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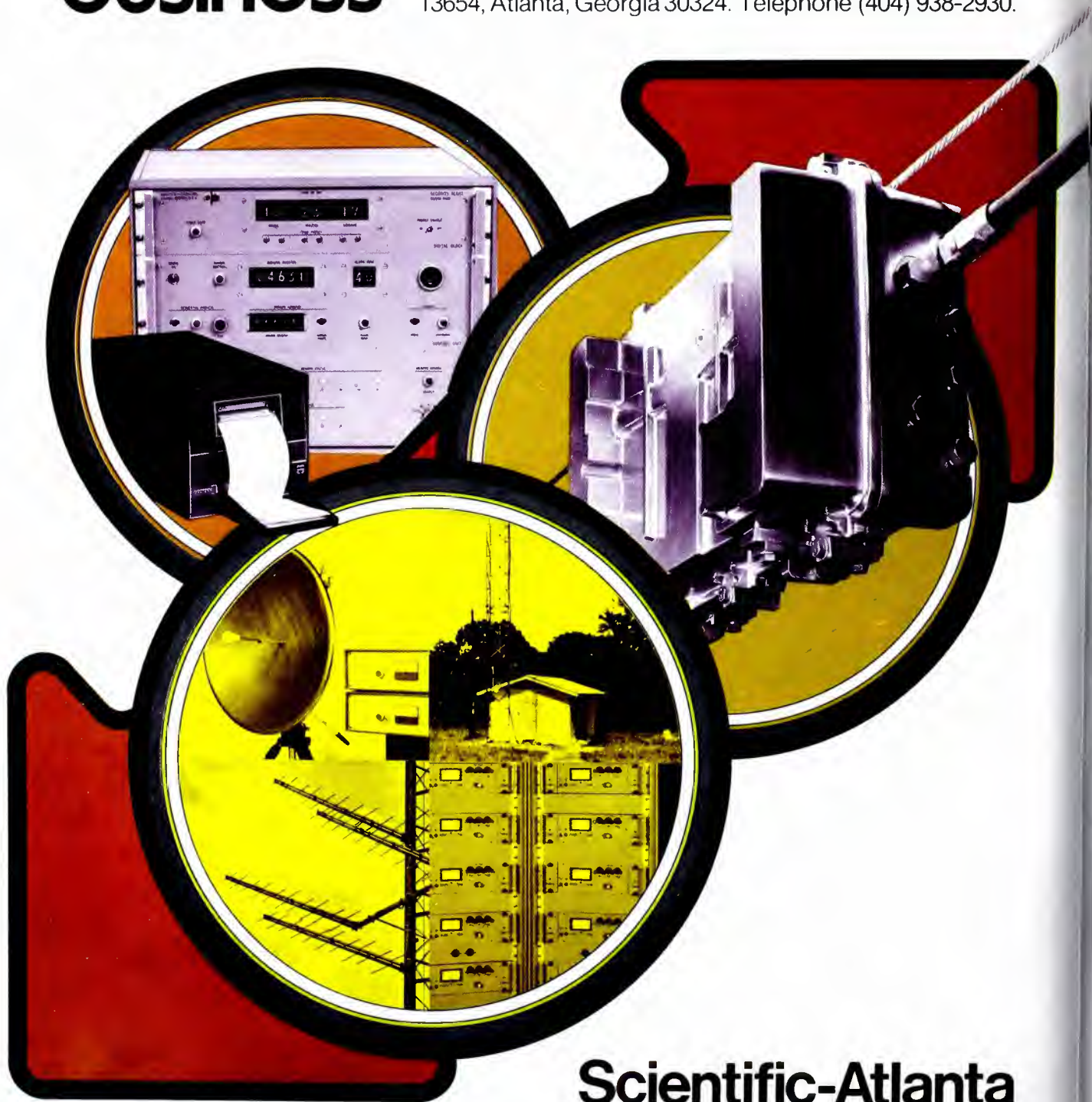


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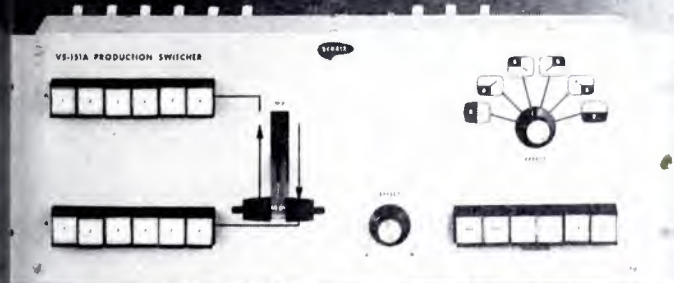


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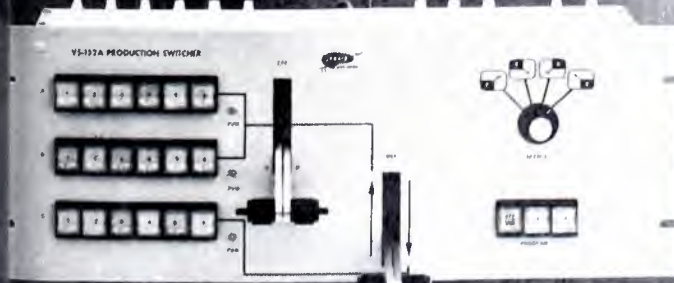
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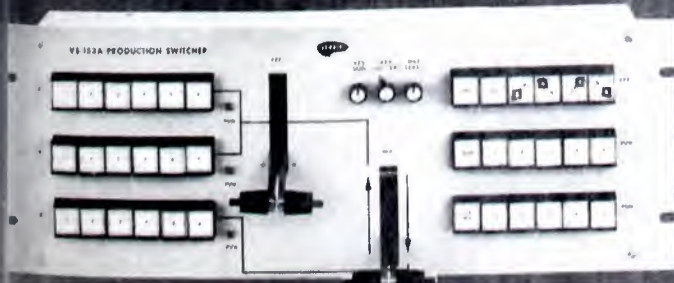
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OCTOBER 1972/VOLUME 8/NUMBER 10



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# BROADCAST INDUSTRY NEWS

## Rich Program Slated For NAEB Meet in Las Vegas

A full and varied program of discussions, panel sessions, technical demonstrations and equipment exhibits will portray the vigorous state of American educational radio and television at the 48th annual convention of the National Association of Educational Broadcasters, Las Vegas, October 29 through November 1, 1972. The hidden agenda will be the society's state of ill health—where will operating money for survival come from?

The organization will give its distinguished service award to John Macy, whose health and failure to win Administration support caused him to resign as president of the Corporation

for Public Broadcasting (see next story). At the same session, Monday morning, October 30, William Harley, president of NAEB, will give the keynote address. He will have a lot to talk about, if he tries to show the way for the 5000 attending to gain financial support without doing violence to their principles.

Topics of the convention will include key developments and problems, not only in radio and television broadcasting, but also in cable television, video recording and computer-aided education. A few of the many subjects are: "Storefront" programming via cable; satellite projects; opening up the university with technology; strong local service by public radio; up-to-the-minute status of video recording. For

more data: NAEB, 1346 Connecticut Ave. N.W., Washington, D. C. 20036.

## Macy Resigns From CPB

John W. Macy Jr., who took over as president of the Corporation for Public Broadcasting in February 1969, resigned from that post in August, effective at a date not later than October 15, 1972. He commented that recent trends in the industry (non-support from the Nixon Administration) made it desirable for him to seek some other form of public service. At presstime no successor had been selected, and John Golden, director of planning and research, was acting president pending the selection.

## SMPTE Meeting Set For LA

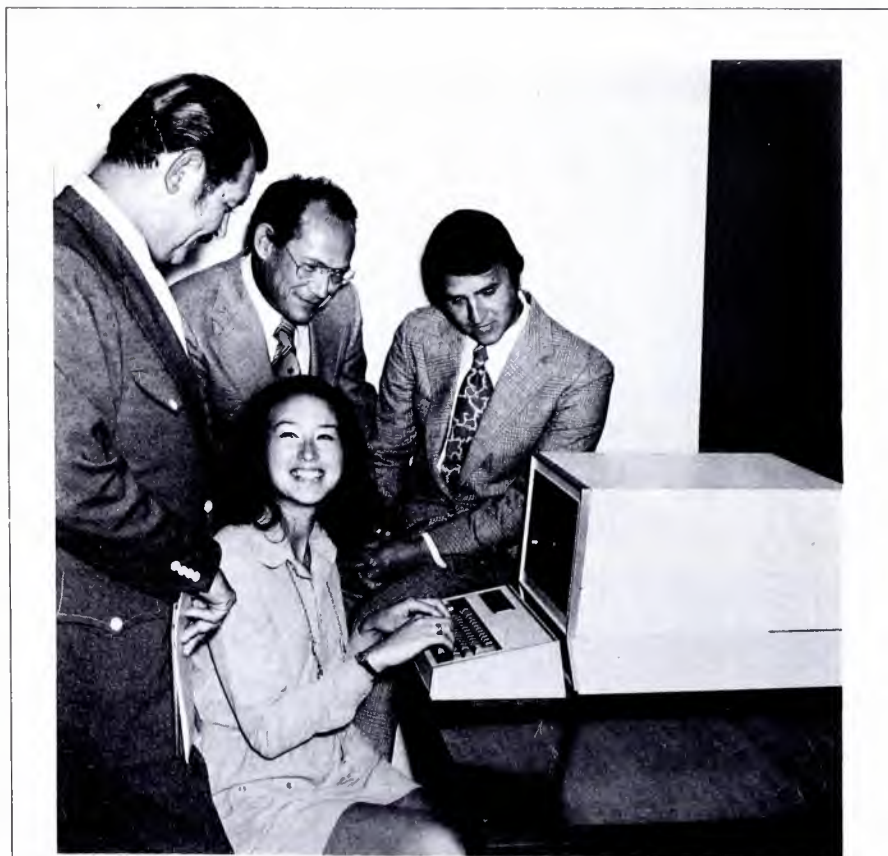
Conference of the Society of Motion Picture and Television Engineers will run October 22-27 at the Century Plaza Hotel in Los Angeles. Frank P. Brackett Jr., program chairman, announced wide-ranging session topics, among them: lab practices in television; photosensitive materials; sound recording and reproduction; satellites and CATV; the great film-vs-tape debate. A long list of manufacturers will show their latest products. Info: SMPTE, 9 East 41st Street, New York 10017.

## Radio Listening Much Larger Than Thought, Says CBS Exec

Radio listening between 6:00 a.m. and midnight by adults has increased 36% since 1967 and is far larger than most people think. Maurie Webster, vice president of CBS Radio Division, told the Rocky Mountain Broadcasters Association meeting in Sun Valley, Idaho.

Hitting other "myths" about radio's audience, Mr. Webster said that car radios do not furnish most drive-time listening, but only 14% in the morning and 24% in the afternoon; that the 10 a.m. to 3 p.m. audience is *not* almost all female, but more than 43% male; that the male audience during that

continued on page 8



On-line computer link now in use by J. Walter Thompson helps spot broadcast media buyers do pool buying. San Francisco office negotiates radio and TV spot buys for other agency offices.



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## NEWS

same period is 97% as large as during drive-time. He said that currently, on a 24-hour basis, the average adult spends 87% as much time on radio as he does on television.

### Radio Revenue and Profit Rose in 1971, Says NAB

The listener strength of radio (preceding story) has a complement in the profit area, according to a survey just released by the National Association of Broadcasters. Time sales for the median (typical) station in 1971 were \$171,000, up 5.7% over the \$162,300 of 1970. Profits rose fractionally, from \$10,500 to \$11,500, reflecting increased costs.

### Network and Spot Down, Local Ads Up, in 1971

The FCC's annual summary of TV financial data for calendar year 1971 showed total revenues at \$2.75 billion, down 2.1% from 1970. Profits dropped 14.2% to \$389 million. The year was the first in which the industry had to do without cigarette advertising, which had accounted for 6% of total revenue in 1970. To produce the drop in revenue, network advertising went down 3.9% and national and regional spots were down 7.2%; these were offset by a rise of 13% in local advertising.

The Television Bureau of Advertising projects an increase of 6% for 1972.

### WNEW Will Use Abto System To Put News in Color

Abto, Inc. of New York announced an agreement with WNEW-TV, Metromedia flagship station in New York, for use of the Abto color system in the station's news operation, allowing the filming of stories with black-and-white film and projection of the film in full color into the TV chain for broadcast. According to the announcement, it was the first sale of the Abto system to a major commercial television system. Color information is coded in black-and-white on the film during shooting, and is decoded during projection. Processing costs are low since black-and-white, rather than color, techniques are needed.

### Adler Sees TV of 1985 As Simplified, Trouble-Free

Television will gain greatly in importance during the coming decade and will be based largely on modular solid-state units that will make component

failure a rare event, according to Dr. Robert Adler, vice president and director of research, Zenith Corporation.

Dr. Adler, in his address to a joint convention of national and international electronics service associations in New Orleans, also said that TV will come in a variety of forms, including flat screen panels. Low-cost video recording and playback equipment is on the way, he said, as well as information retrieval systems for the home and for industry. This greatly increased complexity will maintain high demand for skilled servicing, he added.

### CRTC Approves Large TV Net For Southern Ontario

A network of six TV stations, fed from studios in Toronto and Ottawa, and reaching about six million viewers, has been licensed by the Canadian Radio-Television Commission for construction in Southern Ontario. The project is aimed at, among other things, recapturing Canadian advertising revenue that now goes to TV stations in the Buffalo area on the American side of the border.

Licensee for the six stations is Global Communications, Ltd., Canadian firm owned in part by other Canadian corporations, which will sell public stock for about 57 percent of its equity capital. Global, according to the CRTC announcement, promised to make its programs available to broadcasters in other parts of Canada; to concentrate on programs using Canadian creative resources; and to sell only eight commercial-minutes per hour.

### 25G Grants Available for Public-Service Radio Stations

The Corporation for Public Broadcasting announced that it will make grants of up to \$25,000 each to non-profit corporations, or community-based organizations, submitting approved plans for full-service public radio stations in any of 15 named cities. Existing non-commercial stations are eligible, or the sponsoring group may plan to build a station. Winners will be eligible for grants of up to \$15,600 the second year and, in addition, may get financial help for equipment purchases from the Educational Broadcast Facilities program of HEW. The station becomes eligible for further CPB assistance, and also becomes part of the National Public Radio network.

The cities from which CPB is seeking applications are Miami, Denver, Providence, San Antonio, Dayton, Sacramento, Birmingham, Akron/Canton, Toledo, Hartford, Honolulu,

Tulsa, Allentown, New Haven, and Orlando. Further data: Don Trapp, Corporation for Public Broadcasting, 888 16th St. N.W., Washington, D.C. 20006.

### WFMT, Chicago, Sets Record Straight on First Live Quad

In a letter to this magazine with accompanying documentation, Alfred C. Antlitz Jr., vice president of FM station WFMT in Chicago, has taken exception to the claim of WCBS-FM in New York (reported in *BM/E*, August 1972) that it was the first non-experimental quad broadcast of live material. WCBS put on its premiere in June 1972; WFMT established a clear priority with its Sansui QS broadcast of the Chicago Lyric Opera's production of "Semiramide" in September 1971.

### ITS and NITA Will Merge

Joseph Gorman, president of the Industrial Television Society, and Ed Palmer, president of the National Industrial Television Association, announced that the two organizations will merge effective January 1, 1973.

The two groups, both of which serve specialists in business, corporate, and industrial television, and both of which have been growing rapidly in the last two years, have a combined strength of about 500 members in the U.S., Canada, and overseas. The new organization will have its first national conference March 28 to 30, 1973, in Washington, D.C. Interested persons can get in touch with Gorman at Moore Business Forms, Inc., P.O. Box 542, Niagara Falls, N.Y. 14302; or with Palmer at New England Telephone Co., 185 Franklin St., Boston, Mass. 02107.

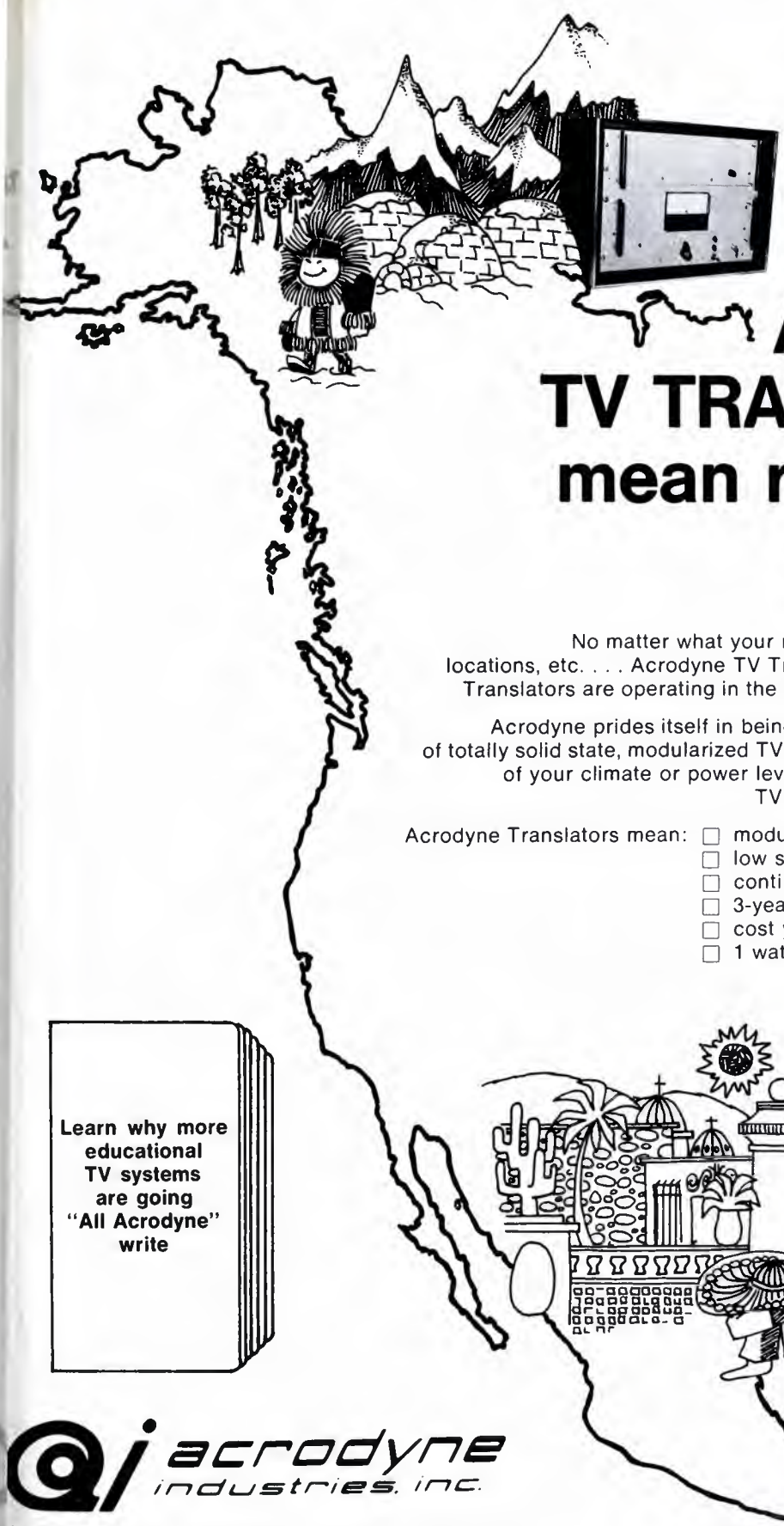
### Echo Science To Build Videotape Recorders

Echo Science Corporation, of Mountain View, Calif., announced a development program for a full line of videotape recorders for broadcast and allied applications. According to James Ayers, chairman of the board, the machines will have performance on a par with present quadruplex units, but will sell at about half the price of comparable equipment. Included will be studio VTRs and a portable unit weighing about 37 pounds. All will be high-band units and will use the Echo Science Video Format, successful in several VTR models made for Department of Defense applications.

**Editor's Note:** At the time this section

continued on page 10





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## NEWS

was sent to the printer, a paper was delivered at the International Broadcasting Conference, London, announcing a new helical scan standard for broadcast developed by IVC and licensed to Rank and CSF Thompson. The new system is said to surpass quad standards.

### Harmful Oversight in FM Translator Rule, Says NAB

The NAB told the FCC that the FM translator rule, as written, can damage existing stations or even subvert the whole system of FM allocations because it allows a group separate from an FM station to carry that station's signal beyond its service contour, in competition with a station in the area served. Under the rule the station itself cannot put up a translator beyond its service area, which clearly intends that a station be protected in its allocated area. But the protection disappears, says the NAB, if any group brings a "foreign" signal into the area.

### NAB Asks FCC To Drop Antenna Cut-Out Rule

The National Association of Broadcasters petitioned the FCC to reconsider the rule that takes a directional radio station off the air automatically if there is a malfunction in the antenna system. The rule went into effect July 14 as part of the series connected with authorization for use by higher-power stations of third-class operators for routine transmitter operation if a first-class operator is a full-time employee.

The NAB said that the public interest would be served better by continuing service with some kinds of malfunction, and it should be left to the operator's judgment how serious the trouble is in each case.

### Meetings Set for Six Cities by NAB

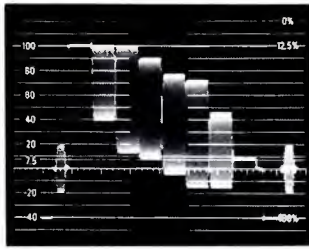
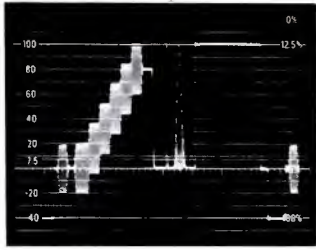
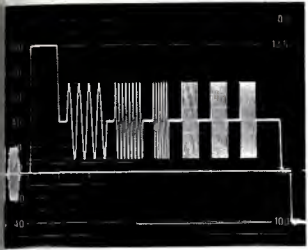
License challenges, counter-advertising, consumerism, and other hot public issues will be on the agenda along with the nuts and bolts of station operation at one-day conferences to be held in six cities by the NAB this fall.

A member of Congress will address each meeting, and there will be a series of panel discussions, a quiz on difficult problems of station management, and a rap session moderated by NAB President Wasilewski. The cities and dates are: Denver, October 10;

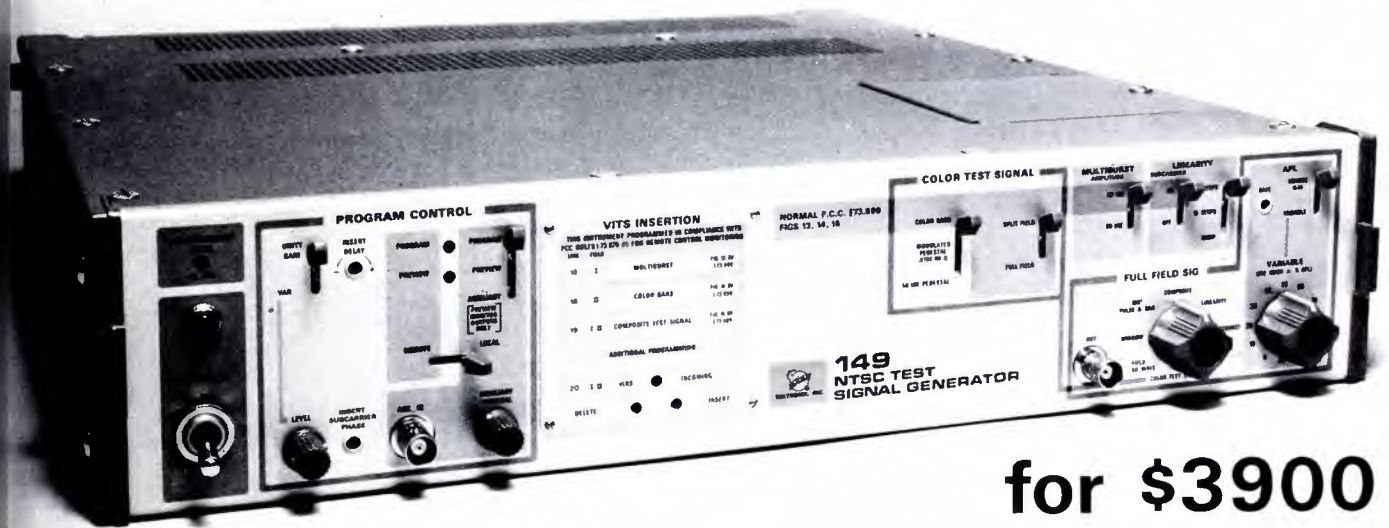
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- Composite FCC §73.699 Fig. 15 Line 19, Field I, II

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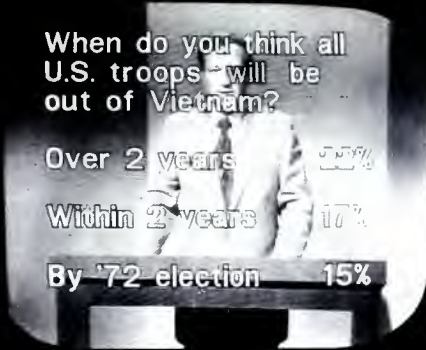
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# INTERPRETING THE FCC RULES & REGULATIONS

## “Fairness” Revisited

Returning to our annual treatment of the Fairness Doctrine, this column will consider a significant Commission ruling—and its likely effect—as such relates to broadcasters and cablecasters.

Preliminarily, the Doctrine may be succinctly defined, in laymen's terms, as follows: 1) when programming involving important, controversial issues is presented, there is a responsibility to present a *reasonable* amount of programming on all other sides of that issue and 2) there is an obligation to provide some controversial-issue programming. The U.S. Congress codified the Fairness Doctrine, in 1959, by inserting provision Section 315(a) in the Communications Act. The U.S. Supreme Court confirmed the constitutionality of the Fairness Doctrine in its 1969 *Red Lion* decision.

### “Fairness” and the Presidential Address

In its first action on its broad-ranging study of the Fairness Doctrine and related public interest policies, the Commission issued an important decision, on June 22, 1972, that *may* suggest a general trend in future rulings. In essence, the Commission declined to apply the “equal opportunities” rationale to Presidential broadcasts *not covered under Section 315 of the Communications Act* (see *BM/E*, “Political Use of Broadcast and Cablecast Facilities,” June 1972).

The Commission acted in accordance with a policy set forth in its *Memorandum Opinion and Order* (FCC 70-881), as adopted August 14, 1970, which stated, in pertinent part:

29. . . . The fairness doctrine is a *term of art*. A layman might say that if A got 30 minutes to speak on some issue, it is only “fair” that a spokesman for the other side also get 30 minutes in the same time period. Thus, in such a lay viewpoint, “fairness” would always entail “equal opportunities.” But, as shown, that is not the thrust of the fairness doctrine, as developed by the Commission and codified in the law in Section 315. *The fairness doctrine does not require equality but reasonableness*—that in the circumstances there has been reasonable opportunity for the discussion of conflicting viewpoints on controversial issues of public importance.<sup>1</sup> (Emphasis supplied.)

With this backdrop, the Commission asserted its reluctance to substitute absolute, mechanical requirements for the discretionary programming judgment of the licensee. “The issue is not whether the American people shall be reasonably informed concerning the contrasting viewpoints on issues covered by Presidential reports,” said the Commission, “but rather whether something more—something akin to equal time—is required.”

The Commission was quick to point out that, in applying the Fairness Doctrine, it has traditionally yielded “wide discretion” to the licensee to choose the appropriate *spokesman, format, and time* for the

presentation of opposing views. *The import of this decision is to maintain and, arguably, further this policy.*

Indeed, the Commission cites only three instances in which licensee discretion on “fairness” issues is limited. First, under Section 315 of the Communications Act, licensees are required to afford *equal time* to legally qualified candidates (see *BM/E*, “Political Use . . .,” June 1972). Second, under the political editorializing rules, the licensee must afford a *reasonable opportunity* for a candidate or his spokesman to respond when the licensee has either 1) opposed him, or 2) supported his opponent in an editorial. Third, under the “quasi-equal opportunities” or Zapple doctrine, the licensee must afford *comparable time* to a candidate's opponents when said candidate or supporters purchase time to broadcast a discussion of the candidates or campaign issues (where said candidate does not, himself, appear). The licensee is not required to afford free time to the opponents, if the initiating candidate, in fact, purchased time.

In rejecting the logic of applying absolute requirements to a discretionary area, the Commission urged all licensees to make a good faith effort to present contrasting viewpoints on issues covered by Presidential addresses. Indeed, the Commission will be judging the balance or lack thereof of broadcaster performances upon complaint and/or at renewal. In a word, the Commission requires *balance*, not *equal time*, on Presidential addresses and shifts the burden of imposing the latter, as follows:

There is a substantial issue, the Commission noted, as to whether such a requirement (equal time) might not run counter to the Congressional scheme. In Section 315(a), the Commission said Congress specified that equal opportunities apply to appearances of legally qualified candidates and that in other instances “fairness” is applicable. It said that while fairness may entail different requirements in particular circumstances, there was a question as to whether it was not up to Congress to take the discussion of public issues by the President out of the fairness area and place it within the equal opportunities requirement—just as it was up to Congress in 1960 to take appearances by candidates for President out of equal opportunities and place them under fairness.<sup>2</sup>

In addition, the Commission *suggested* revision of the equal opportunities requirement to make it applicable only to *major* party candidates. It further noted that the burden of making *distinctions* between Presidential addresses (national issues) and those by a Governor or Mayor (state or local issues) is also uniquely within the province of Congress. Moreover, the Commission cautioned that, in cases where candidates supply broadcasters with audio recordings and film excerpts, the rules require

1. Federal Election Campaign Act of 1971 (Public Law 92-225), Section 315(a).

2. FCC Report No. 7838, Action in Docket Case No. 19260, June 22, 1972.





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that the broadcaster or cablecaster *disclose* both 1) the identity of the tape or film, and 2) any editing by the licensee.

**"Fairness" and Cable**

Carrying its inquiry to all aspects of the Fairness Doctrine, the Commission should soon be handing down rulings on the rights and responsibilities of cable operators in handling controversial matters. In light of this initial Commission action dealing with Presidential broadcasts, a trend *may* be developing in its treatment of the Fairness Doctrine as applied to cable.

Manifestly, the Fairness Doctrine was developed in the context of broadcasting where the management and staff are responsible for the programming emanating from only a *single* station. A cable television operator and his staff of comparable or less size, on the other hand, would appear to be responsible for the application of the Fairness Doctrine to *all* non-broadcast channels used in "origination cablecasting."

The new February 2, 1972 rules provide: "A cable television system engaging in origination cablecasting shall afford reasonable opportunity for the discussion of conflicting views on issues of public importance."<sup>3</sup>

As the economics and technology unfold, it is not unlikely that cable systems will gradually expand to substantially more non-broadcast channels than appears likely today. Hence, the CATV problems of supervision, control, operation, and responsibility

may well become 10, 20, or more times greater than that of the broadcaster. The difference between the regulation and control of these *many* channels by CATV operator is substantially different from that of a broadcaster's *single* channel.

A cable operator, under the new cable rules must provide one or more public access channels: educational channels, government channels and leased channels with the opportunity, under some circumstances, to recapture them temporarily. He is prohibited from exercising program control over these "access" channels. Yet, he must provide operating rules for the public access channels. (Some franchises require as many as four channels on a first-come, first-served, no censorship basis.) The cable operator must 1) provide first-come non-discriminatory access; 2) prohibit advertising (including advertising of candidates for public office) lottery information, obscene or indecent material and 3) maintain a record of all persons requesting access. The rules for the other "access" channels are to be similar with appropriate changes to suit their purpose.<sup>4</sup>

All of these channels will engage in "origination cable casting." In short, the CATV operator is given the responsibility to prevent the violation of the Fairness Doctrine on *all* of these channels. At the same time, he is prohibited from exercising program control. To insure fairness, without the authority to do so, seems like a very unfair burden for a CATV operator to meet.

In light of the Commission's initial "Fairness" action (declining to apply the "equal opportunities"

3. 47 CFR §76.209  
4. 47 CFR §76.251(a)

continued on page 64

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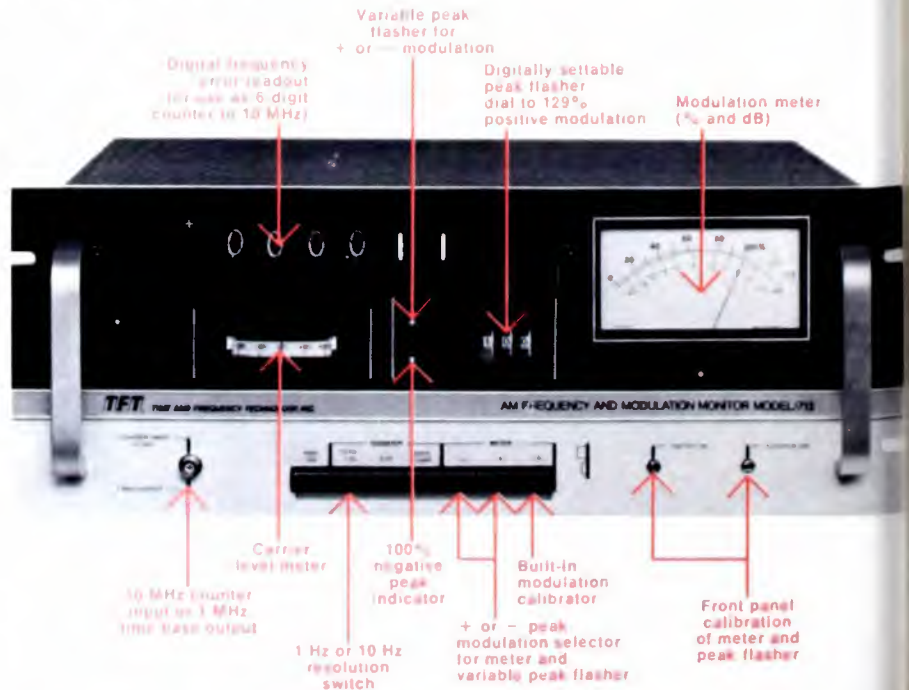
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# The Fourth Revolution Radio/TV/Cassettes for a Learning Society

BY 1972 INSTRUCTIONAL TELEVISION and instructional radio have made no great impact on the educational process—in many schools they haven't even made a dent. In some it has boomeranged—a camera, an unworkable VTR, and other video gear are locked securely in supply closets. But hope springs eternal.

Five years back Eric Ashby identified developments in electronics—radio, television, tape recorders, and the computer—as the fourth revolution\* in education. This summer the Carnegie Commission

## A-V Expert Includes Slides in Revolution; Focuses on Individual in More Open Society

Robert Heinich, Prof. of Education, Audio Visual Center, Indiana University, and 1971-72 president of the Association for Education Communication and Technology, in a keynote address at VidExpo '72, included audio-tutorial teaching and mixed multi-media packages as part of the Fourth Revolution. The role of audio tapes in conjunction with slides or printed workbooks has grown at a fantastic rate, Heinich said.

Current thrust in programming, says Heinich, is to make mediated instruments designed for mass use adaptable for individual study. Here's where videocassettes dial access, and cable systems fit in. "Satellites can deliver instruction wherever the learner is or where he goes," Heinich said. Cassettes make instruction portable.

The individual's needs will be served through these new media. The open university concept offers college education to all at a relatively low cost. Compulsory high school attendance is no longer necessary. Learners can get high school equivalency degrees simply by passing GEDs. Michigan has lowered the age to 16. There is no need to go to a formal classroom if material can be learned elsewhere (at home, a library, learning center, etc.). Such trends can lower the cost of education.

Heinich sees private programmers producing learning packages with states responsible for setting proficiency standards and testing rather than instruction itself. As school financing and budgetary methods change (to fulfill court demands for equalization of quality; to lower the high cost of education because of the present extreme labor-intensiveness), effective material resources will be favored over teacher resources. Teacher roles will change and, in the long run, schools will be the biggest market for videocassette material, Heinich said.

on Higher Education picked the term "The Fourth Revolution" as the title of its report and recommendation on use of instructional technology in higher education. Noting that the fourth revolution has been emerging for the past three decades—much more slowly than earlier prophesied—the Commission nevertheless predicted that certainly by the year 2000 ten to 20 percent of all instruction at colleges and universities, and perhaps as much as 80 percent of off-campus instruction and learning, will be carried on through educational technology.

Use of the new technology increases opportunities for independent study and provides students a greater variety of courses and ways of learning. Students, for example, can choose between a lecturer, a computer program, or other multi-media package. Or, as the Commission notes, they can "choose total immersion in one subject at a time" rather than classroom group instruction.

Access to audio or videocassettes, computer-assisted instruction, and learning kits at 1) learning centers in schools or libraries (public and private) on a 24-hour basis; 2) on cable TV on a nearly individual demand basis; or 3) over-the-air several times a week at even the most remote spots in the world via satellite, make it possible for us to become truly a *learning society*.

The Carnegie Commission and others predict that much of the cost of the new technology can be paid for out of what would be saved by *not* having to continually construct new buildings to house a growing student body simultaneously on space-bound campuses. The cost-effectiveness of instruction (learning gained per dollar spent) can certainly be improved by more wide spread application of technology used in a systems approach. To precipitate the coming revolution, the Commission recommends federal support. Its report called for \$100 million to be spent in 1973 (which would include funding for several regional cooperative learning centers), increasing thereafter to reach an amount equal to one percent of the total national expenditure on higher education.

Comparable or more extensive efforts should be made in the elementary and secondary sector. There is hope that more positive help will spring from the efforts of the proposed National Institute

\*First revolution was when parents selected teachers rather than themselves, and schools rather than the home as the place to educate their young; the second was the adaption of the printed word as a tool (before then it was all oral); and the third came with the invention of printing and the easy access to books.





Participation is the key to instructional TV. At WVTV, students run TV equipment and appear on the camera in live simulation game. See page 24.

of Education and the new separate Center for Educational Technology now within the U.S. Office of Education. What follows in this report is not a complete examination of events that will shape the revolution, but an update on several significant developments underway including:

- A report on how videocassettes are beginning to roll (separate article, page 40);
- What is being learned from Open University experiments;
- University extension as interim step;

- How gaming and simulation via TV involve large numbers effectively;
- A progress report on one company's advances in interactive television;
- A progress report on how one state is trying to bring about more cost-effective television;
- Hopes for instructional radio;
- The biomedical communication network;
- Progress in cable TV delivery systems (*CM E* section).

## Open University: Abroad and Here

GREAT BRITAIN'S OPEN UNIVERSITY—its structure, range of media utilized, decision-making process, teaching system, success and shortcomings, and problems in transferring the concept of the OU to the United States—was described in July to participants at Harvard's "Institute on Telecommunications and Public Policy." Making the presentation was Richard Hooper, senior producer, BBC Open University Productions.

The Open University differs from conventional universities in one major respect—its students are all based at home rather than on a campus or in extension classrooms. OU has been operating for two years and is presently serving around 30,000 adult students studying part-time. Most of these students are in full-time employment.

Because the students participate from home, a variety of media is used in the teaching/learning system. Hooper addressed his remarks particularly to this aspect of the OU.

The range of media includes:

- Home instructional materials which are sent through the Post Office to students. These materials include: correspondence texts; TV and radio notes;

computer-marked assignments; home study kits (for science and technology courses); slides, stills, and discs; audiocassette recorders and audiocassettes.

- Over-the-air instructional programs which are broadcast over the BBC network of television and radio, and are available on demand at some study centers (in cassette form).
- Face-to-face instruction provided through study centers all over the United Kingdom for counseling and tutorial sessions, and through one-week summer school residence at other universities (which are residential).

Computers are used in two major ways—computer marked assignments for all students; and the study and practice of computing techniques.

Hooper stated that the OU makes two basic and important media decisions: *which* media to use in the teaching system; and *how* the media selected should be used. Media selection is first handled on the university-wide level, with consideration given to financial, logistical, conceptual, and political factors. Then, with media selection decided, to a large extent, the *course team* must decide *how* to use what is available to them.

Continued on page 22



In Hooper's view, the course team is one of the most basic and important educational innovations of the OU. Its uniqueness, he stated, lies in the fact that educators and media specialists work together in the creation of course materials from the inception to the finished product. The course team consists of a professor of a given discipline, a BBC person who is a specialist in the subject matter, and an educational technologist from the Institute of Educational Technology. They have collective power over all components of the course, meeting regularly to construct a course in 12-15 months.

Student work is based on the *unit*, which consists of about ten hours to be done in one week. A half-credit course requires 16-17 units, and a full-credit course requires 32-34 units. Spectrum constraints limit radio and television broadcasts to *one per unit*.

This limitation on the use of electronic media is governed by the available transmission times over the BBC's national network. Hooper said that "only 30 hours in each medium per week has been agreed

### Impact of Openness

The structure of the University, with its openness to all, lack of academic qualifications, first-come-first-serve selection criteria, makes it "mass education for the people as opposed to minority education for the elite." But, Hooper points out, there are no remedial, preparatory courses for those "who enter the open door of the university and fall flat on their faces . . ."

Thus far, the appeal of the OU is not as broad as desired. Most students appear to be from the middle class; presently about one-sixth of the enrollment is from what is defined as "working class." This is probably due to the curriculum content, which doesn't yet meet the people's needs. It is too academic to attract significant numbers of working class people.

In addition, OU's pedagogy is mass-produced, with courses being group-paced and group-prescribed. Thus, there is little individualism viable in the present system. There is, however, pressure now to expand the little individual attention that is available through live tutorials in study centers.

Cost-effectiveness is a plus factor for the Open University. The cost of the OU is "estimated to be one-third the cost per graduate at a conventional university, (assuming 50 percent dropout at the OU)." The resource cost is one-sixth per equivalent undergraduate at a traditional university, and capital cost per student is six percent of that at a conventional school ("and this calculation does not even include residential costs at a normal institution"). The cost per student in 1973 will be the equivalent of \$500 (U.S. dollars).

With a large student enrollment, there are economies of scale in the teaching materials because of large orders for such things as correspondence materials and because broadcasts and texts are repeated over a four-year cycle.

Also, professors can be "spread" over many students in this cycle. "In 1973, 200 academic staff members (not administration staff or part-time staff) will be 'teaching' 26 undergraduate courses to 38,000 students. In the university's steady-state situation, 320 academic staff members will be 'teaching' 110 courses to 48,000 students."

by the BBC. These are not in peak hours. As courses proliferate there will have to be a smaller proportion of broadcasts."

Science-based courses are allowed one television program per course unit, whereas arts-based courses are allotted less than one to one. "This decision was made largely on conceptual grounds—the science courses need broadcast time to replicate the vital laboratory experience. Arts courses are traditionally more *verbal*. Arts=more radio. Science=less radio."

In choosing a particular medium for any part of a course, and in designing the course in toto, the course team places its emphasis on the *rationale* for wanting to use a certain medium. While subjective factors certainly become involved, the important stress remains on which subject matter can best be carried in what way.

### Broadcast roles

The specific roles of the broadcast media in instruction break down into four main categories: 1) traditional lecture/tutorial format; 2) a model of teaching which Hooper calls *Primary Source Material*—"The teacher uses television and radio to bring the learner in contact with the world, so that the learner can make his own observations and draw his own conclusions;" 3) laboratory demonstrations, since real experimental work is sometimes not possible in the home; 4) graphic displays of models of abstractions, invisible matter, and theoretical concepts.

According to Hooper, the Open University is trying to do away with the "talking head" approach to instructional television. On the other hand, he finds that it is sometimes justifiable in terms of "the need for personal contact," and "access to top people in the field."

The broadcast media are valuable to the OU in ways other than delivering instructional lessons. The broadcast media provide: openness and publicness; advertising and public relations benefits (there is prestige through being linked with the BBC); and new students apply after listening to application information broadcast at the end of each program); "sense of community in a fragmented home-based institution" (all students, wherever they are based, watch the same programs at the same time); work-pacing—students can work at their own speed using the correspondence texts, but the regular broadcasts linked to the texts tends to keep students moving forward; "fail-safe mechanism"—radio broadcasts are used to communicate to all students immediately if any special problem or change arises.

Transferring the Open University to an American context is problematical, said Hooper. First, the United States already has a more open higher-educational system than does the United Kingdom, and may not be willing to sacrifice its tradition of localism for the centralization needed by an OU that reaches an entire nation.

Secondly, the U.S. has no television set-up comparable to the BBC. The BBC has a reputation for sophisticated, high quality programming, a good audience (50 per cent of the viewing audience), and



financial support. Educational television in the U.S. has relatively low prestige, low viewing, and low financing. It is dependent on a political life-style that does not foster innovation because it is based on annual financing and a four-year schedule of politics. Adventurous ideas are simply too risky. The OU has profited from long term planning and the promise of future grants.

Finally, the television producer and other broadcasting professionals in this country have considerably lower status than do their counterparts in the United Kingdom. There is doubt that they would be treated as equals by university academics in the kind of teamwork utilized by the OU.

Although Hooper expressed these reservations about the transferability of the Open University to the United States, he concluded that the use of media in the OU may represent a turning point in the history of applying new media to education. He stated that in the OU these media are being used not just to lower costs, but to reach new objectives in the curriculum and to reach a broader spectrum of students.

Evidence of this new understanding of media use in education has been shown by many groups in the United States. Among them is the Smithsonian Institute, where Hooper recently showed a film on the OU and spent some time explaining the concepts. S. Dillon Ripley, secretary of the Smithsonian, wants the Institute to be more directly involved in the educational process. The Smithsonian is exploring various ways of creating an outreach to the people, and of integrating its offerings with academic curricula. According to Carl Wesley Larsen, director of public affairs, they are already forming a telecommunications study group and meeting with representatives of television and other media.

The Open University which has received most publicity in the U.S. is probably Empire State College, Saratoga, N.Y. Empire State does not currently use over-the-air broadcasting nor does it have plans for instituting broadcasting at an early date. The State University of Nebraska, on the other hand, which expects to begin operation in 1973, will use multi-media extensively.

After an initial clientele study, two popular courses have been selected for the SUN Open University—an accounting course\* and a psychology course. The temptation to offer a wider variety has been resisted by the SUN staff until more first-hand experience has been gained.

Pilots of the two courses have been prepared and will be field-tested this fall. Like Great Britain, G.

\* To the surprise of the SUN staff, an accounting course rated tops from potential students ages 16 to 89. Needless to say, teaching accounting via TV is no easy task.

## Open University on Communications

The International University of Communications is now accepting applications for students, with the possibility of some fellowships available.

IUC is an "alternate" university, with the project approach, individualized tutorial learning, and the elimination of courses, classes, curricula, credits, and grades. It is the first institution to be totally devoted to using and teaching the use of all forms of communications to directly solve critical social, political, economic, and environmental problems, says an IUC spokesman.

Robert L. Hilliard, president of IUC, developed the original idea and plans. Included on the Board of Directors are: R. Buckminster Fuller; Elizabeth Duncan Koontz, director, U.S. Women's Bureau, and Assistant Secretary of Labor; Yoshinori Maeda, president, NHK, The Japan Broadcasting Corporation; Donald H. McGannon, chairman and president, Westinghouse Broadcasting Co.; Harold Taylor, educational innovator and important figure in concept of open university; and The Rt. Hon. The Lord Willis of Chislehurst (House of Lords), London, England.

IUC is seeking funding. Most of its work is now handled on a volunteer basis, including the many experts who serve as tutors.

For information, write: The International University of Communications, 1100 17th Street, N.W., Washington, D.C. 20036.

Robert Ross, vp for SUN systems, reports Nebraska is using an integrated instructional team. In addition to the accounting and psychology professors are a graphics designer, an instructional designer, a correspondence specialist, an educational psychologist, and a TV producer.

Nothing short of a totally new approach was deemed necessary at Nebraska. A whole new model covering course design, learning modes, and delivery systems is being formulated. Delivery will include the setting up of videocassette-equipped learning resource centers at high schools, libraries, and vocational institutes (ten are planned initially), and programming over the Nebraska ETV network which penetrates 99 percent of all homes. New material will be broadcast once with two repeats during the week (one during the day, another on week-ends). Altogether 20-22 hours of air time per week is envisioned. The program has been coordinated with all colleges and universities in the area (Nebraska and adjoining states) for full credit transfers.

Eventually SUN hopes to be able to permit individuals to take two years of college instruction through off-campus study. Course preparation will be facilitated by the new Nebraska Educational TeleCommunications Center which covers 113,920 square feet on six floors.

## University Extension An Interim Step

ALTHOUGH THE OPEN UNIVERSITY CONCEPT of delivering college credit courses to the home-centered student is in the infant stage, university TV extension

courses via private microwave, leased lines, ITFS, and videotape bicycling, is reaching maturity (*BM/E*, October 1971 and November 1970).

Continued on page 24



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Thus far, the appeal of the OU is not as broad as desired. Most students appear to be from the middle class; presently about one-sixth of the enrollment is from what is defined as "working class." This is probably due to the curriculum content, which doesn't yet meet the people's needs. It is too academic to attract significant numbers of working class people.

In addition, OU's pedagogy is mass-produced, with courses being group-paced and group-prescribed. Thus, there is little individualism viable in the present system. There is, however, pressure now to expand the little individual attention that is available through live tutorials in study centers.

Cost-effectiveness is a plus factor for the Open University. The cost of the OU is "estimated to be one-third the cost per graduate at a conventional university, (assuming 50 percent dropout at the OU)." The resource cost is one-sixth per equivalent undergraduate at a traditional university, and capital cost per student is six percent of that at a conventional school ("and this calculation does not even include residential costs at a normal institution"). The cost per student in 1973 will be the equivalent of \$500 (U.S. dollars).

With a large student enrollment, there are economies of scale in the teaching materials because of large orders for such things as correspondence materials and because broadcasts and texts are repeated over a four-year cycle.

Also, professors can be "spread" over many students in this cycle. "In 1973, 200 academic staff members (not administration staff or part-time staff) will be 'teaching' 26 undergraduate courses to 38,000 students. In the university's steady-state situation, 320 academic staff members will be 'teaching' 110 courses to 48,000 students."

by the BBC. These are not in peak hours. As courses proliferate there will have to be a smaller proportion of broadcasts."

Science-based courses are allowed one television program per course unit, whereas arts-based courses are allotted less than one to one. "This decision was made largely on conceptual grounds—the science courses need broadcast time to replicate the vital laboratory experience. Arts courses are traditionally more *verbal*. Arts=more radio. Science=less radio."

In choosing a particular medium for any part of a course, and in designing the course in toto, the course team places its emphasis on the *rationale* for wanting to use a certain medium. While subjective factors certainly become involved, the important stress remains on which subject matter can best be carried in what way.

### Broadcast roles

The specific roles of the broadcast media in instruction break down into four main categories: 1) traditional lecture/tutorial format; 2) a model of teaching which Hooper calls *Primary Source Material*—"The teacher uses television and radio to bring the learner in contact with the world, so that the learner can make his own observations and draw his own conclusions;" 3) laboratory demonstrations, since real experimental work is sometimes not possible in the home; 4) graphic displays of models of abstractions, invisible matter, and theoretical concepts.

According to Hooper, the Open University is trying to do away with the "talking head" approach to instructional television. On the other hand, he finds that it is sometimes justifiable in terms of "the need for personal contact," and "access to top people in the field."

The broadcast media are valuable to the OU in ways other than delivering instructional lessons. The broadcast media provide: openness and publicness; advertising and public relations benefits (there is prestige through being linked with the BBC); and new students apply after listening to application information broadcast at the end of each program); "sense of community in a fragmented home-based institution" (all students, wherever they are based, watch the same programs at the same time); work-pacing—students can work at their own speed using the correspondence texts, but the regular broadcasts linked to the texts tends to keep students moving forward; "fail-safe mechanism"—radio broadcasts are used to communicate to all students immediately if any special problem or change arises.

Transferring the Open University to an American context is problematical, said Hooper. First, the United States already has a more open higher-educational system than does the United Kingdom, and may not be willing to sacrifice its tradition of localism for the centralization needed by an OU that reaches an entire nation.

Secondly, the U.S. has no television set-up comparable to the BBC. The BBC has a reputation for sophisticated, high quality programming, a good audience (50 per cent of the viewing audience), and



financial support. Educational television in the U.S. has relatively low prestige, low viewing, and low financing. It is dependent on a political life-style that does not foster innovation because it is based on annual financing and a four-year schedule of politics. Adventurous ideas are simply too risky. The OU has profited from long term planning and the promise of future grants.

Finally, the television producer and other broadcasting professionals in this country have considerably lower status than do their counterparts in the United Kingdom. There is doubt that they would be treated as equals by university academics in the kind of teamwork utilized by the OU.

Although Hooper expressed these reservations about the transferability of the Open University to the United States, he concluded that the use of media in the OU may represent a turning point in the history of applying new media to education. He stated that in the OU these media are being used not just to lower costs, but to reach new objectives in the curriculum and to reach a broader spectrum of students.

Evidence of this new understanding of media use in education has been shown by many groups in the United States. Among them is the Smithsonian Institute, where Hooper recently showed a film on the OU and spent some time explaining the concepts. S. Dillon Ripley, secretary of the Smithsonian, wants the Institute to be more directly involved in the educational process. The Smithsonian is exploring various ways of creating an outreach to the people, and of integrating its offerings with academic curricula. According to Carl Wesley Larsen, director of public affairs, they are already forming a telecommunications study group and meeting with representatives of television and other media.

The Open University which has received most publicity in the U.S. is probably Empire State College, Saratoga, N.Y. Empire State does not currently use over-the-air broadcasting nor does it have plans for instituting broadcasting at an early date. The State University of Nebraska, on the other hand, which expects to begin operation in 1973, will use multi-media extensively.

After an initial clientele study, two popular courses have been selected for the SUN Open University—an accounting course\* and a psychology course. The temptation to offer a wider variety has been resisted by the SUN staff until more first-hand experience has been gained.

Pilots of the two courses have been prepared and will be field-tested this fall. Like Great Britain, G.

\* To the surprise of the SUN staff, an accounting course rated tops from potential students ages 16 to 89. Needless to say, teaching accounting via TV is no easy task.

## Open University on Communications

The International University of Communications is now accepting applications for students, with the possibility of some fellowships available.

IUC is an "alternate" university, with the project approach, individualized tutorial learning, and the elimination of courses, classes, curricula, credits, and grades. It is the first institution to be totally devoted to using and teaching the use of all forms of communications to directly solve critical social, political, economic, and environmental problems, says an IUC spokesman.

Robert L. Hilliard, president of IUC, developed the original idea and plans. Included on the Board of Directors are: R. Buckminster Fuller; Elizabeth Duncan Koontz, director, U.S. Women's Bureau, and Assistant Secretary of Labor; Yoshinori Maeda, president, NHK, The Japan Broadcasting Corporation; Donald H. McGannon, chairman and president, Westinghouse Broadcasting Co.; Harold Taylor, educational innovator and important figure in concept of open university; and The Rt. Hon. The Lord Willis of Chislehurst (House of Lords), London, England.

IUC is seeking funding. Most of its work is now handled on a volunteer basis, including the many experts who serve as tutors.

For information, write: The International University of Communications, 1100 17th Street, N.W., Washington, D.C. 20036.

Robert Ross, vp for SUN systems, reports Nebraska is using an integrated instructional team. In addition to the accounting and psychology professors are a graphics designer, an instructional designer, a correspondence specialist, an educational psychologist, and a TV producer.

Nothing short of a totally new approach was deemed necessary at Nebraska. A whole new model covering course design, learning modes, and delivery systems is being formulated. Delivery will include the setting up of videocassette-equipped learning resource centers at high schools, libraries, and vocational institutes (ten are planned initially), and programming over the Nebraska ETV network which penetrates 99 percent of all homes. New material will be broadcast once with two repeats during the week (one during the day, another on week-ends). Altogether 20-22 hours of air time per week is envisioned. The program has been coordinated with all colleges and universities in the area (Nebraska and adjoining states) for full credit transfers.

Eventually SUN hopes to be able to permit individuals to take two years of college instruction through off-campus study. Course preparation will be facilitated by the new Nebraska Educational TeleCommunications Center which covers 113,920 square feet on six floors.

## University Extension An Interim Step

ALTHOUGH THE OPEN UNIVERSITY CONCEPT of delivering college credit courses to the home-centered student is in the infant stage, university TV extension

courses via private microwave, leased lines, ITFS, and videotape bicycling, is reaching maturity (BM/E, October 1971 and November 1970).

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University TV extension courses which started as a means of permitting professionals (engineers for the most part) to take graduate courses at their place of work through a satellite classroom, rather than to travel to a campus (or forego the whole attempt), have expanded to provide special courses for all levels of employees. Those industries which are cooperating with universities are now designing new courses which may be tailored to their own businesses. The universities are available to help.

The Association for Continuing Education (ACE) is a non-profit organization representing a consortium of companies that started out working with Stanford's School of Engineering in offering graduate courses. It now offers an MBA degree in cooperation with Golden State College of San Francisco. This summer the classes scheduled included EE-100, "Practical Transistors," a 15-hour videotape course for non-professionals, and SR-800A, a shorthand review course. In addition, a number of supervisory management courses were offered. Last spring, an ACE student could take a course on effective reading (an adapted Xerox Learning System course), and another on "Personal Financial Development" produced by several principals of a private company.

Chuck Davis, general manager of ACE, sees the program growing on a completely self-sustaining basis (although industry employees usually get all or part of their tuition paid for by their employer).

However, such endeavors are not problem free. ACE can lose money if 30 students or more do not sign up. This calls for advance planning and publicity. Many of the courses are real-time on ITFS systems (four channels) with audio talkback arrangements. ACE has now worked out a plan for videotaping these courses in advance and having them offered for sale to other than ACE members. Genesys Systems Inc. of Palo Alto will do the marketing.

Genesys Systems, under the leadership of Albert J. Morris, president, has been in the forefront of actually installing university instructional TV networks, and Mr. Morris co-authored a comprehensive review of the subject which appeared in the *Journal of Educational Technology and Systems*, Vol. 1, No. 1 (One Northwest Drive, Farmingdale, N.Y. 11735).

The Genesys staff has tabulated a brief summary of ITV university extension activities at some 40

institutions.

Among the interesting proposals prepared by Genesys is the one for Taiwan which would establish three open TV schools, an open university, an open high school, and an open technical school. Taiwan, as a rapidly-growing country, has a vital need for education. In fact, growing economies are the result of good educational systems, Morris says. Yet, the cost of expanding an educational system is often excessively demanding. The way out of the dilemma is the open TV school which would make extensive use of videotaped courses already taught at existing schools. The National Advisory Committee could choose the best instructor for each course.

At least a four-channel system would be called for. (A typical four-year college curriculum in the U.S. leading to a bachelor's degree requires about 1800 hours of classroom contact. One channel operating from 7:00 a.m. to 11:00 p.m. every day could program 5840 hours per year. Assuming programs are repeated twice each day, one of the four channels could probably handle high school requirements and the remaining three the open university (20-24 curricula plus some for the technical school).)

There are four ways of reaching homes and commercial or industrial locations: VHF TV, UHF TV, CATV or ITFS. Of these, Genesys suspects UHF to be the most practical—although no in-depth study has been made. There are not enough VHF bands available. CATV has a high initial investment and ITFS requires special down converters.

The ACE system is entirely a university-industry affair—as have been most systems in operation so far. A broadened scope to provide, for example, retraining of unemployed engineers, calls for additional support. In August, the National Science Foundation announced they are supplying a grant of \$99,575 to the University of Southern California for this purpose. (USC has a fine Norman Topping Instructional Television Center constructed with a grant from the Olin Foundation.)

Experimental programs will be designed for both refresher and retraining purposes. Two Los Angeles County classroom facilities will be constructed. Industrial firms and government organizations will also participate in the program. The USC project is under the direction of Dr. Jack Munushian, Prof. of EE, University of Southern California. Four ITFS channels will be used.

## Simulation Gaming Proves Valuable

SIMULATION GAMING has been in existence since ancient rulers planned war strategies. As the world grew, so simulation gaming became more complex. As an educational tool, it has been used in most formal disciplines, as well as in business, government, and research. With the aid of the computer, whole new capabilities have unfolded. Now television may play its role too. This past school year a computer simulation game was tied in with televi-

sion for possibly the first time.

Under various government grants, "Tri-City," was designed by Envirometrics, Inc. (since absorbed by Planning Research Corporation) to be used for simulating problems on a local-metropolitan scale. It was adapted for television by station WNVT/Channel 53, Annandale, Virginia, whose licensee is the Northern Virginia Educational Television Association. Game operators were Jan Cooper and Phil



Laub, both of PRC.

"Tri-City" was used with the twelfth grade local government course in 23 schools, in five counties and one city (5000 sq. mile area), with approximately 1000 students participating in the game. The game simulates a three-jurisdictional urban government system in which students make all the local-level decisions that would affect the three cities' operation, change, and growth. Decisions outside the local region which affect the local system, and decisions within the local system that are either particularly routine or far too cumbersome for the students to make, are handled by computer.

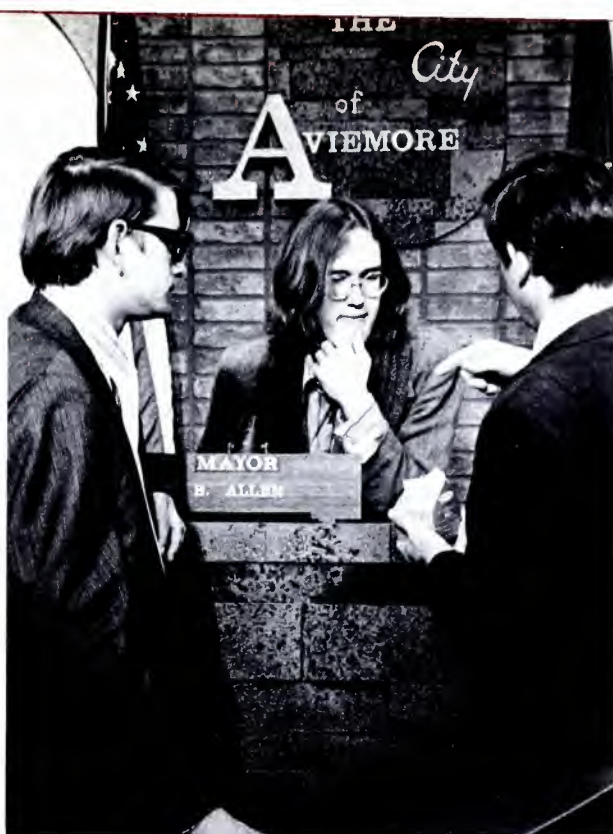
Divided into weekly rounds, each representing a year, the game was played at WNVN for six weeks, with the three "governments" holding meetings for three hours each Monday at the television studios. Before the game was begun, James Dillard, consultant to WNVN and liaison between the schools and the game operators, sketched the model to participating teachers. They were consulted throughout the game.

Each school was given either an economic or a social role, and had five governmental representatives and one newsman to attend the Monday meetings. There were "bureaucrats," "social advocates," and "entrepreneurs." While each school "belonged" to one of the three jurisdictions in the game, it also had economic or social interests in all three jurisdictions, thus creating conflicts that added realistic complexities to the game. Each player could make his own decisions, trying to influence others, calling for better schools, planning new roads, buying land, holding secret sessions, and any number of open-end alternatives. Because there were basically no restrictions, absurd decisions were occasionally made. But these provided good learning experiences too—especially as students saw the results of these decisions, and as pressure was applied by other students.

Following each round of "Tri-City," students recorded their decisions on special coding forms which were then given to the two game operators, Cooper and Laub, who checked the forms. Paul Raschi, who handled the technical aspects of the game and had direct interface with the computer, key-punched the information onto computer cards and took them to an office of Univac which offered free computer service for the game.

Computer printouts, presenting all the changes made by the decisions in the three jurisdictions, were dropped off at delivery points on Tuesday and made available to all participants at their schools on Wednesday of each week. Each representative and his classmates could then see how his and others' decisions had made changes, and how his interests had fared. Even if he made no decisions at all, he would probably find that decisions made by others had effected this area.

After the three-hour strategy sessions at WNVN's studios, 1/2-inch videotapes were made of each council holding 40 minutes of public deliberation. Next, the broadcast journalists took over. A unique adaptation of the game to the television medium, the broadcast journalist roles provided a rare opportuni-



In the game, "Tri-City," the mayor has to make a decision while on camera.



Broadcast-journalist students play a vital role. They edit two hours of live material down to 30 minutes and add analysis. This helps the over-1000 students participating to stay abreast of developments.

ty for the six journalists chosen through audition (two from each jurisdiction). They immediately began replaying and analyzing the videotapes that had been taped simultaneously. From these, the broadcast journalists, doing all their own editing, along with summaries and analyses, reduced the total two-hour broadcast to a half-hour version. They selected the parts of council sessions they thought to be most significant—not without sometimes being charged with slanting the news, another realistic dimension.

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With the sessions meeting on Mondays, the edited tape was aired on WNVN on Tuesdays back-to-back from 7:00 a.m. to 5:00 p.m., thus giving all the participating classes in the 23 schools an opportunity to see the program at the most convenient time.

The newsmen representing each school were responsible for reporting to their schools the information from the Monday sessions and any behind-the-scenes action that was not covered in the broadcasts. Each newsman had an open option on how he was to do this. On their own, in the first round of the game, the 23 newsmen called a joint meeting and formed a United Press Corps, which performed as a newsgathering agency and produced a four-to-six page Bulletin each week. The Bulletin was delivered with the computer printouts each Tuesday. According to Portia Meares, WNVN's coordinator, School Broadcast Services, and prime initiator of the project, "This news service proved to be an important contribution to communication between studio and classroom and was a tribute to student initiative, ingenuity, and hard work."

The "Tri-City" game was the major teaching tool in the classrooms in which it was used. Through the broadcasts, the Bulletin, the computer printouts, and reports from direct participants, the whole class was involved. Between rounds, decisions and analyses of actions were made. Additional classroom activities for the course included: study of local government patterns, relating reality to simulation; small group trips to see government officials in the area and reporting to the class; inviting local decision-makers to talk to the class; and visiting local county board meetings and interviewing elected officials.

As well as having the obvious curriculum objective of guiding students to learn more about local

government, WNVN had some special objectives of its own. In a recent publication produced by the station, "Tri-City, Case History of a Television Simulation in Local Government," these objectives are stated:

- To use television technology in such a way that it becomes integral (as compared with supplemental) to the learning activity;
- To allow students to use television as a dynamic tool to further their own learning;
- To use television as a process rather than a product in the learning environment.

During the winter or spring of 1973, WNVN and its member school systems intend to use another computer simulation game adapted to television. This game, "The River Basin Model" will be like "Tri-City," with an added feature—a water resource component. The River Basin Model was developed by Envirometrics for the U.S. Environmental Protection Agency. For this model, planners expect to expand the participation, both in grade level and in subject discipline, with classes such as botany and biology being involved. (Inquiries concerning this model should be directed to Chief, Publications Branch (Water), Research Information Division, R & M, Environmental Protection Agency, Washington, D.C. 20460. Both "Tri-City" and "The River Basin Model" are in the public domain.)

At the completion of the "Tri-City" game last spring, WNVN asked the question, "Should WNVN/Channel 53 offer a similar television/computer simulation next year?" With both participating student and teacher response being a unanimous YES, early in 1973 will find WNVN's studios once again overflowing with students, placards, confusion, bustling activity, and enthusiasm.

## Progress in Instructional Accountability



Birth control information is being given to a post-partum patient at Harlem Hospital Medical Center using Responsive TV in a 35-minute educational program on Family Planning.

LAST OCTOBER, *BM/E* devoted considerable editorial space to a much-neglected subject—ITV accountability. During the last year a lot of attention has been given the subject. NAEB has instituted workshops on instructional system design, and has made available a pamphlet on the subject authored by Warren L. Wade, KTEH, San Jose, (who also addressed the 1971 NAEB Convention). The Great Plains National ITV Library Newsletter has been running a series on instructional design.

One of the ways of constructing ITV lessons to assure active involvement is to make them interactive. A company that has pioneered in this field is Data-Plex systems which has developed Responsive TV (see box and *BM/E*, October 1971).

The Responsive TV learning system is beginning to break loose in numerous training and educational areas covering a broad variety of subjects directed to a wide range of learner backgrounds.

Thomas Pyle, vice president of marketing, states that "we are finding not only a willingness but an eagerness on the part of all learners, regardless of background, to interact with video-based learning



materials through the Responsive system, as long as the material programmed is at a corresponding interest level."

Pyle cites as examples of programs currently in use or under development—nurses' training in post-natal care for Ayerst Laboratories; product knowledge training for "platform personnel" for First National City Bank; family planning programs for patients in the obstetrical ward in Harlem Hospital in New York City; safety training for miners through the Department of the Interior Bureau of Mines. Other applications being developed run the gamut of basic skill training to psychiatric evaluations for use by MDs, this latter project being explored with the Social Security Administration.

According to Mr. Carl Gambello, manager of training in Citibank's Personal Banking Division, "Responsive TV is being looked at as a way to increase our personnel's ability to recognize customer needs." Gambello points out that Responsive TV simulates real life situations and allows for immediate viewer response to those situations.

While the program will initially be introduced on the trainee level, First National City Bank could eventually extend RTV training to some 1400 customer representatives already assigned to branch offices.

Using the video-based system with the Responsive TV capability, Data-Plex has opened a pilot learning center in Greenwich, Connecticut, directed at transferring existing programming, as well as developing new materials, so that the learning center environment can be totally videotape-based. Such a move would eliminate two of the biggest problems in the learning center industry—reduce servicing time of equipment, coupled with a reduction in the

## What Is Responsive TV?

Responsive TV permits individualized instruction at any time, and any place, using video-based equipment. It can lower the costs of training and education and create viewer involvement through active participation. This improves learning and retention. The Responsive TV system is compatible with cable television and broadcast TV, as well as with videotape.

System components are an inexpensive responder unit plugged into any standard videotape player (cartridge, cassette, or reel-to-reel), and a TV monitor/receiver (black-and-white or color).

The responder unit has four buttons, each labeled with letters, numbers, or symbols. When a responsive videotape is played, programmed questions are seen and heard on the screen, and ample time is allowed for viewers to answer by pressing one of the unit buttons. Whatever the nature of the response—which is played out on the screen—the proper answer is given by the narrator as learning reinforcement so that viewers can test their comprehension of material just covered.

Programs for Responsive TV are specially prepared to require viewer involvement and can be developed for: 1) training; 2) education; 3) role playing; 4) strategy simulation; or 5) pure entertainment. Responses to all alternatives are carried simultaneously on the same videotape from a central source, whether broadcast or tape cartridge. The viewer, however, sees and hears only the response which corresponds to his particular answer.

down-time on existing pieces of equipment that do not enjoy the heavy usage of some of the other equipment.

## Cost-Effective Gains

IN NOVEMBER 1970, *BM/E* reported the inception of Project ICEIT, a television-managed learning system aimed at increasing teacher efficiency by concentrating professional time and talent in basic skills instruction, leaving other areas to a television-

managed learning system which employs highly visual student-involving television presentations and paraprofessional supervision. Subjects that could be handled by TV include elementary science, social studies, health, humanities, and values education.

The *BM/E* article summarized the results of ICEIT's initial endeavor in Rochester. Ray Graf, supervisor of the Educational Communications Unit at the New York State Education Department and the organizer and mover of the project, is pleased to report that Project ICEIT is alive and well and living in many parts of New York State these days.

After Rochester, another pilot was conducted in Baldwin (*BM/E*, October 1971). The objective of this pilot was to employ more field testing in the production of the television modules and, in general, to improve the program and activity quality. During the past year, ICEIT has produced an additional two-day pilot, "The Place of Doors," which has proved highly successful. For the first time, commercial television producers and writers were employed to undertake packaging of the learning materials. Produced in color on quad tape, the program has the



## the place of doors ACTIVITY KIT

An activity kit is an integral part of the "Place of Doors" program.

ability to be disseminated by broadcast stations, or through dubbing to helical format.

During the month of May, *"The Place of Doors"* was made available on Sony 3/4-inch color videocassettes to four schools—East Greenbush, Pocantico Hills, Glen Cove, and Westfield. These districts are typical of the urban disadvantaged, suburban middle class, suburban affluent, and rural districts which are found in New York State.

Evaluation was founded on a pre-test, post-test, re-test basis. Each student was tested for cognitive and attitudinal learning. The results were quite positive, indicating that after two half-days of exposure in the various curriculum areas, right answers had improved from 8812 to 11,528 for an overall advance of 17.66 percent, but a 31.67 percent increase in right answers. The four-to-six-week delayed re-test indicated that learning retention was good. It indicated an increase of 1800 right answers over the

pre-test for a 24.37 percent improvement.

Encouraged by these results the Education Department, working in concert with Nassau County BOCES, has successfully pursued federal funding for ICEIT under ESEA Title III. The project is currently involved in developing, under the Title III proposal, up to 20 days of television-managed learning modules. Work is now under way in developing the curriculum to be field tested for inclusion in those modules. In the early fall, preliminary curriculum packages will be made available to all interested software suppliers in order to seek their guidance and input with regard to the use of existing media in the production of those modules. The project would welcome hearing from any of these suppliers. Call (518) 474-5823, or write to: Project ICEIT, Educational Communications Unit, New York State Education Department, Albany, New York 12224.

## Instructional Radio: Under-Utilized Medium

THE TASK FORCE OF NATIONAL EDUCATIONAL RADIO (the radio division of the National Association of Educational Broadcasters) concludes its chapter, "Findings and Recommendations," (in a report just released) with this paragraph:

"Radio has been with us for more than 50 years. It has had many effects upon our nation, but somehow it never has been harnessed in the service of education to any great extent. Hopefully the work of the NER Task Force will enable American educators and broadcasters to join forces in doing so."

In early 1971 when the newly appointed staff of NER surveyed the situation, it found not more than 25 percent of the 200 non-commercial radio stations belonging to NAEB using their facilities to provide instructional materials to students—in classrooms, on campuses, in places of business, or at home. And, although there was increasing interest in "public programming," there was little indication that schools and colleges beset with budget problems would turn to radio. Educational radio was neither heavily involved in providing services, nor very strongly supported by schools.

At the same time, however, there was growing acceptance of the concept of educational broadcasters becoming telecommunications centers to help solve educational problems. NER, therefore, set out to provide direction to those striving to make use of instructional radio.

Examples of instructional radio were well known and were covered in an earlier report, "The Hidden Medium; Educational Radio." These include, the Task Force notes, "broadcasts on main-channel radio stations, some with the use of FM subcarriers, others with audiocassettes, tape recordings, variable-rate audio devices, control scan video facsimile, and the like." Applications ranged from pre-school to post-professional education. Nevertheless, there was little research to document what really happened to learners.

The recommendations of the Task Force called for:

- Steps to be taken to bring closer working relationships between educational administrators and educational broadcasters;
- Concerted action by all concerned agencies to improve facilities and to provide financial support to stations and audio production centers serving instructional needs (Office of Education support, in particular, is asked for);
- A system on the part of NER/NAEB and National Public Radio and others to get material to

### Commercial Radio Discusses Learning

"What's New in Learning" has been a CBS Radio Network feature since November 23, 1969. It is currently being broadcast by 200 of the 244 stations affiliated with the network. CBS Radio calls it a commercial public affairs program (spot ads may be inserted).

Host is Hale Sparks, a pioneer in educational broadcasting, who started narrating the radio program "University Explorer" in 1933 for the University of California. ("University Explorer" and "Science Editor," another Sparks program, are regular CBS weekly programs.)

Although the program is only four minutes long, it covers many interesting things happening in the field of learning. Among radio subjects: Dictionaries written by children for children, helping a child learn to walk, value of the "external" degree, handling pugnacious grade-schoolers, etc.

### ITV Guide From ERIC

Abstracts of the best ERIC documents on instructional television are included in a 30-page paper edited by Dr. Warren Seibert of Purdue. Write ERIC Clearinghouse on Media and Technology, Stanford University, Stanford, Calif. 94305.



sers (including the preparation of new material); Demonstration projects to provide measurement of results in terms of both learning objectives and costs;

Action to reserve space on satellites and cable TV for narrow-band services.

Part II of the report offers guidelines for effective audio instruction preparation, and several supplementary papers shed light on the problem. A detailed survey of instructional radio shows a decided decline in instructional broadcasting. Of the 140 radio stations responding (214 were queried), 59 percent broadcast instructional materials at one time

or another. Currently only 40 percent are doing so. As few as 11 percent can be viewed as primarily instructional stations. The majority see their primary purpose as providing information and culture to a general audience. The tendency over the years has been for programs aimed at K-12 students to be formal for group listening. College level and adult programs tend to be informal.

The NER report reaffirms a conviction held by its members that American education, currently in deep trouble, could find solutions to some of its difficulties through comparatively inexpensive audio technologies.

## The Biomedical Communications Network

EDUCATIONAL BROADCASTERS have to struggle to convince public school educators that instructional radio (or ITV for that matter) can be of value. Medical educators already have the message and the Lister Hill National Center for Biomedical Communications is a source of many interesting experiments involving communications satellites, computers and communications networks, and cable TV.

The experimental Alaskan Satellite Network, started in August 1971, is one project under the Lister Hill Center's direction. This network is already credited with having saved two lives in medical emergencies.

Inexpensive terminals in villages, field-service unit hospitals, and medical centers are interconnected with a voice link operating through the NASA ATS-1 satellite. Medical traffic is carried two hours a day, seven days per week. Services provided include:

- Voice consultations between community health aides and physicians at hospitals;

- Continuing education of health aides, nurses, and physicians;

- Education of villagers in personal health matters.

The system can also be used to permit hospitalized patients to communicate with their families back in remote villages. The purpose of the experiment is to determine what useful services can be adequately provided by voice communications. The network is also being used to transmit computer data and graphics by facsimile. A similar network is now being planned for Micronesia, American Samoa, the Trust Territory of the Pacific Islands, all linked to the University of Hawaii.

In 1973 the much-discussed NASA ATS-F satellite with video capability, will be launched and demonstrations in the Rocky Mountain states will be conducted. Not all of the experiments are known, but they will include:

- Programmed instruction between medical schools, and between medical schools and remote field sites;

- Medical consultation;

- A combined education and health program for migrant workers and their families using a mobile terminal.

Cable TV experiments using a broadband communications link between the University of Colorado Medical School complex and the Denver General Hospital and neighborhood health clinics will soon be tried. There will be 24-hour access to information and consultation via the cable, and interactive audio and video information will pass between the medical school and hospital.

In New York City, the Mt. Sinai Medical Center, which accepts responsibility for the health care of East Harlem, a large poverty area, will try cable. Many residents are on welfare, or subsidy of some sort, and in need of special services. There are many relocated persons in the area. Since these individuals depend on commercial television for information about the world in which they live, Mt. Sinai will try two-way interactive TV between the medical schools and individuals in their apartments.

Microwave links are also being used by the Lister Hill Center to extend medical resources. One such link under the Center's sponsorship connects Dartmouth's Medical School and University Hospital in Hanover, New Hampshire, with Claremont General Hospital 30 road-miles away. There are now ten hours of transmissions a day, six days a week, passing between the institutions. Programs range from surgical rounds, to a pharmacology course for licensed practical nurses, to actual psychiatric consultation and therapy. A 150-mile microwave extension into Vermont is scheduled for construction in early 1973. Part of the network will include a van-mounted microwave unit to tie small hospitals into the network.

Another project of the Center is to study improved learning techniques. Are notebooks and handwritten lecture notes obsolete? Is a tape recorder more effective? Can speed compressors be used in playback? Answers to some of these questions are being sought at the Washington University College of Medicine.

BM/E

Norelco's New PC-72:

# The Green

An innovative  
new 3-Plumbicon  
color camera  
that eliminates

- Camera mismatch
- Cable mismatch
- Color mismatch





# Gremlin Killer

The innovators at Norelco introduce today's most advanced color camera in its price range. Not an updated model. A new generation. It kills many stubborn problems that have tormented video production men for years. And its CLUE feature helps you get better performance from other cameras you already have.

With the latest solid state circuit technique and modular design, the PC-72 achieves new standards of stability, reliability, and ease of maintenance. Plus three major new standard features you can't find in other cameras.

**CLUE for quick, precise set-up and camera matching.** CLUE allows you to set up accurately and more easily without a waveform monitor. Using a black and white monitor, CLUE compares alternate scan lines from the red, green and blue signals. Peak white, black levels and gamma tracking in the color channels are quickly and accurately adjusted

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Presto, your cameras are set up and matched in a fraction of the usual time!

**Precise compensation for standard cable, mini cable or any combination of both.** Now ringing and smearing from cable mismatch disappear. It's as easy as dialing a phone. The PC-72 operates with up to 3,000 feet of standard cable or 2,000 feet of mini. Mix 'em up in the line if you like. Just dial the footage of each into the camera. Presto, perfect camera/cable compensation!

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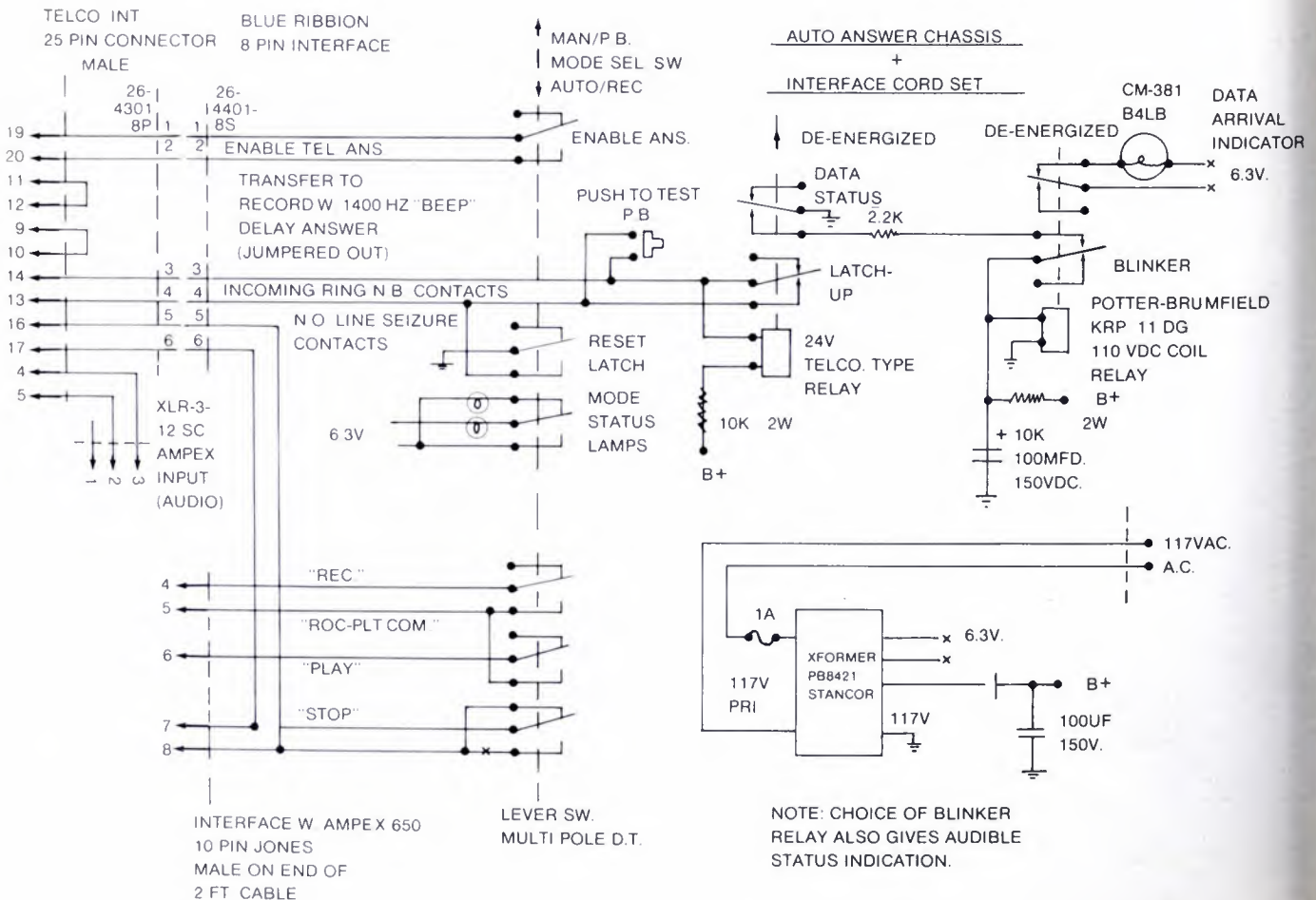
# Automatic Telco Line Recording

By George Endres, Chief Engineer, WGMS AM-FM

HERE'S A DEVICE built to interface an Ampex 650 tape recorder with the telephone company's KS-19522 Recorder Coupler. It's a List 2 Coupler, which can be ordered from any regular telephone company office. If your lines go through a PBX or Centrex, the List 2 Coupler is necessary. List 2 Coupler has a voice operated disconnect which times out after the line is idle for 12 seconds (e.g. after a party hangs up). The List 1 Coupler will not disconnect without central office help. This help is available on normal direct phones, but after some period of time after the calling party hangs up.

Incoming calls are answered after the first ring. A

pause ending with a "beep" assures the caller that the recorder is on line and operating. Twelve seconds after the end of message, the Vox disconnects the line and stops the recorder. A ringing voltage detector at the start of the call-in activates the blinking status indicator, and the unit can be cued up for playback after it stops recording. Since cue and monitor are regular board functions, they are not duplicated. Headphones could additionally be used from front panel of Ampex, if necessary. A possible modification to the Ampex could be made to alert the operator that the machine is not loaded with tape, or that the tape has broken. **BM/E**





A family of standalone television signal products which alone or in combination provide line-by-line or continuous resolution of input video time base errors in monochrome and color composite video signals. Correction to better than  $\pm 3$  nanoseconds absolute or short-term jitter can be made either to reference sync, or to an average time phase of sync or color subcarrier derived from the input composite video signal.

The nominal input video signal to any of these units is 1.0 v p-p composite video sync negative, 75 ohms terminating internally. The signal source will typically be the DEMOD or TBC output of a VTR, or the output of a standalone or integral Dropout Compensator. Applications not involving a VTR include complex video switching or teleproduction processing facilities, and satellite communication down link receivers, for continuous, automatic correction of re-routed or drifting video signals.

**Delta 44 TIME BASE CORRECTOR**  
(AVAILABLE NOW - SEE YOUR DISTRIBUTOR)

Base product of the Delta Series. Input window  $\pm 2.2$  microseconds wide with respect to external fixed or drifting H or color subcarrier reference. Output resolution: monochrome -  $\pm 25$  nanoseconds; color -  $\pm 3$  nanoseconds, both with respect to selected fixed or drifting reference. Standalone Time Base Corrector for all heliscan and quad VTRs equipped with head servo systems which reference external sync in reproduce mode. All versions include adjustable color processing amplifier which rebuilds V and H blanking intervals using sync and subcarrier from reference source.

**Delta 28 TIME BASE DIRECTOR**  
(AVAILABLE IN OCTOBER)

Input processor accessory to Delta 44. Detects time phase of H pulse or burst in input video signal line by line, and derives drifting average value for use as window-shifting reference in the Delta 44 in place of fixed reference. Interfaces to heliscan VTRs equipped with "electronic editor" feature (head servo references external V sync in reproduce mode), and quad VTRs not equipped with "Intersync" or "Pixlock" head servo circuitry, both of whose maximum acceleration is less than 25 cycles/sec<sup>2</sup>. Drifting reference may be looped through Delta 44 to gen lock studio sync generator, permitting limited post-production processing and dubbing of tape from v-locked VTR.

**Delta 7 HEAD VELOCITY ERROR CORRECTOR**  
(AVAILABLE IN NOVEMBER)

Input processor accessory to Delta 44, or may be used as standalone signal processor when time base correction is not required. Detects average rate of acceleration or deceleration of video head to tape velocity through line by line computation of burst phase differences in incoming video, and inserts a new, complementing, linearly varying delay in each succeeding line. This reduces the hue shift effects attributable to the head velocity error component of the total detected error to  $\pm 3$  nanoseconds with respect to color burst phase at the beginning of each line. Interfaces to VTRs which reference external V and H in reproduce mode.

**Delta 635 FULL LINE DRIFT CORRECTOR**  
(AVAILABLE IN EARLY 1973)

Input accessory to Delta 44. Locates H pulse of each incoming TV line, computes its time phase with respect to stable external reference H, and delays that line appropriately to cause its arrival at the Delta 44 input within  $\pm 0.5$  microseconds of the time of arrival of the next external reference H pulse. Interfaces to heliscan monochrome and color VTRs whose H frequency drift is less than 25 cycles/sec<sup>2</sup>.

**Delta 400 HEAD SERVO DRIFT SUPPRESSOR**  
(AVAILABLE IN SEPTEMBER)

Output accessory for Delta 44. Utilizes the internal voltage input to the Delta 44 Delay Status Meter to generate steering voltage of  $\pm 12$  VDC at 10 milliamps. This voltage is available as an input to any VTR with a V-locked head servo system. It provides a means of holding the off-tape signal of VTR in the window of the Delta 44, after-modification and adjustment of the VTR to utilize these signals.

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- ▲ Specifications subject to change prior to introduction.

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# SECAM/60 Could Solve CCTV Color Problems

By Joseph Roizen

Even with high-priced broadcast equipment, consistently accurate NTSC color transmission needs a lot of attention from highly-skilled personnel. CCTV's less refined hardware and smaller operating forces make NTSC color more chancy still, and often for users who need precise color—chemists, pathologists, quality controllers. SECAM/60 could be the answer for stable, faithful color—with a receiver that needs no color adjustment!

THE CLOSED-CIRCUIT TELEVISION MARKET in the United States is heading for a changeover to color similar to that which took place in the broadcast field in the middle sixties. The trend is quite obvious as evidenced by the emphasis placed on color television demonstrations at educational and industrial conferences by suppliers of all varieties of CCTV equipment.

There are major differences, however, between the application of a color television system in the broadcast industry and in the closed-circuit television field, especially in manpower and money. The number and caliber of available technicians, and the size of the budget for the hardware in CCTV, will undoubtedly be much lower than those which a profit-making network or large independent studio can draw upon.

All manner of supposedly low-cost color television devices are now offered by manufacturers of cameras, VTRs, switchers, monitors, etc., with the clear implication that these new gadgets will produce color pictures barely distinguishable from the high-priced brand. Unfortunately, the customer discovers only when he uses the equipment that some of his expectations must be heavily discounted.

Good color television is never easy. The complexities of correct colorimetry, the problem of encoding and decoding, and the multiplicity of interdependent controls on the display device make it difficult to provide even a direct color image of adequate quality. Add to this the further manipulation of the color signal by videotape recording, dubbing, and distribution, and it becomes a miracle that color is as good as it is.

When color merely serves to enhance the entertainment value of the program, faithful reproduction of the original scene is desirable, but not mandatory. However, in applications such as surgery, biochemistry, industrial processes, etc., where patholog-

ical, chemical, or physical information is conveyed by precise hue and saturation, precise color is essential. The FM color system (SECAM/60) described here eliminates some of the more troublesome aspects of the NTSC system presently in use and makes highly accurate color much easier to achieve.

## SECAM/60—Simplicity, stability, accuracy

The SECAM/60 color encoding process utilizes a line-sequential technique to create a color encoding method which considerably simplifies the recording, distribution, and display of color television images. Because the chrominance information is encoded in a line-sequential form, it is possible to generate color difference signals by the use of two *frequency modulated* subcarriers representing R-Y and B-Y. The color subcarriers are deviated, in modulations, several hundred kilohertz to cover the hue and saturation range of the color data. This wide modulation swing makes the system immune over a wide range to differential gain, differential phase, and time-base displacement errors.

The subcarrier amplitude is not critical since the color information is contained in the frequency deviation; thus it is necessary only to have sufficient amplitude of subcarrier to allow the limiters in the receiver to function.

In the SECAM/60 process, the subcarrier amplitude is approximately 16 percent of the overall signal. In addition to this, the large FM deviation allows a tolerance of approximately two kHz for defining a specific color. Even the most unstable helical recorders are capable of recording and playing the SECAM/60 color signal with sufficient fidelity to satisfy precise end-user requirements. As a matter of fact, experiments with SECAM/60 have shown that even saturated color bars, reproduced from a helical recorder while the head drum is subjected to severe externally-induced time-base error, show no shift in significant hue of the displayed color image.

A line-sequential color system requires means of

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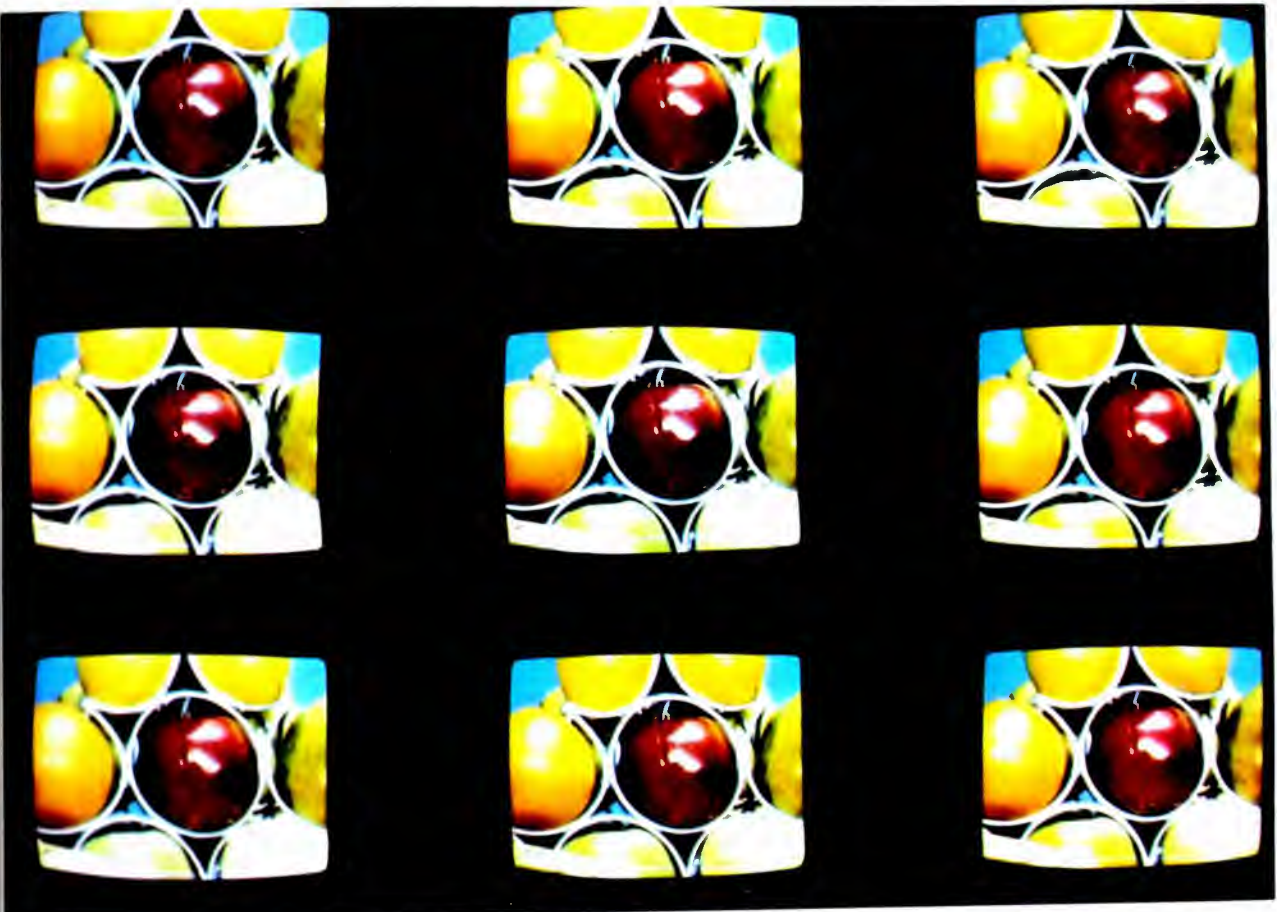
Mr. Roizen is president of Telgen, Palo Alto, California.



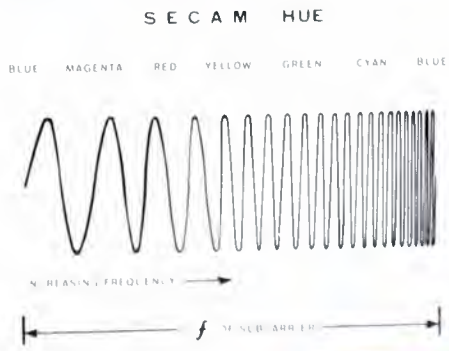
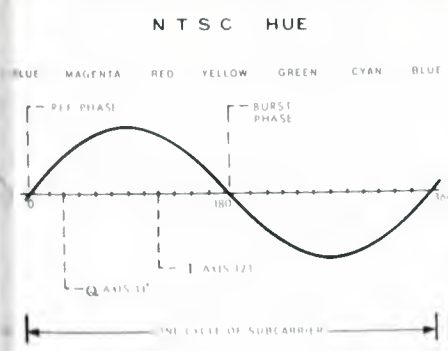
identifying the proper sequence of color lines in every field. To accomplish this, identification pulses are generated during vertical blanking. The nine lines following the post-equalizing pulses contain alternate swept frequencies, in which the correct

sequence for the following field is established. The identification pulses generate positive and negative switching pulses in the receiver decoder to produce the correct color sequence.

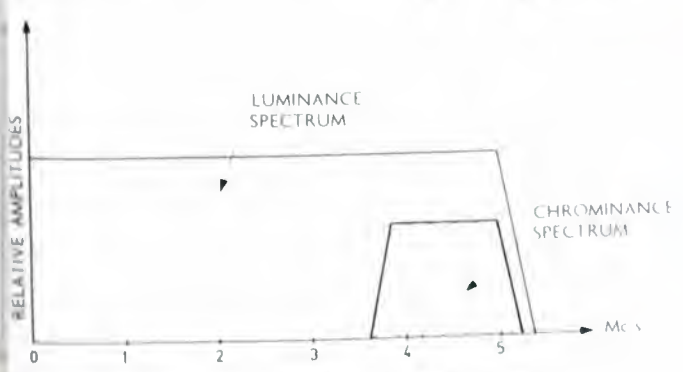
It is necessary to use both R-Y and B-Y informa-



Nine SECAM/60 monitors, which have no color adjustment, demonstrate the color stability of the system by their extremely close match. Almost any group of NTSC receivers or monitors needs frequent readjustment for acceptable color matching.



Basic color encoding is shown, left, for NTSC, and at right, for SECAM/60.



Composite video spectrum of SECAM/60 shows how the color subcarrier is fitted in.



Stability of the SECAM/60 hue with severe timebase error can be seen in this color bar picture, made with deliberate disturbance of video head drum



tion on every line to create a proper color display. The home receiver uses an ultrasonic delay line with a nominal 63.48 microsecond delay to do this. The practicality of the SECAM/60 system was established when it became possible to produce low-cost delay lines that have adequate bandwidth for such relatively long delay periods. At the present time, such delay lines are available for less than five dollars each.

#### No receiver color adjustment

A major advantage of the SECAM/60 process is the absence of any need for color adjustment on the home receiver or display monitor. A normal SECAM/60 monitor has only the monochrome controls of brightness and contrast, plus a very limited range saturation control that requires only infrequent adjustment. There is no hue control in the system since, once screen balance and tracking are adjusted correctly for proper monochrome rendition, the chrominance information is automatically as accurate as the originating source. Immunity of the SECAM/60 signal to the effects of DG, DP, and time-base errors makes it recordable, dubbable, and distributable over most black-and-white equipment.

#### SECAM/60 compatibility

The SECAM/60 signal, since it uses normal EIA sync and blanking, is fully compatible with any monochrome image to the full bandwidth the monitor is capable of. Since the color subcarrier is above four megahertz, the resolution of the image is superior to that of the normal NTSC signal.

However, SECAM/60 signals cannot be displayed as a color image on the NTSC monitor because the method of color modulation is different. The decoder function for the chrominance information in a monitor is only a small portion of the circuitry. Monitors have been built with switchable SECAM/60 and NTSC decoders, as well as the usual single-standard units.

#### Available hardware

At present, SECAM/60 monitors are available in Conrac, RCA Lyceum, and Sony Trinitron models with plans well under way to produce equivalent versions with Tektronix, Magnavox, Electrohome, Setchell-Carlson and others. Normal SECAM receivers made in Europe by major manufacturers, such as Philips, Thomson, EMO, Schnider, etc., can be easily adapted to SECAM/60 by exchanging the European delay line of 64 microseconds for one of 63.5 and readjusting vertical sweep circuits. (**Editor's note:** Mr. Roizen's firm, Telegen, has developed encoders for SECAM/60.)

#### NTSC to SECAM/60—and vice versa

While it is desirable for the reasons outlined that a closed-circuit television system originate and distribute color signals entirely in SECAM/60, it may not always be practical because NTSC units are already in place. To allow NTSC origination and SECAM/60 distribution, NTSC can be transcoded to SECAM/60 by the following process. The NTSC signal must be of good quality to start

with since no transcoding process can improve on the original. This requires either a direct feed from the source or, as a minimum, direct color recovery on a highband recording in which mathematical integrity between sync and subcarrier has not been destroyed. In addition, no band separation filters should have been used to extract chrominance from luminance in the recording process.

The composite NTSC signal is applied to the input of a precision comb-filter decoder (CBS Labs or equivalent). The decoder now will provide an RGB output and decoded sync which is correctly timed to the video signal. These signals are applied to the SECAM/60 encoder and the output will be a composite SECAM/60 signal. In order to assure color matching it is desirable to use a precision monitor with dual inputs. Tektronix Type 650 with an NTSC and RGB switchable input makes it possible to match on the same monitor screen the input and output of the comb-filter decoder thereby assuring color identity.

In the reverse situation, where it is necessary to provide an NTSC copy from a SECAM/60 original, the process is simply inverted. This direction of transcoding is somewhat preferable since the original SECAM/60 signal has a greater bandwidth than the NTSC end product. Decoding of the composite SECAM/60 signal is accomplished by a precision decoder (Thomson TTV4635 or equivalent) and an output on RGB and sync is obtained. These signals applied to an NTSC encoder will yield a composite NTSC output. Since the NTSC encoder is driven by a color sync generator with an integral 3.58 subcarrier, the NTSC output should be fully compatible with any other NTSC source, provided the stability of the original SECAM/60 signal is adequate. If it is expected that a SECAM/60 installation will require frequent interface with NTSC systems it would be preferable that the SECAM/60 encoders be driven by normal EIA color sync, rather than monochrome.

Over the past three years we have conducted very precise transcoding tests in both directions with analysis equipment capable of extremely critical appraisal of the final result, both by wave-form measurement and colorimetric display. With the proper originating signals, transcoded images are virtually indistinguishable from the standard in which they were generated.

#### Summary—SECAM/60's advantages

The selection of a color encoding process for closed-circuit television application is not a simple problem, since many factors related to the specific application and the degree of interchangeability with existent systems must be taken into account. Experience to date with the NTSC system has shown that unless the most rigid technical controls are enforced, and very high quality equipment is used, the end result of the final distributed helical tape is often not acceptable to the critical recipient.

In addition, the fact that the end viewer may alter the colorimetry of the displayed image at will with-

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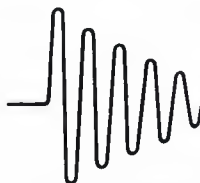
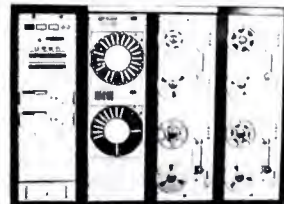




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# RCA

## New TK-28 color film camera.



# The Videocassette Is Beginning To Roll

But a lot of problems hang heavy over it, among them—what will the consumer buy and for how much?; how will the coming titanic intra-industry struggle affect market progress?

SUMMER-FALL 1972 will probably be marked as the period when cartridge video (or cassette video—you can still take your choice) at last achieved some solid marketing motion, enough to refuel the great industry expectation machine, with exuberant talk about making the multi-billion consumer market respectable again. Not only marketing, but technology, got a more solid look than at any previous period.

The most impressive market advance for record/play equipment was chalked up by Sony's U-Matic  $\frac{3}{4}$ -inch system, which became available in the U.S. early in the year. Its main success was as a training and information tool for business, industry, and large organizations of other kinds—the initial market which Sony, in fact, set out to corner.

For example, the Army's Audio-Visual Division, as reported by its director Robert M. O'Boyle, after a trial run with about 600 U-Matics, decided to standardize on that system and said it would buy 6000 to 10,000 units next year. Just a few of the large-scale users among large corporations were Coca-Cola, Prudential, Merrill Lynch, Maytag, and the Ford Motor Co.

But Sony is not going to hold onto this very significant market without a fight. The industry continues to build for a mammoth, winner-take-all struggle among the electronic giants of the world. According to a spate of announcements and press parties during recent months, the big firms with heavy stakes in record/play videocassette development are all going full out. Nobody is going to back down, or join—very soon, at least—any rival's dominant system. We are promised before the end of the year  $\frac{1}{2}$ -inch and/or  $\frac{3}{4}$ -inch systems from Norelco (already very

strong in Europe and on early form, at least, the most important international competitor of Sony); Panasonic, Concord, JVC, and a number of others. Back of them is RCA, with its non-compatible  $\frac{3}{4}$ -inch system promised for 1973; Ampex Instavideo, also for 1973; AKAI, with its  $\frac{1}{4}$ -inch system, already demonstrated at several shows; and IVC which has announced, but not shown, a higher-quality 1-inch cartridge device.

Among play-only systems, EVR shows every sign of staying strong in the fight, even though its developer, Columbia, has taken a somewhat passive stance. Motorola, the principal agitator for EVR in this country (manufacturer of playback units), together with strong associated firms in England and Japan, is pushing EVR worldwide. A big sale of both hardware and software to operators of British oil tanker fleets for entertainment of crewmen occurred early in the year, with other shipping outfits interested. Lloyd Singer of Motorola reported more than 2000 EVR players actually in users' hands.

Looming in back of EVR, and every other play-only system, is the video disc. Teldec was making somewhat quiet we-are-working noises, but RCA rather loudly laid claim to important progress on its disc, promising more detail before the year is over. Some outside observers who saw a prototype of the RCA disc demonstrated at the firm's Princeton laboratory were highly enthusiastic. Zenith has told its distributors it is working on a video disc. The latest development in the disc area is the recent public demonstration (in Eindhoven) of the Philips Video Long Play Disc. Philips has taken an optical approach contrasted to Teldec's embossed vinyl. A mirror surface is laser etched with luminance, chro-

minance, and sound data; the pick-up is a laser feeding silicon diode. Players are projected to cost \$625 and be on the market in 1974. *Television Digest* reports other disc systems are coming from MCA and Thomson-CSF.

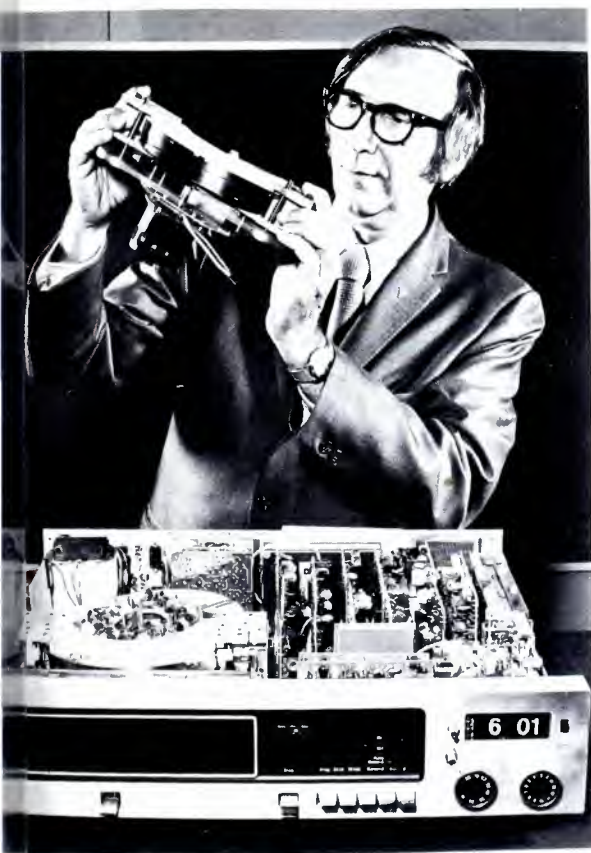
The first large move to garner the legendary consumer market (a legend before it was born), came with sales by Sears in Chicago and other cities of TV consoles incorporating the Cartrivision system. There was at least some public response; Sears is said to have reordered units as this issue went to press.

In late August, Cartrivision introduced at a press show in New York its separate *player* and *recorder-player* units which allow the system to be connected to any existing TV set in black-and-white or color, through the antenna terminals. Results looked high-

quality on a variety of current receivers from all the leading TV set makers. The units were promised for regular delivery in the spring of 1973. Retail prices were pegged at about \$700 for the player and \$900 for the player/recorder.

Brought very much to the fore by the Cartrivision show was the question of what the videocassette home user wants to see, and how much he will pay for it. Cartrivision has put very large sums of money down for its answer which, by and large, is this: what people like today in the movies and on television is about what they will pay rather handsomely for as "self-selected" home video programming. There are two ways of getting Cartrivision programming: a rental fee of \$3 to \$6 gets you a movie, which you can play *only once* (you can't rewind it at home); a

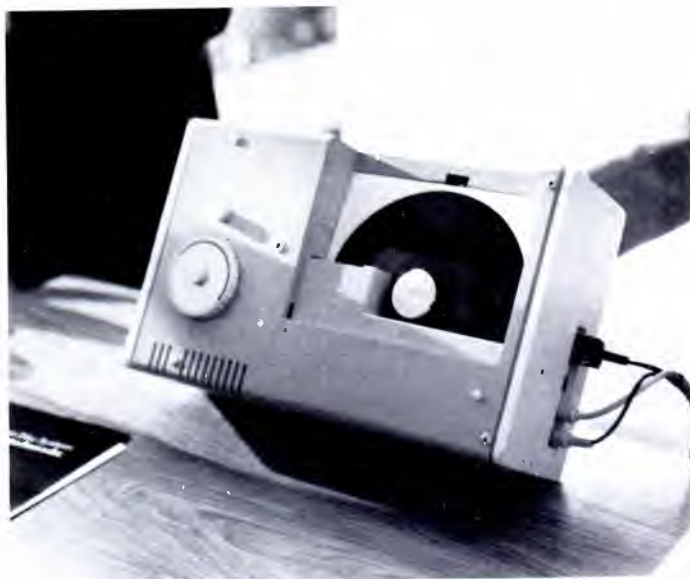
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RCA cartridge concept, which will be adopted by Magnavox and Bell & Howell, has heads entering cartridge for scanning.



EVR player made by MGA (Mitsubishi).



Teldec video disc player shown at VIDCA.



Concord is most recent entry in videocassette race.



## Videocassette Exhibition— VIDCA, Cannes, March '72

Excerpts from a comprehensive report on VIDCA prepared by Donna and Joseph Roizen

There were two subjects of paramount interest at VIDCA—standardization and copyrights. It became quite obvious early in the conference that there is no likelihood of a universal cassette standard as far as video magnetic tape is concerned. The two major companies who were demonstrating deliverable units have different devices employing incompatible formats. It is also obvious that Sony and Philips have both decided to compete for as much of the international market as they can get. Each company has collected its own list of adherents through agreements to participate in the distribution or produce for sale their own configuration. Sony's position is now strengthened through an already existent large-scale distribution network and a recent cross-license agreement with the 3M Company and its consumer arm, Wollensak. Philips has signed up more than ten European manufacturers, such as Grundig, Telefunken, Thorn, Zanussi, etc. Both manufacturers claimed adaptability of their units to 60- and 50Hz power areas thereby providing some level of interchangeability between programs made in North America and other parts of the world.

There was very little discussion of the need for a single standard. As a matter of fact, each representative gave reasons why his format or standard had been chosen and would be held to. Each felt he had the answer to the problem of interchangeability of programs between countries and continents, but his solution to the problem was for customers to buy only his machine. But the "also rans" can't make it because the big companies, mainly Philips and Sony, are well entrenched with a wide range of distributors who will sell to their customers the machine that they have for commercial, political, and technical reasons. Actually, it appears all the machines make credibly good pictures at shows and are certainly usable the way they stand. The question is, can they do the same in users' hands, something which is not as easy as it seems at exhibitions.

It was accepted that Super 8 film represented a "de facto" standard, that EVR being on film might also become semi-universal and that the video disc (TELDEC) would automatically be a standard if no other similar device appeared on the market. In the videotape domain, no uniformity could be expected since the hardware designs are now frozen into at least four major configurations (Sony, Philips, Ampex, Cartrivision) and a dozen minor ones.

The CBS-EVR system is on great display in Europe and apparently reports of its demise are somewhat premature. There were at least four different kinds of players on display, one by the Bosch Company made in Germany, one by Rank made in Britain, one by Thomson, which appears to be a Motorola player with a Thomson name on it, and one by Mitsubishi which is made in Japan. The EVR partnership was displaying three types of machines in

their own booths while Mitsubishi and Thomson both had individual EVR players operating in theirs. Motorola had a private exhibit room showing samples of a catalog of programs and their players.

Pictures reproduced from the system are better than the pictures shown in the U.S. on the same machines. While they appear somewhat soft and noisy, they are perfectly acceptable color images and they were shown on relatively large screen monitors—mostly British, French or German, depending upon the particular booth visited.

The Panasonic booth included a demonstration of both NTSC and PAL, but Panasonic this year is only showing one format which is a cartridge one-half inch machine. It apparently can be made to work on either NTSC or PAL, but not interchangeably. It is interchangeable in monochrome. In any case, the cartridge unit, which is a one-half-inch wide tape, is not compatible with the Philips arrangement and the tapes are different. The Panasonic demonstration was done with very fancily produced tapes with lots of color shifting and color changes in which emphasis was placed on production aspects rather than accuracy of the color reproduction. Pictures look reasonably clean and noise free.

Philips displayed its first SECAM prototype. PAL units are now available for about \$1000—SECAM units are promised for next year. No NTSC units were displayed, but are promised for later this year. There are a variety of configurations, including units with tuners for off-air recording. Blank cassettes (reel over reel one-half inch wide) cost 150 DM (\$35.00) for 60 minutes. Philips units will be manufactured in Vienna where their audio cassette units are made.

Sony was making a very strong pitch for the European market this year which they did not do last year in Europe. Now that they are able to handle PAL and NTSC with the same machines, they are going to give Philips a lot of competition there.

The Teldec booth consisted of a single Teldec player with three monitors connected to the same player. The player is very small—about the size of small reel-to-reel audio recorder. The discs themselves are a little larger than a 45 rpm disc, but very thin and pliable. There were five minutes of play on the disc and the pictures shown were reasonably good, although close inspection showed some color bleeding and moire patterns in the color. Recording must be in RGB, with encoding of the signal after it comes off the discs. It cannot be recorded in real time. The discs are produced by a rather complicated process using a flying scanner looking at a film and recording on the discs in some reduced time scale.

Nevertheless, the player is very compact and works smoothly.



purchase ranging from about \$13 to about \$40 buys you a cartridge, which may be anything over an extremely wide range, from movies to all kinds of self-instruction, self-help, education and "edutainment," and culture in all varieties—from Orson Welles reading poetry, to lectures on Roman art, etc., etc. These, of course, can be replayed as often as you like.

To capsulize the question: how many people will pay on the order of \$15 to be able to watch, over and over, Julia Child, for example, bake a brook trout? Cartrivision is betting there will be a lot, and maybe they are right. A number of perceptive observers think the programming demands of the videocassette are quite different from those of movies or television, and *BM/E* thinks they may be right. But the answer won't be in for awhile, perhaps for several years.

Both the successes and the uncertainties of the videocassette were much in evidence at two large industry shows during the year. In an accompanying box are excerpts from a report by Joseph Roizen on Vidca 1972, international video convention held at Cannes, France, in March. As Mr. Roizen saw it, the industry is bursting with beans, but suffering from the unanswered question as to who is in charge.

At VidExpo 1972, convention sponsored by the Billboard publications at the Hotel Roosevelt in New York, August 22-24, most participants were, again, in high spirits. There were many signs of snowballing interest in the videocassette on the part of users, actual and potential. The main problems of the videocassette were also perceivable.

More than 100 press people came to the show, about 210 others registered and paid the fees to attend the talk sessions, and an additional 700 signed up for the industry exhibits (available separately as well as to the session registrants).

Among the exhibitors:

**AKAI** showed its ¼-inch system, including play and record machines and a camera weighing 5¾ pounds.

**Concord** introduced its ¾-inch players and player/recorders, scheduled for September 1972 delivery, (compatible with Sony U-Matic) as well as a variety of VTR, CCTV, and A-V equipment.

**Mitsubishi International** showed its EVR player, fully compatible with world-wide EVR standards on 50- and 60-cycle power. MGA Div. is U.S. outlet.

**Motorola** showed color EVR cassettes produced at the new duplicating plant in England.

**Panasonic** showed both its ½-inch cartridge and ¾-inch cassette systems, the former compatible with EIAJ ½-inch standards and latter compatible with the Sony U-Matic.

**Sony** showed its own U-Matic equipment, which, as already noted, has made the biggest market penetration of any cassette system so far.

Among those with important exhibits on various aspects of software were **Modern Talking Picture Service** (U-Matic and CATV and CCTV programming); **Thomas Valentino, Inc.**, (music and sound effects recordings); **Videorecord Corp. of America** (very extensive U-Matic library, paralleling in some respects the Cartrivision programming concepts

available in January in Norelco ½-inch form, later in other forms as well); **Video Program International** (X-rated, horror, and feature films on U-Matic dubbing and duplicating service (transfer of any video material to U-Matic form), was offered by **S-T Videocassette Duplicating Corp.**; this kind of service is now available in a number of cities coast to coast.

The uses of the videocassette that got a going over in the talk sessions, in addition to the very active corporate training and information field, were mainly those in education and for the home viewer. The session on education pointed again to the remarkable aid that well-made video programming can give to the learning process. Prof. Robert Heinich of Indiana University said that educational institutions must learn how to use the tremendous potentials of video instruction-aids, particularly in blending the "mass" with the "individualized" approaches possible. He also told how a state-wide network of educational institutions exchanged instructional material via videotape, to avoid duplication of instructional expense in a tight-budget time.

Prof. Georgia Noble of Simmons College, Boston, uses video to show individual and cultural differences in the teaching situation, in a program for teacher training. Bernard Hanley, of the Centereach (New York) school system, uses VTR equipment extensively for making a variety of community resources available to students. Walter Dale, of the Port Washington (New York) Public Library, used funding from the N.Y. Council of Arts to collect community-event video tapes, to show the community how to mirror its own activities.

The school personnel, however, were unhappy because, with their tight, long-range budgets, the lack of cassette standardization is a prime stumbling block. The potentially immense school market obviously will stay well below its potential until some dominant system appears. In addition there remains a question of whether the *quality* of instructional material (printed pages, for example) recorded and played back on ½-inch or ¾-inch equipment will be good enough. A lot of the demos have used material originally recorded on expensive quad equipment and dubbed down to the cartridge form.

The show was again finally dominated by that legendary consumer market. The session titled "The Multi-Billion Consumer Market—When?" found panelists and audience to a large extent polarized around two opposing projections: a) because of the high cost of both hardware and software, and the lack of standardization, it would be five to eight years, and maybe more, before anything like the consumer legend becomes a fact; b) not so—the uniquely new function of recording one's own video programs would prove to be an irresistible attraction for the home user, sweeping in the videocassette home market within a comparatively short period.

The only thing we can be sure of, in the view of this magazine, is that the next five years are going to be *surprising*. It is possible that *everybody* in the videocassette camp is wrong because, as at least two of the panelists at the show suggested, cable TV may take over the main show!

**BM/E**



# Why Not Broadcast Quad Stereo Right Now?

Broadcasting four-channel stereo isn't really the pioneering proposition it was a couple of years ago. With the new matrixing systems now used for discs (the Sansui system is described here), it's feasible to go on the air with quad instantly—with no special FCC permission or equipment required. You can even quadcast discrete tapes and live concerts, with the addition of a simple encoder.

By Ryousuke Ito

IF YOU HAVEN'T ALREADY TRIED your hand at broadcasting quad stereo, chances are you've at least toyed with the idea. Certainly the entire concept of four-channel broadcasting is so exciting and so promotion-oriented that it has to be considered an important part of any station's future programming. But why the future? Why not right now? You can broadcast quad today, right this minute, with no FCC approval or special equipment needed.

The secret is in the compatible simulated four-channel disc, and there are at this writing three such systems that are relatively compatible with each other. Naturally each manufacturer involved (CBS, Electro-Voice, Sansui) claims that his system is the ideal and the one that should definitely become the industry standard. Each one can cite substantiating evidence for his claims.

With time, each of the three has moved somewhat closer to its rivals with the result that today virtually any of the three encoding systems can be played back on any of the decoders with satisfactory results. This doesn't mean that all such results will be equally satisfying, and may certainly be far from idealized, but satisfactory nonetheless.

## Basic encoding

To establish the appropriate encoding methods and phase relationships, let's look at a typical four-channel matrixing relationship. In this and other presentations that follow, LF = left front; RF = right front; LB = left back; RB = right back. In the diagrams, BC = back center and FC = front center.

Fig. 1 shows the basic matrixing used for cutting compatible discs with the Sansui matrixing system. (See *BM/E*, December 1971, for description of the CBS encoding.) Based on these vectors:

$$L = (LF + LB)\cos\theta + (RF - RB)\sin\theta$$

$$R = (RF + RB)\cos\theta + (LF - LB)\sin\theta$$

When  $LF = RF = RB = LB = 1$ , then

$$L = 2\cos\theta = 1.84$$

$$R = 2\cos\theta = 1.84$$

This is the typical output of a four-channel encoder of the generalized type shown in Fig. 2.

**Mr. Ito** is manager, four-channel system planning and promotion, Sansui Electric Co., Tokyo.

The other systems are essentially similar, except that the initial phase relationships may differ, causing an apparent shift in channel location and certain other phase differences. The result: separation and location can differ (and suffer depending on the judgment of the listener) from system to system. Whichever system becomes the industry standard, it must have these features:

- Ability to record sounds occurring at any point in a 360° sound field, reproducing these sounds in the correct location during playback.
- Signal quality should not be degraded in noise, frequency, and non-linear distortion as a result of being matrixed.
- System should be totally compatible with existing playback equipment, using standard components wherever possible.
- The four-channel program should be capable of reproduction on all standard two-channel equipment, with all sonic material from the four-channel program heard in their proper left/right positions.
- Monophonic compatibility should likewise be total with a full program that doesn't lose or alter relative levels of any sounds in the original four-channel program.
- The system should be adaptable to standard software manufacturing practices.
- Any format used should be adaptable to standard software manufacturing practices.
- Any format used should provide full playing time, or the playing time equivalent of stereo recordings.
- The recording matrix should be usable with all major recording media and capable of being broadcast.

The decoder output of a typical matrix is as follows:

$$L = (LF + LB)\cos\theta + (RF - RB)\sin\theta$$

$$R = (RF + RB)\cos\theta + (LF - LB)\sin\theta \quad (1)$$

The relative decoder output is:

$$LF' = L\cos\theta + R\sin\theta = LF + 2R\sin\theta\cos\theta + LB\cos 2\theta$$

$$RF' = R\cos\theta + L\sin\theta = RF + 2LF\sin\theta\cos\theta + RB\cos 2\theta$$

$$RB' = R\cos\theta - L\sin\theta = RB - 2LB\sin\theta\cos\theta + RF\cos 2\theta$$

$$LB' = L\cos\theta - R\sin\theta = LB - 2RB\sin\theta\cos\theta + LF\cos 2\theta \quad (2)$$

From these equations, if  $LB = RB = 1$ , or when there is a sound source at the back center of the

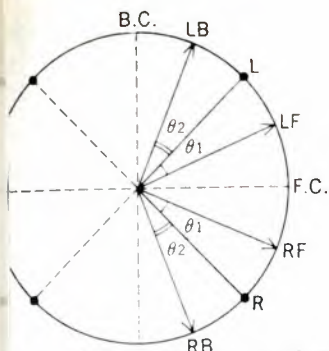


Fig. 1. Basic vectors for cutting matrixed disc.

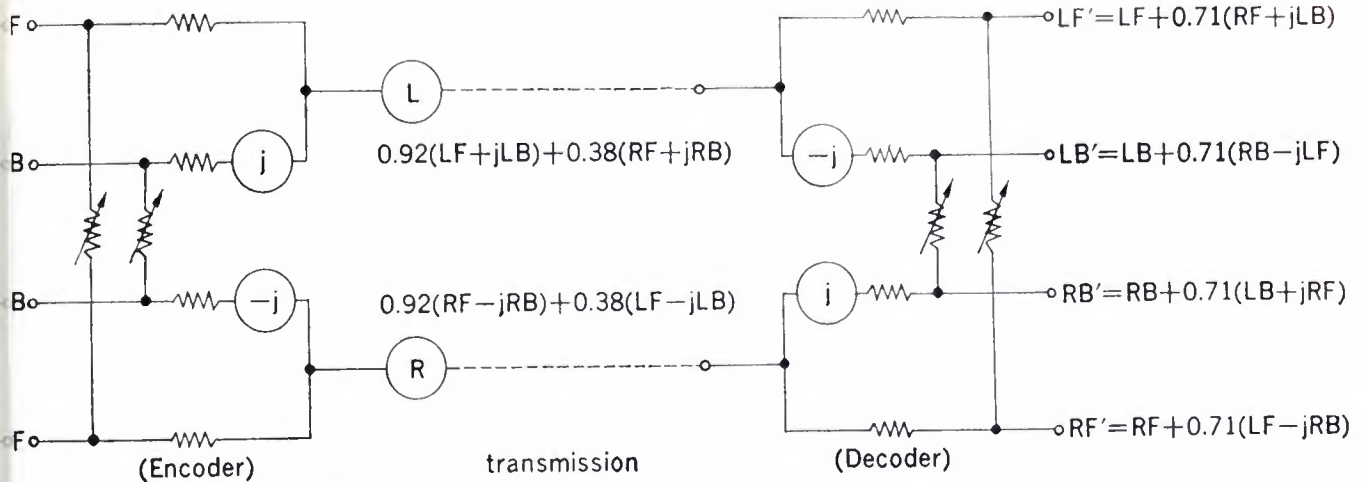


Fig. 3. Block diagram of encoder.

$$\theta = \frac{\pi}{8} \begin{cases} \tan \theta = 0.414 \\ \cos \theta = 0.92 \\ \sin \theta = 0.38 \\ 2 \sin \theta \cos \theta = \cos 2\theta = 0.71 \end{cases}$$

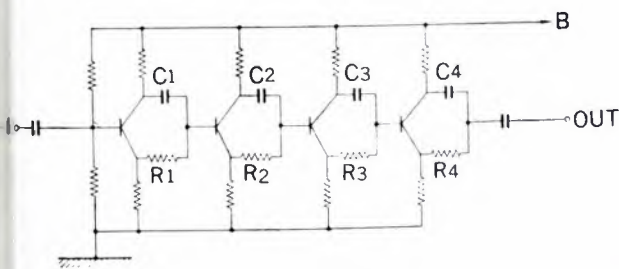
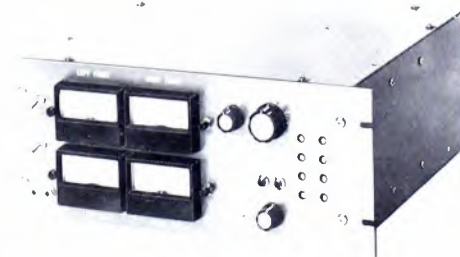


Fig. 4. Phase shifting circuit.



Four-channel encoder by Sansui.

original sound field, these equations can be derived:

$$\begin{aligned} L &= LF \cos \theta + RF \sin \theta + (\cos \theta - \sin \theta) \\ R &= RF \cos \theta + LF \sin \theta + (\cos \theta - \sin \theta) \end{aligned} \quad (3)$$

These equations show that out-of-phase components in the left and right back channels cancel each other out. The result is that the encoder output consists only of in-phase sound components.

This loss of audio information and mislocalization of sound sources happens during the encoding process. This also shows that it is practically impossible to encode simultaneous four-channel signals of identical phase and level with this technique; they'll simply cancel each other out.

The equations (2) show that the left and right back are 180° out of phase with each other. Thus, any sound sources in the back in a quad program would sound very unnatural and unclear, and would have little directionality, even when the encoding is

properly handled. The same will happen with other types of matrixing based on the vectors shown in Fig. 1.

Most four-channel encoders have not been able to convert true four-channel information into two channels and reconvert them to four because of this phase cancellation during the encoding process. The apparent conclusion is that a simple matrixing system for encoding and decoding quad stereo programs doesn't overcome this defect.

### Phase-shifting technique

By introducing a rear-channel phase shift of ± 90°, and by setting the disc-cutting vector angles (θ) between each adjacent channel at 22.5°, these phase cancellation problems can be solved.

This phase-shift in the Sansui QS encoder—instead of using the usual 180° phase inversion used in other systems—produces the desired phase rela-



tionship between the two rear channels. Some other matrix systems introduce a phase shift at the rear channels in playback—and this *artificial* phase shift changes the ambience to produce a sense of

spaciousness that is not true quad stereo. In effect the phase shift is introduced to make up for the system's shortcomings which may have resulted  
continued on page 6:

## The Quadraphonic Sound at AES

The 43rd Audio Engineering Society Convention last month marked a good point in time from which to assess the fast moving and fluid quadraphonic industry. In an opening session John Eargle compared 4-2-4 matrix systems as to their design goals and compatibility—with each other and with normal stereo and mono requirements.

That afternoon J. James Gibson looked at the problem of FM broadcasting 'panoramic' sounds and proposed a 4-3-4 system. Later a panel of broadcasters, manufacturers, and matrix format designers tried to take stock of where the quadraphonic broadcast industry is going.

And, if one wanted to substitute the real thing for theory and expert opinion, one could hear live demonstrations at the suites of CBS Labs, Electro-Voice, Victor Co. of Japan (JVC), and Sansui.

From all this, **BM/E** came away with the following impressions:

- All of the demonstrations were extremely impressive. The psychoacoustic effect on us was that quadraphonic sound certainly adds more to stereo than stereo added to mono.

- All 4-2-4 systems sounded good and directionality was no problem at least for the selections played. Unfortunately, we didn't hear Sansui's encoded records played on CBS decoders and vice versa. E-V was showing a "universal" decoder, but Eargle predicts some losses.

- Discrete four channel discs are here, but it will be a while before a new standard adapted to quadraphonic broadcasting will evolve and gain FCC approval. Broadcasting matrixed records now is no problem, but just what kind of a commitment should be made to quadraphonics is not yet entirely clear.

The demonstrations offered convincing proof that directionality and adequate separation flaws of the past have been worked out. There is no confusion over where sounds come from. Sansui's demo switched between 4-4-4 discrete and 4-2-4 matrix; the compromises, if detectable, were minimal. Sansui, however, never had the directionality problem of others. Whatever lack of directionality and sound-source reversal criticisms that could be leveled at early E-V systems have been largely overcome.

Why this is so was explained by Eargle in his paper. Today all competitive 4-2-4 matrix systems are of the phasor type\*, (all pass phase shift networks). When this was not so, coefficients which were determined by addition or subtraction combinations made it impossible to reproduce a continuum of sound panned around the speaker array. Out-of-phase components occurred in some adjacent speaker arrays causing cancellation or distortion. Because of the inherent low separation of the system (3 dB), out-of-phase could be easily disturbing. Decoder modifications have overcome this and the SQ system uses logic circuits to attenuate the transferred signals to greatly enhance front-back separation. CBS demonstrated this separation at AES, by using a new tuner amplifier from Lafayette, the LR 4000, which incorporates the logic extender. The simpler approach is to use a 10 percent and 40 percent blend, respectively, in the decoded front and back channels. This allows the decoder to retain a 20dB front channel separation, and 8dB back channel separation, and results in a 6dB gain between center-front and center-back separation. This approach is very similar to the

new E-V matrix.

The matrix approaches do not quite match some of the performance of the JVC-CD-4 system which gets discrete channels through FM modulation superimposed on a conventional 45-45 groove. But since discrete four channel consumer equipment will be coming along relatively slowly, 4-2-4 systems got all the more attention from broadcasters. What does relatively slowly mean? The CD-4 system did go on the market in Japan in 1971 and it has been specified as the standard discrete disc by the Japan Record Industry Association. More than 100 albums are cataloged, and Panasonic will be making players in addition to JVC. (Prices quoted at AES were reasonable: decoder \$99, pickup \$69.) Furthermore, RCA Victor plans more releases (some dozen are out now) using the CD-4 format and will be marketing players early in 1973.

But 4-2-4 systems have the lead in the marketplace and true discrete may never catch up. The cutting system is complicated and the pick-up is expected to be costly. Consequently, as far as the broadcasting industry is concerned, the system is of academic interest until the FCC acts. One could undoubtedly get an experimental license for discrete four-channel transmitting, but the point is that few listeners are prepared to receive such signals.

Speculation on what might evolve as the broadcasting standard was rife at the AES, but this much is certain—the EIA industry committee on quadraphonics (called the National Quadraphonics Record Committee, NQRC), is meeting and will eventually recommend a standard from among some seven proposals now before it. Then the FCC will have to come out with a Rule Making. All of this may take two years or longer. (By that time, as Emil Torrick of CBS Labs says, 4-2-4 will be the "standard.")

The 4-3-4 solution by RCA is interesting. RCA says three signals are sufficient to reproduce an acoustic picture around the horizon with uniform response and uniform angular resolution. One signal conveys the monophonic information (below 19 kHz) while the other two convey the directional information (L-R, F-B). One of these is the standard stereo channel, the other a quadrature channel. A fourth channel can be placed in the portion of the baseband above 53 kHz, but this is an inferior part of the spectrum because of noise and intermodulation problems. If only three are used, there can be simultaneous SCA carriage. The arguments for the RCA approach are compatibility, fidelity, and economy, along with the availability of baseband signals in the quality end of the baseband spectrum. From what we heard at the AES session, a Motorola proposal for quad broadcasting is similar to the RCA one.

All of the systems in use and proposed are compatible with mono and stereo listening. But the mutual compatibility between the systems still leaves something to be desired. Eargle discusses this in his AES paper, "4-2-4 Matrix Systems, Standards, Practice and Interchangeability." He uses a spherical notation system proposed by Peter Schreiber to analyze the systems and the diagrams can't be readily converted to words. A copy can be obtained by sending \$1.00 to Audio Engineering Society, Room 929, 60 East 42nd Street, New York 10017.

\* Sansui uses a different approach as the accompanying article describes.



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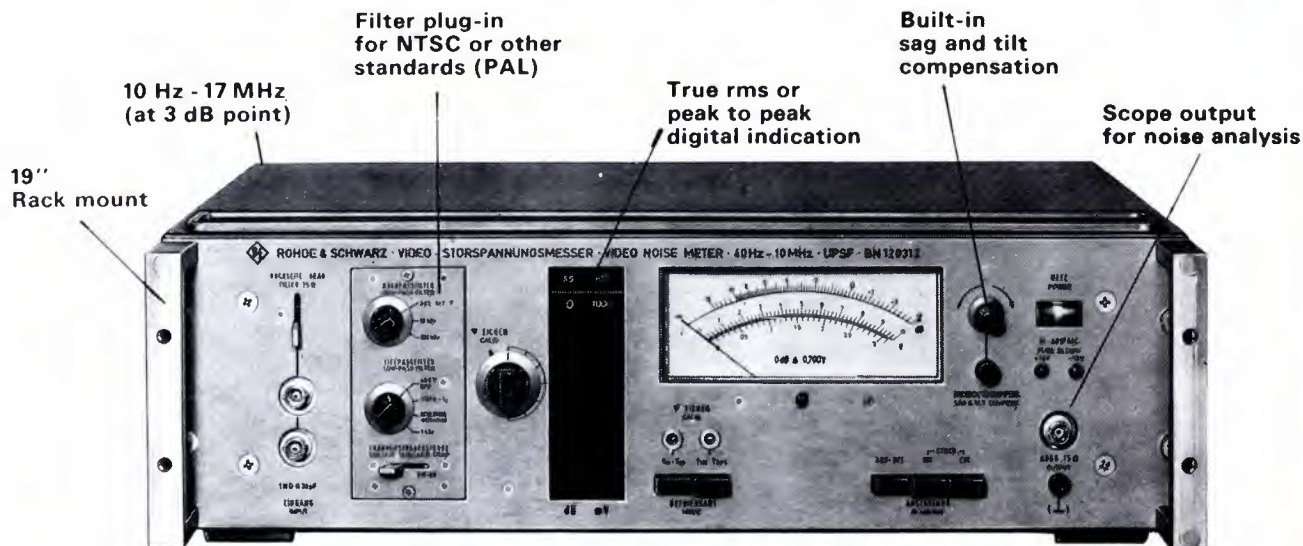


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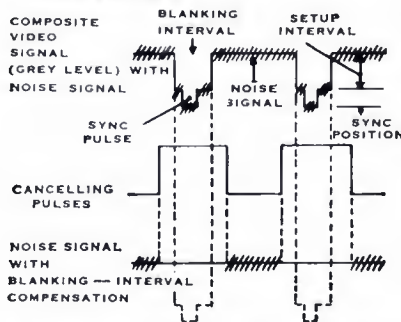
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Measure video noise voltage on:

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Principle of noise-voltage measurement with H or V internal blanking

The UPSF Video Noise Meter is designed to measure the unweighted and weighted noise voltages occurring in 525-line or 625-line TV transmission systems. It has the unique advantage of measuring low level components in the presence of high level horizontal or vertical sync and blanking pulses (see line drawing). The same instrument can be used for the NTSC and other TV standards by changing the filter. These plug-in units contain a bandstop filter as well as the color subcarrier filter, preventing any residual color subcarrier in the test signal from being picked up. High and low pass filters are selectable to assist in analyzing the video noise. The UPSF can also be used as a true rms voltmeter over its frequency range. This improved solid state model is completely free from drift. Built-in sag and tilt compensation eliminates error sources. Built-in calibrator.



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OCTOBER, 1972—BM/E

# BROADCAST EQUIPMENT

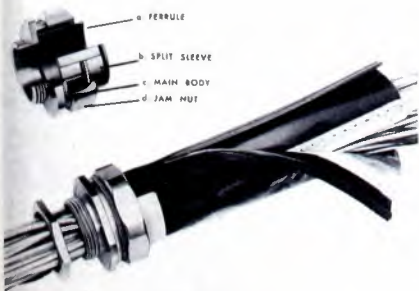
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**MATV broadband amplifier** includes VHF, UHF, and FM bands. Model TV3283 is intended to take the place of seven VHF and three UHF single-channel amplifiers, with high output of 60 dBmV, and 0.5% distortion, gain of 50 dB, and self-contained power supply. RIKER COMMUNICATIONS, INC. **275**

**Cable coupling** provides 360-degree shield termination at the backshell. Model SHK coupling has four easily-



assembled parts, provides both positive strain relief and leakproof shielding against RFI. ZIPPERTUBING CO. **276**

**Power splitters for 75-ohm lines** divide input for 2, 3, 4, or 5 output ports. The Series C splitters have low losses and cover the band from 5 to 300 MHz. MPI COMPANY. **277**

**VHF amplifier** has 20 watts output with 10 MHz bandwidth centered on any frequency from 50 MHz to 225 MHz. Model LA-2041 has -50 dB third-order intermodulation products at 15 watts output. Gain is  $\pm 1$  dB over the whole pass band. \$1500. ACRODYNE INDUSTRIES. **278**

**Vernier knob** with planetary drive has 10:1 reduction ratio. Model PD-10 has a torque exceeding 30 oz/in with self-contained limitations. \$4.95. ALCO ELECTRONIC PRODUCTS. **279**

**Audio level meter** reads from -60 VU to +40 VU, in 10 dB steps. Model 945 "Mini-VU" is battery powered, is within 1 dB from 30 Hz to 15 kHz, has selection switch for bridging either balanced or unbalanced audio circuits. EDISON ELECTRONICS DIVISION, MCGRAW-EDISON. **280**

**"Hear-through" stereo headphones** allow listener to hear outside sounds while listening. Model HV-1 weighs nine ounces, has a high-velocity driver for extended range. KOSS CORPORATION. **281**

**"See-through" stereo headphones** allow the listeners' ears to be seen. Unit was intended as a demonstrator to show p-c crossover network and inner acoustic chamber with suspended woofer, but customers wanted to order the translucent model Pro-B VI which has a frequency response approaching that of electrostatic systems. SUPEREX ELECTRONICS. **282**

**Calibration and alignment tapes** for both cassette and open-reel are individually mastered by TEAC Corporation. Seventeen different test tapes are currently available, among them speed deviation, operating levels, azimuth standards, crosstalk checks, etc. TASCAM CORPORATION. **283**

**Portable cable installer's probe**, pocket-

clip style, can be used for identifying house drops, locating cable shorts and determining whether a cable is open. Battery-powered indicator glows bright with through current, dim for 75-ohm dc, and goes out for shorts. \$6.50. AMECO. **284**

**Sub-carrier converter** provides up conversion from a microwave subcarrier to selected FM or special VHF or sub-channel frequencies; companion model provides down conversion from signal to multiplex carrier (5.2 to 8.2 MHz). Both FMU-2100 converters are completely solid-state and crystal controlled. CATEL, DIVISION OF USC. **285**

**Set-top converter** has switching between standard 12-channel band and additional band of 12 channels. "Sup-



converter A" has maximum of 1 dB loss, operating level of  $\pm 6$  dBmV, noise figure of 10 dB. TELENG (ENGLAND). **286**

**Point-to-point multiplexed microwave system** operates in the 960 MHz band. COM-PAK takes 10½ inches in standard 19-inch rack, combines Granger microwave receivers with GTE Lenkurt 36A synchronized multiplex units. Power consumption is 80 watts, transmitter uses direct FM modulation. GRANGER ASSOCIATES. **287**

**TV camera pan head** has removable handle that mounts for either left or right hand operation. Samson 7201 Series has full range of motion in both pan and tilt. \$40. QUICK-SET INC. **288**

**Bi-directional extender amplifier** has bandwidth of 50 to 300 MHz in the forward direction, 5 to 32 MHz in reverse. Mark V CVT-SEAR is in a single amplifier housing; with power supply and forward push-pull ampli-

continued on page 50



# Sony's award presenting microphone.\*



\*Used at Academy Award and Emmy Award T.V. presentations 1972.

Featuring a high-performance condenser capsule of electret design, the ECM-53 is specifically designed for broadcast, recording studio, public address and similar applications.

The cardioid capsule assembly contains a permanently charged condenser capsule and FET/IC amplifier. A Cannon connector houses the battery supply.

- Frequency Response: (Frontal  $\pm 3$  dB): 40 Hz to 16 kHz
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## PRODUCTS

fier. Reverse filters and amplifier may be added at any time. AEL COMMUNICATIONS CORP. **289**

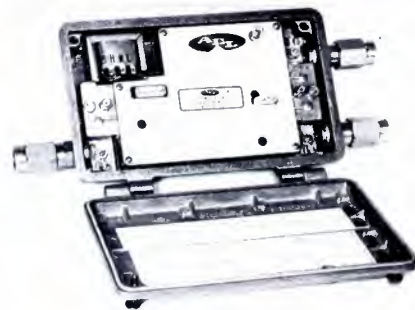
**Sync generator** is available for NTSC color or for monochrome EIA RS-170 standards. Model 2700 has all digital circuitry, pulse jitter of less than 3 nanoseconds in monochrome versions, less than 1 nanosecond for color. Mono model provides sync, blanking, horizontal and vertical drive; color model adds burst flag and subcarrier. COHU ELECTRONICS. **290**

**Unit combining  $\frac{3}{4}$ -inch videocassette player with monitor**, called "videocassette communications system", plays cassettes automatically, or can be



operated manually with stops, rewind, fast forward, etc. VIDEODETICS CORP. **291**

**Automatic cable transfer switch** is designed to provide a normal signal through path for a chosen section of trunk cable. Model AS-1 automatic-



ally switches to an alternate cable feed when normal signal input is lost, or falls below a preset level. AEL COMMUNICATIONS CORP. **293**

**FM monitor receivers** have ten-chan-

# The Pick-Up Pros.



WOR-FM, the country's leading FM/Stereo rock station, has been using Stanton cartridges since its inception.

Program Director Sebastian Stone likes the smooth, clean sound the Stanton delivers; the way it is able to pick up everything on the record so that the station can assure high quality transmission of every recording.

Eric Small, Chief Engineer for WOR-FM, likes the way that Stanton cartridges stand up under the wear and tear of continuous use. "We standardized on Stanton a couple of years back," Small said, "and we haven't had a cartridge failure since." Studio Supervisor Artie Altro concurs.

Whether you're a professional or simply a sincere music lover, the integrity of a Stanton 681 Series cartridge delivers the quality of performance you want.

It affords excellent frequency response, channel separation, compliance and low mass and tracking pressure. An every Stanton cartridge is fitted with the exclusive "longhair" brush to keep grooves clean and protect the stylus.

For complete information and specifications on Stanton cartridges, write Stanton Magnetics, Inc., Terminal Drive, Plainview, L.I., N.Y. 11803.



All Stanton cartridges are designed for use with all two and four-channel matrix derived compatible systems.

Circle 117 on Reader Service Card  
OCTOBER, 1972—BM/E



## Sound pressure levels up to 137 dB.



Sony's new condenser microphones; ECM-64P (Uni) and ECM-65P (Omni) handle sound pressure levels up to 137 dB, with less than 1% distortion.

Both microphones shield the capsule with a unique double windscreen to reduce pop susceptibility when close miking is employed. In addition, they're designed to filter out unwanted extreme low frequencies, all but eliminating the proximity effect that can severely impair the performance of a hand-held microphone. Primarily designed for Phantom power the ECM 64P/65P operates equally well from a self contained battery.

**SONY SUPERSCOPE**

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## PRODUCTS

nel scan or eight-channel switching in any combination of pre-selected channels in LF, VHF or UHF bands. FR-2500 Series have quadruple-tuned RF, sensitivity of 0.3 microvolts for 20 dB quieting, selectivity of 7.5 KHz at 6 dB,  $\pm 15$  KHz at 70 dB. About \$150 to \$190. SONAR RADIO CORP. 292

**Microwave antennas**, for the 4, 6, and 11 GHz common carrier bands, are shrouded parabolics with radiation



suppression greater than 76 dB below the main beam at 180 degrees  $\pm 90$  degrees, and first sidelobe suppression greater than 25 dB. The Ultra Directive series are available with 8, 10, and 12-foot apertures, and are matched to a VSWR of 1.06:1 or less. SCIENTIFIC-ATLANTA. 294

**Programmer/projector controls** two slide projectors, superimposing images on single screen. "Infinity II" provides adjustable-length dissolves, laps, fades, etc., coding the programming information onto 1/4-inch magnetic tape in cartridge form. Playback of the tape is decoded by unit. BERGEN EXPO SYSTEMS. 295

**Digital multimeter** has four full digits plus "1" for 20% overranging. Model 8100B has four ac and dc voltage



continued on page 52

## Variable-directivity condenser studio microphone provides 130 dB dynamic range.



Dynamic range (130 dB)  
+ noise level (24 dB)  
= max. spl (154 dB)

Sony's variable-directivity (Omni-Uni) C-37P\* contains an advanced FET amplifier. A switchable attenuator is placed between the capsule and amplifier to prevent distortion even at extreme sound pressure levels.

The combination of proven excellence in sound quality, and the very latest in semiconductor technology makes the Sony C-37P indispensable in today's quality-oriented recording studio.

Also Consider:

Studio standard condenser microphone model C-500.\*

**SONY SUPERSCOPE**

\*Must be powered by Sony AC 148A or equivalent power source.

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## PRODUCTS

ranges to 1200 volts, ohms in five ranges to 12 megohms. All switching is push-button. \$595. JOHN FLUKE CO. 296

**Receiver/modulator for NBS time broadcasts** combines a crystal-controlled receiver and an FM modulator for putting the time signals on a CATV or CCTV system. Model FMT-2000 adds the NBS time service on the FM band or any VHF TV aural frequency. CATEL, DIVISION OF USC. 297

**Electronic-drive turntable** has potentiometer control of speed at 33 $\frac{1}{3}$  and 45 rpm. Model GA212 has lighted push-button controls, tone-arm cueing, anti-skate adjustment, millisecond electronic correction of wow, flutter and drift. NORELCO. 298

**Compact 10,000-watt studio lamp** permits use of smaller, lighter reflectors than earlier globe-shaped lamps. "Quartzline" Model Q10M/T24/4CL is tubular, 16 inches long, has a halogen regenerative cycle for constant 3200 Kelvin color temperature. Output is 290,000 lumens, life rated 300 hours. GENERAL ELECTRIC. 299

**Video character generators** can be used with audio tape cartridge system for off-line storage. Model 1500 has 15 rows of 32 characters each; Model 2400 has 8 rows of 16 characters, and has four separate internally-stored pages. Both provide EIA RS-170 waveforms, have crawl, flash modes, editing controls, line insert or delete. BROADCAST ELECTRONICS. 300

**Cleaner/waxer for movie film** automatically cleans, waxes, and dries film. It is available for 8/16mm or 16/35mm, allows films slitting from 35mm to 8mm to remove extraneous edge matter; also prepares film for cassette use, protects new film. TREISE ENGINEERING. 301

**Low-power digital timing system** shows seconds, minutes, hours, and days. Model TS-250 also has BCD output, IRIG "C" or "H" serial time code output, and a decade pulse output. Read-out is on cold cathode indicator tubes. SPRENGNETH INSTRUMENT CO. 302

**Multiport cardioid dynamic microphone** has dual system of rear-entry ports to improve low-frequency response. Model TC10 also is free of normal proximity effect, has a front to back ratio of -26 dB and output level of -55 dB (0 = 1 mw/10 microbars).

continued on page 54





**Further proof...  
sound has never  
been in better shape!**

**RE55** OMNIDIRECTIONAL  
DYNAMIC  
MICROPHONE

Ⓔ There are plenty of good, functional reasons behind the new look of Electro-Voice professional microphones. Reasons dramatically proved by the rapid success of the Model 635A and the RE15. Now we've added the RE55 to this handsome group.

The RE55, like its predecessor the 655C, is an extremely wide-range omnidirectional dynamic. And in most electrical particulars it is not greatly different. RE55 frequency response is a bit wider, and perhaps a trifle flatter. An impressive achievement when you consider that the 655C has been extensively used as a secondary frequency response standard. Output level is 2 db hotter, and the exclusive E-V Acoustalloy® diaphragm of the RE55 can provide undistorted output in sound fields so intense as to cause ear damage.

The biggest changes in the RE55 are mechanical. For the microphone is even more rugged than the 655...long known as one of the toughest in the business. There's a solid steel case and new, improved internal shock mounting for the RE55. Plus a fawn beige Micomatte finish that looks great on TV long after most microphones have been scarred and scratched almost beyond recognition.

For convenience we've made the barrel of the RE55 just 3/4" in diameter. It fits modern 3/4" accessories. It also fits the hand (and its length makes the RE55 perfect for hand-held interviews). We also provide XLR-3 Cannon-type connectors to help you standardize your audio wiring. Detail refinements that make the RE55 more dependable, easier to use.

Finally, the RE55 has the exclusive Electro-Voice 2-year *unconditional* guarantee. No matter what happens, if an RE55 fails to perform during the first two years — for any reason — we'll repair it at no charge.

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- single phase power supply

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Circle 122 on Reader Service Card

## PRODUCTS

Impedance is 150 ohms. TURNER DIVISION OF CONRAC. 301

**Dual-channel console** has five input mixing channels, each with two input with pre-switching. Model B-503 has two output channels (not stereo) plug in input modules to accommodate microphones or high-level sources, nominal +8 dBm, 600-ohm balanced output, 4-watt monitor amplifier output and cue facilities. \$950.00. McMARTIN 302

**Four-channel intermodulation test set** provides four high-purity signals and the filters and amplifier to test broad band RF amplifiers. Model FTS-4 has high sensitivity to measure devices with gain as low as 0 dB; can be used with field-strength meter or spectrum analyzer. \$550. AEL COMMUNICATIONS CORP. 307

**High-output MATV amplifier** provides signal for very large distribution systems. Model THPM\*S has six-volt output, gain of 58.5 dB, front-panel output setting from two to six volts accommodates inputs from -8 dBmV to +37 dBmV. Input and output match 75 ohms, selectivity is greater than 26 dB at the next non-adjacent channel edge. JERROLD. 308

**Anti-vibration mounts** have steel tables with natural frequency of 2 Hz. "Vibrostat" series has isolation efficiency of 90% at 7 Hz and above, comes in three sizes. They are opaque to most forms of shock. \$395 to \$550. MILCO COMPONENTS, INC. 309

**Automatic weather forecaster** for CATV systems receives National Weather Service forecasts, stores each until it is updated. Model F-100 automatically generates the characters for video display of forecast. Also included is an auxiliary keyboard character generator for adding messages to the weather display. METRODATA CORP. 310

**Hybrid IC broadband amplifiers** for UHF and VHF cover range from 40 to 890 MHz. ATF Series includes models with gain from 16 dB to 26 dB, extremely flat-gain model,  $\pm 0.5$  dB over range. Thin-film construction is used; power required is standard 24 volts dc. \$5.00-\$6.50. AMPEREX ELECTRONIC. 311

**Building-block system for broadcast consoles** uses seven plug-in IC op-amp modules. ICBM Series allows broad-continued on page 56

# **Fernseh will now sell, ship, and service its TV cameras from all over America. And you will like it.**

We've combined the quality of Fernseh TV cameras and studio equipment with an entirely new American sales and service organization. It's now quite easy to get the KCU-40. The 3-tube color TV camera that revolutionized European production techniques. High light sensitivity. High signal-to-noise ratio. Tilttable viewer. And one-quarter or one-half inch camera cables that make the KCU-40 an ideal lightweight camera for both studio and location use.

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**Robert Bosch Corporation**  **Fernseh Division**

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## Twenty (20) days of broadcasting\* logged on a single 10½" reel.



This Tape-Athon model 900 Logger can operate at 15/32 ips the way most loggers run at 15/16 and 1 7/8. Imagine fidelity to 2500 Hz at 15/32 ips! That extra slow speed allows 409+ hours of recording over 8 channels on ½ mil tape with a 10½" reel.

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### Tape-Athon Corp.

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## PRODUCTS

cast studio to start with a few channel and expand as needed. Included are units for mike, medium-level, high level and remote input, output, communications and monitoring. FAIRCHILD SOUND EQUIPMENT. 317

**"Problem-solvers kit" for aerosol maintenance materials** allows purchaser to choose six or more of any combination of products, rather than the large quantity orders previously required. MILLER-STEPHENSON. 317

**Linear attenuator** uses MystR conductive plastic resistance elements and slip rings with precious metal wipers. LM8A has computer-controlled taper and tracking accuracy. Attenuation range is 0-90 dB, input impedance 600 ohms or 1000 ohms, noise at least 100 dB down, scale accuracy  $\pm 0.1$  dB; 0-20 dB,  $\pm 1$  dB 20-50 dB. WATERS MANUFACTURING. 314

**Portable wide-band bridge** allows measurement of cable return loss and VSWR on standard field strength meter, without oscilloscope. "Portable Bridge" has white-noise generator and precision 75-ohm bridge, head shaped to fit into close places, double male adaptor connector. Distance to shorts and opens can be checked with graphs supplied; unit can also check flatness of field strength meter. \$149.50. SADELCO. 319

**Broadband power amplifier kit** produces unit covering range 0.5 MHz-100 MHz. Kit MP-100 is rated at 2.5 w cw, will accept AM, SSB, pulse, or other complex waveforms. Input of 0.15 volt produces full power output. LARKTON SCIENTIFIC. 316

**Low-cost waveform monitor and video monitor combo** is designed primarily for use on each camera output in studio, but can be connected anywhere in video system. Unit takes 7 inches of rack space, includes a tally light to show camera status. ULTRA AUDIO PRODUCTS. 317

**Hand-held concrete breaker** attaches to basic trencher unit with quick-couple hydraulic connectors. Noise is reduced by elimination of roaring compressor and explosive release of air. The unit takes the shock, reducing strain on operator. DITCH WITCH, DIVISION OF CHARLES MACHINE WORKS. 318

**Plastic material** for filters on TV, theatre, and movie lights does not shed fragments, will not tear. "Tough Spun" is more durable than spun glass, pro-

# Do wonders for your image

Whatever your CCTV requirement . . . or problem . . . we think you should think of Shibaden.

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quality, moderate-priced black and white studio cameras (as the popular FP-100D shown below), and on up to the Shibaden FPC-1000s and the FP-1200, the professional color camera.

Check out Shibaden VTRs. The 510D with electronic editing is shown below. Their many features include (at no extra cost) variable slow and stop motion, servo capstan, internal sync and EIAJ-format specs.

And so on. Portable VTRs. Monitors from 5" to 23". Switcher/Faders. Special effects generators. Lenses. If you need it, you name it. Chances are Shibaden has it . . . off the shelf.

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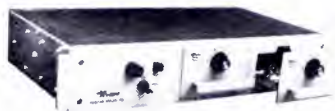
The perfect tone arm for the finest turntable! The RUSSCO TA-12 all metal anti-skating tone arm — only \$59.00

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RUSSCO's MONITOR MASTER amplifier gives you clean sound in a trim standard 19" rack size . . . Quick installation and easy service with plug-in P.C. boards. A trouble-free Power-huset only \$210.00

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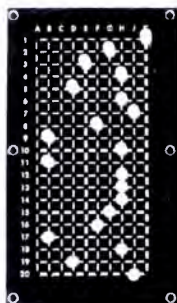
## PRODUCTS

duces slightly more diffusion than standard 0.010 spun glass. \$40 for roll 4 feet wide, 25 feet long. Rosco LABORATORIES. **319**

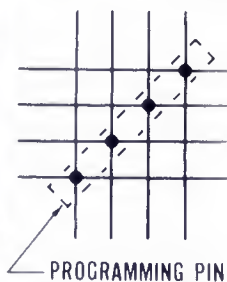
**High-frequency measurement probe** covers range from 10 kHz to 800 MHz, volts from 0.1 to 25 rms. Model 2791 is designed primarily to extend range of Model 2795 multimeter, but can be used with any voltmeter with a 1 VDC-Megohm range. SIMPSON ELECTRIC Co. **320**

**Portable oscilloscopes** weigh 25 pounds each, have 8 cm by 10 cm display, instant view of trigger waveform, dual traces, delayed and mixed sweep operation. Model 475 has 200 MHz bandwidth at 2 mV/cm, sweep speed of 1 nanosecond with X10 mag. Model 465 has 100 MHz bandwidth, 5 nanosecond sweep with X10 mag. Both are battery operated. Model 475, \$2500; Model 465, \$1725. TEKTRONIX. **321**

**Eight-level programming matrix board** connects four inputs to four outputs with single pin insert. Unit handles 1 MHz switching without shielding.



TYPICAL SWITCHING CROSSPOINT



PROGRAMMING PIN

Diode-holding pins are available. \$1.00 per crosspoint in small quantities, \$0.40 at 100 M. INFO-LITE CORP. **304**

**Multiple cable subscriber tap** has rapid connect and disconnect, plus a lock



for security. "Key-Tees" have modules handling up to eight lines each, cover band 5 MHz to 300 MHz, have isolation of 20 dB, have optional 2-way capability. ENTRON INC. **305**

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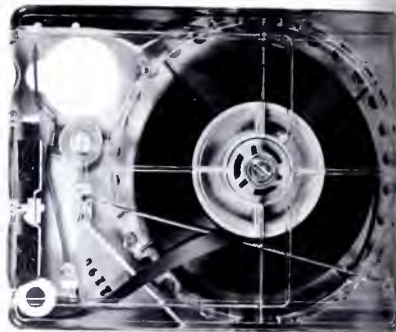
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300C



200C/220C

video tape reels (and everything smaller), costs just \$44.95. Model 200C is hand-held, pushbutton-operated eraser, \$22.60. Similar Model 220C for 230 VAC/50 Hz use is \$24.60.

**HEAD DEMAGNETIZER** is indispensable for proper tape head maintenance, maximum frequency response, low tape noise. Pole piece will not damage head. Only \$8.00.

Order direct or write for details.

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# Get the professional look from helical-scan Ampex **VPR-7950**

## It's that good!

A super-sharp teleproducer can see the superior quality of a VPR-7950 picture compared to one from any other 1" recorder.

### What is a VPR-7950?

The world's highest performance 1" color/monochrome, helical-scan videotape recorder. It incorporates the same advanced design features of the Ampex VPR-7900 and the TBC-790 time base corrector in a handsome, highly functional console.

Video waveform and picture monitor selector switches may be used together or independently. An eye-level panel includes both monitors as standard equipment and an optional vector display scope.

The VPR-7950 is a complete recorder/reproducer which features:

- Very high carrier mode (7-10 MHz) for exceptional quality in color dubs even down to 3rd and 4th generations; 5th, in black and white.
- Precision, fast, *total*, electronic insert and assemble editing from any signal source.
- Internal digital reference system that includes a horizontal lock servo, frame lock and vertical interval switching.
- Three independent tracks (single video - dual audio), each of which can be used, altered, edited or replaced at any time.
- High efficiency ferrite video head with 500 hour warranty and the fastest, simplest replacement system ever devised.
- Capstan controlled high speed tape cycling modes, velocity loop tension servo, direct coupled drum servo, minutes and seconds coun-



ter, monitor amplifier and cue microphone.

In developing the time base corrector, Ampex engineers discarded current technology and took a new



*Ampex VPR-7900 recorder/reproducer  
with TBC-790*

Circle 130 on Reader Service Card

digital approach to time base correction that affords the most stable video signal ever produced by a helical-scan recorder. It produces clean fades, lap dissolves and special effects as well as dubs of edited material of outstanding quality to 1" and 1/2" videotape recorders, quadruplex recorders and transfers to film.

Like the VPR-7950, the combination of the VPR-7900 and TBC-790 produces recording capabilities that meet all standard broadcast requirements. The TBC-790 may be purchased with the VPR-7900 you may now own. The VPR-7900/TBC combination is portable enough for use as a mobile unit for location work. Tapes made on the VPR-7900 are completely interchangeable with those made on the VPR-7950.

Round out your teleproduction system with the Ampex CC-500 color camera system, which incorporates professional features, is simple to operate and low in price.

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Circle 131 on Reader Service Card

**NEW  
LIT**

For copies of these literature offerings, circle number for appropriate items on Reader Service Card.

Data sheets cover two units for **multi-image automation**: Tri-cut control, which controls up to six slide projectors on three screens, for automatic dissolves, zooms, mixes, etc.; and the Media Mix Programmer, which uses computer tape to control three six-channel systems, plus nine auxiliary devices. Spindler and Sauppe. **200**

Brochure and technical notes describe uses of Metrascope, a **multi-channel bar graph display system** using cathode-ray presentation of multiple data sources: strain gauges, thermocouples, etc.; also with alarm at selectable set points. Metra Instruments, Inc. **201**

**Three base-station broadband antennas** of the 6 dB omnidirectional gain type are covered in data sheet. Phelps Dodge. **202**

**Catalog of switches** gives engineering drawings, specifications, covering more than 200 types. Cherry Electrical Products Corp. **203**

**Video products**, programmers, equalizers, amplifiers, etc., are listed and described in Quick Reference Catalog. Dynasciences Corp. **204**

Catalog covers **instrument carriers** and multiple outlet strips. Waber Electronics, Inc. **205**

"All-line" 16-page catalog shows **digital and meter V-O-Ms, portables, laboratory types**, and accessories. Triplet Corp. **206**

**CCTV color television camera system**, Model CC-500, is subject of four-page brochure. Ampex. **207**

**Color film camera, Series 1500** is fully described, with extensive comments by users, in eight-page pamphlet. Cohu, Inc. **208**

"CATV Pathmakers," new pamphlet, tells about **services offered to CATV system operators**. GTE Sylvania. **209**

Engineering data sheet shows how to choose **console modules** to make up audio consoles for specific requirements. Fairchild Sound Equipment. **210**

**Precision electronic test equipment** is subject of Short Form Catalog G-1, including power, sweep, noise, and AM/FM-synthesized and programmable generators; analyzers; field-strength meters; etc. Rohde and Schwarz. **211**

Information Kit provides basic engineering information on the **proper use of attenuators**, in precision laboratory measurements and in communication circuit power level settings. American Electronic Laboratories. **212**

Comprehensive technical data sheets cover: **Model 1710 RF Network An-**

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alyzer, for a wide range of measurements on broadband cable and cable electronic units; and 75-ohm precision coaxial components, including adaptors, connectors, attenuators, etc. General Radio. **213**

"Cartridge Talk" is a pamphlet in news-item style covering broadcast tape cartridge units and related equipment. Tapecaster. **214**

AM/FM self-supporting and guyed towers are described in detail in illustrated leaflet. Stainless, Inc. **215**

Price and ordering information on single and dual cable bi-directional electronic units is given in eight-page listing. AEL Communications Corp. **216**

EMI/field intensity meters, RF current probes, antennas, microwave components, and related test instruments are covered in 16-page short-form catalog of complete line. Singer Instrumentation. **217**

Engineering bulletin describes use of Vertical Interval Reference Signals in testing variations in color in TV program material. Electronic Industries Association. **218**

"Zig Zag" antennas for UHF and VHF are the subject of illustrated data sheet. RF Systems, Inc. **219**

Peak-reading storage voltmeter, which holds peak readings until reset, is covered in technical bulletin. Pioneer Instrumentation. **220**

Technical booklet gives details on "Metro-Com", new two-way broadband telecommunications system using the 6-48 MHz band for distribution on cable. Ameco. **221**

Performance of a number of AMI multi-channel microwave links in actual use is covered in depth in 30-page report. Theta-Com. **222**

Catalog supplement of 8 pages shows new RF directional wattmeters, load resistors and attenuators. Bird Electronic Corp. **223**

Engine-driven electric generators are described in brochure, with typical applications and specifications. Onan. **224**

Coaxial connectors Series 990 for 5-300 MHz, RFI-resistant and anti-pull-out, are described in catalog sheet. Magnavox CATV. **225**

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from rear-channel cancellation occurring in the encoding process.

The Sansui system, on the other hand, introduces its  $\pm 90^\circ$  phase shift at the encoder to eliminate any problem with cancellation; then reshifts the rear-channel information back to its original phase location in the decoder. The system thus recreates the original sound field, not an imitation of it.

The basic encoding system is shown in the block diagram in Fig. 3, while Fig. 4 shows how the phase shifters are wired into the circuit. The left-rear channel is shifted by  $+90^\circ$  and the right rear by  $-90^\circ$ . Thus, the reverse-phase relationship between the back channels is converted into an in-phase one. Now the encoder outputs will be:

$$\begin{aligned} L &= (LF + jLB)\cos\Theta + (RF + jRB)\sin\Theta \\ R &= (RF - jRB)\cos\Theta + (LF - jLB)\sin\Theta \end{aligned} \quad (4)$$

Where  $j = \pm 90^\circ$ , these equations show that there is no loss of back-channel information in the encoding process when  $j$ -phase shifters are used.

In any four-channel stereo system, the information in each channel must be treated equally. Vector analysis shows that this is true only when the vector angles among the four channels are identical—when they are all  $\pi/8$  (because  $2\Theta = \pi/4$ ).

When recordings are made with this angle, adjacent crosstalk is uniformly 3 dB. Thus, the four channels are reproduced equally to provide a square sound field. Equal volume balance is maintained among the four channels, so distinct sound image can be positioned in any location inside the sound field.

Programs encoded by this method can be decoded using a different vector other than  $22.5^\circ$  without losing much of the original four-channel effect. At the same time, a decoder using a  $22.5^\circ$  vector can decode programs encoded at other vector angle without losing a significant amount of the quad effect.

#### Discrete programs

In the early days of quad broadcast experiments the only four-channel material available was on tape, and this was, by definition, discrete material. It required simulcasting by two FM stereo stations (see *BM/E*, February 1970) and early experiments showed a great deal of promise, certainly the demand was there for FM quadcasting, but using two stations for a simulcast was just as impractical as it had been in the early days of stereo.

Various methods of discrete broadcasting have been proposed, (Quadracast, G.E., and Radio Programming Management, see *BM/E*, page 6, June, 1972) but none has been approved by the FCC

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except for experimental broadcasts. See page 66. Besides, any discrete quadcasts would require special receiving equipment for full four-channel reproduction.

While there continues to be a market for discrete quad, most such taped material being sold today is in eight-track cartridges aimed mainly at the high-way listener. But more and more record companies are experimenting with encoded discs. The split is fairly even with about half the major labels opting for Columbia/Sony (now partially combined with the Electro-Voice system) and the rest using Sansui encoding. No matter which of the two encoding systems is used, the other system's decoder will provide satisfactory quad playback.

The important feature of quad matrixing is that an encoded record can be played on the air with no modification to any of the station's equipment. The same phono pickup, the same turntable, modulator, and transmitter are used. In all respects, the matrix disc is treated like an ordinary stereo recording. The listener who has a quad decoder gets a full four-channel program; those listening with ordinary stereo get a balanced stereo program.

If a broadcaster wants to transmit from discrete sources, such as a tape or a live concert, an encoder must be used between the four-channel source material and the broadcast console. But the encoder's output is an ordinary two channels, so we're back to

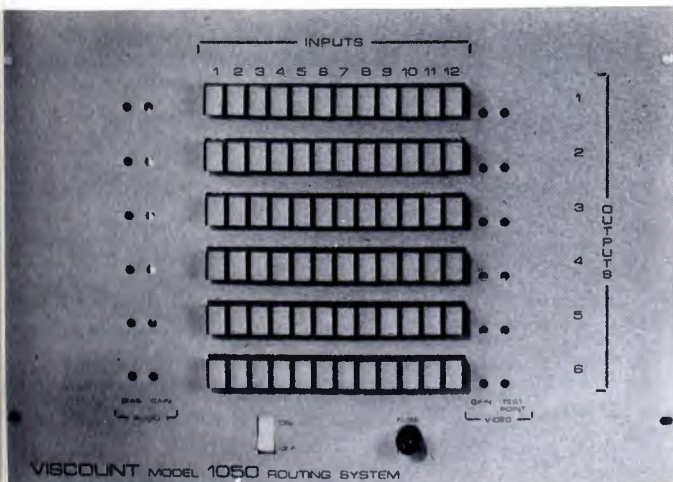
regular stereo again.

The encoded signal makes absolutely no extra demands on the station's equipment or on its allocated channel space. The encoded program has no additional sideband information impressed on it. Proof of the pudding is in the numerous FM stereo stations around the country that are now transmitting encoded music on a regular basis. The FCC has made no move to interfere with or restrict this activity because the stations aren't sending anything that goes outside their license limitations.

The promotional value of broadcasting quad stereo can be invaluable to an FM station. Just as it paid off to go stereo in the mid-1960's, it may now pay to quadcast on a regular basis. This prospect is especially inviting since there is no equipment investment or extra cost of any kind involved (except perhaps to buy the records) when transmitting four-channel stereo.

Local promotional tie-ins with stereo dealers and national co-op deals with manufacturers of quad equipment is also in the cards. Some stations have started special weekly programs to discuss and demonstrate the latest quad recordings and often include semi-technical discussions of the equipment and how it works. It all adds up to larger and more interested audiences. So why not start broadcasting quad stereo now? It's the cheapest program upgrading you'll ever make. **BM/E**

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Also available 1030 series all solid state routing switcher; X-Y address remote control head; touch-button control; 10 input x 10 output; 500 nsec switching time. Recommended user price Video only \$5700; Audio follow Video \$8500. Can be expanded after installation. Options include touchdial or thumbwheel control, or computer language address, also multiple switching memory.

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## FCC RULES continued from page 16

policy to Presidential broadcasts), it, predictably, could heed its own message, stated therein, and forswear applying a *mechanical* formula to an area which calls for discretion by cable operators. This is not to say that the principles of the Fairness Doctrine would not apply to the many cable channels. Rather, the mechanism that has worked well for broadcast stations would most probably not work when applied to all of the many channels of a CATV system, if the Commission's intention is to achieve the diversity of access and program control which appears to be socially desirable.

The instant "fairness" ruling, important to broadcasters and cablecasters in and of itself, also suggests a Commission trend in treating controversial-issue programming problems. Salient Commission observations on the Fairness Doctrine, emanating from both 1) its *Memorandum Opinion and Order* (FCC 70-881), and 2) the instant decision, may be summarized as follows:

1) The Fairness Doctrine is viewed as the single most important requirement of operation in the public interest.

2) The Commission will not substitute its judgment for that of the broadcaster—as to precisely: what is fair; who should be the spokesmen; what should be the format of the program; how long or how often such programming should be carried; whether or not it should be paid-time or free-time.

3) However, if there is a *clear imbalance* of presentation of one side of a controversial issue, the Commission (without specifying the precise method, length of time, etc., to obtain a balanced presentation) will direct the licensee to provide programming on the other side(s) of that issue.

4) Further, if the licensee has been unreasonable or has shown bad faith in presenting imbalanced public-issue fare, the Commission will find the licensee "arbitrary" and may impose fine, forfeiture, renewal hearing, or other form of censure.

5) There is *NO mathematical formula* to determine fairness. That is, the Fairness Doctrine does NOT guarantee "equal" time, time-segment, caliber of spokesman, or format; "equal opportunities . . . is not the thrust of the fairness doctrine . . ."

6) Presidential addresses *are* subject to the Fairness Doctrine, but do *not* necessarily require directly-responsive programming on the other side to satisfy fairness requirements.

7) Fairness will be determined by review of all the programming that has been presented on the issue.

8) The Fairness Doctrine is a "term of art" and does not guarantee balanced programs in terms certain.

### Conclusion

The Fairness Doctrine has been a source of programming uncertainty and confusion to many broadcasters and cable operators. The Commission, equally concerned with the problems created, has launched a broad-ranging inquiry into the efficacy of the Doctrine. The above "Presidential address" decision appears to cast the first shaft of light on Commission treatment of problem areas. Many more rulings should soon follow and bring clarity to the present confusion. Throughout this period, it is the wise licensee or operator who keeps close contact with his communications counsel. **BM/E**

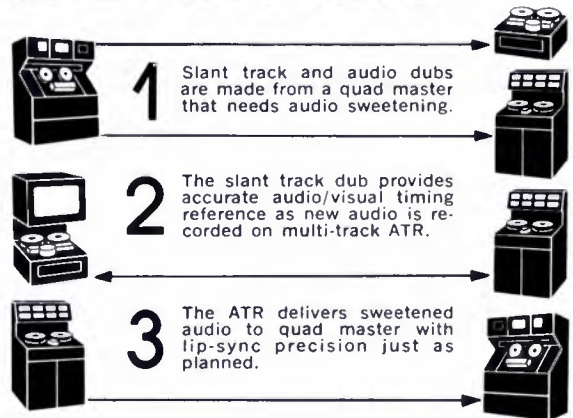


out having a precise reference to go by leads to the further possibility that even a properly recorded tape may be erroneously reproduced. Last, but certainly not least, is that the display of simultaneous NTSC pictures on a group of monitors in the same classroom will require very precise adjustment for color uniformity. It is not unusual that color monitor matching becomes a daily event because of the number of interdependent variables in NTSC. In particular, with the use of low-cost helical recorders or NTSC color, it is often necessary to adjust the color phase-lock control prior to adjusting the phase control (hue) on the monitor without knowing for certain which of the two is rendering final phase accuracy.

The SECAM/60 system eliminates many of the critical adjustments common to an NTSC color television system. It yields the following advantages:

- (1) The elimination of hue adjustment on the display/receiver,
  - (2) A limited-range saturation control which normally requires no change over long periods of time,
  - (3) Minimum visibility of the subcarrier in the Standard L format, because of its high frequency.
  - (4) Satisfactory distribution over monochrome systems including distribution amplifiers, processing amplifiers, microwave, and cable systems. The only modification required is the unblanking of part of the vertical interval to allow SECAM/60 identification pulses through.
  - (5) Recording and reproduction by virtually all Quadraplex VTR's in either highband or lowband color. These recorders require no time-base correctors or velocity error compensators to reproduce excellent SECAM/60 color.
  - (6) Virtually all one-inch monochrome helical recorders can be used to record and play back SECAM/60 signals with little or no modification. Compatibility for the interchange of one-inch monochrome tapes is all that is necessary to guarantee good SECAM/60 reproduction,
  - (7) Helical-to-helical dubs in one-inch format may be made with full color accuracy in the duplicate tape. There is only a small loss in signal-to-noise ratio, dependent upon other conditions.
  - (8) Half-inch helical recorders have been made to work on Standard L SECAM/60 with minor modifications. The results, however, have not been considered fully acceptable from a signal-to-noise viewpoint even though subjective picture quality looked good. SECAM/60 Standard M has been successfully used with half-inch recorders of several makes and has been distributed over ITFS monochrome systems without any shift in image colorimetry.
  - (9) Transcoding in either direction to or from a SECAM/60 format has proven to be practical as long as the original signals are of good quality.
- In view of the great advantages that SECAM/60 provides, it is proposed that this frequency-modulated color encoding technique be used for color programs on closed-circuit television. **BM/E**

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### Discrete Quad Requires Authorization, Says FCC

FM broadcasters may not put on discrete quad broadcasts without specific FCC authorization, the Commission ruled in August. The ruling was in answer to a request from KIOI,

San Francisco, which had earlier been given temporary experimental authority to field-test the Dorren system. The management of KIOI contended that use of the Dorren system could be continued without specific authority since its was compatible with the rules governing two-channel stereo transmission.

The FCC disagreed, pointing out that Section 73.322(C) of the rules allows only a single sine subcarrier, while the Dorren system adds a cosine subcarrier. The FCC also said that the Dorren system might exceed present limits on modulation, so that existing protection ratios for co-channel and

adjacent channel stations must be reviewed before the Dorren system could come into general use.

### Renewal Notice Must Specify 60 Days for Public Comment

When a broadcast licensee gives public notice, as required by the rules, that he will apply for a renewal of his license, the notice must specify that the public has 60 days to comment on station performance after the renewal application deadline, the FCC ruled in August. The earlier rule set 30 days as the period specified in the notice for public comment, but the FCC acknowledged that this was inconsistent with the 60-day period, established in 1969, for petitions to deny renewal applications. The new rule change is in response to a request from Black Efforts for Soul Television (BEST).

### Notice Due Public If Candidate Supplies Recording

The Complaints and Compliance Division of the Commission ruled that a broadcaster must notify the audience when any materials or services in connection with a program are furnished by a candidate for office, or political party, that such materials have been so furnished, even though the candidate or party furnished only technical equipment for the broadcast and the station controls the editorial content. The ruling came in response to a request from a news service which occasionally uses the audio feed service of the Republican Congressional Committee to record interviews with Congressmen.

### FCC Briefs

A proposed rule is the restriction of broadcast of the stereo pilot subcarrier to periods when stereo broadcasting is under way. The Commission said that transmission of the subcarrier during monophonic broadcasting is "contrary to the intent of the rules and serves no useful purpose" . . . Western Connecticut Broadcasting Co., licensee of radio stations WSTC and WSTC-FM in Stamford, Connecticut, will pay a fine of \$10,000 for censoring political broadcasts in a 1969 Stamford mayoralty election, in the initial decision of an FCC hearing examiner stands; the stations were accused of requiring Democratic and Fusion candidates to submit scripts for review (illegal) while giving the Republican candidate a free rein.

The Price Commission, in response to an FCC inquiry, ruled that if a station based its program rates on the size of audience, a rise in rates to

continued on page 68

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S-6	1/1000 min.	10 min.	±.0002 min.
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MST-100	1/1000 sec.	6 sec.	±.001 sec.
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## NEWS

match an increase in the audience would not be in violation of price regulations . . . **Prime time**, for purposes of the access rule, has been redefined by the FCC for the mountain zone as 6 to 10 p.m. local time, effective October 1, 1972; the former limits were 7 to 11 p.m.

**Sansui Electronics Corp.** moved into a new enlarged headquarters and Eastern distribution center at 55-11 Queens Boulevard, Woodside, N.Y. . . . **Telecommunications, Inc.** reported

revenues of \$8,446,311 and earnings of \$837,910 for the first six months of 1972, up from \$4,766,668 and \$263,457 for first-half 1971 . . . **Systems Wire and Cable, Inc.** announced earnings of \$166,006 for the nine months ended June 30, 1972; sales were up 44 percent over the same 1971 period.

**Continental Electronics**, Dallas, has a contract to supply four 50 kw AM broadcast transmitters and supporting equipment to the Canadian Broadcasting Corporation for use at the two CBC Toronto stations, CBL and CJBC . . . **RCA** will enlarge its Scranton, Pa., picture-tube plant with a 34,-

000-square-foot addition . . . **Metro-media, Inc.** bought from Chris Craft Industries the latter's WTCN-TV in Minneapolis-St. Paul.

**Metropolitan Museum of Art**, New York, used videotape recorders and a CCTV system, with SECAM/60 color (see page 34, this issue) to present viewers at a sculpture show with the life of the artist and his comments on the works shown . . . **American Television & Communications Corp.** had revenues of \$14,798,173 and earnings of \$1,452,239 in the year ended June 30, 1972, both record highs for the company . . . **Marconi Communications Systems of England** has sold to Radio-Televisione Italiana ten of the new Model B7103 modular VHF television transmitters.

**CableData** announced contracts with CATV systems in Marion, Indiana; Rancho Bernardo and San Diego, California—all owned by Time-Life—to supply computerized information service . . . **Cablecom General, Inc.** reported revenue of \$8,895,507 and net income of \$294,256 for six months ended May 31, 1972 . . .

**RCA** delivered to the U. S. Marine Corps a mobile TV studio, for use in producing color training programs . . . **Vantage Broadcasting Co.** has bought radio station WINT, Winter Haven, Florida, from Norman Protsman.

**Mike Stocklin**, talk-show moderator of KCFW-TV, Kalispell, Montana, put on a very special one-time program when he was married to Carol Neufeld on the air . . . **HEW** announced that more than \$4 million in Federal grants have been made during the current fiscal year to help establish or improve 33 non-commercial radio and television stations in 26 states . . . **Fairchild Sound Equipment Corp.** appointed M. K. Widdekind Co. northwestern reps, and Adams and Associates, southwestern reps.

**C-Cor Electronics** has received a \$600,000 line of credit for working capital to expand its business . . . **Metromedia Inc.** reported first half 1972 revenues at \$82,984,066 and net income at \$4,271,339, up from \$73,574,151 and \$2,787,904 in first half 1971 . . . **Oak Security, Inc.** has bought the assets of Security Associates, Inc., operator of central stations for burglar and fire alarm systems.

**Institution of Radio and Electronics Engineers of Australia** featured equipment and systems for PAL-B standard color TV at their convention August 30-September 3; Australian broadcasters are currently planning for the changeover to color . . . **Viewer Sponsored Television Foundation**, a non-profit organization in Los Angeles, got a construction permit for a television

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station to operate on Channel 68.

**The Society of Cable Television Engineers**, Central Atlantic Chapter, announced a meeting at the Holiday Inn, Jersey City, N.J., on September 30, 1972, beginning at noon, to discuss two-way cable operation.

## People

**Frank A. Spexarth** is the new general sales manager of Cerro CATV Cable Products, responsible for a national sales program . . . **W. Wallace Warren** was appointed audio marketing analyst for RCA Broadcast Systems . . . **Tom Adams**, of WIOD, Miami, won the annual award by Billboard Magazine for the nation's top radio air personality, sharing first place with "Laugh-In's" Garry Owens and Bob Raleigh of San Francisco . . .

**John R. Gehron Jr.** became program director of WCBS/FM, New York . . . **Robert M. Jones** has joined Malarkey, Taylor and Associates as a financial analyst . . . **Walter L. Roberts**, vice president of research and engineering for Superior Continental Corporation, died when his small plane, in which he was alone, crashed near Sherrills Ford, North Carolina . . .

**William G. Poole** was named manufacturing engineer for Systems Wire and Cable, Inc. responsible for cost control, efficiency, and long-range planning . . . The National Association of FM Broadcasters elected ten new directors-at-large, bringing the total to 15: Phil Sheridan, WNCI, Columbus; James Gabbert, KIOI, San Francisco; Roy Elsner, KQIP, Odessa, Texas; George Kravis, KRAV, Tulsa; Thomas Holter, WLVE, Poyette, Wisc.; Jeff LaCaze, WJBO, Baton Rouge; Thurman Worthington, WTAR, Norfolk; Raymond Fritsch, KSL, Salt Lake City; Alex Smallens, American FM Radio Network; and Jack Baker, CBS-FM Spot Sales.

**James B. Emerson** was appointed directing director of advertising and sales promotion for the Magnavox CATV Division . . . **Kenneth W. Heady** became vice president and general manager of Meredith Corporation's KCMO Audio/Video Systems in Kansas City, Mo.; **Bill McReynolds** succeeded him as general manager of KPHO-TV, Phoenix; and **Lynn Higbee** became general manager of KCMO and KFMU-FM, Kansas City.

**Eric K. Maxon** is the new manager, videocartridge recorder engineering; **Lawrence M. Martin** is manager, television systems planning; and **Willard D. Stickney** is manager, television systems engineering, all of International Video Corporation . . . **Thomas G. Morrissey** became vice president and

corporate director of engineering for Daniels and Associates, Denver . . .

**Douglas C. Williamson** is the new national sales manager for Sadelco, Inc., Weehawken, N.J.

**Cliff Fields** has joined Communications Carriers, Inc. as a cable industry specialist . . . **Sheila Mahony**, former New York City assistant corporation counsel, became a field representative; **Stanley Gerendasy** became director of applications, and **Victor Nicholson** became senior engineer, all for the Cable Television Information Center, Washington, D.C.

**Chester A. Higgins**, veteran journal-

ist who most recently was a senior editor of *Jet* magazine, was named special assistant to new FCC Commissioner Benjamin L. Hooks.

**Don Rappaport** was appointed sales representative for California of Cole-Flex, makers of insulation products . . . The new general manager of WKLM, Wilmington, North Carolina, is **Jack A. Carpenter**, who has 15 years of radio and TV experience in Arkansas and elsewhere . . . C-Cor Electronics named **Richard L. Gray** as manager of the order services department, responsible for processing all orders received.



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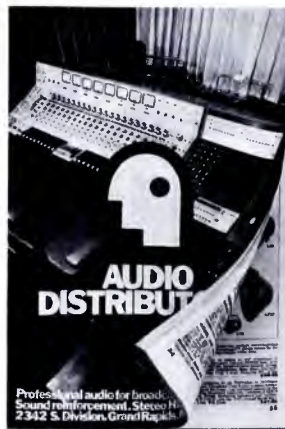
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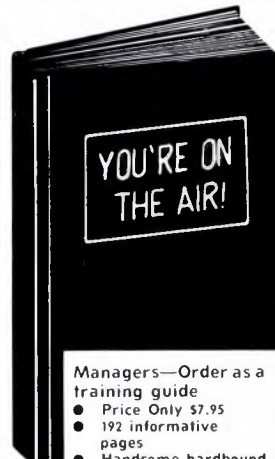
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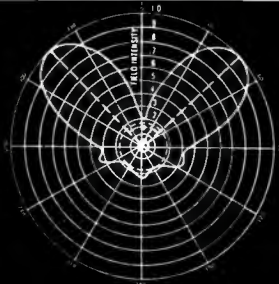
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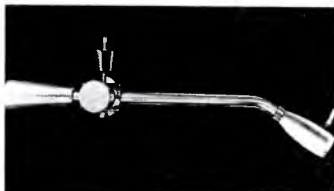
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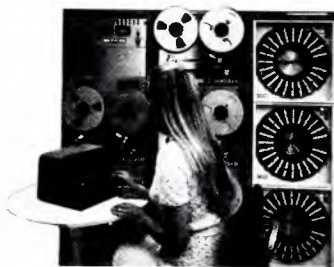
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FOR MORE INFORMATION ON Schafer's broadcast automation systems, write to:  
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## Schafer Electronics... providing broadcast automation systems for all kinds and sizes of radio stations.

If you didn't see the exciting new 900 Series when it was unveiled at the 1972 NAB show, simply send



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- Send me literature on the 900 Series System
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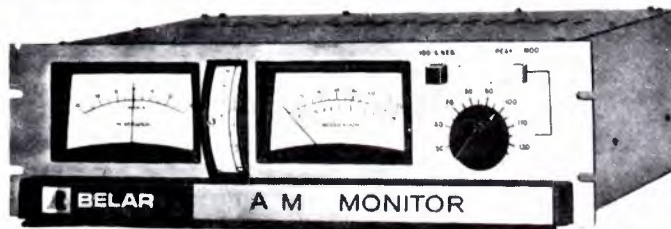
FOR MORE INFORMATION ON Belar's AM monitor, write to:  
**BELAR ELECTRONICS LABORATORY INC.**  
 P.O. Box 826  
 Devon, Pa. 19333

## AM STATIONS, ATTENTION!

Comply with new FCC ruling on monitoring 125% positive peaks) and simultaneously measuring 100% negative peak).

Return this card or call Belar Electronics, (215) 687-5550 for full information on our AMM-1 AM frequency and modulation monitor. In addition, send information on FM , TV , monitors. Or skip the AM; just send us information on FM  TV  monitors.

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RELIABLE AUTOMATIC HEATER CONTROL



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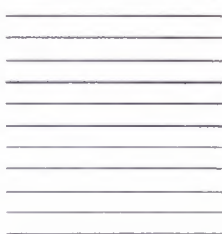
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- FM Station(s)
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- Instructional or Closed Circuit TV or Campus Limited Radio
- CATV Facilities
- Telephone Company
- Program Sources or Recording Studios
- Government
- Consultant
- Lawyer
- Distributor/Manufacturer dealer
- Other (please specify) \_\_\_\_\_

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3. Are you responsible for more than one station or facility?  
 Yes  No

Is this your business address?  Yes  No

4. My primary area of responsibility is: (Please check one)
- Corporate Management
  - Engineering & Engineering Management
  - Operations Management
  - Station, Production or Program Management
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# Look at the Difference



Unretouched photographs of 21" studio monitor. Photographic data Rolleiflex C-3. CPS color negative film — ASA 100, 1/15 second at 1/5 f

## ...after 3M Color Dropout Compensation

Here's what 3M's Color Dropout Compensator does for your VTR reproduction:

Look at this unretouched composite photograph of a studio monitor. It shows, at the left, a videotape playback with 13 electronically recorded-in dropouts. These dropouts were created by a special test generator which attenuates the RF level to the record driver. On the right, these dropouts have been completely restored by the DOC.

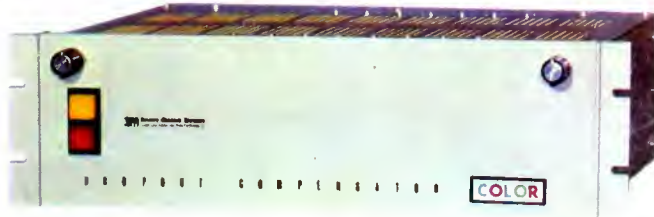
The black dropouts shown on the left are followed by a complete loss of color-lock in the direct color recovery equipment. Since these dropouts include horizontal sync and color burst, they cause transient color flashing not ordinarily attributed to the dropouts themselves. Even shallow dropouts can create a similar problem due to loss of side-band information.

**Only the 3M Color DOC corrects all these effects.**

After compensation, note the precise color match and complete freedom from switching transients. Also, the dropout disturbance to the time correction unit has been eliminated. Proc amp and

servo stability are improved to such a degree that it is possible to play this tape in full intersync or pixloc mode.

In the compensated half of the photo, compare the replacement material with the original signal two scan lines above the dropout due to a *complete* frame being photographed. Try to find the 13 switching transients.



**The 3M Color Dropout Compensator is the only system available that can provide proper color and luminance replacement.** For details write for the booklet, "Compensating for Dropouts in Color Television Recording."

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# Studio quality color monitors for less than a grand!



UNIMEDIA SMT-DUAL 9 \$1295.



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UNIMEDIA SMT-9 \$745.



UNIMEDIA SMT-17 \$995.

Not just one model, but the whole family of rackmount studio color monitors in four different sizes and five different models.

Unimedia's SMT series of color monitors are specifically engineered for quality broadcast, closed-circuit, cable and teleproduction applications.

The heart of each SMT monitor is the remarkable Sony Corporation Trinitron® picture tube. The inherent simplicity of the single-gun Trinitron eliminates convergence problems and moire.

It produces a brighter, truer picture, with excellent colorimetry and stability. Solid-state circuitry throughout assures continuing high-quality video display reliability.

Each SMT chassis is constructed of heavy gauge aluminum and control panels may be custom-colored to match existing equipment or to provide color-coding of equipment functions.

All monitors rackmount in standard 19" racks, and the 9-inch model is available in two configurations — a dual 9 and a single 9 with frame for mounting a half/rack-style waveform monitor.

A 24 volt talley lamp is provided, and a built-in audio speaker/amplifier may be included.

Three professional features are included in an option package for an additional \$125. These provide front panel switch control of underscan, A-B selection of two separate inputs, and pulse cross. The pulse cross mode permits shifting the picture either horizontally or vertically, or both together, to display sync, burst, blanking, vertical interval test and reference signals. SMT monitors are NTSC units, but SECAM 60 and PAL-M versions are available on special order.



UNIMEDIA SMT-12 \$795.

SMT studio quality color monitors are just some of Unimedia's imaginative ideas, systems and products for the world of audiovisual communications.

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