place, London, United Kingdom WC2R OBL.

Ferris Signals Non-Protectionist FCC To Encourage New Technology

Status-quo positions that tend to keep new technology out of public service will get sharp treatment from the FCC, according to new chairman Charles D. Ferris, but the market, aided and abetted by regulation, will be the main instrument of advance.

In a series of speeches in April and May, Ferris seemed confident that he and his agency (with help from the public) could find the true public interest amid today's complex swirl of changing technology, monopoly and political power.

Starting with his appearance before the National Association of Broadcasters in Las Vegas on April 12 (*BM/E*, May 1978), Ferris broke with a vengeance the public silence he had maintained after his swearing-in on October 17, 1977. In four more public speeches (to May 15) and in comprehensive statements accompanying FCC decisions, he repeatedly put his chips on *competition*, rather than *regulaton*, as the main agent shaping telecommunications services to the public interest.

But he also made clear that he was not plugging "competition just for competition's sake": each decision would be guided by a responsible seeking of the public interest. He showed that he would not be backward in assailing groups he thought were acting contrary to the public interest. And he strongly urged the public to take part in the difficult and awesomely important decisions that he saw on the way for telecommunications regulation in this country.

Ferris issued his call for public participation in FCC decisions in a speech May 1 to Action For Children's Television (his first appearance before a consumer group). He said that the Commission made most of the long-range policies for commercial television in the 1940s and 1950s; public groups did not get interested until 20 years later, when it was too late. "Do not forget this lesson," he urged.

In a speech to the National Cable Television Association on May 2, Ferris flogged that industry for not moving ahead substantially on its many promises of greater diversity in programming. He threw cable's own statements back at it by reading from an NCTA pamphlet outlining cable's limitless potential for delivering specialized information to the home screen. Ferris acknowleged that the industry had been held back by restrictive regulation, but said it must now start moving toward its potential or face defeat by other technologies that better serve the public.

On May 12 he told the Telecommunications Policy Research Council that he would institute a fundamental reexamination of the Commission's policies and goals. He said he wanted more economists in the decision process. The FCC should regulate, he said, only to help the natural forces of the market function efficiently: the guiding principle should be assurance of the broadest possible choice of services to the public, without inflation of prices by hidden subsidy, market inefficiency or monopoly position. Among the many topics he wants to tackle, he said, is the reason the U.S. has not developed information retrieval systems via the home screen like those coming into use in England and Japan.

In a talk to the International Communications Association on May 15, Ferris put himself squarely on the side of more competition in common carrier services, including telephone service. This would continue and advance FCC policy of recent years, opening new markets in this area to competition on a step by step basis, to transfer pricing power from monopoly and oligopoly to the consuming public.

In these speeches and in statements accompanying FCC decisions, Ferris demonstated very firm conceptions of the public-service mandate of the FCC under the Communications Act, and

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firm determination on his part to carry out that mandate.

Special Radio Network Formed For California Primary

The Radio Division of Combined Communications Corporation, headquartered in San Diego, formed a special radio network for the California primary election last month. The California Election Network lines extended from Oregon to Mexico and provided radio stations all over California with continuing coverage of election returns from the moment the polls closed at 8:00 p.m.

The key broadcast origination point was in the state capital at Sacramento, where the vote count was supervised by the Secretary of State. Reporters were assigned to Los Angeles, where candidates for state-wide office have their campaign parties. Other reporters from network affiliates throughout the state provided the network with reports on significant issues in their regions.

The network consisted of some 16 AM and FM stations. Communications lines were provided by Pacific Telephone, General Telephone and Continental Telephone.

NAB Supports Minority Station-Ownership

The NAB has filed in support of the Office of Telecommunications Policy and the U.S. Department of Commerce petition for a federal policy promoting minority ownership of broadcast stations. NAB said that the policy statement requested of the FCC "establishes minority ownership as one of several objectives to be considered in Commission decisions and in no way suggests the imposition of quotas of any type."

In the filing, the NAB stated that the Commission action "should be designed to assure equality of opportunity — not to mandate equality of result." The association also noted that minority ownership "would contribute to important Communications Act goals by serving the needs and interests of the nation's minority population, increasing diversity of viewpoints, and enhancing the training and employment opportunities of minorities."

Comments filed were not all affirmative. The NAB said that it disagrees with the petitioners that the Commission can act on all their proposals without the need for an inquiry proceeding. To issue a blanket policy statement on each of the proposals, the NAB said, would not be in the public interest. The association also said the FCC should consider a general revision of its financial standards which would be applicable to all broadcasters, not just minorities.

NAB also urged the FCC to act immediately on their proposal that a tax certificate be issued whenever a broadcast property is transferred to a buyer which is minority owned or controlled.

Advance Notice of Sale Will Not Be Required, Says FCC

Sellers of broadcast stations will not be required to give at least 45 days' advance notice of intent to sell, the FCC declared May 17, terminating an inquiry (Docket 21352) exploring the advisability of such a requirement. The plea for the advance notice came from groups who contended that it was needed to give minority groups a better chance to buy stations. According to the FCC, however, its investigation indicated that "financing, and not notice, is the most important barrier to minority ownership... [the delay] would come at the cost of imposing significant burdens on sellers." The FCC also said it would

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continue to seek other means of responding to the problem.

NAB Chides SBA: Minorities Need Help

The NAB has taken the Small Business Administration to task for the manner in which it is administering its Business Loan Program, designed to assist minorities and other disadvantaged Americans seeking to purchase radio and television stations. The association asked the SBA for clarification of its loan guidelines and to initiate an affirmative education and information program on its loan procedures. NAB pledged cooperation in the program.

In reply to a letter from Arthur E. Armstrong, director of SBA's Office of Financing, NAB senior vice president and general counsel Erwin G. Krasnow and attorney Melvin L. Reddick accused SBA of not responding meaningfully to NAB's request and pointed out that the SBA program "should consist of much more than an article in one issue of *SBA News*." The association also stated that Armstrong's reference to the government not being a party to encouraging or financing the transfer of assets of business to minorities at "inflated prices" (Armstrong's characterization) "flies in the face of the real world of broadcasting and seems to portray an attitude which subverts the basic purpose of the program."

NAB urged the SBA to take into consideration the intangible assets of a broadcast property in establishing assistance under its Business Loan Program. It said any other interpretation would be inconsistent with the Internal Revenue Service bulletin outlining the various factors involved in determining the fair market value of broadcast properties. NAB pointed out that the IRS and knowledgeable banks recognize that "intangible assets involved in broadcasting cannot be realistically ignored in valuating a broadcast property."

Corinthian Picks The SK-80: Record Sale For Hitachi

The Corinthian Broadcasting Corporation has purchased 36 Hitachi SK-80 broadcast color cameras. Valued at over one million dollars, this represents the largest single camera order in the history of Hitachi Denshi America, according to Marvin Bussey, southwestern regional manager.

With the acquisition of these 36 units, Corinthian now owns a total of 51 SK-80s. The self-contained hand-held cameras are used for ENG and EFP applications in the news and production departments of Corinthian's five TV outlets and the TVS Television Network. When asked why the SK-80 was chosen, Art Biggs, director of engineering for the Corinthian Group, said, "after evaluating the other cameras available, we felt the Hitachi SK-80 was the best camera for the money, and it fulfilled our ENG and field production needs."

UHF Broadcasters Win; FCC Reduces UHF Noise Figure

The Council on UHF Broadcasting (CUB) and other groups who joined them in a plea to the FCC to reduce the allowable noise figure of UHF TV receivers won the FCC's assent in a decision announced May 19. Several set makers had claimed that it couldn't be done at any reasonable price in a panel discussion on the subject convened by the FCC May 10.

The new 14 dB noise limit (replacing the previous limit of 18 dB) must be applied in all sets submitted for certification after October 1, 1979. By Oc-

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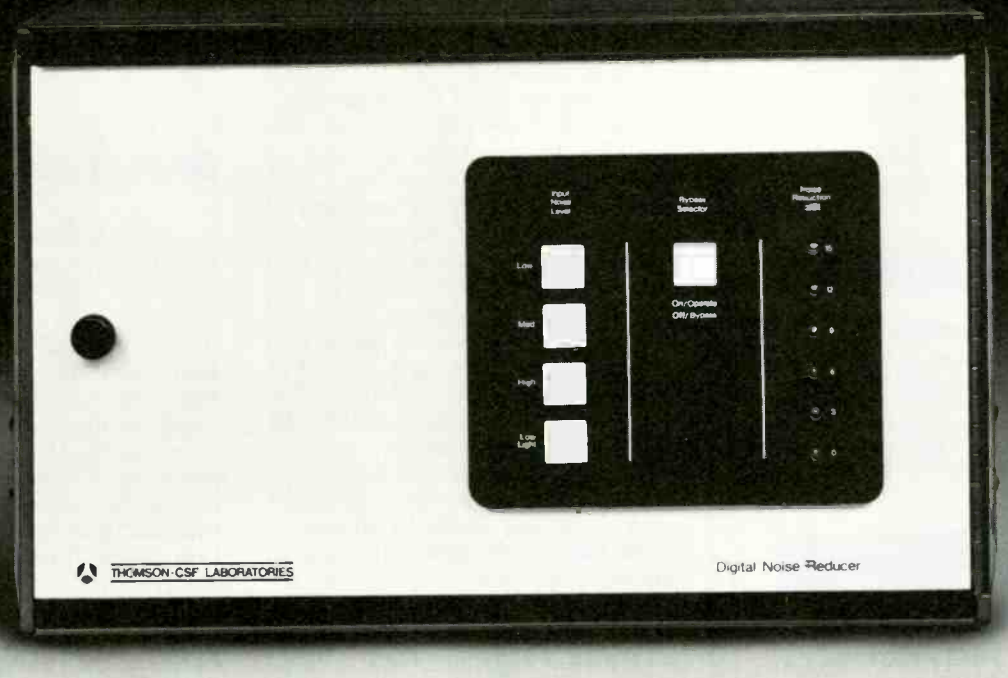
NOISE NOISE NOISE NOISE



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News

tober 1, 1981, all new sets must come within the limit. The FCC set a further reduction to 12 dB to become effective October 1, 1982, unless it is demonstrated that the lower figure would increase interference or otherwise damage the public interest.

The decision was an important victory for CUB and other groups who have been agitating for improvements in UHF reception to bring it closer to technical parity with VHF. The decision also fitted well with the "progressive" image projected in recent speeches by new FCC chairman Charles D. Ferris.

Showtime Pres Predicts Bright Future For Pay-TV

By 1980, cable systems will be carrying competing pay-TV services; pay-TV companies will be buying and producing programming jointly; pay-TV companies will be offering additional channels for "specialized audiences"; and the major Hollywood producers will be producing play for pay specials exclusively for pay-TV enterprises.

These developments were all predicted by Jeffrey Reiss, president of Showtime Entertainment Inc., in a speech to members of the Academy of Television Arts and Sciences. Reiss stated these predictions in the context of an overall optimistic view of the pay-TV industry's future. Showtime has grown rapidly over the recent past and now holds about eight percent of the approximately two million pay-TV households. Reiss believes that by the end of 1978, Showtime will increase that share to 13 percent or better.

Reiss's prediction that different pay-TV services would be competing on the same cable systems seemed to contradict his prediction that pay-TV outfits would unite in joint production efforts. Reiss indicated, however, that he foresaw a situation where a major Hollywood producer, like Universal, could present a project to pay-TV of such scope that it would need backing by more than one pay-TV system and moreover, that pressure by cable system affiliates would be great enough that the pay-TV system would have to get in on the project.

Already, Reiss pointed out, pay-TV systems are buying films on a non-exclusive basis from Hollywood distributors, and joint ventures requiring upfront money would not be all that different. Reiss expressed a willingness on the part of Showtime to help back the right HBO project right now. "If Time-Life Films [HBO is a subsidiary of Time-Life Inc.] were to ask us to back, say, a David Susskind-produced mini series, Showtime would commit."

Reiss also explained that when Hollywood producers begin making programs for exclusive pay-TV exhibition, broadcasters will learn how to promote off-pay reruns of the programming the same way they promote films. As for the additional channels, Reiss explained that it is only a matter of time before pay-TV learns how to program for the specialized audience. He suggested that Showtime's Front Row series of G and PG rated films for family viewing was a first step in this direction. Reiss also speculated that professional sports are another area that might help make up an additional channel service. Showtime does not currently offer sports, said Reiss, because it finds that sports do not provide a good mix for its entertainment channel.

As a measure of Showtime's commitment to the production of original pay-TV programs, Reiss cited its current expenditures of about $100,000 per hour special, and pointed out that Showtime has budgeted $2 million for original production to be expended between the third quarter of this year and the third quarter of 1979.

News Briefs

A study indicates that more than **$2 billion** will be spent on VTR equipment in the next ten years by professional and industrial users. Nearly 30 percent of this amount will be for the new one-inch equipment, which is expected to supercede the two-inch quadruplex machine as the standard for television broadcasting. User areas covered in the study are TV broadcasting, CATV, production houses, institutions, business and industry. For further information regarding this two-volume analysis, contact Weeks Research Associates, 750 Welch Rd., Palo Alto, CA 94304 . . . . **WITF-TV** (UHF), Hershey, PA, a non-commercial educational station operated by the South Central Broadcasting Council, reported significant power savings in the operation of its UHF transmitter using RCA's anode pulsing device.

Research shows that consumer market response to the VCR has been so favorable that from 1976 to 1977, **VCR production increased 96 percent** and exports from Japan to the U.S. rose 245 percent. This new Frost & Sullivan research also projects explosive growth in the next few years, with an increase of 97 percent in American sales forecast for the period 1977 to 1980 . . . . **AP Radio** has added a daily summary of Canadian news to its service. APR's

continued on page 14

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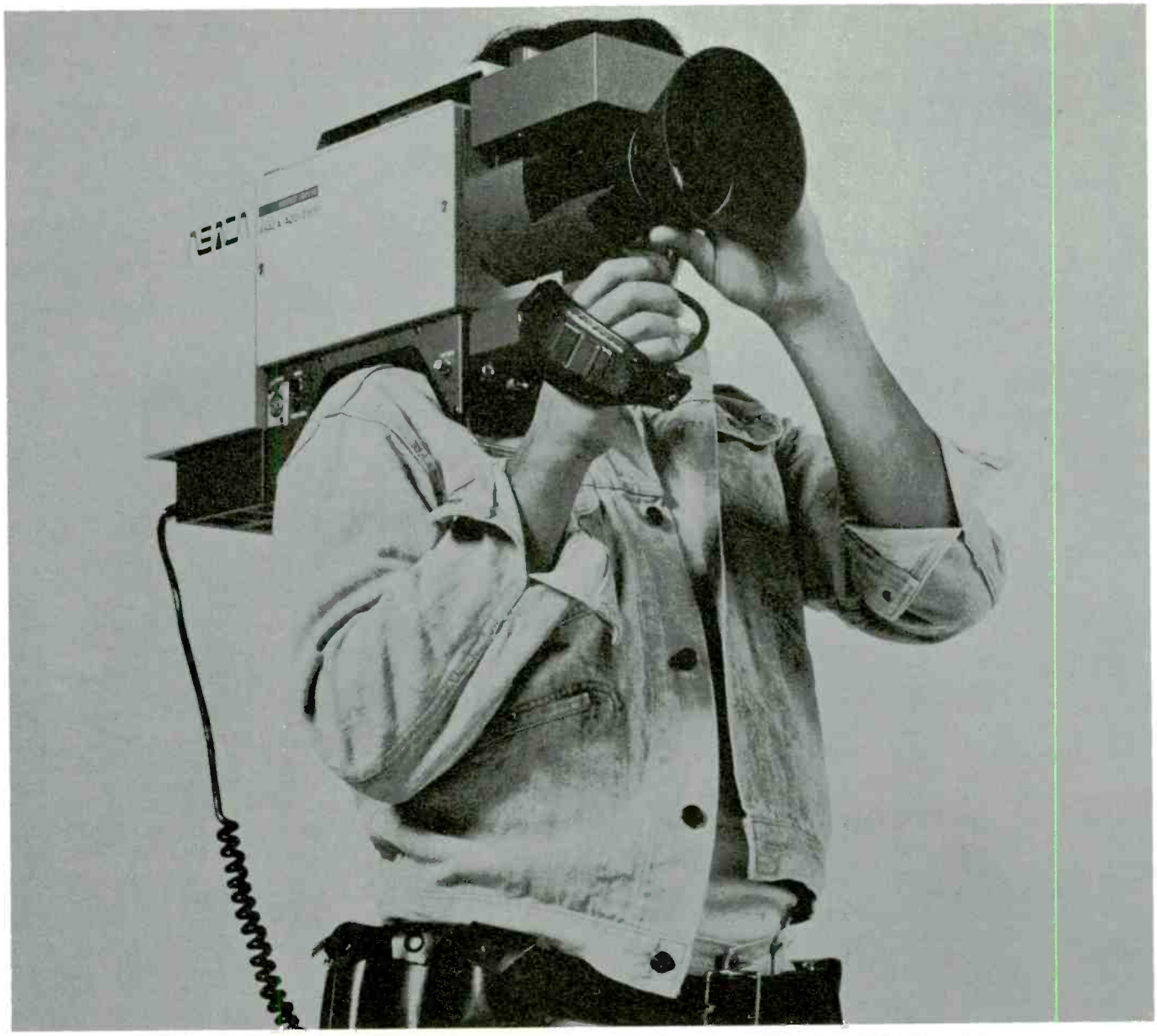
News Briefs

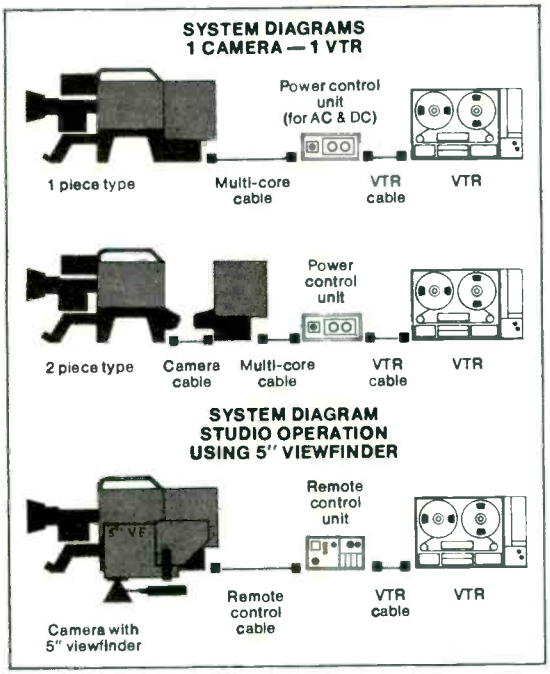
managing editor, Ed DeFontaine, said that the news package was added to serve the millions of Canadians who visit the U.S. annually.

NAB has urged the FCC to continue to allow broadcasters to use their judgement in determining **when to make time available to candidates** seeking federal office. In its filing with the Commission, NAB said a series of court decisions has upheld the First Amendment interest in shielding journalistic decisions made by broadcasters from government second guessing. Regarding reasonable access, NAB said: broadcasters should be allowed flexibility in balancing requests with other types of programming; there should not be a national standard; the Commission should issue guidelines on the length of time access should be available (45 days prior to the primary and 60 days before the general election); and a cut-off date for access requests by candidates should be established (one month before the election) . . . . In another filing, the **NAB urged the FCC to rescind its order** permitting CATV systems to carry duplicate network programs already provided by local stations. Although the Association recognizes the need for adjustment of non-duplication priorities in some cases, it suggests that the Commission's latest action has made the exception the rule. NAB said that the FCC "has placed abstract niceties above the public interest in the continued maintenance and development of this nation's system of locally-oriented broadcast service and has done so in a contradictory and arbitrary manner which makes a mockery of the Commission's rulemaking process." NAB further stated that it considered the matter decided in 1976 when the FCC agreed that further relaxation of the non-duplication rules to permit full carriage of significantly viewed signals was not in the public interest.

NAB's **Radio Programming Conference,** scheduled to be held at Chicago's downtown Hyatt Regency Hotel, will play host to presidents of six record companies, who will participate in the conference's "Face the Music" segment. Five network radio presidents will also be on hand at the conference to offer their views on where network programming is headed.

Former members of the Army & Air Communications Service will hold their **second reunion** in Orlando, FL, October 13 to 15, 1978. For info, contact Wally Bailey, 4688 Posada Dr., Orlando, FL 32809 . . . . **Trinity Broadcasting Network** has begun distributing religious TV programming via RCA's Americom satellite. Programs originate from TBN's KTBN-TV in Tustin, CA.





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BIDIREX eliminates mode selection error. And it gives Sony U-matic editing a true "film" feeling ordinary editing systems can't match.

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RADIO

PROGRAMMING & PRODUCTION FOR PROFIT

Counting The House: How Radio Management Peeks Through The Curtain

SINCE A BROADCAST STATION has no equivalent of the front door ticket taker, gauging audience size has some aspects of a peek through a hole in the curtain, the actor's traditional way of getting a personal count of the house. Indeed, a practiced eye behind the curtain is probably more accurate in many cases than current radio audience measurement, which is all based on estimates derived from sampling.

But those estimates are essential to the operation of the industry. This column describes a radio management's (unfortunately somewhat limited) choices as to who shall make those estimates and how they shall be made; it is a brief survey of surveys. There are sometimes home-brew methods that will meet the small-market station's objectives, and we will discuss the experiences of several radio managements with audience "measurement" they devised and carried out themselves.

At the top of the survey list, as everyone knows, must come Arbitron, which for some time has almost totally dominated the big-market measurement field. This domination takes the vital form of acceptance of Arbitron's figures by the media buyers in the large ad agencies handling national acounts, the men and women who decide which radio stations get which national ads. No other big-market survey figures have recently had such general acceptance, although a number of firms have tried to break into this complex, costly and very profitable field.

Arbitron's surveys employ a diary filled in by one or more individuals in a household, covering a week's listening. This method has both supporters and detractors among experts. Similar cases can be made for and against the principal rival to the diary, the telephone interview.

In fairness to Arbitron (and all other responsible firms in the field), it should be noted that they carefully label their findings as *estimates* based on sampling and statistical manipulation. As with any figures produced by such operations, radio audience ratings can develop sizeable random variations for which no "cause" is assignable. Trade paper commentators have adopted the term "wobble" to describe this, and readers are often advised to wait for the next survey before drawing firm conclusions. In fact, it is conventional wisdom in the field that a series of surveys is far more reliable than a single study, with "wobbles" tending to even out so that genuine trends are evident. The inevitable tendency of the ad agencies, however, is to give each set of figures point by point significance: it is hard to see how this natural shift could be avoided.

Artibron regularly "sweeps" about 170 of the largest radio markets, and has data on a number of smaller markets because of special studies ordered by individual stations or groups of stations. However, many small radio markets are not regularly Arbitron-rated. In some small markets, detailed ad agency-acceptable audience figures, directly comparable among all stations in the market, and with demographic classifications, may not be necessary to the station's economic health. As already noted, some such cases are described below, along with home-made audience measurement techniques devised by each management.

What may well be the best current source of detailed audience estimates for non-Arbitron markets, and a fast-developing alternative to Arbitron in large markets, is Mediastat. The Silver Spring, MD company was founded by a group headed by James Seiler, now president. Seiler was among the original founders of Arbitron, left it when it was sold to Control Data Corporation, and after an agreed period started his own rival survey operation.

Seiler gave *BM/E* an excellent case for the telephone interview, his method of doing the original sampling. The main point seems to be that *any* sampling survey must be carried out with extreme sophistication in statistical methods and great care to avoid the numerous pitfalls. Just one of the special skills required is devising questions that people can answer without being swayed by their own or the questioner's biases.

continued on page 20

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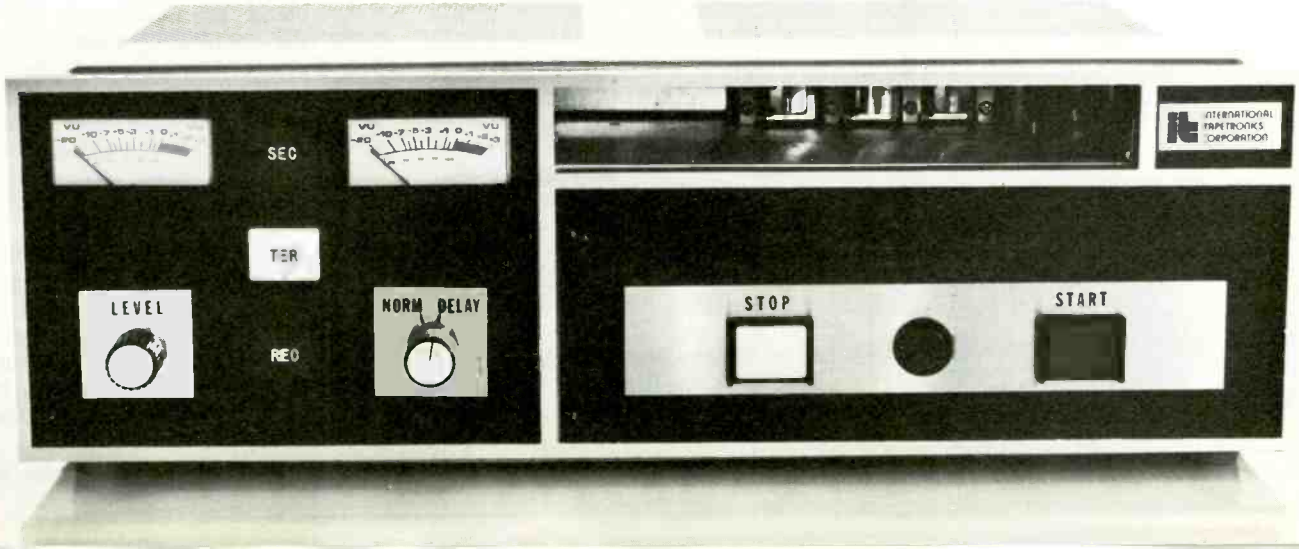

Radio Programming

That Mediastat's skills are at least comparable to those of Arbitron seems to be indicated by the good correspondence between results of the two methods when the same markets have been surveyed at roughly the same time. This has happened in a number of recent cases. As to the acceptability of Mediastat's figures, Pam Person of Mediastat told *BM/E* that they are "in" with regional agencies, and have won a place as a supplement to Arbitron in about a dozen of the largest agencies. Recent strong forward movement in this area indicates that further success is on the way.

The same rapid forward movement applies to Mediastat's market coverage and range of services. They have recently been regularly covering 16 of the largest markets and about 200 smaller ones, but steady expansion is underway. A radio management should call Mediastat for an update when an interest develops for their services.

Fees of the two firms are computed in different ways; moreover, the services offered are not directly comparable. Arbitron has a formula based on each station's ad rates; Mediastat has a flat fee for each class of survey, with no reference to ad rates or market size. Thus, Arbitron's charge to a station in the largest markets will generally be much higher, perhaps several times Mediastat's top current rate of $4660.00 (for the most elaborate survey, with a minimum sample of 1000 persons). In a small market with less elaborate needs, the station's particular choice of services might cost less with Arbitron. All the factors in each case would have to be considered. The comparison must be careful if a group of stations are jointly ordering a survey (a common event). The two survey firms both offer group discounts, but figure them on quite different bases.

It is important to note that a station management wanting to use detailed figures from any audience survey in approaching advertisers, or for any other purpose, *must subscribe to the service*. The brief summaries of ratings which Arbitron and others have released to trade publications contain only a small part of the information that ad agencies want from a radio station; the station gets the detailed "book" only by subscribing. Moreover, it is illegal for the station to use even these brief summaries for business purposes unless they have subscribed to the service. Arbitron, Mediastat and the others in the field police this area closely, for obvious reasons.

Several other firms are in various stages of trying to break into the field. One of the newest is Audits and Surveys, of New York, who have developed a new method called "Trac 7." This came out of an elaborate research program in which a committee of the National Association of Broadcasters participated, along with a number of experts in the field.

Trac 7 was announced and described in detail at the NAB Las Vegas Convention. It uses telephone interview sampling, with a CRT input to a computer right at the interviewer's station. The computer tells the interviewer what questions to ask; the answers are then fed into the computer for holding in the memory. The name "Trac 7" was chosen because each interviewee is called on each day of the survey week. This multiple-call method, the developers say, avoids one of the slippages in the telephone interview, the tendency of people to forget what stations they heard more than a day or so before.

Putting the answers in coded form in the computer memory allows summaries and totals to be prepared almost instantly. For these and other reasons the developers of Trac 7 express great hopes that it will give the radio industry a fresh alternative for audience measurement.

However, any rating service aiming for national significance has a long, hard row to hoe, and a very costly one. All major markets must be covered, and the results must win acceptance from most of the regional and national ad agencies. This will take any new venture in the field a lot of time and loads of money. Trac 7 is scheduled to get into about 20 markets by the end of this year; we probably won't know for another year, at the best, whether it will win a major place. We should wish it, as well as Mediastat, great success because lively competition in this field will clearly be a boon to the radio industry.

Perhaps a dozen other firms make radio audience surveys, many on special order, but some, like the RAM operation of Cyberdynamics in San Diego, have ambitious aims for regular work on a national scale. As far as *BM/E* could determine, none has yet come near establishing a national market. However, they do make it seem likely that the next few years will bring fruitful new variety for radio managements needing audience measurement.

In the small-market area, with the station's sales efforts mostly local, a splendid variety already prevails. For example: Luin Dexter of Hamilton, Montana manages the only two radio stations in town, KYLQ-AM and KYLQ-FM. What his local advertisers wanted to know was, which station do most people listen to? Roughly, how

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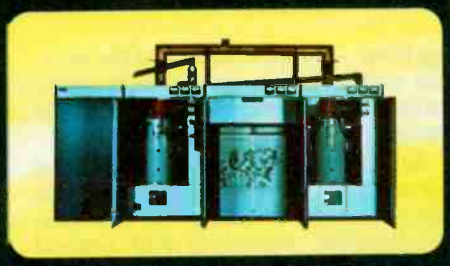
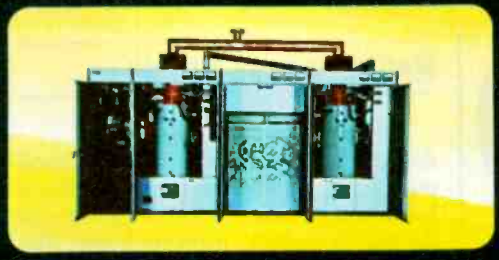
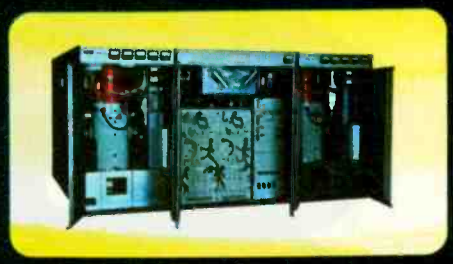
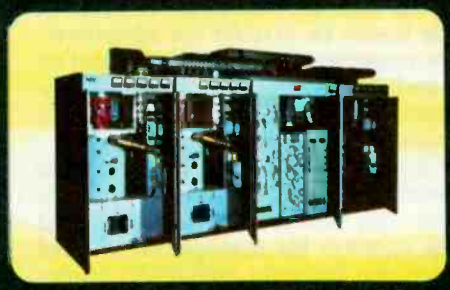


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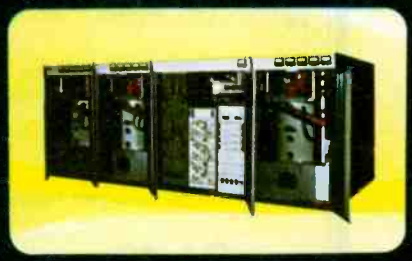
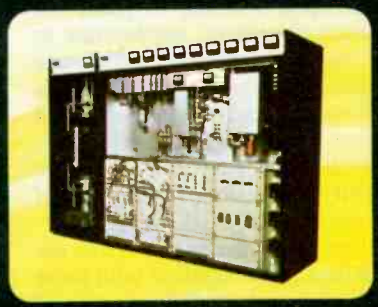


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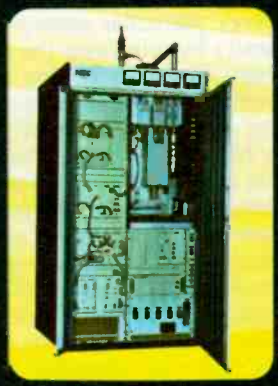
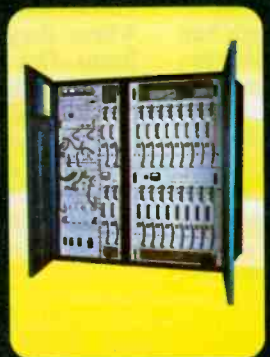
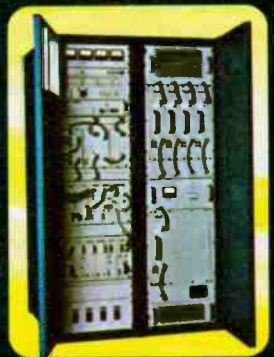




Radio Programming

does the audience divide? Dexter found out by hiring a former employee, now a housewife, to call every tenth name in the telephone book from her home. The results were convincing to everybody concerned, and the cost was, of course, comparatively miniscule.

Chris Hubbard, general manager of WGYL-FM, Vero Beach, Florida, does have competition: two AM stations. He developed an impressive demonstration of his station's "pull" by offering on the air a special key ring, to be picked up at the station or at various retail houses in town. The key ring carried the call letters in large letters, readable at a distance, and also functioned as an admissions ticket to a viewing stand for a Fourth of July fireworks display. The key rings were picked up by the hundreds, making the size of Hubbard's audience extremely visible at the celebration. Contests, which come in infinite variety, are particularly useful for this purpose if properly designed. You must offer something that a lot of people want, says Hubbard, and there must be some way of demonstrating the size of the response.

Louis Maierhofer is president and general manager of WKMC, Roaring Spring, Pennsylvania, the only station in town — but there is significant competition from stations in nearby Lewisburg and Holiday. He has used a series of survey methods, any one of which, standing alone, might have lacked persuasiveness. Taken together, however, the results have stimulated the station's sales strongly.

Maierhofer has hired students from marketing courses in nearby schools to survey particular areas of his market, mostly by telephone (he says door-to-door calls are much too slow and unproductive). The callers use a set pattern of questions carefully worked out by Maierhofer to get accurate information quickly. He has a staffer at remote pickups — sports events, meetings, store openings, etc. — who circulates through the crowd, asking what station people tune in, what they like, etc. Similarly, staff members have interviewed as many people as they could pin down at shopping centers. This method is rejected by professionals who must come up with comparative ratings the ad agencies will accept, but for Maierhofer it was good reinforcement for his other interview data. The station has a regular talk show with listeners telephoning in to get on the air. Maierhofer says they sometimes have as many as 200 calls backed up on the switchboard. He has an arrangement with the telephone company to get information on where those calls are coming from — more evidence of the *location* of listenership, important to establishing the geographical reach of the station.

All this makes WKMC the "most surveyed station" of this report. At the other extreme is KITN of Olympia, Washington. President and general manager Don Whitman uses no surveys of any kind, but sells on the evidence of the results he gets for his advertisers, the improvements in *their* sales that air time has effected. These have been impressive enough to get the station's sales to a comfortable level.

It is important to note that in all these cases (and there are certainly hundreds more like them in small markets around the country) the management did not need the carefully weighted samples and proper statistics that lead to reasonable estimates of actual audience *size*, measureable against similar estimates for other stations in the market. We have already remarked on the necessity for using very high skill in developing such estimates.

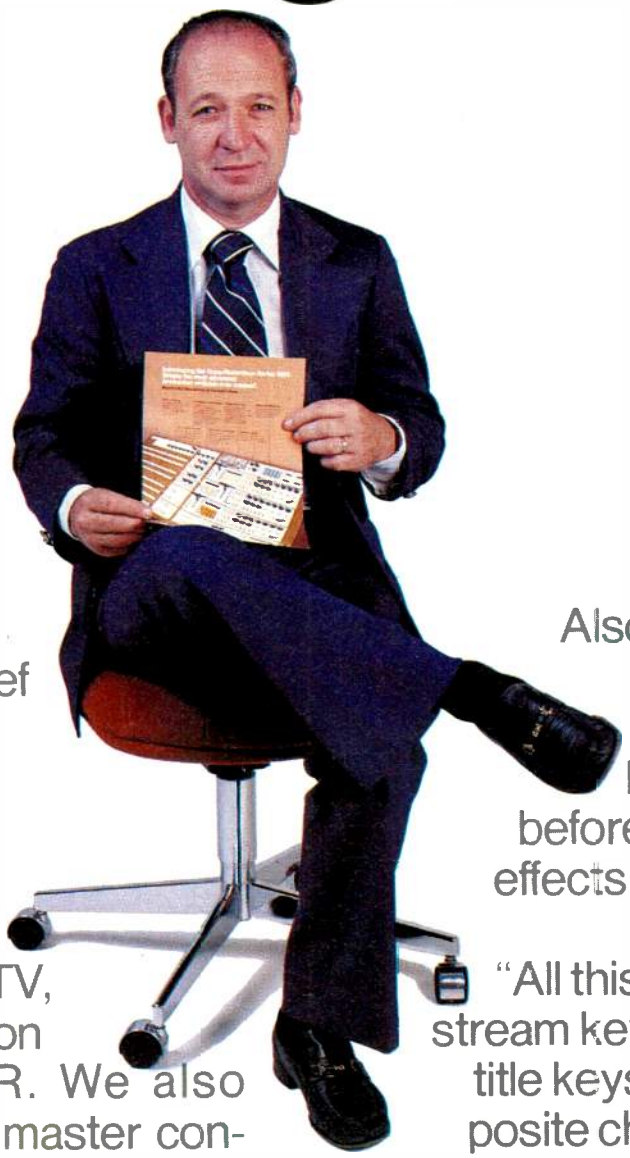
Further advice developed in several *BM/E* interviews with radio program syndicators, who could be called "third parties with a primary interest" as far as audience measurement is concerned. Dave Scott of Century 21 says they have developed a series of plans for audience measurement, appropriate to various market situations, which are recommended in the regular consultation with each new client. Some general guidelines: for local home-brew surveys which are highly visible in the community, use local persons of weight, such as CPAs; if the local survey convinces the management that the station is far ahead overall or with some demographic group, and a large-area ad campaign is wanted, then it pays to call in Arbitron or Mediastat for an "overnight" or special study that will confirm the station's standing to the satisfaction of the ad agencies.

Joe Benson of Tanner finds contests and promotions especially important in small markets. He affirms the difficulty of using shopping center interviews to develop accurate comparative figures. The main reason seems to be that Americans move a great deal, so that the crowd in a shopping center does not represent the long-term residents of the community accurately; home or telephone calls do that better. An over-the-air contest, however, gets people where they live. It can take many forms. One good way to check the station's pull is to ask people to drop their names in a box in one or more retail shops to qualify for the contest, possibly in cooperation with a promotion for that shop. An important principle used by Benson (and some other syndicators) is to get figures on another

continued on page 25

About the Duca-Richardson Series 4000 production switcher:

"We bought two!"



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"comparative" market, one with similar size, demographics, competition, etc., and then get a comparative line on how the station is doing by means of a carefully drawn telephone survey.

Kemper Freeman, president of Broadcast Programming International, emphasized the difficulty of drawing up questionnaires that people will answer truthfully (although they mean to); this work must be done with high skill. He agreed with Benson's use of the "comparative market" method for a general line on the station's standing.

Ron Nickel of TM recommends that stations in the small markets hire temporary personnel to make about 1000 telephone calls a month for several months to get an idea of their pull, what's good or bad in what they are doing. Then if the station needs Arbitron or Mediastat for ad clients, the management can fix up what's wrong before calling the rating service in. Nickel affirmed the fact that a once-a-year survey is too subject to errors. At least one repeat at a two-month interval is needed to show trends, and a longer series would be better still.

BM/E's conclusion from this brief plunge into the ratings whirlpool: the millenium is certainly not here, but a radio management can, with care and effort, count the house well enough to prove its efficiency.

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IN THIS DEPARTMENT IN DECEMBER, *BM/E* took note of the squeeze on programmers of beautiful music caused by the American record industry's near-total abandonment of this class of music. Syndicators and individual stations using beautiful music need to push hard for usable material. We also noted briefly in December the operation of Starborne Productions, one of the organizations helping to ease the difficulty in finding fresh material for beautiful music programming.

Since then, the activities of Starborne have expanded into sizeable production of recordings which are being bought by many syndicators in the field and by around 400 stations around the country. Thus, although Starborne is not a total-time syndicator like the others we've covered here, it seems worthwhile to describe its services more fully.

Starborne is the creation of Jim Schlichting, who had nearly a decade of experience in assembling beautiful music programming, first at Chicago's WLAK and later as assistant to Jim Schulke at Schulke Radio Productions. SRP has been, of course, a seminal force in the spread of beautiful music (*BM/E*, March 1977). Schlichting started out for himself three years ago with an operation he called Disc Location, which searches around the world for recordings that radio stations and syndicators want and can't find through regular channels. Dozens of syndicators and stations are using Disc Location to find recordings for them, and the operation is on a steady growth curve. Schlichting says that he can get any of over one million recordings, American and foreign, and the list is continually updated with new releases.

But new production of beautiful music, as the December article pointed out, is essential to keep the material flowing. Starborne's production has so far been mainly in England. There, the twelfth volume of a series by the Frank Chacksfield Orchestra was recently completed for Starborne. The recordings are delivered to Starborne in this country on two-track stereo tape. They go to the JVC cutting center in California where the cutting is carried out at half speed, an old but still valid way of getting the extreme highs on the discs with full strength and low distortion. The JVC cutting operation has to be very high grade because it is used for mastering the CD-4 discrete four-channel records.

The pressing is the work of the Wakefield plant in Phoenix, Arizona, which has won a reputation for putting out discs with extremely quiet surfaces.

Schlichting points out that his recordings come in at an acceptable cost partly because of the well-known lower cost of musicians' time in England, but also in large part because the recordings are done on two-track originals, eliminating the expensive mix-down process that is universal in American recording studios. Recording directly to two-track requires very careful microphone technique because the balancing must be done acoustically before a note goes onto the tape. But if well done the results can be extremely pleasing, with a "concert hall" ambiance that is right — even necessary — for this kind of music.

This kind of recording is well established in England, and has been a specialty of, among others, Audio International of London, who are making the recordings for Starborne. Director of the operation for Audio International is Richard Miller, an English recording engineer with long experience in this area.

The Chacksfield recordings have been so successful for Starborne in this country that Schlichting has moved into distribution of a number of other similar series. Schlichting has exclusive U.S. distribution rights for ITW Productions of Manchester, who record a number of English orchestras, including the Carson West, the Claude Chiari, the Henry Solomon and the Sounds Eighty. Together they have recently made a large series, with more than 70 titles available at this writing.

Another way in which Starborne is easing the beautiful music squeeze is by selling records directly to individuals who tell their radio stations they want to buy a recording they've heard on the air. The stations send these requests to Starborne, who then supply the records by mail. Schlichting says that such requests have built up to 40 or 50 a week, and the trend is definitely up.

This evidence of an unsupplied consumer demand for music of the kind Starborne is producing confirms what is obvious, that if several hundred radio stations make a good living from programming beautiful music, there must be a large listening public that likes such music. Thus Schlichting has strong incentives to expand his production activities, not only to supply the syndicators and radio stations who will need more and more material like his as time goes on, but also to tap the consumer market.

Methods for doing this are being studied by Schlichting. Perhaps he will find a way to escape — and thus reduce — the rigidity of U.S. record marketing, which resists almost any popular material not part of the great teenager rock-and-pop hullabaloo. **BM/E**

TELEVISION
PROGRAMMING & PRODUCTION FOR PROFIT

Capitol Broadcast News: When It Comes To D.C. Coverage, The Sky's The Limit

WITHIN THE NEXT SIX MONTHS, more than 40 television stations will be receiving Washington, D.C. news stories of local importance via satellite. As Doug Terry, national director of Capitol Broadcast News Service, puts it, "Washington, D.C. can be as close as city hall."

The satellite feed which CBNS will inaugurate in the coming months is an outgrowth of the long range plan for the company. CBNS was begun some four years ago by Doug Terry and Carol Kadushin, who now serves as bureau chief. For the past four years the company has been operating as a news service supplying television stations with filmed footage of Washington news stories that have local importance. In that time, CBNS has expanded to include a staff of five professional reporters, two film crews and two additional administrative personnel. The client station list has also grown to some 40 stations in the top 80 markets. In addition, CBNS now does in-depth reports for use by stations on successive evenings, and investigative and feature reporting. CBNS is also switching its primary reliance from film to ENG as part of its program that will lead to the daily half-hour satellite news feed.

The mainstay of the CBNS coverage is the localized Washington report. Most CBNS stories are related to government actions or events that relate strongly to important local issues and may not have the type of national appeal that would draw attention from network news organizations. For instance, on the day *BM/E* interviewed Doug Terry, two CBNS crews were at the White House covering a meeting between President Carter and several state governors regarding federal water projects. Though the networks will probably pick up the meeting, CBNS will provide focused reports dealing with the participation of governors whose home state stations have contracted with CBNS. Congressional hearings, meetings between local and federal government officials, reports on regulations and government agency happenings, Supreme Court decisions and a host of other federal government stories with local impact are the grist of the CBNS mill. Backgrounding and research for such stories can often be extensive. Frequently, a station news director will supply CBNS with clips and background information from which to begin research. Sometimes it works the other way around. CBNS is occasionally asked to research federal records for a story being done by the client station at the local level.

In addition to these hard news stories coming out of Washington, CBNS also generates feature stories. One recent story was a five-part series of reports on the Panama Canal Treaty. Two CBNS film crews and reporters spent nine days filming in Panama. The five-part series, which was used by 10 stations, began with a historical report on the canal using film footage from the National Archives in addition to original footage. Another segment dealt with defense issues; a CBNS crew accompanied U.S. soldiers on maneuvers in the Canal Zone to highlight the report. A segment on the Zonians discussed the impact of the treaty on the thousands of U.S. citizens who live and work in the Canal Zone. Two additional segments dealt with Panamanian reactions to the treaties and with Gen. Omar Torrijos, the Panamanian chief of state.

In June (as this issue goes to press) two CBNS crews will accompany a group of U.S. governors on a tour of Cuba. One crew will record stories on the tour and focus on individual governors while the other crew engages in the production of another multi-part mini documentary on "Cuba Today," which will be offered to stations as a separate package.

Feature stories such as these are also done on special order from stations. WJLA, Washington, D.C., for instance, is having CBNS put together a series on "Changing Rural America." Veteran reporter Jim Kincaid (a Peabody Award winner while with ABC) will be the correspondent on the series. This series is being shot on video using the Thomson-CSF Microcam and a Sony BVU recorder. According to Terry, the series has required much shooting in low light level situations, and he reports excellent results with the

continued on page 28

American Data, innovator in fourth generation production switching, now introduces the first fully programmable computer controlled television switching system.

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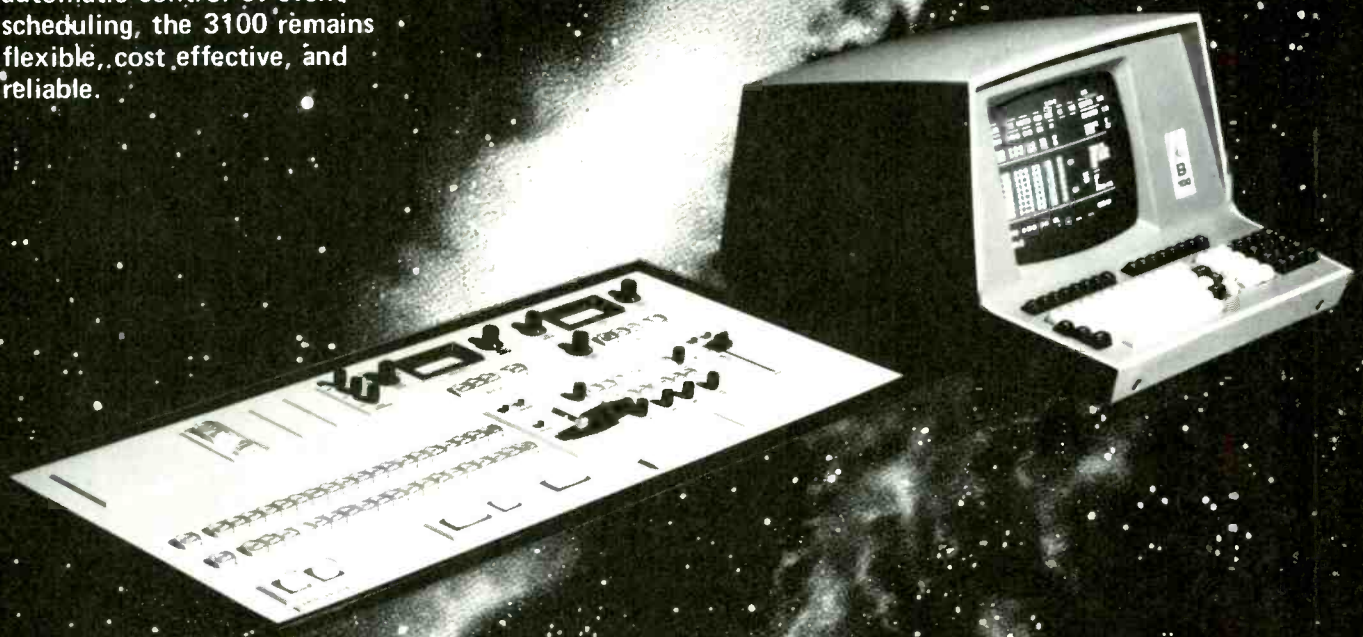

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TV Programming

Microcam under these conditions.

Currently, the vast majority of CBNS stories are shot on film. Terry, however, will be switching over to ENG equipment in the near future as plans for the satellite feed mature. CBNS now files most of its stories by air freighting unprocessed film to client stations. Stations are shifting to ENG increasingly, and some have shut down their processors, so Terry often supplies processed film with the lab bill going directly to the client.

Since all CBNS stories are shot single system, the client station receives the unprocessed film complete with narration, stand-ups, sign-offs and other audio material. The station is free to edit the piece in any way it chooses. Based on request, the sign-off can be either that of Capitol Broadcast News, or the client station's call letters.

Frequently, when a station is to get a story that would be better told using visuals achieved at the station's end, Terry will get on the phone and coordinate the content of the story with the station. For instance, a story on a Veterans Administration hospital might involve an interview with a government official, but visuals would be more informative if they included footage of the local VA Hospital rather than just the talking head of the official. In this case a station will get a complete sound track and filmed footage with plenty of flexibility for inclusion of visuals from the receiving end.

There are two basic arrangements between CBNS and client stations. The most common case is one in which the station contracts for a minimum of two stories per week from CBNS. These stories can be offered to the station as a result of the normal news gathering done by CBNS or they can be specific stories suggested by the client station. The price for this service varies according to market size. For instance, the per story price for stations in markets one through five is $140; markets six through 10, $120; markets 11 through 20, $90; markets 21 through 40, $80; and so on, down to a price of $57.50 for markets 101 and smaller. There are some stringer outfits in Washington, D.C. with lower prices, but Terry does not consider them major factors. CBNS's prices compare favorably with the probable per story costs in most medium and large markets.

Since most stations do not figure the cost of a story on a per unit basis, many stations do not know how much a story actually costs. They do know what their annual budget is and whether it is adequate for accomplishing the mission of the news department. One exception that Terry pointed out is KMOX-TV in St. Louis. According to Terry, KMOX did a study that showed their average news story costs about $250 to produce locally (including car insurance, gasoline, etc.), while a similar piece produced by the CBS Washington bureau which serves KMOX would cost about $350 to $400.

The CBNS prices remain low, Terry points out, because the pricing structure is designed to encourage local stations to use the service. News stringer services are not new in Washington, D.C., and many have either performed badly and gone out of business or have merely offered talking heads. All this, says Terry, has left a bad taste in the mouth of many a news director.

With many stations the issue is not money but journalistic credibility. Terry points out that CBNS not only employs journalists with the stature of Jim Kincaid but also is willing to present the credentials of any of their reporters to a news director as if he were hiring the reporter for his own station. Client stations do, however, develop preferences for certain reporters based on their styles. When this situation arises, every effort is made to assign the favored reporter to any story that is being done for that client station.

A future in three phases

Now that CBNS is firmly established, plans call for a phased entry into the satellite age. First, CBNS is moving to ENG. Terry expects to purchase one, and possibly two Sony BVE-500 editing systems. In addition, ENG cameras and field recorders are to be acquired during the first phase. The second phase will be the establishment of a microwave link between Capitol Hill and the CBNS offices in northwest Washington, and another microwave link between the offices and the Western Union ground station in Arlington, Virginia.

By the time these two phases are completed (in approximately six months), Terry expects to have satellite communications channels open to about 18 major U.S. cities. These cities include the present locations where Western Union has earth stations and the ones planned for the near future by Western Union. Miami, however, does not have a Western Union ground station, but details are being worked out whereby the local independent television station will permit CBNS client station WTVJ to use its ground station.

There are a number of ways in which the client station can receive the material from the gound station or Western Union's Television Operations Centers. An AT&T ground loop would cost the station about $89 per hour, or the station might elect to install a mic-

continued on page 32

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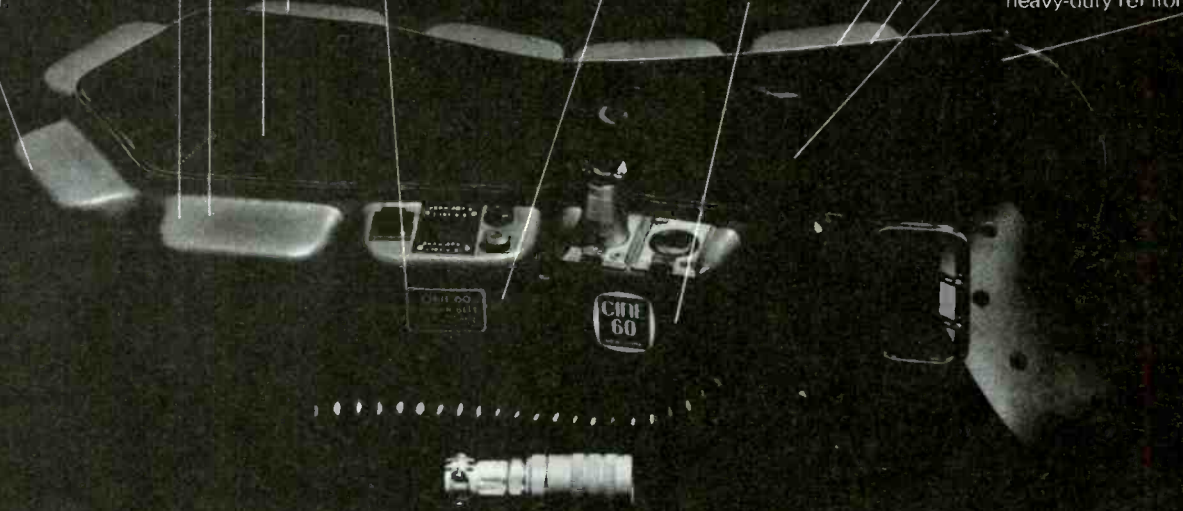

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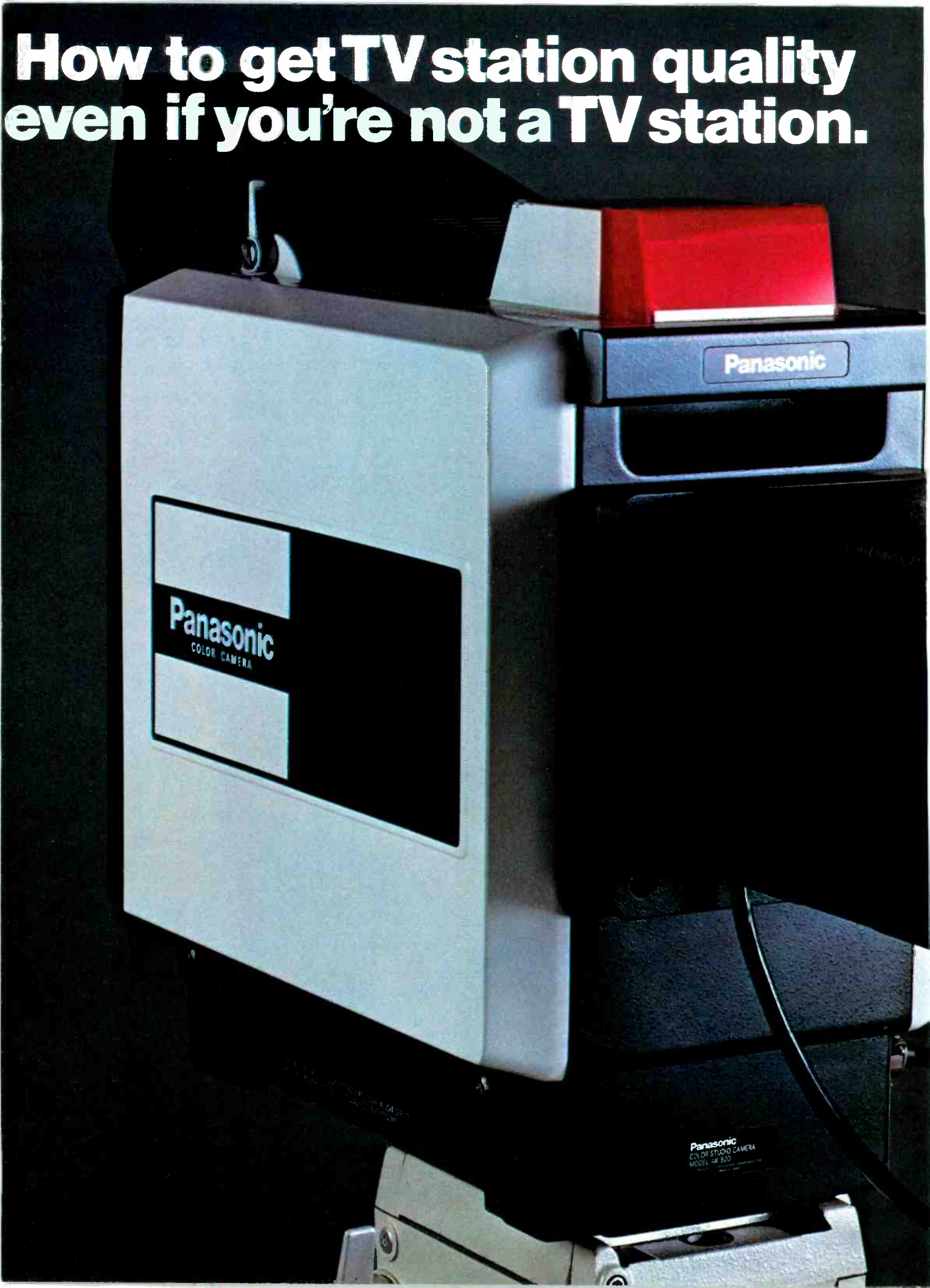
Circle 121 on Reader Service Card

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



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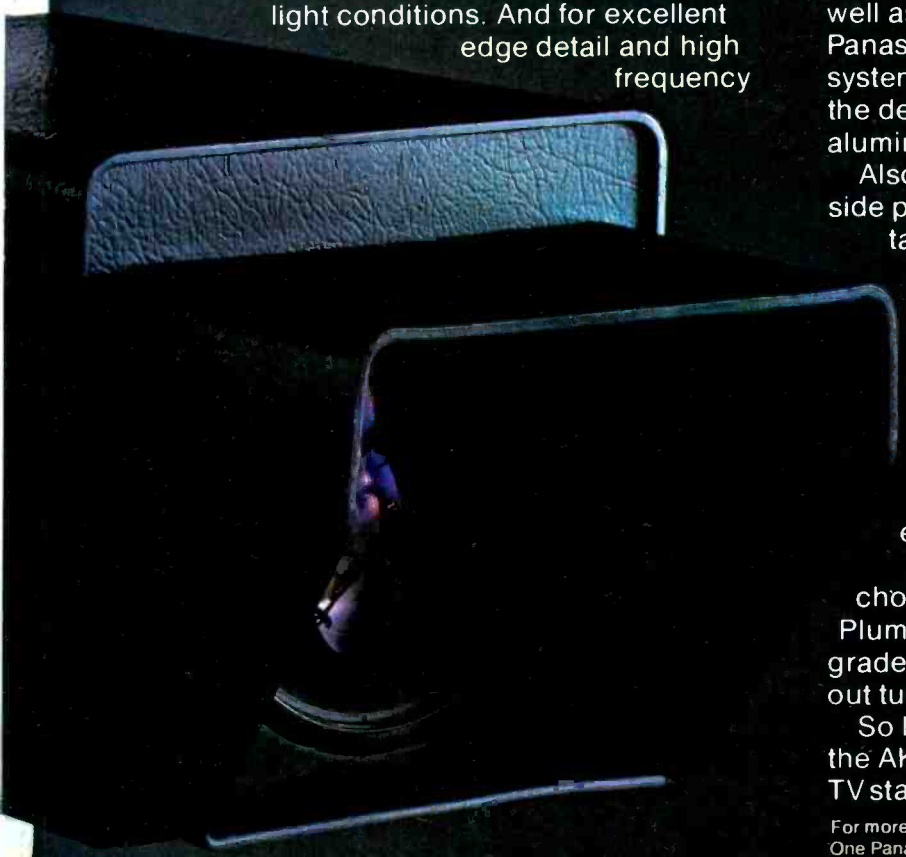

And since the AK-920 is a Plumbicon camera, you get performance that's hard to beat. Like low noise, low dark current and lag, high sensitivity, as well as the capability to reproduce high brightness details without burn-in or blooming.

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

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

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TV Programming

rowave link. Another option that CBNS is exploring with Western Union is the possibility of allowing the client station to install a U-type VCR at the TOC. Since the half-hour CBNS news feed is scheduled from 4:30 to 5:00 p.m., a technician could be sent by the station to operate the VCR and ferry the completed tape back to the station.

The half-hour CBNS news feed will initially consist of all stories completed by CBNS for all clients. The individual station may use either the stories intended for it or any of the other stories transmitted during the course of the feed. If a particular station does not have a scheduled CBNS story on a given day, the station is not obliged to take the feed. This means that the client station is only obliged to take its normal two story per week minimum just as in the current setup.

The advantages of this plan are apparent. First, the speed with which stories are transmitted will be much faster than the current air freight approach. Secondly, economies can be achieved since there will be no further film processing, air freight charges, or other incidentals. Just what savings are actually realized remains to be seen, but it is reasonable to presume that even a slight increase in per story costs would be balanced by the advantages of rapid transmission.

Perhaps the greatest advantage that CBNS expects its clients to achieve through satellite communications is the possibility of going live from Washington, D.C. on the local news. Though going live is not likely to become a nightly, or even weekly, occurrence for most stations, there are occassions when this capability could be important. Terry suggests that the current Rapid Rail Transit controversy in Florida is one such story, where major developments from Washington could happen at any time. Terry believes that when they do, WTVJ in Miami will be glad to be the only station in its market with the capability to go live from Washington on its early news. The other Miami stations, all of which are represented in Washington one way or another, will probably not get their filmed reports until 8:00 at the earliest.

Though these plans seem ambitious for a relatively small outfit, backers are encouraging the expansion. CBNS is convinced that once the satellite feed is up and flying, the value of the service will be proven. Confidence is so high that the master plan reaches beyond the satellite feed to encompass a vision of a true national news service approaching the level of those operated by the networks. **BM/E**

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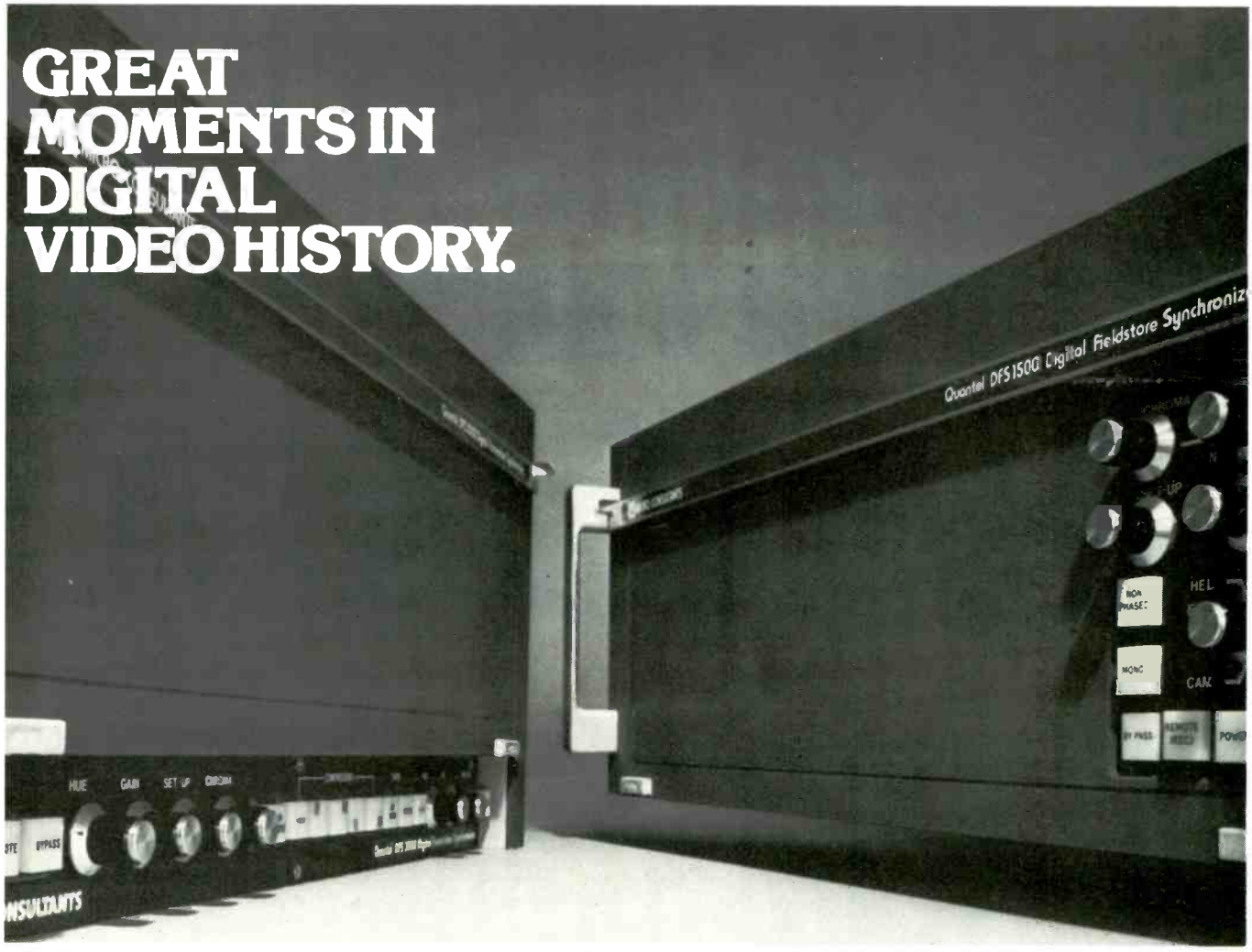

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Introduction To Microprocessors—Part III The Single Board Microcomputer

By Juan Rivera

In Part 1 (June '77) the primer defined the very basic elements of the microprocessor chip. In Part 2 some basic applications of microprocessors were discussed. Part 3 extends the discussion of applications and the rudiments of programming.

RECENT ADVANCES IN LARGE SCALE INTEGRATED CIRCUIT TECHNOLOGY have been spectacular, making the introduction of small digital computers into many new areas in broadcasting not only possible but inevitable. This new technology offers many new and exciting possibilities. And yet many broadcast engineers look forward to this new technology not only with great interest, but also with apprehension.

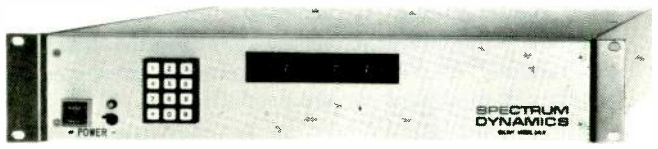
Many people have been put off by the apparent complexity of these new chips. Since much of the available literature on the subject is written for design engineers, it provides the reader with extremely detailed information, which, while essential for designers, is of only passing interest to us as users. The basic concepts, however, are very straightforward and easy to grasp.

Fundamentals

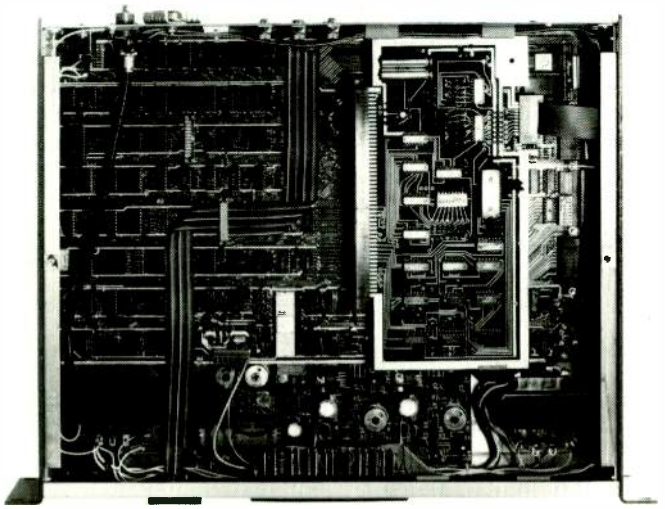
Every digital computer is composed of five basic elements. If the computer is a microcomputer, two of the five elements are contained in a single integrated circuit, the microprocessor. These two essential elements are the control section, which, as its name implies, controls the overall operation of the system, and the arithmatic logic unit, which performs all logical and arithmatic operations. The three remaining elements are input, output and storage. These three are similar in that they may all be thought of as arrays of storage registers, each individually selectable, and each able to store an eight-digit binary number, or computer "word." The difference between them lies in the manner in which each may be accessed. The input section accepts data from the outside world for processing. This data may be from a keyboard, from a bulk storage device such as a floppy disc or from another piece of equipment such as a digital clock or a transmitter telemetry system. The output section then presents the results of processing to the outside world for use. This output may take the form of characters on a video terminal, data to be stored on a floppy disc for future use or control signals sent back to the transmitter. The final element necessary to complete the digital computer, the storage element, stores the intermediate results of arithmatic and logical operations as well as the sequence of instructions which are required to direct the operation of the computer via its control element. This sequence of instructions is referred to as the program.

Synchronize with the master clock

Not included as one of the five elements, but essential to the operation of the system, is the master clock. This clock is usually implemented using a quartz crystal oscil-



The Spectrum Dynamics microcomputer logging unit requires only 3½ inches of rack space



With the top removed, the single board computer, real time clock board, and power supply are visible

Mr. Rivera is Assistant Chief Engineer at KNEW AM/FM, San Francisco, and is president of Spectrum Dynamics of Walnut Creek, California.

lator. Its function is to synchronize the system operations, and as an added benefit, it permits very stable and accurate timing. For example, in a system based on the Intel 8080 microprocessor, if the decimal number 255 were loaded into a register and then the computer were instructed to decrement the contents of this register in steps of one, each time checking the contents of the register until it equalled zero, it would take exactly 3.06 milliseconds to complete this task. In this way, accurate time delays are easily generated.

System busses

All of these elements are interconnected via three busses which are to be found in all digital computers. They are the data bus, which is used to exchange data between circuit elements (it's bidirectional), the address bus, which is used to direct the data to a specific register within the system, and the control bus, which connects the control element to all other elements within the computer.

Memory

As previously mentioned, one of the five essential sections of any digital computer is the storage element. Two distinct types of memory will usually be found here: ROM (read-only memory) and RAM (random access memory). Read-only memory, as its name implies, can not be written into by the computer. It is used for the storage of permanent data. The machine's instructions, as well as any other permanent data, such as a transmitter's normal operating parameters, could be stored here. This type of memory is referred to as non-volatile since the continuous application of power is not required to retain the data. Various types of ROM are available. One of the most common types is electrically-programmable and ultraviolet-erasable. It is referred to as EPROM. It may be programmed, erased and reprogrammed many times, as changes or modifications are needed.

The second type of memory is read-write memory, which is referred to as RAM (random access memory). This is slightly misleading, since both types of memory are random access. Random access simply means that all areas of memory are accessible in the same length of time. Unlike ROM, read-write memory is volatile and requires power to retain data. It is used for temporary storage.

In addition, certain applications will require external mass storage of data. The storage medium could be paper tape, magnetic tape or a floppy disc. There is no limit to the amount of data which may be stored externally. Occasionally, however, the time required to locate and retrieve this data becomes critical.

Control

The orderly flow of computer operations is controlled by the program, also called the "software." In the case of the Intel 8080 microprocessor, the chip's instruction set consists of 78 instructions, each a unique eight-bit binary number. All computer programs must eventually reach this chip as various combinations of these 78 basic instructions. These instructions are known as the machine language. The machine's instructions are executed sequentially, one after the other. Because of its great speed, it may give the appearance of doing many things at once, but this is not the case. Also, since the machine never stops, it can't be told to wait until a button is pushed to take some action. We can say, "Check the button. Is the button pushed? If the answer is no, then repeat the process. Otherwise do such and such." This is called a program "loop." The computer will continue to execute the loop until the button is finally pushed.

Once the criteria have been established, it's time to begin blocking out the program. A flow chart such as Figure 3 is a very useful aid. Of course, any flow chart is a simplification, but it helps organize and structure the program. First the task must be broken down into an orderly progression of simple steps, and all decisions reduced to simple yes-no responses. Only after the flow chart has been carefully checked for problems should actual programming begin. It is much simpler to catch errors in logic at this stage than it is when the faulty program crashes months later. Now that the program is blocked out on paper and appears sound, it is finally time to sit down and begin programming. Each functional block, or "module," may be designed, tested and debugged separately. This reduces the task into small sections which may be easily dealt with. If a particular module will be used more than once, it may be written as a "subroutine." Any time that function is required, the computer will be directed to that subroutine. The last step in a subroutine always returns program execution back to the next step in the main program. This feature eliminates the need to write redundant modules, and greatly reduces the size of the program.

Programming

The actual programming can be done in several ways, the most basic of which is machine language itself. Programming in machine language requires the programmer to enter the various instructions as eight-bit binary numbers. Some PROM (programable read-only memory) pro-

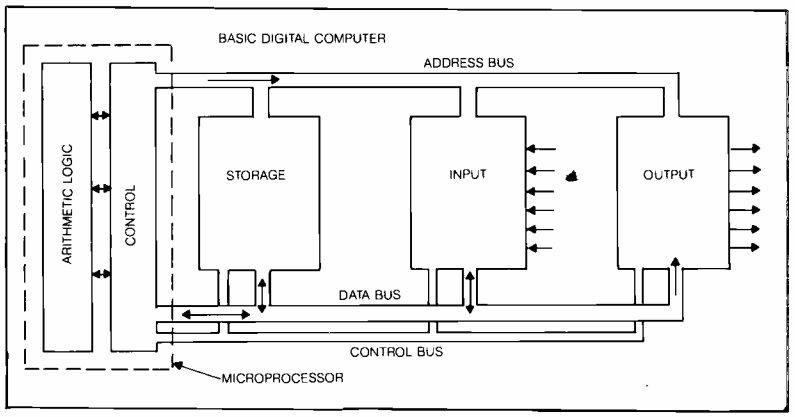


Fig. 1. All microcomputers contain these five basic elements. The control and the arithmetic logic unit (ALU) are usually both implemented in a single chip – the microprocessor

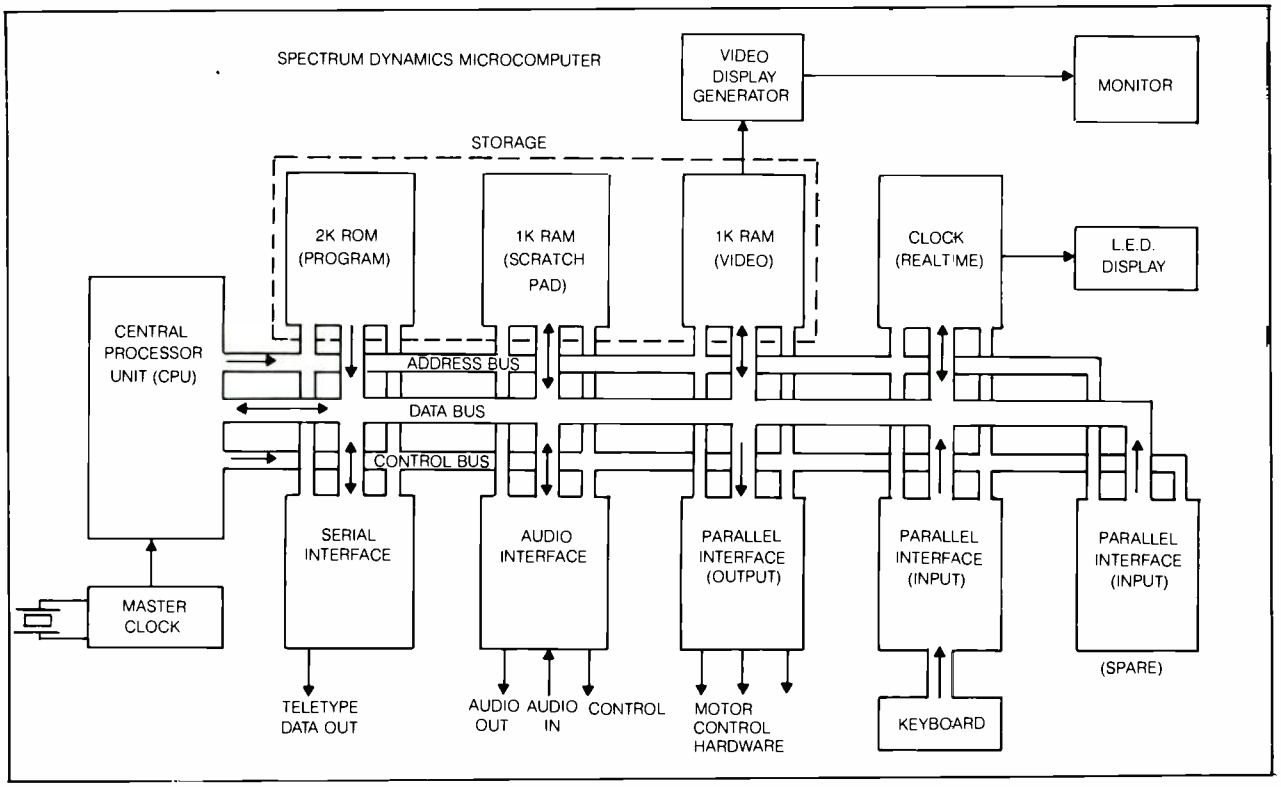


Fig. 2. The single board computer selected by the author features both serial and parallel communications interfaces, a keyboard interface, a 1200 bit per second audio interface, and a video interface. The board contains 2048 bytes of RAM and 2048 bytes of ROM. Elements within the system are interconnected via the three busses: control, data, and address

grammers allow data to be entered in octal or hexadecimal notation from a keypad. In its crudest form, each number must be entered using eight individual switches. As can be seen, this method is very tedious and subject to error. It is only suitable for very simple programs. A much more desirable method of creating machine language code is through the use of a program called an assembler. Such a program allows the programmer to enter instructions using a conventional keyboard. In assembly language, each instruction is referred to by its mnemonic. This is a two- to four-character label which the assembler will translate to the appropriate machine code. For example, the mnemonic for the instruction which exchanges the contents of the H and L registers with the contents of the D and E register pair is "XCHG." Mnemonics are much easier to remember than the corresponding machine code. In addition, many simple coding errors are eliminated by the assembler. If an instruction were entered which the assembler did not recognize, it would generate an error code and a correction could easily be made. With the system in use by the author, sophisticated text editing is possible as well. Sections of the program may be modified, deleted or relocated with ease.

Both of these methods require an intimate knowledge of the microprocessor and result in machine-dependent code, which must be written for that particular microprocessor. 8080 code will not work on a 6800, for example. These methods produce extremely compact and efficient code if properly written. At the other end of the spectrum, far removed from the machine's language, but much closer to English, are the various "high-level" languages such as BASIC and Fortran. By far the most popular high-level language among small system users is BASIC. The BASIC program is called an interpreter. It allows the user to enter his instructions in a form resembling English, and then interprets them into machine language at the time of execution. Since these languages are machine independent, no knowledge of the internal workings of the computer is required; the interpreter handles the translation to machine code. This frees the programmer to concentrate on what he wants the computer to do, instead of having to tell the machine how to do it. As a result, each BASIC instruction may translate into many machine language instructions. However, since the interpreter itself will occupy from four to 16,000 bytes of memory and must reside in memory at the time of program execution, high-level languages are seldom used for simpler control applications.

A logger with a brain!

Now that some of the basics are out of the way, let's look at an actual single-board computer application. One of the author's systems is presently programmed to operate as an audio cartridge logger. Data describing the contents of any cart is stored on the cue track of that cart in a predetermined sequence. As the cart is aired, the data is read from the cue track and displayed on the video terminal for the operator. Then, a log entry is printed which includes the time of day as well as all information required by the FCC. This type of application falls into the category of a fixed-program, dedicated controller.

After carefully defining the functions required, the first step was that of selecting the most appropriate board from among the more than 100 offered today. At no time was the thought of designing a board from scratch entertained. It would make no sense unless thousands could be sold. The board finally selected contained all of the needed

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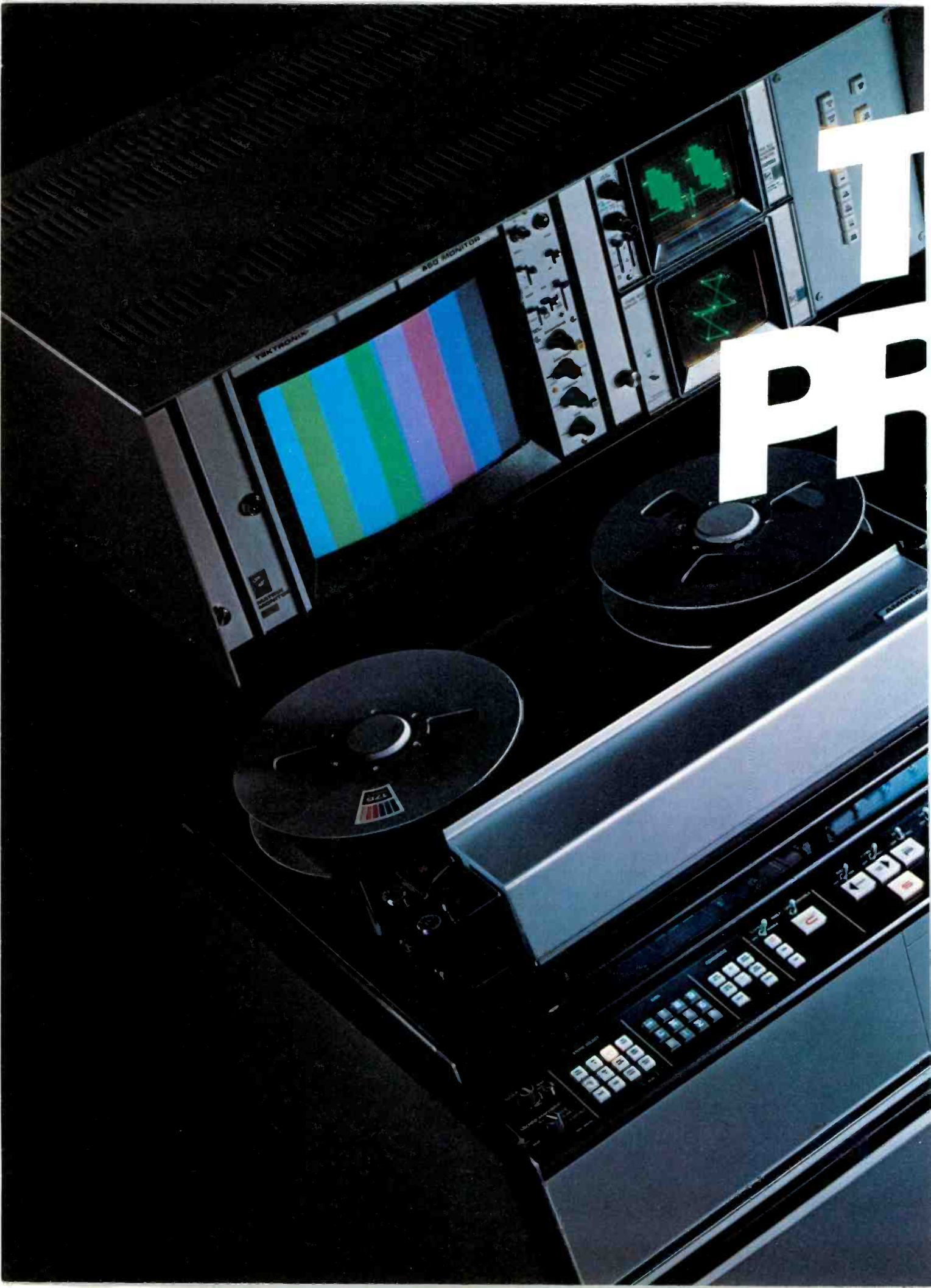
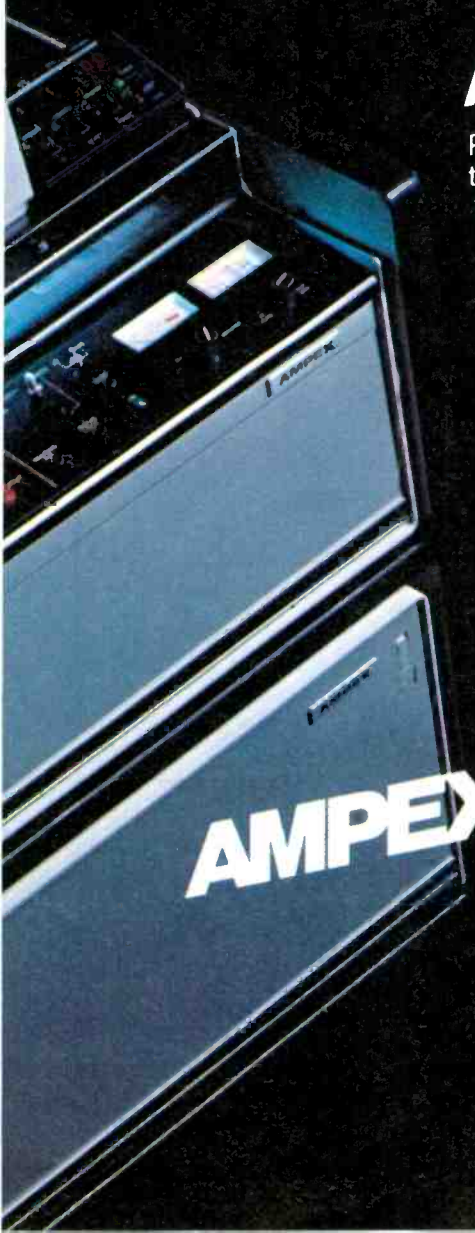

TEKTRONIX
480 MONITOR

E
ODUCER



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circuitry with the exception of a digital clock and the power supply (Fig. 2).

The computer operates in two modes: record and playback. Since the system cannot operate in both modes at once, two units are required, one for continuous use as a logger, and the other for use in the production room to encode the carts and to verify the accuracy of the data. The record section of the production unit will be discussed.

Record mode

Referring to the flow chart in Figure 3, notice that upon program entry, the computer immediately clears the screen, displays the question "type?" and then enters a "loop," waiting for an input from the keyboard. When a key is pressed, a comparison is made between the binary bit pattern generated by the keyboard and a list of five binary numbers stored in ROM. If a match is not found, the computer will reenter this keyboard input loop.

The first three numbers in the list represent the letters "M," "C" and "P," which in turn stand for the three categories of material which may be carted: music, commercials and public service announcements. Assume the "M" key is pressed, indicating that a music cart is to be recorded. This is first verified by displaying "*MUSIC*." The computer will then ask for the information unique to music carts, followed by the section which is common to all three formats, as shown. Since the display location on the video monitor is determined during playback by each item's position within the data stream, the commercial and PSA formats must each be padded to maintain the proper positioning of the remaining entries (there are fewer items). As data is entered into the computer, it is displayed on the video monitor and stored sequentially in the scratch pad area of RAM. The operator may backspace to make corrections or start over at any time.

When the last item is entered (comment line #3), the computer again enters a loop, this time waiting for the "Tape" key. When it is struck, the computer will turn on the turntable, wait half a turn, start the cart machine, wait again while the stop tone is recorded on the cue track, and then record the data stored previously in RAM at a rate of 120 characters per second. Another keyboard loop is then entered to await the record's end. The turntable is turned off when the "Control-C" key is pressed, and the whole process is begun again. Since at this point all data is still

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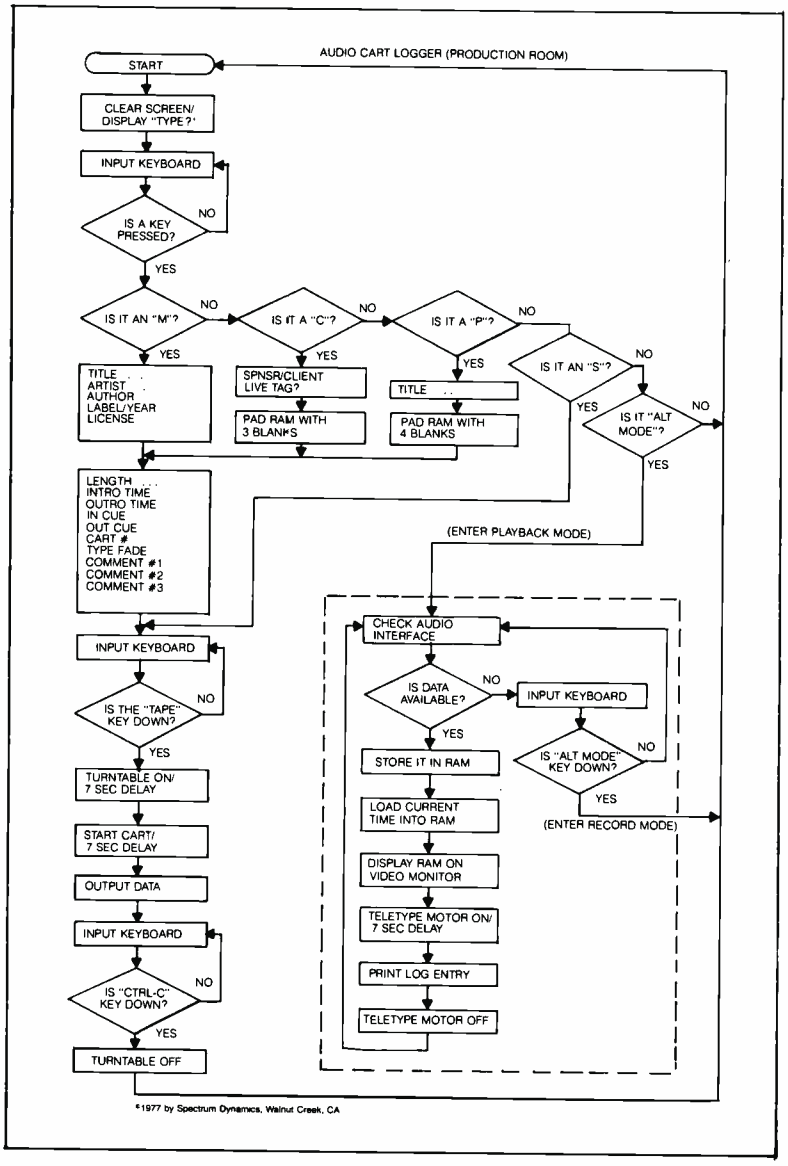

Fig. 3. The production room unit records data on the cue track of audio cartridges using two-tone AFSK (audio frequency shift keying). In addition, it controls both the turntable and cart machine motors. A simplified playback capability is also included to permit data accuracy verification

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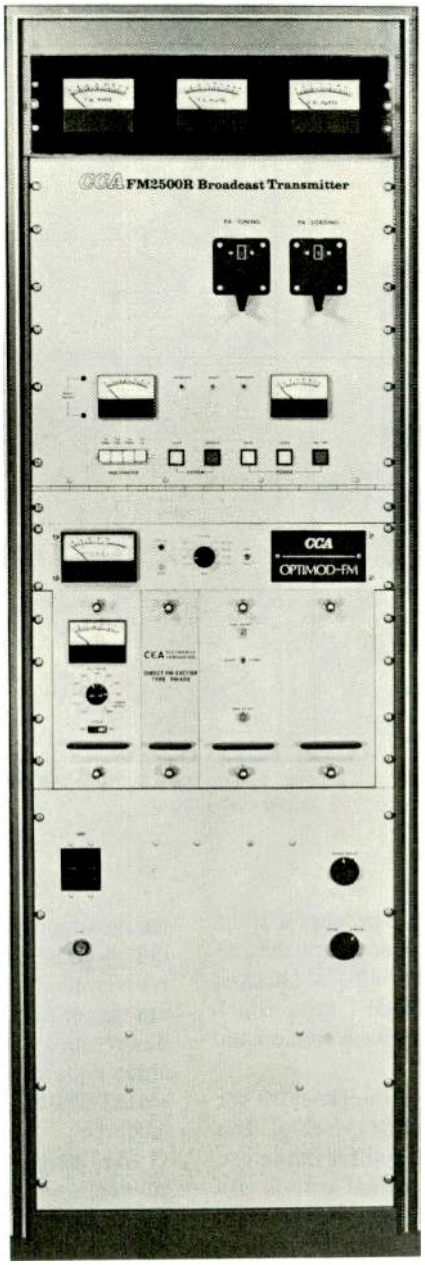

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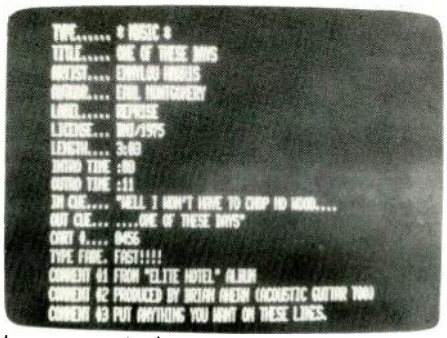
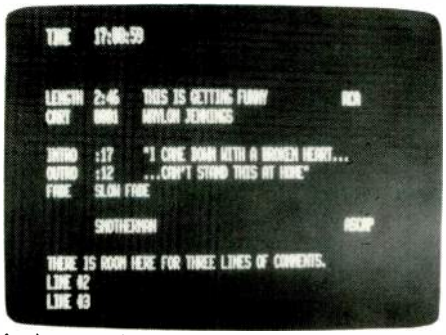


In response to the computer's questions, information about a cart to be dubbed is entered by the operator and displayed on the video monitor. The operator has an opportunity to backspace and correct errors or start over at any time



As the cartridge is aired, data is read from the cue track and displayed on the monitor at a rate of 120 characters per second (in this example, less than three seconds were required). A log entry is then printed which can contain any information shown on the screen, limited only by the column width of the printer

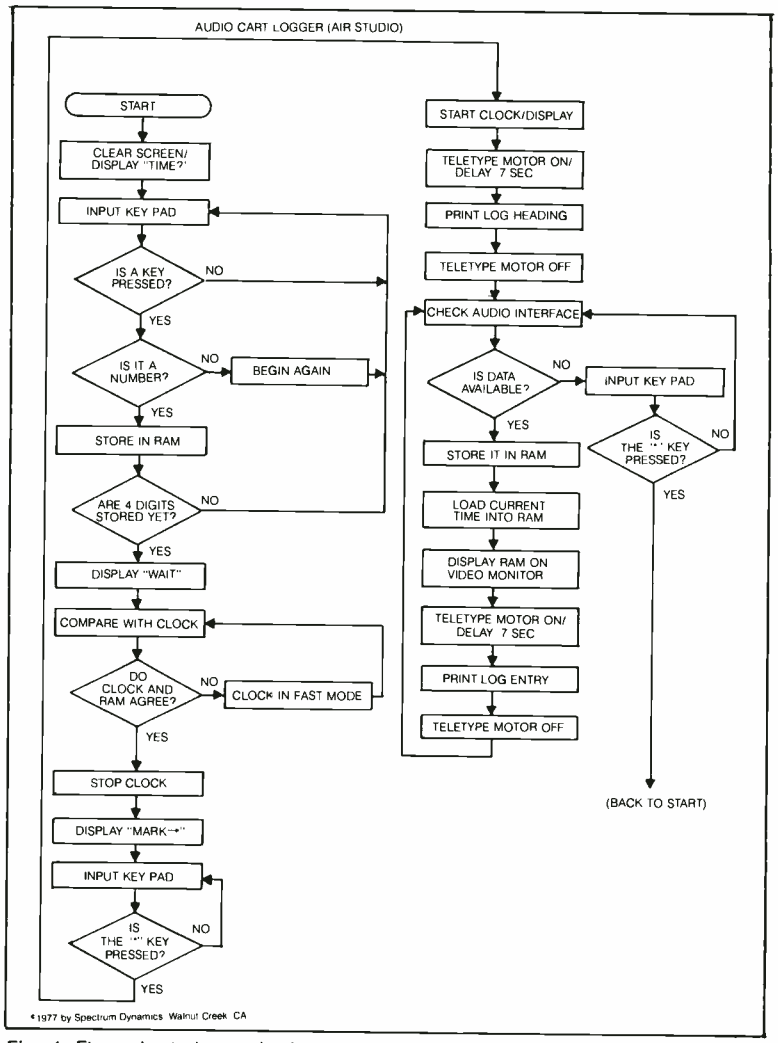


Fig. 4. Flow chart shows the beginning stages of program development for the audio cart logger

intact in RAM, it is possible to repeat the process without entering this data a second time. This is accomplished by typing "S" (for "same"). The cart may also be checked for accuracy by pressing the "Alt Mode" key, which forces the computer to branch to the playback section and begin execution there.

Both this and the playback section of the program are stored in a single 24-pin 1024 byte EPROM chip. The assembly language "source code" is stored for future use on floppy disc in the author's developmental system. As modifications are needed, the source code is loaded into the developmental system from the disc. Once loaded into the computer, the source code may be modified and then reassembled into machine language. It may then be run on the larger machine for testing and debugging. When all modifications and corrections have been made, the machine code is once again loaded back into the previously erased EPROM, and the EPROM replaced in the smaller machine.

The flexibility of such an approach is unparalleled with conventional hard-wired logic.[1] The same hardware used as a logger will soon be used by the author to control his amateur radio teletype station. It will convert between the ASCII and Baudot teletype codes, allow real time justification of both margins and control the transmitter. It will also allow either a video display of received signals or hard copy. It is hard to imagine hardware more flexible than that! **BM/E**

Suggested Reading

Carol A. Ogdin, "Microprocessor Design Course," EDN Magazine, Novemeber 20, 1976

James S. Coan, *Basic BASIC* (an introduction to computer programming in BASIC), Hayden Book Co., Rochelle Park, NJ

Adam Osborne, *An Introduction To Microcomputers*, Adam Osborne and Assoc., 2950 7th St., Berkeley, CA 94710

Lance A. Leventhal, *8080A/8085 Assembly Language Programming*, Adam Osborne and Assoc.

[1] The production room computer's capabilities may be greatly expanded by adding a hardcopy printer, a mini-floppy disk system, and additional RAM. Such an expanded system is capable of a multitude of applications. For example, this article was written and edited using such a system. As text was typed into the computer, it was displayed on a video monitor. Any letter could be deleted or changed, whole lines revised, erased or spread apart and additional words inserted, all by pressing a few keys. The text was stored on a floppy disc, and as new material was added and corrections made, the old version was simply overwritten by the new. Finally, as need arose, a hardcopy printout was produced.

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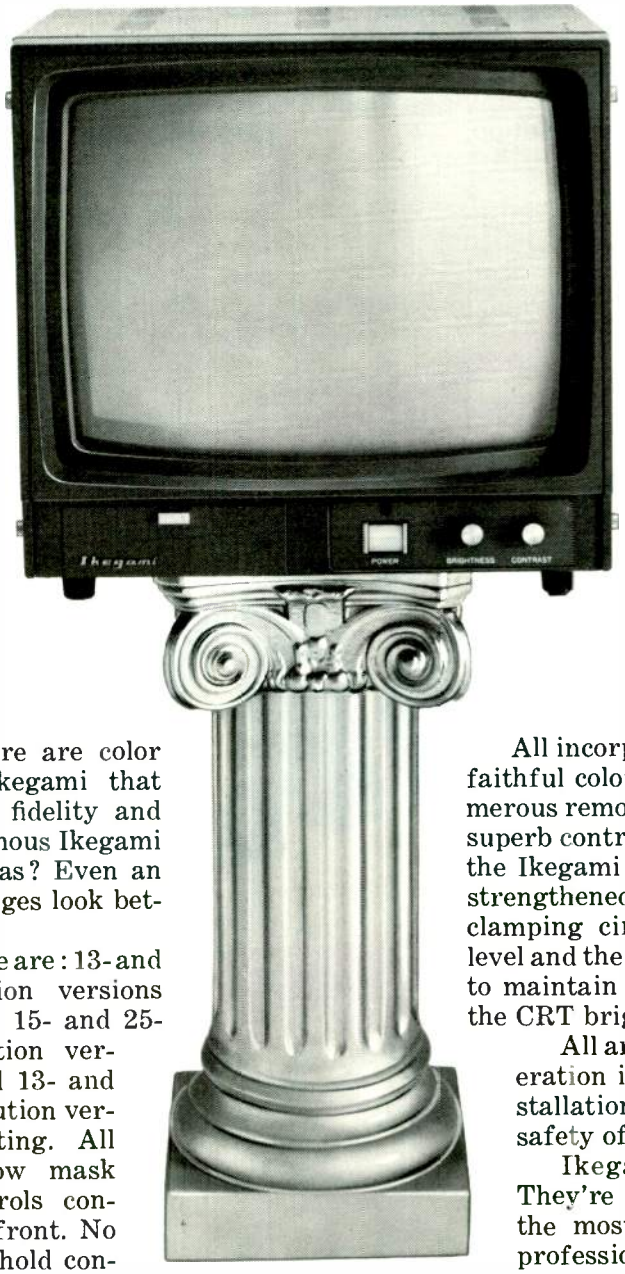

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Getting Involved With Microprocessors

With the coming of low cost, yet very powerful microprocessor boards, many broadcasters will be seeking information on the new technology. Some engineers have already covered a lot of the new territory that others will soon traverse.

JUAN RIVERA, author of the preceeding article, is probably not typical of assistant chief engineers of radio stations around the country—though in a few years, he may be. His story may be illustrative to others mainly because he has already traversed territory that many of his colleagues will find themselves exploring as the microprocessor and computer become increasingly commonplace in broadcasting facilities.

Rivera, now 34 years old, has been involved in the electronics industry for the past 15 years, of which only the past five have been in broadcasting. Just out of high school, Rivera got a job with a subcontractor to the NASA Apollo 1 project. He spent a few years there and in subsequent jobs in the aerospace industry, and then went to work for United Airlines as a radio mechanic. After five years on the graveyard shift, Rivera got the urge to do something different. He saw an ad, "Wanted: engineer to build one kW FM radio station." As Rivera puts it, "What better way to get into broadcasting than to build a radio station?"

It might have seemed to many that this was a precocious step to take, but Rivera figured that total immersion would probably be the best way to learn about broadcasting. He applied and got the job. "There was a great deal I didn't know," said Rivera, "but I was fortunate enough to have people who knew what they were doing come around at strategic points and save my neck."

Soon after the one kW educational FMer was built, Rivera joined KNEW AM/FM, San Francisco, where he is currently assistant chief engineer. Rivera says that he has been involved in pretty much one major reconstruction job after another at the station, since KNEW has embarked on a major modernization program. Instead of viewing his nomadic wanderings through the electronics industry as diversions, Rivera believes that he has benefited greatly from seeing other approaches to other problems, and is thus more versatile and less rote than some engineers who have spent all of their working lives in broadcasting.

Rivera is, for the most part, self-taught, since he found formal education incapable of providing him with a curriculum flexible enough to address whatever project he might be working on at any given moment. Rivera may be atypical in that teaching himself new tricks is old hat. He admits to always having been inquisitive about things electronic, and has a cartoon drawn by one of his father's fellow animation cartoonists that shows him at about age three, sitting on his father's lap and attempting to implant an electrical plug in his father's nose.

Putting aside for the moment Rivera's penchant for self education, what he has learned about microprocessors and how he has learned it is what is most important.

In the past two years since launching himself into the computer age, Rivera has experienced many things that will probably be commonplace to engineers seeking to get ready for the new technology. First, Rivera apprehended the notion that the new technology was fundamentally different from the old, and that this fundamental difference would lead to new opportunities for the improvement of broadcast operations. "I realized it was a major advancement in technology in the same way transistors were an advancement over vacuum tubes. It's part of the same transition. It is such a powerful new technology that it was apparent to me that it was only a matter of time before microprocessors started showing up everywhere." He began by reading magazine articles, and then went down to the local computer store (of which there are now hundreds throughout the U.S.) and purchased a manual for the Intel 8080 microprocessor chip. "By about page three," says Rivera, "I became convinced that I'd never be able to understand this stuff. I became convinced that I wasn't going to learn very much without having a computer at home to learn with. This slowed me down for quite a while."

Finally a friend took Rivera to a meeting of the local Computer Club. Located in Palo Alto, the birthplace of the microprocessor, it held its meetings at the auditorium of the Linear Accelerator Building on the Stanford University Campus. The club, which is the oldest and largest computer club in America, almost sent Rivera packing. "Here were all these kids surrounding me. Some looked like eight years old—you know the type: Coke bottle bottoms for glasses, huge briefcases and slide rules. They were talking about stuff I'd never even heard of and using words I didn't even understand."

After Rivera got over his initial sense of intimidation, he figured that "the task can't be as imposing as I thought if all these high school kids and housewives felt comfortable with it." The big leap forward for Rivera came when he bought his first microprocessor-based computer, an Altair 8800A. "As soon as I got my hands on the pieces of equipment," said Rivera, "I shot way up on the learning curve. I learned more in the first night than I had learned from all the books I'd read."

Rivera admits that he, like most others involved with "personal computers," was primarily attracted as a hobbyist and did not really start out with the idea of applying what he learned to his profession as a broadcaster. Nevertheless, the first program he wrote was related to his job. Using BASIC, a high level programming language and the easiest to learn, Rivera wrote a program related to the measurements and meter readings that KNEW makes every other day at its transmitter site. Instead of figuring

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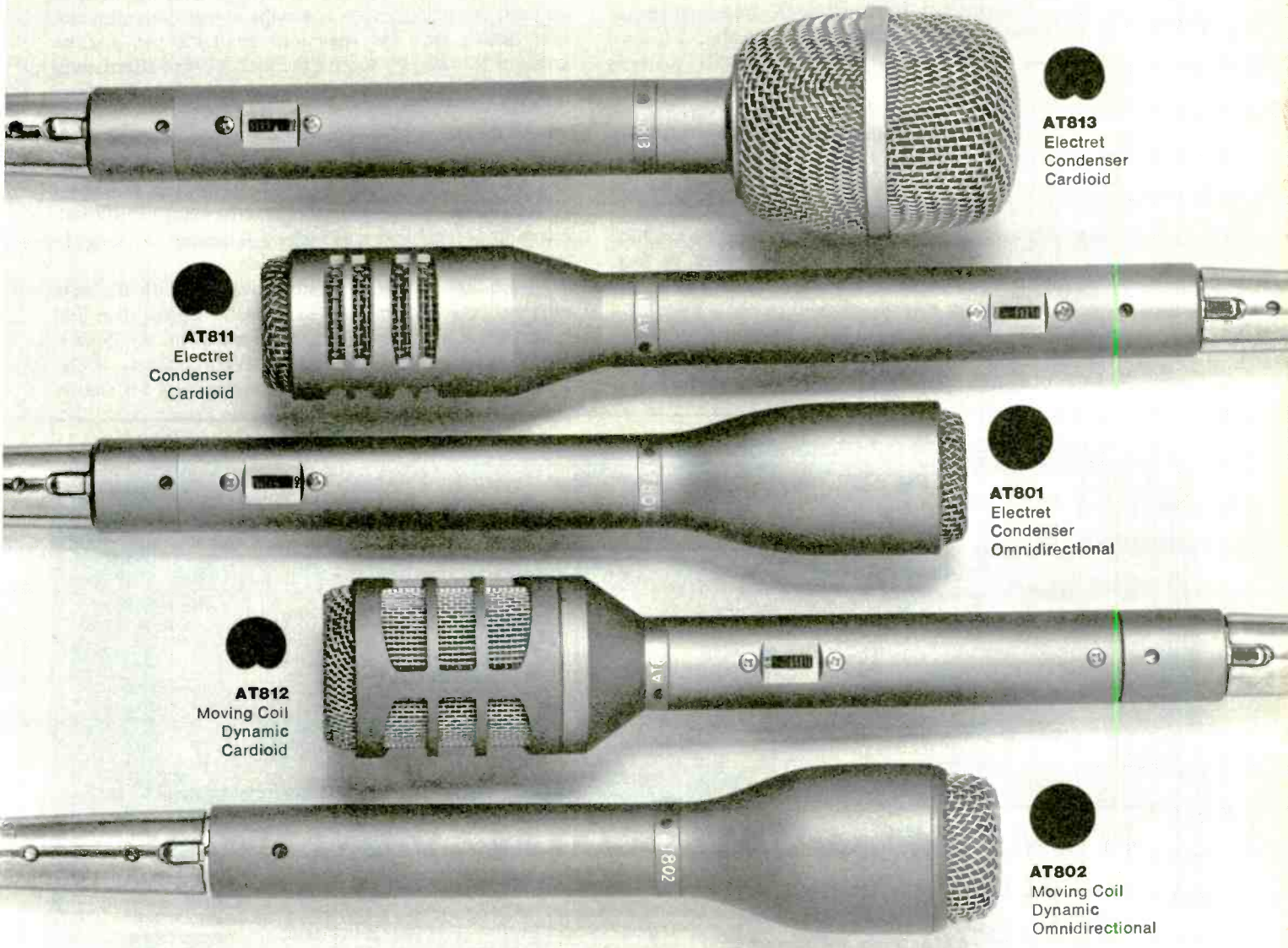
Audio-Technica introduces five new microphones... and a pleasant surprise.



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out base current ratios and deviation from licensed values on the back of a napkin (as he often did), he figured that here was a job well suited to his home computer. "I was delighted with the results of this program," said Rivera. "even though it's extremely simple."

As Rivera continued to learn, he soon reached a stage where his home computer had become quite sophisticated and included some 500 chips. His programming skills had grown beyond a mere command of BASIC, and he was now using assembly language half the time. Assembly language requires a far more intimate knowlege of what the microprocessor chip actually does than does BASIC. As Rivera points out, "The chip talks in zeros and ones, an almost incomprehensible language to the human being, and the human being talks in English, an almost incomprehensible language to the computer. BASIC really is two languages, English for use by the human and a translator program, invisible to the human, to convert English into something understandable to the computer." Assembly language is just one step removed from machine language and uses mnemonics, a series of numbers and letters, to cut down on the number of commands needed. One line of assembly language converts into one machine instruction, whereas one line of BASIC may, in fact, represent hundreds of machine instructions. The difference between using assembly language and a high level language like BASIC, says Rivera, is that "with assembly language you can get the machine to do anything it is capable of doing, while with BASIC you are limited to what the language can do." In other words, the author of the BASIC program decided for you which instructions are important and which are trivial.

Soon, Rivera's entrepreneurial instincts were awakened, and he began to conceive of microprocessor-based products that he thought might be attractive to other broadcasters. He founded his own company, Spectrum Dynamics, and set to work out of his garage. His first product was the logger, explained in his article. He is now working on a Music Management system that he believes will be more attractive to the general broadcaster. The new system will permit the data base manipulation of a station's music library according to a set of rules determined by the program director. In its simplest form, the system is a jock assist that will provide the DJ with a list of all the music available to him. It will provide information on each record's (or cart's, or tape's) intro time, tempo, title, artist, etc. The selections available can also be grouped by category to give the jock a list of alternatives from which to select in certain situations. Selection from this list can be governed by rules set down by the program director, i.e., "no more than three vocals in a row," or, "no single title to be played more than three times in any hour," etc. The system not only assures a consistent format, but allows needed changes to be made simply with complete assurance that all jocks will handle the change in the same way.

Rivera has obviously gotten involved with the new microprocessor technology to a greater degree than will most station engineers. The point is that he has done it with no special advantage other than his curiosity. As he sees it, the most likely level of involvement for station

engineers will be at the level of microprocessors for dedicated control functions. For example, Rivera knows one chief engineer in the Bay Area who wants to extend the power of his remote status and alarm system for the transmitter. The idea is to have a microprocessor learn the identity of the various remote controls and alarms and to sense when the alarms indicate certain conditions. At that point, the microprocessor will initiate a telephone call to the chief engineer's pager. The engineer will dial up the system and use a touch-tone signalling system to initiate some remedial action or to switch to the backup transmitter. It is hoped that the system will be extended to his car so that he will be able to take action and stay informed about the transmitter condition as he drives towards the remote site.

For this type of task and hundreds of others, Rivera believes that the average station engineer can acquire the requisite knowledge. "I don't think that many engineers will ever have the occasion to build their own boards, both because it would be too time consuming and require too much knowlege and because there are many manufacturers of mp boards that are already designed to accomplish most tasks that a station engineer could come up with."

Rivera recommends that fellow broadcasters interested in getting involved in microprocessor technology get on the mailing lists of mp board manufacturers such as Pro-Log of Monterey, CA and Digital I/O of Bellevue, WA. These two companies build boards around very flexible designs, varying in memory size, I/O configurations, power and expandability. They are, however, simply waiting for a program describing the job to be done in order to spring to life. Both of these companies offer ways for the end user to learn how to program their boards. Pro-Log, for instance, offers about one seminar per week in various cities around the country. The three day seminars, according to a Pro-Log spokesman, can teach almost anyone the requisite programming language and techniques needed to initiate their boards. The cost of such seminars is usually around $350, and includes not only the lessons but also a beginning kit with E-PROM programmer. About half of the time in the seminars is spent on lectures, while the other half is hands-on experience.

Other ways of learning about microprocessors and computers are bountiful. Many colleges and high schools have computer clubs which can be important sources of information, and a number of states now have chapters of the Southern California Computer Society. SCCS is probably the largest single organization of computer enthusiasts. In addition, computer stores are springing up all over the country, and most are important centers for finding out more about computers, as well as for buying equipment. At these stores you will probably also find racks of magazines and books devoted to computers.

The power of microprocessors is an accomplished fact. As broadcasters learn more about how to use these powerful tools, we can expect a great upsurge in demand for information concerning computer technology. *BM/E* will continue to follow the progress of computers in broadcasting, and will try to provide you with the information you need. We are interested in helping you exploit this new technology. If you have any specific ideas on just how we can best help, please write to *BM/E* with your suggestions.

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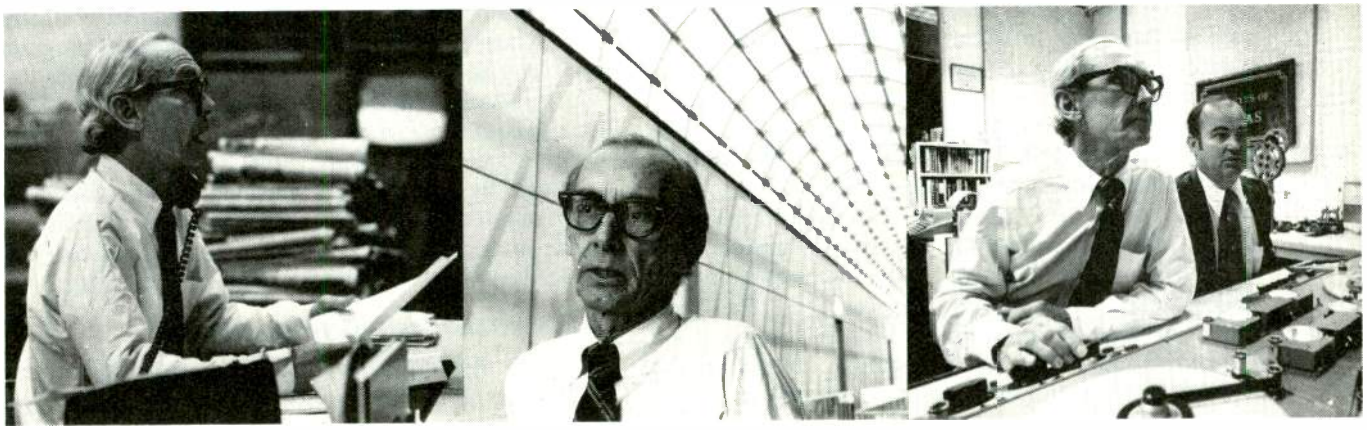

"I'm not in the broadcast news business, I'm in the news business," says the news director of KPRC, Houston, Texas.

"I don't subscribe to the theory that TV news is a special breed of news that ought to be tailored to what the audience wants. I'm not going to go that route.

"It goes back to the question of whether TV news is press or entertainment. I've always felt it was press. I have never used the word 'media.' To me it's phony, made-up jargon. I'm not in the *broadcast* news business. I'm in the *news* business.

"There are stories that ought to be done whether the public is clamoring for them or not. For example, at KPRC we maintain a full-time bureau in the state capital. Two reporters work for us full-time, and do nothing but report news from state government headquarters. I would hate to be called in to prove that I'm getting our money's worth from that bureau. I'm happy to say no one has ever asked me to prove it. But I would much rather explain why I *do* have a bureau than why I *don't*.

"Of course, TV stations should try to make difficult stories as uncomplicated and 'un-dull' as possible. It's not easy. The selection of reporters is the key. We do pay some attention to cosmetics, but no one here was hired because of his or her looks. All of our people have journalistic credentials. They all write. No one is here just to read someone else's copy.

"I am opposed to 'happy talk' banter when it is overdone. When one of our people passes the camera on to another, it's all right to say something. And the new person can make a response, but we don't go any further than that. Happy talk shouldn't cut into air time.

"We use the new Eastman Ektachrome video news film high speed 7250 tungsten for all of our filmed night coverage. It's great. We did a series on hospitals and 7250 was an enormous help in filming a childbirth sequence in the delivery room. Even after we use filters to correct for the interior light, we still have enough exposure margin to stop down and get good depth.

"We don't do as many documentaries as I'd like to because they take so much time. However, we do have a weekly magazine on Texas. It's all on film. The people have to travel all over, and film cameras are more portable. A good film man like Bob Brandon can get results that I've never seen anyone duplicate any other way.

"We have no ambition to have a 'live' piece every evening. I think trying to do so is a mistake. It's like editorials. I believe in them; but if we tried to do an editorial every night, or every week, we'd wind up with some bad ones.

"I am most proud of the attitude our people have. I think our staff tries to do things a little better. I've tried to convey to the people working here that our objective is to be the best news operation in town. If it comes to a choice of being first or best, I want to be best."

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Business Automation: Taking On New Tasks

New services are being offered to broadcasters, and the flow of information increases

IT WAS NOT LONG AGO that the term "total automation" was used to describe a business automation system interfaced with technical automation. Such a system is no longer as extensive in scope as was then believed. The reason for this is that business systems are taking on ancillary functions in addition to the usual traffic, accounting, scheduling and master control areas. More and more television and radio stations are turning to computer power to help run their operations, and they are looking to their computers to perform more and more tasks. Not only does the dollar investment in automated systems make it desirable to use these systems to their fullest capacities, but cost efficiency demands it. The new applications most significant to and best received by broadcasters seem to be demographic and library/inventory services. The introduction of these services seems to mark the beginning of a trend in which automation is beginning to take on the shape of a true management information service.

Music library catalogue

KGB AM/FM, San Diego, used to maintain the 4000-title library for their AM and FM stations and KXOA-FM, Sacramento on three by five cards. This filing system arranged song titles alphabetically. Now the stations are using the Music Control Feature of their Automated Business Concept system to provide them with a variety of information regarding the music in their library. Title, time, category, artist, tempo and chart number are a few of the parameters used in music programming. Intro time and beginning and ending keys of a musical piece are parameters that prove valuable in building segways.

Under the old way of doing things, two people were employed to a maintain the three sets of three by fives (one set for each station). Once or twice a year these cards were sent out for a "sort/cross-reference" to be printed. Now, the library for the three stations is handled by one librarian, and an up-to-date sort can be had any time it's wanted. KGB's Cliff Cox says, "Most importantly, the system has enabled us to give our program directors a printout that they can peruse at their leisure before they have their weekly meeting, and call out the records that they don't think should be played." Those records are put into a "hold" file (temporarily removed from the play list). Cox says that he couldn't even guess the amount of time that is saved with this new library system. They no longer have to go through the cards, rely on memory or go to the stations and rummage through the records to see what they have and what they want to play.

In addition to keeping the stations on top of their music inventories, the system can provide a printout sorted by any field. Available label information makes it easier to order new records. The system keeps track of what's being played on the air. Call for a sort by publisher, and the printout aids in ASCAP and BMI billing procedures.

At XTRA-AM, San Diego, the music library is kept on a rolodex file. The basic library contains 1000 records but a custom series of contemporary music in a beautiful music format on reel-to-reel tapes adds to that. XTRA is installing an Automated Business Concepts system, and expects it to be operational this month. Operations manager Rich Tyson indicated plans to use the system for maintaining a record and tape library, as well as for its programming and accounting capabilities. Tyson said that they "look forward to making complete use of the system." He also commented that when the word got out that XTRA was looking for business automation, the station was contacted by a number of companies. The decision to go with Automated Business Concepts was due to an interest in the immediate availability of broadcast-oriented, customized services other than accounting and billing.

Cart, film, and news inventory systems

WTNH-TV(VHF), New Haven, recently implemented its Jefferson Data System cartridge/film/videotape physical inventory system. So far, the system is being used to keep tabs on some 1000 carts (commercial spots) and has been dubbed "the dancing carts." Previously, WTNH's cart inventory was maintained with by-hand entries in a number of large books. One book was a listing by cart number, another book was an alphabetical listing by client. All information had to be listed and cross referenced in each book. It was a time-consuming task not only to make these entries, but also to search and find the information when it was needed. A common error under the old system was the assignment of one cart to more than one commercial spot. Traffic Manager Beth Glynn says, "It is now basically impossible to make that manual error. It can't, or hasn't, happened yet because once a cart has been assigned and the information has been put into the computer, a kill entry has to be made before the system will allow a cart to be reassigned. The time savings here have been incredible in not having to chase down the information from numerous sources, find the error and then go back to make the corrections."

The cart service is strictly an inventory system. Information programmed for call-up can include the cart number, client, product, length and start and end dates. A printout by end date can provide information indicating fulfillment of contract, and therefore can be used to suggest that a cart be recycled.

Glynn has attended troubleshooting classes offered by Jefferson Data Systems. She comments that the annual seminar where systems users can brush up on operations procedure is also valuable in that it allows users to meet in a learning environment and pick each others' brains for new ways for the system to serve their common needs.

Last February, KMBC-TV in Kansas City, MO, began using the BCS, Kaman Sciences "Karts" inventory system. Before "Karts," KMBC's inventory system consisted of 40 "giant boards," each holding 25 index cards. The cards were numerically coded with cart number,

continued on page 54

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client name and probable end date. Information was hand-written, and when a cart was to be replaced, the card was pulled from the board. If a client's cart had to be located, a search had to be conducted which could conceivably entail going through the entire inventory. There was no facility for cross-referencing index information.

In addition to filing information such as length of cart and commercial, sponsor, agency and pull date, the new system records the type of material (that is, CM, PRO, PSA, EDIT), and also has the capability to sort and print or display by any combination of these categories. KMBC's traffic operations computer director, Don Trujillo, says that with the old system, there were two people doing the work. Now there is one person who maintains three times the old workload. One person can handle as many as 4000 units of commercial information, and can find any detailed information needed in less than two minutes. Trujillo also said, "It [the system] gives us more control, which gives us more time to do other things."

The system is not limited to carts. Trujillo noted that by simply changing the master title head, his staff has adapted "Karts" to provide them with inventories of their slide and film commercials as well. Also available are a printed advance program notice and a display/list of what has been aired and what is yet to come. Right now, the system can provide an end date print out which indicates when a cart has completed its schedule of airings and is a likely candidate for recycling. The availability of this information spurred station management to work with BCS to provide an enhancement to the system which will provide them with addtional service.

Currently, the system can keep track of how many times a commercial is being aired. The program under development will also keep track of how many times a cart has been used, and how many airings it has had. The report to be generated here will be of use to the engineering department. The tape on a cart has to be replaced every so often as age and drop outs begin to take their toll. Presently, any problem with tape quality cannot be detected until the tape is aired and the problem occurs. When this happens, a commercial is lost and a make good is required. With a preventive maintenance program for the replacement of a cart tape after, say, 200 airings, the need for this type of make good will be eliminated, and money will be saved. The point is that with a little imagination, an inventory system can do more than keep inventory.

Inventory systems can be used for more than music records and tapes, and more than carts. They can be used for film or tape programs, and, as in the case of KOOL-TV, Phoenix, can be of value in the news department. "News" is the name of KOOL's BCS Kaman Sciences inventory system. It attacks a problem that must be common to most, if not all, TV stations that maintain a file of their news footage. That problem is the one of having easy access to footage of past events for use with current stories. With this system, information regarding length and decription of story, origination, type, names, dates and category is all immediately accessable. Entries in the system can be sorted and display/printed by any combination of the variables listed above. Examples of how the system is being used came from KOOL's Bert Kennedy.

In recent coverage of a meeting of the state prison board, KOOL was rapidly able to locate and use filed footage of previous stories depicting prison conditions. Another recent incident involved the death of the governor, which occured during a flood. The news department was able to use footage of previous flood conditions and footage of the governor's accomplishments in order to present a more relevant, complete story. Whether covering a meeting, an obituary or a natural disaster, the ability to access and intercut filed footage with current footage can often make the difference between a dull clunker of a story and a multi-faceted, visually interesting one.

Demographics

At KTXL-TV, Sacramento, the sales department makes good use of the station's Cox data system to store and provide them with access to ever-important demographic information. Operators put into the computer certain selected information from the Arbitron and Nielsen services. Once in the system, the data can be accessed and printed out at any time. This process has proven to significantly increase the efficiency of the sales prep department. Sales manager Ed Branca said that once the data from the services has been entered, a computer presentation (printout) for commercial sales can be had in five minutes. This presentation enables sales personnel to show a potential client when and where his commercial should be aired in order to reach his desired audience. Branca also commented that the ability to access and print this demographic information has provided KTXL with a tool that has led to client budget increases ranging from 20 to 400 percent.

Showing a potential advertiser detailed statistics regarding a certain audience is only one of the possible applications of demographic information. WJLA-TV, in Washington, has found other uses. Their Jefferson Data

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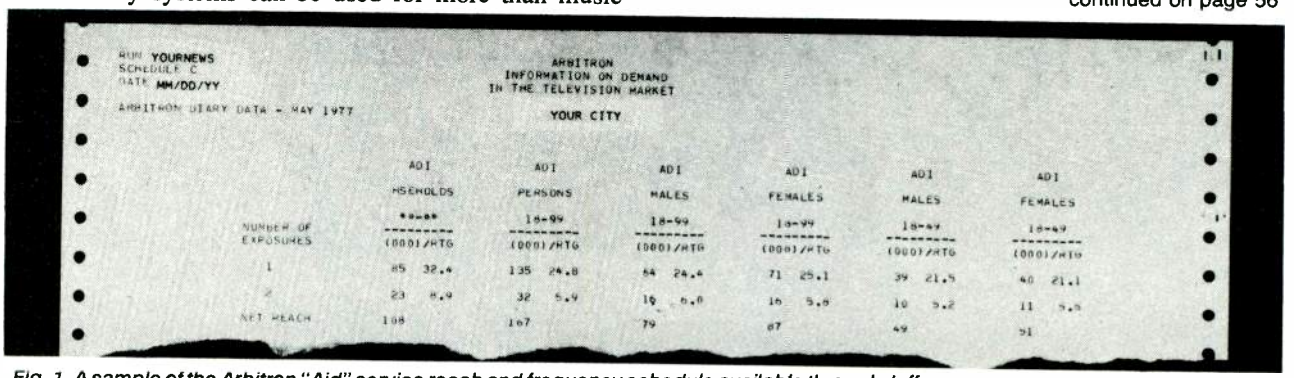

Fig. 1. A sample of the Arbitron "Aid" service reach and frequency schedule available through Jefferson Data Systems interface

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If you need professional performance from a hand-held color camera, Hitachi FP1020 is your answer.

No matter what the assignment, the FP1020's three ⅔" Saticon® tubes deliver broadcast-worthy resolution and colorimetry. And like all Hitachi portables, the FP1020 combines lightweight handling with heavyweight performance features such as: auto white and black balance controlled by an 8-bit digital memory ...three-way power via 2-hour battery belt, AC, or 12V DC...built-in color bar generator...vertical enhancer...and a 5-position color temperature filter disc.

Two key options extend the versatility of the FP1020: built-in Gen-Lock for multi-camera system use and a remote Operation Panel which controls camera functions from up to 150 feet away.

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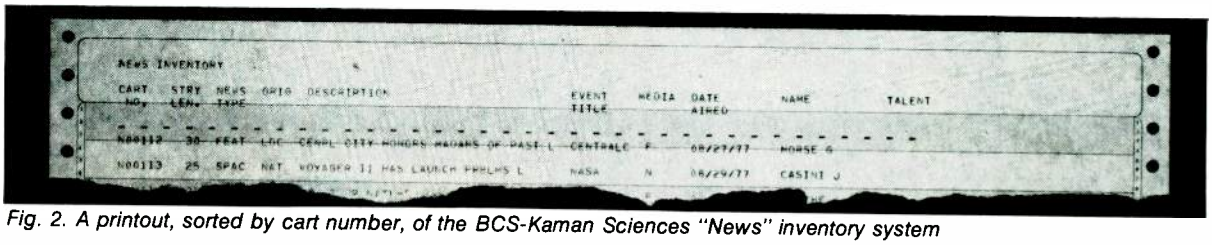

Fig. 2. A printout, sorted by cart number, of the BCS-Kaman Sciences "News" inventory system

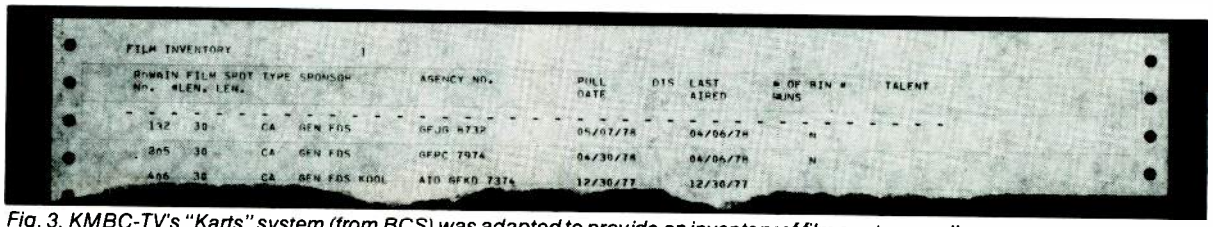

Fig. 3. KMBC-TV's "Karts" system (from BCS) was adapted to provide an inventory of film spots as well. The "sort" above is by expiration date

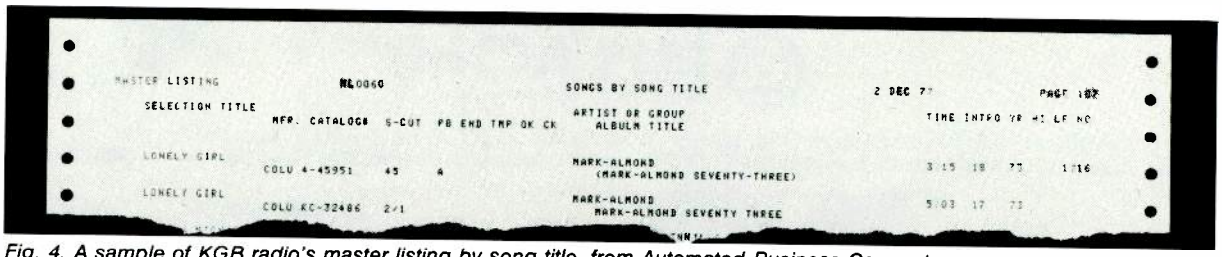

Fig. 4. A sample of KGB radio's master listing by song title, from Automated Business Concepts

Systems demographic service provides them with on-line access to, among others, the Arbitron "AID" Service.

Lin Wallace, WJLA's director of research, says that the station is able to interface its computer with, say, Arbitron's computer, and to introduce its own variables for audience analysis. The result of this interface is direct access to "customized" and cumulative demographic, geographic (down to zip codes) and sociographic information. Armed with knowledge of the age, income and educational level of one's audience enables a station to "fine tune" their programming. Wallace offered examples of how demographic information might be used.

WJLA's programmers may find that they have a very strong show in Thursday's 7:30 to 8:00 slot. The competition may have a strong show in Tuesday's 7:30 to 8:00 slot. Basic audience demographics can be obtained from the rating book. With the new system, a "duplication study" can be made as well. This study identifies how much of the competition's Tuesday audience is the same as WJLA's Thursday audience. If the duplication rate is high, they may decide to take an aggressive position and move their show to Tuesday in order to vie for the same audience. The system can also provide information regarding audience flow—that is, when and where certain audiences are tuning in or out. Audiences may completely turn over after a particular show because the following show has no similarities in appeal. Customized demographics may also be useful in scheduling promos. For example: "Happy Days" and "Welcome Back Kotter" may both have a stong 18 to 34 audience. A duplication study may reveal that although the audiences of the two shows are of the same age group, 75 percent of "Kotter's" audience may be of a different sociographic group (income/education). In that case, it might be advisable to run a promo for one show during the other, in order to reach that non-duplicated group of potential viewers.

Before implementing the direct access system, WJLA subscribed to the AID service and would request reports from Arbitron. Wallace commented that now, with direct access, they can use the service with greater ease and frequency and with considerable savings in time and cost.

Business automation systems in themselves are not new; they have been used by broadcasters for some time. Interface with technical automation is not new either, and debates are still going on whether or not it is feasible for all broadcast installations. It was evident at this year's NAB convention in Las Vegas that new companies are springing up in order to supply an expanding market. More companies are offering more services. (See box story.)

The companies and new services mentioned here are by no means comprehensive. As broadcasters demand more of their systems, companies try to fill those demands. Groton Computer is working on a demographics package; Station Business Systems (formerly Compunet) is working on a film inventory, as is BIAS, Data Communications Corp. Paperwork Systems, Inc., is putting together an inventory package and also offers election tabulations.

Computer power has been with us for a while. The introduction of new services seems to have been the result of a climate of cooperation between broadcasters who want to make the most of their business systems and automation companies who want to serve the specialized needs of their clients. It has been shown that the computer doesn't just belong in the traffic, master control and accounting areas. There are jobs it can do in programming and there are inventories it can maintain. It can provide broadcasters with undeniably valuable management information. **BM/E**

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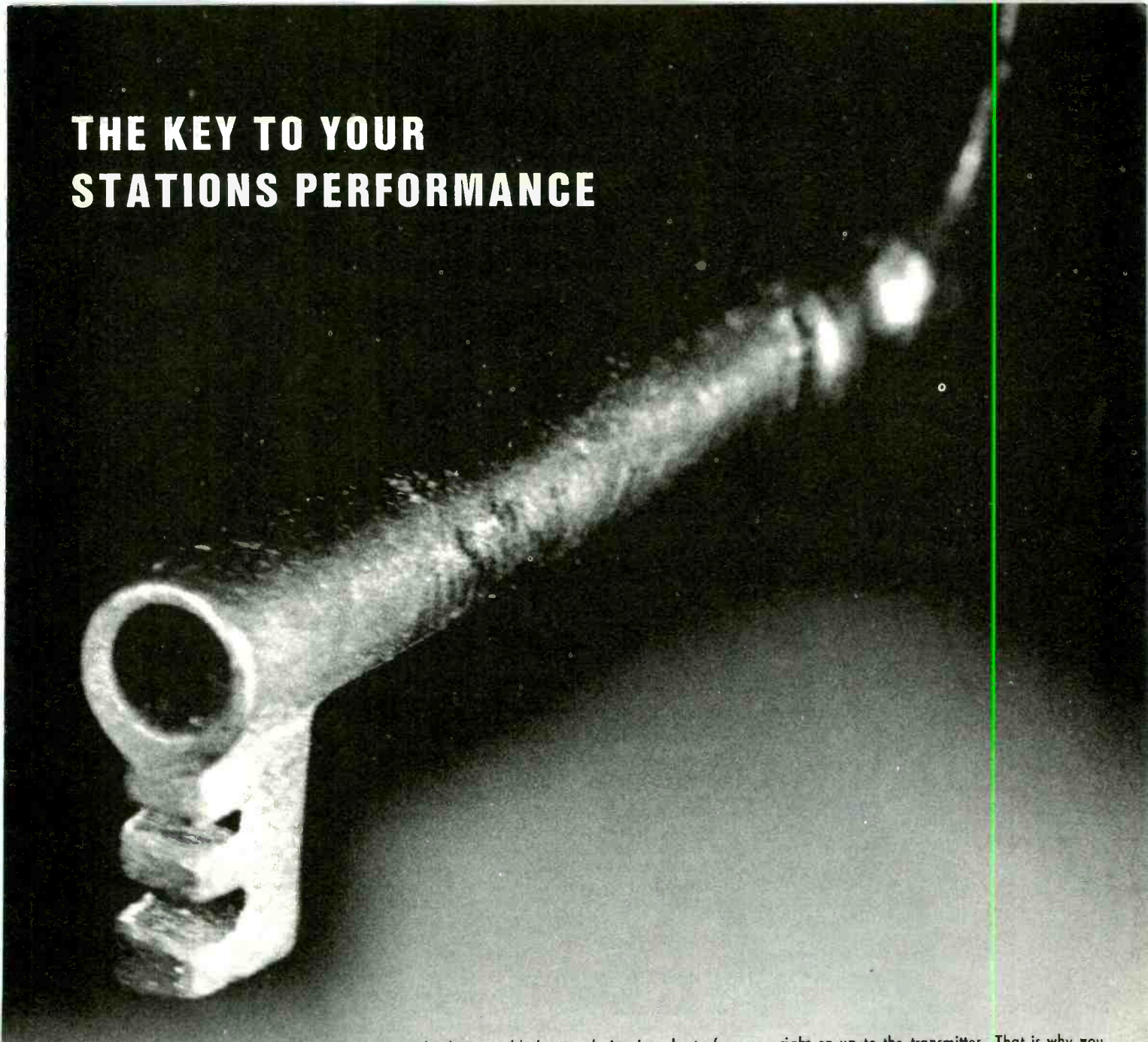

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Circle 136 on Reader Service Card

New Micro Bias terminal system will extend computer power from a large station to a smaller satellite station

Business Automation: New Services Offered At NAB '78

The general virtues of business automation for broadcast stations have been established for a decade or more, and events of recent years in this field have consisted largely of development of new services, along with more and more interfacing with technical automation for the totally computerized station.

At Las Vegas, the established firms showed ingenuity in applying computer power to more kinds of jobs in broadcast stations. And there were a few new firms with broadcast business automation systems, attracted by a market that is still very far from saturated.

Jefferson Data Systems announced a new "package," Stand Alone General Accounting, which is in-house processing of all reports in the General Accounting Package supplied by this firm. It can be added to other System 80 services, and uses the Sycor 400 series of mini-computers. The system gives the management total independence, flexibility and security in handling various monthly and yearly closings. It can, for example, generate accounts payable checks at any time.

Jefferson also announced that their System 80 may now be had as a licensed software program for IBM 360/370 series computers. Original software design was for the Honeywell 66, and that of course is still available. System 80 is for nighttime mainframe operation schedules, and can coexist with other systems that work on the same computer in the daytime.

A third introduction by Jefferson is a Demographic Service. This gives the station on-line access, through the in-house mini-computer, to the Marketron TV and Radio research service for avail submissions and CPMs; to the Arbitron "AID" for audience flow, customized demographics, and other services; the Nielsen NSI Plus service for a variety of services, such as spot package ratings, area studies, reach and frequency analysis, and many more; and to the New York Times Information Bank, for current affairs information and detailed news background. Jefferson is now set up in about 60 stations, half television and half radio.

BIAS (Data Communications Corporation) put emphasis on its new Micro Bias Terminal System, which will extend computer power from a large station to a smaller satellite station. The system consists of a microprocessor with 18K of read/write memory and six K of read only memory; a CRT-keyboard unit; and a line printer. The usual configuration is two processors (one back-up), two CRTs, and two printers (one back-up).

BIAS is currently in about 190 radio and TV stations with its host-computer, in-house mini-computer systems; the mini-computer can also direct program switching, through the interface system BIAS has developed.

Paperwork Systems (PSI) also has a fully developed interface to technical automation for their BAT business systems. At the show they were demonstrating connection to technical automation for TV at the Vital booth, and for radio with Harris, Cetec and Broadcast Electronics. A new system for them is the large BAT 1700, which is an adaptation of the high power of their BAT 1751, a TV system, to the serial invoicing used in radio. Several of PSI's other systems were on display.

Kaman Sciences' BCS announced three new services, called "Films," "Karts," and "News." "Films" is an inventory and amortization system for keeping track of film material. It includes comprehensive cross-referencing so the film operator can retrieve any film according to subject matter, length, previous airing or other characteristic. "Karts" supplies similar library control and retrieval of commercials in various forms — on carts, reel-to-reel tapes and film. "News" is for complete control of news inventory, again with comprehensive cross-referencing to allow instant recall of past stories according to persons, events, organizations, etc. The news director can review in a very short time previous coverage on any topic.

Groton Computer, who made an appearance at the NRBA in New Orleans but is new to the NAB, described its on-line system with computer in Groton, CT and input system, CRT readout and printer at the station. The terminal is hard-wired to an isolated telephone line and is queried by the computer, either for input from the station or to send processed data to the station. The system provides on-site printed logs daily, as well as intra-monthly reports. Month-end statements go to the station by mail or express. Groton gets a detailed "profile" of each station, to guide development of the software for that station's business. The method allows Groton to supply service at modest prices.

A new firm in the field, Automated Business Concepts of San Diego, CA, came with "Mesa Two," an in-house system that uses A.O. Smith computers for a comprehensive accounting, traffic, billing, payroll and logging system. It has numerous optional capabilities, such as music scheduling and selection, and automation interface. The "building block" hardware can be used to increase the computer core from 32K to 256K, to raise data storage from 10 million to 320 million characters and to add CRT terminals up to 12. ABS says that their data storage system, which records the data closely back to back without the category gaps often used, has one of the highest densities available. A standard system for an AM/FM combo station in a medium market will be priced around $49,000.

Another firm new to NAB, Centro Corporation, also of San Diego, brought two systems: "CASS," a computer-assisted switching system, and "CATS," a computer-assisted traffic system. They are described in the section on TV technical automation and master control, in May's *BM/E*.

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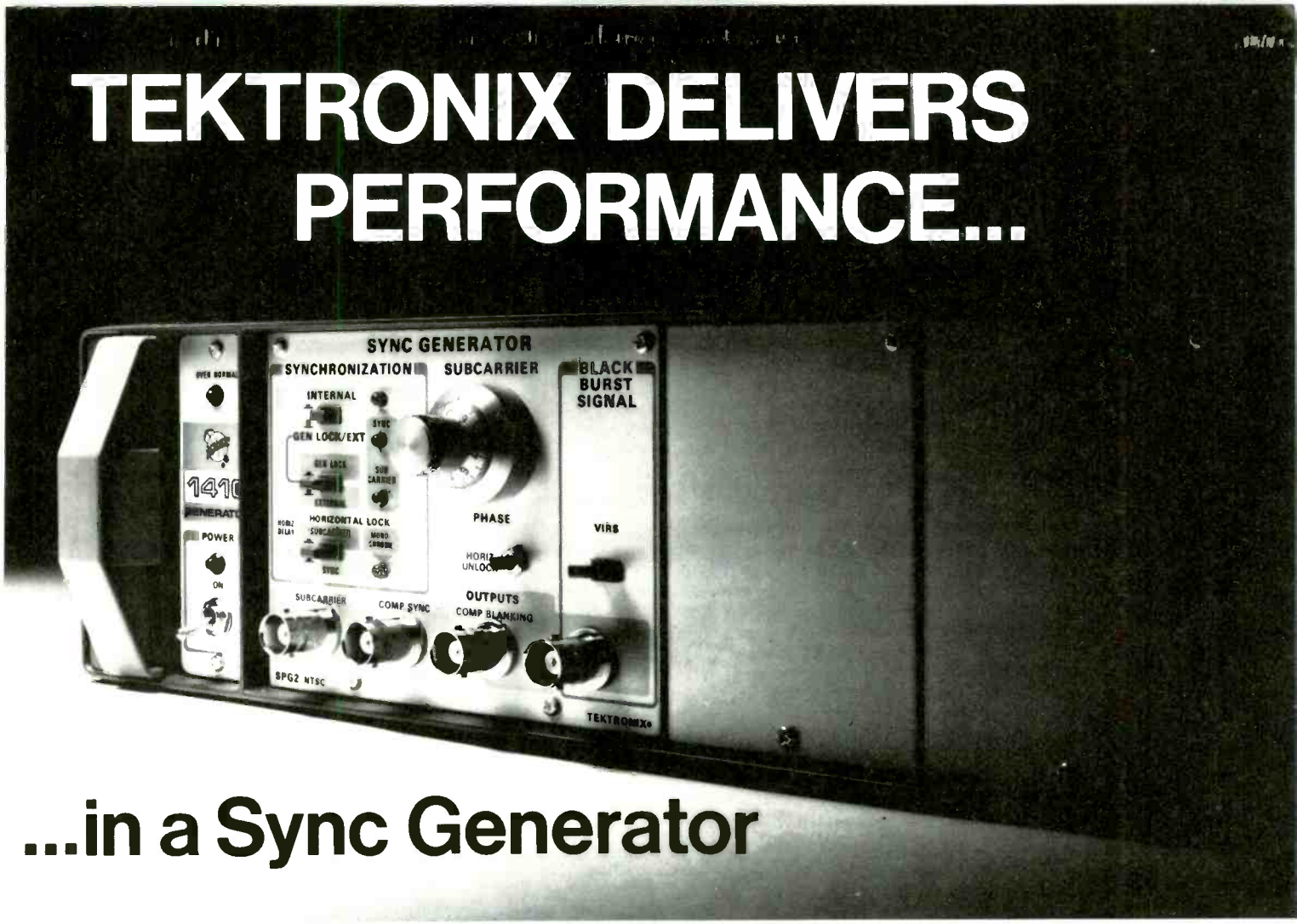

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☐ 1410 Mainframe easily accommodates additional test signal generators.

☐ Put your total sync system together with TEKTRONIX
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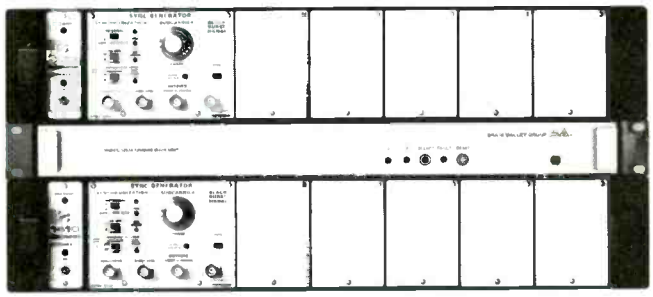

Typical NTSC sync generator system comprised of two 1410R Option 01 mainframes with SPG2 sync generator modules, and one GVG 3257A Automatic Changeover Unit.

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Circle 139 on Reader Service Card

Microcomputer Provides Security At WKY

One of the top rated AM radio stations in the southwestern United States is using a microprocessor-based central control security system to protect its new 17,000 square foot headquarters in Oklahoma City.

Station WKY's complex of studios and offices contains thousands of dollars worth of audio and mobile equipment. The Interrogator 880—manufactured by Cardkey Systems, a division of Greer Hydraulics, Inc., Chatsworth, CA—is used to control access into the building and inside the building itself.

In addition to safeguarding expensive equipment, one of the main advantages of the system is its ability to prevent numerous visitors—listeners and advertisers as well as messengers, suppliers, etc.—from wandering into the station's recording studios, music room, engineering sections and announcer's booth to disturb operations.

The WKY 880 system consists of a dedicated microprocessor, displays, associated line printer and seven card-reader terminals, each connected to a door electronically and automatically controlled by the processor. Four other exterior doors are monitored by intrusion detectors connected to the central controller. An alert panel in the news department lights up whenever one of these doors is used, and an alarm also sounds at the central console.

A card reader controls the main entrance to the building only after business hours. During the work day, an override key can bring the card-operated system instantly on line in the event of an outside disturbance. The employee entrance and doors to controlled areas inside the building remain locked at all times and can only be opened by a valid credit-card size Securiti-Card®. Each WKY employee has been issued a card. Cards are programmed into the central processor memory to discriminate between those employees who have access to the building and anywhere inside at any time, and those who are restricted as to the time, door or combination of doors they can use.

The invisibly-coded card keys carry a unique facility code (assigned to only one customer), plus a 5-digit I.D. number which determines the access authorization of the person assigned the card. If a card is inserted into a reader and the facility code is correct, the reader terminal transmits the I.D. number to the central controller, where access parameters are verified. Unless the card-holder identified by the number is *not* authorized to enter the door in question at that particular time—or the card has been previously reported lost or stolen—the controller will transmit an 'unlock' signal to the reader. The entire transaction takes less time than use of a conventional key.

Unauthorized access attempts and alarm signals from intrusion detectors are printed out by the 880 in red to distinguish them from valid card transactions, printed in black. In an emergency, the system can quickly print out the entry status of all employees or determine the presence of technical or first aid personnel.

Program changes can be made at the console in a matter of seconds for an individual or entire group without ever recalling a single card key. According to Don Copeland, WKY business manager and security officer, "If we want to change the shift of an engineer, we just type in the change on the keyboard controls at the console. It takes only a few seconds. And there's an immediate printout so we don't make mistakes."

"Hobby" Type Computer Can Be Important Training Tool

With the presence of several "hobby" type computers now on the market, ranging in price from under $600 to just over $3500, individuals and companies alike are taking the opportunity to prepare themselves to enter the computer age. One company, Dynair, began with the purchase of a Radio Shack TRS-80 computer using BASIC, a high level programming language which can be learned easily by even the most technically disinclined. The TRS-80 was equipped with a 16K RAM and cost under $2500.

The original purchase was intended to give Tom Meyer, Dynair's product manager, an opportunity to institute an employee training program that he hoped might make Dynair employees more comfortable with the new microprocessor technology Dynair was using in its audio/video routing switcher systems. The idea was that a firm understanding of how computers and computer programming work would make each of Dynair's employees more effective, whether they were administrative, sales or engineering personnel.

It wasn't long after the training program got under way that the first practical benefits began to spin off. Mel West, Dynair's marketing support manager, soon mastered the BASIC programming language and decided to write a program that would bring some order to the very complex task of price quotes on routing systems.

Within two weeks, West had written a program for the TRS-80 which took into consideration pricing formulas for 11 different switch frames, two types of power arrangements, audio and video switch cards and output amplifiers for each, two microcomputer controllers, terminations, jumper cables and numerous other variables. Moreover, West also programmed the system to take into consideration both the current and future needs of prospective clients.

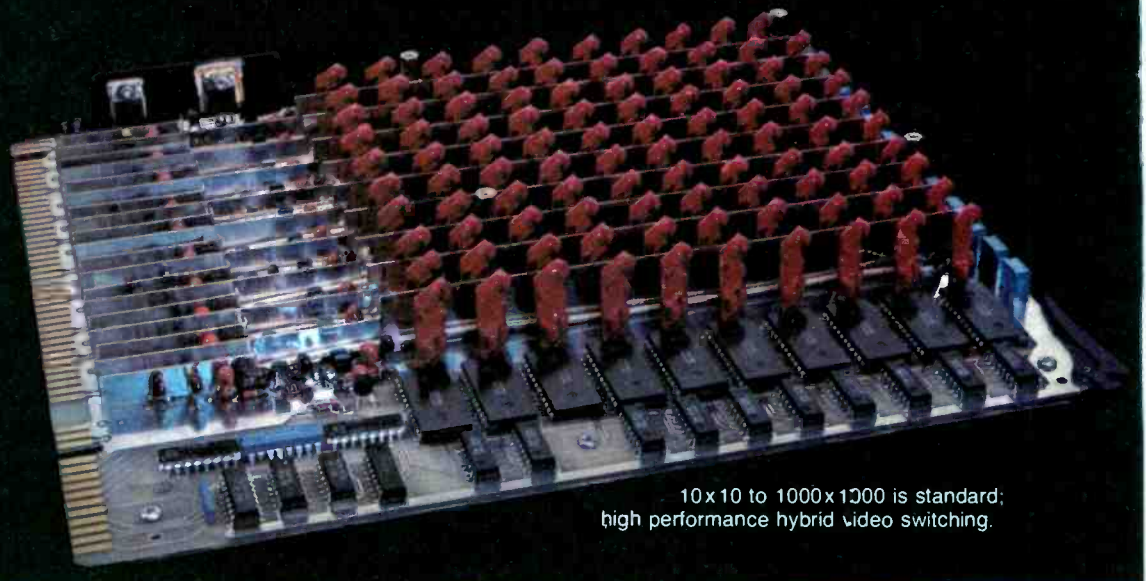
By the time Dynair was ready to go to NAB where it would introduce its new microprocessor-controlled switching systems, West had prepared the computer to ask a series of basic questions concerning the number of inputs of each type, audio and video, requirements at the present time, number of outputs and types of control, plus a series of questions relating to a client's future needs. Broadcasters arriving at the Dynair booth could respond to the computer's interrogatories and then, after waiting just a few moments while the computer displayed the message, "Quiet — I'm thinking," get a complete price quote. The quote would provide a comprehensive bill of materials — right down to the jumper cables. It would also be cut two ways to show current and future systems needs.

Dynair was so pleased with the results of its employee training program that West's quoting system will soon be available on cassette to Dynair distributors for use in their own Hobby computers. A Dynair spokesman said that the system could save the company thousands of engineering dollars, since it is not uncommon for a Dynair distributor to call the San Diego headquarters and ask them to figure out a complex quote.

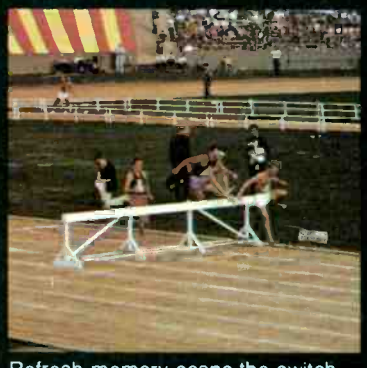
Eventually the Dynair quoting system will be incorporated into an in-house Management Information System. The bill of materials for a specific quote will then be able to be compared to a product availability file so that instant delivery estimates can be made.

These are fairly heady surroundings for the spin-offs of a humble training program, but that's the way computers are. It is not unlikely that many radio and TV stations can benefit from similar training programs.

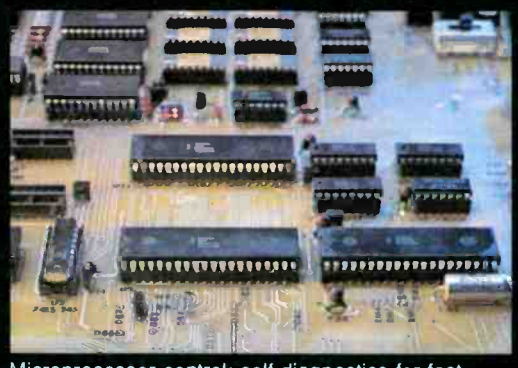
Presenting
now TV switching



10x10 to 1000x1000 is standard; high performance hybrid video switching.



Refresh memory scans the switch each field; change a switch module and the refresh sets it automatically; battery backup preserves memory during power failure.



Microprocessor control; self-diagnostics for fast troubleshooting; constant status output keeps tabs on where you are.

It's a big memory machine with total switch preset-take; single command salvo switching; up to 8 separate control levels with simultaneous follow or breakaway.

System 21: has come of age.

It's a neat package; compact enough for 180x10 to 270x15 in a single module frame.

Air quality, "pop-free," integrated circuit audio switching; 30 dBm at 150-ohm output available.

System 21 is a very *mature* routing switcher. Highly intelligent, it gives you the flexibility and capability you need to fill constantly changing systems requirements.

It's what other switching systems would like to be when they grow up.

21 is a major milestone in anyone's life. That's why as we turn 21 years of age, DYNAIR, America's most experienced manufacturer of switching gear, is pleased and proud to present System 21.

It marks a significant stage in the development of broadcast switchers, by combining technologies brought to maturity over a 21-year period of innovation and progress with the sophisticated capabilities of microprocessors and integrated circuitry.

With automation-compatible control, and plug-in video, audio, hard contact and data switch modules that are instantly replaceable — with power on — it delivers performance unmatched in the industry. From video specifications like 0.15% differential gain and 0.15° differential phase, to incredibly low power consumption.

There are many reasons why you should look into System 21. So if you're ready for the mature system, we're ready to show you that DYNAIR's System 21 stands head and shoulders — a whole generation — above other routing switchers. Why fool with the minors when you've got a major job to do!

A single line for multi-station, serial data control; choose from CRT, touch pad or alphanumeric controllers.

System 21 — the director's choice . . . let's *you* realize the full potential of today's technology.

SYSTEM 21 *the mature generation*

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Circle 141 on Reader Service Card

Radio Taps The Endless Skills Of The Microprocessor

The "computer-on-a-chip" is beginning to take over old and new jobs in radio stations. Here are a few of those operations, including some extremely useful new ones that couldn't be done before the microprocessor came.

THE MICROPROCESSOR-IN-RADIO STORY is still in its early chapters, but already the plot and moral are clear. Because it makes computer power very small, very inexpensive and unbelievably versatile, the microprocessor will be far and away the greatest tool ever developed to aid the operation of radio stations.

The kinds of things the microprocessor does are not new in themselves. They have been available for a long time from large computers. But economic and technical logic bars the large computer from most operating jobs in radio. Nobody would think for a second of using a $100,000 mainframe computer to run a remote control system, one of the applications discussed below.

With a microprocessor, however, plus the few support chips that turn it into a microcomputer, the designer can insert computer power just about anywhere it would be handy. He can create a complete computer on a single plug-in card that will cost him less than $100.

The abilities of the computer-on-a-card are being enlarged almost monthly as the makers of microprocessors pack more and more intelligence onto the small crystals. In fact, Dr. Federico Faggin, president of Zilog (makers of the very "hot" Z80), predicted in a recent article that advances in semi-conductor technology will soon put more intelligence onto a microprocessor chip than anyone presently knows how to use. He recommended certain major changes in computer architecture to utilize this extra intelligence.

The microprocessors now available are intelligent enough to revolutionize many jobs in radio broadcasting. Following are examples of recently introduced equipment in just three areas of radio operation — remote control, intercoms, and program automation — in which microprocessors give the operator dazzling new control powers and efficiencies.

Remote control: "smart" talkback

Introduced at the NAB show in Las Vegas was the new Model 7640 Telescan from Time and Frequency Technology, Inc. It is a data acquisition, logging and alarm system which can stand alone for those purposes, or be combined with TFT's (or other makers') digital remote control systems for computer-assisted remote control operation. The computer power comes from the Intel 8085 microprocessor.

Broadcast Electronic's "Control 16" uses microprocessors for greater flexibility and ease of control with CRT read-out

The 7640 has a keyboard input and CRT readout, for interaction between the operator and the system. The system will report on up to 120 telemetry and status channels and log up to 20 automatically. Some of the functions the microcomputer performs are:

- Takes all information as it arrives from the remote scanner at the transmitter site, and turns it into alphanumeric data for display on the CRT;
- Allows the operator to enter up to 15 characters as the description for each channel;
- Checks each piece of the digitally-transmitted information for accuracy, using parity bits and checking sums forwarded along with the data, thus virtually eliminating errors;
- Allows the operator to put any given piece of information anywhere on the screen for easy study;
- Allows the operator to direct what will be logged and how to enter the logging information;
- Allows the operator to set narrow and wide tolerance limits for each telemetry channel, and provides an aural and visual alarm system which tells the operator instantly what parameter is out of tolerance, and how much;
- Provides continuous time/date on display, and enters it in the log with each entry.

Those functions are startling enough, but the system is virtually unlimited in the additional functions it can provide simply by altering the "firmware," the plug-in EPROMS that establish the basic instructions for the microprocessor. TFT makes available alternate EPROMS with a wide range of specialized functions, covering almost anything the user can dream up. The EPROMS supplied are erasable and reprogrammable.

This complete open end on functions is the most revolutionary aspect of the computer power that microprocessors are bringing into radio. It means that station management does not need to change hardware to get an enlarged or different operation. Only the software need be changed to achieve the additional functions desired.

Combined with a remote control system, the 7640 clearly provides a new level of efficiency and accuracy. Moreover, with changes in the firmware, the combined system becomes an ATS *without any hardware additions*. Score another plus for the microprocessor!

Moseley Associates, another leader in remote control, is presently preparing units to retrofit all Moseley systems in the field for microprocessor control. The benefits will, of course, be similar to those described above; the equipment and its functions will be described in detail in a later

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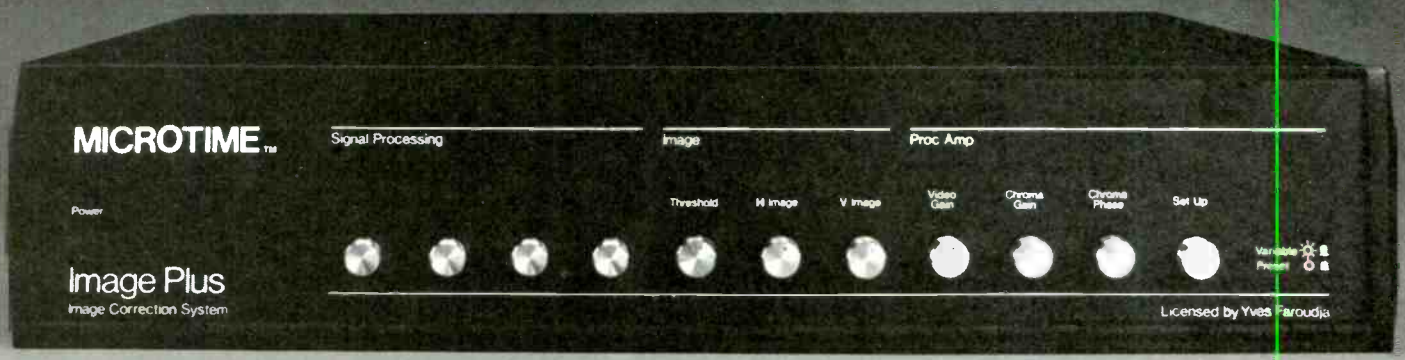
Improve Any Video Signal.



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Radio Taps Microprocessor

issue. The advantages of microprocessor control are so strong in this area that it is hard to imagine a new system appearing without it.

"Intercom" becomes "audio distribution"

Shown at the NAB in Las Vegas (see *BM/E*, May) was an intercom system transformed into considerably more than an intercom system with the help of a microprocessor. It is the Model 8332 Communications System from Automated Processes, Inc.

The 8332 is a "hub and spoke" system, with each station connected by its own cable to the central switching unit (CSU), where solid state switches make all interunit connections under microprocessor control (the Zilog Z80). Each cable is an ordinary, unshielded four-conductor telephone-type cable. Two conductors carry digital switching data from station to CSU; the user enters the switching instructions with a small panel of buttons on the station. The other two conductors carry the analog signal.

In line with current trends in audio, top broadcast signal quality is maintained throughout: the specs are for a 20-to-20,000 Hz bandwidth, with extremely low distortion. Thus, the system can carry program audio around a broadcast plant. The old squawk-box intercom is an endangered species. Since the impedance across the signal pair is only 80 ohms, noise pickup is minimized and high frequencies are carried with little loss.

Here are just a few of the operation conveniences the microprocessor supplies (any reader can extend this list — just about anything he thinks of can be done by changing software): a station can call any other station; can choose any group of other stations for group communications; can impose privacy on any pair or group of stations; can inform a group of a desire to break in (with indicator light); can put into the memory various groupings; or can call up any one with a single button. The memory can be extended and stored on optional floppy discs.

This memory store for groupings is highly relevant since the standard system easily handles up to 80 stations. Installation of a station simply means running one length of the four-conductor cable from the station to the CSU. Expansion and rearrangement are simple and do not involve rewiring elaborate multi-conductor cables and mechanical switching systems.

The microcomputer software, of course, by making available any combination of connections or sequence of groupings, or any other operational program, eliminates massive mechanical switching and, in fact, supplies operational flexibility far beyond that possible with any practical set of switches. Here again is the essence of what the microprocessor can do for radio. It has made possible a new kind of audio distribution system, not only for a new level of intercommunication, but also for the handling of program audio in a broadcast plant, with any needed routing made easy and foolproof.

Automation: more power, less money and space

Some of the largest technical automation systems for radio have used computer control for quite a while. But within the last year, a new generation of automation

systems in medium price brackets have put microprocessors to work. Such systems are more intelligent than before, much more flexible and easy to operate and less subject to error.

Three versatile microprocessor-based systems shown at the NAB in Las Vegas were the Broadcast Electronics "Control 16," the Cetec-Schafer 7000, and the IGM BASIC. All three allow the operator to make entries and give instructions in plain English, and allow the system to "talk back" to the operator in English. The latter capability is especially valuable when there's a problem: the machine tells the operator in English what and where it is. It is also very handy for the logging operation, which can be automatic on all these systems.

The ability to communicate in English (a translation of machine language to a high-level language) has become practical with the development of large-capacity memories of reasonable cost. The firmware for such language translation must hold, in ROM, all the necessary English words.

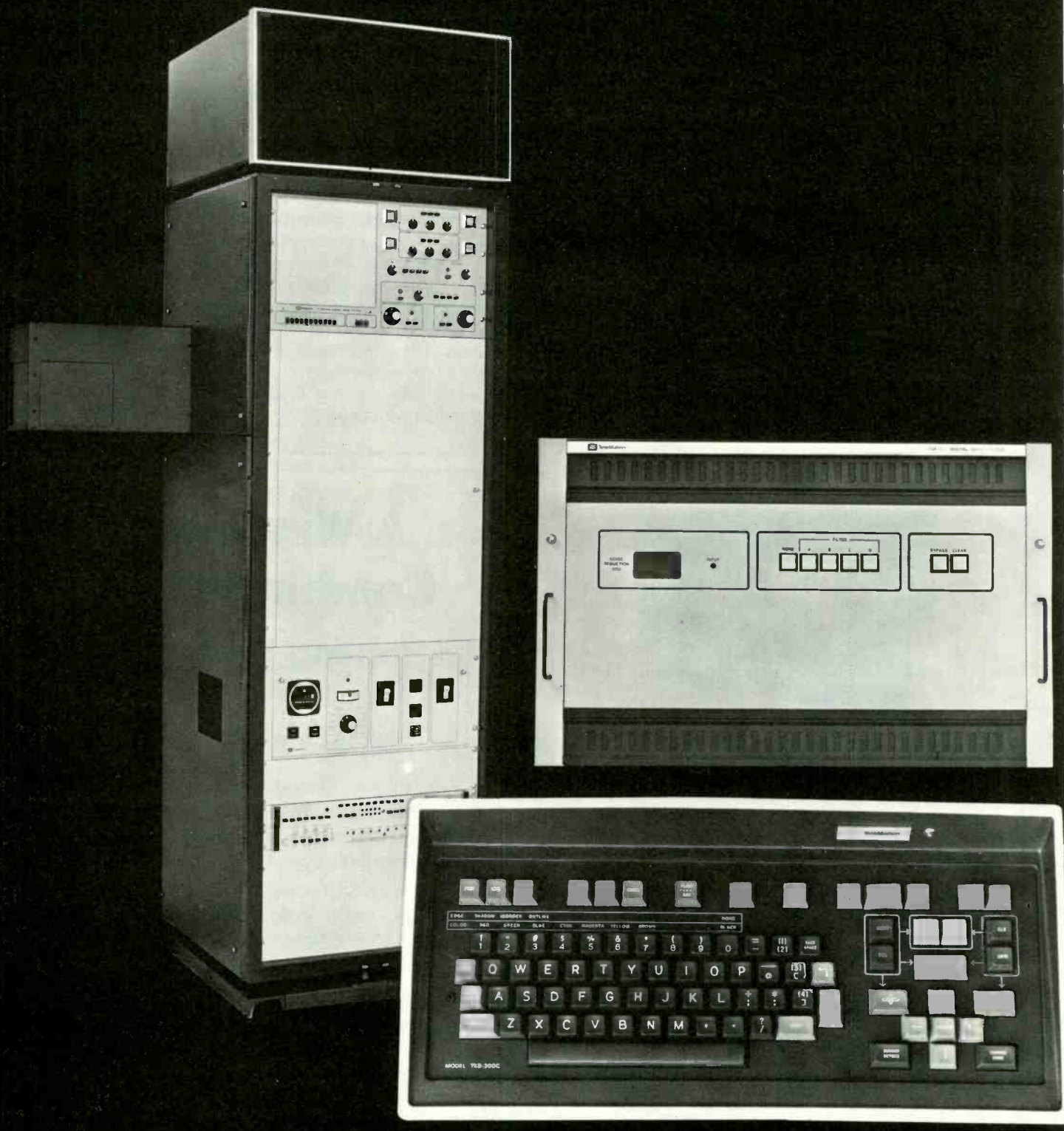
Beyond the language, the microprocessor in each case makes possible a number of operation modes not available before that simplify the operator's job and cut down on error. These require considerable memory, too, another reason for being thankful for the drop in memory costs. The overall result — extremely high efficiency — is roughly similar for the three systems, although they differ in details.

Some of the special microprocessor-based capabilities of BE's "Control 16" (in addition to the regular item entry and read-out common to all automation systems) are these:

- An automatic memory search allows the operator to call up any upcoming item of a certain type; for example, an ad from a given advertiser, or an item scheduled at a certain time for identification, cancellation, rescheduling, or whatever;
- The system has 11 functions, each called up by a single button (which can be altered by changes in the software), such as linkage of named items, simultaneous playing of two items (voice over music, for example), firing an external relay, etc;
- The operator can call up a readout of what's happening on the log at any time and can call up as many as 72 items set to go at named times;
- Machine assignments can be called up at any time, and altered from the keyboard; again, software takes the place of hardwiring, and makes possible instant changes that would otherwise call for extensive rewiring of the automation interface to source equipment. There is much more, along the same lines.

The Cetec-Schafer 7000 and the IGM BASIC have somewhat different sets of operation modes, but they are of the same general type in providing operational flexibility and sureness far beyond those found in medium-level automation before the microprocessor came. Moreover, the obvious point must be made again: almost any operational sequence a user wants with these automation systems can be provided by putting it in the software or firmware, the ROMs that all these systems use for basic instructions. The shift from hardwiring to software is the grand gift of the microprocessor to the operators of radio broadcast stations, and it is hard to imagine a gift with richer potential for aiding them. **BM/E**

New from TeleMation



Introducing a state-of-the-art digital noise filter that costs less.

From input to output, the 8-bit TDF-1 represents an entirely new approach to digital noise reduction. At the input, we've included a full, broadcast-quality processing amplifier that completely regenerates incoming sync pulses. The TDF-1's charge-coupled device (CCD) memory offers the same high performance as RAM systems at a significantly lower cost. We've also increased the video sampling rate from three-times-subcarrier to four-times-subcarrier for greater bandwidth and resolution. And maintenance of the TDF-1 is made simple by a built-in diagnostic system.

A graphics system with off-line archival storage.

Everyone who uses an electronic graphics system has their own artistic requirements. With the new Compositor I™ memory system, each of your clients (or departments) can use the fonts they like and logos they need to create up to 999 graphics on a low-cost, removable cartridge disk. At the end of their taping session, they simply take out the cartridge and put it on the shelf. The next user (such as your news department) can then load another cartridge containing different fonts, logos, and pages and be on line in seconds. And, with the new dual disk system, you can copy directly from one cartridge to another.

What else is new with Compositor I? Fonts! More than 40 fonts are now available, including weather symbols, graph characters, and foreign fonts. And Compositor I's are now in use in PAL countries.

A microprocessor-controlled distribution switcher.

The new TVS/TAS-1000 Distribution Switcher microprocessor option can be programmed to perform salvo switches of multiple crosspoints simultaneously. Eight (or more) different salvos can be loaded into the system's memory and previewed by the operator before the live switch is executed, virtually eliminating the possibility of error. Other new control options include X-Y panels, where the source is selected with one button and the destination with another, and category-number selectors, where the input is selected by a name key (such as "VTR," "Camera," "Studio," etc.) and a number key.

A telecine camera that replaces GE units quickly and easily.

A new optics kit allows the TCF-3000 Broadcast Color Film Camera to replace GE 240 and 240-format cameras without so much as moving a projector or changing a lens. The TCF-3000 also gives you true hands-off color balance and color correction, automatically correcting poor-quality film without disturbing balance or gamma tracking of good film. This long term operational stability is made possible by unique, temperature-compensated sampling and control techniques. The TCF-3000 has several other advantages over competitive units, such as lower noise, more detail in black, and superior color separation. And a fully-remotable six-vector color corrector is available as an option.

For more information about these TeleMation products, circle one of the numbers below or contact:
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Comparing Computer Power

By James Craig Ziegler

Rapid changes in computer technology have led to a pantheon of minis, micros, large minis and mainframe computers. All these types of machine intelligence vary greatly in cost, complexity and power. Which ones are best suited to the jobs at broadcast stations?

IN THE LAST FEW YEARS we have seen many uses of computers in the broadcast station. These start with simple functions for the accounting department and range through automation of sales and traffic bookkeeping, switcher operation, radio station automation and even to programmed play lists for radio formats. Many different types and sizes of computers have been used for these applications, and new ones are constantly being marketed. How do you know which one to use, what to look for in making your selection? To answer these questions, let's first look a little closer at what a computer is.

What is a computer?

A computer is a machine for storing information and following instructions describing in step-by-step fashion what to do with that stored information. To understand how one works, look at its functions separately (Figure 1).

The heart of the computer is the central processing unit (CPU). This is the part that follows the step-by-step list of instructions called the computer's program. The CPU gets these instructions from another part of the computer called the memory. Each instruction can cause the CPU to get some data out of the memory, put some data into the memory, get some data from an input unit or put some to an output unit. The process of following the list of instructions is called executing a computer program.

The computer's memory is like a blackboard on which the central processing unit can write, erase and rewrite information. It stores data and instructions and can be changed constantly by the central processing unit during program execution. It must generally operate at a high speed to keep up with the CPU and other parts of the computer.

The input units bring data into the computer when the CPU executes an instruction calling for this data. A typical input unit might be a typewriter or a cathode ray tube display with keyboard (CRT). Computers can also have input units that monitor such things as temperature (which might be used in a program to control heating and air conditioning) or switches (a button being pushed on a switcher console). Other pieces of equipment can also serve as input devices for a computer. For example, media identification information can be transferred to a computer from a cartridge video tape playback unit.

Information is transferred out of the computer by output devices when this is called for by the appropriate program instructions. Typical output devices would include typewriters, CRTs or high speed printers. Computers can also output signals to operate switches, such as to turn on a tape deck or operate valves to adjust the flow of cool air in an air conditioner, for example. As you can see, some input devices can also be used as output devices, as in the case of a CRT or typewriter.

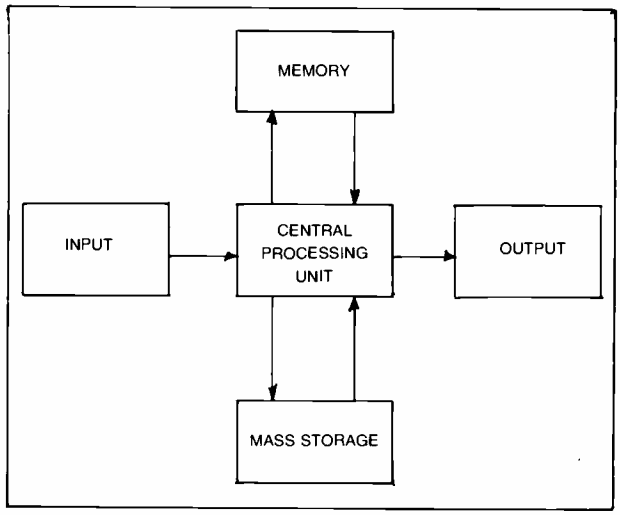

Fig. 1. Functions of a basic computer

The last major element of our computer is the mass storage device. This is actually both an input and an output device, but its uses are specialized enough to warrent a separate description. Not all computers have mass storage—indeed, not all can—but where used it serves as an extension of the computer's memory by providing a much larger, although slower, storage area for programs and data. Another important feature of mass storage is that its storage is generally permanent. The memory of the computer may be unable to retain data during a power failure, however.

How do you compare computers?

Each of the parts of the computer can be built in many ways. The inclusion of certain features in the design can make a large difference in the computer's performance. Extra cost usually brings higher performance, but in some cases extra cost features which make the machine faster for some problems can make it slower for others. Design elements should be carefully evaluated when selecting a computer. Let's look at some of the more important ones.

One of the most important factors is the size of the information the computer is designed to handle at one

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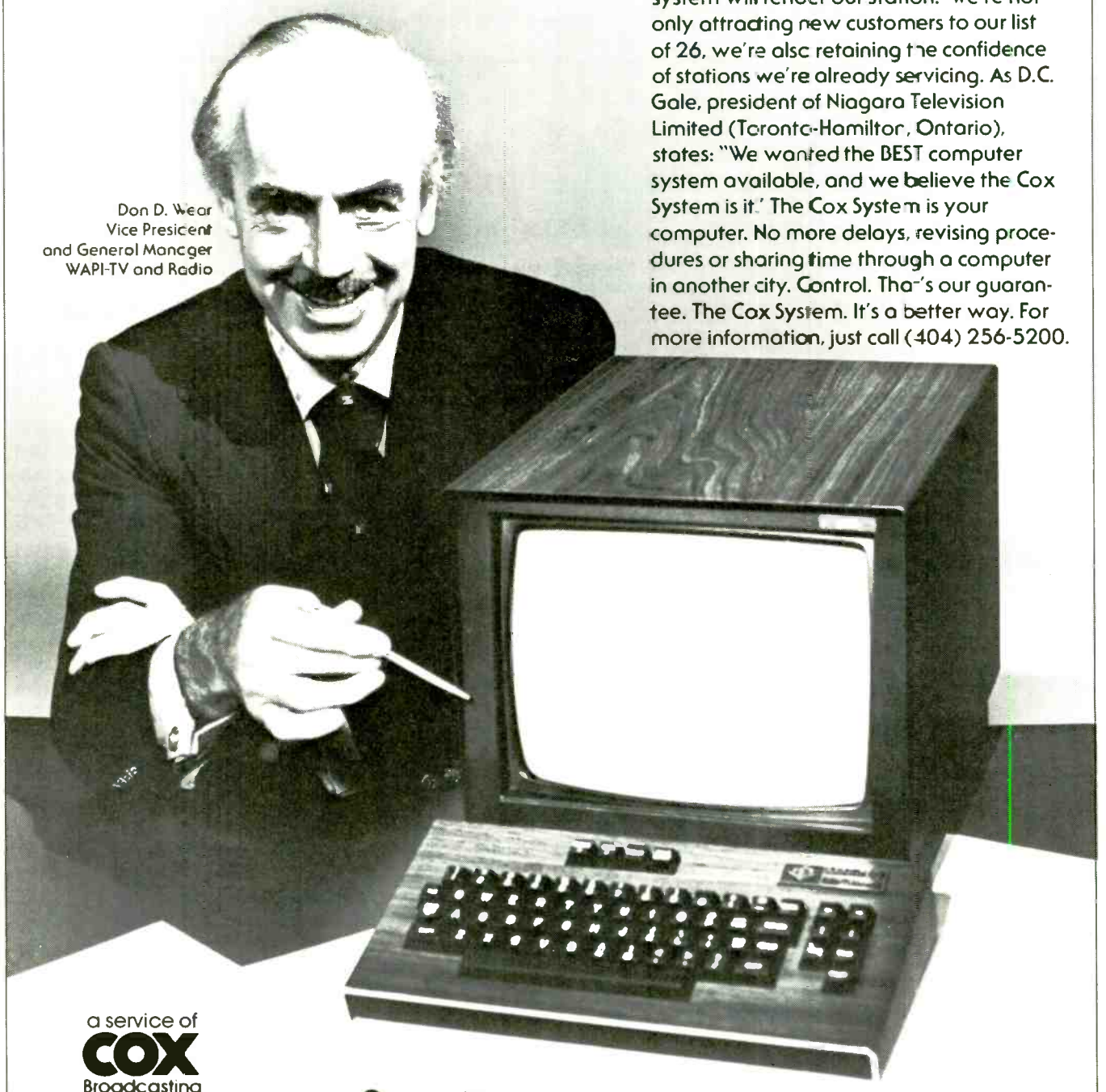
Mr. Ziegler is senior vice president of Data Communications Corp., and as such was instrumental in developing the Micro BIAS system.

"Cox Data emerged clearly a winner."

That's the opinion of Don D. Wear, vice president and general manager of our newest customer, WAPI Television and Radio, Birmingham — which began using Cox Data's television automation system June 26. As Mr. Wear explains, "Our decision was reached after minute comparisons with other types of television computer control systems, and Cox Data emerged clearly a winner. We eagerly look forward to the many capabilities that your splendid system will render our station." We're not only attracting new customers to our list of 26, we're also retaining the confidence of stations we're already servicing. As D.C. Gale, president of Niagara Television Limited (Toronto-Hamilton, Ontario), states: "We wanted the BEST computer system available, and we believe the Cox System is it." The Cox System is your computer. No more delays, revising procedures or sharing time through a computer in another city. Control. That's our guarantee. The Cox System. It's a better way. For more information, just call (404) 256-5200.



Don D. Wear
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and Generol Mancger
WAPI-TV and Radio

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cox data services

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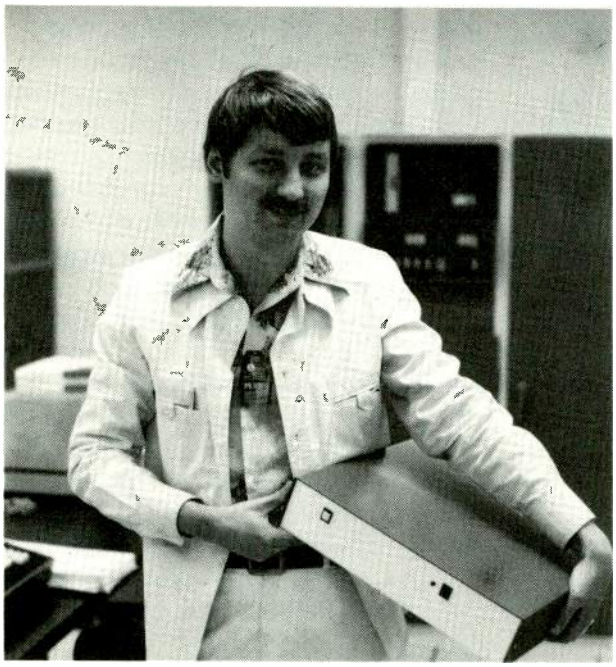
Comparing Computers



Jim Zeigler holds the microcomputer that he designed for use in the Micro BIAS program at DCC. This tiny computer is capable of doing the work of minis several times larger

The other end of the spectrum in computer size and power is the two Tri-Processor Burrough's 6700s which can handle all the business and traffic affairs of the more than 180 radio and TV stations in the U.S. and Canada that are BIAS clients

time. This is called the word size, and is measured by the number of bits per word. Computers are currently available with word size anywhere from four to 64 or more bits per word, though eight and 16 bits are most common in mini-computers and microcomputers. Sixty-four bit or larger word size would be used only in the largest commercial computers. To understand the difference these sizes make, consider that a computer with a four-bit word can only store, in each word, a number smaller than 16, while a computer with a 16-bit word, only four times larger, can store a number in each word up to almost 65,000. A computer that uses a small word size must use multiple words to hold numbers which, in a computer with larger word size, could be stored in one word. This can cause two computers with the same number of words of memory to be very different in their capacity to handle information.

Word size also has an effect on the speed of a computer. For example, if the computer's memory is capable of retrieving one word in a given amount of time, a computer with a larger number of bits per word that can retrieve information in the same amount of time will be capable of processing more information, since each word contains more. Because of this, some computers even have a larger memory word size than can be handled by the central processing unit. This allows a slower memory to service a faster CPU, since each reference to the memory brings out enough information for more than one instruction. On the other hand, some computers use a larger word size in the central processing unit than in the memory. This allows a less expensive memory unit to be used, but eliminates the requirement that large numbers be managed with several instructions by causing the CPU to wait for more than one memory operation between the execution of each instruction.

The speed required of the memory is affected by the size of the memory words and the CPU speed. It can also be affected in some computers by the speed of the input and output units. If input and output operations are proceding simultaneously with program execution, the memory must be able to handle the combined speed of the CPU plus all of the devices in simultaneous operation.

Another factor affecting the cost and performance of a computer system is the overall size of its memory. The actual size (number of words) of a machine's memory is important, but also important is the maximum size of memory that can be attached. In general, the more memory, the higher the performance that can be obtained from the machine, (and, of course, the higher the cost). A large memory size can be a disadvantage in some cases, however. The computer's instructions for storing or retrieving information must contain, as part of the instruction, a number designating where in the memory the information is stored. As the computer's maximum memory size gets larger, so does the size of these memory referencing instructions. Therefore, if your problem can be solved with a small program, it will take more memory to contain this program on a machine with a large maximum memory size than it would take on a machine with smaller maximum memory.

We have considered memory so far to be capable of storing and retrieving information, although large portions of memory may never be changed. Consider a computer operating a remote transmitter. Although set points and parameters may vary, the program for checking each of them and making adjustments to the transmitter will probably change only infrequently. Program information can be stored in a special type of memory called read only memory (ROM) which is lower in cost than the normal

continued on page 74

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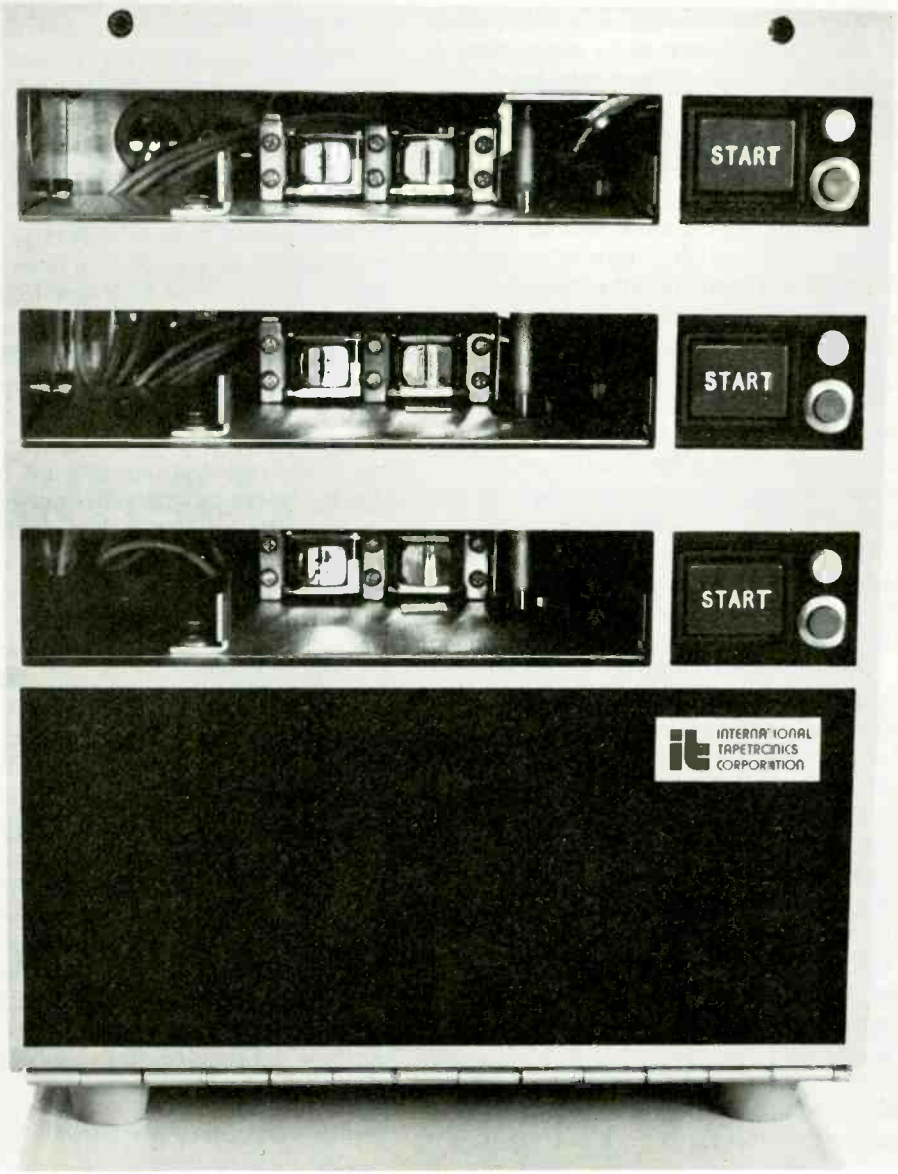

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computer memory, but is capable only of being read by the central processing unit. This can be a great advantage since a read only memory will not be changed during a power failure.

One of the most important and most elusive measures of computer performance is the power of the instructions it can execute. The total of all the different instructions the computer can perform is called the computer's instruction set. This can be a confusing measure by which to compare computers, for there is no standard established for describing and comparing instruction. It may not even be possible for there to be such a standard, as instruction set designs are one of the most widely variable features of modern computers. It is important, however, to make some such comparison, as an inefficient instruction set can easily make one computer run 10 or 100 times slower than another that is otherwise identical. For example, if your program needs to move 10 numbers from one place in the computer's memory to another, some computers can perform this operation in one instruction. In contrast, one of the popular microcomputers uses 63 instructions to do this. Obviously, even if these two machines executed their instructions at the same rate, one of them would be performing almost 100 times faster than the other.

A rough comparison between the instruction sets of two computers can be made by simply counting the number of instructions in each set. But be careful, because some manufacturers count differently from others. If a computer has an instruction to add numbers it may come in two versions, almost identical but having slightly different uses. One might add two variables together while the other might add a constant to a variable. In some manufacturer's literature this would be counted as one instruction with two "addressing modes," while others would count two separate instructions. Comparison of instructions sets can only be effective when the same procedures are used in all cases to calculate the size of the set.

There are several other features than can be present in a computer and provide dramatic improvements in performance. Some of these may be standard with some computers and not available in others, or they might be available as options for an additional cost. Most significant of these features are direct memory access and interrupts.

Direct memory access (DMA) is a means of speeding the processing of input and output by letting a separate part of the computer, called a DMA controller, handle the details of input and output (I/O) operations while the CPU continues to execute other instructions. In a computer without DMA, the central processor may have to execute a series of instructions to bring each character of input from the mass storage device and send each character back. In most small computers, the amount of work involved in performing this transfer is so great that it can consume the resources of the whole CPU. During transfer to mass storage, no other processing can occur. With DMA, the processor executes an instruction at the beginning of the transfer that causes the DMA controller to start the I/O operation. Then the central processor can continue with normal program execution while the operation is in progress. Mass storage operations done in this fashion may take less than one percent of the resources of the CPU. DMA is a powerful feature in applications requiring mass storage operations, but it is costly. If mass storage operations are required relatively infrequently, and other operations can be suspended for their duration, it is an option which can be done without.

Interrupts reduce demand on the central processor by eliminating constant checking for the occurance of an event which happens infrequently, but to which the computer must respond quickly. For example, a video switching computer must check a manual override button much more frequently than once every second for its operation to be judged satisfactory when manual override is required, but a manual override may occur only once per hour. If the computer must check many times per second for an event that happens only once per hour, a great deal of its powers are wasted. The interrupt is a feature which allows the computer hardware to do this checking automatically, without being given specific instructions to do so. Then, when the event being checked for occurs, the CPU is immediately forced to depart from its normal program execution to the sequence specifically designated for handling the interrupt. There may also be provision for more than one type of interrupt, with the type being checked by the program after the interrupt has occurred. An even more sophisticated form of interrupt option may be present, called vectored interrupts, which allow a separate sequence of instructions to be designated as the interrupt sequence for each type of interrupt.

Equipment which can be used for mass storage includes computer-controllable tape and disc recording devices. While the use of tape equipment for mass storage was once prevalent and is still used occasionally because of its low cost, disc equipment is more likely to be the mass storage device of choice. This is due to the overwhelming advantage of being able to quickly access information anywhere on the disk by moving a recording head to the proper position. The problem with tape equipment is that large amounts of time are required to wind the tape forward or backward to the position of the data of interest. Mass storage capabilities vary from computer to computer. The smallest may not even be able to use mass storage, and one of the performance comparisons between machines is the amount and speed of mass storage that can be attached.

How do computers compare?

Rather than being clearly distinguished, mini- and microcomputers form a whole spectrum of machine sizes from the smallest single-chip computers to super mini-computers which can perform as well as large commercial computers. There are no clear dividing lines between micros and minis. Indeed, some of the largest super mini-computers are built from collections of micros, and in most of the new mini-computers, microcomputer chips are used as construction components.

The smallest computers available today are called single-chip microcomputers. These are entire four- or eight-bit computers constructed on a single integrated circuit chip. They include 1000 to 2000 words of read only program memory on the chip, 100 to 200 words of main memory and 10 to 30 single-bit input or output lines. They may have one or two interrupts and may have some provision for expansion. These single chip computers cost as little as $10 to $100 each, and find application as low level equipment controllers for such appliances as wash-

ing machines or microwave ovens. They may be found in the broadcast station in programmable instruments and similar equipment.

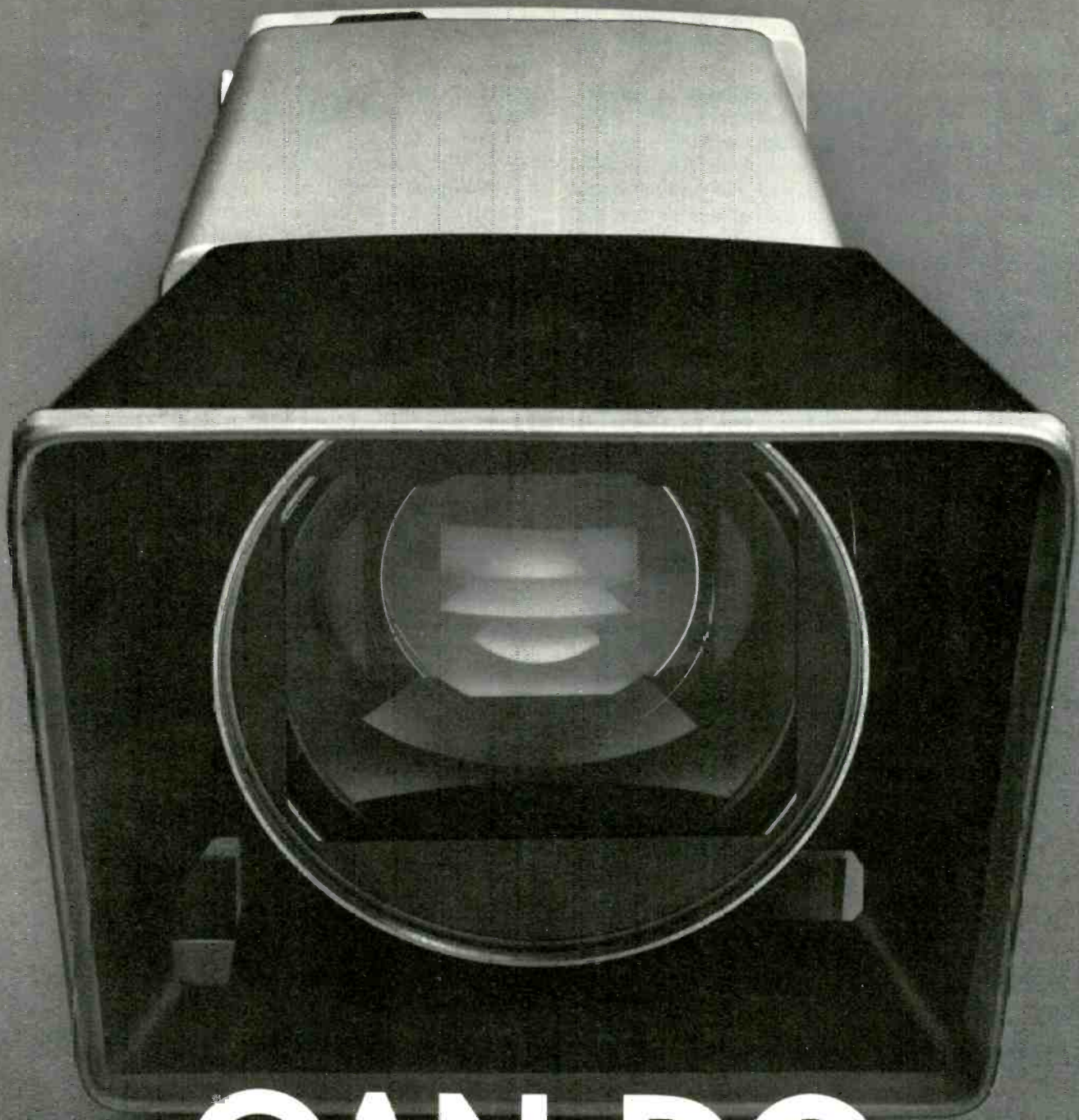
The next level of computer complexity commonly available is the modular single board computer. These usually use an eight-bit word width, although some are available with four- or sixteen-bit words. They usually contain a single chip CPU along with 4000 to 8000 words of read only program memory and one to four thousand words of data memory. They usually have 10 to 30 single-bit input or output lines on the board, and may have some provisions for DMA or interrupt capability. There are generally provisions for expansion of the memory and for adding additional input or output devices. This type of equipment would sell for $100 to $1000, and in the broadcast station could be used for connecting remote terminals to another computer, providing a limited amount of intelligence at the terminal location, and comparable applications.

Small eight- or 16-bit computer systems with 8000 to 64,000 words of program or data memory and a general purpose, flexible structure for connecting input/output devices verge on the capabilities of traditional small mini-computers. This size machine would have direct memory access cabability and probably vectored interrupts, and would be capable of operating slow to medium speed mass storage equipment. Costing $1000 to $10,000, it is used for simple accounting chores, station play list scheduling, transmitter data logging, election return tabulations and similar problems.

Medium size mini-computer systems are generally 16-bit machines with 16 to 256 thousand words of memory, and able to handle fast, large, mass storage systems with extremely fast DMA and vectored interrupt systems. They may also be able to perform simultaneous multiple input and output operations to mass storage. Machines in this class have significantly larger instruction sets than the smaller machines and come with software support allowing sophisticated operating modes, such as multi-tasking and multi-programming, which allow the user to perform several jobs at once on the same machine. This type of machine can cost from $10,000 to $100,000 and is suitable for general purpose accounting operations, automated video switching, automated radio station operation or automated remote transmitter operation.

Today's largest mini-computers are becoming virtually indistinguishable from the smaller models of the largest commercial computer family lines. These machines will use word widths of 16 to 32 bits (or more), have from 64,000 to several million words of memory and are capable of multiple simultaneous high speed input and output operations. These machines cost well over $100,000 and rival the traditional mainframe computer in power. Some even use the same software and operating systems as the traditional equipment.

Today's micro and mini-computers offer gradually increasing power and capability with increasing cost. The important point is not how the machines are built or what they are called but what they can do. Some of the new micros can outperform the smaller mini-computers, and this trend will continue as new microprocessors continue to be introduced. The challenge remains to pick the machine that gives the best trade-off between cost and required performance. **BM/E**



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Circle 151 on Reader Service Card

Software — The Invisible Product

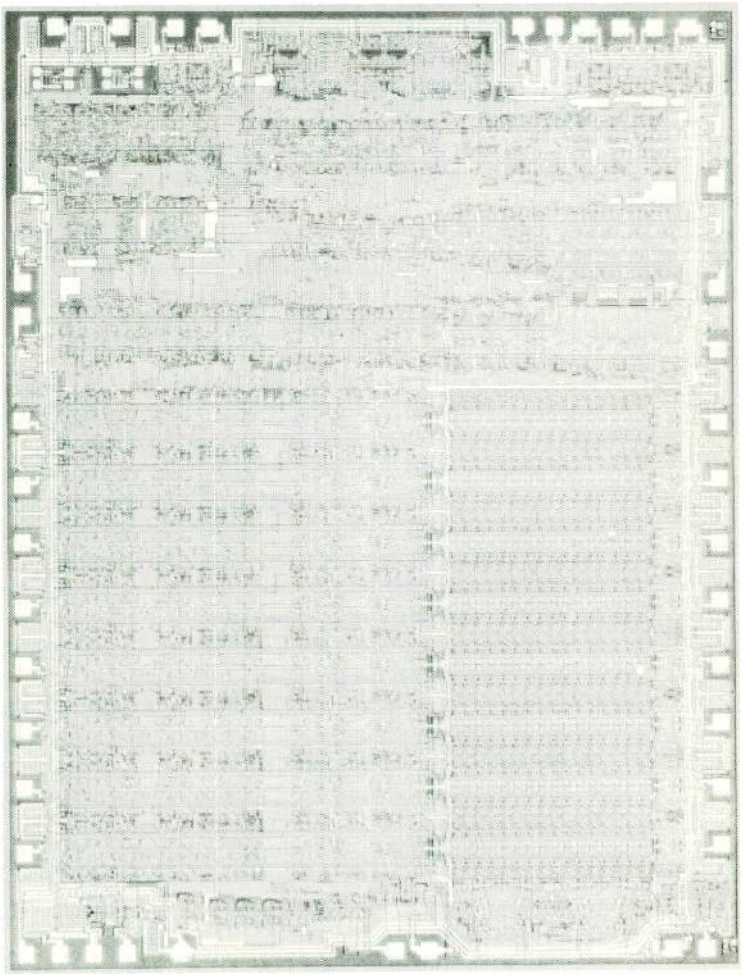
By Tom Meyer

Are microprocessors low cost computers or compact replacements for large logic circuits? Yes! And much more!

PACKAGED MICROCOMPUTERS with general purpose *microprocessors* and problem- or function-oriented software (BASIC, Fortran, Cobol, etc.) offer cost effective answers for many business and engineering needs. Complex control sequences have been implemented in products ranging from microwave ovens to automotive emission control systems using specialized microcomputers carefully matched to software designed for the *specific* application.

A *microprocessor* is the central processing unit (CPU) of a computer, reduced to a single integrated circuit; it provides arithmetic, control and interconnection facilities which are the heart of a computer system. A *microcomputer* is a *system* which includes a microprocessor, program and data storage (memory), interfaces for external equipment and a software package which establishes the system's functional characteristics. Single integrated circuits containing a CPU, memory and interface "ports" are specialized microcomputers used principally in high volume, control applications. The product provided by a microprocessor-based system is the function which it performs, as determined by its program — the program *is* the product.

Microcomputers are categorized by membership in one of two social strata — general purpose or dedicated control. A general purpose system usually contains changeable memory which can digest a variety of programs to perform functions ranging from disciplining errant checkbooks to estimating the probability of a visit by the FCC; these programs generally allow user manipulation to adapt functions to local customs or establish new habit patterns. The system will usually operate a variety of



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

external devices ranging from switches for sprinkler systems to color graphic displays. General purpose versatility is achieved only by accepting certain penalties: the system will contain components not needed by all users and general use programs occupy more memory space and operate more slowly than special function programs.

Dedicated control systems are the specialists of microcomputer society. A microprocessor employed in this field is chosen for maximum compatibility with a specific application. Careful trade-offs are made between hardware and software functions to yield a system containing the minimum hardware consistent with a compact, speedy and reliable program. Programs are usually housed in non-changeable memories to provide maximum protection against a world generally hostile to computers. External associations are limited to the specific devices required by the intended system function. Advanced control systems have specific provisions for communication with other computers to permit orderly cooperation with other systems and to accommodate custom functional needs. A well-bred control system contains a specific provision for rapid and logical location of faults within its area of responsibility.

Microcomputer-based products provide several distinct advantages:

- Sophisticated features can be provided at cost comparable to less capable products built with discrete components;
- Performance upgrades can be accomplished at moderate cost by simple replacement of the program module;
- Hardware reliability is increased and fault isolation is simplified by significant reductions in component quantities; and
- A single microcomputer may be used in several different products with different programs, greatly simplifying spares stocking and technical support requirements.

A product is an item which performs a valuable function and is produced in quantity in a *fixed form;* this definition applies equally to matches, metronomes and microcomputer-based products. The design steps for a microcomputer-based product are identical to those taken for any reputable electronic product:

- Establish the value of the functions to be performed;
- Define the functions precisely;
- Build a working prototype and thoroughly test its capability to perform the required functions, in its intended environment, for its intended user;
- Thoroughly document the product for manufacturing and maintenance.

A product program is developed according to the steps outlined above; the tools and techniques are quite different from those used to design other types of products. The functional characteristics are first described by a "software schematic," the flow chart, which maps the path the microprocessor will follow to provide the desired functions. This flow chart must also map all detours which may be required by varying conditions, and must further specify what condition is associated with each detour. (This wonderous process is called "conditional branching" — so named because the wrong choice of condition places the programmer out on a limb.)

When the programmer has convinced himself and at least one skeptic that the flow chart depicts a workable program which solves the correct problem, he proceeds to reduce it to a series of instructions which the CPU can recognize; this process is known as "coding." One look at a program listing will establish the accuracy of that terminology.

Program coding can be done directly in the CPU's native tongue, the "object program" — a series of "words" written in ones and zeros (10110110, 00110101, etc.). This is not recommended for programs requiring more than 10 instructions, as it tends to cause programmers to emit distinct ticking sounds. Most control programs are coded in assembly language, which is a set of pseudo-English mnemonics for the various instructions (ADD, JMP, STO, IN, OUT, etc.). Programs coded in assembly language are converted to the object program using a computer and a program referred to as an "assembler." A product engineering group normally uses a general purpose mini-computer for assembly and initial test of microcomputer programs. This type of system can support several different types of microprocessors, which can be selected for an optimum match to a specific application.

Program coding can also be performed in high level languages (the closer to English, the higher the level), which can reduce coding and test time by a factor of 10 or more. The high level languages now available for use with microcomputers, such as BASIC, tend to be unsuitable for most control applications due to low speed, large program size and limited capacity for operation of external devices. New languages designed specifically for real-time control applications are in process; a promising entry is PASCAL, which can run in a wide variety of CPU's without change and contains pre-defined branching facilities to simplify program path selection ("structured" program elements which guide the programmer away from the ends of limbs). These specialized languages require the use of a general purpose mini-computer to produce microcomputer object programs.

Program test and "de-bug" is the most demanding phase of program development; test situations must exercize all program paths under "worst case" conditions. Test programs, often larger than the product program, are frequently required to establish a suitably regorous environment. The test cycle must include operation of the product by typical users. A complete, tested and documented program is a true product; housed in a few integrated circuits, it looks deceptively small, but represents a major financial commitment by the manufacturer and a significant, professional effort by the designers who have created it.

Product programs are intended for quantity use in a fixed form; there is no such thing as a "little" change. Any change in this type of program requires a return to development step two, "Define the function precisely," and *all* that follows if the program is to provide the reliabiltiy of a true product.

Custom functional requirements are the special province of organizations established specifically to fill such needs, and several capable groups are available to serve the television community. A custom system normally uses a general purpose mini- or microcomputer connected to external control interfaces of standard products; the external interface should be a standard feature of most microcomputer-based products. **BM/E**

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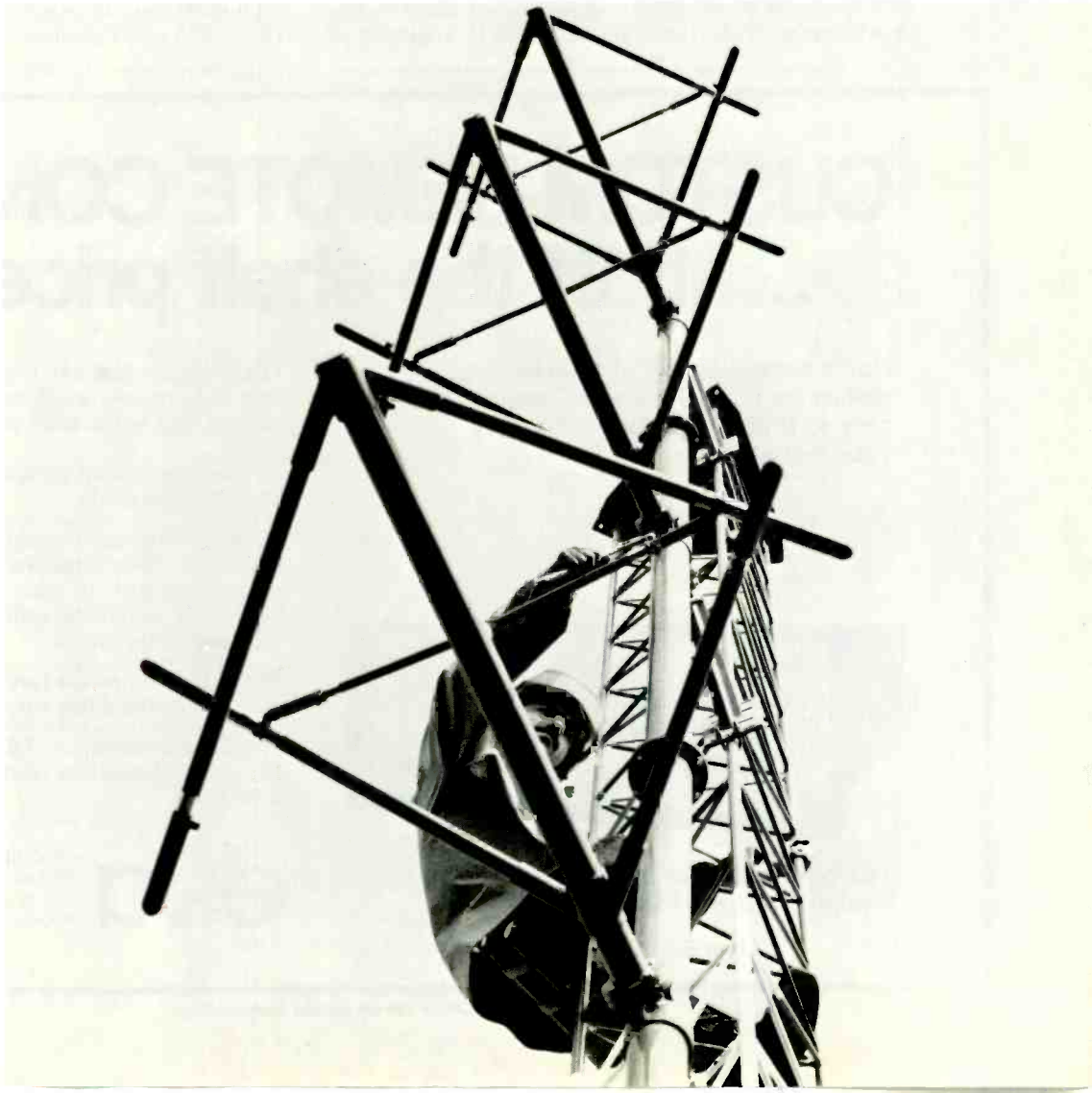

Audio Demonstrates Continued Vigor At West Coast Meet

The forward movement of digital technology made an impressive showing at the recent Audio Engineering Society Convention in Los Angeles. Also notable were reports on advances in several other areas, some of special interest to broadcasters.

CONTINUING ITS STRONG UPSWING of recent years, the Audio Engineering Society drew to its 60th Convention, Los Angeles, May 2 thru 5, its largest number ever of attendees (about 5100) and exhibitors (about 130), and presented the longest list of technical papers (nearly 80) — all records for the West Coast show.

But more important than the statistics was the show's demonstration of the great vigor of audio research and development, with significant advances in a number of areas. Topping the list were the papers and exhibits on digital audio technology from about a dozen firms. They showed this revolution in audio recording beginning to establish itself, but with wide-scale use still some time away.

Two firms, Soundstream and 3M, showed digital recording machines actually in production — both have been described in earlier issues of *BM/E* (see February 1978). 3M says that three machines will be produced this

year, and quite a few next year; the company reports many more orders than it can fill. Until production is on a more regular basis, 3M will lease machines only, with a $10,000 installation/reservation fee and a $4000 monthly rental charge.

Soundstream is supplying, with considerable success, a complete digital recording service, available for any location. Included in the service are Soundstream's four-track digital machine and electronic digital editing system, as well as microphones and all other necessary equipment. Soundstream carries out the whole operation from microphone placement to delivery of a completely edited tape to the disc cutting service, followed by cooperation with the cutting organization in producing disc masters.

Dr. Tom Stockham, president of Soundstream, told *BM/E* they have made improvements in their machine — for example, the high frequency limit is now above 21 kHz — with the objective of providing the absolute top quality potential of the technique. He said he is concerned with establishing a quality level for digital technology that is not lowered by price or engineering compromises. The Soundstream service has been used for a number of commercial recordings, and more are on the way.

Other firms with digital displays were Mitsubishi, with a tape machine and a laser disc machine; JVC, with an adapter for putting digital audio on their VHS videocassette recorder; and Panasonic, with a prototype digital tape recorder. Sony did not exhibit, but the Sony adapter for putting digital audio onto the Betamax tape recorder was in use in a system for demonstrating loudspeakers for Cerwin-Vega.

Among the dozen papers on digital technology were several from JVC, Mitsubishi, Matsushita and Sony, analyzing in depth the underlying technology of error correction, editing and other aspects of the technique. There was also an excellent overview of digital audio as a whole by Alistair Heaslett of Ampex Corporation, and a good general treatment of coding for digital audio by Paul Rudnick, also of Ampex.

A session on broadcasting offered three papers on satellite distribution and its effects on broadcasting audio in the 80's (see "Audio for the '80s," *BM/E*, October 1977). Wayne Hetrick of National Public Radio described in detail the audio characteristics of the satellite net being planned for NPR: it will deliver top-grade audio to all NPR stations around the country, using a noise reduction system for a signal/noise ratio close to 70 dB.

Richard Knowles of the Canadian Broadcasting Corporation described CBC's FM network, which distributes programs across the whole breadth of Canada to about 10 stations in the largest cities. Transmission is by dedicated telco microwave, in stereo, with a bandwidth of 50 — 15,000 Hz and other characteristics to match. Stations on the net also have stereo production facilities and can originate programs and send them in stereo to headquarters in Toronto, on the net. Programming emphasizes classical music, public affairs, news and drama. The system is automated in the sense that time zone delays are automatically inserted, with a four-hour difference between the east and west coasts. **BM/E**

Is That Station Really a Bargain? Financial Considerations For The Prospective Station Owner

By David E. Schutz

There are relatively few broadcasters who have not toyed with the idea of owning their own station. Frustrated by inefficiencies or unrealized potential where they work they often observe, "If I owned the station...!" This is the first half of a two-part article that examines the basic economic and financial factors that affect the operations and hence the value of every commercial station.

ECONOMISTS NOTE THAT A HOUSE is the largest purchase made by most people. If you are a broadcaster, however, you have probably considered something much larger — a broadcast station. Unfortunately, many prospective station owners harbor dangerous misconceptions and inflated expectations as to their ability to instantly transform a marginal station into a highly successful enterprise. The business graveyard contains the tombstones of competent broadcasters who allowed their dreams to mask the economic realities of the stations they purchased. This discussion is not intended to diminish your enthusiasm for station ownership. Rather, it should impress you with the need for careful analysis of the economic and financial aspects of your "dream station."

The principles and concepts that will be examined can be applied to either radio or television. Since the supply and prices of radio stations make them more accessible to the first-time owner, this article will concentrate on that medium. In order to facilitate the presentation of different concepts, frequent reference will be made to a hypothetical station, WDES, which is located in a hypothetical market. It will be assumed that the station is being offered for sale at a price of $250,000. The primary question confronting the prospective buyer is whether this is a fair price.

David E. Schutz is an independent consultant who specializes in the economic and financial aspects of the broadcasting industry. From his office in Arlington, VA he performs station valuations, management analyses and economic feasibility studies for new stations. Prior to establishing his own company he served as an associate of the consulting firm of Frazier, Gross & Clay, Inc.

Schutz started his career in the technical segment of the industry. His first job was as chief engineer of WERI AM/FM, Westerly, RI. From there he moved on to staff positions at WENY-TV, Elmira, NY and WTEV-TV, Providence, RI.

The key to station value is profitability

There are people who will pay inflated prices to acquire ownership of a specific station. These individuals may seek the satisfaction that is derived from owning a station in their home town. Such situations are in the minority. Overall, the prices paid for stations reflect the future earnings (profits) that they will likely generate. This relationship of price to earnings is not unique to the broadcasting industry. In fact, the value of virtually all types of business enterprises is based upon present and future earnings.

It is easy for an interested buyer to determine the *present* earnings of a station. A quick examination of its Income Statement will reveal the magnitude of its "accounting" profit or loss. The difficulty arises in estimating its *future* earnings, since these will be influenced by factors which are beyond the control of the station's owner.

continued on page 84

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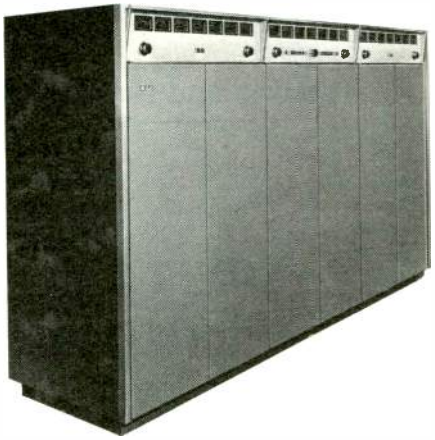


RCA

Financial Considerations

Market analysis

Broadcasting stations derive virtually all of their revenues from the sale of advertisements for specific products and local retail establishments. The total advertising expenditures in a given market are functions of its population, disposable income and retail sales. Therefore, the first step in estimating the potential of a station is to determine the vitality of its local market. The local Chamber of Commerce, state sales tax office and Bureau of the Census can provide valuable data regarding these characteristics. In addition, there are commercial publications, such as Sales & Marketing Management's "Survey of Buying Power,"[1] that provide valuable information.

Over time, changes in population, disposable income and retail sales will affect the pool of advertising revenue that is available to the local stations. Hence, it is very important to know how the local market is changing. Figure I shows a method for comparing the expected growth of the basic characteristics of our hypothetical market with those of the country overall. Since the growth rates are close to the national averages we can consider this market "normal."

The Federal Communications Commission publishes valuable information regarding the overall revenues and expenses of stations in its "Annual Financial Reports." If your market has three or more AM stations and/or a like number of independent FM stations it will be afforded separate treatment in the publication. Comparison of a market's total radio revenues with its population and retail sales will help you determine whether the market is "over or under sold." To illustrate, data extracted from the most recent radio report shows that the national average for radio revenues is $9.35 per person. Likewise, $3.05 in radio revenues were generated for each $1000 of retail sales. How does your station's market compare? If it is substantially below these levels there could be untapped revenue potential.

When examining a market, there are other factors which you should consider. Is the local economy dependent on a single industry or employer? If it is, your station will be exposed to additional risks. Consider the recent experience of Johnstown, Pennsylvania! The flood wiped out much of the employment and a good deal of the purchasing power in one wet moment.

[1] Sales & Marketing Management's "Survey of Buying Power" is published annually by Bill Publications, New York, NY.

Fig. I
General characteristics of a hypothetical market

Characteristic	Present Value	Projected Value in Five Years	Five Year Growth	National Average
Population	169,000	175,400	3.8%	4.0%
Disposable Income	$928,000	$1,392,000	50.0%	55.0%
Retail Sales	$530,000	$795,000	50.0%	55.0%
Comparison of Radio Revenue to Market Characteristics				
Total Radio Revenue[1]	$1,590,000	—	—	—
Radio Revenue per person	$9.40	—	—	$9.35[2]
Radio Revenue per $1000 of Retail Sales	$3.00	—	—	$3.00[2]

[1] Net Revenue for AM & AM/FM and independent FM stations in the market as it might be reported in the FCC's "Radio Financial Report."

[2] Present ratio.

Competition

When broadcasters think of their "competition," they are likely to focus their attention on the other stations in the community. While this is the most direct form of competition, a knowledgeable buyer realizes that it is not the only type. Even in single-station markets there will be competition from the weekly newspaper, billboards and even the "Yellow Pages."

A key element in station evaluation is to determine the saturation of local media. There is a market in New York State which has a population of 100,000 and attempts to support seven radio stations, two television stations, plus daily and weekly newspapers. In such situations the pool of local advertising dollars must be divided into so many parts that virtually none of the media makes any money. Your prospective market's overall broadcast income (profits) as reported by the FCC, combined with your own investigations, should let you identify such situations.

If you are considering a station in a multiple station

continued on page 86

Fig. II
Listing and ranking of radio stations in hypothetical market

Station	Frequency (kHz/MHz)	Power (watts)[1] Day	Night	Subjective Evaluation Power[2]	Freq.[3]	Hours of Operation[4]	Total Points	Theoretical Share
"A"	620	1,000	-0-	1	1.3	.5	2.8	12%
"B"	1500	10,000	1,000	3	.8	1.0	4.8	20%
WDES	1230	1,000	250	1	.9	1.0	2.9	12%
"C"	103.7	12,000	12,000	3	1.0	1.0	5.0	21%
"D"	94.3	3,000	3,000	2	1.0	1.0	4.0	17%
"E"	96.7	3,000	3,000	2	1.0	1.0	4.0	17%
						Total Points	23.5	

[1] In the case of FM stations antenna height has not been given separate treatment since it was considered "normal" for stations of the respective classes.

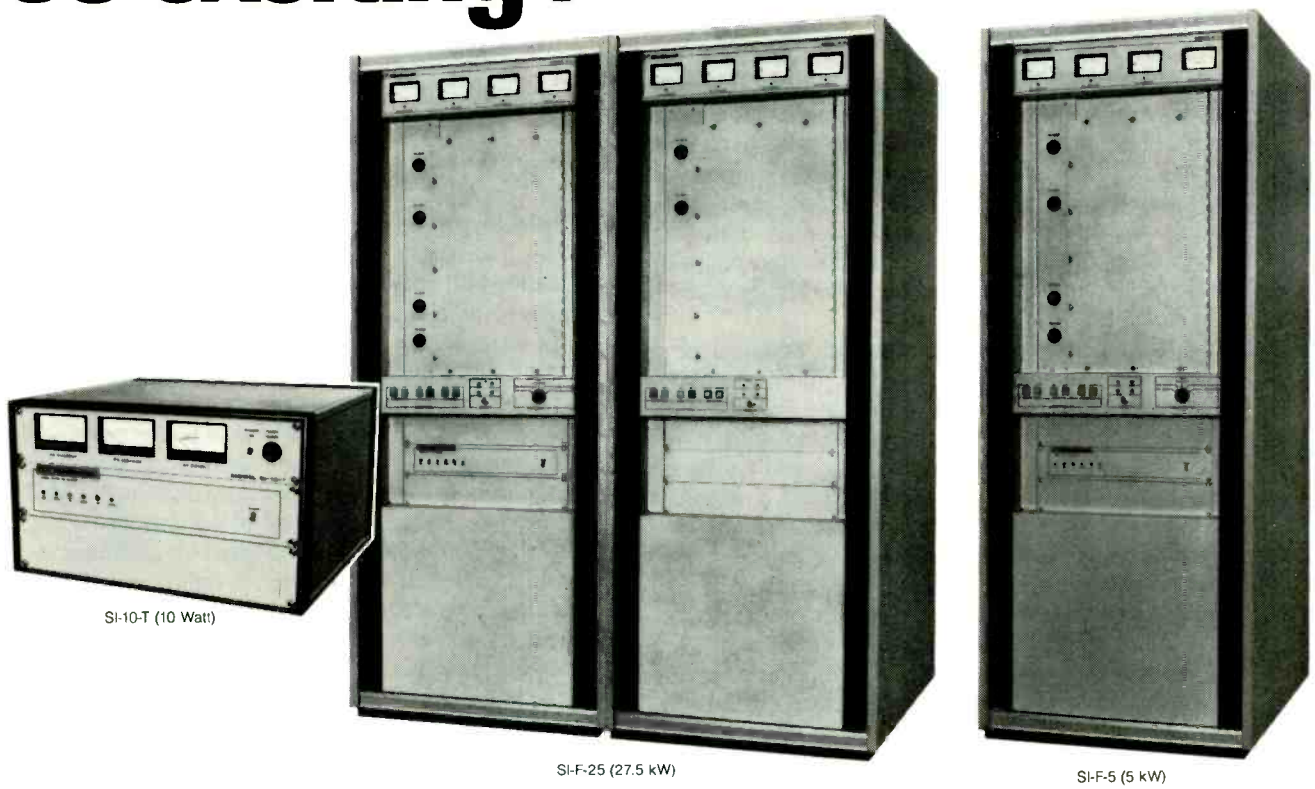
[2] Computed on the basis of $\sqrt{(\text{station power}/1{,}000)}$ and rounded to nearest whole number.

[3] Applied to AM stations only on the basis $\sqrt{(1060/\text{station freq. in kHz})}$ FM stations receive 1.0.

[4] Daytime stations receive .5 while stations with unlimited hours receive 1.0.

[5] Shares do not total 100% due to rounding.

What makes these new Sintronic FM transmitters so exciting?

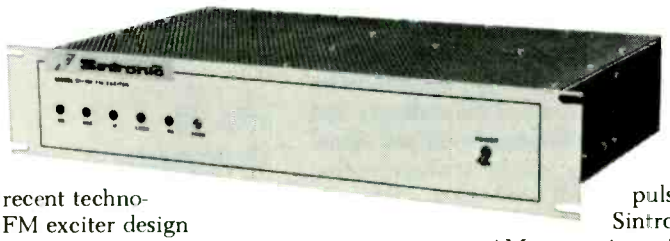


SI-10-T (10 Watt)

SI-F-25 (27.5 kW)

SI-F-5 (5 kW)

Well for one thing...



. . . the new Sintronic on-frequency, direct FM exciter. It's the heart of all our latest FM transmitters.

And it's exciting because it combines good engineering and recent technological advances in a solid-state FM exciter design which embodies such features as .001% stability without expensive crystals or ovens. . . 5 LEDs which continually monitor the key circuits. . . noise and distortion figures so low we could barely measure them in the lab (but we spec'd them conservatively, just like everything we do at Sintronic).

But there's a lot more that's exciting about our FM transmitters.

We start with our new exciter to a pair of 4CX250Bs driving a stable, grounded grid power amplifier for our 1.5, 3.5, and 5 kilowatt transmitters. We add another cabinet containing our high power amplifier and we're at 12.5 kW or 27.5 kW; and with two 27.5 kW we go on up to 55 kW. Each has its own "12-pulse" power supply.

Sintronic has been making FM and AM transmitters for more than 15 years. They are now operating in more than 34 countries, some in remote locations under severe environmental conditions.

That's the Sintronic story: solid design, terrific performance, and all at prices that make our cost/performance ratio pretty exciting, too.

Call or write to learn all the other exciting details of our FM transmitters—and our AM transmitters are exciting, too! Sintronic Corp., 212 Welsh Pool Road, Lionville, PA 19353. (215) 363-0444. Ask for Tom Humphrey.

Sintronic CORPORATION

Sintronic is a subsidiary of Singer Products Co., Inc.

Circle 156 on Reader Service Card

market, you must consider the size and quality of its signal area in comparison to the other stations. It should be obvious that signal deficiencies can restrict the potential of a station.

Start your evaluation of the competing stations by listing them along with information regarding their licensed facilities. This information can easily be obtained from "Broadcasting Yearbook."[2] To facilitate comparison, list the AM and FM stations separately. Figure II shows how data concerning the stations in our hypothetical market would be arranged.

Many broadcasters are overly preoccupied with the power of the station they are considering. While this is important, it must be considered in perspective. What is most important is the station's ability to render a "good" signal in the residential and commercial portions of the community. The precise definition of a "good" signal is dependent on the strength and location within the band of competing signals. A Class IV AM station might be the best facility in the market if the other stations are 500W daytimers!

Speaking of daytimers, these are perhaps the most maligned stations in the industry. Over 50 percentof the AM stations in the United States are licensed only for daytime operation. The ability to tune your station at virtually any hour of the night or day will enhance your prestige with the radio audience, but it can be expensive to operate with such an extended schedule. Once the evening arrives a majority of people turn from radio to television for entertainment. Because of this, most AM stations make little if any profit from nighttime broadcasting. In a top fifty market, "unlimited hours of operation" is more of an asset due to such factors as audience retention, etc. But as the size of the market decreases, so do the economic advantages. In fact, it is not unusual to find situations where the profit margins of daytime stations exceed those of their fulltime competitors.

Reference to Figure II shows that there are six stations in our hypothetical market. A question now arises regarding the potential for each station. More specifically, if the current popularity of programming among all of the stations is overlooked, what are "normal" audience and revenue shares for WDES? One possible answer to this question is obtained by simply allocating equal shares to each station. Since there are six stations, each would be expected to obtain 1/6 or 16.7 percent of the audience and revenues over the long term. Unfortunately, due to signal differences there are few, if any, markets where such a simple approach can be used.

It is possible to construct elaborate models to show the precise influences of power, frequency, and hours of operation on station performance. But their complexity in formulation makes them impractical for use by most prospective buyers. There is an alternative method that is far simpler to use, although not as accurate.

Engineers know that the size of a station's coverage area varies at a rate that is equal to the square root of the change in radiated power. Restated, this means that in order to double the size of a a station's signal area its power must be increased by a factor of four. It is possible to apply this simple relationship to an analysis of the relative quality of the competing signals in a market.

In Figure II there are three columns that contain data regarding our evaluation of the licensed facilities of each station. The first of these, "Power," simply is the square root of the ratio of the station's daytime power divided by 1,000. WDES has a daytime power of 1000 watts so its value in this column is 1.

$$\sqrt{\text{station power}/1000}$$

Because AM receiver selectivity and ground wave propagation are affected by differences in operating frequency, adjustments must be made to compensate for stations that operate in different portions of the band. The column labeled "Frequency" allows for these adjustments. It is simply the square root of the quotient obtained by dividing 1060 by the station's frequency in kilohertz.

$$\sqrt{1060/\text{station frequency (kHz)}}$$

It was noted earlier that "daytime only" operation can be very profitable, but that such stations normally are handicapped in terms of their overall audience and revenue shares. On a seasonally adjusted basis the daytime station will only be able to operate twelve hours per day. The column labeled "Hours of Operation" compensates for this situation. Daytime stations receive a value of .5 in this column while all other stations are given a 1.

The three values assigned to each station are now totaled. Next, the aggregate total of points among *all* of the stations is computed. The "theoretical share" for each station can now be determined by dividing its total points by the aggregate total for all of the stations. WDES has a total of 2.9 points. When divided by 23.5, the aggregate total among all the stations, it indicates that the station should have a 12 percent "theoretical share." This means that over the long term, prudent operation of WDES should enable the station to enjoy an approximate 12 percent share of the market's radio audience and revenues.

$$\frac{\text{station points}}{\text{aggregate total points}} = \text{"theoretical share"}$$

Audience & revenue shares

Overall, there is a close correlation between a station's audience and revenue shares. These, in turn, should show a relationship to the station's "theoretical" share. If the market is surveyed by one of the reputable audience mea-

Fig. III
Comparison between audience shares and theoretical shares in hypothetical market

Station	Net Weekly Circulation[1]	Audience Share	"Theoretical" Share[2]
"A"	31,300	13%	12%
"B"	60,100	25%	20%
WDES	26,500	11%	12%
"D"	45,700	19%	21%
"E"	38,400	16%	17%
"F"	38,500	16%	17%
Total	240,500	100%	

[1] In place of Net Weekly Circulation, Average Quarter Hour Audience (6:00 a.m.-midnight, Mon.-Sun.) could be used.
[2] From Figure II.

[2] Published annually by Broadcasting Publications, Inc., Washington, D.C.

surement services, such as Arbitron, you will be able to determine the precise correlation between the three types of shares. Begin your analysis by determining the "total average quarter hour audience" (6:00 a.m. to midnight, Mon.—Sun., in persons) for all of the stations you analyzed in Figure II. If you cannot obtain the "average audience," you can use "net weekly circulation." To determine the audience share for an individual station, simply divide its audience by the aggregate total for all of the stations. Figure III illustrates how the data would be arranged for the stations in our hypothetical market. Examination of the figure shows that WDES had an 11 percent share of audience. Since this is within 20 percent of its "theoretical share," it is considered normal.

$$\frac{\text{station's audience}}{\text{aggregate total audience}} = \text{station's audience share}$$

If your market is given separate treatment in the FCC's "Radio Financial Report," you will be able to determine your station's revenue share. Before proceeding, however, a note of caution must be sounded concerning use of the FCC data. Because of delays in compiling the financial reports, the data they contain is at least 10-12 months old. The most recent "Radio Financial Report" reflects the operations of stations in 1976! The 1977 report is not expected until the fall of this year.

To calculate the revenue share of a station, simply divide its revenues by the market's total radio revenue. In this instance total radio revenue is the sum of the revenues for AM and AM/FM stations *and* independent FM stations. The purpose of this analysis is to determine whether the prospective station's revenue share substantially lags behind its audience share. A wide discrepancy is normally caused by an inefficient sales department within the station. This is a desirable situation for the buyer searching for an "undeveloped station." In most cases revenues can be increased rapidly by revitalizing the sales department.

Fig. IV
Comparison of WDES revenue, audience and theoretical shares

Total Radio Revenues[1]	WDES Revenue[2]	WDES Revenue Share	WDES Audience Share	WDES Theoretical Share
$1,590,000	$175,000	11%	11%	12%

[1] Total Radio Revenues are comprised of AM & AM/FM revenue *plus* independent FM revenue for stations in the market as reported by the FCC. The year for which these revenues are reported is assumed to coincide with those of the audience reports.
[2] Net Revenue from the sale of station time and related services, excluding "interest income."

Figure IV lists our hypothetical market's total radio revenues as well as those for WDES. The 11 percent revenue share for the station is in substantial agreement with its audience and "theoretical" shares. Thus, in terms of programming and sales efficiency the station is operating at an "average" level.

To this point we have generally dealt with the external factors that influence station operations. In the next part of this article an examination will be made of the internal factors that influence station profitability. It will also include formulation of financial projections, including a loan repayment schedule. **BM/E**

INTERPRETING THE FCC RULES & REGULATIONS

Commission Fines Radio And TV Stations For Variety Of Violations

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

BROADCASTERS OFTEN ASK their communications counsel what are the frequently violated FCC rules. These broadcasters reason that if they can find out what the most frequent violations are, station personnel can pay special attention to rule compliance. This will minimize exposure to costly forfeitures of up to $20,000 or designation of their broadcast licenses for revocation hearings.

Recently, the Commission issued a Public Notice listing 10 instances, over a three-day period, in which it notified broadcast licensees of apparent liability for forfeiture. The forfeitures ranged from $100 to $2,000. A brief discussion of each of the 10 forfeiture actions follows. This is a fairly typical list of Commission rule violation actions.

Texas AM and FM combination: The Commission notified a jointly-owned Texas AM and FM combination of apparent liability for a $400 forfeiture for alleged *repeated* violation of Section 1.539 (a) of the rules. The licensee filed its license renewal applications late. The license or renewal application is due not later than the first day of the fourth full calendar month prior to the expiration date of a station's license. For instance, if a station's license expires on December 1, 1978, the license renewal application is due on August 1, 1978.

The Texas AM and FM combination was tagged by the Commission for *repeated* violations of the renewal application filing deadline rule. Repeated violations often subject a licensee to *greater* forfeitures. It is surprising how easy it is to slip into repeated violations of many of the Commission's rules. In the case of a license renewal application that is filed five days late, the Commission may find the licensee liable for five specific violations of Section 1.539 (a).

Texas FM Station: The Commission notified another Texas broadcaster of apparent liability for the same violation — filing its renewal application late. The station filed its renewal application more than one day late and was noticed by the FCC for *repeated* violations.

The moral of these first two episodes is to plan ahead and be *absolutely sure* that the license renewal application will reach the FCC Secretary's office in Washington, D.C. *before* 5:30 p.m. on the filing deadline date. If your station has Washington counsel, be sure to follow any filing instructions with care. Be sure that your signed application reaches your communications counsel's office in sufficient time to permit review and filing at the FCC. If your station does not retain Washington communications counsel, be sure to make appropriate arrangements to have your license renewal application delivered to the FCC in plenty of time. If you must rely on the U.S. mail, be sure to mail your renewal application at least a week or 10 days before the filing deadline.

New York AM station: The Commission notified a Hudson valley AM station of apparent liability for a $1,000 forfeiture for *repeated* violations of Section 73.52 (a) of the rules. The station allegedly failed to maintain the antenna input power of its transmitter as near as practicable to its 1,000 watts daytime (and 250 nighttime) authorized power.

Maintenance of antenna input power of a station's transmitter is a perennial problem. The Commission's rule permits a variance from the actual power — not less than 90 percent or more than 105 percent of the authorized power. The Commission developed this margin of "error" as being reasonable enough to permit all stations to comply with the intended input power rule. Accordingly, the Commission has traditionally felt no hesitancy in notifying stations of apparent liability for forfeiture when their antenna input power falls outside the 90-105 percent parameters.

Again, this is a rule violation that is especially susceptible to repeated violations; the Commission specifically notified the New York AM station that it had observed repeated violations. This explains, in part, the fairly stiff $1,000 forfeiture.

Missouri AM station: The Commission notified a Missouri AM station of apparent liability for forfeiture in the amount of $500. The station allegedly violated Section 73.93 (e) (3) of the rules from mid-1977 to the first week of 1978 by failing to complete partial and skeleton proof of performance of the station's directional antenna system at the required time intervals.

There are simply so many technical and other operating rules that continual review of them by station operating personnel is essential.

This is another situation that is especially susceptible to repeat violations. For instance, a station that fails to perform proof of performance within a required time interval is chargeable with a separate violation for each and every day thereafter.

Missouri AM and FM combination: This station combination was notified of apparent liability for a $1,000 forfeiture for violation of Section 73.1211 of the rules, which forbids lotteries. The station had undertaken a promotion campaign which, apparently unbeknown to it, contained the elements of a lottery: *chance* combined with *consideration* to result in a *prize*.

North Carolina AM station: The Commission notified an AM station in North Carolina of apparent liability for a

continued on page 90

TECHNICAL DIRECTION MADE EASIER.

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.

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FCC Rules & Regulations

$300 forfeiture for alleged repeated violation of Section 73.47 (a) of the rules. This rule requires that equipment performance measurements must be made each calendar year, but not more than 14 months after the last set of equipment performance measurements. Again, each day which passes after the measurement "deadline" constitutes a separate violation.

Oregon television station: This station was notified of apparent liability for a $1,000 forfeiture for violation of Section 73.1212 of the rules for failing to make appropriate sponsor identification announcements.

A station can violate the sponsor identification rule with surprising ease. Sometimes an announcement does not appear commercial on its face, especially if the person maintaining the programming logs is not informed that a payment has been made to the station for broadcast of the announcement.

Utah television station: The Commission ordered a Utah television station to forfeit $2,000 for repeated violation of Section 73.1206 of the rules for failing to inform a party before recording a telephone conversation with the party for broadcast.

A station faces double jeopardy here. First, failing to tell a party that a telephone conversation is being recorded for broadcast will very likely result in a substantial FCC forfeiture. Second, the expanding law on right to privacy might very will open up a station to a lawsuit by the person whose voice was recorded without prior knowledge. In some instances, substantial damages have been assessed in privacy lawsuits.

Florida AM and FM combination: The Commission notified a Florida broadcaster of apparent liability for a $1,000 forfeiture for violation of the Communications Act and Section 73.1212 for failure to comply with the requirements for sponsorship identification of commercial announcements.

This is an often recurring violation and can become expensive to a station, as the $1,000 forfeiture levied in this case indicates.

Washington television station: The final forfeiture notice was in the amount of $250 for repeated violation of Section 73.676 (e) of the rules. This station allegedly failed to enter in its maintenance log the weekly remote wave form monitor calibrations. The entries were allegedly omitted for the period from mid-May, 1977, to the beginning of August, 1977.

Conclusion

These 10 forfeiture notices show that the Commission readily moves to levy forfeitures against stations for certian obvious rule violations involving license renewal filing deadlines and sponsorship identification announcements. At the same time, it is clear that the Commission does not only concentrate on the more obvious violations. As the final forfeiture notice discussed above indicates, the Commission will not hesitate to take a station to task for violation of any provision of its rules.

Station operating personnel ought to be instructed to review the Commission's rules relating to their specific areas of responsibility on a *continuing* basis. This is the best method to assure that your station will not end up in a Commission Public Notice, as have the ones discussed in this article. **BM/E**

WHAT TO DO DURING YOUR NEXT OBSCENE PHONE CALL.

Order Eventide's BD-955 Broadcast Delay Line. It will delete your obscenities & tape loops. And more.

When Eventide — the world's foremost manufacturer of digital delay equipment* — decided to build a better time delay system for obscenity deletion, it went digital.

The result is the BD-955, a RAM based DDL providing up to 6.4 seconds of delay.

Substitute the BD-955 for the tape machine you're now loading, monitoring and changing tapes on. The BD-955 will allow plenty of time for either the engineer, announcer — **or both** — to hit remotable DUMP buttons.

The BD-955 cancels the objectionable program material; its rear-panel terminals allow automatic control of the phone and/or auxiliary equipment.

**According to Billboard Magazine's latest U.S. Equipment Brands Usage Survey, 44.9% of major U.S. recording studios use Eventide delay equipment vs. only 6.0% for the nearest competitive digital.*

THE BD-955's EXCLUSIVE CATCH-UP MODE:

Here's where the BD-955 really shows its stuff — and makes the switch to Eventide obscenity deletion as much a programming decision as a technical one —

When the DUMP button is hit, **programming instantly returns to real-time.** With no necessity to fill the air with "7 Second Announcements" or stand-by jingles. The show goes on. The BD-955 cancels the obscenity and automatically builds back to full delay time. Digitally: without wow or flutter and no need to stand by for rearming an obscenity loop. The program continues immediately — with sufficient time delay for the announcer to take the next call. No excuses necessary. Sound like magic? We've manipulated time like this for over five years.

When it's not being used for obscenity deletion, the BD-955 serves double-duty as a production tool. It allows front-panel selection of delays from 6.5 milliseconds up through the full delay available, for musical and segue effects — including vocal doubling and automatic double tracking (the audible illusion through which a single voice or instrument is made to sound like two) and digitally-clean slapback echo.

Other significant features about the BD-955 Broadcast Delay Line:

1. Full 15 kHz response and 90 dB dynamic range equals the specs of the best music recording delay lines; 7.5 kHz response, perfect for telephone talk shows *at lower cost*.
2. Full digital Random Access Memory. Like the Eventide 1745M music recording DDL, it runs cool, can take the mallet.
3. *It's available*. With more experience than any other manufacturer in building digital audio delay systems, the BD-955 is an extension of proven techniques. More than just a design: it's available now!

Pricing Information

		FREQUENCY RESPONSE	
		7.5 kHz	15 kHz
DELAY	1.6 seconds	$2300	$2950
	3.2 seconds	$2950	$3900
	6.4 seconds	$3900	$6300

DUMP AND GO!

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SPEAK OUT:

"It's Time For A Digital Interface Standard for Broadcasting," Says Eric Small

Editor's Note: As more and more manufacturers move to machine intelligence in the design of their equipment, concern is growing that the full benefit of computerization may be retarded by the absence of a standard interface. BM/E would be interested in hearing from others regarding standardization of not only the interface but other areas where communication between machines and between man and machine is important.

Eric Small, president of Eric Small & Associates, Inc., San Francisco, is a consultant in broadcast technology and manufacturer of the TELESIS remote control system. He was co-designer of the Optimod FM and a former chief engineer of WOR-FM and WNCN radio, New York

THE FUTURE GROWTH OF DIGITAL SYSTEMS in all aspects of broadcasting depends on the adaptation of a good hardware interface standard *now*. Adapting a standard soon will save stations money because of a wider selection of suppliers. Manufacturers will sell more equipment because stations will be more willing to buy systems in a multisourced marketplace. It will also not be necessary for each company to "reinvent the wheel" for each product line.

Ten years ago the test equipment industry faced the same challenge that broadcast faces today. With increasingly sophisticated systems to be checked out and repaired, testing had to be controlled digitally. Everyone realized that no single supplier was going to be able to supply all the equipment to fill every requirement. Hewlett-Packard Company took the lead. The result was the General Purpose Interface Bus (GPIB), IEEE Standard 488- 1975. Thanks to this standard, thousands of instruments are available today from dozens of companies with GPIB. And most important, those instruments can all work together using the same connectors and the same interface signals.

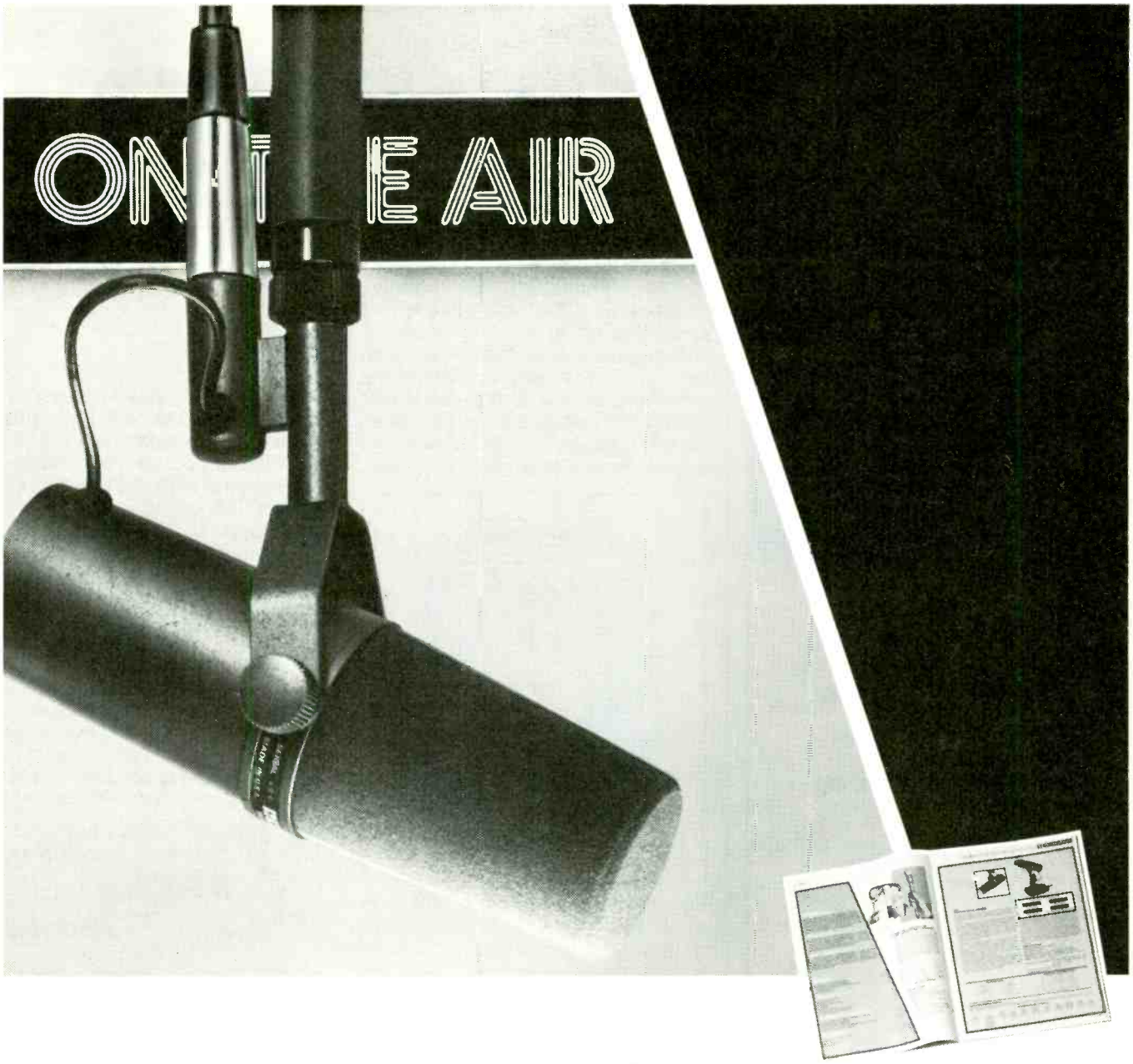
Broadcasting has a hodgepodge of digital controllers and digitally-controlled equipment. Probably the longest standing mess is program automation equipment. The situation will only get worse with the introduction of large scale random access cartridge systems. Wouldn't it be nice if any tape deck or cartridge system would work with any automation "brain"?

At the transmitter, the mess is just starting to develop. As the designer and builder of a mini-computer based transmitter control system, I know first-hand how much time and money the absence of any standard for interconnecting transmitters, antenna monitors and modulation monitors costs. Imagine how much simpler things would be if systems like ATS, Tektronix's ANSWER II TV analyzer and my TELESIS could uniformly connect to station equipment.

One tremendous advantage of GPIB is that it is truly a bus system. Up to 14 devices may be stacked onto one GPIB controller port. The cost savings over having to provide an individual port for each device are obvious.

Several semi-conductor houses have introduced ICs to implement GPIB. This brings the cost of GPIB in line with that of providing a non-standard BCD type interface.

You, the consumer of broadcast equipment, can do much to further adaptation of GPIB as the broadcast digital interconnect standard. Talk to suppliers about it — insist that it be available as an option on all equipment, from cartridge machines to transmitters. Maybe in this way it will not be necessary for broadcasting to reinvent the interface. **BM/E**



Station Master.

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

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

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

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

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

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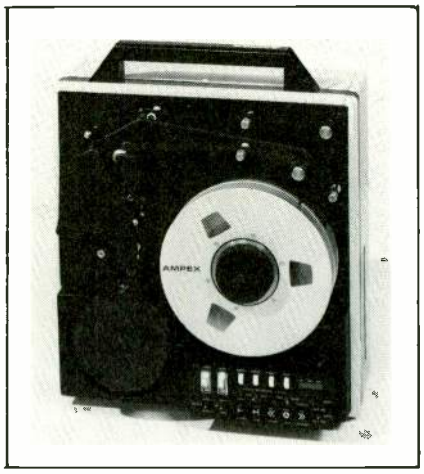
BROADCAST EQUIPMENT

One-Inch VTR 250

The VPR-20 is a SMPTE Type C one-inch helical-scan, high-band color unit designed for ENG and other remote production situations. It provides record capability on all three audio channels, plus video channel and optional sync channel. The system has remote control and built-in back space assemble edit capabilities. It is fully servoed and can be operated while in motion.



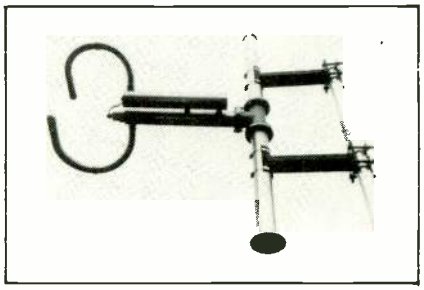
Record time is 60 minutes, with a rewind time of less than five minutes for a 60 minute (nine-inch) reel. Standard features are AC power pack and quick charger for the self contained batteries, built-in electronic tape timer and a "confidence" playback system that permits record verification while in the field. The unit is compatible with the studio VPR-2. AMPEX CORP.

Character Generator 251

The model D-3016 is designed for professional TV systems that require quality titling/captioning, and features a 16-page memory capacity. Three type styles are available: Video Gothic, Piper Roman and Helvetica Semi-Bold. All are available in upper and lower case characters. The unit will display up to 22 characters in a row and 10 rows per page. It also features three-speed vertical roll and horizontal crawl movements and automatic centering. A title mode allows maximum use of the internal memory by permitting storage of up to 160 single row titles. $6900. 3M COMPANY.

CP Antennas 252

A new series of super power CP FM broadcast antennas has three models available. The single bay SPC-1 is rated at 20kW input, and will achieve a power gain of .475, -321 dB, and a field gain of .69, while producing a field strength, at one mile, of 95 MV/M with 1kW input. Model SPC-2 is power rated at 40kW and achieves power gains of 1.0, 0.0 dB, and a field gain of 1.0, while delivering a field strength of 138 MV/M with 1kW input, at one mile. The four-bay array, SPC-4, is power rated at 40kW, which represents a power gain of 2.15; expressed in dB the gain is 3.3. The field gain is 1.47 and the field strength is 203 MV/M with 1kW input at one mile. All antennas include complete mounting hardware for leg installation or face-mounting on uniform towers of 24-inch face. Brackets for other towers are available, as are deicers. PHELPS DODGE COMMUNICATIONS CO.

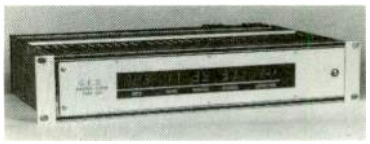


Master Clock System 253

This digital system operates to an accuracy of within 1/1000 second. It operates up to 100 slave clocks, but the number of slaves can be unlimited by using additional drivers. Either digital or analog clocks can be linked to the system, which is operated from a solid state integrated circuit master clock which uses main power supply, but switches automatically to battery operation in the event of a power breakdown. Features include leap-year correction,

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

leap second correction, provision for error read-out against an external source, various crystal options to one second a year, pulse outputs for special



timing applications and either 12 or 24 hour displays. GENERAL ELECTRONIC DEVELOPMENTS.

Echo Effects 254

The CCD Echo Effects Module was designed for use with HH's Stereo 8 and Stereo 12 Mixers to provide sound effects including echo, reverb, flanging, vibrato and phasing. The unit uses an integrated circuit, the Charge Coupled Device (CCD), to eliminate poor bandwidth and high noise levels. The echo select consists of four basic push-button delays for use individually or in any of 15 combinations. Other features include variable time delay control, vibrato and vibrato speed control, as well as repeat and repeat volume. AUDIOMARKETING LTD.

Digital Audio Delay 255

The BD955, designed specifically for the broadcast industry, is a RAM-based unit offering a maximum delay of up to 6.4 seconds. It is primarily intended for the policing of live shows to eliminate objectional or profane program material. Featured in the BD955 is a unique "catch up" mode which allows the

program to continue in real time. When the Dump button is depressed, the delay goes to zero and the obscenity is deleted. The delay then increases at a variable rate while the program continues so that a new delay margin for deletion is built up. The unit is available with a frequency response of 7.5kHz for "talk only" and 15kHz for any program material. Delay range is from 6.5 msec to 6.4 seconds. Memory capacities are 1.6, 3.2 and 6.4 seconds. $2300 to $6300 depending on frequency response and delay time. EVENTIDE CLOCKWORKS, INC.

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Broadcast Equipment

16mm Lenses 256

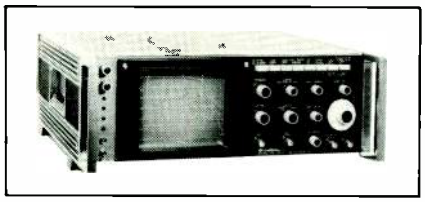
Lenses included in the Ultra T series are 9mm (T1.35), 12.6mm (T1.25), 16mm (T1.25) and 25mm (T1.25). Features include focus and iris rings with built-in gears for motor drive operation, easy interchangeability with CP and other mounts, removable calibrated focusing scale to permit change from footage to optional metric scale, and iris ring marked in "T" stops only. Complete set of four, $4500. CINEMA PRODUCTS CORP.

Color Analyzer 257

Designed for transferring color temperature readings from a master color monitor to other monitors, this electronic unit displays red and blue as separate percentages of green with a working range extending from a background level of 0.5 fL to above peak white value of 30 fL. Peak white may also be set by using the luminance button and this reading is displayed on the "blue" meter. The unit also features a filter/photo cell combination giving greater reliability and improved spectral response. This is contained in a new lightweight sensing head with an integral mask and "limpet" type suction pad operated by a lever. POWER OPTICS, INC.

Envelope Delay 258

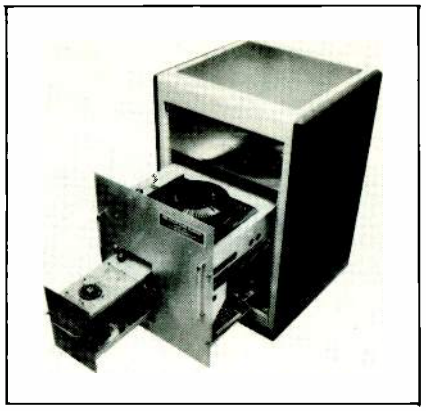
Model 201 measuring unit has built-in sync and blanking circuit, allowing for easy measurement of any transmitter.



Large CRT screen displays envelope delay and frequency response simultaneously. The unit also features a fixed marker and switchable sweep and CW (point by point) measurement. Available in both NTSC and PAL. ASACA CORP.

Slide Scanner 259

The model CSS-1 color slide scanner is designed to provide color programming without the use of a color camera. In operation, slides are programmed in a Kodak carousel and each slide is scanned and converted on cue to color video signals. The scanner may be operated manually by a switch or tone control, or set to operate at predetermined intervals by an automatic timer. $2495. TELEMEASUREMENTS, INC.



Audio Consoles 260

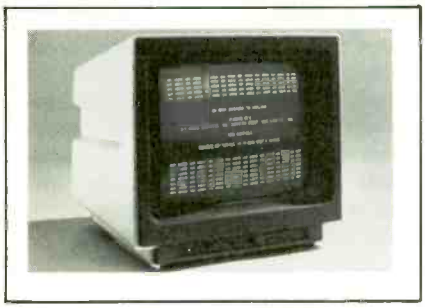
The B-1000 series is available in five models, an eight-channel mono or stereo with rotary attenuators, an

eight-channel mono or stereo with vertical attenuators, and a five-channel stereo vertical attenuator version. The five-channel model has 10 inputs into five mixer, and the eight-channel models have 18 inputs into eight. All models feature mu-metal audio input transformers, military grade type G-10 PC board material, gold plated contacts on PCB connectors and hybrid monitor amplifier with full 15W output mono, 30W stereo. Specifications include program amplifier output level of +8dBm nominal, +28dBm maximum; frequency responses are ±0.5dB, 30 to 15,000 Hz/±1dB, 20 to 20,000Hz; distortion levels are 0.5 percent or less, 30 to 15,000Hz/1.0 percent or less, 20 to 20,000Hz at +18dBm output. McMARTIN.

CRT Terminal 263

The Model 400E is a microprocessor-based CRT receive only terminal. The unit displays 24 lines by 80 characters on a non-glare screen. Three character accents, blink, dim and reverse-video, are standard, as well as RS232 data interface and RS170 video output for driving auxilliary motors. The 400E responds to 14 commands including Erase memory; Cursor home, return, up, down, left and right; Set Cursor X- and Y-positions; Set screen position;

and Start blinking, dim, reverse-video and normal characters. Options include panel rack for mounting, upper/lower case diplay, 40 character line, double



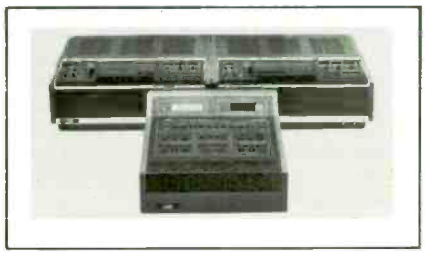
high characters and CR/LF options. $950 to $1200. ANN ARBOR TERMINALS, INC.

Lead-Oxide Tubes 261

Spectracon tubes are available in the 30mm variety and are warranteed for 2000 hours (in both broadcast and industrial grades). They are designed to replace all lead-oxide tubes used in broadcast cameras such as PC-60, PC-07, TK-44, TK-45, PE-250, PE-350, Mark VII and others. TEMTRON ELECTRONICS LTD.

Editing System 262

The CR-8500LU ¾-inch editing recorder (shown with an RM85U control unit) features high speed search function operating at 10 times normal speed in FF and REW. The search control



may also be set at twice, $^1/_5$, and $^1/_{20}$ normal speed, as well as still frame. Horizontal sync phase compensation is employed to minimize timing error at edit points. With editing accuracy ± two frames, the CR-8500 performs both assemble and insert edits and offers automatic pre-roll editing. JVC.

Color Quantizer 264

Originally designed to translate greytone thermography into discernible hues, this video image processor/quantized color display terminal has applications in satellite weather photography and TV and motion picture programming. The 12-inch CRT accepts a monochrome video input sig-

continued on page 98

Broadcast Equipment

nal and separates it into 10 narrow slices adjustable to any amplitude level between black and white. The discrete hue presentation, arranged to follow the visible spectrum, provides for rapid interpretation and ease of discrimination in analyzing otherwise complex pictorial data. Color sequence may be reassigned to any format by changing patch pins on the PC board. AMTRON.

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

NAB Convention Update

Since *BM/E's* massive 46-page NAB Show-In-Print issue hit the streets in May, we have received numerous compliments and a few barbs. Though we provided the industry with its first comprehensive report on the NAB Convention and Exhibition, a few ommissions and mistakes got through and these need to be corrected.

First of all, RCA announced the sale of its 1000th TK-76, but a typographical error showed this as 100th. We may have also created a slight misrepresentation on our comparison of the MNC-71CP from Cinema Products when we compared it to the NEC MNC-61A. Whereas the MNC-61A does make use of several of the new LSIs developed for the MNC-71CP, many significant circuit differences do exist between the two cameras. Also, during the editing process of the May report, a paragraph was omitted that drew attention to the Oscar, a Class I Scientific/Technical Award granted to the Steadicam™ inventor, Garret Brown, and to the engineering staff of Cinema Products.

Another typographical error that may have been caught by more than a few readers was present in our reporting of the Harris BTD-100H3 transmitter package for CP. The package, which uses two BT-50H3 50 kW transmitters, employs only six tubes as compared to the 14 tubes used in most 100 kW (not 50 kW) transmitters. While Jesse Maxenchs, director of marketing for Eric Small & Associates, wrote to us and said, "You all did a great job on the NAB review," he did note that ESA considers their TELESIS system a top of the line remote control system and not ATS.

In reporting the new small production switchers at the show we neglected to give credit to Industrial Sciences for its Model 902 Video Production Switcher. This was the first showing of the 902 at NAB. The 902 offers full dual mix/effects as well as the usual functions in a compact $4200 package.

The model 750 was designed for use with broadcast TV cameras with integral field lenses requiring large image format, and has three inputs and one output. The unit features dynamic image transitions between inputs at less than 100msecs, illuminated local mode selection switches and dome lamps, audio follow and simple remote control plug-in. Adjustable 48-inch optical centerline is also provided. The unit requires 11 by 18 inches floor space, and operates from either 115V-60H or 230V-50H AC power output. Under $4000. ZEI-MARK CORP.

In our write-up of the Cinema Products CP-16R Information Display, we should have noted that this product is not new; it has been on the market for about three years. We apologize for any wrong impression we may have given.

Perhaps the most serious omission in the report occurred when, somewhere during the make-up of the issue, our description of the Comrex exhibit got lost in the shuffle. Comrex introduced a couple of significant new products and reported on the success of several groups of their products. The Comrex line of LX Low Frequency extenders, which are now enjoying wide acceptance in the industry, were shown. The LX system is an encode/decode system that extends low frequency response of dial telephone, microwave, satellite and cable circuits. These systems are now being used by major networks and in numerous other applications, from sports to STL-backups. The LX system sells for less than $2000.

Another Comrex product that garnered considerable attention was their new Radio ENG Repeater System, which is the outgrowth of a four-year development project between Comrex and WBZ, Boston. Now available in production versions, the system consists of a 1 watt handheld transmitter with built in electret mic, a pocket cue receiver tuned to the news car frequency, and a repeater receiver installed in the news car. The systems available range in price from $2350 to $2710 per car and are extremely compact. *BM/E* ran a detailed article on the Comrex RENG system in the January 1978 issue.

Despite these few detractions from our report, we have received overwhelmingly positive response from our readers and the manufacturers. Comments range from a simple "Great job. I've read every page" to "an outstanding issue and a real editorial service to the thousands of *BM/E* readers who could not be in Las Vegas." We appreciate these comments and the opportunity to make these corrections and additions.

Business Briefs

RCA has received a $4.5 million order from the Korean Broadcasting System. The order includes 14 TK-760s, seven TK-76s, seven TK-28 telecine islands, seven TR-600 quad recorders, seven HR-1020 portable VCRs and 14 HR-1060 editing videocassette recorder/reproducers. The equipment will be used in new studios to be built in seven South Korean provinces, which are expected to be operational in mid 1979 . . . . **Wometco** has announced that a new company has been formed to be jointly owned with American Distributors, Inc., the largest independent film distributor in Latin America. The new company will be called ADWO Film Distributors . . . . **Telepromoter** has announced an agreement in principle to settle the Lewis v. Teleprompter suit for a total of $2,575,000 . . . . Teleprompter also announced the purchase of the nation's **first large scale fiber optic CATV** trunkline system from Times Fiber Communications Inc. on a turnkey basis. The trunklines will be used on the two coasts, one in Lompoc, CA, and one in New York City.

A.F. Associates, Inc., Northvale NJ has designed and built a new Videocassette Division facility for Columbia Pictures Industries, Inc. The new facility, located in Chicago, will be engaged in the duplication of ¾-inch U-matic, ½-inch Beta and ½-inch VHS cassettes, and ancillary services for non-broadcast users, CATV, and the consumer market . . . . Millennium Communications Company, Inc. announced the **acquisition of Creative Media Consultants, Inc.** of Walnut Creek, CA. With the acquisition comes CMS's production studios, record library and broadcasting consulting and syndication clientele. Millennium's Broadcasting Consulting Division will now be located at 425 Bush St., San Francisco, CA 94108 . . . . **Telemine Company, Inc.** has signed national sales rep organization, Video Components, Inc., to handle their entire package on an exclusive basis. VCI has offices in 20 major cities, with 35 reps.

Chyron Corporation's Video Products Division has appointed Television Equipment Associates as dealer for their ¾-inch Videocassette Cleaner and Evaluator for the broadcaster and government markets . . . . Conrac has been awarded a **contract in excess of $300,000** from Texas Instruments, Dallas, to supply CRT monitors for the Air Force's Tactical Information Processing and Interpretation program . . . . Quantel Limited, member of the Micro Consultants Group, left the NAB in Vegas with signed **orders in excess of one million dollars.**

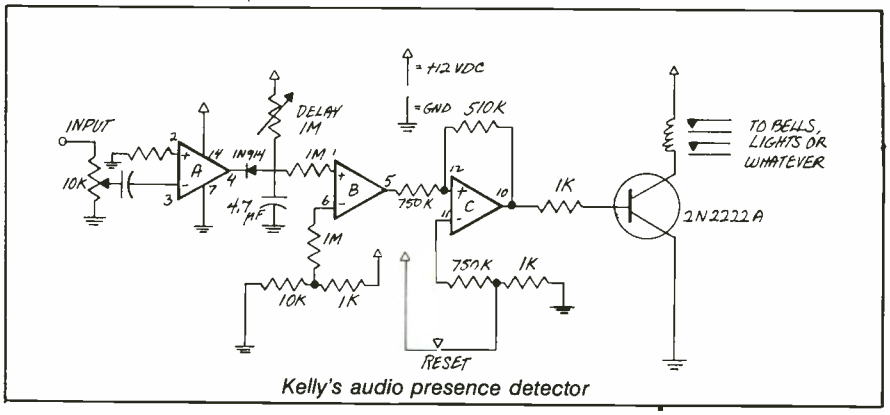
Business Briefs

George Boardman, formerly with Ampex Corporation, has established **George Boardman Public Relations** to provide public relations services for corporations and other organizations in the San Francisco Bay area. The agency is located at 1601-A Manzanita, Belmont, CA . . . . Ampex Corporation has announced average **price increase of 5.5 percent** on selected broadcast video and audio products . . . . Pentagon Industries, Chicago, has appointed **Joseph F. Hollenkamp** as its national sales manager . . . . **Bruno F. Melchionni** has been appointed manager of antenna engineering for RCA. **Art Nobo** has been appointed RCA's sales manager for the Caribbean and Central America.

John W. McCarthy has been appointed marketing and sales manager of the newly established Belden Fiber Optics Group, Geneva, IL . . . . **ADDA Corporation has appointed Wiltronix, Inc.** as their exclusive rep for commercial and institutional applications within the states of Delaware, northern Virginia, Maryland, Pennsylvania and Washington D.C. For info, contact Dwight L. Wilcox, Wiltronix, Inc., 5504 Waterway, Rockville, MD 20853, 301-460-1454 . . . . **English Electric Valve Company** announced that the acquisition of the former Marconi integrated circuit factory at Witham will provide them with an additional 100,000 square feet of space.

Dennis Fraser, general manager of NEC America's Broadcast Equipment division has been named a vice president of NEC America . . . . KVC, Inc. announces the acquisition of **two mobile broadcast quality facilities** designed to cover assignments from a single camera "shoot" to an event requiring eight cameras. Info available from KVC, Inc., 770 Lexington Ave., NYC 10021 . . . . **Memorex** will offer blank ½-inch cassettes to consumer and professional markets early next year . . . . **Utah Scientific** delivered its first television routing switcher to KUED-TV, Utah . . . . **GTE's Sylvania CATV Operation** will move to new headquarters at 10841 Pellicano Dr., Stamford CT . . . . Atlanta's **WPCH-FM Stereo 95** became the property of Meredith Corporation. Formerly owned by Sudbrink Broadcasting Inc., WPCH will be moved to 550 Pharr Road NE, Atlanta, GA . . . . **Video Production Services** announces a **new facility** located at 1442 San Pablo Ave., Berkely, CA 94702, 415-526-6741 . . . . **Allied Broadcast Equipment** has moved to larger facilities at 635 South E St., Richmond, IN 47374.

GREAT IDEA CONTEST



Kelly's audio presence detector

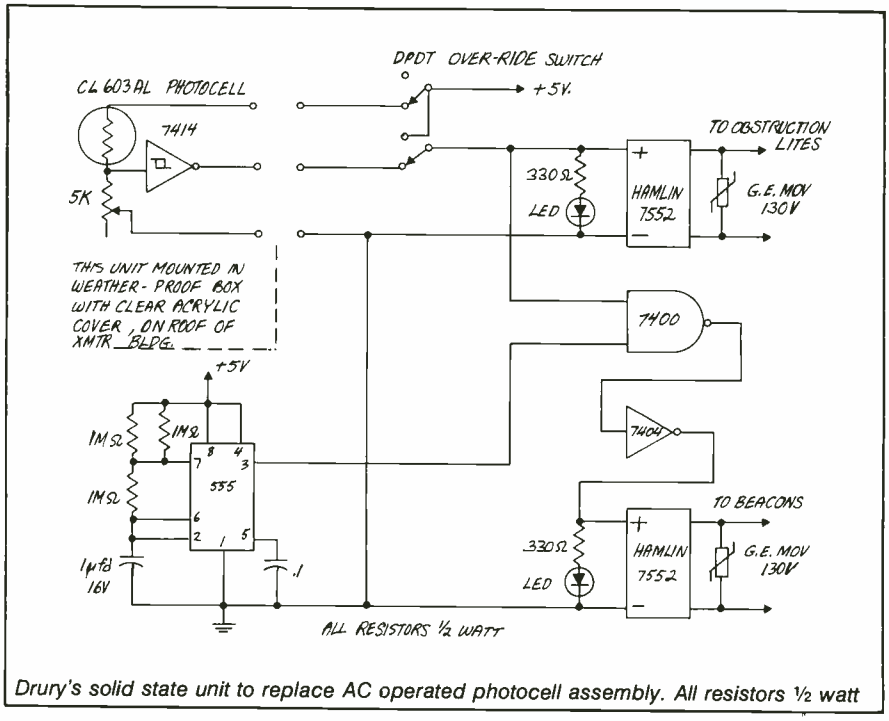
43. Audio Presence Detector.

Charles W. Kelly, Jr., Chief Eng., KIUP/ KRSJ, Durango, CO.

Problem: To detect silence on an audio line.

Solution: The design is simple: IC section A is an amplifier which produces a pulse to zero when audio above a preset level is input. The pulse shorts a capacitor. If no audio is present, the capacitor charges, and after a time delay set by the delay pot, toggles the comparitor, section B. Section C operates as a bi-stable multivibrator, turning on the transistor and relay when silence is sensed. The pushbutton resets the indicator device.

This unit is accurate and cheap enough so that you can build two for stereo to indicate if you lose just one channel. Basic parts cost under $10, and you can build it in an afternoon with readily available parts.



Drury's solid state unit to replace AC operated photocell assembly. All resistors ½ watt

44. Replacing Obsolete AC-Operated Photocell With Solid State.

Joseph E. Drury, Chief Eng., WEAN, Providence, RI.

Problem: Repair or replace AC-operated photocell assembly, noisy relays, and motor driven flasher unit for tower light operation.

Solution: Replace entire system with solid state components. The old AC-operated tube/photocell, relay system mounted on roof of the transmitter building was replaced by a CL603AL photocell, 7414 Schmitt trigger and 5k potentiometer. With the photocell facing north the 5k potentiometer is adjusted to turn tower lights on at the proper light level conditions. With proper adjustment, as it starts to get dark the output of the 7414 goes high turning on Hamlin solid state relay to obstruction lights and turning on LED at input to solid state relay. Also one input of 7400 Nand gate goes high. The other input of 7400 comes from output of the 555 timer. When both inputs are high the output is low and drives 7404 inverter. The output of the inverter turns on solid state relay to beacons and LED at input of beacon relay. Both LEDs are there for trouble-shooting purposes only.

The 555 timer with values shown on diagram will flash beacons 26 times per minute with on-time of 1.5 seconds and off-time of .75 seconds.

The whole unit including power supply (5 volt) was built on perf-board and mounted in existing relay boxes. Terminal strips were used to connect 3 conductor wire to photocell board. The solid state relays should be mounted using heat sink compound. These relays are zero-voltage switching and should extend lamp life. The G.E. varistors protect the relays during thunder storms. S-1 is an override switch. An alarm indicating on and off times should be very easy to add, for those who wish to do so.

continued on page 104

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Circle 176 on Reader Service Card

Great Ideas

45. Interfacing EBS To Automation System For Automatic Alerts.

John E. Shepler, Chief Engineer, WZOK, Rockford, IL.

Problem: To interface a typical EBS tone generator to an automation system so that EBS tests and alerts can be programmed to run automatically.

Solution: WZOK is an automated FM station using an SMC DP-1 automation system. We desired to connect a McMartin TG2/EBS tone generator to one of the audio channels and interface it to the control circuits of the automation.

The solution to this problem involves making certain modifications to the EBS generator and adding a few components.

Fig. 1 shows the modified start circuit. To start a source the DP-1, audio switcher provides a logic signal that goes from +24VDC to ground whenever a channel is energized. Capacitor C_A blocks the normal DC voltage but allows the negative start pulse to pass to the base of the transistor Q_A. This turns on the transistor and triggers the IC timer of the tone generator.

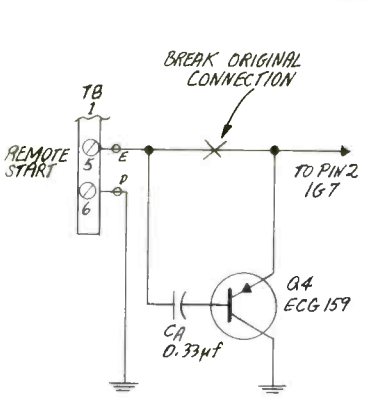

Fig. 1: Modified start circuit

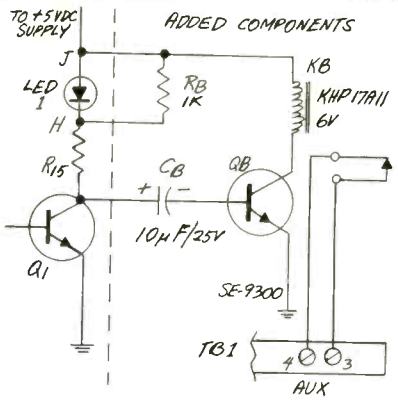

Fig. 2: Momentary contact circuitry to signal automation advance

After the tone has run for 20 to 25 seconds, a signal is needed to tell the automation to advance. This signal can be provided by a momentary relay contact closure similar to that provided by a tape deck or cart machine.

Fig. 2 shows the circuitry needed to accomplish this. LED 1 is the front panel indicator on the tone generator that is illuminated whenever the tone is activated. A resistor (R_B) is parallel to the LED so that the voltage measured at the collector of Q_1 is +5VDC when the transistor (and LED) is off. When the tone is activated, logic circuitry in the tone generator turns on Q_1 and the collector goes to ground. This lights the LED and places the positive side of capacitor C_B at ground potential. When the LED is extinguished, the collector of Q_1 goes high and the resulting positive pulse is conducted by C_B to the base

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of transistor Q_B. This transistor energizes or conducts momentarily, causing the relay K_B to pull in and close the normally open contacts for a half-second or so. These contacts are wired to the terminal strip TB1 in place of the 45ohm loudspeaker connections. The audio switcher auxiliary control lines are then connected to this terminal strip.

To use the modified generator for an automatic EBS test, three steps are programmed into the automation controller. The first step is a cartridge which gives the opening statement of the test. An auxiliary (150 Hz) tone at the end of this message steps the machine to the next event which is the tone generator. When the tone is completed, the machine steps back to the cartridge which then gives the closing statement of the test message. The cartridge must stop between the first and second messages.

While this project involves mating a specific generator to a specific automation system controller, there is no reason why the same principles shouldn't apply to other systems.

The primary advantage to making these modifications is that a lot of manual steps are eliminated in running an EBS test. This not only tends to make the tests more reliable but could prove useful during an emergency when actual alert bulletins need to be broadcast.

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1978 Entry Form

Name_____ Title _____

Station Call Letters _____

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Licensee _____

Class of Station at which idea is used (check one) TV____ FM____ AM____

Category: Audio____ RF____ Video____ Control____

Objective or Problem: *(in few words; use separate sheet for details)* _____

_____

_____

Solution: *(Use separate sheet–500 words max)*

I assert that, to the best of my knowledge, the idea submitted is original with this station; and I hereby give BM/E permission to publish the material.

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Standard TV Production Console
(32 x 4 x 2 configuration)
WBS Model L3242

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