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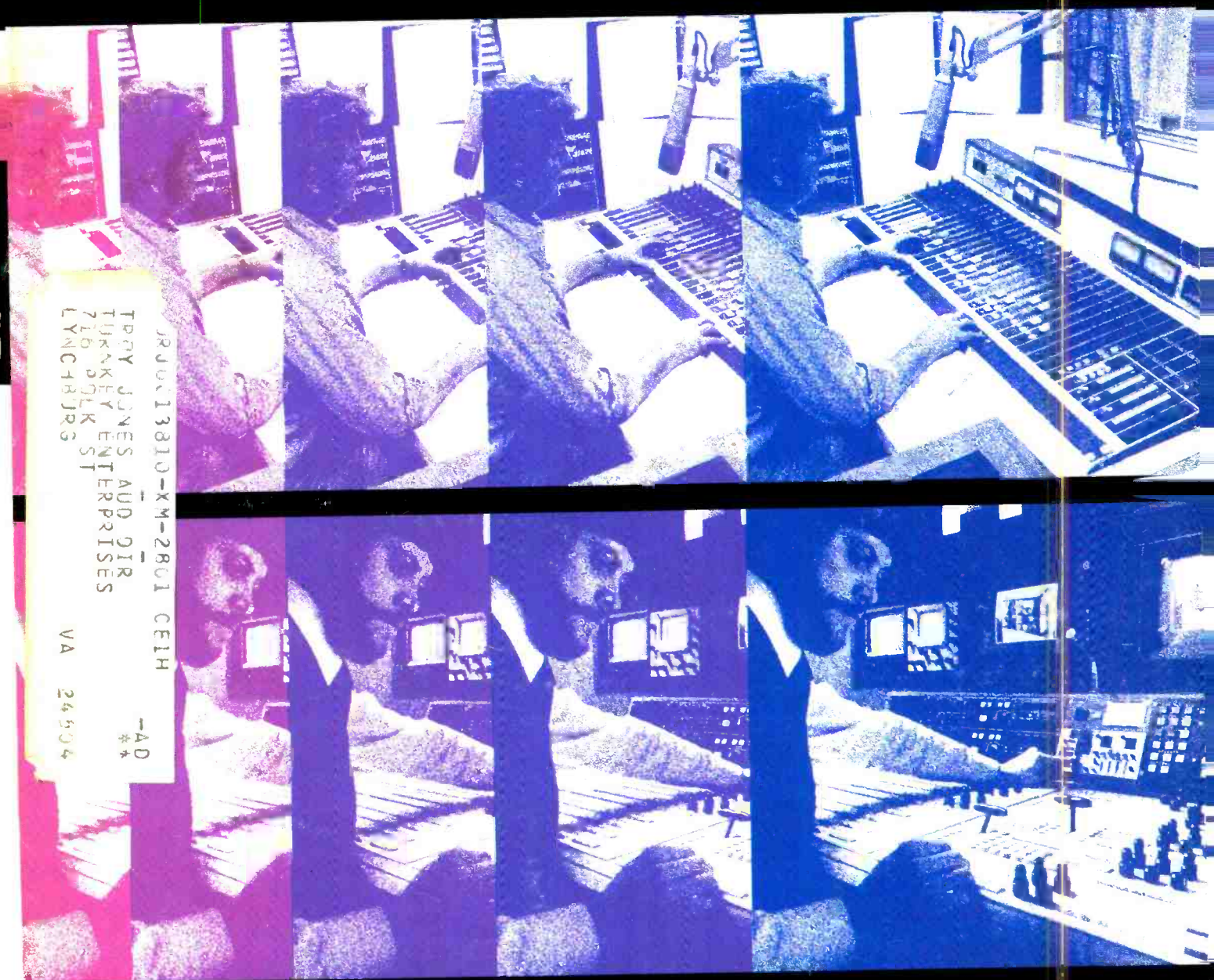
BM/E

BROADCAST MANAGEMENT/ENGINEERING



RADIO AND TELEVISION: MOVING FROM HERE TO DIGITAL.

HITACHI
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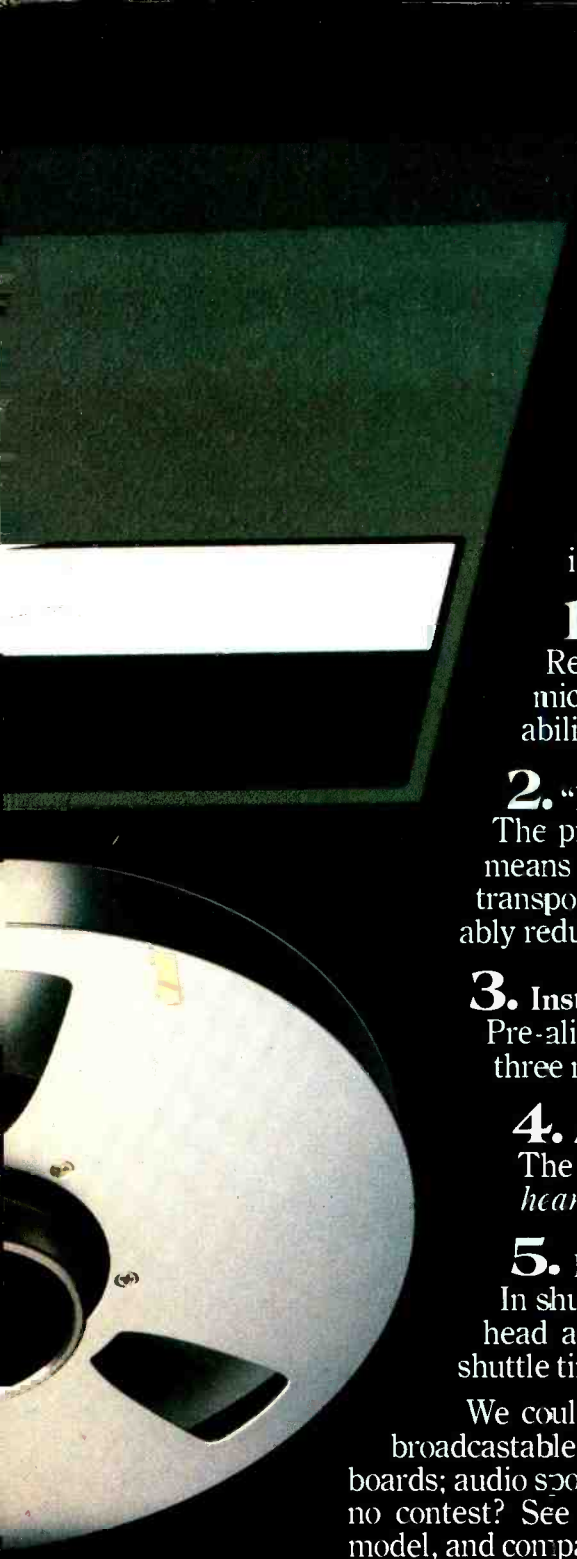
HR-200



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That's the score in one-inch VTR technology.

We've gone the first generation of TYPE C machines *five* better ...to help you get all the potential of one-inch out of your video installation. Here's what the competition *doesn't* give you.

1. Retracting Tape Guide
Retracts for unequalled ease of threading; repositions with one micron accuracy for up to two million threadings. Provides the reliability of a quad thread system in a one-inch format.

2. "PRO" Tape Path
The protective reverse oxide ("PRO") configuration of the tape path means *only* the video and audio heads touch the oxide surface. All other transport mechanisms guide the tape by its reverse side. Result: noticeably reduced dropouts; longer tape life.

3. Instant Head Replacement
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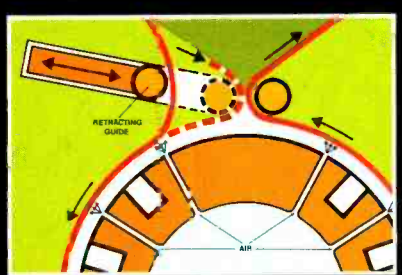
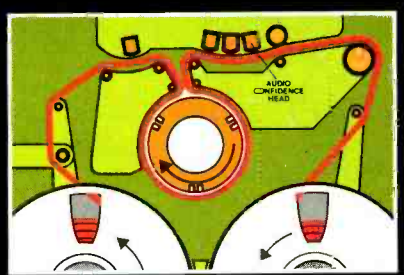
5. Non-contact Tape Shuttle System
In shuttle and standby modes, tape rides on a cushion of air. Increases head and tape life immeasurably. Cuts frictional resistance, yielding shuttle times of only 80 seconds end to end.

We could go on. With impressive features like microprocessor control; broadcastable slow motion; one-touch shuttle and jog; front access circuit boards; audio spot erase and on and on. But why run up the score, when it's already no contest? See the Hitachi HR-200, it's equally impressive portable HR-100 model, and companion TC-200 Time Base Corrector.



• Tape guide retracts for threading ease • Air drum eliminates head contact in shuttle/standby modes



• Full audio and video confidence
• "PRO" tape path reduces dropouts

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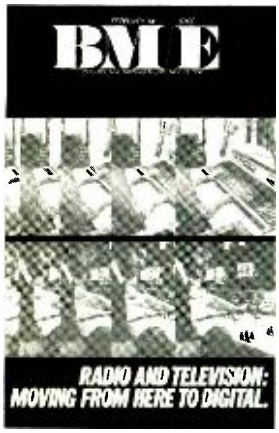

The emerging mass communications market of the 1980s will demand the most radical technical change since color television. Both radio and television broadcasters are preparing to meet the challenges of new media and new audiences

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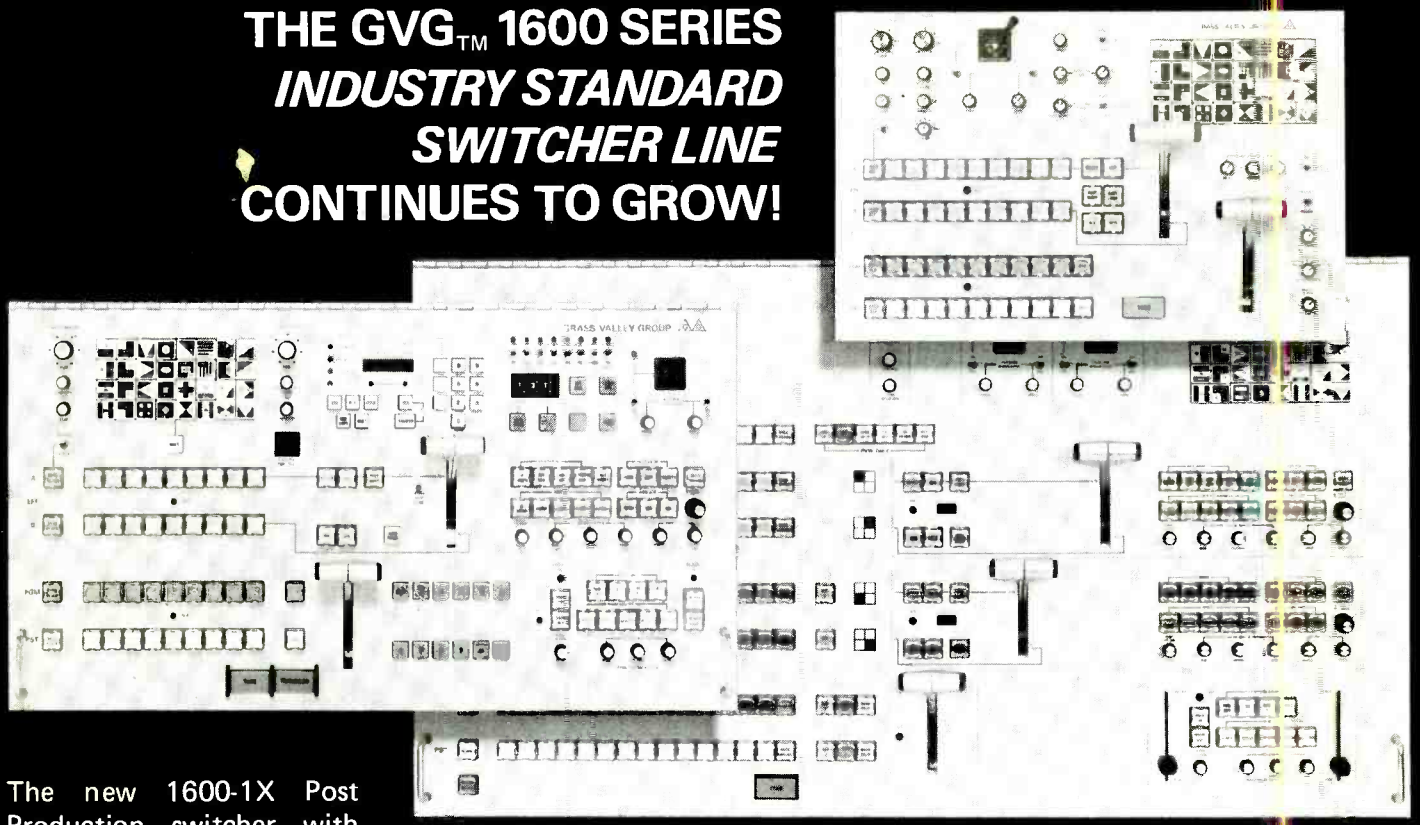
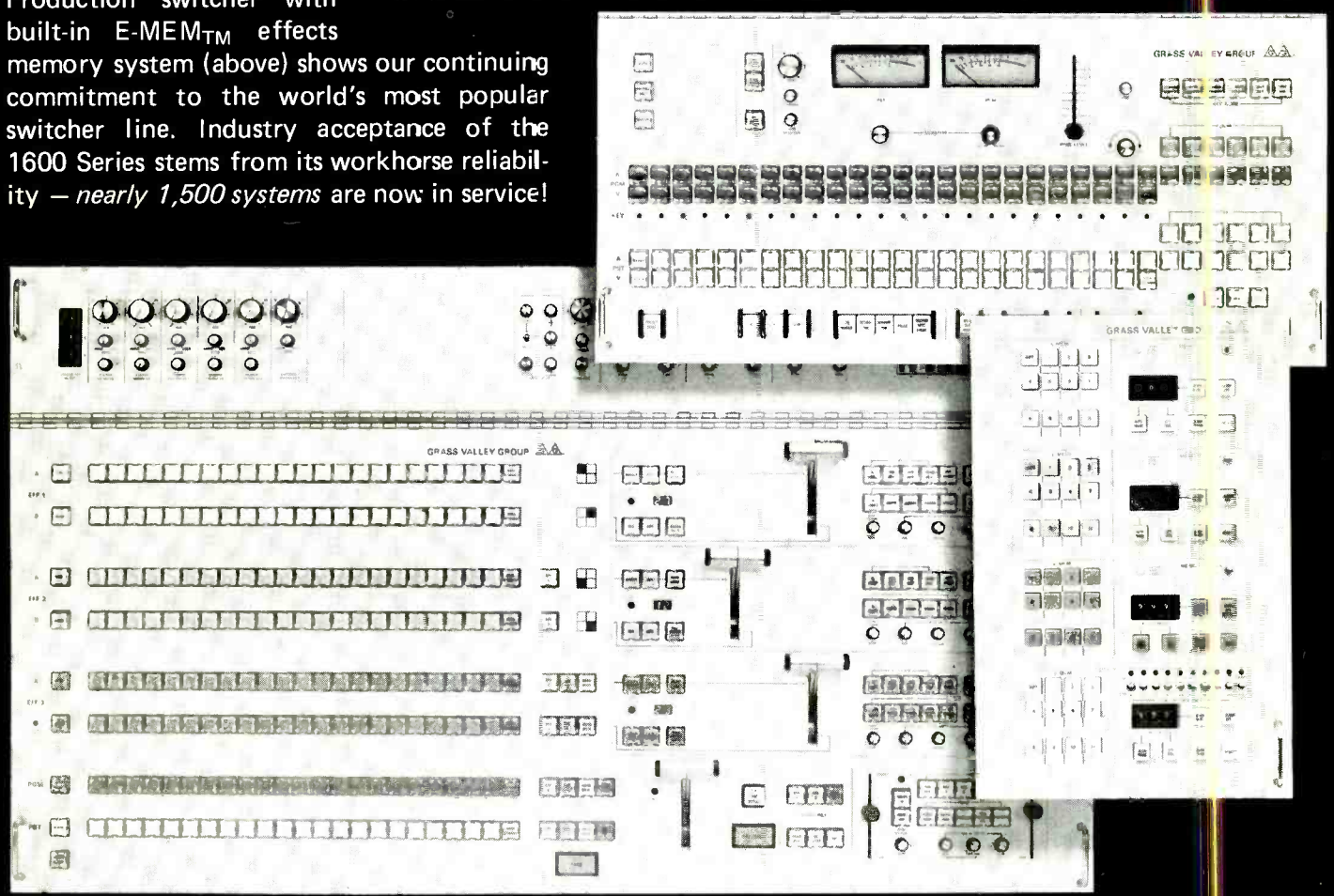


The new 1600-1X Post Production switcher with built-in E-MEM$_{TM}$ effects memory system (above) shows our continuing commitment to the world's most popular switcher line. Industry acceptance of the 1600 Series stems from its workhorse reliability – *nearly 1,500 systems* are now in service!



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BROADCAST INDUSTRY NEWS

Radio Sheds Commercial, Public Affairs Limits

The FCC has dropped the commercial time limits and minimums for nonentertainment programming for radio stations in a deregulatory move that has delighted broadcasters and disappointed public interest groups.

The Commission's ruling allows radio broadcasters to determine for themselves the appropriate amounts of commercials, news, and public affairs programming for their audiences. Replacing the nonentertainment minimum is a nonspecific standard requiring radio broadcasters to address themselves to important community issues, including controversial ones.

The NAB was quick to hail the "enlightened" move, calling it "a turning point in the history of broadcast regulation." Religious and public interest groups, which had opposed lifting the limits, were considerably less pleased. The Media Access Project's Andrew Jay Schwartzman called the ruling "a sad day for minorities, women, the poor, religious groups, and other working people who have relied on the FCC" to see that listeners' needs were met.

Stations' public files will have to include each year a list of issues of community importance they have addressed; the list will still be reviewed during license challenges.

Domestic Satellites Get Big Lift From FCC

A massive action by the FCC at the close of last year has paved the way for the launch of 20 new domestic satellites, with five more authorized to be constructed but not launched yet. The birds will replace existing satellites ready for retirement, expand the services of existing carriers, and start off new services. The new birds are all scheduled for launch between now and 1983 and should do much to relieve the current satellite squeeze.

The eight companies involved include: Hughes Communications, which will build three birds and launch two of them; Southern Pacific Communications Co., also building three and launching two; Comsat, authorized to launch its fourth Comstar satellite; AT&T, which will construct a three-satellite Telstar System to replace the Comstar birds when they expire (two of the birds are approved for launch); RCA Americom, which will construct six new Satcom satellites and launch four of them; Western Union, given the go-ahead for construction and launch of two additional Westar birds; Satellite Business Systems, which got approval to launch its second satellite; and GTE Satellite Corp., which will construct three satellites and launch two of them.

Gannett Forms Satellite News Firm

Gannett Satellite Information Network has been formed by Gannett Co. to beam information to print and broadcast media outlets via satellite. The Rochester, N.Y.-based publishing giant said that the info—to include news, advertising, and entertainment—initially would be transmitted from a transmitting station in Springfield, Va. The service has been titled "U.S.A. Today" and has leased time from the American Satellite Co.

Theoretically, an infinite number of stations and papers could be hooked into the net. Satellite subsidiary president Maurice Hickey said that several newspapers already have the small receiving dishes used for the Associated Press satellite net. Gannett owns seven TV stations and 12 radio stations in addition to its 81 newspapers.

Cable Goes West: Western Cable Show

Over 200 exhibitors—selling programming and cable equipment of all descriptions—and 6000-plus attendees crowded the Disneyland Hotel in Anaheim, Calif. for the twelfth annual Western Cable Television Show and Convention, December 10 through 12. Due to record attendance, next year's show will be moved to larger quarters, conference officials said.

Program suppliers were very much in evidence and very much in competition, resorting to such tactics as heavy leafletting of seats at all the sessions (Private Screenings, purveying sexploitation films) all the way up to a black-tie dinner on board the Queen Mary (CBS Cable). Other major suppliers and hopefuls regaled the conventioneers with big name entertainment, including the likes of Dolly Parton and Red Skelton. Premiere, moving right along in the face of its still-unsettled Justice Department suit, announced its January schedule; Time-Mirror Satellite Programming Co. announced

Outgoing FCC commissioner Tyrone Brown

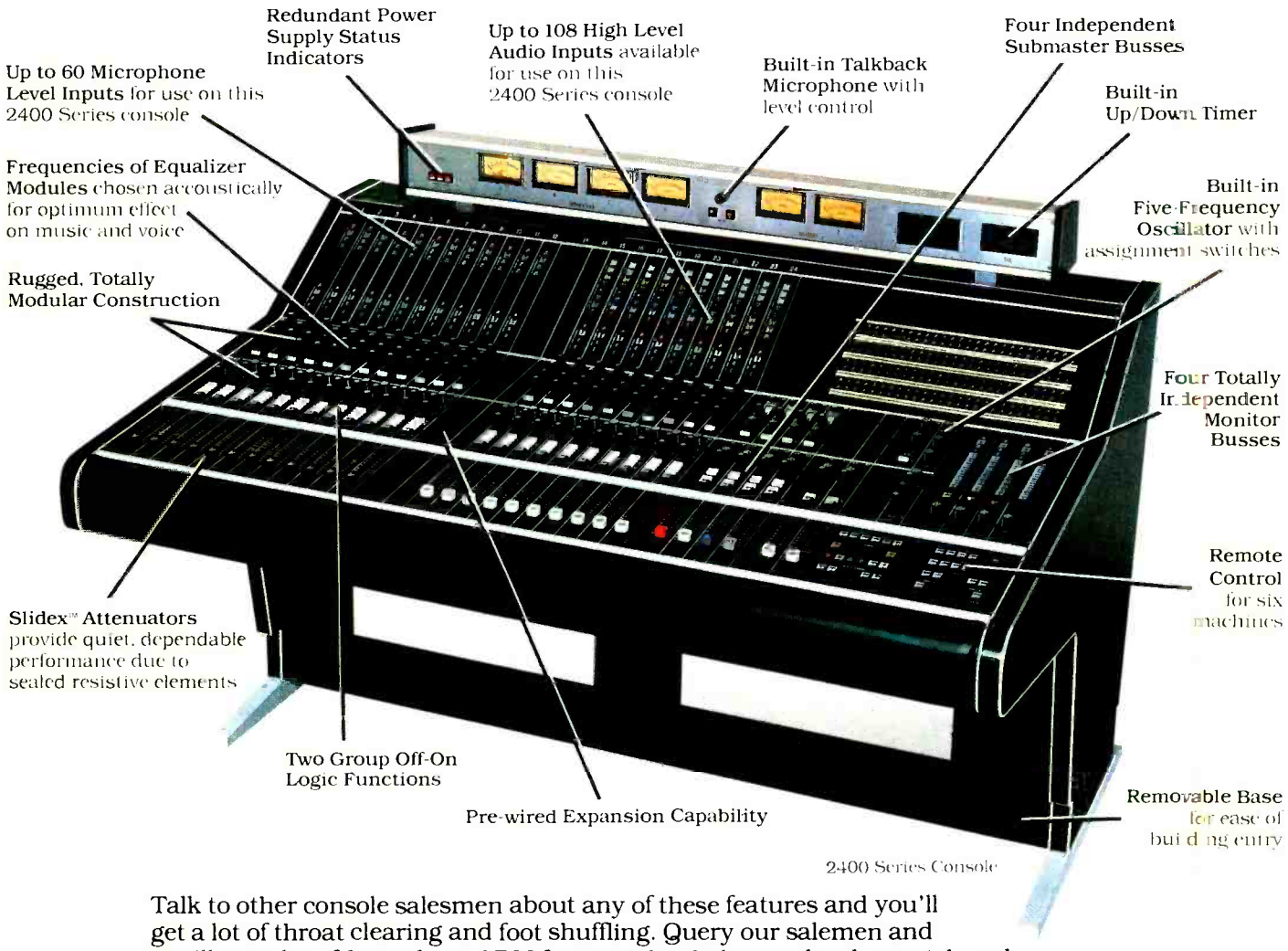
Tyrone Brown Resigns; Hopes For Black Successor

Commissioner Tyrone Brown, the only black member of the FCC and just the second black commissioner in FCC history, has resigned his post effective January 31 to accept a position as general partner in Steptoe and Johnson, a Washington, D.C. law firm.

Brown's letter of resignation to President Carter stressed the importance of minority representation on the Commission, saying, "I hope your successor will recognize [this] as you did . . . Such an appointment is not merely a matter of "tokenism"; it reflects an understanding that minority representation at the Commission level is the most effective way to assure that minority perspectives are considered..."

He praised FCC chairman Ferris who, Brown said, "has guided the FCC through one of its most dynamic and productive periods." Brown also noted that during his three "challenging and rewarding" years on the Commission, the body had become "the only independent regulatory agency to officially endorse and successfully implement a minority ownership program."

It makes our competitors nervous to discuss these standard ADM benefits



2400 Series Console

Talk to other console salesmen about any of these features and you'll get a lot of throat clearing and foot shuffling. Query our salemen and you'll get a lot of facts about ADM features that help you do a better job and he'll tell you about our exclusive 5-year warranty. (Yes, we *have* to build them better, and we do!)

Learn more about our Series 3200, 2400, 1600 or 800 ADM Audio Consoles. Contact ADM Technology, Inc., 16005 Sturgeon, Roseville, Michigan 48066. Phone (313) 778-8400. TLX 23-1114. West Central Sales Representative, Gordon Peters, (817) 467-2990.

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News

a cable home-shopping service, to begin by the middle of this year.

The hardware suppliers were there full force, including plenty of names well familiar to broadcasters—ADDA, Bogner Broadcast, Compact Video, Harris, Jerrold, Magnavox, Microwave Associates, Motorola, RCA Americom, Station Business Systems, and System Concepts, to name a few. Reflecting the importance of the satellite to the cable industry, the parking lot of the hotel was filled with dishes from manufacturers such as Hughes, Scientific-Atlanta, Microdyne, and Gardiner.

PBS Loses BBC Shows To New Cable Net

When new cable network RCTV goes into operation in January, 1982, its impact will be felt strongly at the Public Broadcasting Service. That is because RCTV, a division of Rockefeller Center Inc., has signed a 10-year exclusive contract with the British Broadcasting Corporation for rights to BBC-produced programming.

The high-quality BBC shows, such as *Masterpiece Theater* and *The Ascent of Man*, have been a staple of the PBS offerings for several years, helping the public TV stations draw viewers and financial support. Under the RCTV-BBC agreement, RCTV will own the shows on an exclusive basis for at least one year, perhaps longer for the most popular shows. After that period the shows may be made available to public or commercial TV stations.

The new network, which has not signed up for satellite space, will also offer U.S.-made entertainment and children's programming. RCTV was introduced at the recent Western Cable Show (see story in this section).

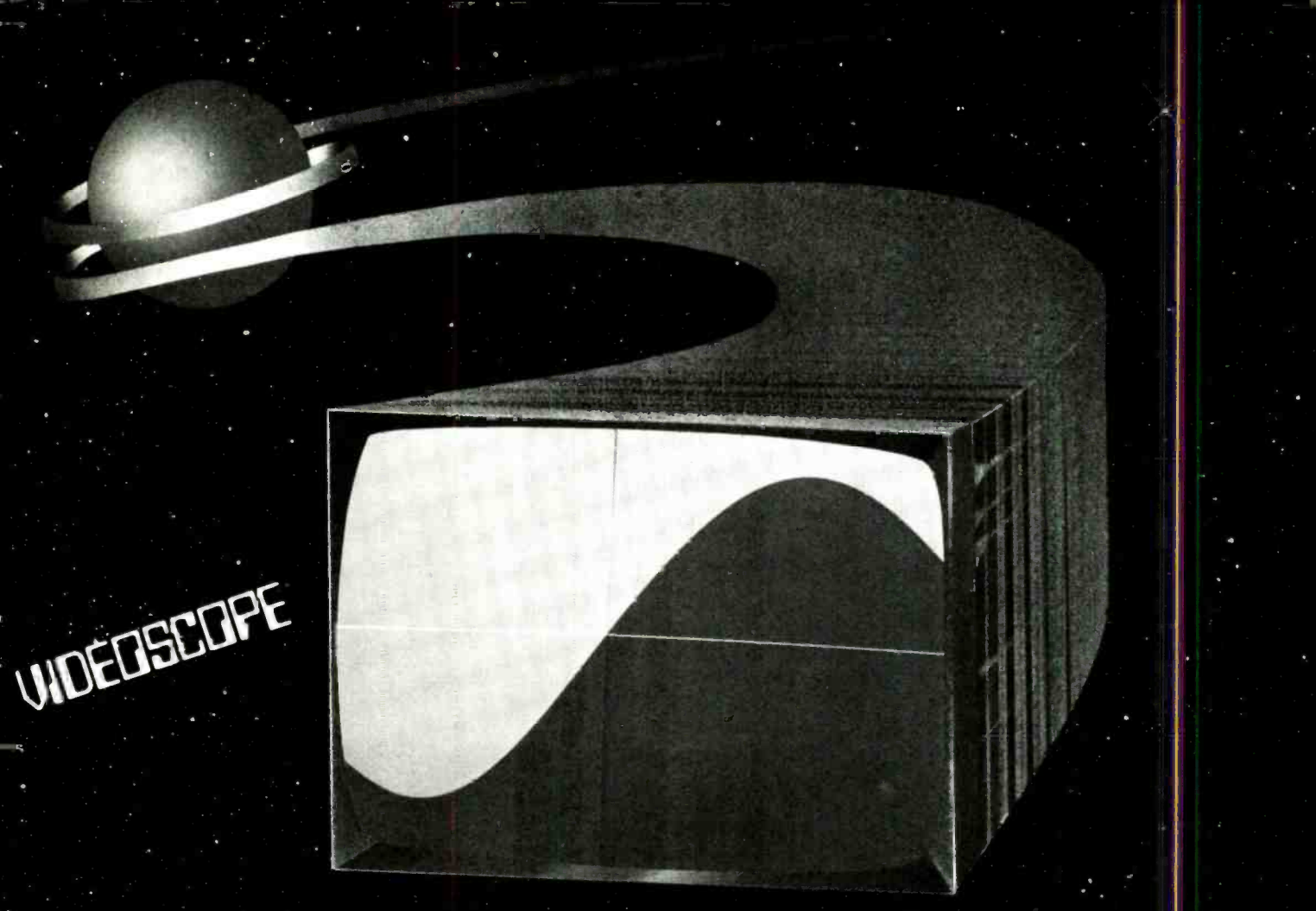
FCC Proposes Lifting Common Carrier Rules

Major deregulation of specialized common carriers, resale firms, and satellite carriers has been proposed by the FCC. The Commission based its proposal on a provision of the Communications Act that allows it to refrain from regulation of carriers with little or no market power.

Companies such as RCA Globcom, Western Union's satellite divisions, American Satellite, and Eastern Microwave could be among the beneficiaries of the deregulation plan, which defines market power as the ability to control prices and restrict output. The proposal specifically exempts AT&T, the independent telcos, and Western Union's telex and TWX services from deregulation, citing the large market power they hold. Competitive firms in the industry were termed "non-dominant" and therefore qualified for potential deregulation.

News Briefs

FCC commissioners Robert E. Lee and Anne P. Jones were due to make recommendations to the Commission by the start of this month about the agency's need for office space. A decision on the **proposed move to an office tower in Rosslyn, Va.,** was delayed until the recommendations could be considered . . . . **Complaints and comments** received by the Broadcast Bureau in 1980 were down almost 15,000 from 1979, with 70,000 of the 94,500 classified as complaints . . . . NAB has asked the FCC for a **freeze on low power TV and TV translator applications** because of the huge volume of such filings; present processing procedures, NAB said, violate the Administrative Procedure Act . . . . Technical standards for **FM quad broadcasting** should be set by the FCC, not left to the



Verify your RS-170A with a dynamic, easy to read video display that's light years ahead.

The new RS-170A Video Line Output specifications are designed to insure a consistent relationship between video burst and sync phase particularly during tape record and playback.

The specifications are relatively easy to achieve; however certifying and timing the signals is a different story.

We at Lenco have taken a careful, thoughtful approach to the challenge. We have developed the Videoscope.

The Videoscope will display a full cycle of sub-carrier and will tell you when correct SC/H phase is (or isn't) on the mark.

In addition to certifying, you can phase compare sync and burst of two video signals. Now you have a truly usable system analysis device.

Another plus. The Videoscope can give equally accurate results in source-to-source timing in a Non "A" System.

And because it is viewed on a standard video monitor—any monitor—you can look at the Videoscope display and quickly relate it to what is actually happening in your system. No more looking at faint lines on scopes in dark corners. To certify your RS-170A, all you need is Videoscope. Anywhere in your plant. Light years ahead.

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News Briefs

marketplace, NAB told the Commission . . . . The association has filed its opposition with the FCC to Turner Broadcasting System's request for **repeal of the mandatory cable carriage rules.**

Marvin Josephson Associates has agreed to purchase the assets of **WNOR-AM and FM,** Norfolk, Va., for a reported $2,600,000 . . . . Gulf Broadcast Group Inc. of St. Petersburg, Fla., has completed the resale of four of the nine radio stations it purchased from the San Juan Racing Assn. last fall. Infinity Broadcasting Corp. bought **WKTU** and **WJIT,** New York, and **WYSP,** Philadelphia, for $32 million; District Group Communications Inc. bought **WUST,** Washington, D.C., for $1.5 million . . . . Bible Broadcasting Network has agreed to purchase its fifth radio station, **WXNC-FM** in North Carolina.

The U.S. Environmental Protection Agency has awarded a $230,000 contract to the University of Tulsa, Okla., to study the **effects of microwave radiation** on unborn mammals. (For a discussion of concerns raised by broadcast use of microwave, see *BM/E's* August, 1979 article, "The Deadly Spectrum?") . . . . National Captioning Institute close-captioned this year's Sugar Bowl game for ABC-TV, marking the **first captioning of a live sports event.** NCI has also begun captioning PBS's successful *Sesame Street* children's series.

The audio products group of **Ampex Corp.**'s Audio-Video Systems Div. has moved its operations to the company's Cupertino, Calif. facility . . . . Time base corrector manufacturer **Edutron Inc.** has moved to new corporate headquarters at 6649 Peachtree Industrial Blvd., Suite A, Norcross, Ga. 30092, (404) 447-4422 . . . . **U.S. JVC Corp.** has officially opened its new headquarters at 41 Slater Dr., Elmwood Park, N.J.

Robert D. Lloyd, formerly of Gold Key Entertainment, has formed **Lloyd Enterprises** to provide program distribution to commercial, public, and pay TV stations. The new firm is located at 15910 Ventura Blvd., Suite 800, Encino, Calif. 91436, (213) 788-4880 . . . . **Centel,** described as New England's largest one- and two-inch video post-production facility, has opened in Boston. The complex was designed by New York architect John Storyk and features a **CMX** editing suite.

A.F. Associates of Northvale, N.J., has organized a direct mail department to sell spare parts, modules, and components for the Ampex VR 1200 and VR 2000. A copy of the company's *Parts Bulletin* may be obtained by calling (201) 767-1000 . . . . **Moseley Associates** of Goleta, Calif., has named two exclusive Canadian distributors. They are Nortec West Ltd. of Vancouver, B.C., and Applied Electronics of Toronto, Ont.

Transportable earth stations were a transmission method of choice for stations covering last season's big football games. Four Oklahoma TV stations—KOCO, KTVY, and KWTV of Oklahoma City and KTUL, Tulsa—shared a **Wold Communications** transportable uplink for their coverage of the Orange Bowl in Miami, while the Cable News Network beamed its Super Bowl coverage out of New Orleans via **Satellite Syndicated Systems'** transportable earth station. SSS recently purchased a Torus 4.5-meter multiple beam earth station antenna from **Radiation Systems, Inc.**—the first sale of the unit.

SUN Television's new $3 million 40-foot remote video production vehicle, built by **Compact Video Systems,** has been outfitted with **Ikegami** HK 357A and HL-79 cameras, a **Quantel** DPE 5000 Plus effects unit, and an **ADDA** frame store/synchronizer.

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

Audio for TV Stations!

Simplicity, reliability and high performance are the parameters needed by TV broadcasters in the 1980's. And Neve delivers just *that* in its wide range of purpose designed TV audio consoles; consoles surprisingly price competitive and often available on short delivery. Our 542 series spans 6 to 16 in, ideally suited for video production facilities and TV audio sweetening. The 5315 and 5316 consoles are available in sizes from 12 to 36 in with 4 or 8 submasters for TV sound production and on-air applications. Please write or call for our comprehensive TV audio console information package, so you can put Neve in your budget now. You'll be joining the Neve world of excellence!

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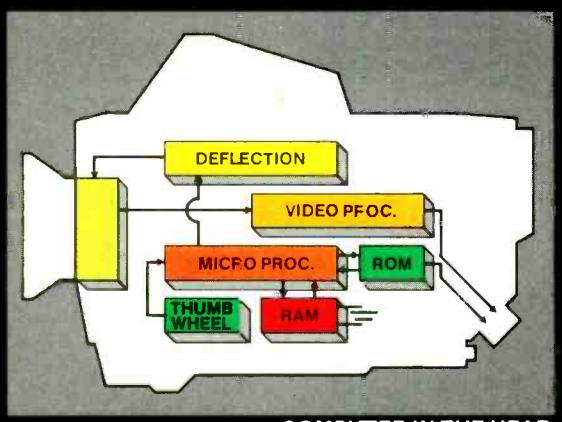
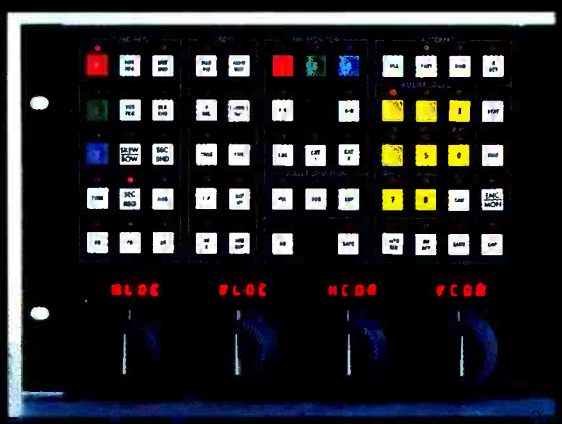
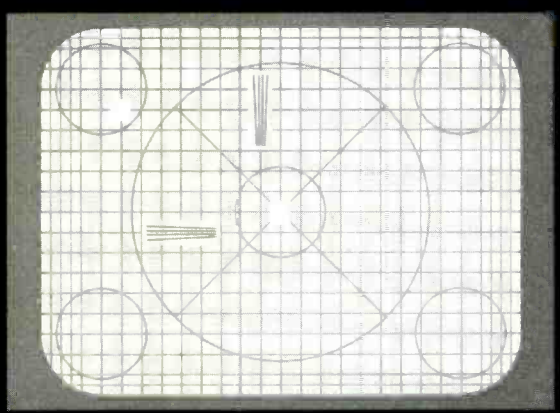


COMPUTER IN THE HEAD



MASTER SET-UP PANEL



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The MSP. Total Control Manually or Automatically.

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

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RADIO

PROGRAMMING & PRODUCTION FOR PROFIT

The Program Flood Is Rising

IT APPEARS CLEAR that a main feature of the radio landscape in the near future, along with rising competition, will be a tremendous increase in the number and variety of programs available to stations around the country. The satellites are a main cause, encouraging the development of a whole new software industry for radio, with old-line networks joining many new organizations as the creators. But program activities outside satellite distribution are being stimulated, too. The program market enlargement effected by the satellites is encouraging other groups to plunge in with new kinds of programming, and many are selling well.

Competition is applying its own spur to program creation; stations even in small markets now find they need programs with more "finish" than they can afford to supply themselves. The syndicator is riding the wave.

In a later issue *BM/E* hopes to bring together a fairly comprehensive account of the programming scene, with a directory of sources. In the space available here we note, as we have in earlier issues, a few of the short-program syndications we have learned about lately.

"Country" personalized

Louisville Productions is a division of WHAS, Inc., operator of the veteran radio and television stations in that city. The firm has been successful in production of film and videotape programs and radio and TV commercials. Its first venture into radio syndication is *Inside Country*, 52 weekly programs each consisting of five-chapter interviews interspersed with music. Each weekly series presents one country musician, highlighting his or her life history, comments, attitudes to music, etc. The interview segments are 3½ minutes long with room for commercial breaks. This allows for easy rotation with the music, fitting into the station's programming in a natural way. Louisville Productions recommends that each interview segment be used four times a day, but stations can do it less or more as their formats dictate.

"The country music audience identifies with the personality of the artist as much as with the music," Bob Gordon, president of Louisville Productions, said. "We try to provide a feeling of intimacy with the artist . . . and this requires the skill of an interviewer with insight, sensitivity, and perspective."

The interviews are put together and conducted by Alanna Nash, biographer of Dolly Parton and with a large volume of other writing to her credit in many media on the subject of popular culture, especially country music. She has also created a number of radio specials for various organizations, in-

One of the groups covered in Inside Country, *a syndicated country music interview series from Louisville Productions, is the Charlie Daniels Band, shown in concert on January 8, 1981*

cluding Creative Radio Shows and National Public Radio.

The list of names for the first year of *Inside Country* includes just about every country artist with an impact, past and present. Nash's expertise is evident in the scope of her choices.

The subscribing station has the right to repeat the programs at will during the one-year period. Cost is based on market size.

The fact that a successful producer of video programs is moving into radio syndication is more evidence of the radio programming rise. As of fall, 1980, 55 stations were taking *Inside Country*, a good start for the program.

The programs are distributed on discs, each holding the segments for two weeks of the program. Bob Gordon told *BM/E* that discs were being used in part because of the hope that several hundred stations would eventually take the program.

Radio programmers who want more information on *Inside Country* should call Gordon at (502) 582-7555.

Interviews from Israel

A series of 15-minute weekly interview programs, *Dateline Israel*, is distributed free to radio stations by the Anti-Defamation League of B'Nai B'rith. The series includes such material as a discussion by Israel's president, Yitzhak Navon, of the contributions through history of the Jewish people to the ethics and principles of Western civilization; energy alternatives being developed by Israel, described by Yehuda Bronicki, director of the country's energy program; a report from Israel's Arabs by Ibrahim Shbat, a distinguished poet and novelist; a discussion of solutions for Israel's inflation rate by Dr. Haim Ben-Shachar, president of Tel Aviv University; an analysis of Israeli entertainment preferences and the role of entertainment in times of crisis by Dan Almagor, playwright and television producer.

Interested radio programmers should address the Anti-Defamation League at 823 United Nations Plaza, New York, N.Y. 10017, or any of the League's regional offices.

Special to the 45-and-over

We are there now, or will be sometime later. Thus *New Age Radio*, a series directed to the problems of aging, will continually gain graduates to its intended audience of "older" Americans. The series is produced by Jameson Broadcast, Inc., of Washington and Columbus, Ohio. The plan is to produce the series on a state-by-state basis, with a sponsoring organization in each state. The show will have a retired couple, Ed and Irene Martin, as hosts who will answer questions from listeners and discuss across a table all the topics of main interest to the 45-and-over: finances, health, leisure, legal matters, housing, etc.

By basing the series in each state, Jameson intends to make specific reference to services available in that state. This has worked out well in the first aired series, which is sponsored by the Ohio Commission on Aging and has been carried by more than 100 Ohio radio stations beginning in June of 1980.

An ever-present hazard of old age is aloneness, and Jameson is aiming to provide an active two-way communications line with listeners so their individual concerns can get quick attention with essential information and support supplied. Each segment of the program is three minutes long, with the hosts handling the material in a personal, informal manner.

For info: Margi Hess, Jameson Broadcast, (614) 476-4424. **BM/E**

Program Marketplace

Syndicators For Radio

Cavox Stereo Productions
502 South Isis Avenue
Inglewood, Calif. 90301
Tel. (213) 776-6933

RADIO IN THE SMALL and medium markets reflects the trends in broadcasting more intensely, in some respects, than do radio operations in the big cities. For example, competition, more and more the dominating condition of the radio broadcaster, can be a life and death matter with only three stations in the market—if the city has, say, just 50,000 citizens. A radio station cannot survive with 10 to 15 percent of the active listeners in a city that size.

Lee Tate, founder and president of Cavox, is acquainted in detail with the survival problems of radio broadcasters in the small and medium markets. As described in this column in December, 1977, the firm has eight main formats, covering nearly all branches of popular music. Further, each format is divided into blocks which can be reassembled in other orders, menu-style, for the particular formulation the management believes is best for its market.

This implies close consultation on a continuing basis between Cavox and the subscriber. Lee Tate, in a recent interview, told *BM/E* that the intensifying competition in radio has, in the last few years, made subscriber consultation more and more a continuing fact of life for his operations. Changes come faster in radio markets than they used to; station managements more quickly jump to new forms of programming when the competition in the market poses a new threat.

Thus more frequently than in the past a subscriber, or a prospective subscriber, issues a call for help, even when the emergency or the threat is a minor one. Lee Tate, with more than two decades of experience, is a "programming doctor" with tested expertise. His long concentration on stations in the small and medium markets has paid off with a steadily growing subscriber list. 1980 was up again as all recent years have been.

His renewal rate is very high; he told *BM/E* that more than 80 percent of the stations on the list at the time of the December, 1977 column are still there.

His comments on trends in radio's use of popular music are quite a bit like those of other syndicators recently interviewed. With most of the Cavox subscribers in small and medium markets, the demographic appeal in general must cover the whole age span without the concentration on the teen bracket that some big-city stations are able to afford. This mostly grownup audience is showing increasing aversion to anything like hard rock, and is turning to a mellower sound. Cavox serves this taste with various forms of an Adult Contemporary format. Tate says it might be called MOR, but not the MOR of five and 10 years ago: that would have a nostalgic sound now. This new formulation is built on current music and has a thoroughly up-to-date sound.

Also still very successful for Cavox is the Beautiful Music format, which is stronger than ever. But Cavox has the problem that all syndicators of Beautiful Music have; finding Beautiful Music. The format was dropped by the American record industry, and the syndicators must go to other countries to find it. Lee Tate goes to England for some of his recordings. He has worked with Jim Schlichting of Starborne Productions (*BM/E*, December, 1980) and

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

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

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

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

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

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

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

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

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

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

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

That was well over a year ago. Since that time I've spent many months listening critically to a parade of darn good prototypes, shaking my head and watching some of the world's best speaker engineers disappear back into the lab to tweak and tune. And, I spent a lot of time on airplanes heading for places like Los Angeles, Grand Rapids, Charlotte and New York City with black boxes under my arm testing our designs on the ears of broadcast engineers.

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

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

Greg Silsby

Market Development Manager,
Professional Markets

Electro-Voice
a gulton company

600 Cecil Street, Buchanan, Michigan 49107

In Canada
Electro-Voice, Div of Gulton Industries (Canada) Ltd.
345 Herbert St., Gananoque, Ontario K7G 2V1

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constantly searches in other domestic and foreign record supply sources for what he needs.

Cavox has recently begun to open a new market for the music, which is also a very old market for Cavox. The name of the firm itself signifies "Cable Voice" because one main objective at its founding in 1971 was to furnish cable systems with background music for their "character generator" channels—the weather, local notices, etc.

At that time the "cavox" function did not flourish largely because cable systems did not find it cost-effective to market the service to subscribers. Cavox turned major attention to broadcast syndication and built its success there. The cable industry went into its doldrums of the middle 70s.

In the last two years, though, with cable expanding tremendously and becoming a much stronger market for services under the influence of the satellites and of sophisticated pay-cable operations, the opportunities have spiraled back to the original Cavox plan. Today the cable operator can make money with salespeople actively pushing the various pay-cable services, and music in some form is one of the inducements to subscription.

This may take the form of music in back of the "local announcement" channel. Close to 100 cable systems now use Cavox music this way, which is as Lee Tate originally envisioned the service.

Also building strongly are sales to the cable subscriber of "pure" music channels. The subscriber gets one or two channels of *commercial-free stereo music* of top quality "split" from the TV cable into his FM receiver. The cable operator gets a moderate extra fee for this, and it is efficient for him to sell it along with HBO, Showtime, or other pay-cable entertainment services. More than 25 cable systems have adopted the plan and the subscriber welcome has made them enthusiastic about it.

To equip the service Cavox sets up a tape playback system of top broadcast quality at the cable operator's main studios. The tapes then go out on a regular schedule, as they do for a broadcast station. Choice of material is governed by much the same considerations as those that apply to broadcast music.

Cavox is well-positioned for setting up the equipment because it has a sister company, Tapeathon, which has a large business in this country and abroad in the supply of equipment and programming for background music. Lee Tate had a valid idea. He was just a little early. **BM/E**

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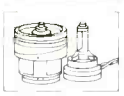

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Shown from left AU-700 editing recorder, AU-A70 programmable editing controller.

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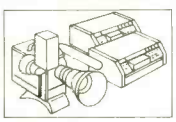

With our AU-A70 editing controller not only can you generate and read time code pulses, microprocessors let it perform up to 20 time code edits automatically. Add an AU-J10 multiple source adapter and it will accept inputs from two source decks and one live line plus perform A/B rolls. Microprocessors also let you automatically go to specific tape locations. You can also search both ways at speeds of 1/20X, 1/5X, 1X, 2X, 5X plus pause with picture. Other features include program check, program exchange, insert programming and overflow indication. For editing convenience, separate address time and lap time indicators are included. The AU-A70's error codes pinpoint any procedural errors to avoid incorrectly programmed edits. The AU-A70 can also be used with any Panasonic solenoid-operated ¾" and ½" VHS™ decks. For worldwide versatility, there is a built-in voltage selector that is compatible with 100V / 120V / 220V / 240V AC, at either 60 Hz or 50 Hz.

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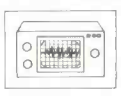

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TELEVISION

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RTNDA: Technology Versus Journalism

THE RTNDA's ANNUAL CONFERENCE is starting to rival NAB and SMPTE for introduction of new equipment. That may be a little overstated, but it is clear that companies are fully aware that the biggest single purchaser of technical equipment, outside the chief engineer, is the news director.

The exhibit area at the 35th International Conference of RTNDA was the largest in the organization's history. More importantly, the size of the hall at the Diplomat Hotel in Hollywood, Fla., was the sole limiting factor. RTNDA officials had a long line of exhibitors waiting in the wings. About a week before the conference opened one of the exhibitors dropped out. Even with that short a notice, exhibit chairman Eddie Barker had no trouble finding someone to use the available space. Most of the attention in the exhibit area focused on weather graphics, news computers, and helicopter microwave gear.

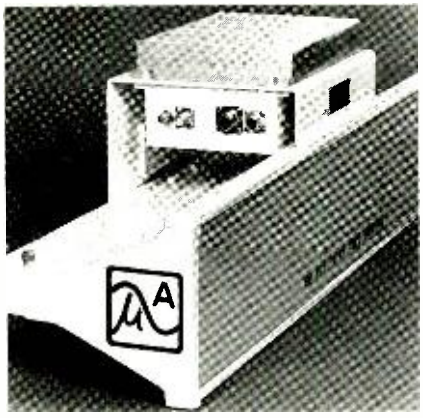
The panel discussions dealt with basic journalistic concerns (such as freedom of information, investigative reporting, and writing) and improving management skills. There were also two sessions that allowed outsiders a chance to express their dissatisfaction with broadcast journalism.

There was an unofficial theme at this year's convention which dealt with whether technology has gotten out of hand in local television newsrooms. The public expression of the controversy came in several speeches and some of the formal sessions. The opening salvo was fired by Reuven Frank of NBC News, who said, "I believe we were better off when technology was not so advanced"—his point being that the use of the technology has been to bring more of the same kind of information available in other media only faster. His contention is that the visual aspect of the medium has not been exploited to its full potential. Frank thinks that television news has become so wordy that it is more to be listened to than watched. And because there is a dependence on stories that aren't inherently visual, there is an overdependence on "devices that give forth numbers and letters and split-screens and zooms and star bursts and insets and flipovers."

Dan Rather of CBS News was next to observe that the technology was like the tail wagging the dog. "We're on the edge—some of us already are over the edge—of becoming so enthralled by the machinery that we forget about some of the elements of a newscast that only gifted people can provide. I wonder if we're not becoming the slaves of these advances, not their masters." Rather then differed with Frank in saying that broadcasters were becoming overly dependent on pictures and forgetting about words. He lamented that he saw little evidence that television was nurturing writers.

A final public shot was fired by Pauline Frederick of National Public Radio, who was given the coveted Paul White Memorial Award for her contribution to international reporting. "The technology," Frederick contended, "...has given our profession marvelous tools with which to work. But the question that should forever confront us is whether in our eagerness to use these instruments, the import of the message may become confused with the messenger who could be perceived as trying to make and shape the news." Frederick went on to say that reporters should stop practicing "'What if...' journalism" and just report what happened.

NIWS had one of the busiest booths in the exhibition hall and reported a significant number of sales



Microwave Associates displayed its prototype 7 GHz array antenna for the first time at RTNDA

Attack on integrity?

There were no formal answers given to the public pronouncements but privately many news directors held forth on what they considered an attack on their integrity and professionalism. "The network people," said one news director, "are always about two years behind the trends in local news." He said that there was a time when the technology may have been misused "because we had it and not because we knew what to do with it."

He and a lot of his colleagues interviewed by *BM/E* said that the use of the new technical equipment is back in balance. They contend that the dog is firmly in control of the wagging tail. A news director from a medium market in the midwest said, "I've got a helicopter, microwave vans, the latest cameras, and color radar. But I've also got an investigative unit, three more reporters, and two field producers. I now feel like I've got the tools to do what I'm supposed to be doing—news."

Bill Taylor, senior partner in the consulting firm The Media Associates, thinks that there is some validity to both sides of the argument but believes that there is a tendency by network pundits and others to "underestimate the intelligence of the public. People watch news for news...not for helicopters."

Dave Emery, news director at WMAR-TV, Baltimore, summarized things this way: "If we're such slaves to technology, why are the workshops on every subject but technology?"

Two of the first workshops held (and well attended) were Ed Bliss's lectures on writing for radio and TV. Bliss's lectures have become somewhat of an institution at RTNDA conventions, but he claims that this is the last year he will address the group. Many say they will miss him if that is true. "He's an analytical man," says Mike Beecher, news director at KTIV-TV, Sioux City, Iowa, "in an industry that needs to be more analytical in its approach."

Another popular workshop was the one on investigative reporting (see story on I teams in the January, 1980 *BM/E*). Quite a bit of the discussion

centered on the ethics of investigative reporting. Lea Thompson of WRC-TV, Washington, D.C., says, "You have to have long, hard philosophical discussions about what you will or will not do in going after a story. Do you pay bribe money? Would you show how to break into a car? Do you misrepresent yourself? These questions have to be dealt with because while we will be slinging mud at others, we have to be prepared to have mud slung at us."

For an industry that is the constant focus of criticism it seemed strange to some that there would be two panels devoted to critical looks at broadcast journalism from non-industry panelists. The panel of media critics included Hodding Carter III, Jeff Greenfield, media critic for CBS News, and Bob Schulman, news critic for the *Louisville Times*. Schulman was a last minute substitution for Tom Shales of the *Washington Post*, who was unable to attend.

Carter took the hardest stance against local news by saying flatly, "A lot of people in local news don't know what the hell they're talking about."

Inequities in access

Greenfield and Schulman both worried about what Greenfield called "class bias" in reporting. Schulman felt that because poor people have limited access to the media, the impression is given that news is there to "give comfort to the comfortable and affliction to the afflicted."

"Business Talks Back" was the title of a panel made up of Robert Beck, chairman of Prudential Insurance, Brewster Atwater, Jr., president of General Mills, and Ronald V. Rhody, vice president of Kaiser Aluminum. Each in his own way felt that television did a poor job of reporting on business. They claimed there was too much reliance on government assessment of questionable business practices, that reporters were rarely schooled in business and could not provide perspective on how business operates, and that too often stories on business tended to be what Rhody called "trial by television." The panelists agreed on what would help to correct what they saw as the bad image of business—better-trained and business-oriented reporters. Their feeling was that there should be more reporting on business's contributions as well as its problems.

Exhibits

Hughes Helicopter got a lot of traffic through its booth because of its small helicopter ENG system called the "Inflation Fighter." The piston-driven 300C helicopter is equipped with a new microwave transmitting system developed by Tayburn Electronics, and its $160,000 price tag is about two-thirds less than larger systems. Hughes says that the cost breakthrough came about because of Tayburn's TBT-50 portable transmitter, which weighs only 22 ounces. The complete ENG package weighs just 25 pounds. The system is said to be capable of all the live functions of larger systems. A version of the system is in use at KPNX-TV, Phoenix. Hughes says that the new system will allow smaller market stations to get into this aspect of live television.

Microwave Associates surprised many people by showing the prototype of a new 7 GHz array antenna for ENG vans. It offers an alternative to the four-foot dish antenna. It is a fixed right circularly polarized unit with the option of left, vertical, or horizontal. It puts out 30 W of power with 24 dB gain. The unit can also be tripod-mounted. It's priced at under $5000 and can be delivered in 90 days.

Five companies exhibited some type of color radar graphic system: Colorgraphics Systems, Information Processing System (IPS), Technology Services Corporation (TSC), Weathermation, and Weatherscan International. "RTNDA is the only place where you have all the latest equipment available under one roof," says Eric Ober, news director for WBBM-TV, Chicago. For a complete rundown on color radar see *BM/E*, January, 1980.

The news computers drew a lot of interest because this is the first meeting following the pilot programs. KSL, Salt Lake City, and WQAD, Moline, Ill., both opted not to buy Station Business Systems' Newscom at the end of the six-month trial period. The system had been having some problems in the time it was taking to print the final script. George Papula of SBS says that the problem has been minimized with new software and that WQAD decided not to buy the system for economic reasons, not solely because of the system's debugging problems.

Too much, too soon

Spencer Kinard, news director at KSL, Salt Lake City, felt that SBS tried to do too much with the system all at once. He also made much of his decision for economic reasons: "Looking at the system and what it would cost, we didn't think we were ready to buy it at this point."

Even though the formal trial period is over, SBS is leaving the equipment at KSL so that the new software innovations can get a workout in a real newsroom. George Papula says, "As long as KSL is willing to work with us we will continue to work with KSL."

Jefferson Data System's Electronic News Processing (ENP) system has had more success because it is being phased in gradually at WBTV, Charlotte, N.C. And while JDS and WBTV are co-owned by Jefferson Pilot Broadcasting, there has been an openness in discussing problems with the system. A question was raised, for example, about whether the IBM Series I computer could handle the number of terminals proposed for the system.

JDS officials say that the system is still in the pilot stage and it is premature to speculate on the system's capacity before that capacity has been tested. They add that if the specifications call for the system to drive 20 terminals, when ENP is delivered it *will* drive 20 terminals.

Weatherscan is the weather reporting and on-air graphic component of Newscan. New software has increased the resolution of the computer graphic display. The quality of the picture attracted a lot of news directors who were looking into color radar systems. One observer noted that there was so much attention on the graphics system that the news computer didn't make as much of an impact as it should. "Newscan is the most underrated system being sold," he commented, "because of the weather and graphic system."

Ron Hudson, marketing director of Newscan, did not respond directly to that point but noted, "We're getting about a tenth the traffic that we had at NAB, but there is a thousand percent more interest. And those that stop are better informed. I didn't have to explain what a news computer did."

Basys, Inc., was showing its News Fury system, but seemed to be focusing more on gathering ideas than selling the product. It could be that Basys, having made a sell of a very large system to Ted Turner's Cable News Network, is less interested in making more sales at this time than in researching the market. Peter Kolstad of Basys says, "Right now, we are interested in selling a concept. The idea of who makes a sell is not as important as people being

TV Programming

convinced that the concept of a news computer is a viable one." Kolstad also noticed that the news directors were better informed about computers—"In fact, we got the idea for a couple of new products at RTNDA."

System Concepts' QuantaNews made an appearance at this year's convention with new, custom-designed hardware. Because the hardware is its own, the company feels that it can not only sell a basic news computer for less but also provide a character generator that is under the control of the news department so that supers, sports scores, weather information, etc. can be loaded from any of the news terminals. QuantaNews is aimed at the smaller markets. System Concepts feels that it can provide most of the features of the larger computer systems at half to two-thirds less.

All the computer vendors set aside their competitive situations at one point during the convention to get together to propose unified standards for wire service codes. The guiding force behind the standardization drive was Bill Ferguson of UPI. During the NAB convention, Ferguson polled vendors to see if they were interested in some kind of standard broadcasting code for news computers. A meeting was held at RTNDA to propose establishing codes that were in the same format as the ones used by the American Newspaper Publishers Association (ANPA), but redesignated via selector codes for strictly broadcast use.

All the vendors attended the meeting, as did Jim Hood from AP and Larry Cooper from KCBS. The group agreed to draw up a list of proposed codes and submit them to RTNDA for its approval early in the year. A proposal that RTNDA go on record as the sponsoring body for this new code standard was unanimously adopted by the membership.

Other highlights

NIWS, the News and Information Weekly Service that went on line in November, made major strides at RTNDA. When NIWS arrived at RTNDA there were 24 stations signed up. There are now 39 stations in the line-up and more are expected soon. NIWS president David Salzman has no doubt that RTNDA made the difference. "We felt that we had to have a presence at RTNDA," Salzman noted, "but we did not expect to do any significant business there or as a result of being there in the short context. We were wrong. We were able to increase our line-up by about 60 percent as a result of being at RTNDA." Some of the stations that signed up for the service included WCVB in Boston (considered a coup because WCVB has a reputation for rarely dealing with outside vendors for news product), KUTV, Salt Lake City, the Harte-Hanks group.

Angenieux introduced a new ENG lens at RTNDA. The zoom lens is a 15×9, 9–135 mm, with an aperture of f/1.5–1.9. The lens operates at very low light levels. It boasts a built-in 2× extender that changes the focal length to 18–270. The lens weighs 4.6 pounds and is priced in the $6000 to $7000 range. Delivery for most cameras will be in early 1981.

Beston Electronics (BEI) had the distinction of being the only exhibitor in three places at once. Because BEI was the only vendor that had an electronic prompting device available that could interface with news computers, two of the computer companies were using the BEI DataPrompter as a component of their products. Jefferson Data Systems had it hooked in as the prompting interface with its ENP system. Station Business Systems' Newscom was using it for the same purpose but also was integrating the closed captioning function for the newscasts produced by its news computer.

The DataPrompter on its own could be used as another first step in a station's gradual move into computerized newsroom functions. The full DataPrompter System, which runs about $13,000, not only acts as a prompter and character generator, but also has a text editor for writing and even filing news scripts. There is also an encoder available for line 21 closed captioning.

Electronics Application, Inc., introduced the new Christie On-Board Nicad ENG batteries. The KR series fits on most ENG cameras currently in use, including the new RCA TK-86. The battery charges in 12 to 14 minutes when used with the Christie ReFlex 20 "burping charger." Price for the battery is under $500.

This year's convention attracted an official registration of 1570 people, the largest in the history of the gathering. But there were also, by one estimate, about 200 unofficial attendees. RTNDA is turning into a major job market. The bulletin boards were covered with resumes and the hospitality suites were full of people drumming up business for various projects. A number of vendors who couldn't get space in the exhibition hall were there nonetheless, buttonholing news directors in the halls and over drinks. Joe Rovitto, news director at WTAE in Pittsburgh, commented on all the activity by saying, "It shows that RTNDA has moved into the big leagues." **BM/E**

Ikegami's third microprocessor-controlled camera reduces registration set-up time and cost

The ideal camera for field broadcast television assignments must meet three major criteria. It must be air-ready moments after arrival at the camera site. It must deliver pictures of studio-quality color, crispness, and clarity. And it must be consistently reliable.

The Ikegami HK-357A meets those criteria in the field and is equally suitable as a studio camera. And it allows the camera crew to concentrate on creative aspects of their assignment instead of on time-consuming set-up and readjustment tasks.

Once on-site, the HK-357A requires hook-up to only three cables and power source. Then, a push of the microprocessor activate button automatically cycles it through a check and recheck of all set-up and registration adjustments. This takes approximately 45 seconds per camera (up to six cameras can be handled). No external registration and chip charts are necessary because a test pattern projector (diascope) is built into the lens. Camera distance from the compact base station can be nearly a mile with triax, or 2,000 feet with TV-81 multicore cable.

Because the HK-357A optimizes the capabilities of the newly developed Diode Gun Plumbicon®, the picture output is of very high resolution, low lag, low noise and wide dynamic range. Dynamic Beam Stretch to reduce comet tailing; Geometric Correction for near-perfect registration; auto iris and auto white balance — all contribute to the superior color picture program output of this camera.

The HK-357A is notably versatile too. It offers selectable contrast compression levels; built-in chroma keyer; gen-lock to Sync and SC or VBS/BBS; and several other features, including an unusually compact CCU, optional RCU, tiltable and rotatable 7-inch high-resolution electronic viewfinder.

The performance record of Ikegami cameras at the major networks in the United States and around the world attests to their consistent reliability and long, trouble-free service life.

If you are upgrading, a demonstration may well reveal that the other cameras you've considered may already be obsolete when compared against the HK-357A.

Ikegami HK-357A

Ikegami Tsushinki Co., Ltd. 5-6-16 Ikegami, Ohta-ku, Tokyo 146, **Japan**; Telex: 2466738 IKETSU J. Europe Representative Office, 4040 Neuss, am Alten Weiher 13a, **West Germany**; Phone: (02101) 23069; Telex: 8517960 ITCD. Ikegami Electronics (**USA**) Inc., 37 Brook Ave., Maywood, NJ 07607; Phone: (201) 368-9171. **West Coast**: 19164 Van Ness Ave., Torrance, CA 90501; Phone: (213) 328-2814. **Southwest**: 330 North Belt East, Houston, TX 77060; Phone: (713) 445-0100.

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"Our Sony video recorders have not only traveled the equivalent of fifteen times the circumference of the earth, but they've logged more than 2,500 hours of taping time," says Martin McAndrew, Vice President of Operations for Continental Colour Recording.

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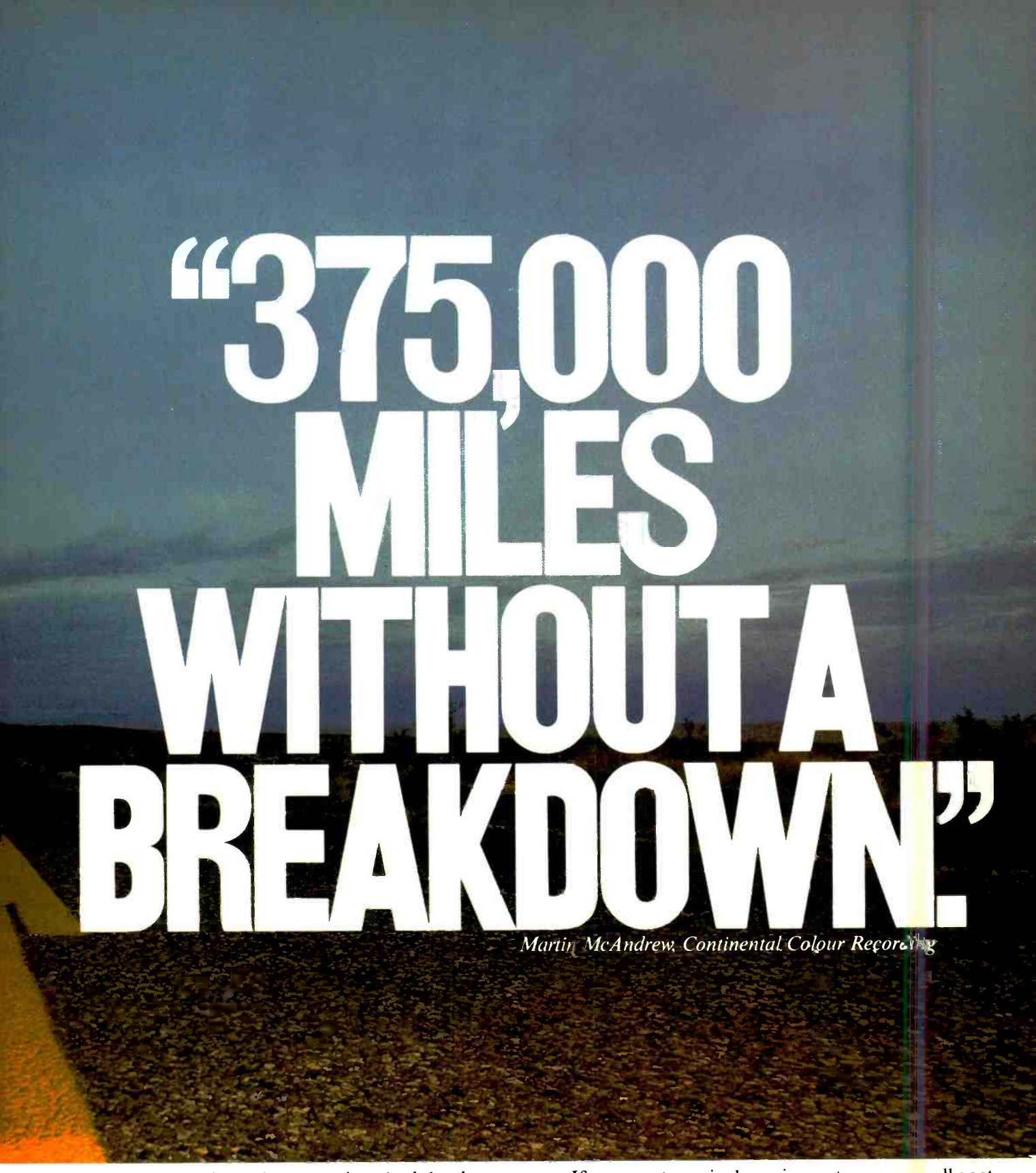
"Seventy per cent of the time, our equipment is used by ABC and NBC, but we also rent it to local television stations and production companies."

Continental Colour, the country's largest video equipment rental company, has specially built trucks and trailer trucks that are virtually television stations on wheels. Two of these trucks are equipped with one-inch equipment, including a total of two BVH-1100 and four BVH-1000 one-inch high-band video recorders. Continental has also purchased additional Sony recorders for its brand-new post-production facility.

"Sony picture quality is excellent," says McAndrew,



"much better than its main competitor. And the slow-motion capability of the BVH-1100's means that each can do the work of two separate machines, in less space, at less expense. No one else's equipment can match these 1100's.

"No wonder our Sonys are almost always on the road. They've covered the World Series, the Winter Olympics, the daytime Emmy Awards, the Tony Awards, operas and symphonies for PBS, and the Pope's visit to the U.S. And we've had zero problems; working with Sony has been delightful."

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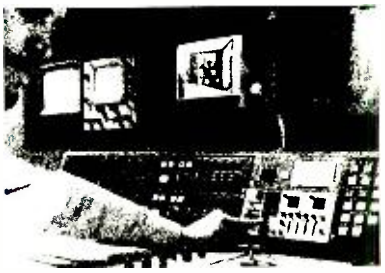
THE BROADCAST PLANT: FROM HERE TO DIGITAL



***"There is not a single, simple reason but rather a variety of factors that have combined to make serious discussions of studio digital systems a necessity for users of television everywhere in the world"*— Fred Remley (122nd SMPTE Technical Conference). And the discussion is just as important to radio broadcasters.**

MUSEUMS, ANTIQUE SHOPS, and curiosity collectors are in possession of thousands of inventions developed over the years. Those that did not find a role in the marketplace are either said to have been "ahead of their time," or are seen as manifest eccentricities. The truth of the matter is, inventions become innovations and innovations become standards of practice when, and only when, the needs of the marketplace and capacity of the invention coincide. The critical realization for today's broadcaster, whether devoted to radio or television, is that digital audio and video are the only known technologies capable of meeting the industry's long-term growth needs.

With the depreciation period for most broadcast equipment ranging from three to five years and the useful life of much production equipment doing better than that, it is fair to assume that much of the equipment purchased for today's plant will still be around when digital video and audio begin to assume a dominant position in the production chain. This fact has not gone unnoticed by SMPTE, EBU, AES, and other industry organizations struggling with issues such as equipment interface standards, communication formats, audio and video recording standards, and common carrier considerations.

In the articles that follow readers will come to understand some of the problems confronting today's broadcaster as the move to digital progresses relentlessly. Inherent in each step toward digital is the need for broadcasters in radio and television to meet marketplace challenges. There is no turning back. For corporations currently involved in the broadcast industry, managers routinely see industry projections placing $163,000,000 in advertising revenue in markets other than the U.S. by 1990. In the domestic market, by 1990 28.5 million homes may use cassette or disc recorder systems for home entertainment, 31.4 million homes will probably receive pay cable services, and 47.5 million homes will subscribe to regular cable television. The same projections see these figures more than doubling by the year 2000. (See figs. 1 and 2.)

Few, if any, reasonable pundits see the demise of broadcasting. It will continue to be the single most dominant mass communications medium well into the next century. While broadcasting currently enjoys a near-monopoly on electronic mass communications, what planners and investers see is a slowly decreasing share of market for broadcast as these new technologies come on line. All three major commercial networks are already diversified communications companies that actively seek new interests in the cable television, video disc, and motion picture markets. CBS, supported by NBC and ABC, recently sought a declaratory ruling from the FCC regarding financial interest in nonbroadcast rights to programming. In December, CBS asked the Commission to waive its rule prohibiting major television networks from owning cable television systems. CBS wants only the right to experiment with new programs and services on a system of 90,000 subscribers or less but it, the other networks, and many broadcast companies have made no secret of their desire to enter this new market. Both CBS and ABC have announced plans to develop special program packages for cable distribution.

At the recent Outlook For The Media 1981 Conference, held in New York, several group broadcasters explained their plans for expanding their interests in the cable and nonbroadcast markets. Cox, McGraw-Hill, and Harte-Hanks Communications Inc. were among the presenters.

So, the interest of major broadcasting companies and

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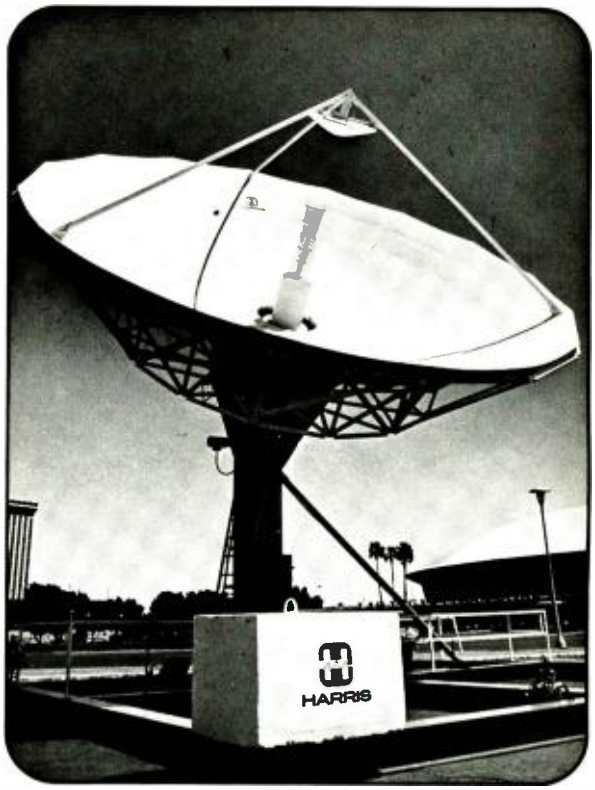

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by extension, most broadcasting companies, is to take advantage of technological changes so that they are major participants in these new media. If, as some studies project, traditional broadcasting will slip to a 70 to 80 percent share of audience by 1990 while pay, cassette/disc, and cable will share the remaining 20 to 30 percent—clearly—significant portions of that 20 to 30 percent share of the audience will still be viewing the products produced by today's broadcast companies. As indicated by the advertising revenue projections quoted earlier, the international market for television programs is also growing in importance. There is already a significant increase in commercial broadcasting abroad as England, Italy, and Spain add commercial networks, while other countries consider future growth for both commercial radio and television. Interest in cable, direct broadcast satellites, and pay TV is also growing rapidly abroad. The existence of a world split into NTSC, PAL, and SECAM television standards represents a serious barrier to program exchange and this realization was, in fact, the primary concern prompting Europeans to begin research into digital television more than 10 years ago.

Demand for more product conflicts with costs

While the numbers of channels available for the distribution of programming promise to increase by an order of magnitude over the next 10 years, the means for producing the programs to fill those channels grow more slowly. Already, cable systems boast 50 or more channels, yet often are able to fill only a dozen or so. The videodisc industry continues to sputter along, blaming a shortage of software; yet RCA plans an $18 million marketing investment to push its players into American homes in 1981 and beyond. Interest in direct broadcast satellites and multi-point distribution systems continues to grow. Cable has already turned to multi-tiered services offering subscribers two or more choices of pay TV channels.

Meanwhile, the cost of producing programming continues to escalate. According to a report in *Variety*, the average motion picture now costs 25 million dollars to produce. A single one-hour episode of a prime-time action series costs the networks $500,000, and series producers scream that the price doesn't even begin to cover costs. To meet the diversified programming needs of the audiences reached by these new channels new program forms, less costly to produce, will have to be developed and traditional program forms will desperately need to control the escalation in production and distribution cost.

As noted in last February's *BM/E* special report, "Strategies For The 1980s," broadcasters plan to restructure the way they market programming in order to defray the cost of production over several marketplaces. Not only will there be a network run, reruns, off-network syndication, and foreign sales, but attempts to repackage programs for pay TV, cable TV, and videodiscs. Larger projects such as *Battlestar Galactica* and *Shogun* are even now edited as theatrical releases for foreign distribution. While these costs seem staggering, the cost of producing local programming has similarly spiralled upwards.

Digital controls costs and increases productivity

The interest in digital audio and video, from a management perspective, is the hope it holds out for the control of costs and its promise to increase productivity. Manufacturers of broadcast equipment see the opportunity to design and build digital equipment that may be suitable to broadcast and nonbroadcast markets and domestic and foreign markets, thereby reducing their per-unit production cost measurably; R&D cost would be defrayed over a larger volume of sales. Broadcasters, of course, hope that these savings to the manufacturer will be passed along.

Greater productivity for the broadcaster relies heavily on the hope that new media will provide additional markets for programs and that more programs can be produced with fewer people. In the articles that follow (see "Machine Control At KPIX: Cornerstone To Digital" and "Machine Control Trims Equipment Costs, Prevents Labor Expansion") it can clearly be seen that the first step toward increasing productivity is the elimination of wasted time and motion. Machine control and clean intra-plant signal transmission allow routine activities, such as tape loading, and machine operation to involve fewer people. At the same time, machine control also puts into the hands of the producer all the technical resources needed to produce a project with a minimum of preproduction time spent organizing equipment. Productive capacity will stand idle less often:

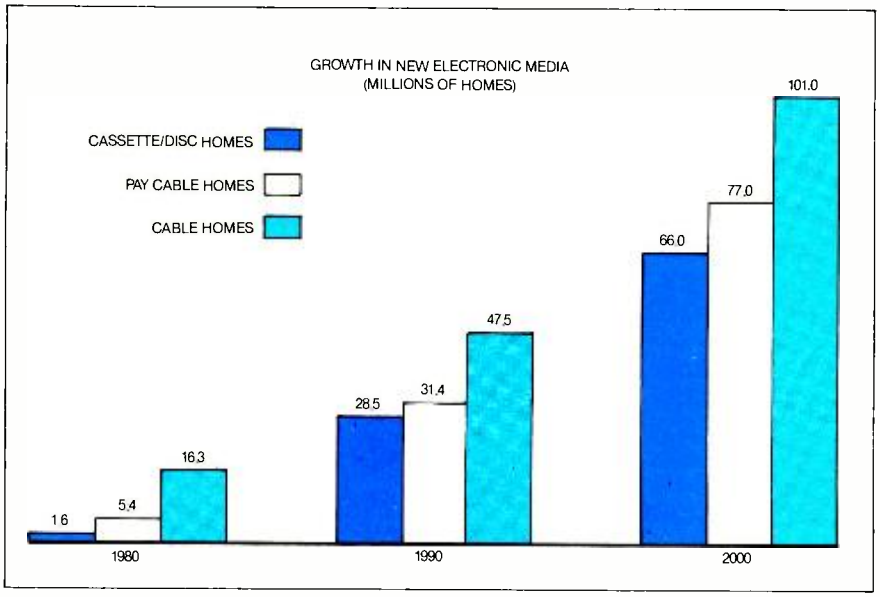
While taking effective control over a production facil-

Advertising Expenditures Outside The United States

(Millions Of U.S. Dollars)

	1980	1990	2000
United Kingdom	$ 6,140	$ 16,000	$ 40,000
West Germany	7,100	21,000	65,000
France	4,500	13,500	40,000
Italy	1,100	4,000	12,000
Japan	10,500	30,500	83,000
Total	**$29,340**	**$ 85,000**	**$240,000**
All other countries outside the U.S.	$25,660	$ 78,000	$220,000
Total outside the United States	**$55,000**	**$163,000**	**$460,000**

The increasing importance of the international market and the advertising dollars it will attract presents a strong motivation for minimizing the technical barriers to program exchange



While broadcasting will remain the dominant medium in the years ahead, its share of audience is likely to decline as new media penetrate the market. Digital technology holds out the hope that broadcasters will be able to meet the enhanced quality demands of these non-broadcast markets

ity's resources may be the first step toward the all-digital plant, it is only a tentative one. As broadcasters who have gone through a transition from a manual traffic and billing system to an automated system know, computers can make a good manual system much better and a chaotic manual system much worse by accelerating the rate at which errors occur. The same experience can be expected in machine control automation systems, with the difference that design of an effective technical operation is a more logical process than the design of an effective business system since the objectives are clearer and results more easily observed and measured. But while there will be problems, the results will prepare a station for the future by bringing all of the station's technical capacity into a logical relationship.

The next step after the establishment of effective machine control will be the introduction of systems and subsystems that handle video and audio in digital form. Broadcasters are already familiar with many such devices ranging from framestores to reverberation units for radio. Digital video and audio devices in use today, however, are only harbingers of things to come. (See "Digital Television Development: A Look Into The Future.") For radio, the transition to digital might even precede television's. Effective digital audio recorders are already in the marketplace, with scores of other devices coming on-line continuously. (See "Coming: The Digital March Into Radio.") While television will pursue digital technology in its search for new markets and greater efficiency, radio will adopt digital technology in its effort to keep the quality of its product comparable to the quality offered listeners by digital consumer products.

The ramifications of this changeover are staggering. While some see digital broadcast technology as a great dream, others see it as a nightmare. The change will be even more traumatic for engineering and operations personnel at television stations than the changeover to color TV. Both radio and television will share the trials of introducing digital technology to a generation of technicians versed in analog and used to gaining familiarity with a particular piece of equipment through constant adjustment of it. Digital equipment will require far less adjustment and breakdowns will be less frequent. Documentation of digital systems and service manual practices will need radical overhauls in order to permit timely and effective maintenance of broadcast systems. Certainly on-board diagnostics, modular replacement of failed parts, and the introduction of sophisticated test and measurement equipment will ease this trauma, but digital systems will fail too, sooner or later.

When a digital system suffers a catastrophic failure beyond the skill of the system's diagnostics or the station's technicians, the relationship between the manufacturer and the user will be of immense importance. Stations will need highly trained personnel (though not as many) in the station to work with the manufacturer's engineers and programmers. Manufacturer's field service teams as well will have to be highly trained, and therefore expensive. Operations and maintenance concerns desparately need to be thought through as broadcasting edges into the digital era. (See "From Analog To Digital: The TV Plant In Transition.") For broadcasting will "edge into" digital. This year at the NAB convention in Las Vegas, radio and television broadcasters will see even more computerized equipment and systems designed to use audio and video in digital form. Progressively, these sub-systems will be added to the broadcast plant and analog will move over more each successive year to make room for digital. The most difficult years lie just ahead of us as broadcasting tries to make the old live side by side with the new.

Analog technology is not standing still, and its pace of quality enhancement keeps pushing ahead the goals that digital must reach. Broadcasters have not purchased their last piece of analog equipment. Cameras, recorders, switching systems, and a host of other systems remain analog, though digital technology keeps closing the gap. The important thing for broadcasters to remember is that the road does, in fact, lead from here to digital. Without preparation, planning, and a clear vision of the evolving technology, the stumbling blocks will be many and the road extremely rough. **BM/E**

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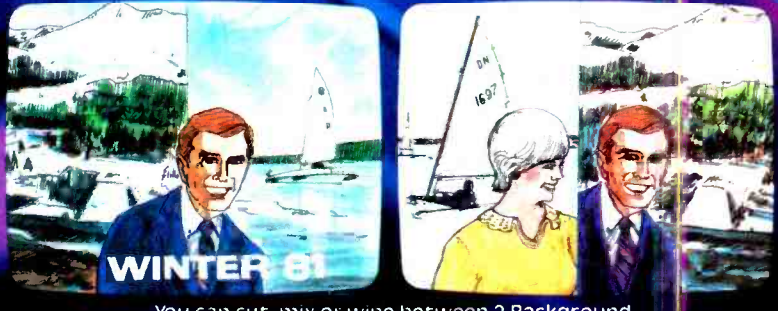

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MOVING FROM HERE TO DIGITAL

COMING: THE DIGITAL MARCH INTO RADIO

Already, in remote control, in reverb systems, in various kinds of switching, the radio broadcaster is using digital technology almost on a routine basis. But the big takeover is still ahead; it will ride in mostly on the digital tape recorder and the digital audio disc, both now poised just offstage. When the mostly digital plant arrives, broadcasters will have fantastically varied, accurate, and versatile control of their plants and of the characteristics of their signals.

FOR RADIO BROADCASTERS, digital technology is like an army with forces massed around the analog frontier; it has already claimed some outposts in analog territory. The attack will come on one front after another, and like most multi-front attacks it is sure to succeed within some reasonable period of time.

But it will not be a fast sweep, a sudden rout. Analog technology has, and will have for a long time, the advantage of much lower cost. Analog is there, on the job: it can be displaced only if digital does something radio broadcasters want and can't get with analog techniques.

However, the logic driving the digital advance is strong enough to keep a general forward movement underway, one that will change radio technology drastically in three to five years. The changes will give the broadcasters far more flexible and accurate control of their plants, eventually at reduced costs. It will improve the technical quality of the product sharply, and this better signal will be not an "extra" but a necessity in the competitive situation of the late '80s and thereafter.

In this article *BM/E* surveys first the main lines along which digital technology is advancing into the radio plant. Then we sketch briefly the characteristics, as far as we can see them now, of the all-digital or mostly digital plant and note some of the moves the radio broadcaster can make now to ease the transition to the future.

Remote control/ATS: digital at work

In the advanced remote control systems now available to the radio broadcaster we find digital techniques showing their advantages to good effect. First: digital systems can "read" meters far more accurately, quickly, and surely than any operator, both for monitoring and control. The system can know within a small part of a second when any quantity is out of tolerance, and issue the warning or initiate the action the user has specified in advance.

One function in which this has special value not often noted, as pointed out to *BM/E* by John Bisset of Delta Electronics, is in automatic modulation control, in which digital signal analysis, driving an automatic gain-control system, can take a lot of pressure off "amplitude crunching" in variable-gain amplifiers. The digital controller compares the modulation level at every instant to preset values and adjusts the volume control in an appropriate amplifier to keep modulation as high as is wanted without overload. Since a microprocessor is involved, the system can be given complicated instructions.

Similar flexibility and accuracy result from the use of digital techniques in the other remote control functions. The system constellation that is developing here has validity for the whole digital plant. At each major function, a "local" microprocessor provides a "smart" terminal that can act on its own initiative for a number of particular objectives. A mainframe computer can assume control of all the microprocessors for overall coordination.

Bisset and Charles Wright of Delta point out an important value of this high-accuracy control. It makes possible an extensive exploitation of the new FCC rules on operators. Far less operator skill is needed for routine plant operation, and the system can, in fact, be given a high resistance to "operator goof" by careful design of both hardware and software. This frees the management to make wider use of lower-grade operators, as allowed under the new FCC rules.

Several other firms with advanced radio remote-control systems are showing the basic strengths of digital techniques in similar ways: Time and Frequency Technology, Harris, Moseley are some of them. All make excellent use of digital techniques to supply the accuracy, speed, capacity for sophisticated action, and resistance to operator mistakes that will spread throughout the radio plant with the spread of digital techniques. And all, as noted many times in this magazine and elsewhere, bring the great advance of putting system enlargements, instructions, and operation refinements in the *software* rather than the hardware. This is one of the most valuable attributes of the computer-controlled broadcast plant.

Program switching: another digital territory

Automation of program switching is a long-established technique in radio. Digital techniques are part of it in the "memorizing" of program sequences covering

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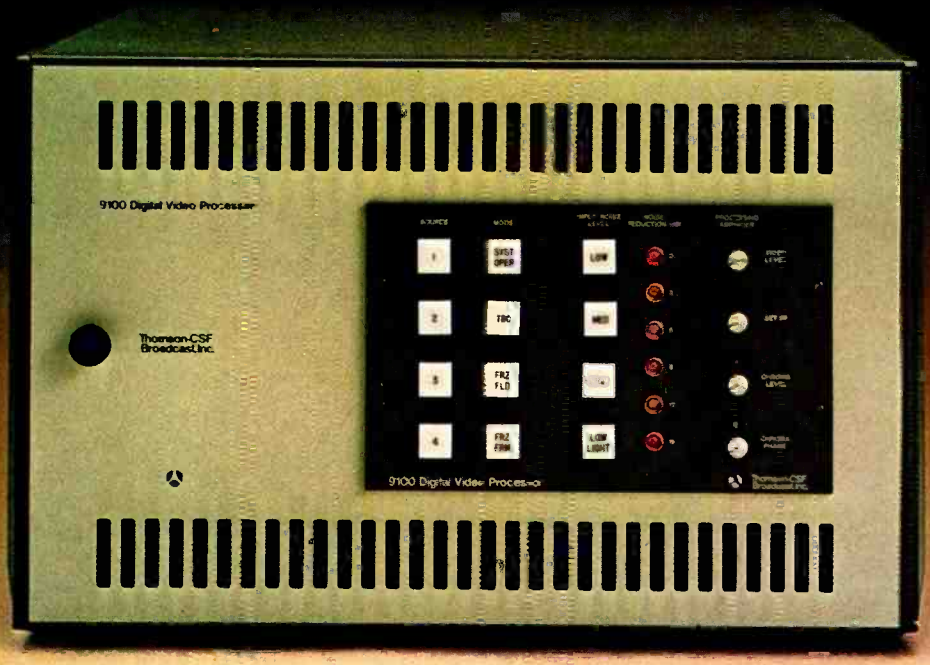

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days or weeks of operation, with the indicated switching sequences carried out by mini-computer. Andrew Jettner, concerned with the design of the Harris System 90 automation and facilities control systems, pointed out to *BM/E*, again, the desirability of having some distributed processing, with microprocessors at various control points and an overall computer. This, he said, leads to better reliability. He gave a piece of future-directing advice: computer control is coming so fast that it is well, even now, to look toward interface compatibility among all the digital systems in a broadcast plant. With standardization on, for example, the RS-232 serial interface, the broadcaster has a lot of freedom to add, change, rearrange the various elements of the plant while keeping all the advantages of digital control.

Jettner foresees the use of fiber optics communication around the digital plant, with its speed, immunity to interference from RF and hum signals, and very large bandwidth. He also predicted (as did some others—see below) the coming of digital audio signals to the radio plant in the form of both the digital disc and the digital tape recorder. The digital disc, as a storage medium of extremely high density, could greatly reduce shelving problems in the automated system, with 1000 or more short musical selections taking up one small shelf.

Beyond the convenience, the digital disc could transform automated operating by raising the technical quality of the program material several long leaps beyond that standard today. There is more on the digital disc below.

The radio broadcaster now has a wide selection of excellent digitally operated program automation systems (with the signal, of course, in analog form), surveyed on many occasions in this magazine. The meaning of these systems to the digital plant of the future is large: they will quite readily interface with larger and larger measures of digital control, and will gratefully accept, as noted just above, the signal itself in digital form.

Reverb, special effects

Digital technology has been one of the mainstays of the reverb/special effects "spectacular" of a dozen or more excellent units that bring the radio broadcaster endless versatility in these areas. Most readers by now know at least the main outlines of this technology, and several hundred radio stations, at least, are using one or another of the devices on the market.

By converting the signal to digital form, the reverb/special effects designer gets quite easily a stable of incredibly varied functions. Similar functions can be carried out with the signal never leaving analog form, but the general opinion finds this less versatile and efficient than digital manipulation.

Again, the reverb/special effects unit will be a standby of the all-digital plant, and it won't need the internal A-D and D-A converters that are now universal in this application. Moreover, it will easily combine with digital signal-processing in an all-handling digital unit: more on this below.

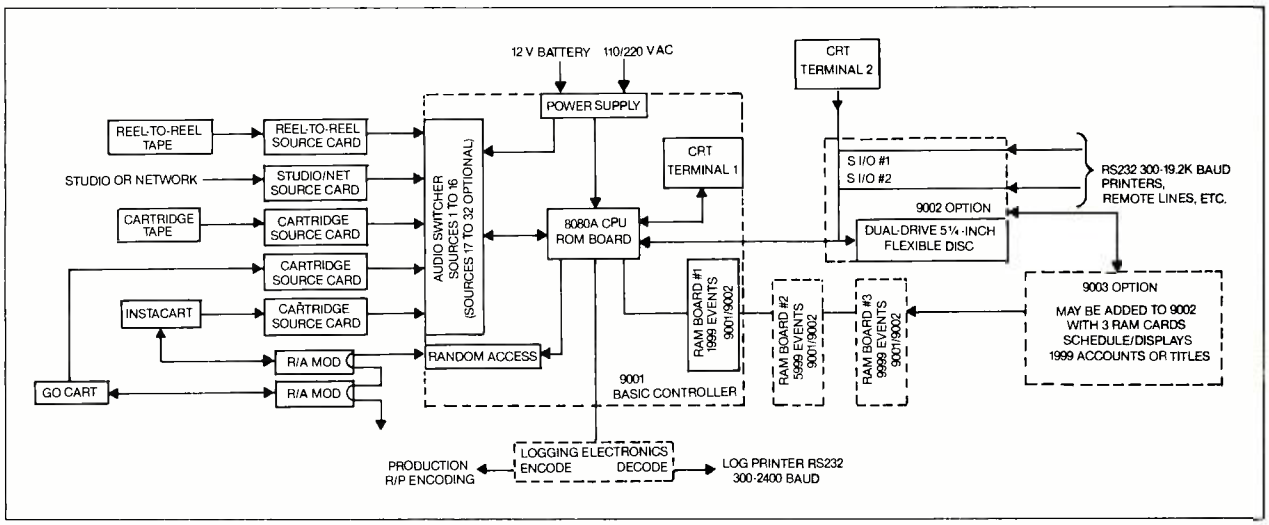
The digital intercom

Digital control of switches is basic in some of the applications we have discussed. It is here in another area: the top-quality intercom and program-around-studios distribution system. There are great advantages in having all switching for an intercom-distribution system carried out in one central unit, with each terminal connected to the center in an arm-and-hub structure. And again, the most versatile and efficient operation comes with a microprocessor in each terminal, which can be programmed for various connection schemes that then become available at the touch of a button.

An outstanding system of this kind is Intercom 80, now built and sold by Sound Systems, Inc., of Long Island City, N. Y., and based on an earlier system of the kind marketed by Automated Processes, Inc. When the latter firm went out of business, some key personnel formed Sound Systems and refurbished the intercom as one of their products.

What's ahead

Digital techniques are creeping into the radio broadcast plant along some other paths, but the main ones are those noted in the foregoing. Large bits of the territory still to be occupied, with the digital invasion right on their borders, are the key plant unit, the audio console; and the



Large program automation system in which digital signals are used for a number of functions is the Harris 9003. Functions include accurate switching, and storage of song titles, names of artists, and news copy in computer memory for instant recall

DBX HELPS KMJQ WORK MAJIC.

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

Yet KMJQ was the softest station on the dial.

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

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

KMJQ installed dbx tape noise reduction on all their cart machines. Not just for their program material, but for their commercials, too. "That keeps our advertisers happy because their commercials sound as clean as our music," says Dietrich. "And we use a dbx Model 500 subharmonic synthesizer to restore the low end. It makes the station sound especially well balanced. Even at low listening levels."

KMJQ also needed a compressor/limiter – but they didn't want to ruin the sound quality they had worked so hard to get. "After hearing how smooth the dbx 165 compressor/limiter works, there is no doubt in my mind that it's the best limiter I've ever heard in my life. We use it on voices, and it gives us the control we need without sounding like we have *any* control."

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

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

For more information on dbx's complete line of equipment for the broadcast industry, write Professional Products Division, dbx, Incorporated, 71 Chapel St., Newton, Mass., 02195, USA. Tel. (617) 964-3210. Telex: 92-2522. Distributed in Canada by BSR (Canada) Ltd., Rexdale, Ontario.

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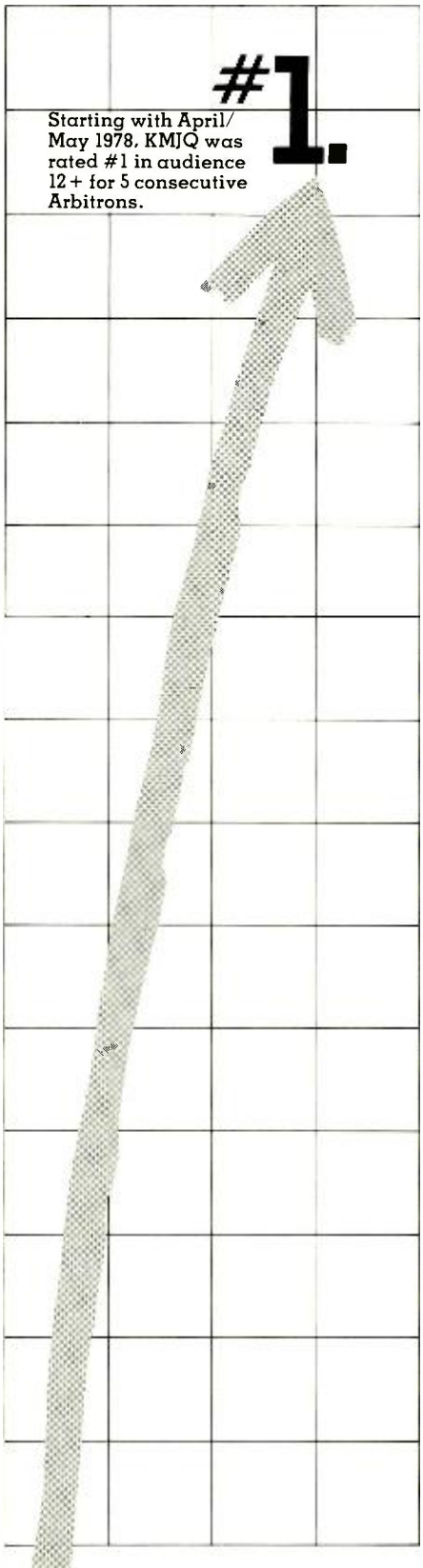


Circle 125 on Reader Service Card

systems, disc and tape, for recording and playing back the signal itself.

Let's look first at the digital audio console, which is beginning to appear in experimental, prototype form. At the recent Audio Engineering Society meeting in New York (November, 1980) at least two early digital consoles were described in technical papers, one from Matsushita in Japan and one from EMI in England. There seem to be no large problems in the technology of the digital console. The impression gained from these experimental units is that cost is still very high compared with standard analog consoles, and physical size (in the case of the EMI unit) dismayingly large. But these are for-the-moment problems.

We will talk about the coming of the digital signal in a moment. It is important first to establish the central role of the digital console in the mostly digital plant. The console will be the natural center for all control functions, and might well include the overall computer that runs the plant. It will hold, of course, the signal level and switching controls, and also signal processing units, which will be parts of, or subsidiaries to, the computer.

The processing of the audio signal in digital form will supply some of the great advances in precision and versatility. The digital filter and the digital equalizer are already being explored by engineers. For example, a paper by John Umhey, consultant of New York, given at the recent AES Convention developed the theory for parametric equalization using digital filtering techniques in the 2920 signal processor. This is just one of the approaches to the technique in recent technical literature.

The digital equalizer will be able to do things that no hard-wired analog component equalizer can, and moreover its characteristics can be altered by changes in software, making it highly controllable over a wide range. A bank of such equalizers built into the digital console will give the broadcast operator a control of signal character far more detailed and accurate than today's control.

As already noted in our discussion of the Delta modulation controller, digital techniques will allow the modulation density to be increased with a minimum of damage to signal quality. The designers of the new class of FM and AM processors that has appeared in the last few years have, in many cases, performed prodigies in the control of modulation levels without seriously distorting the signal. With the signal in digital form, the processor builders will be able to go farther in this direction.

Interfacing In The Computerized Radio Plant—One Way To Do It

As digital devices and systems take over more and more of the jobs in the radio plant, interfacing them with each other and with controlling computers will become a very serious design requirement. By planning ahead radio broadcasters can save a lot of money and avoid frustrations: they should move into digital technology with the interface problem always in mind.

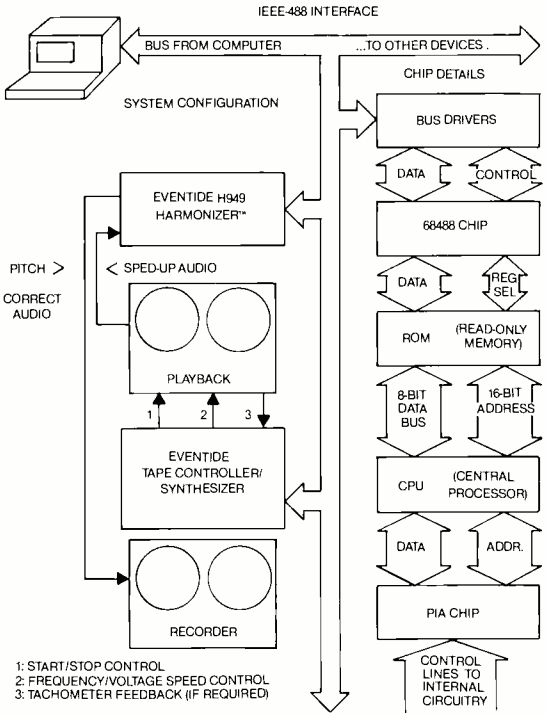
In a paper read at the AES Convention in New York in November, 1980, Alan Derr of Eventide Clockworks described the excellent results available with the IEEE 488 standard interface bus. This is a parallel-feed eight-bit bus, and as such is very fast in action. Derr said that all Eventide products capable of computer control are now supplied with interface for this bus. It will connect a computer with a piece of microprocessor-controlled equipment that has the proper input arrangements, a function that will be basic in the computer-controlled radio plant as it is now developing.

The bus can transmit control to up to 16 devices, reaching the one wanted in each case through the use of a six-bit address.

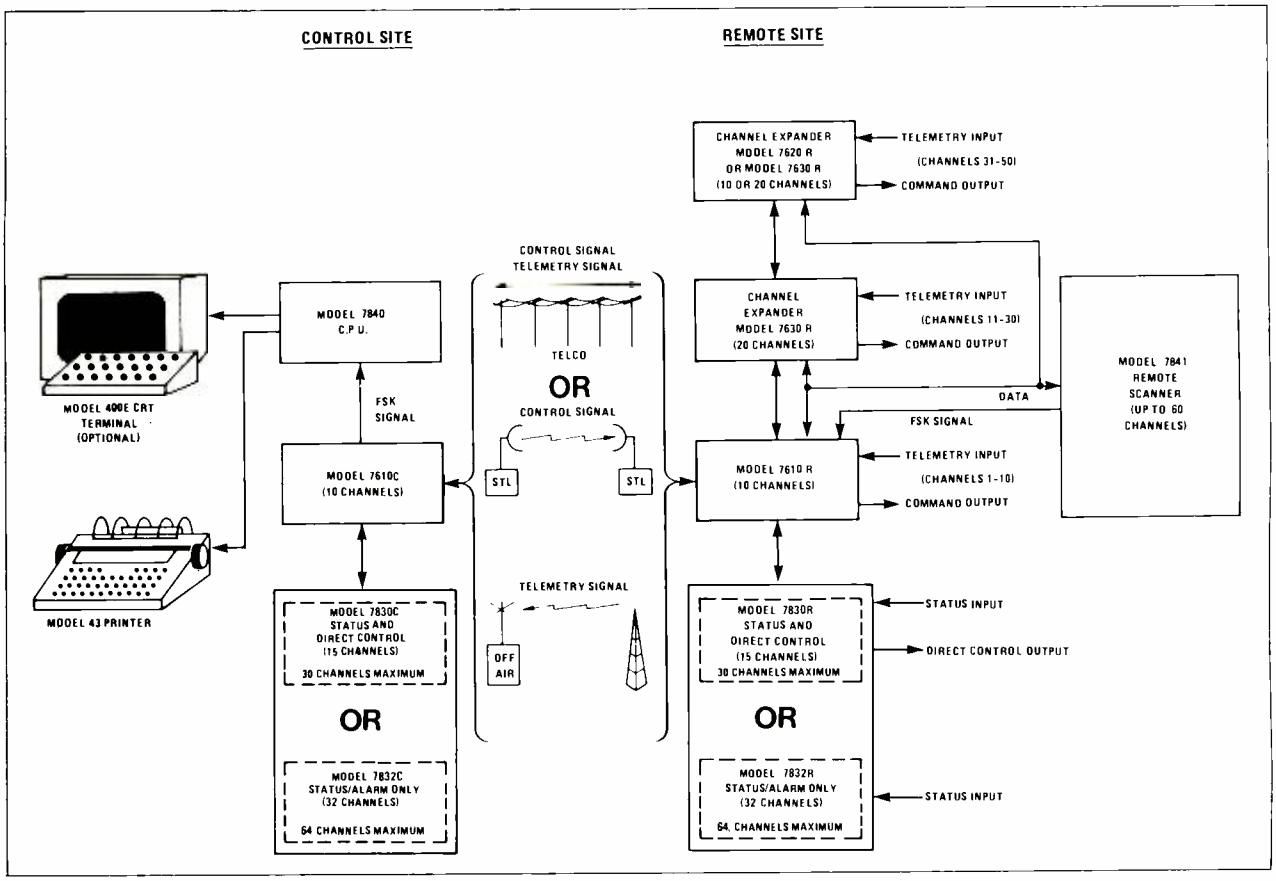
Derr points out that the system would be excellent for connecting up computer control of a radio automation system. There would be a single small computer and microprocessors at each of the tape machines to be controlled. Each piece of program material, PSA, ID, and commercial would have an address; the tape machine location with that address would be cued up in advance for automatic rolling at the proper time by action of the computer. Setting up the system for this standard program automation sequencing would be easy and effective with the 488 as the interface.

Another use that has increasing attractiveness is connecting computer control to automatic test equipment. Derr points out that most of the leading test equipment makers are now equipping their units for connection to this particular interface system: among them are Hewlett-Packard (the patentor of the 488 system), Tektronix, Gould, and Fluke. For the other end of the link, small computers increasingly are supplied with IEEE 488 bus control among their features. The system is assuming the character of an industry standard.

Automated mixdown on recording consoles is another use for the interface that is increasing. This is not as pressing an area for radio broadcasters as program automation. But extremely handy in radio stations is a way of changing the timing of commercials to make them fit. Derr tells a good way to do it, using two tape machines, a desktop computer, the IEEE 488 bus, and an Eventide Harmonizer. The accompanying block diagram of the system shows how it works.



Typical use of IEEE-488 interface bus, drawn by Richard Factor of Eventide Clockworks, shows system for changing time of commercials. Right section is detail of interface. Left shows how two tape recorders, plus other units, are controlled by computer for speed change



Model 7600 remote control system from Time & Frequency Technology uses digital pulse code modulated communications throughout with FSK keying. Digital data filtering sends each command twice, and they are compared bit by bit at remote point. Command is carried out only if they match completely

Digital audio: it's here

The fact that the signal in the radio plant is still mostly in analog form is, in one sense, an anachronism. The digital tape machines are here, and even in their "first generation" form they have many splendid advantages for the radio broadcaster. But until very recently they have been far too expensive for general use by radio broadcasters. And there has been the feeling on the part of the broadcaster that super-quality like that of the digital audio machines is out of line and will be lost in the lower quality of the rest of the plant.

Both of these barriers to the use of digital audio are beginning to weaken. The Sony PCM-100 converter, which puts digital audio onto videotape machines, is aimed specifically at broadcasters, with a price around $15,000. At this writing *BM/E* knows of only a few cases of extensive use of the PCM-100 by broadcasters; this is sure to expand quite rapidly because the logic of the machine for radio is very strong. What it is magnificently primed to do is record live concerts for later broadcast at super-quality levels. In the accompanying box we describe what some radio managements are doing with the system and how they feel about the results. We can say here that in general the use of a digital machine for live recording/tape broadcast does bring an improvement in signal quality that is most noticeable, and most welcome, to large sectors of the audience.

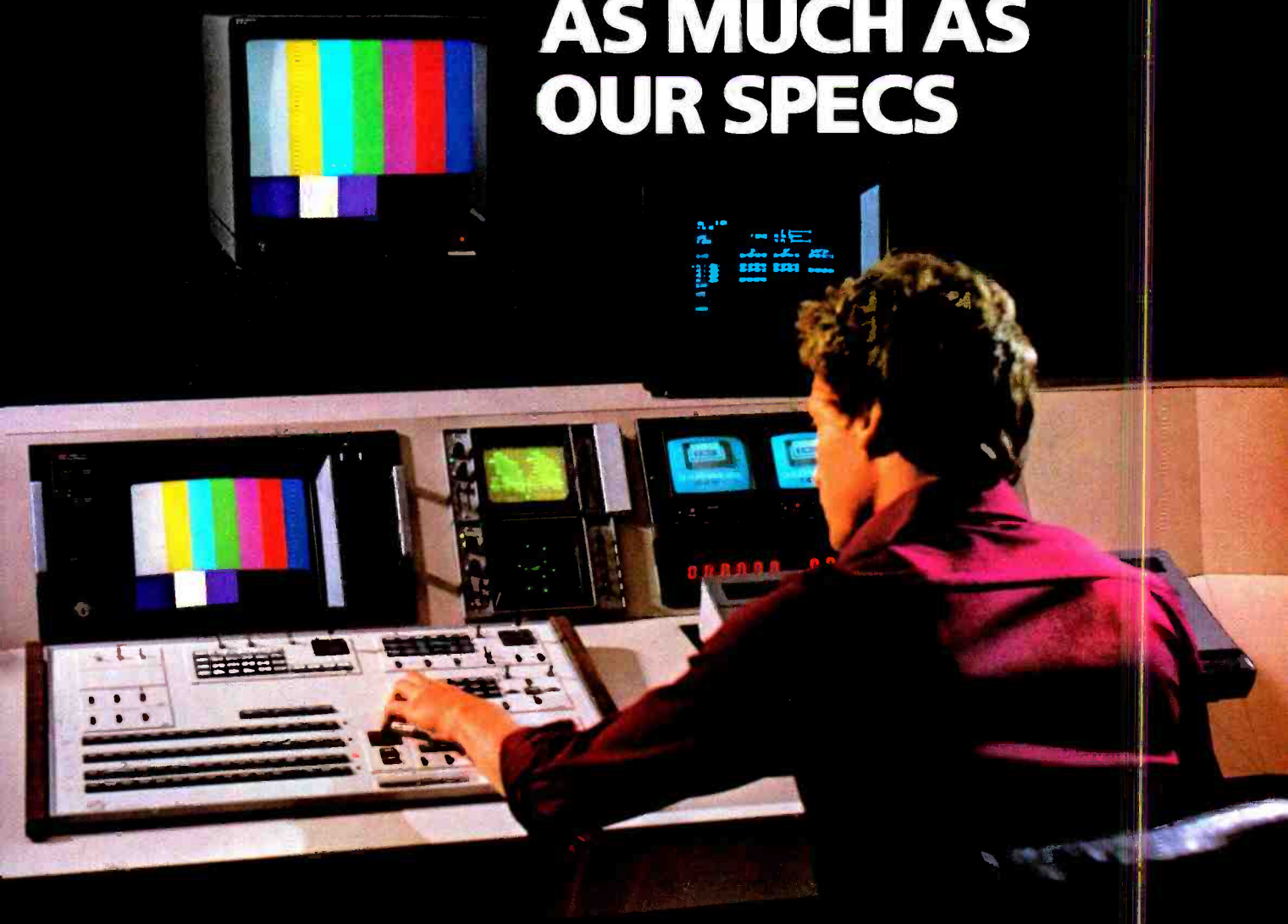
Another very recent item in the trend to lower pricing is the Mitsubishi X-80 series of two-channel digital recorders, 16-bit machines introduced at AES, with prices in the range of $25,000 to $30,000. Mitsubishi says they can be delivered immediately. The firm also promises a complete electronic editor and a *complete digital mixing console* "in a few months." The tape recorders seem to have excellent control arrangements which make them easy for analog-trained engineers to use. Here again is a machine that, on the face of it, could raise considerably the quality level of live recording for the broadcaster.

A number of other firms are adding force to the invasion of broadcasting by the digital tape recorder, as reported last month in *BM/E*'s account of the AES Convention. JVC, Pioneer, and Panasonic are a few more of the giants in the field with very active development work on digital tape units. JVC, for example, has converters somewhat like those of Sony for putting PCM audio onto videotape. What this all means is that digital tape recording is just on the verge of a fairly rapid expansion into radio broadcasting.

Also getting close: digital storage

Predicted for some time as one of the great potentials of digital technology for radio has been the storage of short program material in digital form to give the broadcaster the accuracy, high quality and very fast random access that come with material in computer-type memories. Until very recently this seemed quite far in the future, largely because of the cost of memory devices capable of holding the quantities of information involved.

OUR TAPE WILL IMPRESS YOU AS MUCH AS OUR SPECS



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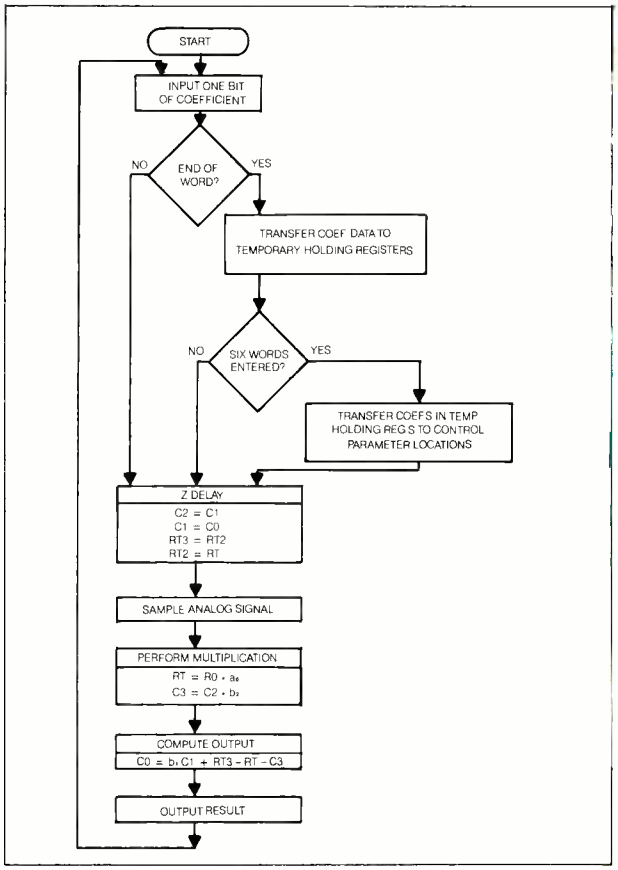
The digital video people.

But this technique, too, is now about to knock on the radio broadcaster's door. One early form is the Digiphon Model 450, announced last fall by EMT of Germany. The Digiphon uses an established magnetic disc system of Control Data Corp., the CDC BK 6 XX, with standard I/O interface plus electronics developed by EMT. The disc has a 300 million byte capacity, enough to hold about 35 minutes of digitized stereo signal recorded with 16-bit linear coding and with an elaborate error-correction scheme. EMT says average location time for any point on the disc is 50 ms, search accuracy 5 ms. RMS linear dynamic range is given as 80 dB. No price had been announced when this was written; deliveries are expected in spring, 1981.

Other systems using magnetic disc drives for this function are known to be in the works; it looks as though the breakthrough to storage of short program material in digital form is this year. With some 30, 40, or 50 commercials or 30-second shorts instantly available and in super-quality form on one small disc, the airing and storage of commercials will be transformed into much more efficient and accurate processes.



Flowchart for digital parametric equalization, presented at AES Convention by Jon Umhey, shows an early design for processing signals in digital form. Great flexibility and accuracy will come with digital processing

Watch for the digital disc

The advance to the digital plant is getting plenty of shove from the developments described so far. That advance will get a very large shove, many observers now agree, when the digital audio disc becomes generally available. *BM/E* tentatively put forward this opinion in the October, 1979 issue; the course of events since then seems to have strengthened the importance of the digital disc in the future of digital radio.

The basic scenario was outlined for *BM/E* by Dick Dubbe, leader in digital development at 3M. The outlook is that not too long from now the digital disc will reach the consumer market on a large scale. The resulting leap in audio quality expectations of the consuming public will put heavy pressure on FM broadcasters, who will necessarily incorporate digital discs into their programming. Since they then will have excellent digital material on hand, the pressure will spread to extending digital handling to other plant functions, eventually to the whole plant.

Dubbe sees the role of the multi-track, recording-studio digital recorder as creating a body of recorded material that can be used for all forms of delivery to the consumer via radio or recording, with full maintenance of top mastering quality through all future digital developments. He reported that 3M (at the time of the interview) had delivered more than 40 of the multi-track machines to recording studios, so that the backlog of digital recordings is growing rapidly.

Both Dubbe and Jettner of Harris saw another potential in the digital disc (or in the technology that creates it):

Digitally Recorded "Live" Music On The Radio Air: Some Firsts

The first series of concerts recorded live on digital audio tape machines and put on the air by a radio station were originated in the San Francisco Opera House and broadcast by local public station KQED over a three-month period in 1980. About 12 concerts got the digital treatment, including symphony concerts and opera performances covering a wide range of music.

KQED used the Sony PCM-100 converter to put digital audio onto videotape recorders. Both half-inch and ¾-inch VTRs were tried and both performed excellently. The one problem that emerged came from a few awkward breaks when the ¾-inch machine ran out of tape before a pause in the music occurred. Chief engineer Gene Zastrow told *BM/E* that the half-inch machine, with its longer playing time, solved this one for them. A better way, of course, would be to set up two machines, with the second one cued to start just before the first runs out.

KQED is one of the uplink stations for the National Public Radio satellite net. The concerts were fed to the net, and a large proportion of the affiliated stations broadcast them. There were numerous praises for the outstanding fidelity of the signal, both by the participating radio managements and by listeners. Zastrow called the audio quality "superb," saying he would buy digital recording equipment for constant use if and when his budget allowed it. The Sony equipment had been on loan to KQED for a demonstration of its effectiveness in just this function, which is sure to be one of the main motivations for the use of digital tape by radio stations.

Another on-air use of digital audio, this one for a television simulcast, took place on Christmas Day, 1980, at station KCET in Los Angeles. The program, "All That Brass," brought listeners and viewers the Modern Brass Quintet in pieces by Bach, Elliot Carter, Satie, and Scott Joplin. Again, the Sony PCM-100 was the digitizing unit. Jerry Zellinger, engineer, said it was chosen in part because it could be integrated quite easily into the station's video editing system.

Again, however, the outstanding finding of the users was *clarity*. "It just blows you away how clean the sound is," Zellinger said. The program went out in stereo on local FM station KPFK. Again, a number of listeners praised the audio quality, a tiny preview of the effects of wide use of digital tape machines in broadcasting, not too far in the future.

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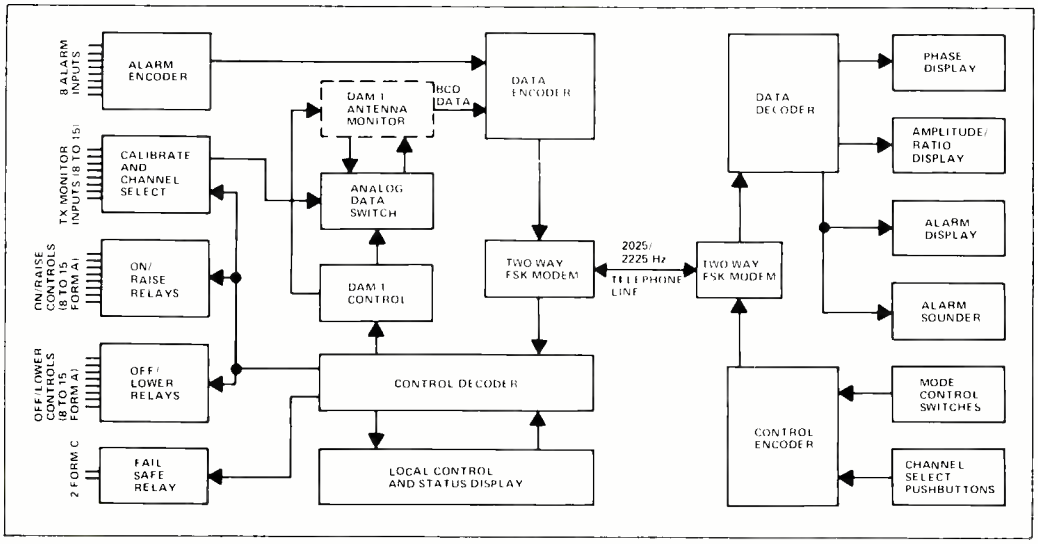

Antenna/transmitter remote control system, TMCS-1 from Delta Electronics, converts analog readings at transmitter site to eight-bit "words" for easy handling on voice-grade lines and at control station

it could be the medium for storing program material in radio automation systems. Again, there would be very large gains both in technical signal quality and in storage density. The disc will be available in small forms, probably from two inches up to six. As Jettner notes, storage of 1000 standard-length musical selections would take only a small fraction of the space now needed for a library of that size.

This automation and storage prospect is attractive because of the *very* fast random access capability of the digital disc and its long playing time. With at least a half-hour of music on each side, the playing time can be used for one long number or 10 to 12 standard-length pop numbers. The playback machinery could find any one of them in a few milliseconds. This potential of digital technology could clearly lift the quality of automated programming several levels higher than it generally is today. And again, it would mightily promote the advance to the computer-controlled plant.

Disc choices are firming

Where does the industry stand on the digital disc now? As reported in earlier issues of this magazine, there have been three to four systems developed, each one incompatible with the others. But very recently the Japanese electronics industry, motivated by a vision of vast market potential, has moved toward standardization. At this writing a committee set up for the purpose had apparently come down to two systems, the laser-played Philips Compact Disc (already supported by Sony and Pioneer), and the JVC capacitance system. It is unclear as yet what the practical effects of this will be; a spokesman at Philips told *BM/E* that the Compact Disc would be marketed early in 1983 in any case.

Meanwhile, in December Teldec demonstrated in New York its proposed Mini-Disk, "a contribution to the digital audio disk standard," which the firm said could easily be compatible with the capacitance-type disc. The Teldec disc uses a piezo-electric (pressure-operated) pick-up riding a vertically modulated track, with about 10,000 tracks laid down on each inch. Teldec has simplified the production process by cutting the master disc directly into a copper plate from which stampers are made. The claim is that the system would be much less expensive and less subject to error than the laser system.

However the choices are finally made, we can be certain that the digital disc in one form or another (and probably at least two) will be marketed widely in a couple of years. Its effects on the high fidelity industry and on radio broadcasting will be enormous.

What will it be like?

Through this article are a number of suggestions as to what the mostly digital plant will be like when it finally arrives. There will be a concentration of control in a "main" computer, with many individual units having their own microprocessors for programmable local action. Computer control will be very much faster and more accurate than operator control in most of the main functions, and will save money by speeding action and eliminating errors while giving the broadcaster many new kinds of action for his choice.

The signal will have far higher quality than it often does now, and processing it will be much more accurate and flexible. The density of storage for commercials and program material will rise by at least an order of magnitude. Recording of live concerts will enter a new era of transparent audio quality.

Beyond the transmitter

That takes the digital signal right up to the transmitter, where a D-A converter will be needed to get the signal on the air. Can we take a digital signal any further? The Philips research lab in Holland is experimenting with an all-digital FM transmission system that puts a digital signal onto the FM carrier and does not convert it back to analog form until it gets to the output of the receiver. Some tryout broadcasts are underway with the help of the Dutch Broadcasting System; detailed results are not yet released.

There are a number of large difficulties in the way of anything like this in American broadcasting. Obviously, it takes more bandwidth than analog FM, and in this country the available spectrum is already sliced as thin as we can get it so that a lot of different people can each have a piece. But with as weighty an organization as Philips actively pursuing the idea, we may hope that a decade or two down the road it will reach us. Noise in radio? Gone! Distortion in radio? Gone! It's worth hoping for. **BM/E**

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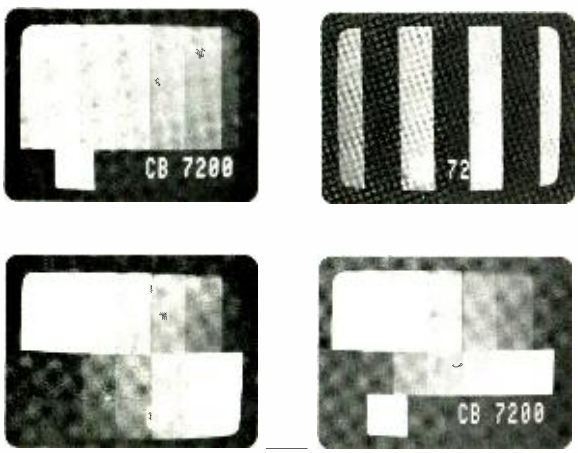

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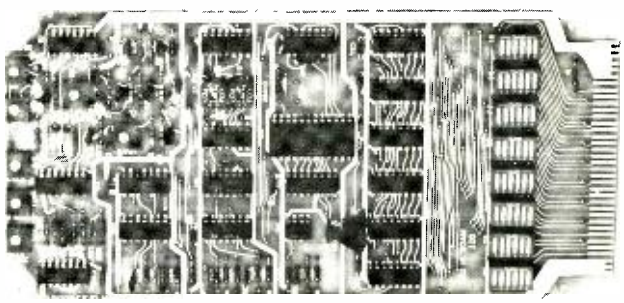

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MOVING FROM HERE TO DIGITAL

MACHINE CONTROL AT KPIX: CORNERSTONE TO DIGITAL

By Merrill Weiss

When a television station takes comprehensive control of its equipment inventory, it crosses over into the fundamental stages of the digital plant. Control moves from the mechanical age to the age of information in which what a machine does is more important than where the machine does it.

"READY TO TAKE two direct . . . take it! Ready to roll framestore two . . ."

Roll framestore two?

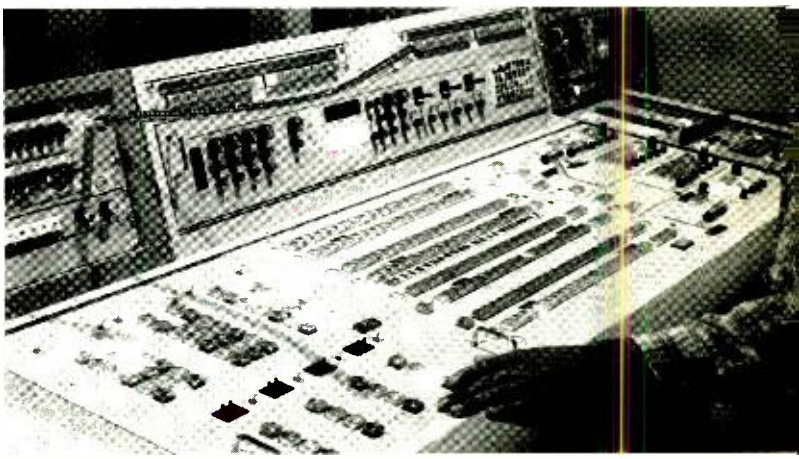
Almost anyone can roll a VTR or a film projector or, for that matter, an ENG truck, but KPIX technical directors have been "rolling framestores" every night since the station's digital machine control system went on line in February 1980. This first-of-its-kind system has moved KPIX one step closer to total automation.

For those who are considering methods to improve efficiency—especially in a new plant—herewith is a case history of the new machine control installation at KPIX: how we identified the need, designed the system, and selected a vendor; and how we got the vendor to build a system based on the requirements of the station in terms of existing equipment and labor agreements.

The opportunity for installing the system came with the realization that our old facility, which was built in 1950, could not be remodeled or expanded to keep pace with the station's growth. Not that you could fault the original architects, whose contingency plans even included turning the whole place into a parking garage (nobody was sure that TV would last in those days), but the structure wouldn't stand more stories, and adjacent residential property was not available. Well, the station thrived, the parking situation in San Francisco got that much worse, and the search was on for a new building.

At least partially because the FCC requires in-city studios, a large five-story structure on the east side of town emerged as the best candidate. From the top two floors, the building afforded an outstanding view of the Bay Bridge—a view not likely to be blocked since most of San Francisco's "movers and shakers" happen to live next door on Telegraph Hill. While this arrangement was radically out of step with the "drive-in" studio tradition, a ground floor studio was not considered necessary in today's field production environment. (See "KPIX-TV Raises High The Roof Beams," *BM/E,* June, 1979.)

While there is certainly nothing novel about controlling VTRs and film chains from remote locations, the "machine control" concept allows a single panel to address more than one machine. It also means that a given machine can be operated easily from more than one location in the building.



Machine control panel, Grass Valley switcher, and Vital SqueeZoom in news studio control room at KPIX

In fact, our old plant was equipped with a hard-wired, dual-location, start/stop only remote control system operated by the "switcher," a term used at KPIX to describe the production switcher operator. By the terms of our IBEW contract, this was a technical—which is to say union—position. So we already had control room personnel with the credentials to run every machine in the building. If now we could get the right pushbuttons in front of our switchers, they would have split-second control of tapes and films, our VTR/telecine operators would be released for duties other than standing by for roll cues, and our viewers would be less likely to wonder when (or if) an ENG segment that had just been introduced would appear.

Presented with these immediate advantages, as well as the long-range prospect of comprehensive automation, we were encouraged to investigate a multi-machine, multi-location control system. We considered the possibility of building a hard-wired system similar to the one in our old building, and had budgeted some funds for parts, but we quickly encountered several basic obsta-

Merrill Weiss is assistant engineering manager for KPIX Television, San Francisco, Group W, Westinghouse Broadcasting Co.

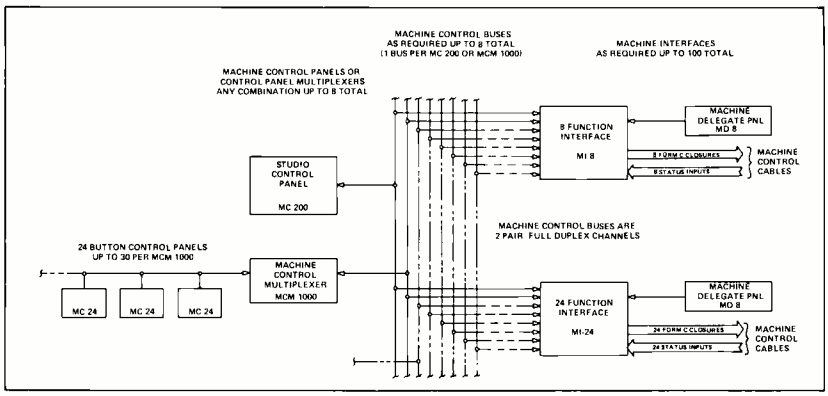


Fig. 1. TCS-1 machine control system. The center of the diagram illustrates the eight-bus wiring concept

cles. First, every additional machine function (fast forward, rewind, record, etc.) would have meant pulling another length of copper wire through the building. Secondly, for every machine we wanted to control, we would have to stake out another parcel of pushbutton territory on the switcher's console. Finally, even the most dedicated multi-conductor cable/mechanical relay enthusiast would be hard pressed to switch hard-wired control between more than a couple remote locations—which is exactly what we needed in order to reduce the back-and-forth movement of our tape room people and to allow us to produce any show from any control room.

We wanted a machine control system that would reduce on-air miscues and tighten up the timing of our news shows, allow our tape operators to get more work done in less time, and even allow us to usher a production crew from a broken control room to an OK control room on a moment's notice. We were convinced that a totally new microprocessor-based digital control system would be required to achieve these goals.

Going from fiction to fact and affording it

Well, fine. But did such a system exist? And if it did, could we afford it?

As to the first question, the answer seemed to be... not really. As to the second, we decided that if we could buy a machine control system *and* a distribution switcher for the amount of money already budgeted for the new distribution switcher plus the small amount budgeted for machine control parts, we would add the machine control system.

Fortunately, we soon discovered that the distribution switcher budget was somewhat on the high side, and this gave us reason to hope that, if we could find a good switcher at a reasonable price, we could make, or convince someone to build, the machine control system too.

One area of special concern to us was the audio output capability of the switcher, in terms of output impedance and output level. We knew we would be faced with long cable runs (400 to 500 feet or about 1000 feet on a round trip) which in a traditional matching (600 Ω output impedance/600 Ω input impedance) audio system would result in something like a 10 dB loss at 20 kHz. The answer here was to find a switcher with an output impedance much lower than the usual 600 Ω—something on the order of 80 Ω or less, the same as we were using for the rest of our audio distribution system. Such a switcher would then fit in perfectly with a low output/very high input impedance audio system that would reduce the high frequency loss to about 2 dB at 20 kHz and also allow us to bridge as many inputs as we wanted across a given output. Along with a low output impedance, we wanted a switcher with plenty of headroom protection—about 20 dB above our standard operating level of +8 dBm—before hitting a clip point of +28 dBm. We also wanted to eliminate transformers, if at all possible, in order to reduce low-frequency distortion and permit better phase response.

We then proceeded with a parallel research study on six different manufacturers' switchers in terms of technical characteristics and cost. In our estimation, the switcher with the best price/performance ratio was the TeleMation (now Fernseh Inc.) TVS/TAS-1000. There were a couple that were better priced but with somewhat lower performance; there were a couple that had similar performance but were more expensive, but there were none that had overall better performance, in our opinion. The TVS/TAS-1000 had an audio output impedance of 10 Ω, which was well within the 80 Ω number that we wanted, and it had a 26 dBm audio output level which, while not quite making the 20 dB headroom that we were after, was better than anything else available with a transformerless design. Furthermore, the price gave us enough room to pursue our machine control idea.

As anyone who has attempted this sort of comparison knows, it involves more than just sending for the spec sheets and drawing up a matrix. Many phone calls to the manufacturers involved were required, either to get a particular specification or to find out how a measurement was made. In some cases, we went to the factory to take the measurements ourselves.

During one such trip to Fernseh's plant in Salt Lake City, we discovered a problem with the TVS/TAS-1000: the audio amplifiers, when greatly overdriven, were folding back rather than cleanly clipping the signal. We brought this to the attention of Fernseh's design engineers, and, as we worked to locate the source of the distortion (it turned out to be an op-amp which was ultimately replaced with another component), we began conversations on the subject of machine control. We presented an overall system design, including the number of inputs and outputs, system architecture, communications scheme, and operational features. Fernseh's engineers indicated that it would be feasible for them to design the hardware and develop the software necessary to implement our concept. These ideas then were pre-

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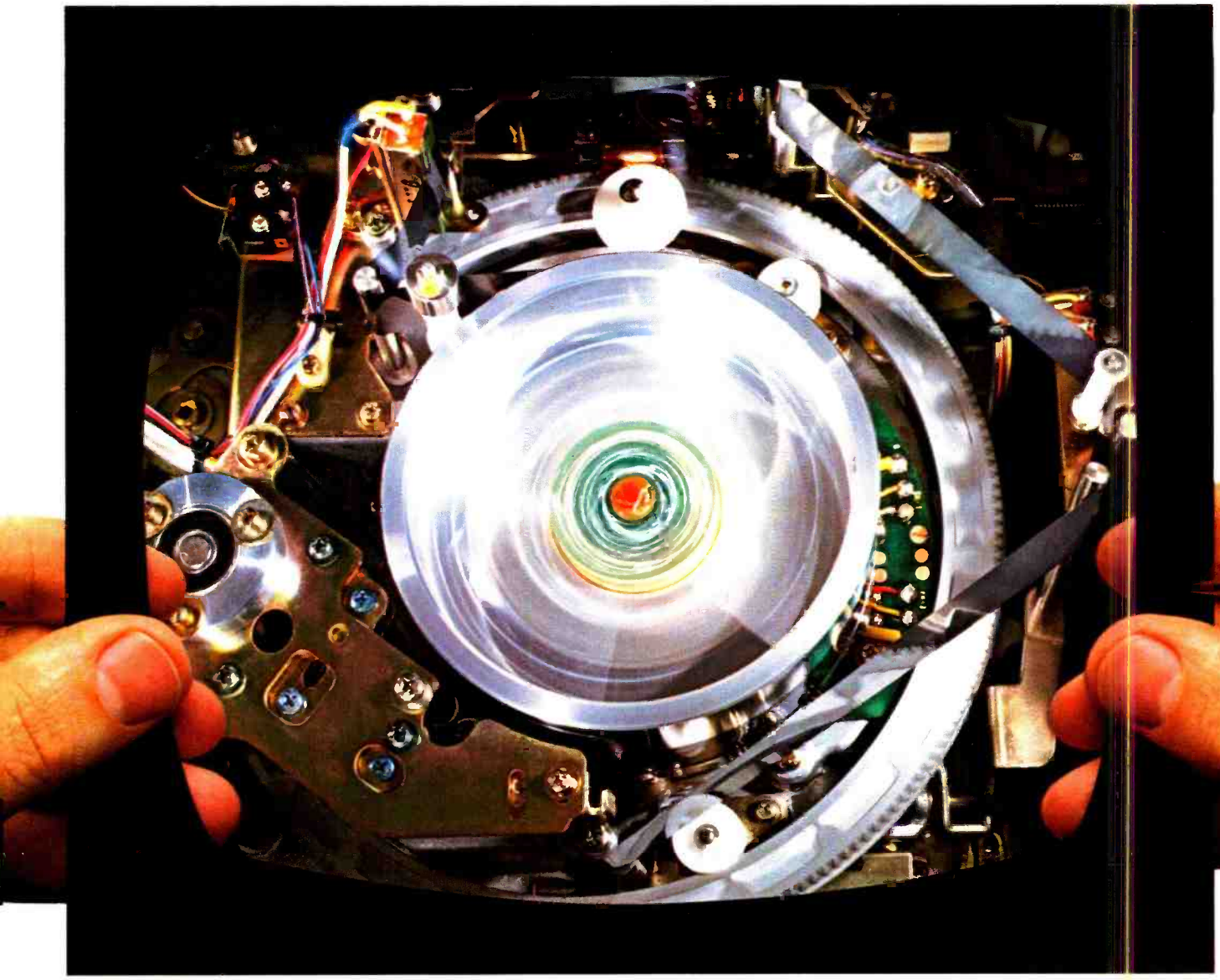

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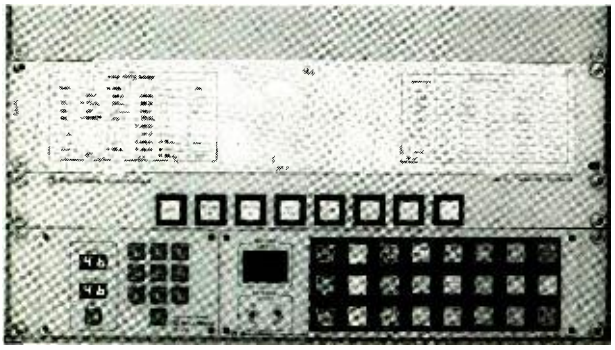
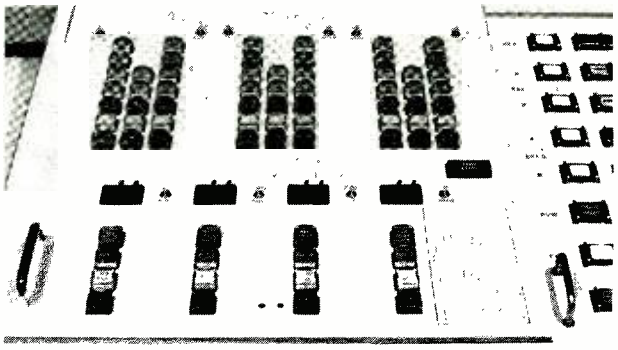
Fig. 3 (right). "Studio" type machine control panel, with three film chain pushbutton groups and four thumbwheel-selectable VTR pushbutton groups. Gang start button (center, right) is enabled by small toggle switches

Fig. 2 (below). Typical VTR room control cluster. Note machine select thumbwheels and external start toggle switches





sented to Fernseh's management, who agreed on a price for a routing switcher and machine control system package. It was understood that Fernseh would have the eventual right to place the system on the market as a standard product.

During these meetings, we developed specific design objectives in terms of machine interfaces, number and type of control buses, and remote control configurations (Fig. 1). We wanted to be able to control any combination of up to 100 film chains and VTRs, generally using a 24-function interface for film islands and an eight-function interface for VTRs, although there should be nothing to preclude the system's being configured differently when it might be advantageous to do so. We felt that each interface should consist of a control section for sending operating commands to the machine and a status section for reporting (via lamp illumination) what mode the machine is in. Because of the wide variety of remote control schemes existing in machines, it seemed apparent that the control section should be able to handle anything from dry circuit switching to two amps at 120 Vac. Some familiar examples of the variety a station engineer might encounter include older VTRs with 24 V dc relays, newer VTRs with 5 V logic level control, and on up to 120 V ac relays in older model audio recorders.

In a further effort to make the interfaces as universal and reliable as possible, we specified bifurcated, DPDT (double pull, double throw) relay contacts with both poles connected in parallel. This would provide four contacts in parallel in an SPDT (single pull, double throw) arrangement so that the same relay could be used for a "normally open" or "normally closed" function. For reliability, all contacts were to be gold plated.

For the status section of the machine interface, we wanted an optically coupled bridging device that would permit operation from 5 to 30 V without modification, and up to 120 V with a change of only one resistor. The status section was to be able to work with ac or dc and, in the case of dc, with either polarity. Optical coupling was selected in order to provide complete voltage isolation, and increased reliability.

As to the number and type of control buses, we encountered a much broader range of design possibilities. A single-coax control bus—perhaps the most obvious approach—would reduce wiring costs to near minimum. However, we opted for the additional speed and reliability of an eight-bus distributed processing system that would allow each bus to operate independently (Fig. 1). Since one of our original objectives was to provide more precise timing of machine starts to our switcher operator, the last thing we wanted was a system that might become sluggish during periods of heavy use because of too much data trying to get in and out of one CPU through one coax line. With a multiple bus approach, we could actually run the data on each bus at a slower rate—which would mean more reliable communication and less expensive components—and still end up with a faster overall system than one using a single control bus. Beyond the speed advantage, the multiple bus/distributed processing concept would also mean that if one bus failed we could simply switch to another, and no single equipment failure could put more than that one device out of service.

Each of the buses was to be two balanced, differential data links (based on EIA Standard RS-422 for this type of interface), which meant two audio-type pairs per bus: one pair for control, one pair for status. This was another speed consideration, since it would allow status data to start coming back as soon as a machine was addressed. The buses were to be constructed in a closed-loop configuration so that they could be opened for adding equipment or for maintenance while the system continued to operate. Furthermore, any open cable would have no effect on system operation.

The eight-bus approach lent itself to a very straightforward delegation system, since we could wire each bus to a single control room. We would then place a simple eight-button panel next to each machine so that the operator could press "Studio N" to delegate control to the north studio, "Post Prod" for the post-production control room, and so on. Each of our control rooms would in turn be equipped with a control panel able to address (via leverwheels) and operate up to three film islands and four VTRs simultaneously. These "studio" control panels would also have a "gang start enable" toggle switch

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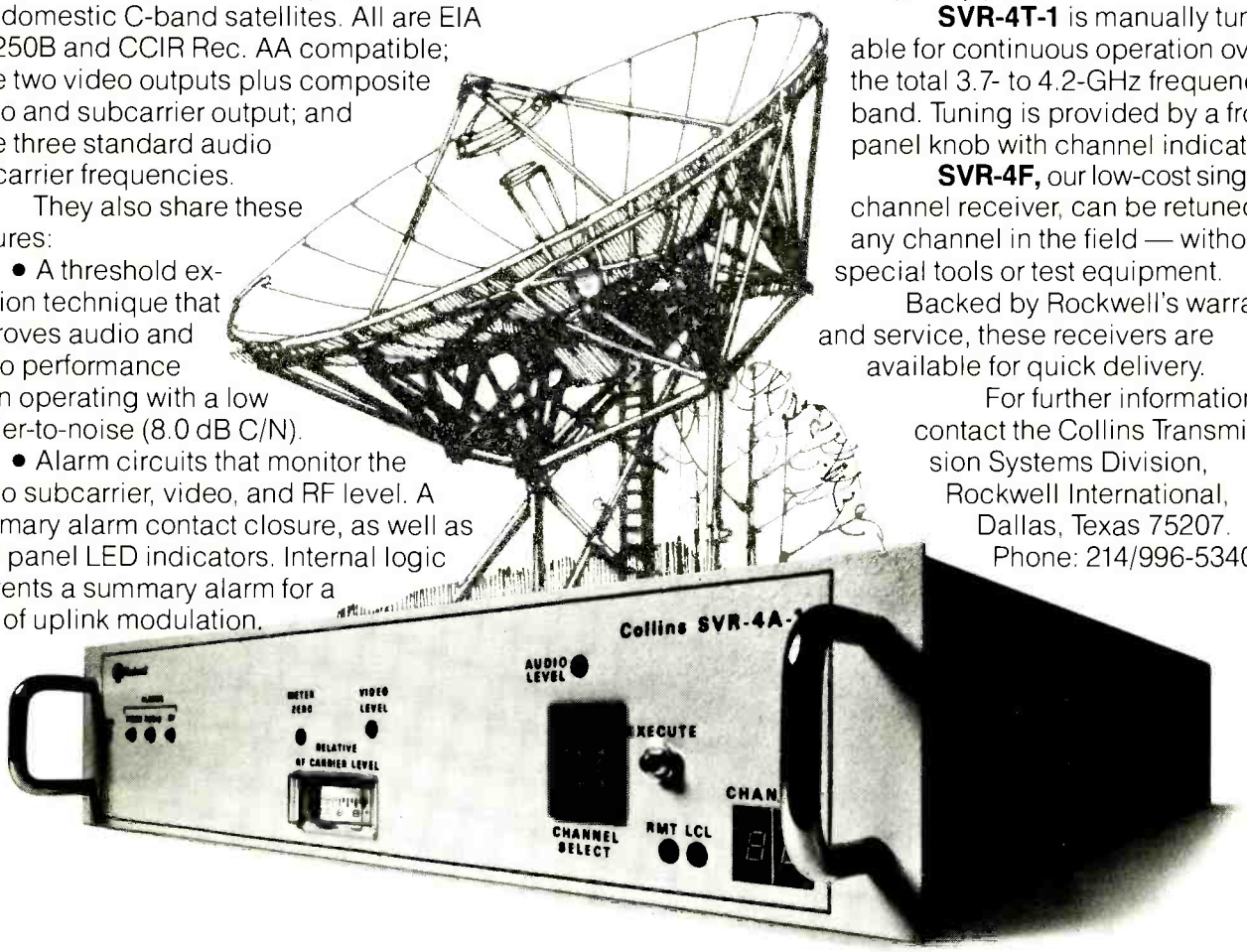

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adjacent to the button group for each machine. All machines so enabled could then be started at once.

Satisfied that these design objectives would give our switcher operator quick and reliable control of any machine in the station, we then considered another of our basic concepts: increased efficiency of personnel in the VTR/telecine area. Since we wanted one operator to be able to run any machine in the room from any other position, we would need a 24-function control panel adjacent to each machine. To make matters easy for the machine operator, we decided to assign each of these "single-machine" control panels to the same data bus via a "control multiplexer." Once a given machine had been delegated to the "VTR" (machine room) bus, that machine could then be operated from anywhere in the area.

As a further refinement, we wanted our tape operators to be able to use the machine control system to simplify the process of dubbing commercials from two-inch reels and 16 mm film to our ACR-25 cart machine. After loading and cueing the play machine, we wanted the operator to be able to throw an "external start" toggle switch on the remote control panel associated with that machine. Since the ACR-25 generates an external start pulse whenever it is placed in the record mode, our idea was to simply route this pulse via the machine control system to the play machine to assure perfect program cueing on the finished cart. This technique could also be applied to our AVR-3s, VR-2000, and film projectors, allowing the operator to start more than one machine with the push of a single button during dubbing, transfers, or editing.

While all of these design objectives were developed to meet the requirements of the KPIX system, the hardware and software engineers at Fernseh had to remain mindful of the eventual use of the system at other stations. For example, the system has been modified since our installation at KPIX to accept variable speed controls for VTRs—a feature that we did not require. To explain how this was possible, I must digress for a brief discussion of the system's communication architecture.

Software concerns

As I said earlier, the system uses a distributed processing approach, and in fact has a separate microcomputer in every box—machine interfaces, control panels, and multiplexers—a total of 31 CPUs in the current configuration. The microprocessor used exclusively in the system is a 6502—a 40-pin, multi-source IC selected primarily because of its "pipeline" design, which provides simultaneous execution of the last instruction and fetch of the next instruction, and its "memory-mapped I/O" technique, which makes I/O-intensive applications such as this much more efficient. Each 6502 talks on a 40-conductor ribbon-type data bus to a 256-byte RAM and, depending on the size of the program needed at that location, either a 1 or 2 kilobyte EPROM. The EPROM, being reprogrammable, is a key element in the overall flexibility of the system.

For example, on the eight-button machine delegate panel, we originally intended the first button to be labelled "OFF," so that by pushing this button the machine would be assigned to a bus with no controller. This left only seven other buttons, meaning that we really had

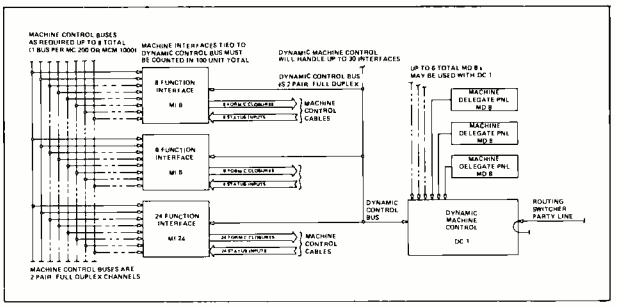

Fig. 4. Dynamic machine selection system (optional add-on for TCS-1 system) showing routing switcher party line connection at right

access to only seven buses, not eight. We finally decided that we wanted eight buses more than we wanted an "off" switch, and modified the software so that pushing a delegate button once would put the machine on the bus, and pushing the same button again would take it off.

Additional devices on the internal ribbon wire bus vary according to the purpose of the box. Machine interfaces, for example, have one eight-function relay interface board if they're talking to VTRs, or three eight-function relay interface boards if they're connected to film chains.

Terminating the internal data bus is what we refer to as an "eight by 422" board. This is an eight-port RS-422 multiplexer that electrically connects the individual box simultaneously to all eight machine control buses that run through the plant and selects one of them for communication with the microprocessor.

The machine control buses operate on a bit-per-function protocol in which one control relay is operated by turning on one bit, two relays by turning on two bits, and so on. The same is true for the status data.

With this approach, you can look at the data stream and see the bit toggle up and down as the relay goes on and off, or as the light goes on and off in the case of a status function. This means you can have an infinitely long control word: the first byte being the address, the second being the length of the message to follow, and, in the case of an eight-function interface, two bytes of message. For 24-function interfaces, there are four bytes of message. But if more bits are required—as it developed in the case of the variable speed control—you can simply change the message length byte and tack on the additional data.

We also tried to keep the system flexible in terms of packaging, even to the extent to having some of Fernseh's mechanical designers visit the station. As a result, the system has three basic mechanical formats. The first is a 1¾-inch rack-mount package used for delegate panels (MD-8), eight-function machine interfaces (MI-8), and machine control multiplexers (MCM-1000). (Twenty-four-function interfaces utilize a 3½-inch high version of this package.) The second is a 3½-inch rack frame, which can be thought of as three units wide. A single-machine control panel (MC-24) takes up two of the three units, leaving one unit for whatever other control may be required. In our case, we asked Fernseh to invent a 10-key, single-bus routing switcher control that would fit in that space. (This turned out to be the CP-1200A.) For those wanting variable speed control for VTRs, the space can be used just as easily for a shuttle knob. Where necessary, the 3½-inch frame can also be used to mount

Machine Control At KPIX

three CP-1200As.

Drawing from rack-mount packages, we then assembled a basic control "cluster" for each machine (Fig. 2) consisting of one MD-8 machine delegate panel, one 3½-inch rack frame (containing an MC-24 single machine control panel and CP-1200A switcher control for selecting the input to the VTR), and a printed directory of video/audio sources and machine numbers.

The remaining mechanical format in the system is the MC-200 studio control panel (Fig. 3), which at 19 inches high by 17 inches wide was designed to fit alongside our Grass Valley production switchers.

Here again, we felt that our particular arrangement might not be everyone's cup of tea, so each button group on the MC-200 was mounted on a separate PC board to facilitate other layouts, including different control functions and overall dimensions. Other mechanical details, such as pushbutton type, paint color, etc., were specified to match our Grass Valley equipment.

The system was installed and operating in time to meet our "drop dead" air date of February 22, 1980, and has been on line since then. But even after we were on the air, we had a few more things to learn.

For instance, it turned out that RS-422, which, of course, is a basic element in the system design, does not specifically refer to tri-state data systems, and we didn't realize that this was really the source of what seemed to be a noise problem. What we saw was random illumination of the status lights—which was a little disconcerting to the operators, to say the least.

The EIA RS-422 standard, which specifies such things as voltage and impedance, is commonly used in data communications systems. At the same time, the tri-state (high/low/high impedance) concept is often used when more than one line driver needs to talk on the same bus. This is exactly what happens when two machine interfaces try to send status to the same studio control panel—a very common requirement. Since they both can't send status simultaneously without causing a short circuit, there has to be a certain amount of cooperation so that only one line driver is talking at a time. This is conventionally done, in this as in many other systems, by having the first line driver sign off by "disappearing," that is, by bringing the bus to a high impedance state. With the bus thus released, another send can start talking, and so on.

The problem was easily corrected—we just modified the line release procedure in software to make the system more noise immune, then terminated the buses with hardware for extra noise protection. First we had to figure out that we were trying to marry two standards that hadn't really been properly introduced.

In spite of our efforts to keep the system as flexible as possible, there remains one feature that doesn't lend itself to every application—dynamic machine selection (Fig. 4). This is an idea that works only if you happen to have a TVS/TAS-1000 distribution switcher in your building.

As part of our system, we wanted to build two U-Matic playback stations, each consisting of four ¾-inch VTRs connected through a small routing switcher to two ADDA VW-1 frame synchronizers. The main uses of

these systems are on-air playback of ENG tapes and real-time post-production of EFP programming, such as *Evening Magazine*. For the sake of economy, it made sense for us to share the four frame synchronizers among the eight U-Matics. But with respect to tight on-air work, it added a potential booby-trap. The production switcher operator might very well be told to "take your video on frame synchronizer 1" and "roll your tape on U-Matic 3." Since we were building two identical playback stations it made the situation even more confusing.

It seemed to us that the switcher operator should have to remember only *one* number for video and machine control, and that number should be that of the frame synchronizer. The way to achieve this was to have the routing switcher talk to the machine control system.

First, the VTR operator loads, say, U-Matic 3 and switches it into frame synchronizer 1. By using an MD-8 delegate panel, the operator then delegates control of the "frame synchronizer" to the production switcher operator. The MD-8 panel is connected to a box called a dynamic machine selector, which in turn is connected to the party line of the routing switcher. Through the party line connection, the machine control system will dynamically select for operation whatever VTR happens to be switched into, as in this example, frame synchronizer 1.

Now, the VTR operator can call to the switcher operator, "take your tape on frame synchronizer 1," which in the shorthand of production jargon becomes "standby to roll framestore 1." The switcher operator punches up framestore 1, addresses framestore 1 on the machine control panel, and hits PLAY. He or she really has no idea which machine is playing the tape, and doesn't much care.

One potential for future applications of the system arises from the provisions which had to be made to permit dynamic machine selection. The dynamic control bus (see Fig. 4) could easily be run throughout the plant to permit control by a central assignment computer. As it stands now, the communications bus to be used and the address to be accepted by each machine interface can be communicated over this dynamic control bus. Additional functions could be incorporated by some minor software changes. While not necessary for KPIX at this time, these capabilities lend themselves to higher levels of control and automation in larger station, production house, and network operations.

For the meantime, we are well satisfied that we have realized our original objectives in terms of news production and machine room operations, both of which have achieved a greatly improved level of accuracy and efficiency. The system has also proven to be extremely easy to change and expand. What we do with it next, only time and our imaginations will determine.

To make the transition from all-analog to all-digital that is surely approaching, we have taken the first steps. We have moved from treating machines as isolated mechanical functions to coordinated information processing stages. While even our new machine control system may change in the years ahead, the fundamental concept is correct. Whatever devices we need to "roll" in the future, in addition to "framestores," we will control through an understanding of their functions rather than through brute force dictated by their location or mechanical peculiarities. **BM/E**

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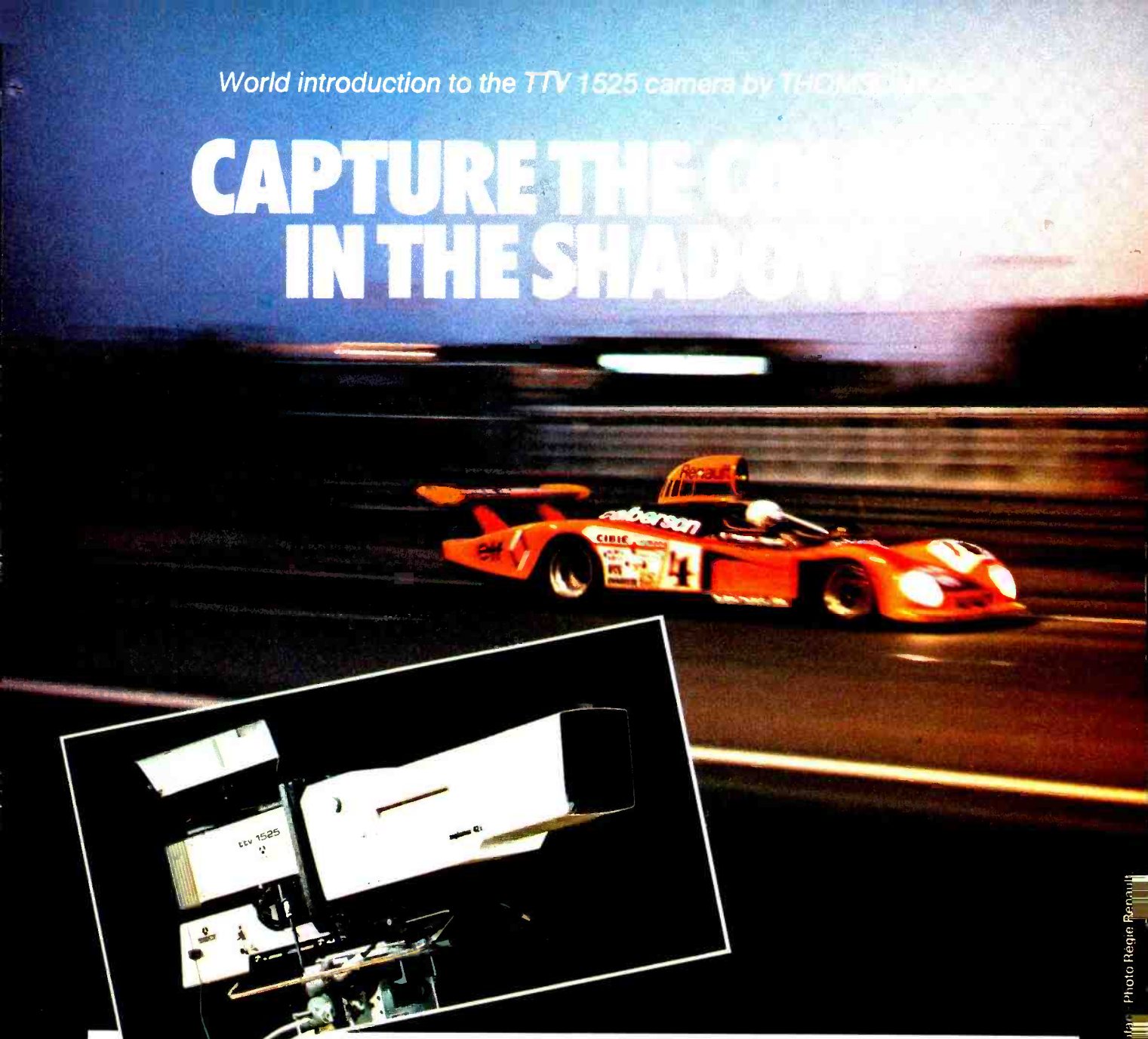

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MACHINE CONTROL TRIMS EQUIPMENT COSTS, PREVENTS LABOR EXPANSION

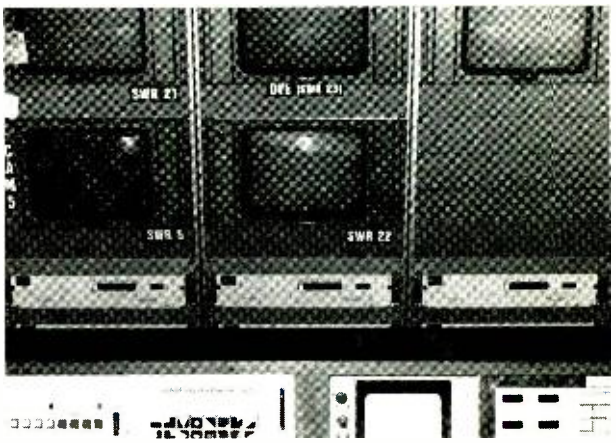
Inflation is playing havoc with the cost of equipment and labor. Plant equipment and personnel must be managed at peak efficiency. Machine control is the light at the end of the tunnel.

TWO YEARS AGO, ABC in New York had a serious problem. New machines were constantly being added to its hard-wired or simplified control system, requiring that new control cables be run. The problem was that the installation cost of each new cable was about $1000. Even though many control signals were multiplexed over one cable, over 25 cables had to be run throughout the entire plant to meet the complex machine control needs. Over 100 machines had to be manipulated from 20 studios.

Al Molinari, audio-video development engineer, and Ben Greenberg, audio-video development manager, unsuccessfully sought a company that had designed machine control systems, using existing plant video lines. They did, however, discover a firm that had designed a system used in South Africa in 1973.

That company, Dynamic Technology of London, U.K., sent machine control signals over video lines without the accompanying video. Working closely with the company, Greenberg and Molinari helped them develop the present VIMACS (Vertical Interval Machine Control System). VIMACS uses standard in-plant video lines, without affecting the picture. The concept takes advantage of the fact that broadcasters use sophisticated signal conditioning techniques to provide a stable and clean video path. Thus vertical interval control signals are relatively noise-free. This results in a reduced system price, if for no other reason than the elimination of additional cable needs.

Another control system that extends the effectiveness of the engineer to a large amount of equipment located throughout the plant was first shown at the IBC exhibition last year. This is the Pye TVT-Philips LDM 600. Not yet sold in the U.S., this system controls machines with signals tuned to the video color black. As in the VIMACS system, no new cables need to be run as communication is accomplished via the existing video network. Unlike VIMACS's bi-directional video lines, the LDM 600 uses alternate TV lines to send data in opposite directions. Control of eight analog functions and 46 ON/OFF conditions is achieved with 720 data bits. Pye has found enough room in its active video technique to transmit three bi-directional 6 kHz digital intercom channels. The LDM 600 interfaces with master control switchers as well as business computer systems. A unique option is source identification coders and decoders.



At ABC in New York, the VIMACS machine control encoders/decoders can be seen rack-mounted horizontally below the TV monitors and directly above the production switcher

Source identification can become a major problem. At last year's Olympics, Greenberg and Molinari were faced with the difficulty of many sport event feeds arriving simultaneously; the desired event could not be spotted quickly on the video monitor. Using VIMACS software and a character generator, they designed a source identification system. This automatically keys in the captioned identifiers of only the desired sport event. The keyer was so successful it will be used again in the 1984 Olympics.

VIMACS uses available production switchers, while the Pye TVT system offers a choice between a dedicated control panel or an available production switcher. Other systems use a standard CRT terminal. However, smaller stations with limited machine control needs may favor a small dedicated control panel over a CRT terminal due to the lower cost. In the past, machine control was considered an adjunct to a routing switcher. Increasingly, routing switchers are becoming an adjunct to machine control. Studios, source machines, and destination equipment all become part of a comprehensive loop. Switchers, VTRs, and telecines are an interactive part of that loop. This means that VTR and film chain operators

need no longer stand by for roll cues. With all VTRs located in one room, machine operating personnel need not move from studio to studio.

Changing station operation

Machine control is rapidly expanding from post-production to transmitters, lighting, and all the way to total plant automation. In the early days, ac power cables had to be run for control purposes. Each additional machine required additional cables. Now that video lines or dedicated digital lines are used there is no limit to what can be controlled. The high cost of cable installation no longer limits the expansion of machine control. SMPTE has established data-line and equipment interface communication standards for this purpose. The society recently concluded a definition of protocol, or command sequence. SMPTE's digital control committee is now about to tackle the difficult problem of developing a common editing language. Once this is accomplished, universal editing commands will extend the value of machine control systems. The ultimate control system will have a common lexicon of machine commands able to be initiated by any switcher in the plant, regardless of the manufacturer.

A growing variety of systems

Control applications vary a great deal. Large networks have different needs from smaller stations. Some users may wish to limit their control to only one type of machine. For them, there is the dedicated control panel. On the other hand, the universal control panel will function with a variety of equipment. Both NEC and 3M use the universal control panel concept.

NEC has designed its system around a control module or matrix. A single matrix controls 15 functions on 15 different machines. By adding additional modules, a 15 by 15 multiplication of function and machine accessibility is achieved. If 10 control modules are installed, 150 functions on 150 machines can be controlled.

Bob Curwin, marketing manager of NEC, told *BM/E* that theoretically an unlimited number of machines could be controlled using the universal panel and the modular matrix building concept. Curwin said the NEC TMC 105 sends digital data over dedicated coaxial lines using the RS-232 data format. A modem port allows digital data to be converted to FSK for transmission over ordinary telephone lines. Control data can thus be sent to machines in distant cities.

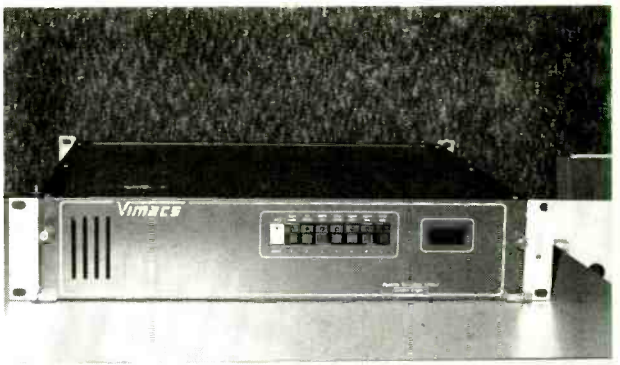
Another control system using dedicated control lines and similar to NEC's system is the 3M 6500. Jerry Curr, 3M product manager, told *BM/E* that the universal control panel controls up to 99 machines of a particular type, and up to 10 different machine types. An RIC (remote interface controller) is provided at each machine to offer individual verification of machine status. Each interface handles 16 functions per machine and is continuously polled for status by the control panel. Coax to machines can run up to 5000 feet. The 3M 6500 stands alone or can be used with the firm's 40X or 20X routing switcher. A video terminal shows matrix status, all commands, and keyboard addresses to the microprocessor. Organization of the display is clear and concise.

Another form of universal machine control system is Fernseh's TCS-1. Up to 100 VTRs and film chains can be controlled, each delegated to any of eight studio control panels. A single panel can control eight multiplexers, each of which handles 30 machines—a total of 240 machines. A dual twisted pair communication line talks to machine interfaces, each of which has its own individual microprocessor. According to George Crowther, Fernseh's marketing manager, four TCS-1 systems have been sold over the past two years. The system can cascade separate studios up to four deep. A unique feature of the system is erasable programmable read-only memory (EPROM), which provides a fully software-based system. EPROMs can be altered to account for changes in machine types or control parameters. Control words are user-designated.

American Data's 3200 is a flexible machine control system that can be custom-designed to operate with the company's routing switcher.

Equipment control over large distances

SMPTE tests in Salt Lake City successfully sent valid machine control signals over a distance of 16,000 feet. A growing number of applications require far greater control distances than are possible using dedicated lines or video cable. For example, in New York City, Metromedia's WNEW-TV was mandated by the FCC to establish New Jersey studios to provide a tax base input in that state. An ICR (inter-city-relay) microwave link was established to control $270,000 worth of VTRs and $140,000 in film-chain equipment. Four film editors, six engineers, four operators, and a maintenance supervisor are located in the New Jersey studios.



VIMACS machine control rack-mounted interface includes encoder/decoder, power supply, character generator, and time code card. Video and machine control line are in rear

According to Rich Miller, assistant chief engineer of WNEW-TV, without machine control the number of engineers in New Jersey would have to be doubled. In addition, the sync problems would be devastating, frame store devices would be required for each remote line, and a substantial on-site repair inventory would be required. WNEW-TV is about to install a New Jersey news bureau and do live street broadcasts from there. Their present microwave link machine control system will adjust all the microwave antennas remotely.

A microwave link is less expensive for full-time machine control operation than is a dedicated telephone line. However, if microwave equipment is not available,

that too can be an expensive data communication link. Duncan Campbell of American Laser Co., Goleta, Calif., suggests an interesting alternative for distances up to two miles. Video containing machine control signals could be transmitted over laser beam using American Laser Co. standard transceivers. There is no license requirement and the system cost is one-third that of microwave transmission. A laser channel extends up to 12 MHz. This is more than sufficient for high-quality video or for six and a half megabits of digital data.

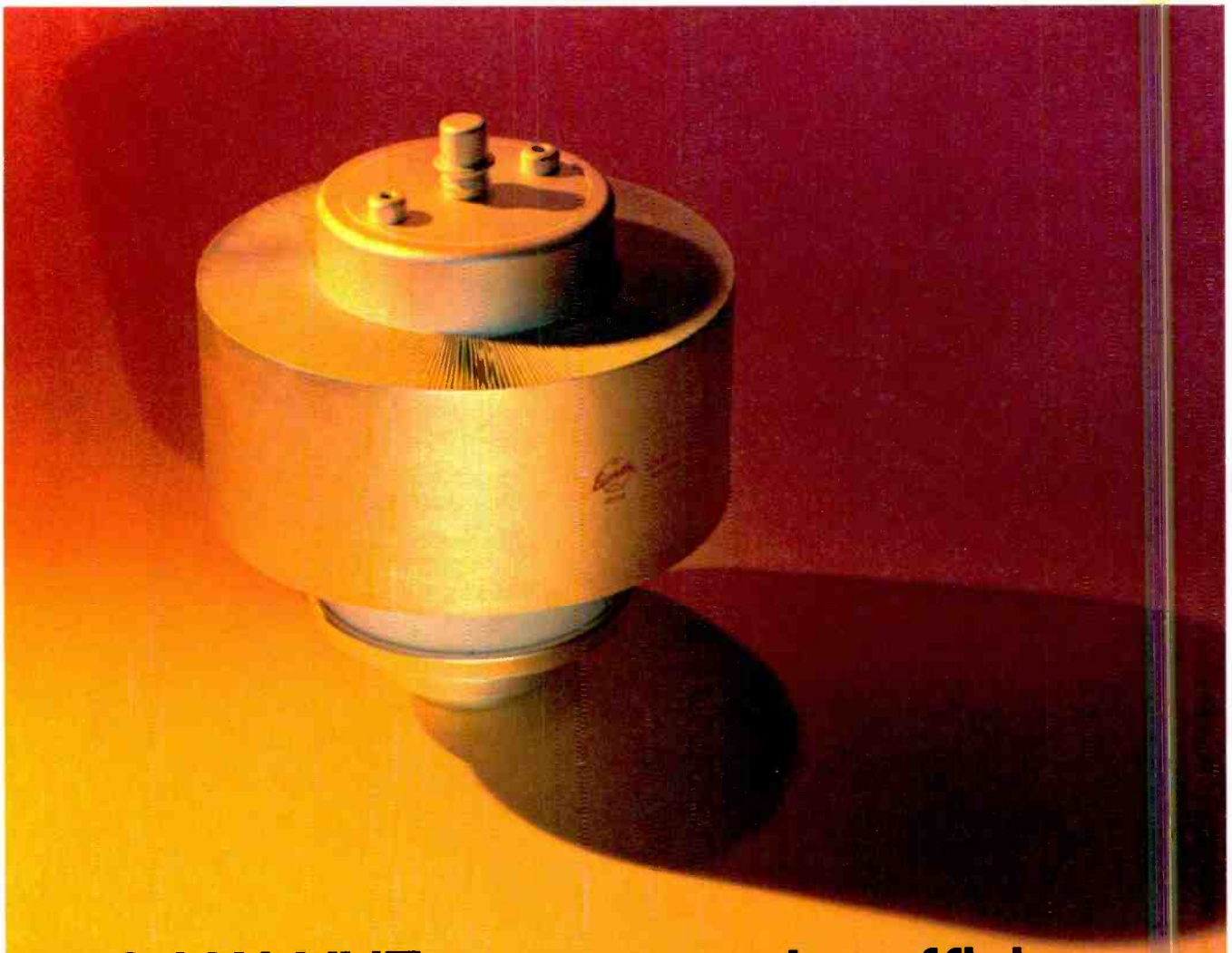
When ABC has finally completed its purchase of VIMACS encoder/decoders, the network will own over 500 units. Some will be located at KABC and at outlets in Washington D.C., Detroit, and Chicago. It is conceivable that a production studio in New York City could control a VTR in Chicago, the west coast, or even further away. This is not at all science fiction. Each VIMACS encoder/decoder has a modem port for use when video lines are not available. Digital data is converted to FSK and sent directly over ordinary telephone lines. ABC in New York now runs six VTRs in Union City, N.J. over dial-up telephone lines.

System reliability

Control systems cut labor costs by preventing the expansion of new labor requirements. A single person in a room full of VTRs can change tapes on multiple machines in response to requests from numerous studios. Digital signals in dedicated lines can control as many machines as matrix module stacking will allow. Theoretically, a full complement of VIMACS encoders and decoders could control 4096 machines, without the installation of a single cable. Given these benefits, it will not be long before more and more broadcasters will take to machine control. With stations so dependent upon these systems, what is their reliability?

When dedicated control panels are used, manual backup is provided to account for any failure in a control panel circuit. In the 3M and NEC systems, an under voltage alarm signals an engineer when data-line voltage drops below a preset danger level. The Pye-Philips system has battery power to protect the main computer memory, so that signal routing will not be disturbed when ac power fails.

In the VIMACS system, encoder/decoders at each machine location results in a completely modular approach. The impact of component failure would be limited to only that small part of the total system loop. Of course, if video is lost, that is an entirely different matter. Assuming that video is intact, Dynamic Technology and ABC have designed a great deal of reliability into VIMACS. Each encoder/decoder has a Zilog Z-80 microprocessor with dip-switching and EPROM for software flexibility. Data transmission integrity is enhanced by a sophisticated data protocol. In the first field of a video frame, 40 bits are sent: 24 data bits and 16 qualifiers for cyclical redundancy. The second field of the same video frame contains another 40 bits. This time, 32 are machine commands and eight are parity bits. Thus, a total of 24 bits are used only for reliability purposes to guarantee data integrity.



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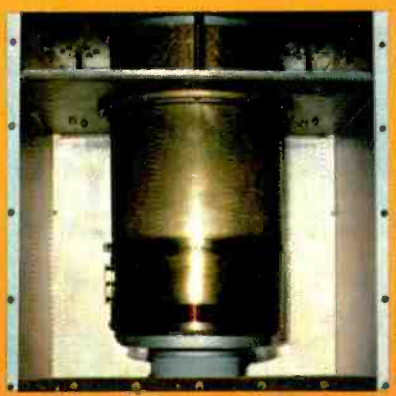

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Machine Control

Effective control of plant equipment could never get off the ground without universal standards for communication lines, protocol, and the data itself. The electrical and mechanical features of the communication line have been compared to a highway and the protocol or sequence of characters on the line to a vehicle traveling on that highway. The data being sent is compared to the passengers in the vehicle. Control panels must interface with equipment made by various manufacturers. Ultimately, machines themselves will talk to each other.

SMPTE's committee on digital control has been attacking these problems for two years. Tests were conducted at KSL-TV, Salt Lake City, in September, 1979, and in October, 1980 at KPIX in San Francisco. Electrical and mechanical standards for machine control communication lines were the first priority.

SMPTE's electrical standards call for a four-wire, full-duplex, balanced configuration. Line impedance is 75 to 110 ohms and data rate is 38.4 kilobaud. Line drivers such as the TI-SN 75-172, which are designed to operate on RS-422, will function with the new SMPTE standard.

Robert McCall, chairman of SMPTE's digital control committee, told *BM/E* that the new standard permits true plant automation to become a reality. In-plant control can now proceed beyond the limits of what was once considered only machine control. Transmitters, lighting systems, test equipment, and any variable may be controlled. The new standard requires no new test gear.

Future trends in machine control

Machine control luminaries see the field expanding in several directions. One is more software directly at machine interface. More microprocessor programming at a machine means a machine can talk to other machines upon request. For example, the same command that creates a still store display will also drive a character generator to produce a pre-chosen title.

Another extension is in the area of human decision-making. Today, the system tells the operator what resources are available. The operator then makes the choices. In the future, software programming will permit the system itself to evaluate available machines, explore various options, and choose alternatives.

The system is in a better position than the operator to evaluate machines in the loop because it can obtain a function by function tally of a given machine. For example, VTR 3 may be available for playback only, but not for record. It would then only be put on line for playback. The machine control system would continuously interrogate each machine for an updated indication of the status of each function.

A slight extension of this idea leads to a fascinating way to eliminate the financial loss associated with emergency equipment repairs. Sensing transducers at each machine would detect machine-generated waveforms, power output, frequency stability, and other specifications. Any variation beyond preprogrammed limits would indicate that a machine component is going south. Periodic preventative maintenance procedures could pick up this data and remove a machine *before* it fails. In another variation of this idea, upper and lower limit alarms would immediately notify the engineer when any machine in the plant is out of spec. **BM/E**

American Data's 3200 machine control system is in use at San Francisco's KQED

M. Cosgrove (right) explains the Philips LDM 600 machine control system, currently in use in Europe, which may make an American appearance in the near future

Control Video Corporation is one of several companies now making special purpose machine control systems. The computer control concepts used in such devices may lead to larger and more powerful systems

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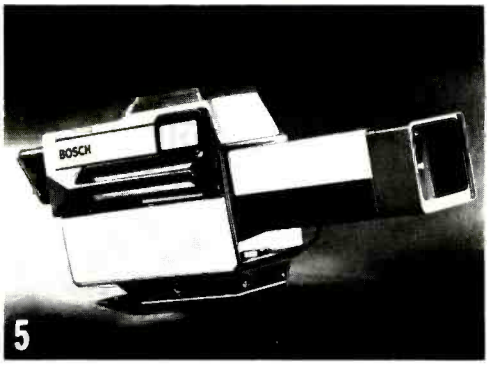
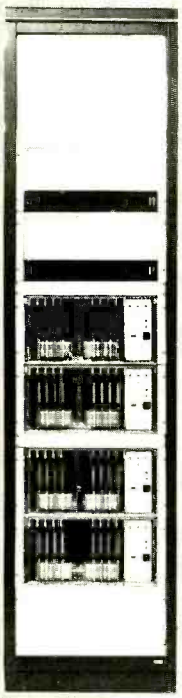
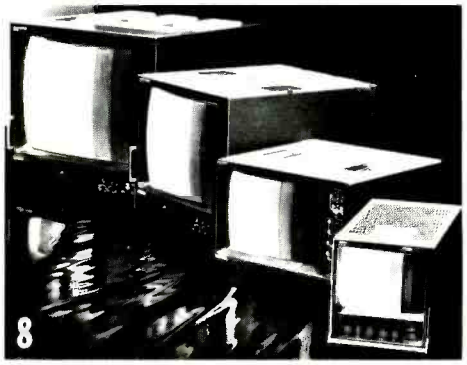
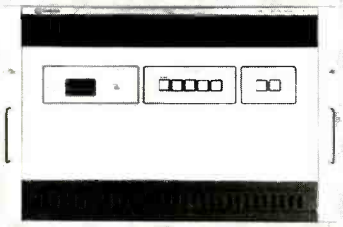
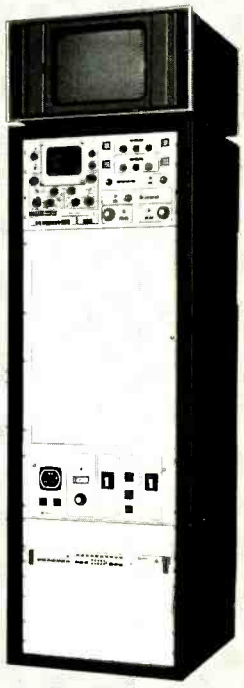
television products











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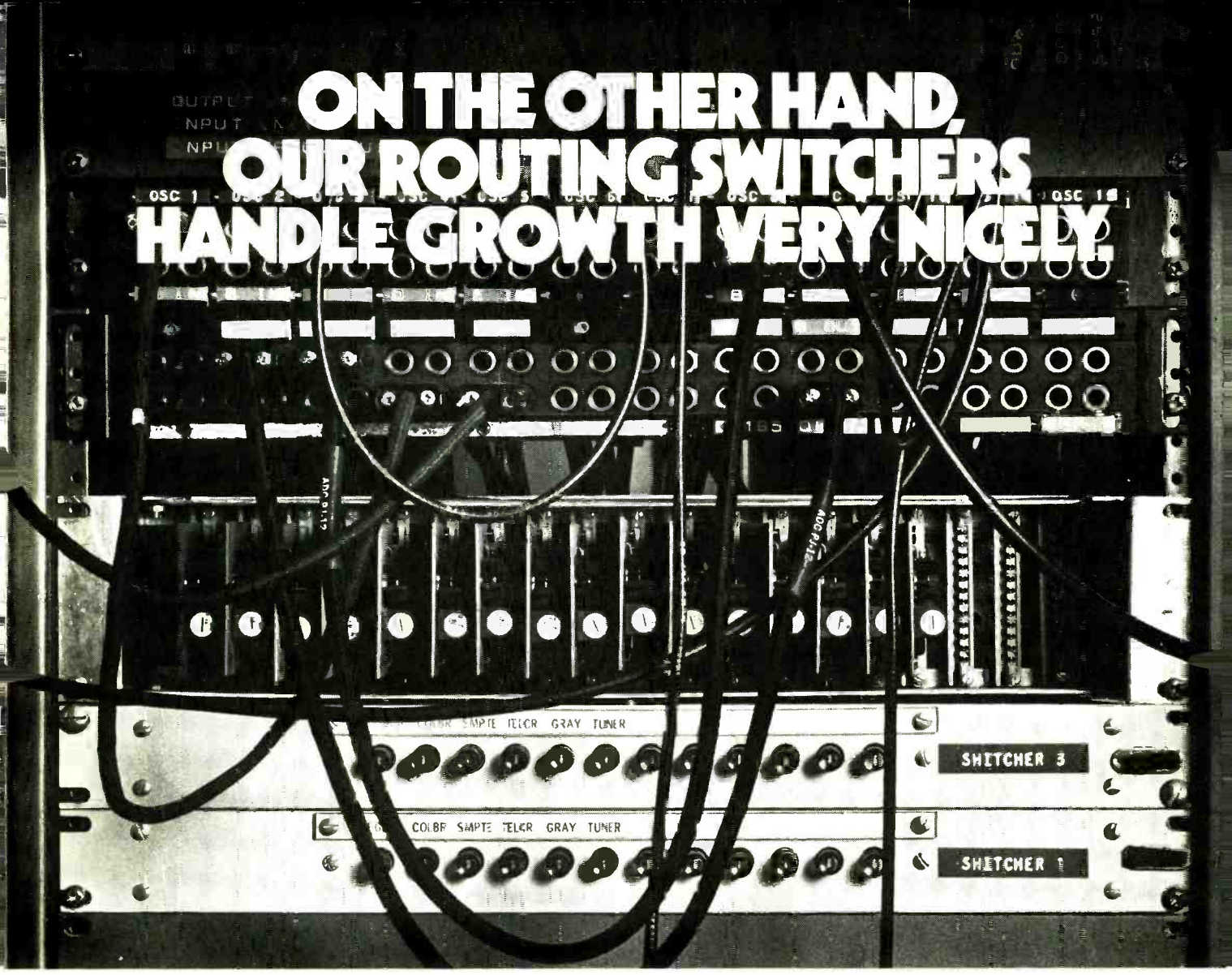

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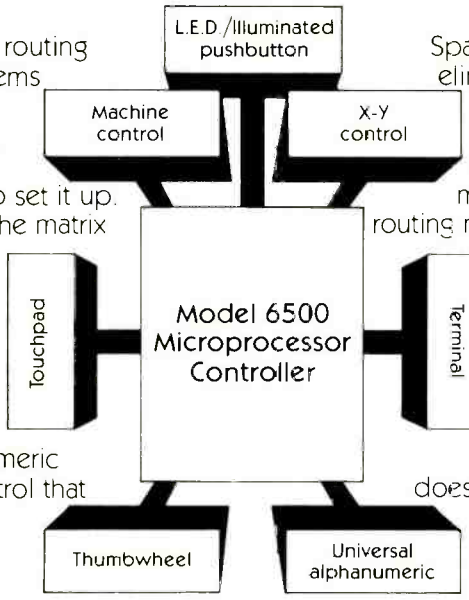

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MOVING FROM HERE TO DIGITAL

DIGITAL TELEVISION DEVELOPMENT: A LOOK INTO THE FUTURE

By David E. Acker

The development of the digital studio hinges on the clear understanding of how the technology has to evolve. The goals, standards, and equipment must all mesh for the smooth transition to digital.

THE DIGITAL TELEVISION REVOLUTION, launched nearly a decade ago with the development of the first digital time base corrector, has been the technological basis for the vast majority of new television products developed over this period of time. Full digital processing is the way of the future and can provide advantages in many areas. Let's look at a few:

- The digital signal is "robust" compared to the "fragile" analog waveform that is currently routed from one processing equipment to another.
- Signal processing capabilities such as special effects, which are accomplished in the digital domain, are not possible using the analog techniques.
- Digital processing offers economic advantages as a direct result of digital processing advancements associated with the rapid growth of the computer industry, and will continue in the same direction—more capability for less cost.
- Digital videotape recorder (DVR) multi-generation performance far exceeds that of current analog equipment.
- Operational advantages in editing, production, and control are inherent in digital systems.
- Converting the signal into digitized samples can provide a basis for program interchange from one TV standard to another.

How *do* we get there? What preparation is necessary? How does one plan for the future? Many questions still must be answered to allow us to even start to prepare for the expansion we expect in digital television. With clearly defined goals, which I believe can be simply stated in terms of the advantages that digital processing offers, we have to proceed to generate attainable and logical standards and in turn develop equipment that will provide the capability that meets our originally stated goals.

David E. Acker is president of Datra Inc., a consultant to the broadcast industry. He was formerly president of Microtime, Inc.

Standards

The digital signal. A considerable amount of study and effort has been expended by SMPTE committees in an effort to generate standards for digital television signals. The Working Group on Digital Video Standards under the direction of the committee on new technology was established to concentrate on the video aspects of the new and quickly emerging technology.

Many in the field predicted the evolution of digital television would begin with the digital interconnection of processing boxes so that the undesirable effects of A-D and D-A converters (multiple codecs—*co*de/*dec*ode) could be eliminated. It was primarily for this reason that the Working Group was given the charter to define this interconnection interface. This group did the required research and prepared a recommendation that specified a 4x subcarrier sampling rate and eight-bit (255 grey code levels) encoding of the composite signal and described the characteristics of 10 parallel signal lines (eight bits, one timing signal and the clock signal) which would be used to interconnect the black boxes.

With this document barely completed, a rather significant change in direction and thinking occured within the committee. The emphasis switched from composite encoding to component encoding in an effort to generate a standard that would be directly compatible or easily converted to that proposed by television engineers in Europe. While this represented a large change in scope and in charter, I believe it was timely and the right direction to take; the emphasis on the interconnection of digital black boxes was over. In fact, it is not apparent that any manufacturer has interconnected even its own black boxes, standard or no standard. Even if some have, it is certainly not commonly done with digital equipment. The reason is that extensive use of digital processing beyond what is included in one box, such as a time base

corrector, field/frame store, noise reducer, or special effects equipment, hasn't happened yet. Sure, a few of these functions have been combined, but they are still contained within the unit. So, despite the fact that we are in the digital decade, we are not ready to interconnect a series of digital processors and replace all of the analog equipment in the studios.

The video tape recorder. Video tape recorder standards are, of course, also essential to the realization of all of the benefits of digital processing. Again, SMPTE has established a Study Group on Digital Television Recording that will make its recommendations to the committee on new technology, which in turn will (it is hoped) appoint a working group to make recommendations regarding standards.

Several technical aspects have to be considered, and while it would be highly desirable to have the same standard for both processing and recording it may not be possible to simultaneously realize sought-after economic goals regarding tape consumption, achieve projected performance levels, and consider the major worldwide television standards (NTSC, PAL, and SECAM) for program interchange.

Whatever the final format or (as has been suggested) heirarchy of formats that will allow manufacturers to make meaningful performance/cost tradeoffs, the basic reasons for digital recording should not be lost in hassles of standardization. Better overall performance in areas such as signal-to-noise, substantially increased multigeneration capability to simplify post-production and distribution, and maximization of the performance/cost ratio are the advantages that must not be lost.

Hierarchical Structure

Ratios	f_s (MHz)		
	Y	R-Y	B-Y
2:1:1	7	3.5	3.5
4:1:1	14	3.5	3.5
4:2:2	14	7	7
4:4:4	14	14	14

Fig. 1. Table shows possible sampling rates in a hierarchical relationship for component encoding

Multiple standards and codes

It is almost certain that three video standards will be needed for digital video in the future. First, the basic interface and processing standard as discussed above will be required. Secondly, a single-wire, serial data transmission code which will permit studio equipment interconnection over longer distances will be needed—it simply is not practical to consider multiple parallel paths (component encoding using eight bits, a clock, and a timing signal would require 26 lines). Thirdly, it is likely that a hierarchical approach that has been discussed in the literature will be adopted for recording, representing a third set of digital television codes. A brief discussion of this approach follows.

In specifying the sampling rates for component encod-

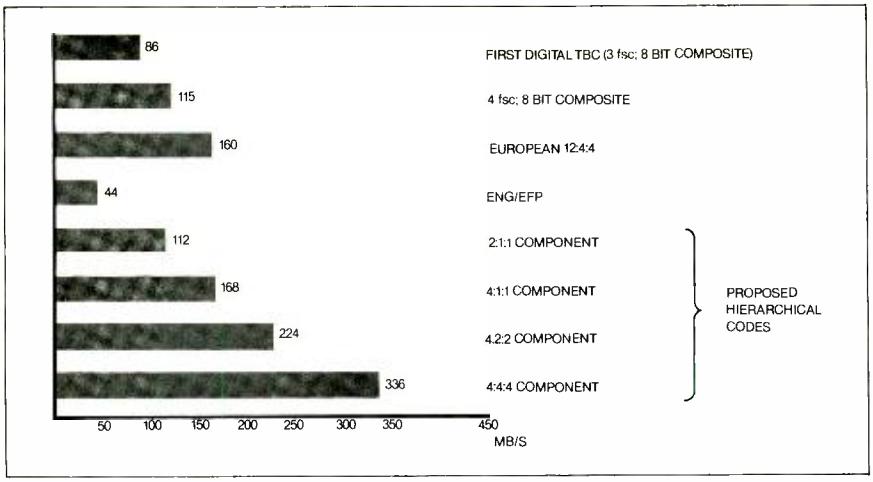


Chart shows various digital television encoding schemes used in existing and experimental equipment

ing, it is possible to construct a family of codes that allows simple conversion techniques to change from one code to another. The highest level code might be direct conversion of RGB signals to digital format, thus requiring the highest sampling rates; the lowest would be aimed at ENG/EFP performance and employ the lowest sampling rates. See Figure 1, which relates these various parameters.

An important issue that perhaps is lost sight of in the heat of debate over which code or standard is best, is: who is going to build the equipment so specified? Will manufacturers be enticed into providing the necessary equipment for hierarchical conversion, for example, or will they spend their R&D dollars on something more lucrative?

Equipment needs

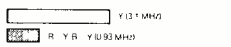
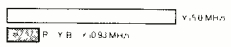
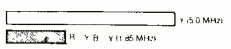
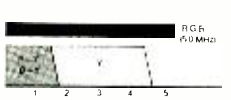
Digital processing has several advantages, as has been pointed out above. There are others, related to the equipment, that are equally important. For example, we can achieve a high degree of stability and reliability with virtually no "tweaking" using digital circuits. In addition, simple operation of digital equipment is possible through the use of microprocessor control (and a human-engineered control panel interface to the world outside). Self-diagnostic circuitry can be incorporated into the system design to aid in maintenance and repair while minimizing test equipment requirements and service training. These characteristics have to be included in any digital equipment, again in line with our overall goals to fully realize the advantages and utilize the extensive

capabilities of digital processing.

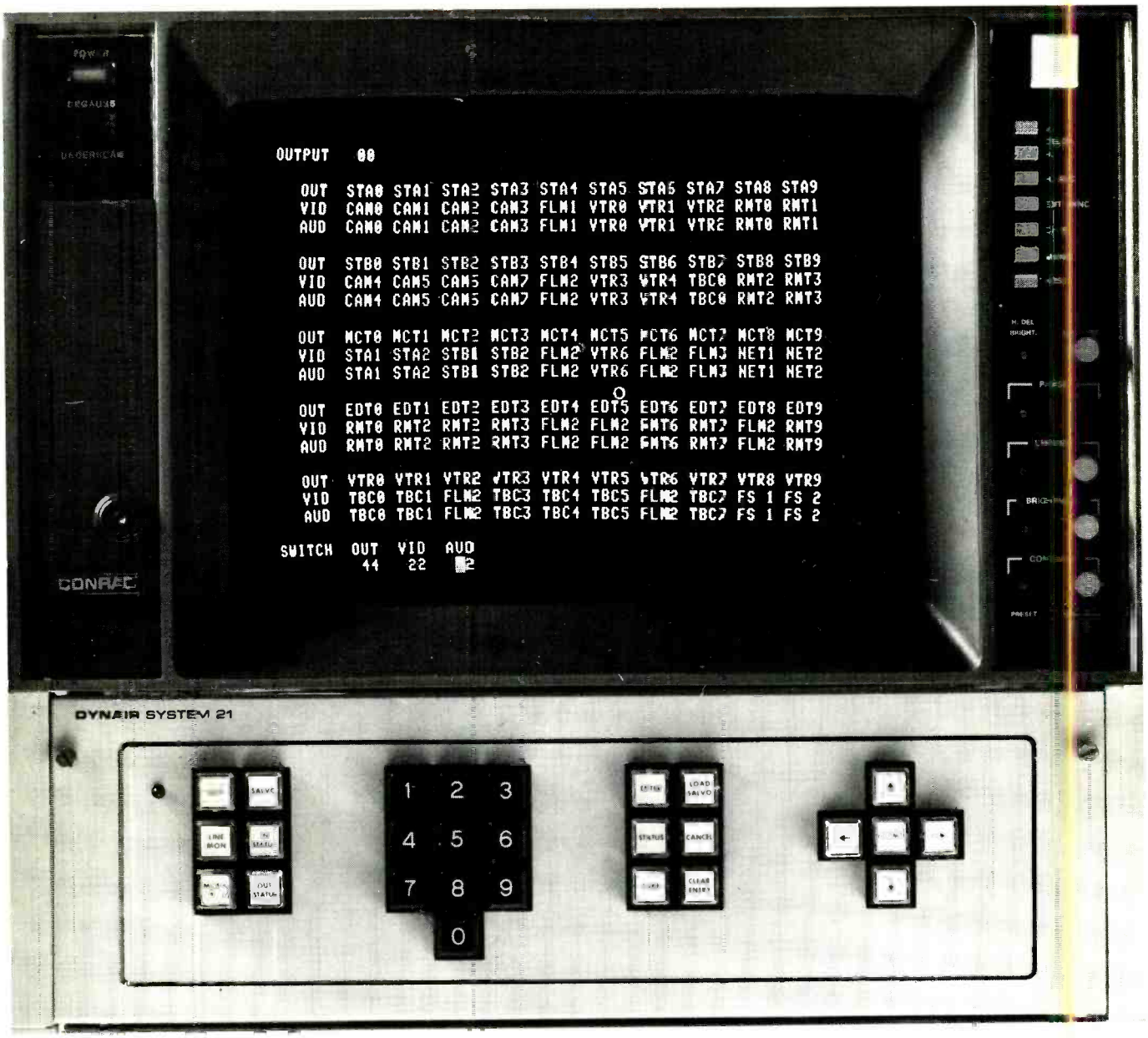
The digital video tape recorder (DVR) would seem to be the most vital link in the chain of digital processing equipment. However, without the equipment means for switching and distributing digital signals, conversion to analog is necessary at the DVR output. Therefore, we must have all of today's major analog processing equipment available to us in digital format to fully realize all of the advantages of digital and, of course, to build an all-digital studio.

As has been discussed in the literature, the fastest way to attain our goals is through an evolutionary process which begins with a digital editing subsystem. The heart of this system will be the DVR, so therefore we will need that first. The digital switcher/mixer would complete this subsystem. More sophisticated switchers and distribution equipment should follow to permit larger-scale use of digital processing in the studio. The signal in digital form cannot be viewed directly without conversion back to analog; monitoring equipment therefore will be necessary to verify program continuity and quality.

One fundamentally important last point—the economic factors associated with digital equipment and processing must provide a clear advantage over current analog equipment. If not, why change? Simply because it's digital? Key factors, in addition to initial costs, that must be included in the economic analysis are: pre- and

Data Rates Mb/s	Ratios Y:R – Y:B – Y	Samples Per H-Line Y R – Y,B – Y	f_s MHz Y R – Y,B – Y	Maximum Practical Bandwidth MHz	Applications	Pros	Cons
115	2:1:1	456 228	7.2 3.6		• ENG/EFP • Lower cost video equipment	• Lowest data rate	• Limited picture resolution
172	4:1:1	912 228	14.3 3.6		• ENG/EFP • Some video processing equipment	• Low data rate • Better Y resolution than 2:1:1	• Y and R – Y,B – Y bandwidths not fully compatible
228	4:2:2	912 456	14.3 7.2		• Some teleproduction • Most video equipment processing	• Good technical performance vs data rate tradeoff	• Probably not high enough performance for all studio processing
343	R G B 4:4:4	912	14.3		• High-quality studio teleproduction	• Should provide excellent overall performance	• Highest data rate

Cost/benefit tradeoffs for various sampling schemes



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It's a master control . . . using easy to understand keys, call for any one of the System 21's 1000 outputs. Connect it to any of the 1000 inputs, different video and audio if desired.

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post-production savings, operator skill level (training costs), maintenance costs and revenue producing capacity—all of which should be attractive, if again, our basic goals are met.

The digital studio—an evolution

It is clear that the all-digital studio will evolve from several stages of continued integration of digital equipment into the studio. With the editing subsystem described earlier and the addition of other equipment, we will eventually create the all-digital studio. We will be living with a hybrid analog/digital system for several years since it will be some time before frequent use of analog archival tapes and program sources drops off to make way for all-digital program sources.

Serial bit-stream data transmission will require new equipment and considerable reworking of pertinent existing communications links. It will take a fair amount of time to make this change and it most certainly will have to be carefully planned. Yes, the all-digital studio will happen, but it represents a significantly larger change than what was required to convert to color back in the 1950s—something to think about!

To summarize the basic thoughts in this article, I believe that we should see the following steps occur in the advancement of digital television—indeed, we are even now in the midst of the first three:

- The goals for digital television processing clearly identified and sought through standards and by equipment manufacturers as we proceed into the digital decade;
- The encoding formats and standards set forth to reap the advantages of digital, equal or better the performance of current equipment, and provide more capability than what is available today—at equal or lower cost;
- Continued integration of digital and analog equipment into studio and teleproduction systems so that users can gain basic experience and manufacturers have sufficient time to create products that will provide the inherent stability, reliability, and full capability of digital systems;
- Development of basic and necessary system functions based on technical merit and optimum choice of parameters; and finally
- To proceed with the orderly conversion of today's analog studios to digital, where it makes sense and where the advantages are clear. **BM/E**

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Paulson, C.R., "Television is Moving Fast . . . From A to D," *Broadcast Communications*, Volume 2, Number 8 and 9, August and September 1979.

Remley, F.M., "What Do We Expect from Digital Video Equipment," paper presented at the 122nd SMPTE Technical Conference, New York City, November 1980.

Various SMPTE Committee Reports and References.

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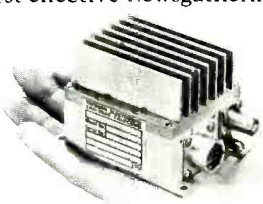

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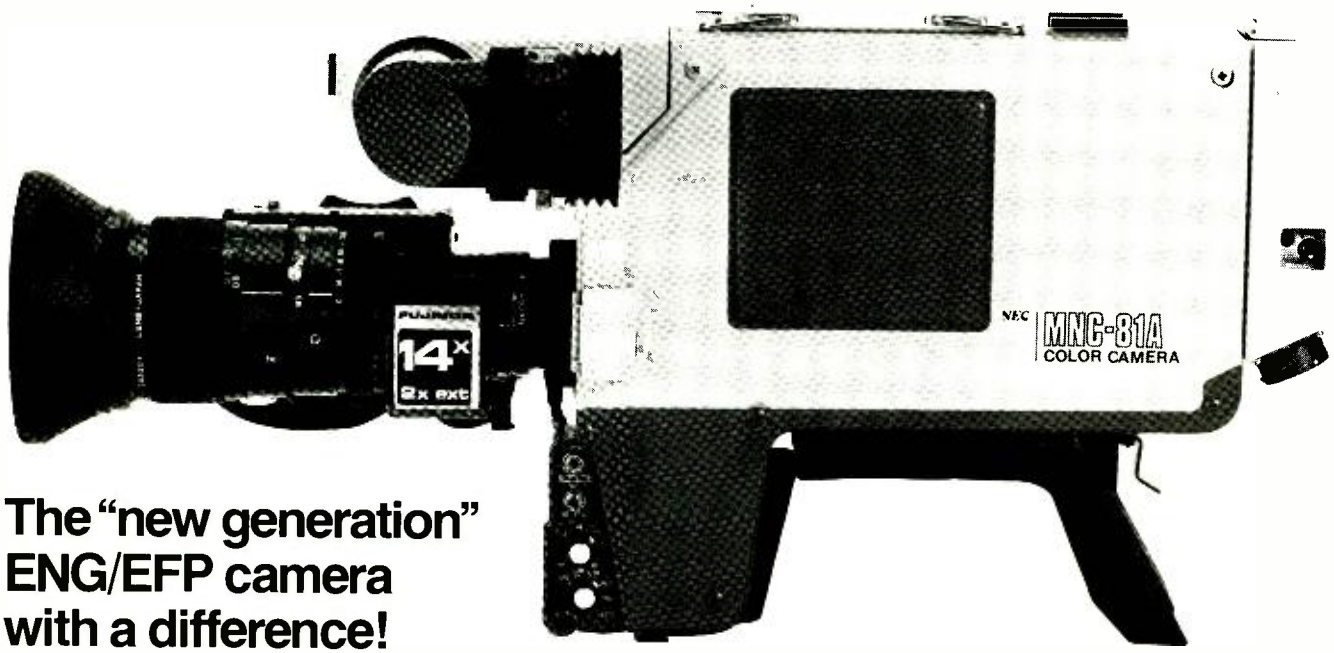

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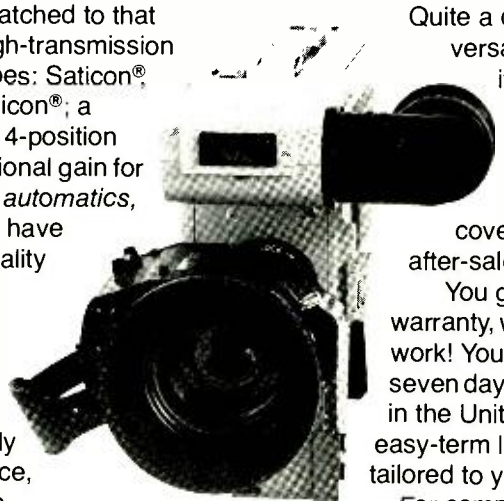

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MOVING FROM HERE TO DIGITAL

FROM ANALOG TO DIGITAL: THE TV PLANT IN TRANSITION

Operating the modern television station with a mixture of digital and analog equipment presents a number of problems in planning for the future. Is it possible to plan now for the digital plant?

MOST CHIEF ENGINEERS are firmly convinced that we are moving rapidly into the digital age. Many are equally convinced that planning for the digital plant is an exercise in frustration. The question of how to plan for a mix of analog and digital equipment over the next decade or so with an eye toward having a digital plant is one that many just don't want to face right now.

"It's nice to brainstorm at conventions about what direction the future technological developments will take," says one chief engineer, "but when you come back to earth you've still got to worry about staying on the air with the equipment that's available."

Steven Smith of Broadcast Technology Consultants feels that the main problem is, "How do you plan for a digital plant when no one has defined what a digital plant is?" Some version of that sentiment was heard in a number of interviews with engineers concerned about the issue. Because of the nature of the problem set forth here—how to run a plant in transition—most of the chief engineers we contacted are in the midst of or have recently implemented major changes at their stations. It was felt that since they were planning new or radically changed facilities, the process of thinking about the future would still be fresh.

Ted Newcomb is the chief engineer at KOCO in Oklahoma City; the station was one of the finalists in *BM/E*'s 1980 Best Station competition (December, 1980). Newcomb has thought about the transition plant but is stymied as to how to really proceed. "At the time that you are planning you don't know exactly what is coming up in the future—digital-wise—and how it will interface with the equipment available in this day and age.

"We tried to go with as much digital equipment as possible during the acquisition of equipment for our new building. You try to purchase, for example, a switcher or something like that so you can marry it into a digital system at a later date. You have to follow along that line."

Newcomb feels that, unfortunately, there will be equipment purchases that will have to be made that can't be interfaced with digital equipment that is still in the development stage. He sees that problem for the short run, within the next two to three years. Trying to avoid that is a real concern, especially with major purchases which can't be written off in that short a period. Newcomb wonders how one can "read the manufacturers' minds on what they have coming up."

What the manufacturers are coming up with seems to be for them at the same level of frustration as their customers. There is the problem of standards. For example, everyone has a favorite approach for digital standards in videotape machines, but until a standard is agreed upon does a manufacturer sink a lot of research dollars into development of a system that might be incompatible with prevailing industry practices?

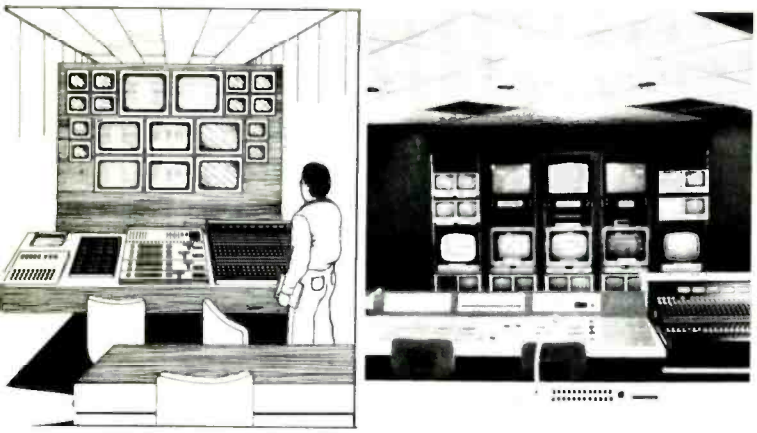
Those standards, some say, are still down the road—a long way down the road, say the more pessimistic. So what happens in the meantime?

Pete Ford, WTSP-TV, Tampa predicts, "The transition from analog to digital is going to take place on a gradual basis. I think that more and more you will find equipment that has both digital and analog ins and outs...so that you get to the point where you can connect machines digitally or on an analog basis." Ford sees this parallel option as a compromise, but one that deals with the problem of interfacing older equipment with new.

Smith agrees with the parallel approach because he sees the mixture of analog and digital continuing for a while yet. While he won't put a time frame on it, he would not be surprised if the transition from analog to digital weren't still going on into the next decade. Given that, he feels, "The most practical approach to technology is a mixture of analog and digital, and it will probably

The Ampex 4000 H1 production switcher was chosen at KOCO because digital effects could be added later

The TV Plant In Transition



The artist's conception of the WTSP control room during planning and the reality which had to accommodate change

be that way for a long time."

Ted Newcomb feels that the discussion of the transition to digital is all well and good, but he is concerned more at this point with the problem of how to maintain the equipment once the standards are agreed to. Engineers who are competent to deal with digital equipment are in great demand right now within the industry. And Newcomb doesn't see the situation getting any better. "Engineers who are really knowledgeable about digital equipment," he notes, "do not seem to be getting into broadcasting."

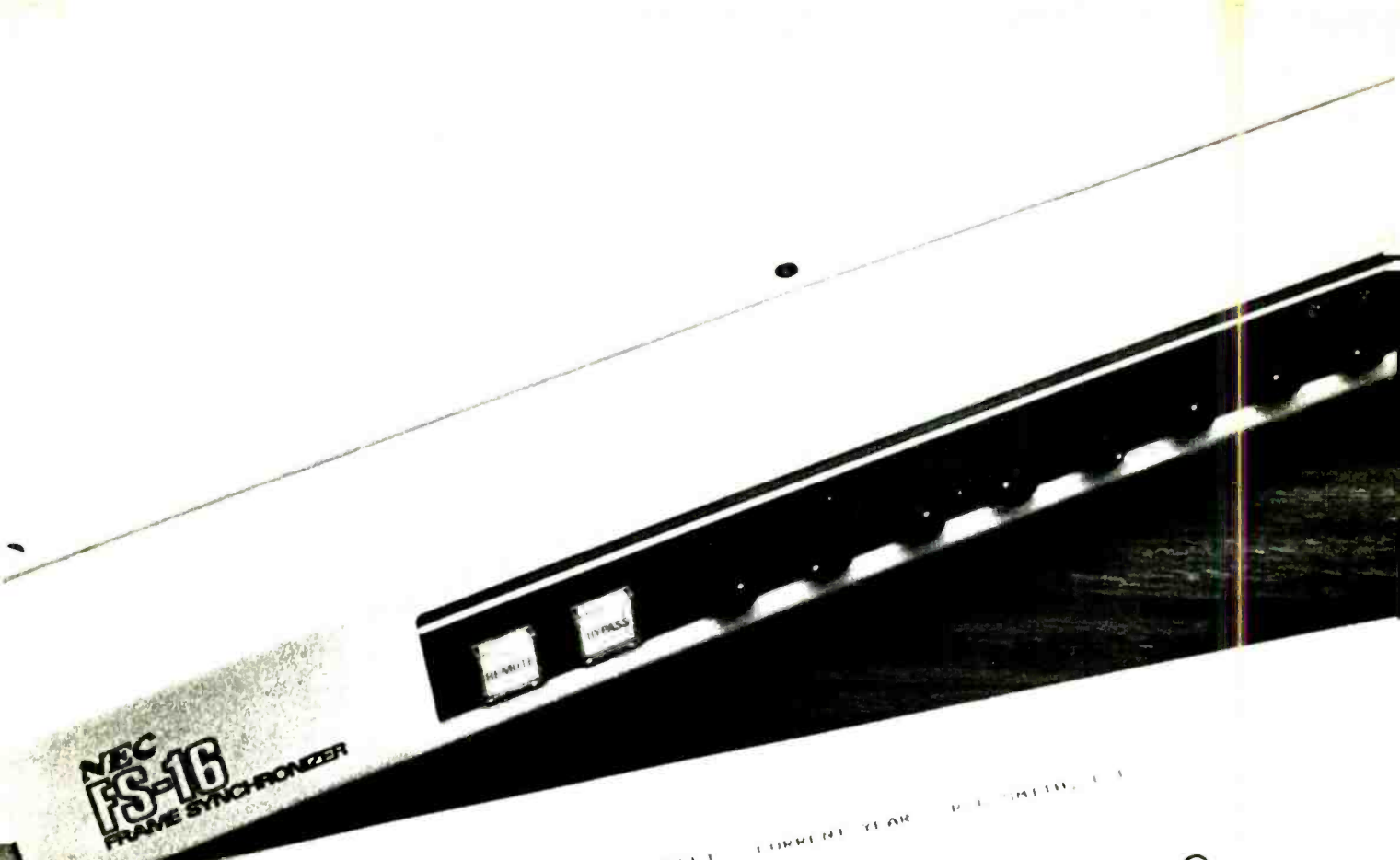
Newcomb is not alone in his concern about finding good people who understand digital concepts and equipment. "The people we're hiring today," says Harry Owens of WDVM, Washington, D.C., "have to have strong skills in digital technology."

Ron Arendall, manager of engineering for WTHR-TV, Indianapolis, feels, "There has been a shift of emphasis from the operator to somebody who understands logic and digital circuitry so that he can be able to repair the equipment."

But finding such people is getting harder because everyone recognizes the need and that is leading to intense competition for their services. But the question still remains: if digital is the growth industry everyone believes it to be, why are good digital engineers so hard to come by?

"Number one," says Ted Newcomb, "the wages are more appealing in the computer industry. Secondly, you only have to deal with one piece of equipment—the computer itself. In broadcasting, you have to look at microprocessors and digital equipment of various types. In talking to technical schools, I've found that a lot of the students concentrate on a particular piece of equipment such as a computer and not the variety of equipment that would be called for in broadcasting. Unless the broadcast industry can persuade some of those coming out of colleges and technical schools to go into broadcasting, the problem is going to get worse."

A key question that has to be repeated is: just what is a digital plant? There is no one view, but without it how can one plan effectively? There is lots of digital equip-



ENGINEERING CAPITAL EXPENDITURE BUDGET — CURRENT YEAR

QTY	ITEM	COST
1	FRAME SYNCHRONIZER	$ 26,000.00
1	SPARE KLYSTRON	55,000.00
1	DIGITAL EFFECTS	24,000.00
6	AUDIO DA'S	1,200.00
1	CHROMAKEY GEN.	6,000.00
4	VIDEO DA'S	1,800.00
3	TYPE C VTR'S	135,000.00
1	VIDEO SWITCHERS	3,000.00
2	CHARACTER GEN.	50,000.00
1	SERVICE SCOPES	8,000.00
2	A/V ROUTING SWITCH	31,600.00
1	ENG/EFP CAMERAS	88,000.00
2	PORTABLE MICROWAVE	17,000.00
2	CONDENSER MIKES	800.00
8	PORTAFLE LIGHT SETS	1,600.00
2	ENG VANS	19,000.00
2	GAS GENERATORS	6,000.00
10	HEADSETS	2,000.00
1	DIGITAL TBC	13,000.00
2	3/4 VTR'S	6,000.00
3	AUTO DELAY LINES	5,500.00
2	AUDIO AMPS	1,500.00
1	AUDIO DECKS	10,000.00
2	AUDIO MIXERS	900.00
1	AUDIO CONSOLE	22,000.00
18	STUDIO LIGHTS	6,000.00
1	PROM PROGRAMMER	2,000.00
4	WORK BENCHES	1,200.00
4	WORK STOOLS	500.00
1	RF GENERATOR	3,200.00
1	FREQ. COUNTER	8,000.00
1	SWEEP GENERATOR	3,000.00
3	DIGITAL VOM'S	1,800.00
1	AUDIO CART MACHINE	1,500.00
1	AUX BUS FOR SWITCHER	10,000.00

TOTAL DEPARTMENT BUDGET	$ 410,800.00
TOTAL SPENT TO DATE	335,684.50
REMAINING BALANCE	75,115.50

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The TV Plant In Transition

ment around, but none of it is really tied together in a real digital system. Steve Smith asks, "Once everything has been digitized, is a digital video switcher a computer or a switcher?"

Some feel that you can't have a real digital plant until the problem is solved of sync, signal routing, and signal switching. The equipment has to be able to talk without going from D to A and back again.

And there is the cost factor. "I can't see paying $100,000 for a piece of digital equipment just because it's digital when there is improved analog equipment to do the same job at much less cost," commented one chief engineer. It was pointed out that while everyone is saying that the cost of digital is coming down, it is overlooked that the cost of comparable analog equipment is also coming down. According to Steve Smith, "a good analog switcher today is very inexpensive because of the use of digital circuitry."

That brings us back to the mix of analog and digital, which causes many people to be less concerned about planning for the day of the digital plant. Somehow, someway, it is believed, the problem of going from analog to digital will be dealt with when it has to be dealt with.

It has to be dealt with now. There has to be clear cut direction on which to base your plans for the future. The only way to get the direction is by participating in the process of change. **BM/E**

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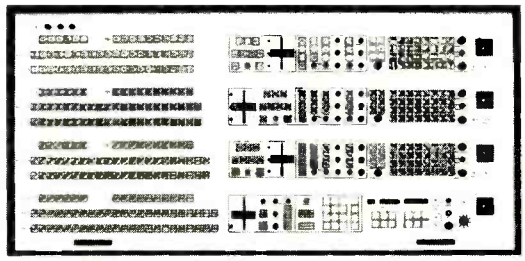
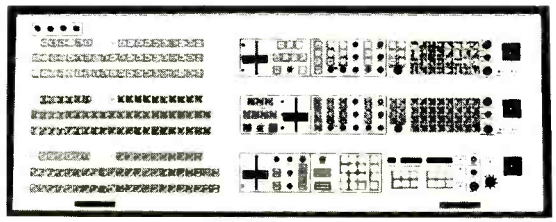
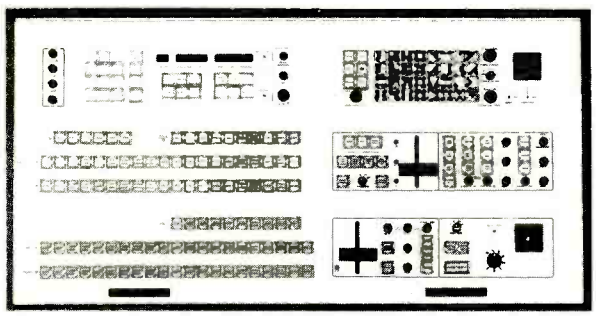


ISI 200-3 Production Switcher



ISI 200-2 Production Switcher



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Broadcasters To Be Careful Consumers In 1981

The 11th Annual Panels of 100 Survey of Broadcast Industry Needs reveals radio and television's "most wanted" products for 1981.

AS INTEREST in the 59th Annual Convention of the National Association of Broadcasters (Las Vegas, April 12 through 15) builds, thousands of broadcasters are preparing themselves for their first hands-on exposure to this year's crop of new broadcast equipment. While both radio and television broadcasters will pour over new production equipment as usual, this year they will also show their first concrete interest in earth station equipment. Some 80 percent of television broadcast respondents and some 62 percent of radio respondents listed earth station equipment on their "most wanted" list.

Generally, however, broadcasters showed more restraint this year, spreading their interests out more evenly over the four equipment areas: production, control, transmitting, and test and measurement. In television, production equipment still took the lead by a considerable margin, with 44 percent of all television respondents saying that they would concentrate on acquiring equipment in this area. Radio broadcasters listed production equipment as their area of greatest interest 31 percent of the time. Both groups gave high marks to T&M equipment (TV, 23 percent; radio, 24 percent), but here the figures are skewed by the lopsided contribution of engineers who cited interest in T&M three times more frequently than did their management counterparts. Active interest in control and transmitting equipment was nearly evenly split by both television and radio broadcasters. Television respondents cited both control and transmitting equipment 19 percent of the time, while radio cited control 23 percent and transmitting 22 percent.

The survey, which polled 1540 top broadcast engineers and managers in large markets and small and received a response rate of just over 32 percent, asked broadcasters to give their opinions on specific products and general industry trends (see page 86). In television, it became clear that many stations have completed their move to all-ENG, with 15 percent of stations expecting to complete the move within the next two years. Radio broadcasters continued to expect some movement toward AM stereo, with 28 percent stating that they expected it to have the greatest impact on their operation over the next two years. Generally, however, the continued computerization of broadcast operations drew the highest level of concurrence between radio and television respondents, with 25 percent of radio and 32 percent of television broadcasters citing this as the most important near-term trend.

In general, managers expressed a greater faith in automation than did engineers, particularly in business automation. In radio, for instance, 49 percent of managers listed business automation as highly desirable, while engineers listed it only 30 percent of the time. Technical automation, on the other hand, enjoys broad support from both engineering and management. In television, switching automation was cited as desirable 49 percent of the time by managers and 57 percent of the time by engineers for an overall interest level of 54 percent.

While interest in computerized equipment (and as the preceding articles in this issue show, digital equipment in all its many forms) will be of increasing importance, broadcasters are likely to make the shift only as they make major overhauls in their systems. Asked if such major renovations or construction of new facilities were planned for the next two years, 23 percent of both radio and television broadcasters answered, "yes."

This year, however, the responses to particular equipment interest were more cautious. During the past three survey years, certain products in both radio and television showed distinct signs of consumer enthusiasm, with large numbers of respondents checking off extreme levels of interest. This year, when asked to indicate their level of interest as "very interested," "some interest," "low interest," or "no interest," the spread concentrated across almost all product categories at the "some interest" level. While the interest level is there, converting it to buying activity will require greater efforts on the part of equipment marketers.

Panels Of 100 Survey

Overall Interest In Radio Equipment

Rank '81	Rank '80		Percent Actively Interested[1]
1	2	Consoles, Mixers	77
2	1	Tape Recorders/Players (studio)	72
3	5	Test Equipment	71
4	6	Audio Processors	65*
5	4	Cartridge Players/Recorders	64
6	3	Remote Pickup & STL	63
7	NL	Earth Stations	62
8	11	Noise Reduction Systems	60
9	9	Antennas	49
10	14	FM Monitoring Equipment	49
11	16	Automation Equipment	48
12	NL	Telco Interface Equipment	47
13	13	FM Transmitters	47
14	12	Turntables	45
15	15	Tape Recorders/Players (field)	44
16	10	AM Transmitters	43
17	20	AM Monitoring Equipment	41
18	18	ATS Equipment	41
19	19	Monitor Speakers	39
20	21	Reverb & Special Effects	34
21	17	Business Automation Systems	30
22	22	FM Quad Equipment	13

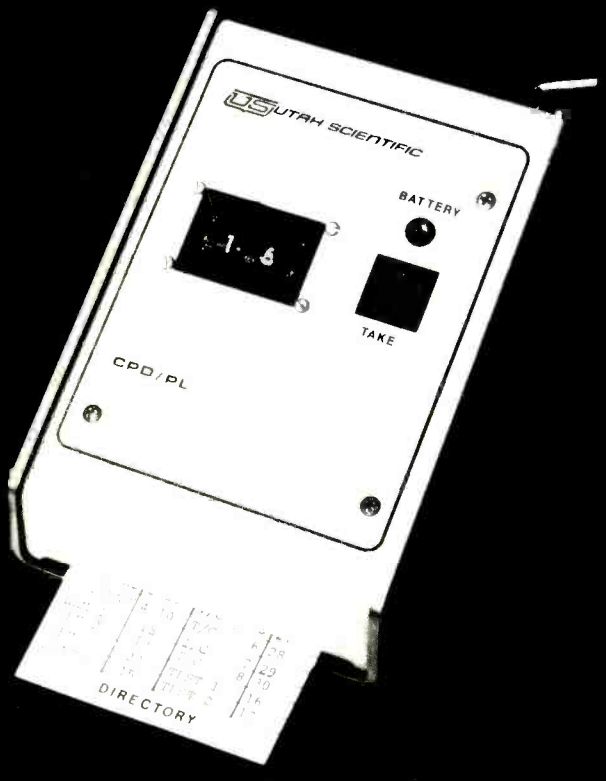
Overall Interest In TV Equipment

Rank '81	Rank '80		Percent Actively Interested[1]
1	2	VTRs (one-inch)	81*
2	NL	Earth Station Equipment	80*
3	1	TV Cameras, ENG	76
4	8	Digital Effects Devices	75
5	7	Test Equipment	73
6	3	Videotape Editors	71
7	4	VTRs (¾-inch)	70
8	9	Frame Synchronizers	68
9	5	Microwave for ENG	67
10	10	Video Monitors	65
11	11	TV Cameras, EFP	65
12	12	Electronic Still Stores	64*
13	16	TV Cameras, Studio	65
14	21	Routing Switchers	61
15	25	Film and Slide Chains	56
16	23	Production Switchers (large)	56
17	18	Production Switchers (small)	61
18	17	Noise Reduction	56
19	24	Remote Control (status, etc.)	56
20	14	Switching Automation	54
21	22	Character Generators	53
22	13	Audio Consoles, Equipment	52
23	20	Time Code Equipment	51
24	27	ATS Equipment	51
25	26	Image Enhancers	50
26	19	Lighting Equipment	50
27	NL	Vehicles, ENG/EFP	49
28	28	CP Antennas	42
29	30	Transmitters	37
30	31	VTRs (quad)	22

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

TIRED OF PATCHING FEEDS TO THE GM'S OFFICE?

(OR TO OTHER OFFICES, CLIENT VIEWING ROOMS, EDIT SUITES, ETC.?)



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The color projectors utilize General Electric's exclusive single optical path light valve. All color information is projected simultaneously in one light beam. This system eliminates time-consuming registration of three separate images which is required for all other color television projectors.

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Call or write: General Electric Company, Video Display Equipment Operation, Electronics Park, 6-206, Syracuse, NY 13221. Phone (315) 456-2152.

IN SALES—General Electric color TV projector dramatically displays new product highlights at Keepsake® Diamond Rings annual meeting.

IN THE BOARD ROOM—At Mellon Bank, N.A., Pittsburgh, General Electric color projector displays computer data, graphs and information.

GENERAL ELECTRIC

Circle 159 on Reader Service Card

Panels Of 100 Survey

Radio's "most wanted" in 1981

As in the years past, radio broadcasters showed their greatest interest in the staples of their business—console/mixers, studio tape recorder/players, test equipment, audio processors, cart player/recorders, etc. Few radical changes were noted, with the exception of interest in earth station equipment. This was the first year that this equipment was noted and it shot immediately to the number seven position on the list. Also new to the list in 1981 is telco interface equipment, which took the twelfth position on the list.

For the remainder of the products noted, some rank adjustments were indicated but rarely more than a rise or fall of four positions. It is important to note that the rank of a product shows little more than the intensity of interest in that particular product relative to all other products listed. A fair analysis would show only that broadcasters need "product A" more than they need "product B," though both products are in demand. This analysis is supported by the fact that few products received high levels of "no interest" with the exception in radio of FM quad equipment, a technology whose time has not come in the minds of most broadcasters.

TV's "most wanted"

Like their radio counterparts, the staples of the industry tended to take the lead positions. Television broadcasters listed one-inch VTRs, ENG cameras, digital effects, test equipment, and videotape editors high on their lists as usual, indicating their continued expansion of production capacity. A surprise entry in the "most wanted" list was earth stations, which took second place. Even more surprising was the intensity of interest among television broadcasters. Forty-four percent of television engineers and 47 percent of television managers gave earth stations their highest level of interest.

An analysis of the full figures indicates as well that, after several years of concentrating on developing their field production capacity, television broadcasters are beginning to pay attention to their studio facilities. While interest remains high in field production and ENG equipment, nearly every studio class of equipment showed increased interest this year.

In next month's issue, *BM/E* will preview the products to be introduced at NAB. Readers will be able to get an idea of how manufacturers are responding to their 1981 needs. **BM/E**

Don't let your station sound like a phone booth.

Every broadcaster knows the problems of on-air telephone links. The garbling when announce-feeds go out simultaneously through the board and the phone. Or the mysterious cutoffs in the middle of an important interview when line noise or sibilants generate 2600 Hz for a disconnect signal.

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Circle 161 on Reader Service Card

INTERPRETING THE FCC RULES & REGULATIONS

Time Brokerage Satisfies Some Minority Programming Needs

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

TIME BROKERING and part-time programming might be solutions to the problem of often ignored minority audiences, according to the Commission in a recently published policy statement.[1] The Commission found that although the growth of television and the modification of radio stations have tended to narrow the programming focus of radio stations, "[t]here are, nonetheless, some specialized audiences whose tastes continue to go unmet because they are too small to support an entire weekly schedule of such programming."[2] This is apparently especially true of foreign-language audiences. More flexible time brokerage and time sharing arrangements could in turn foster the development of programming more responsive to these "specialized audiences." Moreover, the FCC considers this policy statement as another in its series of shifts from regulatory mandates to competitive incentives for broadcasters.

This column will examine these new developments, as well as review some pitfalls licensees might encounter with time brokerage and part-time programming.

What is time brokerage?

The Commission defines time brokerage as "the practice of licensee sale of discrete blocks of time to a 'broker' who then supplies the programming to fill that time and sells the commercial spot announcements to support it."[3] Such practices have been common in larger markets since before passage of the Communications Act in 1934. Many radio licensees in larger, more diversified markets provide several hours weekly of such programming as a result of time brokerage. Such specialized programming dominates the schedule of some licensees. In the largest markets, there are brokered television programs on television stations as well.

As many licensees have already discovered, the generally low cost of such programming makes it an attractive way of reaching otherwise unserved listeners or viewers. Often the broker is also producer and host, thus cutting costs. Also, the brokered program is effectively subsidized by the broker/producer's acceptance of lower compensation than would be required for most commercial programs.

Previously, the Commission had no routine for administrative review of such operations. Although licensees will have to continue to place time brokerage contracts in the local public inspection file, the Commission does not propose any new formal reporting requirements or procedures.

Part-time programs for minority audiences

The lack of any systematic reporting has apparently made it difficult to establish firmly any conclusions about part-time programming and time brokerage. However, a Library of Congress study of radio formats and operations other than black or Hispanic found a substantial number of such programs, as well as considerable ethnic variations between markets. The study estimated that at present there are approximately 7000 weekly broadcasts totalling more than 2000 hours of such programming and that *industry publications fail to report more than 50 percent of this.*[4] Other Commission studies have found that although there are only some 120 black-owned broadcast stations in the nation, at least 415

[1] *Policy Statement On Part-Time Programming*, BC Docket No. 78-355, FCC Mimeo No. 80-621, ___ FCC 2d ___, Adopted October 21, 1980; Released November 13, 1980.

[2] *Id.*, para. 31.

[3] *Id.*, footnote 2.

[4] *Id.*, paras. 7-8.

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- Controls 5 VTRs plus switcher and DVE
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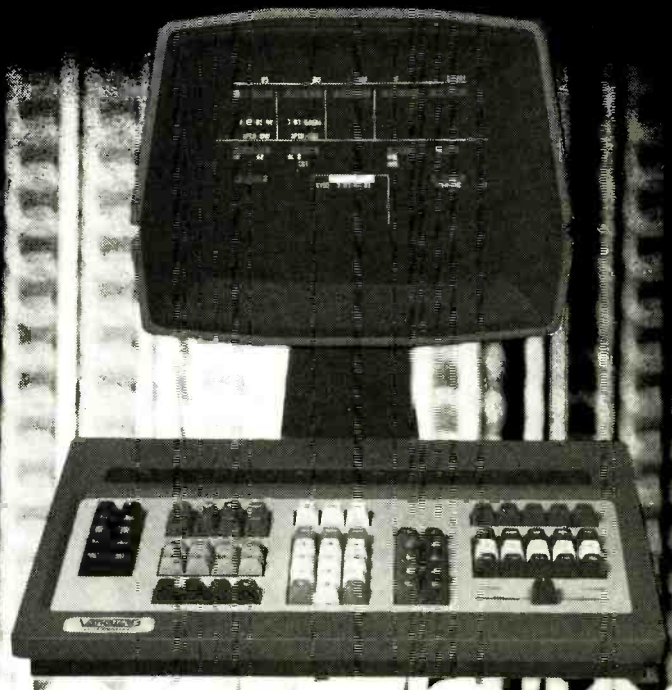

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MAKING CREATIVE EDITING AFFORDABLE

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stations offer black-oriented programming.[5] Weigel Broadcasting Co., licensee of WCIU-TV, Chicago, noted in its comments that even the larger minority groups in Chicago could not support full-time specialized programming. So, even for such large and concentrated minorities as Chicago's Polish-speaking or Southern Massachusetts's Portuguese-speaking minorities, time brokerage is perhaps the best and possibly only option for news and entertainment in a foreign language. The FCC has concluded that a general need exists for such programming and time brokerage provides a flexible response to meet the particular needs in individual markets with varying amounts and types of programming.

No further regulation but continued responsibility

The Commission did conclude that no more regulatory procedures would be necessary and that existing procedures would suffice. However, the Commission cautioned that this decision does not lessen the responsibility of licensees to maintain overall control of programming decisions. Nor does the policy statement change the requirement that part-time programmers and brokers comply with the Communications Act and applicable FCC rules.

The Commission recalled the case of Cosmopolitan Broadcasting Co., which lost a radio license in New Jersey because it had abdicated its responsibility to maintain control over the station's programming.[6] Although the Court of Appeals remanded the case to the Commission, neither the court order nor the supplemental FCC decision suggested "that time brokerage relieves a licensee of its responsibility for programs thereby presented."[7]

The Commission determined that it would be far simpler to ensure compliance with the Communications Act and its rules if enforcement efforts were focused on the licensee's responsibility. According to the Commission:

> The independent broker may not be concerned with the license renewal processes or with economic sanctions that can be levied against a substantial capital investment. The licensee, however, would be, and this encourages licensees to broker time only to responsible entrepreneurs and to become involved actually in supervision of their activities. We believe that licensees must expect to retain control over, and responsibility for, all programming if they wish to remain public trustees...[8]

Shifting overall programming responsibility to brokers would create serious problems including those arising out of a need to have all such agreements filed with the FCC. However, "we do not intend to relieve brokers of their responsibility to avoid rule violators."[9] Forfeitures can also now be assessed against any "person" who violates the Communications Act because of changes in the Act in 1978.

Related matters

Several related matters in this proceeding of interest to broadcasters include (1) special credit in equal employment opportunity reporting for licensees who encourage

[4] *Id.*, para. 12.
[6] *Cosmopolitan Broadcasting Corporation*, 59 FCC 2d 558 (1976), *recon. denied*, 61 FCC 2d 257 (1976).
[7] *Policy Statement, supra*, footnote 8.
[8] *Id.*, para. 15.
[9] *Id.*, para. 16.

FCC Rules and Regulations

brokerage of minority-oriented programming and (2) political advertising incentives.

Opportunities in broadcasting for women and minorities could be expected to increase because of increased time brokerage of minority-oriented programs produced by women and minorities. However, any formal reporting requirements might prove a disincentive. Therefore, the Commission concluded that:

> [I]t is conceivable that situations will arise in which it would be reasonable to consider the time broker's employment profile and practices in judging the licensee's affirmative action efforts...Accordingly, we welcome the submission of supplemental EEO information on a *voluntary* basis where the licensee considers it necessary to portray fully its affirmative action efforts.[10]

With respect to political advertising, Section 315 of the Communications Act requires that licensees offer advertising time to all candidates at the lowest unit rate at which the same class and quantity of time has been sold. Time brokers generally set lower commercial rates commensurate with smaller, more specialized audiences. Sales of time by a time broker to a political advertiser would tend to lower the licensee's lowest unit charges.

Previously, the Commission has disregarded brokers' rates in determining the lowest rates of individual stations. This policy ignored distinctions between a licensee's regular programming and brokered time and this factor has prevented brokers from deriving the benefits of political advertising.

First, under the terms of Section 315, time brokerage can be considered a separate "class" subject to different "lowest unit charge" requirements. A licensee must make a determination based upon the programs themselves.

> [A] licensee that carries one general audience format but brokers time for another general format could not establish a different lowest unit charge for each [format]. On the other hand, a *general format station that brokered time for specialized minority in foreign language programming could show that the audience differences were such that establishment of different lowest unit charges would be reasonable.*[11]

So, such decisions will be left to the discretion of the licensee, subject to FCC review under the requirements of Section 315. It is the Commission's opinion that this approach would benefit all parties concerned: licensees, time brokers, and political candidates.

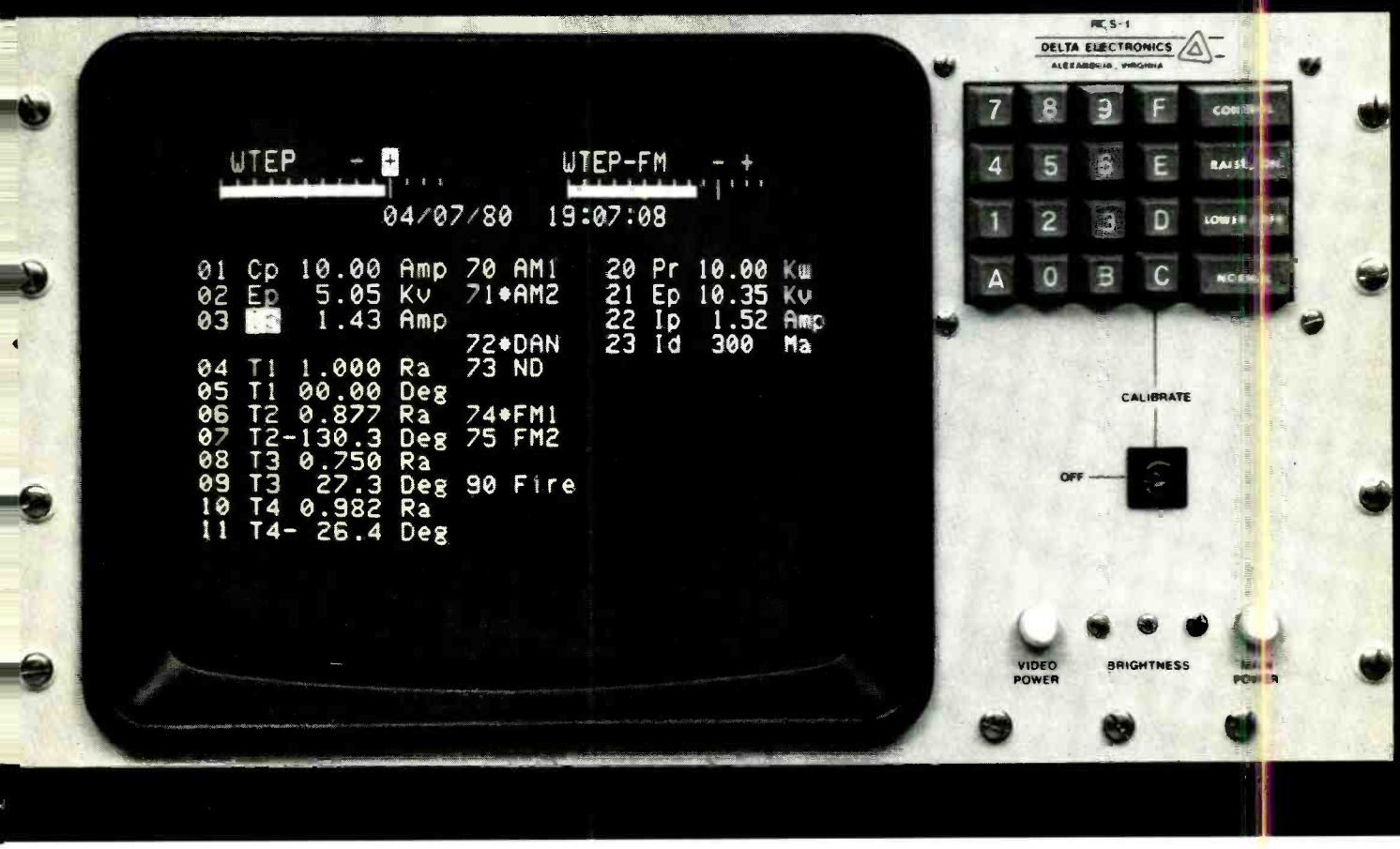
Conclusion

The policy statement does not add new rules to the Commission's rules and regulations. By its very nature, a policy statement outlines a statement of the intent of Commission policies and practices. In this case, the Commission has reaffirmed its commitment to time brokerage as one means of meeting minority programming preferences.

Broadcasters cannot forget their responsibility over all programming on their respective stations. And the question of political advertising at the lowest unit rate might prove a thorny question for some. Any problems in this regard should be referred to communications counsel for proper analysis. **BM/E**

[10] *Id.*, para. 21.
[11] *Id.*, para. 23.

LISTEN TO THE DIFFERENCE.



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

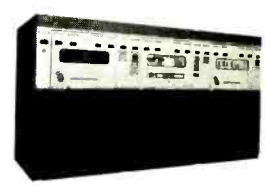
And to back KFI's programming is a first-rate engineering department with a management that's not impressed with a data sheet. KFI wanted hands-on experience, so they approached the Continental 317C transmitter and its competition with extensive test requirements.

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

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

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

For information on the 317C or other Continental transmitters, phone (214) 381-7161 or write to Broadcast Sales Dept.; Continental Electronics Mfg. Co., Box 270879, Dallas, Texas 75227.



Continental Electronics

Circle 168 on Reader Service Card

GREAT IDEA CONTEST

VOTE NOW
Ballot On Reader Service Card

Editor's Note: Before attempting to implement any Great Idea involving the modification of equipment, station personnel should check with the equipment manufacturer to insure that no violation of warranty will occur.

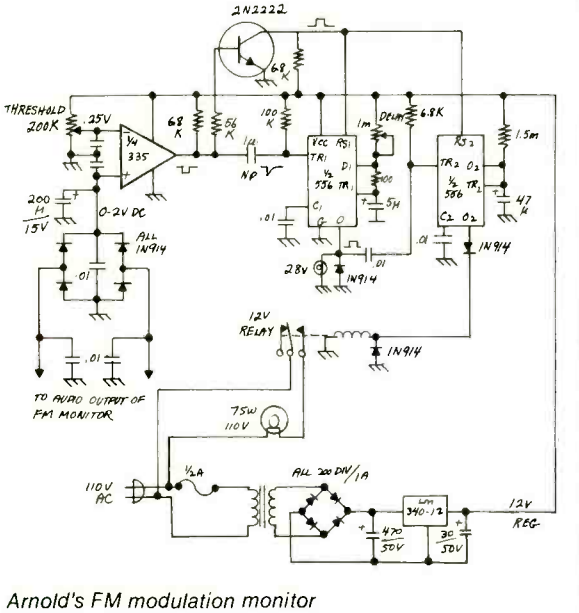
If the Great Idea involves any technical standards governed by the FCC, stations should make sure that the idea will in no way cause a violation of FCC rules.

4. FM Modulation Monitor

Jerry D. Arnold, Chief Engineer
WACF-FM/WPRS-AM, Paris, Ill.

Problem: To let the operator know that FM automation system has lost modulation, but not carrier.

Solution: The circuit I came up with is quickly wired on a piece of perf-board. The 339 comparator threshold is set at a suitable level—in my case about 0.25 V. Audio



Arnold's FM modulation monitor

is sampled from our FM modulation monitor, rectified, then fed to the non-inverting input of the 339. Once this level drops below 0.25 V, the output of the 339 goes to ground, triggering the first timer. This is set for five seconds to allow for an amount of "dead time" before energizing the second timer. Once activated this pulls in

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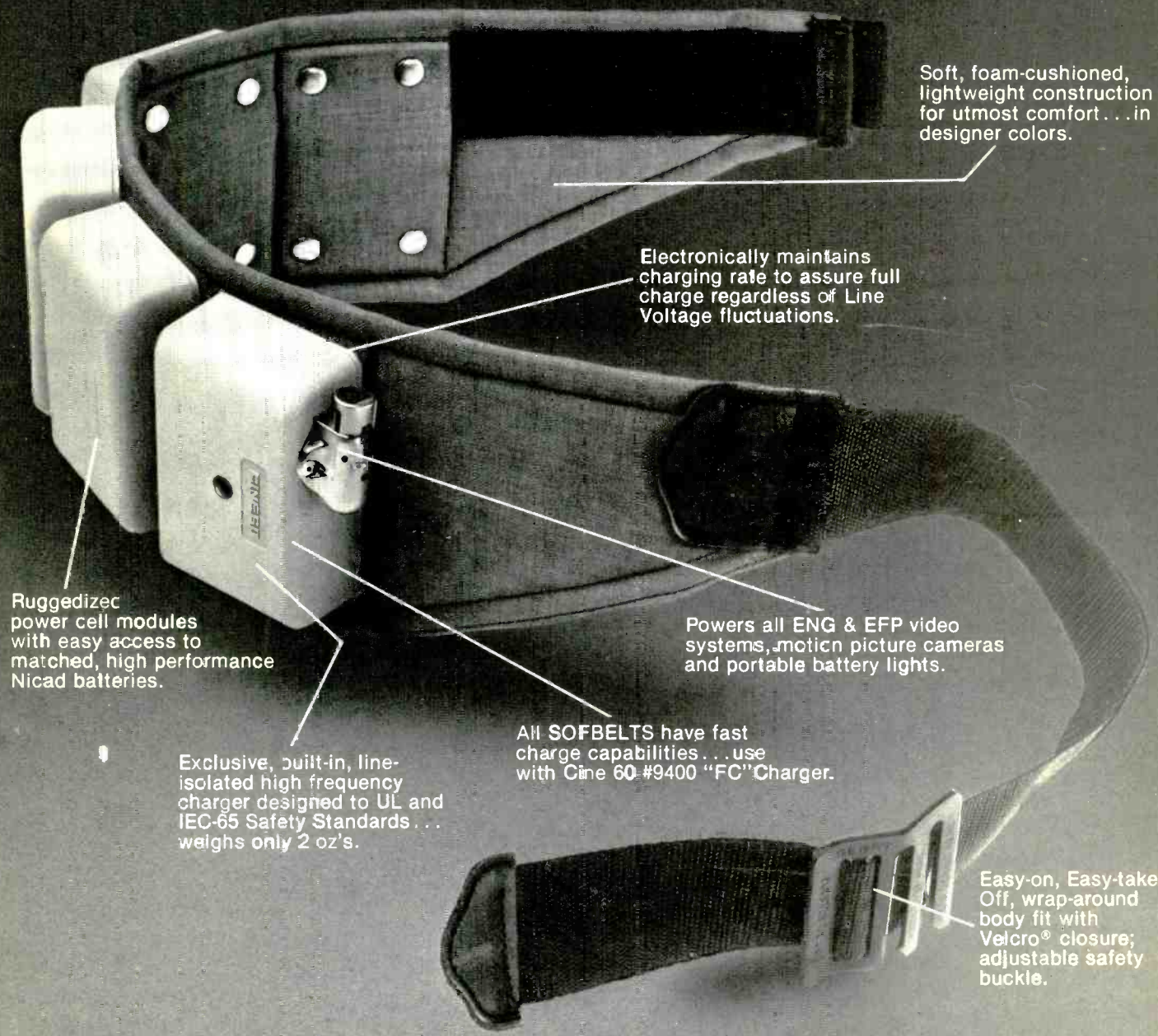

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Circle 170 on Reader Service Card

the relay, lighting a console-mounted 75 W incandescent lamp. When the modulation returns, the reverse happens: the 2N2222, once the 339 "snaps" high, pulls the reset line low, cancelling any counting sequence.

It would be possible to put a latch in the circuit to hold the lamp on, if desired. The 200 μF cap on the noninverting input of the comparator is to slow down the response so that the monitor doesn't try to follow the audio waveform fluctuations, but rather keeps an average level. The 28 V lamp is really just a frill—I use it to set the threshold and first timer time. I used a 28 V lamp so it wouldn't glow brightly.

VOTE FOR BEST IDEAS
Ballot On Reader Service Card

5. Simple Conduit Box Locator

Robert A. Senne, Technical Maintenance Engineer
WOJO-FM, Evanston, Ill.

Problem: To locate electrical conduit and boxes inside walls or other concealed areas.

Solution: Using a hand-held bulk tape eraser, move the energized eraser along the wall, noting any tendency of the eraser to vibrate at the power line frequency. This vibration will occur whenever the field of the eraser encounters a metallic object such as a pipe, conduit, junction box, or anything else that will provide a better path for the field than the surrounding material. After the conduit is located and its path determined, move the eraser along the conduit path until the vibration peaks. This will indicate a box.

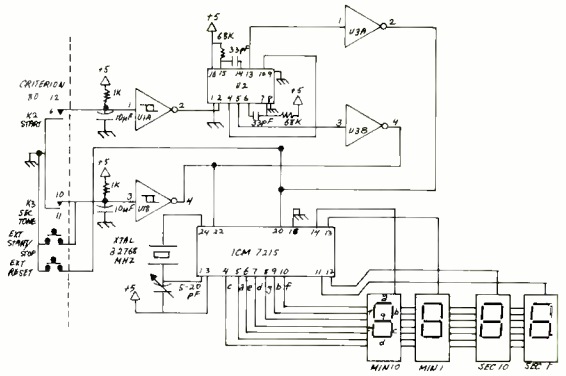
I have successfully used this method to locate a junction box in a wall behind a large, permanently installed record cabinet. I was able to cut through the rear of the cabinet at the exact location of the box. I have also used a bulk eraser as a stud finder by detecting the nails in the same manner.

6. Newsroom Timer For Cart Machines

Edward B. Schwartz, Engineer
KRLD-AM, Dallas, Texas

Problem: Being a large all-news operation, we needed timers for our many tape edit stations. This timer is basically used to time carts containing actualities and voicers.

Solution: The entire circuit is based around the Intersil 7215. This chip contains all of the timing, display multiplexer, and driver circuitry. While the chip can be operated in many modes, we set it up for a simple START-STOP-RESET operation. The chip, along with the 3.2768 MHz crystal, was available as an evaluation kit from our parts distributor.

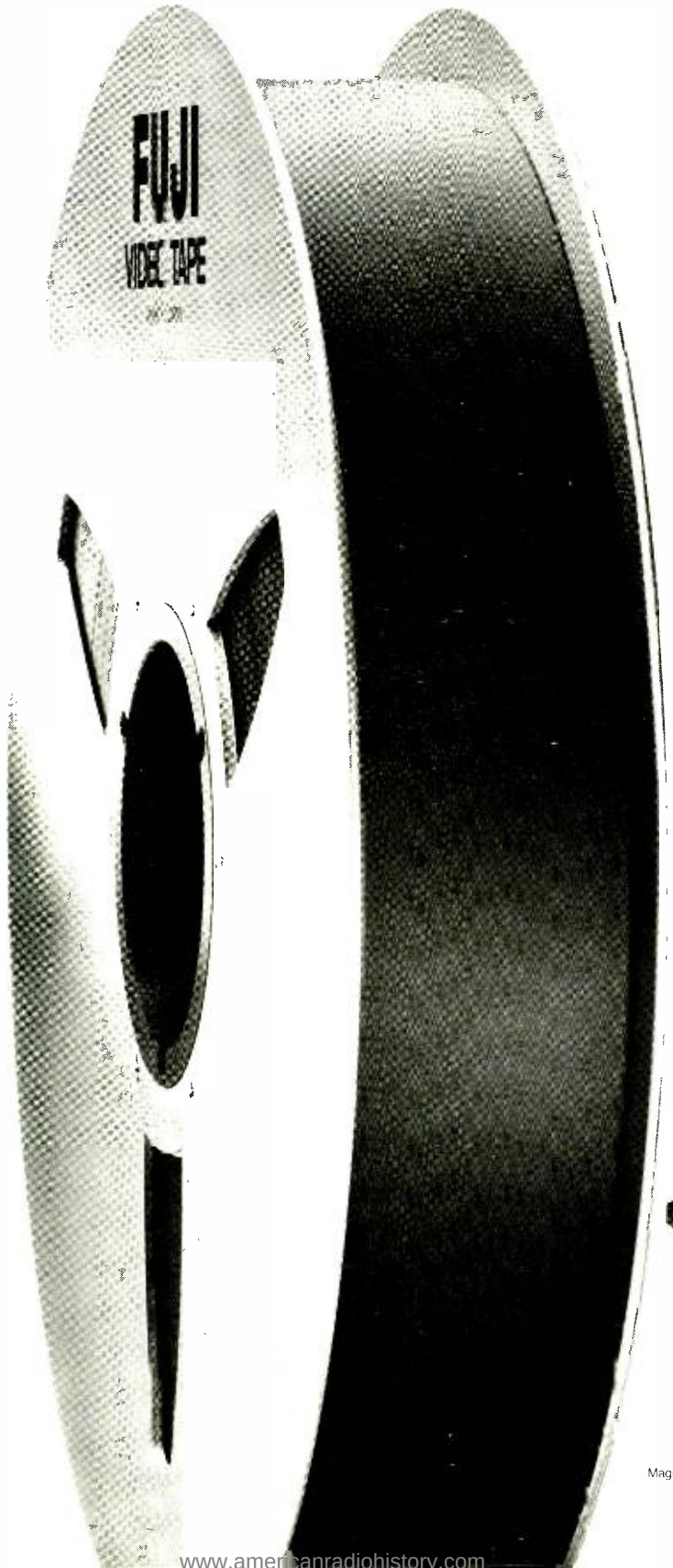


Schwartz's newsroom cart timer

To interface the timer to our Criterion cart machines pin 7 of J3 was tied to ground while pin 6 was connected to the input of a Schmitt-trigger U1A. Relay K2 energizes momentarily when the machine starts. The 1K resistor, 10 μF capacitor and the Schmitt-trigger condition the line to avoid contact bounce problems. The output of the Schmitt-trigger is connected to a dual one-shot U2.

The one-shot first resets the timer and then starts it counting. A time delay is necessary between operation of the RESET and START functions due to chip design. This delay is accomplished by connecting the Q output of the first one-shot to the B input of the second. The second one-shot will not fire until the first has returned to the normal state with Q going to a logic high state. The Q output of the first one-shot is inverted by U3A and

The measure of success.



In 2," 1" and ¾."
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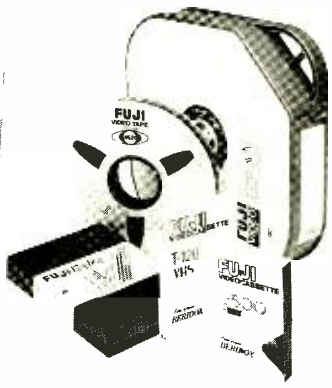
Cassettes.



FUJI

Magnetic Tape Division 350 Fifth Avenue NY NY 10118

Circle 173 on Reader Service Card

connected to the reset input of the timer chip. The Q output of the second section is also inverted (by U3B) and connected to the START/STOP input.

At our station we use secondary tones at the end of actualities to turn off audio modules on our Cetec board. By utilizing a set of contacts of K3 (also available through J3 pins 10 and 11) and conditioning as before, the display can be frozen at the end of the recorded material on the cart. I also provided two external buttons for manual reset and START/STOP of the timer. The entire unit was built on a four-inch by four-inch PC board which is mounted inside the edit station. With very simple modification this timer can work with any cart machine.

7. Remote Automation Monitor

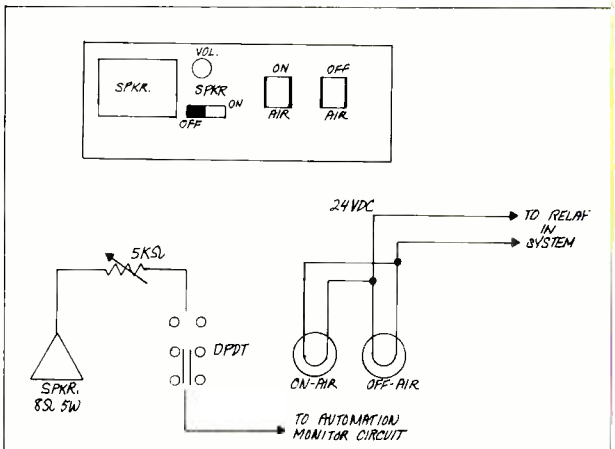
Mark A. Schnell, Technician
WONO-FM, Syracuse, N.Y.

Problem: To provide a remote visual and audio status indicator of an FM automation system at the sister AM station control point.

Solution: This circuit is merely an extension of visual and audio indicators found at the automation location. The automation system in use is a Schaffer 900 series. First, this circuit was designed to be mounted on the rear of a standard 19-inch rack filler panel.

In dealing with the remote audio indicator, all that was necessary was to tap into the external air-monitor system at the automation control point. This audio, rated at 8 ohms, is then fed into a 5 W speaker, preceded by a rotary volume control and a DPDT switch.

Two visual indicators are employed, a green one to indicate "on-air" status and a red one to indicate "off-air." These lights are controlled by a 24 V relay at the automation's external air circuit. When "on-air," 24 V is fed to the green indicator. If the system goes "off-air," this same relay trips the red indicator. Since this panel could be mounted in the AM's equipment rack or even at the audio board, it provides a two-fold check of the automation's on-air status at the flick of a switch or a glance across the room at the equipment rack.



Schematic for Schnell's automation monitor

Rules for BM/E's 1981 Great Idea Contest

Mail to:
Editors, BM/E
295 Madison Avenue
New York, New York 10017

1981 Entry Form

Name _____ **Title** _____
Station Call Letters _____ **City** _____
State _____ **Zip** _____
Telephone No. _____
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.
Signed _____ *Date* _____

1. Eligibility: All station personnel are eligible. Consultants to the industry may enter if the entry indicates the specific station or stations using the idea or concept. Manufacturers of equipment or their representatives are not eligible.

2. How to Enter: Use the Official Entry Form on this page or simply send *BM/E* a description of your work. State the objective or problem and your solution. Include diagrams, drawings, or glossy photos, as appropriate. Artwork must be legible but need not be directly reproducible and not exceeding three in number. Camera reproducible material is preferred. Length can vary, but should not exceed 500 words. *BM/E* reserves the right to edit material. Entry should include: Name, title, station affiliation, and the class of station—TV, FM, AM. Indicate if idea is completely original with you.

3. Material Accepted for Publication: *BM/E* editors will make all decisions regarding acceptability for publication. If duplicative or similar ideas are received, *BM/E* editors will judge which entry or entries to accept. A $10 honorarium will be paid for each item published.

4. Voting: Every reader of *BM/E* is entitled to rank the ideas published. This can be done on the Reader Service Card in the magazine or by letters or cards sent to the *BM/E* office. To vote, readers should select the three ideas they like best and rank them 1, 2, or 3.

5. Winners: Top rated entries in the year-long tally will become winners in each of the three major categories (AM, FM, TV). Final winners will be picked in February, 1982, and announced in the March, 1982, issue of *BM/E*.

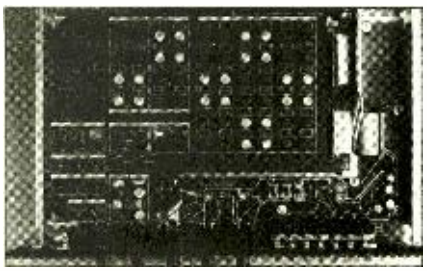
6. Prizes and Awards: Three top prizes will be awarded; a programmable electronic calculator will be awarded for the highest rated entry in the respective categories of AM, FM, and TV. Ten engineering slide rule calculators will be awarded as secondary prizes for the highest rated entries in the following additional categories (top three winners are not eligible for these prizes): audio (three prizes, one each in the AM, FM and TV categories); RF (three prizes, one each in the categories of AM, FM, TV); Control (three prizes, one each in the AM, FM and TV categories); Video (one prize in TV).

BROADCAST EQUIPMENT

This month's selection of new broadcast equipment focuses primarily on products introduced at October's SMPTE Exhibition. Leading off our survey this month, however, is Tektronix's new high quality monitor, seen here for the first time.

Color Picture Monitor 250

The 690 SR is a quality high-resolution 19-inch color picture monitor designed for camera control, studio control, production, and post-production applications. Designed to be, in the manufacturer's words, "the reference standard picture monitor," it features a high resolution shadow mask picture tube, stabilized color balance, stabilized picture, accurate color decoding, and excellent color convergence. Efficient power supplies, modular construction, easy alignment, and ruggedness give the unit high dependability. In addition, it features plug-in decoders and adaptability to future standards. A plug-in interface module takes care of all signal processing and decoding needs; new modules will become available as needed to keep up with technological advances, according to the manufacturer. The true high resolution shadow mask tube has 0.31 mm dot triad spacing with no moire problems; precise convergence allows for critical examination of the picture (0.5 mm). A convenient pull-out control drawer houses 52 hand-adjustable convergence controls, backed up by a full-color convergence control matrix panel. A lower-priced version with a medium-performance picture tube will also be available. $8000 to $9500 (anticipated price range as of April, 1981). TEKTRONIX.



Subtitling Option 251

The new subtitling option for the Compositor I graphics system with 64K computer can be programmed for automatic insertion of up to 2000 subtitles per disc cartridge into time-coded NTSC or PAL videotapes. Consisting of a software program and an FR-10 subtitling time code reader, it becomes ready to use with the addition of record and playback VTRs. The replaceable disc cartridges, standard on the Compositor, allow unlimited subtitle storage with random access editing capability. In and out points are entered by the system's standard keyboard, and the option allows full access to all fonts, character edging, and colors. Compositor systems equipped with the 32K computer may be field retrofitted to accept the new computer and option. FERNSEH INC.

Time Code Reader 252

The Avitel TRE 2030 reads SMPTE/EBU time code at speeds from 1/25 to 80 times play speed. Front-panel LEDs

monitor incoming time code, warning of level, jitter, frequency, and edge faults. The unit provides a jitter-free reclocked output for dubbing at play speed. Its built-in character generator allows decoded time or user bit information to be inserted into a television picture in various positions and sizes. The display freezes for identification of event or cue points. Drop-frame indication, remote control of all functions, and parallel BCD output are featured. The unit may be supplied in a free-standing case or rackmount frame, which will house two units. TELEVISION EQUIPMENT ASSOCIATES.

Subtitling System 253

The QST subtitling system combines a full-function, high-performance teleproduction studio titler—the Quantafont Q-7A—with an expanded software and time code interface package to provide totally flexible automatic or manual electronic subtitling. The system includes the Q-7A, switch-selectable for complete subtitling program or teleproduction studio titling; dual flexible disc memory storage and playback, providing an unlimited number of automatic or manual three-row subtitles; and the subtitling software program, which interfaces directly with audio or TTL level EBU/SMPTE time codes. Comprehensive off-air edit/control display provides "next," "current," and "prior" control rows simultaneously in TIMING and EXECUTE modes. Other features include selectable manual start and stop time control; automatic sequential subtitle indexing; insert, delete and recompose editing; selectable vertical line positioning; colorized characters selectable by row. SYSTEM CONCEPTS.

Waveform Monitor 254

The PM 5565 waveform monitor has been designed specifically for studio and mobile broadcast applications. With the companion PM 5567 vectorscope, it forms a complete color setup system for color cameras. Among its features are a probe input at the front that works with standard oscilloscope probes; six calibrated time base positions; an internal graticule for elimination of parallax errors of readings; external sync with composite video signals and sound-in-syncs; and very fast retrace. Two equal inputs have full

For more information circle bold face numbers on reader service card

Broadcast Equipment

screen deflection sensitivities of 1 V and 200 mV, plus a probe input and an internal calibration source. Power requirements are 110/127 V ±1 percent or 220/240 V ±10 percent, 48 to 65 Hz; consumption is 30 W at 220 V. PHILIPS.

Video Controller 255

The Intelligent Controller™ combines three basic video control functions in one modular, microprocessor-controlled unit. It may be configured in a variety of ways according to user need—for example, with two SMPTE readers, two SMPTE writers, two keyers (optional with the writer), and two VTR controllers in one compact chassis, or with just one of the basic functions, for later expansion with plug-in modules. The basic functions are: the VTR Controller IC1001, compatible with all remotable VTRs, which features standard VTR controls, searches by control track time code, or scene and take, and VTR speed and direction variable by a "stroker™"; the SMPTE Reader IC1100, with high sensitivity specs that allow SMPTE time to be recorded at lower levels, minimizing crosstalk; and the SMPTE Writer IC1010, which multiplexes user bits, allowing up to 30 separate inputs per second to go into user bits. CONTROL VIDEO CORP.

Three-Channel Sound Mixer 256

For portable video recording applications, the three-channel sound mixer A 97 features two mic inputs (−70 dBm to −40 dBm, preattenuation); one mic or line input; and phantom power of 12 V on each mic input. Other features include a high pass filter (125 Hz) and "presence filter" (3200 Hz), VU meter, LED for peak measurement (+8 dB VU), and 1000 Hz oscillator. Mic level output is −51 dBm; balanced line output is at +4 dBm with output transformer. The unit is battery powered by 10 1.5 V R6-AA cells. It weighs less than three pounds without batteries and measures 10.8 by 3.2 by 2.4 inches. Noise is rated at −125 dBm. L.T.M. CORP. OF AMERICA.

One-Inch VTR System 257

The TR-800 system is built around the maker's TR-800 one-inch VTR, supported by several sophisticated equipment options: the TBC-210P/S digital time base corrector; the SSE preview-

able/multi-cue editor; time code modules; the AE-800 time code editing system; the MRVC variable motion remote controller; and multiple remote control capabilities. Full record, playback, simulplay, and monitoring capabilities are among the TR-800's many standard features. The system is compact to fit in a wide variety of spaces. Featured advantages include: precision tape handling, with two-hour reel capacity, simple tape loading, and servo motors that eliminate tape stress while insuring high acceleration and winding speeds; and microprocessor control with the built-in Supertrack system, multi-rate video operation, and a fingertip control panel. The built-in editor is standard, with the Super Search Editor (SSE) optional. RCA.

Intercom System 258

The System II distributed amplifier intercom system is designed for superior intelligibility in high-noise environments. Operating range and capacity have been increased over previous models through high-impedance bridging circuitry. Up to 100 remote stations can be accommodated. Circuit breakers and LED short indicators have replaced fuses and are on the front panel. A proprietary contoured frequency response delivers maximum intelligibility under a wide variety of conditions. Any or all channels may be monitored separately or simultaneously without being tied together; visual signalling is standard. Provision is made for an auxiliary program input to be mixed into the intercom system, and an adjustable side tone enables the user to vary the amount of his or her own voice in the headset, also preventing feedback when the headset is removed. Nominal power is 28 V dc, but the system will operate over a full range of 32 V down to 9 V. CLEAR-COM.

Camera Testing Stand 259

This remote controlled TV color camera testing stand is designed to provide alignment and adjustment of television cameras for registration, resolution, gray scale, and color. Luminance and color temperature are held constant and brightness is evenly distributed; luminance and color temperature at the screen are optionally adjustable. The remote control unit provides ON/OFF and pattern changer control from the studio control room. Five different test patterns are available. The complete system includes 50 feet of input cable with connectors, 50 feet of remote cable with connectors, remote control box, and lamp. About $7000. KLIEGL BROTHERS.

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