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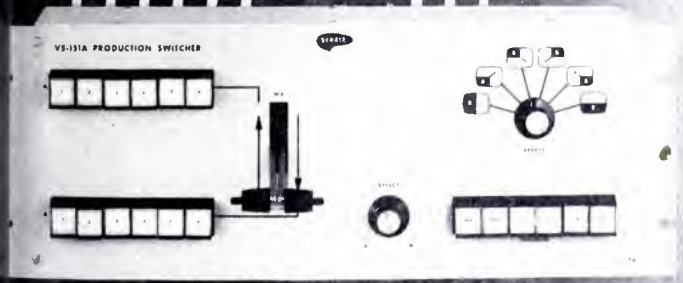
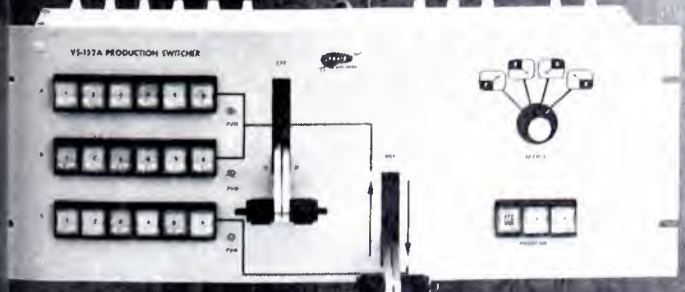


VS-151A PRODUCTION SWITCHER



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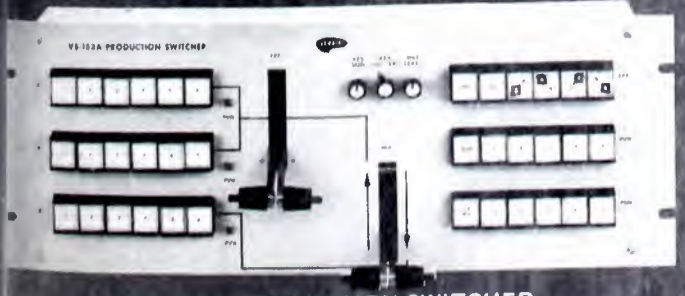

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BROADCAST MANAGEMENT/ENGINEERING

OCTOBER 1972/VOLUME 8/NUMBER 10

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10:37:13 AM                              COUNTING

            VIDEO    AUDIO
  TIME      SRCE  TR  SC TR     PROGRAM
AIR
   0:03     VT1       VT1      HAPPINESS HOUR

NEXT
   0:20     F1A                VARIETY PROMO

   0:10     F2S   IWSA C2 FO   TOPICAL MSG.
  02:45     STA    DM      D   MORNING NEWS
  -MAN-     REM    FS      F   PARADE
10:45:00 <<<<<<<<<<<<<<<<<<<<<<<<<<<<<<AM
   0:10     F2B    DF          KETCHUP COMM'L
   0:30     VT2                WRIGLEY'S
   0:20     F4A    RMB         NEWS PROMO
   0:05     F3S   C     AN     PUBLIC ANNOUN.
   0:03     ---         C1 DU
   0:02     F3S         C2  0
  -CLK-     NET                COMEDY HOUR
10:58:30 ------------------------------AM
   0:10     F2S   I            DISCLAIMER
   0:20     VT1   UDF  AN      CHEVROLET
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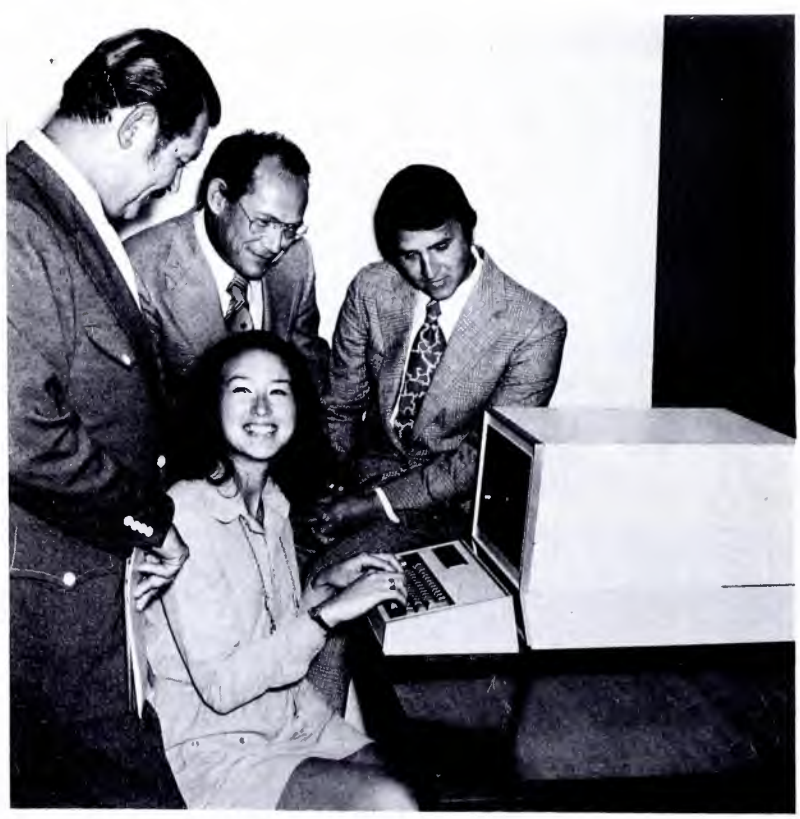
BROADCAST INDUSTRY NEWS

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.



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.

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

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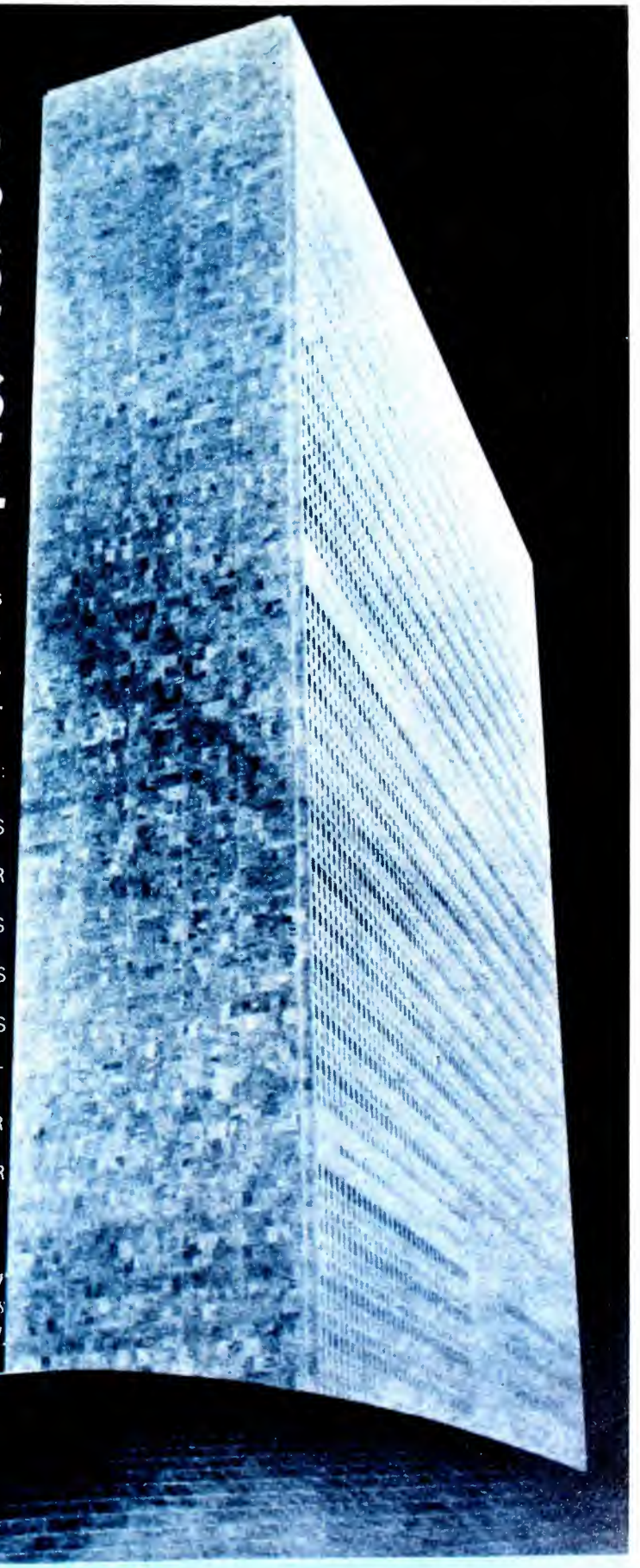

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same period is 97% as large as during drive-time. He said that currently, on a 24-hour basis, the average adult spends 87% as much time on radio as he does on television.

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 noncommercial 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 quadraplex 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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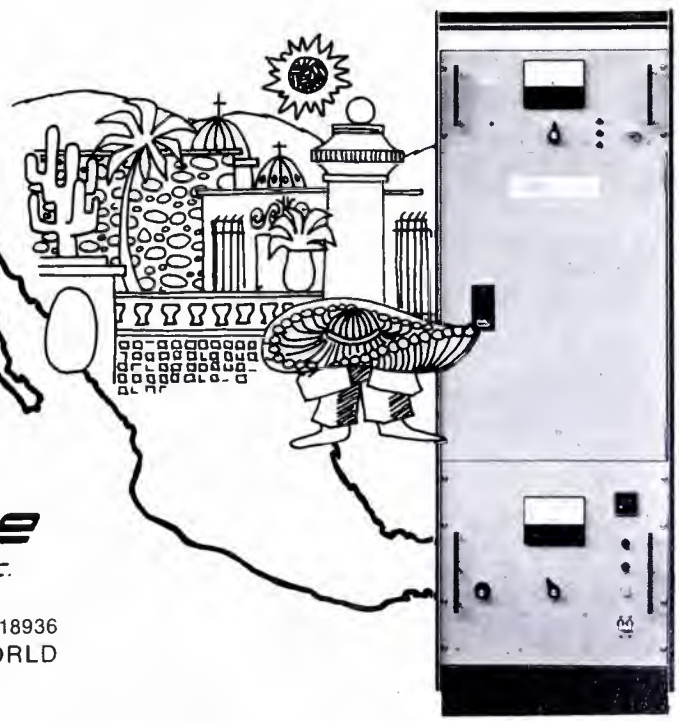

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NEWS

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.

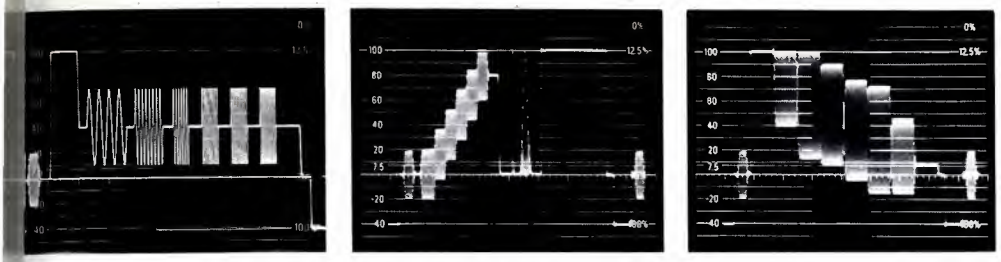
Meetings Set for Six Cities by NAB

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;

continued on page 66

the FCC required signals . . .



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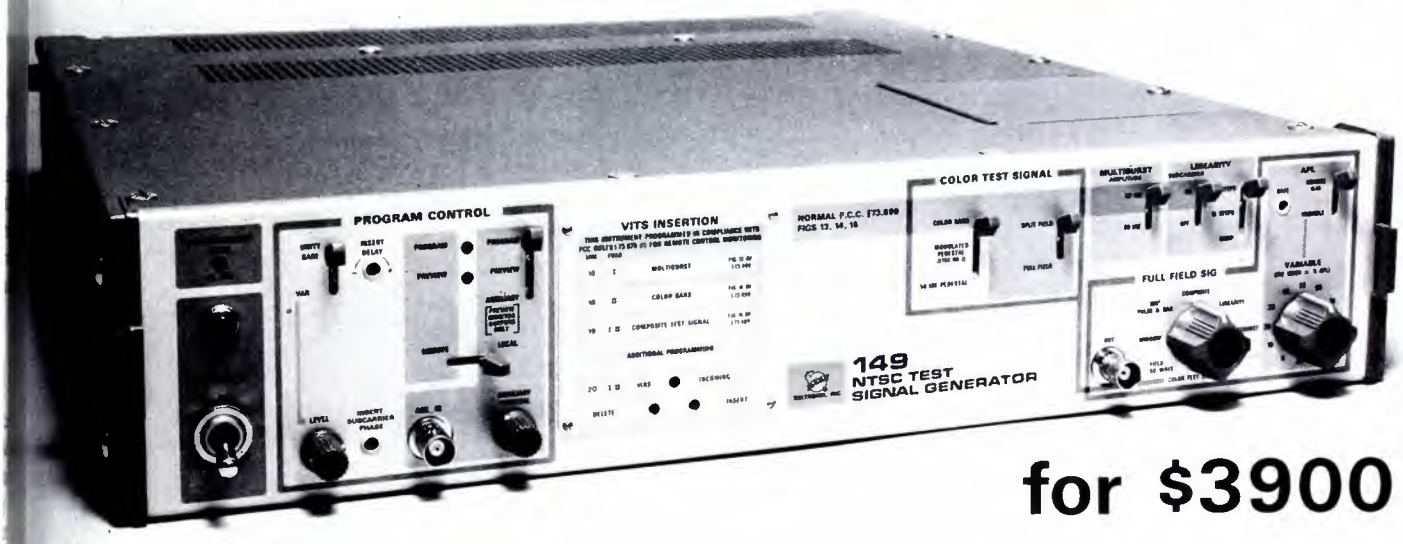

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lultiburst FCC §73.699 Fig. 13 Line 18, Field I
olor Bars FCC §73.699 Fig. 14 Line 18, Field II
omposite FCC §73.699 Fig. 15 Line 19, Field I, II

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ull-field test signals including (but not limited to) ultiburst, colors, composite are all included in the 49. For example:

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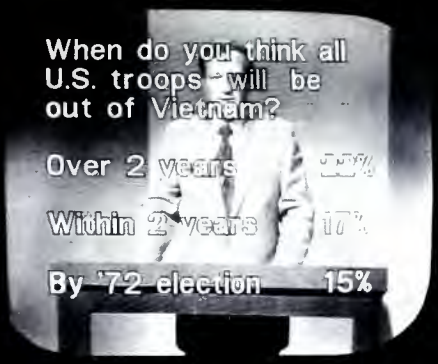
As of October, 1972



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Circle 108 on Reader Service Card

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.'"[1] (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.[2]

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.

continued on page 16

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FCC RULES continued from page 14

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."[3]

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 tha that of the broadcaster. The difference between th regulation and control of these *many* channels by CATV operator is substantially different from tha 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 an leased channels with the opportunity, under som circumstances, to recapture them temporarily. He i prohibited from exercising program control ove these "access" channels. Yet, he must provide oper ating rules for the public access channels. (Som franchises require as many as four channels on first-come, first-served, no censorship basis.) Th 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 requestin access. The rules for the other "access" channels ar to be similar with appropriate changes to suit thei purpose.[4]

All of these channels will engage in "origination cable casting." In short, the CATV operator is give the responsibility to prevent the violation of th Fairness Doctrine on *all* of these channels. At th same time, he is prohibited from exercising progran control. To insure fairness, without the authority t 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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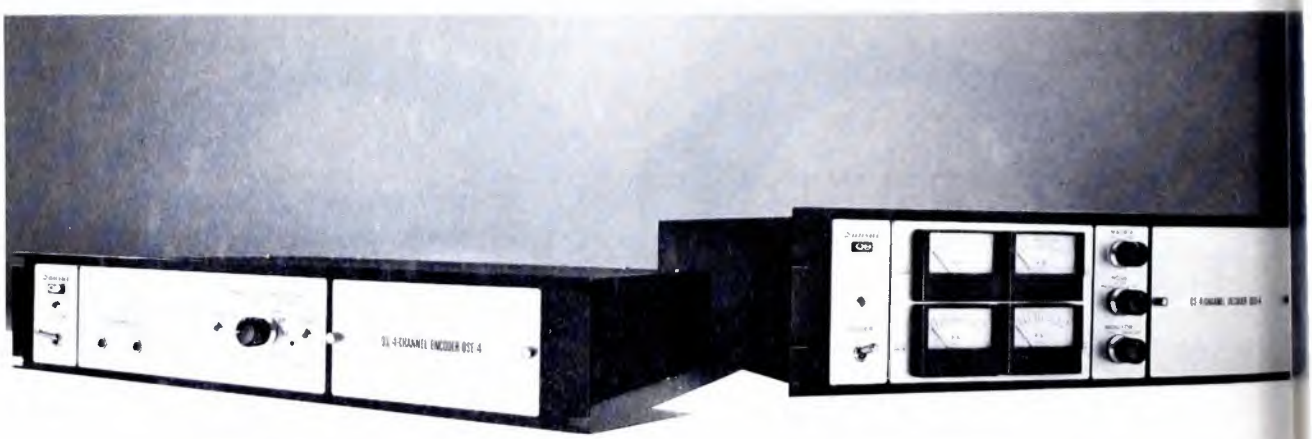

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3 **THE QS SYSTEM** does not in any way degrade any current standards of high-fidelity sound reproduction, whether they involve noise, distortion, dynamic range, frequency response or anything else.

4 **THE QS SYSTEM** offers dual compatibility with existing two-channel stereo equipment. On the one hand, when an encoded recording or program is played back on standard two-channel stereo equipment, the depth and dimension of the normal stereo presentation are enhanced. This makes it possible to produce a single version of any recording—one disc serves as both the four-channel and enhanced two-channel version. On the other hand, when a standard two-channel disc or other source is played through the decoder, a superb four-channel effect is synthesized.

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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 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.

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.

Participation is the key to instructional TV. At WNVT, 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 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

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."

inancial support. Educational television in the U.S. ıas relatively low prestige, low viewing, and low inancing. It is dependent on a political life-style that loes not foster innovation because it is based on nnual financing and a four-year schedule of politics. Adventurous ideas are simply too risky. The OU has profited from long term planning and the romise 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. 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 weekends). 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.

* 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.

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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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."

nancial support. Educational television in the U.S. as relatively low prestige, low viewing, and low nancing. It is dependent on a political life-style that loes not foster innovation because it is based on nnual financing and a four-year schedule of pol- ics. Adventurous ideas are simply too risky. The)U has profited from long term planning and the romise of future grants.

Finally, the television producer and other broadasting professionals in this country have considerbly lower status than do their counterparts in the Jnited Kingdom. There is doubt that they would be reated as equals by university academics in the kind f teamwork utilized by the OU.

Although Hooper expressed these reservations bout the transferability of the Open University to he United States, he concluded that the use of nedia in the OU may represent a turning point in he history of applying new media to education. He tated that in the OU these media are being used ot just to lower costs, but to reach new objectives in he curriculum and to reach a broader spectrum of tudents.

Evidence of this new understanding of media use n education has been shown by many groups in the Jnited States. Among them is the Smithsonian Institute, where Hooper recently showed a film on the)U 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. 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 weekends). 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.

* 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.

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 television for possibly the first time.

Under various government grants, "Tri-City," was designed by Enviromctrics, 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 WNVT 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 WNVT 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 WNVT's studios, ½-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 opportunity 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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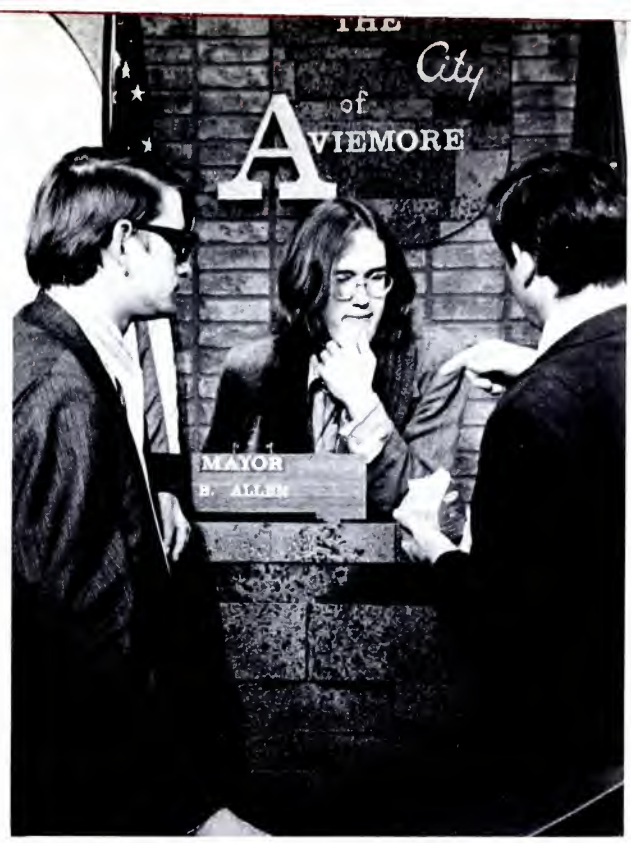

In the game, "Tri-City," the mayor has to make a decision while on camera.

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.

With the sessions meeting on Mondays, the edited tape was aired on WNVT 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, WNVT'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, WNVT 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, WNVT 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, WNVT asked the question, "Should WNVT/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 WNVT'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

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

Pyle cites as examples of programs currently in se or under development—nurses' training in postpartum care for Ayerst Laboratories; product nowledge training for "platform personnel" for First National City Bank; family planning programs or patients in the obstetrical ward in Harlem Hospital in New York City; safety training for miners hrough the Department of the Interior Bureau of Mines. Other applications being developed run the gauntlet 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 raining in Citibank's Personal Banking Division, 'Responsive TV is being looked at as a way to ncrease our personnel's ability to recognize customer needs." Gambello points out that Responsive TV imulates real life situations and allows for immediate viewer response to those situations.

While the program will initially be introduced on he 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 earning 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 down-time on existing pieces of equipment that do not enjoy the heavy usage of some of the other equipment.

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.

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.

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

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

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 ¾-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 f results in terms of both learning objectives and osts;
Action to reserve space on satellites and cable V for narrow-band services.

Part II of the report offers guidelines for effective udio 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 adio stations responding (214 were queried), 59 ercent 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 onvince public school educators that instructional adio (or ITV for that matter) can be of value. Medical educators already have the message and he Lister Hill National Center for Biomedical Communications is a source of many interesting xperiments involving communications satellites, omputers and communications networks, and cable TV.

The experimental Alaskan Satellite Network, tarted 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 Gren

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ıe innovators at Norelco introduce today's most advanced ılor camera in its price range. Not an updated model. A new ɜneration. It kills many stubborn problems that have tor- ented video production men for years. And its CLUE feature ɛlps you get better performance from other cameras you ready have.

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LUE for quick, precise set-up and camera matching. LUE 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 for optimum color balance. CLUE allows the same reference to be used to match between cameras.

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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!

Pre-set pushbutton varichrome variable matrixing holds the color the sponsor wants on every shot. Varichrome gives independent remote control of hue and saturation settings for all primary and secondary colors. Without affecting grey scale. Once you've decided the settings you want to compensate for lighting from each camera angle, your final take is routine. Just push a button for each angle. Presto, the color you want in every shot!

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And—scene contrast compression. A flick of a switch and scene contrast compression brings out detail lost in shadowed areas...without loss of highlights.

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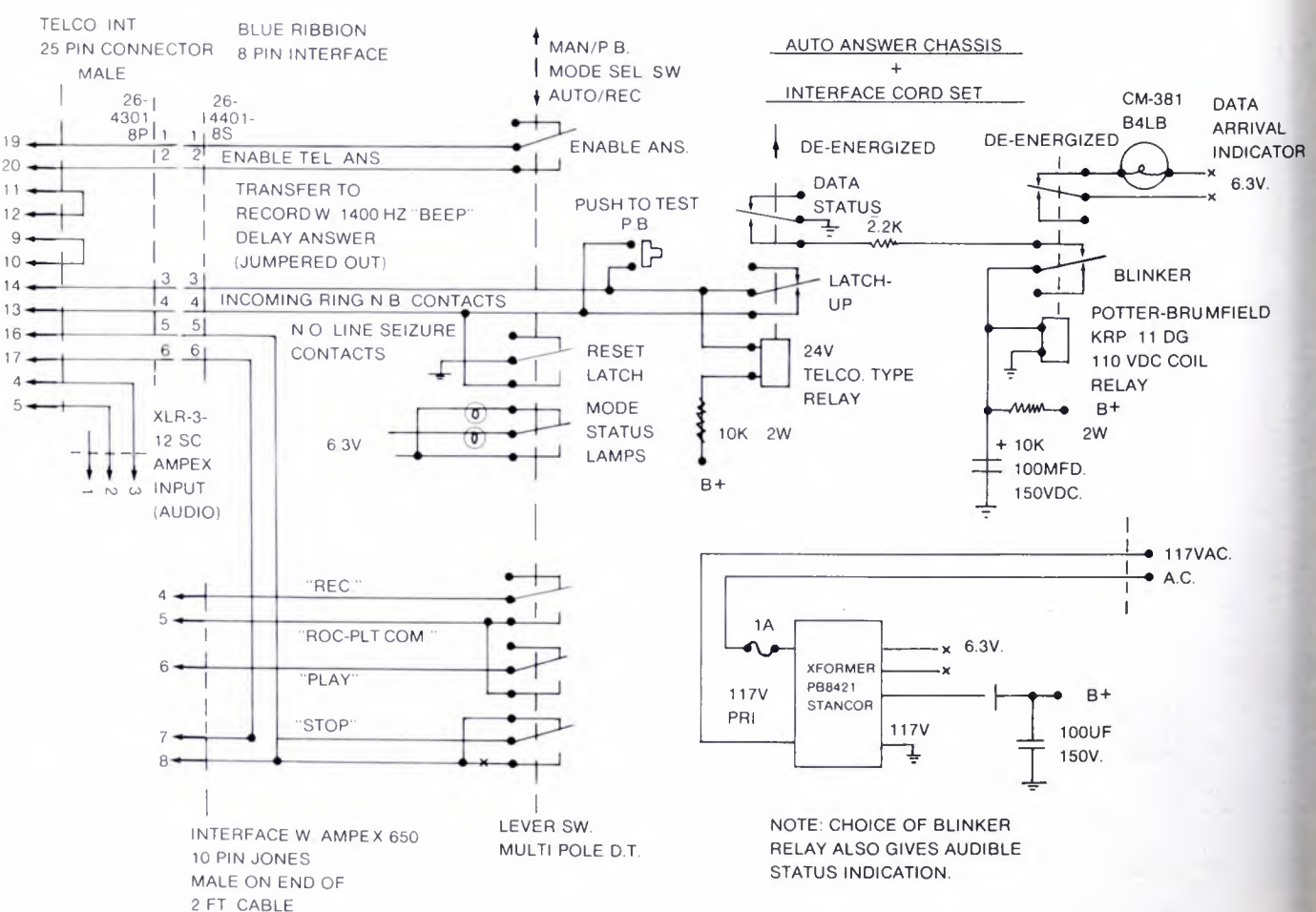
Circle 112 on Reader Service Card

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 ±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 ±2.2 microseconds wide with respect to external fixed or drifting H or color subcarrier reference. Output resolution: monochrome – ±25 nanoseconds; color – ±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^2. 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 ±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 ±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^2.

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 ±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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Circle 113 on Reader Service Card

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 pathological, 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.

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

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 kiloherz 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.

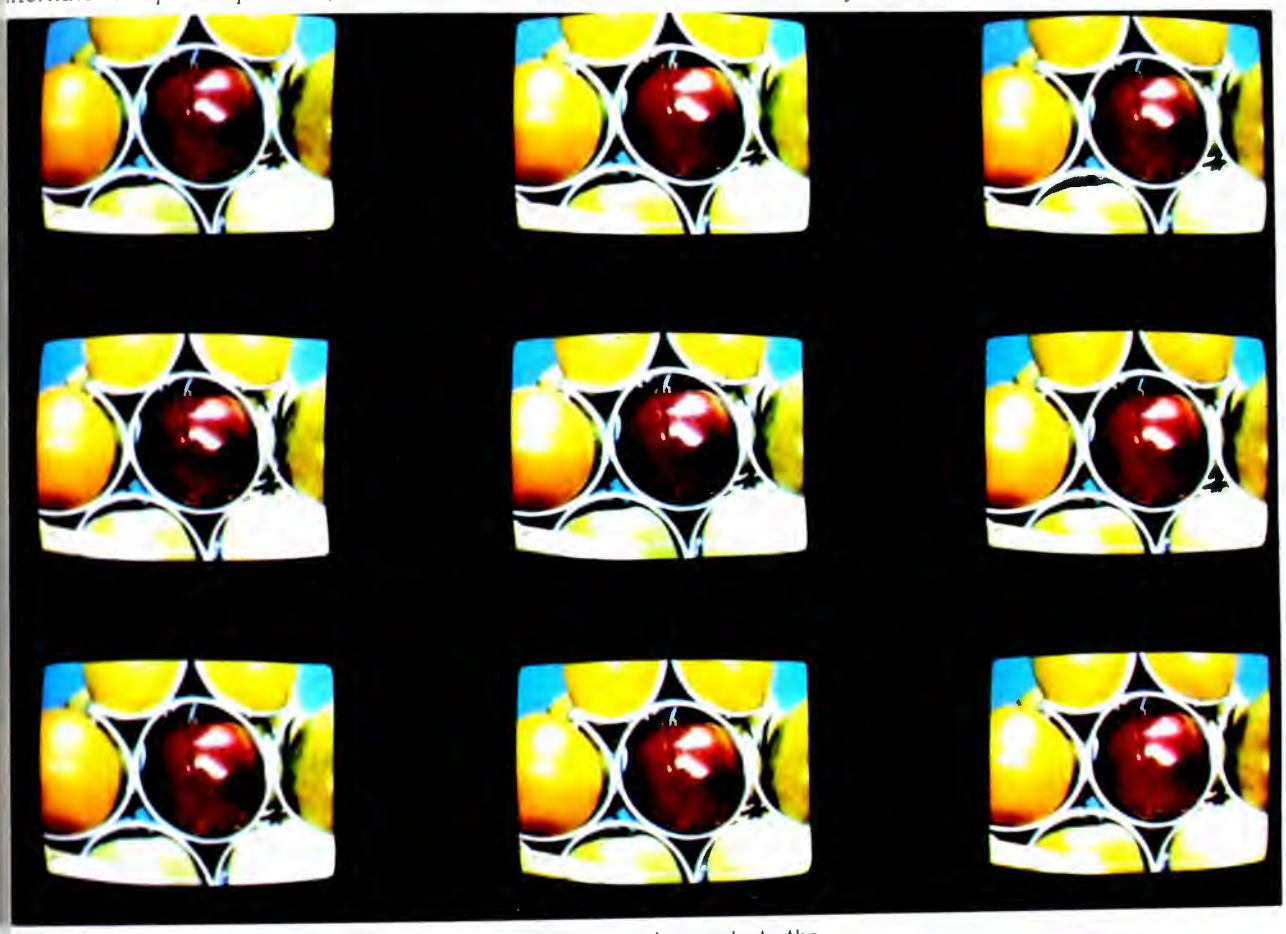
The subcarrier amplitude is not critical since the color information is contained in the frequency deviation; thus it is necessary only to have sufficient amplitude of subcarrier to allow the limiters in the receiver to function.

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 kH 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.

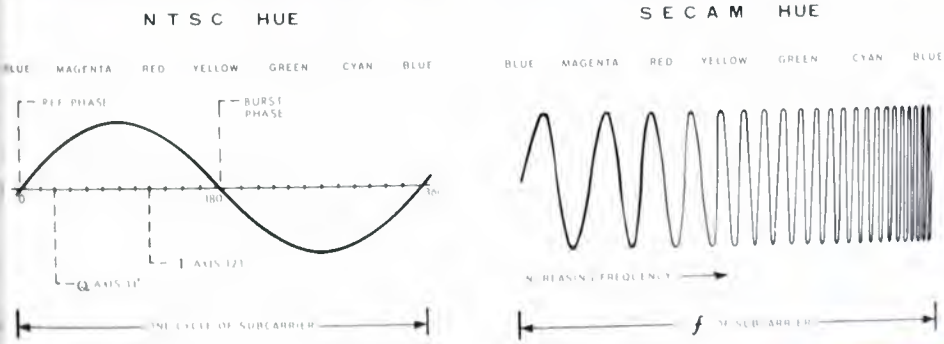
A line-sequential color system requires means of

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.

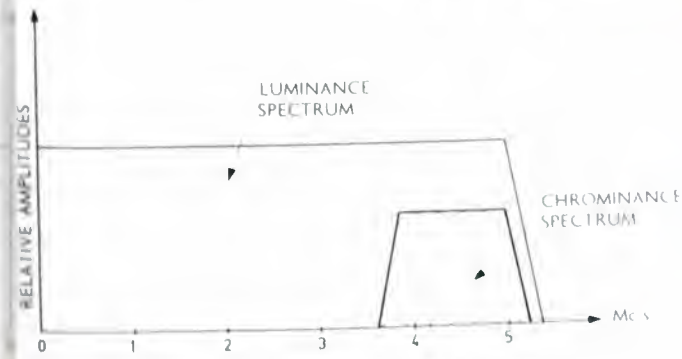
It is necessary to use both R-Y and B-Y informa-



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

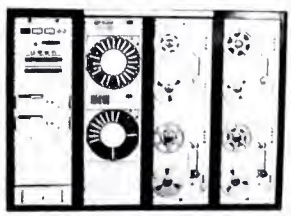
The selection of a color encoding process for closed-circuit television application is not a simple problem, since many factors related to the specific application and the degree of interchangeability with existent systems must be taken into account. Experience to date with the NTSC system has shown 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-

continued on page 65

even your wife thinks you're at the station...

with the on-air sound your Broadcast Products Automation System provides. And what a relief to know that no matter how complex your operation is or will become, you purchased the system you control, not the system that controls you. All components are modular, meaning you have unparalleled flexibility, accessibility, availability plus low operational cost. Speaking of cost, the installed cost was low . . . 30% less than competing systems on a feature-by-feature basis.



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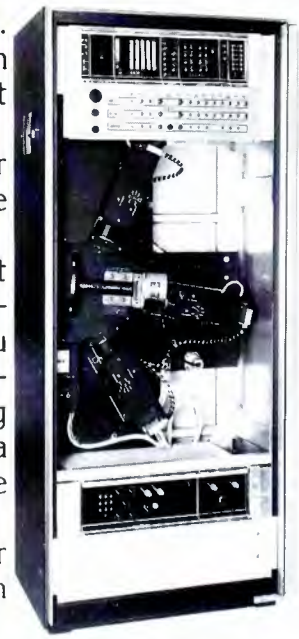
And a three-tube design (vidicon or lead oxide) helps assure a performance approaching that previously associated only with live cameras such as the TK-44B.



So if erratic color film quality is getting you down, ask your RCA representative for the cheery and profitable facts about the TK-28. Or write for new brochure. RCA Broadcast Systems, Building 2-5, Camden, New Jersey 08102.

RCA

New TK-28 color film camera.

Circle 159 on Reader Service Card

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 titantic 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 exhuberant 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 ¾-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 ½-inch and/or ¾-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 ¾-inch system promised for 1973; Ampex Instavideo, also for 1973; AKAI, with its ¼-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

continued on page 43

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 ones 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.

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

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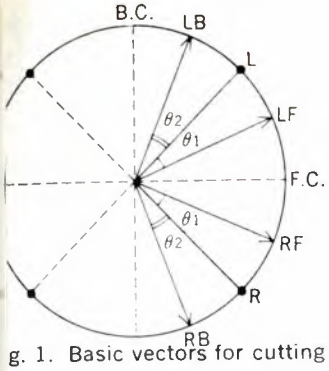
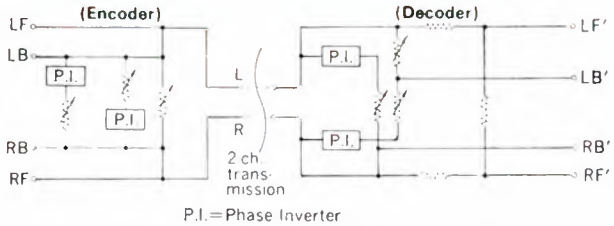
Mr. Ito is manager, four-channel system planning and promotion, Sansui Electric Co., Tokyo.

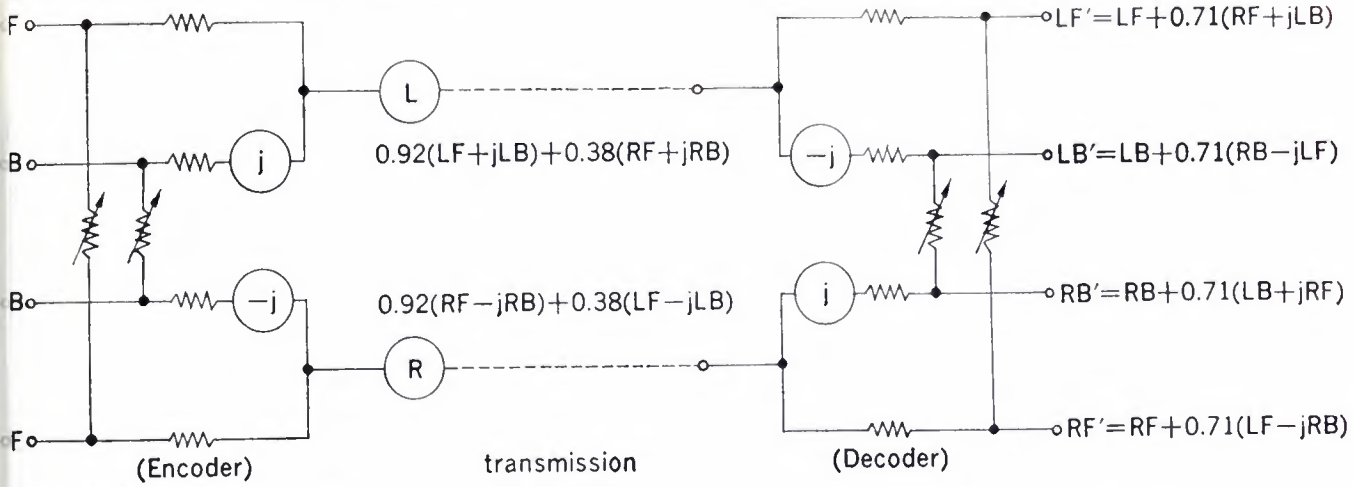


g. 1. Basic vectors for cutting matrixed disc.



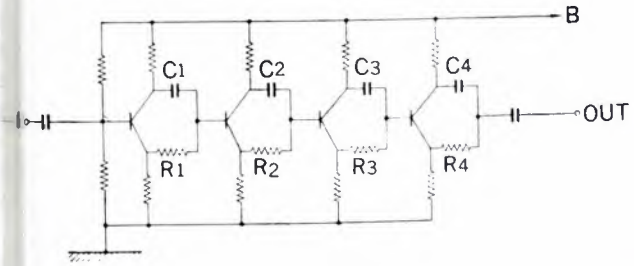
P.I.=Phase Inverter

Fig. 2. General approach to encoders-decoders.



ig. 3. Block diagram of encoder.

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



ig. 4. Phase shifting circuit.

Four-channel encoder by Sansui.

riginal sound field, these equations can be derived:

$$L = LF\cos\Theta + RF\sin\Theta + (\cos\Theta - \sin\Theta)$$
$$R - RF\cos\Theta + LF\sin\Theta + (\cos\Theta - \sin\Theta) \quad (3)$$

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 62

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 compatability—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 compatability, 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 compatability 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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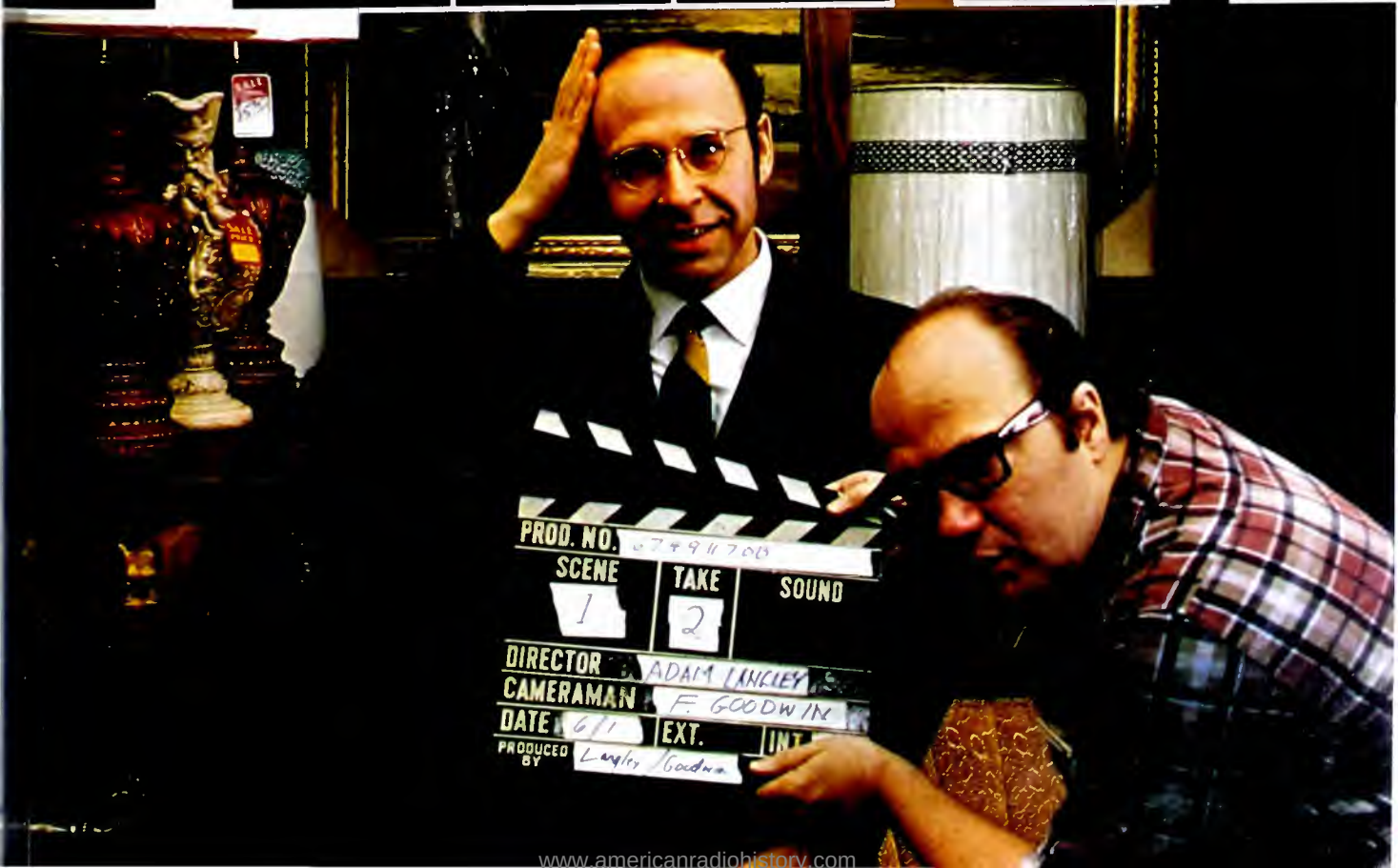
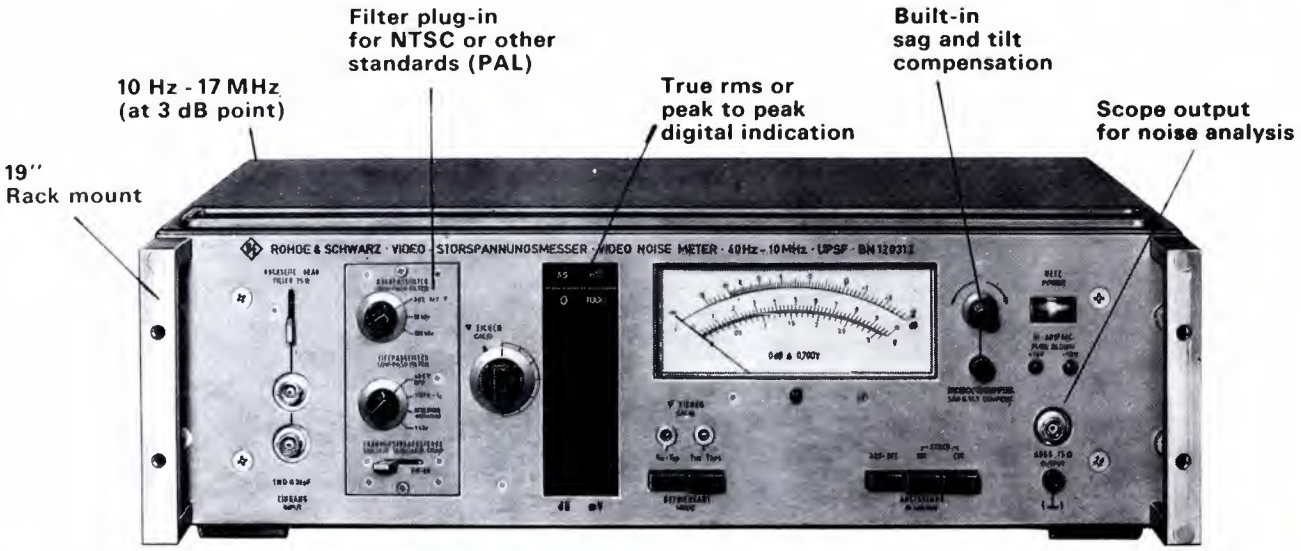
film



Measure and analyze video noise accurately (0.5 dB)



Video Noise Meter UPSF
40 Hz - 10 MHz

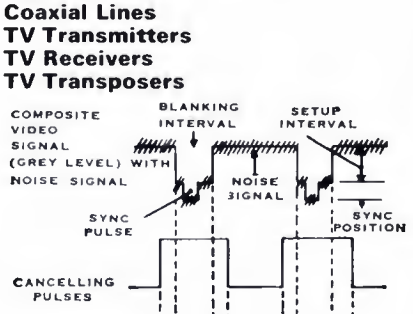
Features

- Meets requirements of all U. S. black and white and NTS color systems
- Measures noise voltage in the presence of sync and blanking pulses
- Can measure down to -85 dB referred to .714 Volts
- True rms measurement using semiconductors – no thermocouple, no thermistor; thus instantaneous indication
- Easy to read linear scale for both peak to peak and rms modes of operation
- Same instrument can be used for NTSC or PAL by changing plug-in filter
- Input impedance: 1 MΩ shunted by 30 *pF*, or 75 Ω bridging
- Completely solid state
- High accuracy (±0.5 dB) and repeatability

Applications

Measure video noise voltage on:

TV Cameras
Film Scanners
Video Tape Recorders
Radio Links
Coaxial Lines
TV Transmitters
TV Receivers
TV Transposers



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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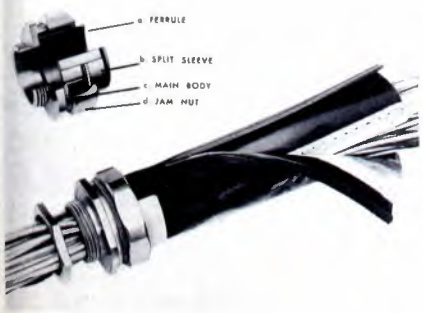
BROADCAST EQUIPMENT

New Sync Pulse Generator, CLD-1100 uses advanced digital circuitry and achieves long term stability. Works as a master unit, a standard sync generator, or in pulse system applications. Stability is derived from a timing circuit employing a single servoloop in which the 3.58 MHz color frequency is generated from a 14.31818 MHz crystal reference

source. Subcarrier drift is less than 0.1 Hz per month. Horizontal and vertical pulses are generated from the 3.58 MHz signal, thus virtually eliminating jitter between horizontal, vertical, and color burst. A 15 Hz Color Frame Indent Pulse assures correct color subcarrier-to-sync phase relationship. To assure correct color phase editing for network sync lock application, the new generator also has a 100 nanosecond "window" referenced to 3.58 MHz to allow for minor sync time instabilities. Now in stock. Price $1,995.00. CBS LABORATORIES. **324**

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 ± 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-

erverter A" has maximum of 1 dB loss, operating level of ±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

PRODUCTS

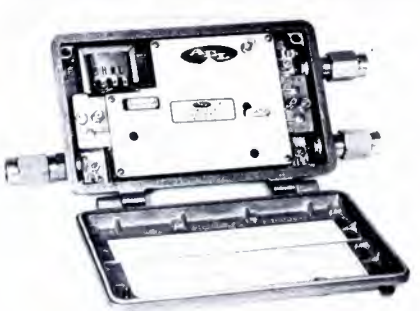
fier. Reverse filters and amplifier may be added at any time. AEL COMMUNICATIONS CORP. **289**

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 ¾-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-

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, ± 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 ± 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 ¼-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

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 33⅓ 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 systems 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 firms 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. Readout is on cold cathode indicator tubes. SPRENGNETHER 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.

Try the Electro-Voice RE55 today. The more you listen, the better it looks!

ELECTRO-VOICE, INC., Dept. 1021EM, 614 Cecil St., Buchanan, Michigan 49107

high fidelity systems and speakers • tuners, amplifiers, receivers • public address loudspeakers • microphones • phono cartridges and stylii • aerospace and defense electronics

Electro-Voice

a GULTON subsidiary

PRODUCTS

Impedance is 150 ohms. TURNER DIVISION OF CONRAC. 30

Dual-channel console has five inpu mixing channels, each with two input with pre-switching. Model B-503 ha two output channels (not stereo) plug in input modules to accommodate mi crophones or high-level sources, nomi nal +8 dBm, 600-ohm balanced out put, 4-watt monitor amplifier outpu and cue facilities. $950.00. MCMARTIN 30

Four-channel intermodulation test se provides four high-purity signals an the filters and amplifier to test broad band RF amplifiers. Model FTS-4 ha high sensitivity to measure devices wit gain as low as 0 dB; can be used wit field-strength meter or spectrum an alyzer. $550. AEL COMMUNICATION CORP. 30

High-output MATV amplifier provide signal for very large distribution sys tems. Model THPM*S has six-vol output, gain of 58.5 dB, front-pane output setting from two to six volts accommodates inputs from −8 dBmV to +37 dBmV. Input and outpu match 75 ohms, selectivity is greate than 26 dB at the next non-adjacen channel edge. JERROLD. 30

Anti-vibration mounts have steel table with natural frequency of 2 Hz. "Vi brostat" 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. MILC COMPONENTS, INC. 30

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. 31

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, ± 0.5 dB over range. Thin-film construction is used; power required is standard 24 volts dc. $5.00–$6.50. AMPEREX ELECTRONIC. 31

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. Tiltable 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.

We're ready with a full team of specialists to give you all the service, parts and technical help you'll need. Plus, a complete line of products including telecine cameras, standards converters, special effects equipment, and video recording systems. So now, you can get the quality and dependability of Fernseh TV equipment from an American company with an office near you:

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Houston (713) 681-8461
Los Angeles (213) 398-0777
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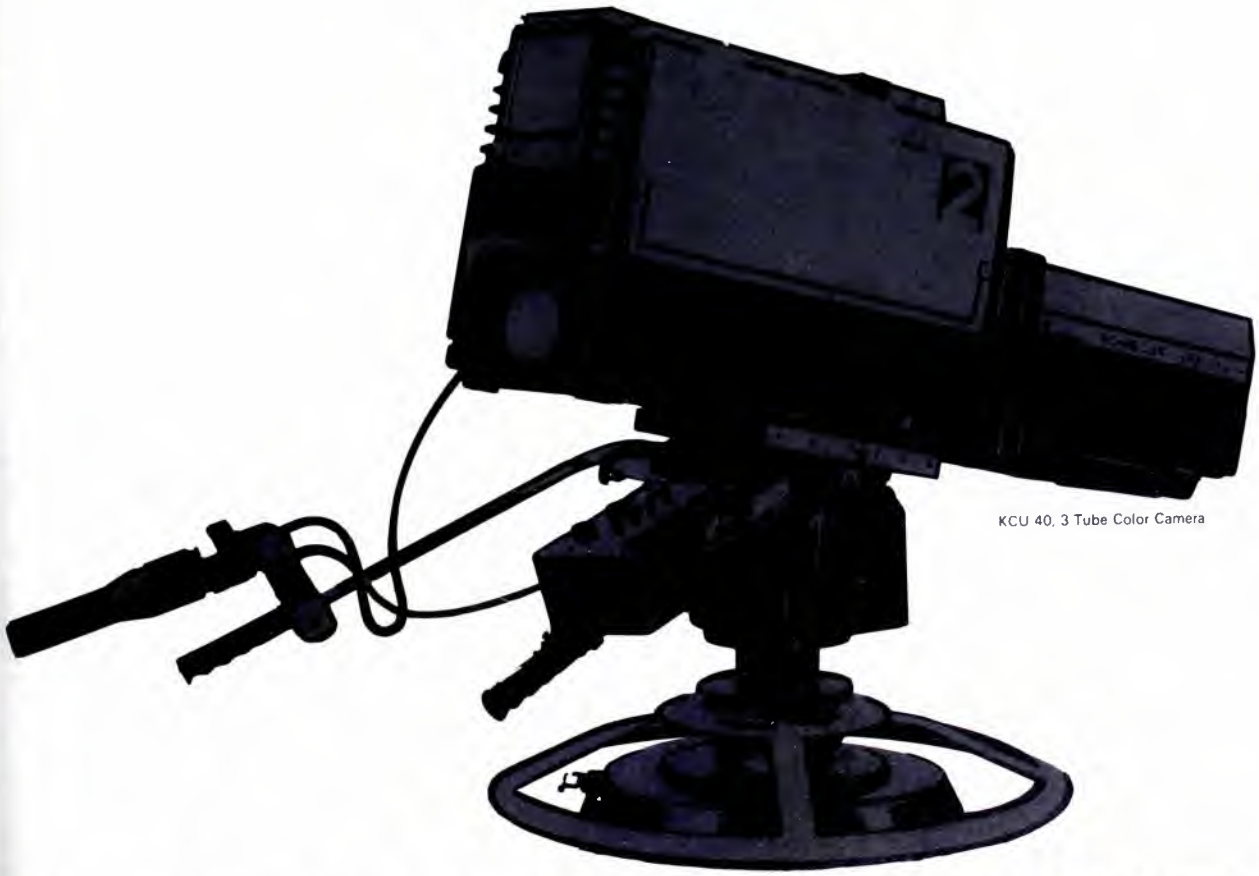
San Francisco (415) 583-9470



KCU 40, 3 Tube Color Camera

Robert Bosch Corporation **Fernseh Division**

Circle 123 on Reader Service Card

PRODUCTS

cast studio to start with a few channel and expand as needed. Included ar units for mike, medium-level, high level and remote input, output, com munications and monitoring. FAIR CHILD SOUND EQUIPMENT. 31

"Problem-solvers kit" for aerosol main tenance materials allows purchaser t choose six or more of any combinatio of products, rather than the larg quantity orders previously required MILLER-STEPHENSON. 31

Linear attenuator uses MystR conduc tive plastic resistance elements an slip rings with precious metal wipers LM8A has computer-controlled tape and tracking accuracy. Attenuatio range is 0–90 dB, input impedanc 600 ohms or 1000 ohms, noise at leas 100 dB down, scale accuracy ± 0. dB; 0–20 dB, ± 1 dB 20–50 dB WATERS MANUFACTURING. 31

Portable wide-band bridge allow measurement of cable return loss an VSWR on standard field strengt meter, without oscilloscope. "Porta Bridge" has white-noise generator an precision 75-ohm bridge, head shape to fit into close places, double mal adaptor connector. Distance to short and opens can be checked with graph supplied; unit can also check flatnes of field strength meter. $149.50 SADELCO. 31

Broadband power amplifier kit pro duces unit covering range 0.5 MHz 100 MHz. Kit MP-100 is rated at 2. w cw, will accept AM, SSB, pulse, o other complex waveforms. Input o 0.15 volt produces full power output LARKTON SCIENTIFIC. 31

Low-cost waveform monitor and video monitor combo is designed primaril for use on each camera output i studio, but can be connected anywhere in video system. Unit takes 7 inches of rack space, includes a tally light t show camera status. ULTRA AUDIO PRODUCTS. 31

Hand-held concrete breaker attaches t 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. 31

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

continued on page 58

Do wonders for your image

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

Shibaden offers a complete line of *professional quality* video equipment. Tested, proven and in use throughout the world.

Education. Training. Medical. Industry. Security. Broadcasting. Cablecasting. You name it . . . there's a Shibaden TV camera, video tape recorder, monitor or receiver, and all the accessories for it.

The video products pictured below are only four of the 150 currently available to those who won't compromise quality, yet must consider economy.

Look into the camera line. From mini-sized security cameras, up thru the high-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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Circle 127 on Reader Service Card

RUSSCO STUDIO-PRO and CUE MASTER turntables offer the ultimate in rugged long-wear dependability and ease of operation . . . only 3 moving parts! No-slip starting and reliable Bodine synchronous motor. The finest professional engineering with prices starting at a low **$152.00**

Circle 150 on Reader Service Card

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

Circle 151 on Reader Service Card

You get the most "headroom" for the money (+18 DBM) with RUSSCO's New "FIDELITY-PRO" and "FIDELITY-MASTER" phono preamps. 8 models stereo or mono to fit your needs, self-powered and featuring a unique "easy-service" case. Years ahead in engineering with economical prices starting at **$92.00**

Circle 152 on Reader Service Card

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

Circle 153 on Reader Service Card

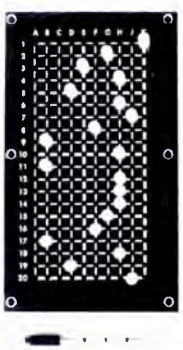
PRODUCTS

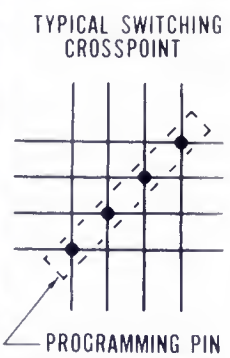
duces slightly more diffusion than standard 0.010 spun glass. $40 for roll 4 feet wide, 25 feet long. Rosco LABORATORIES. **319**

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.





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**

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 counter, monitor amplifier and cue microphone.

In developing the time base corrector, Ampex engineers discarded current technology and took a new 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 ½" videotape recorders, quadruplex recorders and transfers to film.

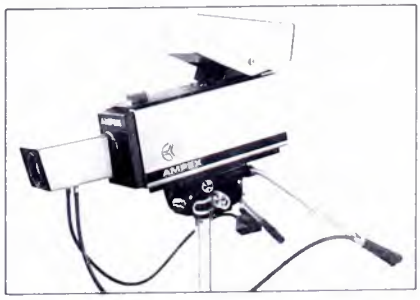
Ampex VPR-7900 recorder/reproducer with TBC-790

Circle 130 on Reader Service Card

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.

CC-500 Camera



Call your Ampex Dealer or write: Audio-Video Sales, Ampex Corporation, 401 Broadway, Redwood City, CA 94603.

AMPEX

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. Triplett 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-**

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 **AML 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**

QUAD STEREO continued from page 46

from rear-channel cancellation occurring in the encoding process.

The Sansui system, on the other hand, introduces its $\pm 90°$ 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 $+90°$ and the right rear by $-90°$. Thus, the reverse-phase relationship between the back channels is converted into an in-phase one. Now the encoder outputs will be:

$$L = (LF + jLB)\cos\Theta + (RF + jRB)\sin\Theta$$
$$R = (RF - jRB)\cos\Theta + (LF - jLB)\sin\Theta \quad (4)$$

Where $j = \pm 90°$, 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 images 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° without losing much of the original four-channel effect. At the same time, a decoder using a 22.5° vector can decode programs encoded at other vector angles 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

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 highway 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**

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**

SECAM/60 continued from page 36

ut having a precise reference to go by leads to the urther possibility that even a properly recorded tape nay be erroneously reproduced. Last, but certainly ot least, is that the display of simultaneous NTSC ictures on a group of monitors in the same class- oom will require very precise adjustment for color niformity. It is not unusual that color monitor natching becomes a daily event because of the umber of interdependent variables in NTSC. In articular, with the use of low-cost helical recorders or NTSC color, it is often necessary to adjust the olor phase-lock control prior to adjusting the phase ontrol (hue) on the monitor without knowing for ertain which of the two is rendering final phase ccuracy.

The SECAM/60 system eliminates many of the ritical adjustments common to an NTSC color tele- ision system. It yields the following advantages:

.) The elimination of hue adjustment on the dis- lay/receiver,

2) A limited-range saturation control which nor- nally requires no change over long periods of time,

3) Minimum visibility of the subcarrier in the Stand- rd L format, because of its high frequency.

4) Satisfactory distribution over monochrome sys- ems including distribution amplifiers, processing mplifiers, microwave, and cable systems. The only nodification required is the unblanking of part of he vertical interval to allow SECAM/60 identifica- ion pulses through.

5) Recording and reproduction by virtually all Quadraplex VTR's in either highband or lowband olor. These recorders require no time-base correc- ors or velocity error compensators to reproduce ex- ellent SECAM/60 color.

6) Virtually all one-inch monochrome helical re- orders can be used to record and play back SE- CAM/60 signals with little or no modification. Compatibility for the interchange of one-inch mono- hrome tapes is all that is necessary to guarantee ood SECAM/60 reproduction,

7) Helical-to-helical dubs in one-inch format may e made with full color accuracy in the duplicate ape. There is only a small loss in signal-to-noise atio, dependent upon other conditions.

8) Half-inch helical recorders have been made to ork on Standard L SECAM/60 with minor mod- fications. The results, however, have not been con- idered fully acceptable from a signal-to-noise view- oint even though subjective picture quality looked ood. SECAM/60 Standard M has been successful- y used with half-inch recorders of several makes nd has been distributed over ITFS monochrome ystems without any shift in image colorimetry.

9) Transcoding in either direction to or from a SE- CAM/60 format has proven to be practical as long s the original signals are of good quality.

In view of the great advantages that SECAM/60 rovides, it is proposed that this frequency- nodulated color encoding technique be used for olor programs on closed-circuit television. **BM/E**

NEWS continued from page 10

Las Vegas, November 2; Boston, November 9; San Antonio, November 14; St. Louis, November 16; and Atlanta, November 21.

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 r viewed before the Dorren syste could come into general use.

Renewal Notice Must Specif 60 Days for Public Commer

When a broadcast licensee gives publ notice, as required by the rules, th he will apply for a renewal of h license, the notice must specify th the public has 60 days to comment c station performance after the renew application deadline, the FCC ruled i August. The earlier rule set 30 days the period specified in the notice fo public comment, but the FCC a knowledged that this was inconsisten with the 60-day period, established i 1969, for petitions to deny renew applications. The new rule chang is in response to a request from Blac Efforts for Soul Television (BEST).

Notice Due Public If Candidate Supplies Recording

The Complaints and Compliance Div sion of the Commission ruled that broadcaster must notify the audienc when any materials or services in con nection with a program are furnishe by a candidate for office, or politica party, that such materials have bee so furnished, even though the candi date or party furnished only technica equipment for the broadcast and th station controls the editorial conten The ruling came in response to a re quest from a news service which occa sionally uses the audio feed service o the Republican Congressional Com mittee to record interviews with Con gressmen.

FCC Briefs

A proposed rule is the *restriction o broadcast of the stereo pilot subcarri er* to periods when stereo broadcastin is under way. The Commission sai that transmission of the subcarrie during monophonic broadcasting i "contrary to the intent of the rule and serves no useful purpose" . . Western Connecticut Broadcastin Co., licensee of radio stations WST and WSTC-FM in Stamford, Connecti cut, will pay **a fine of $10,000 fo censoring political broadcasts** in 1969 Stamford mayorality election, i the initial decision of an FCC hearin examiner stands; the stations were ac cused of requiring Democratic an Fusion candidates to submit scripts fo review (illegal) while giving the Re publican 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

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 . . . **Metromedia, 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 nonprofit organization in Los Angeles, got a construction permit for a television

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, Poynette, 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 acting 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. Morrisey** 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 journalist 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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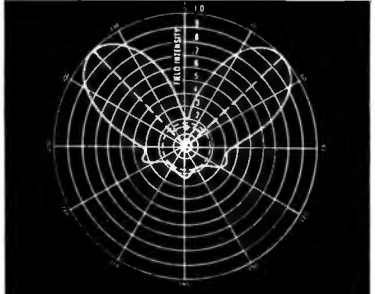

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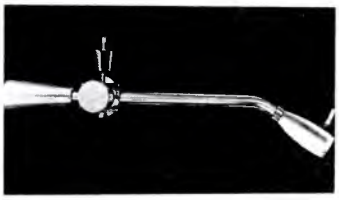

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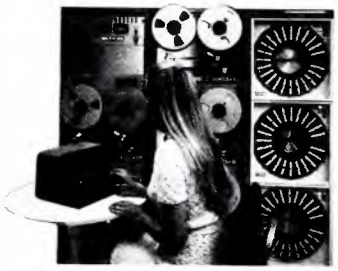

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Outstanding new values in cartridge tape equipment ... audio consoles and other broadcast products and accessories. Just check the boxes and send us this card. We'll speed complete information by return mail.

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Record-play & playback models, compact & rack-mounted, mono & stereo
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- ☐ The classic 500C
- ☐ The economical 400 (from $440)
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Multi-Cartridge Equipment
- ☐ New Mini-Series models (3 to 15 decks)
- ☐ Economical Five • Spot & Ten • Spot
- ☐ 610BX Automatic Audio System

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- ☐ Professional turntables
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- ☐ Remote controllers
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- ☐ Fidelipac & Audiopak cartridges (all sizes, any length tape, or empty cartridges), no minimum order, lowest prices

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FOR MORE INFORMATION ON Belar's AM monitor, write to:
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P.O. Box 826
Devon, Pa. 19333

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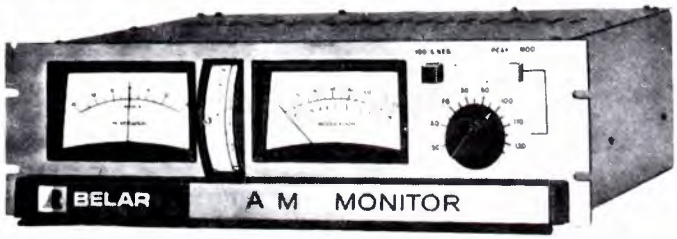
Comply with new FCC ruling on monitoring 125% positive peaks) and simultaneously measuring 100% negative peak).

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.

Belar Electronics Laboratory Inc., Post Office Box 826, Devon, Pa. 19333



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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 f/5.6

...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."

Mincom Division 3M COMPANY
300 SOUTH LEWIS ROAD • CAMARILLO CALIFORNIA 93010

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Studio quality color monitors for less than a grand!

UNIMEDIA SMT-DUAL 9 $1295.

UNIMEDIA SMT-15 $895.

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 broacast, 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.

UNIVERSAL MEDIA CORPORATION 29115 MISSION BLVD., HAYWARD, CA 94544, (415) 537-2483

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