JULY 1972

BM/E

BROADCAST MANAGEMENT/ENGINEERING

Convention Recap:

NCTA Show In Print

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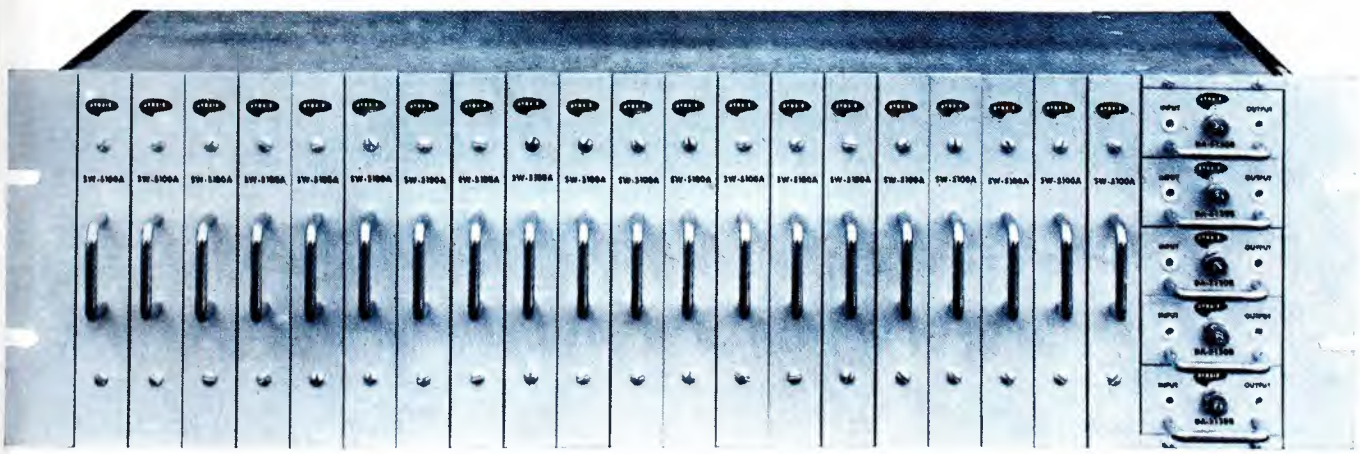

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BROADCAST MANAGEMENT/ENGINEERING

JULY 1972/VOLUME 8/NUMBER 7

Illustrator Sudduth screwed up a few frames this month, which wouldn't have happened if he had used a modern electronic editor. See articles beginning page 16.

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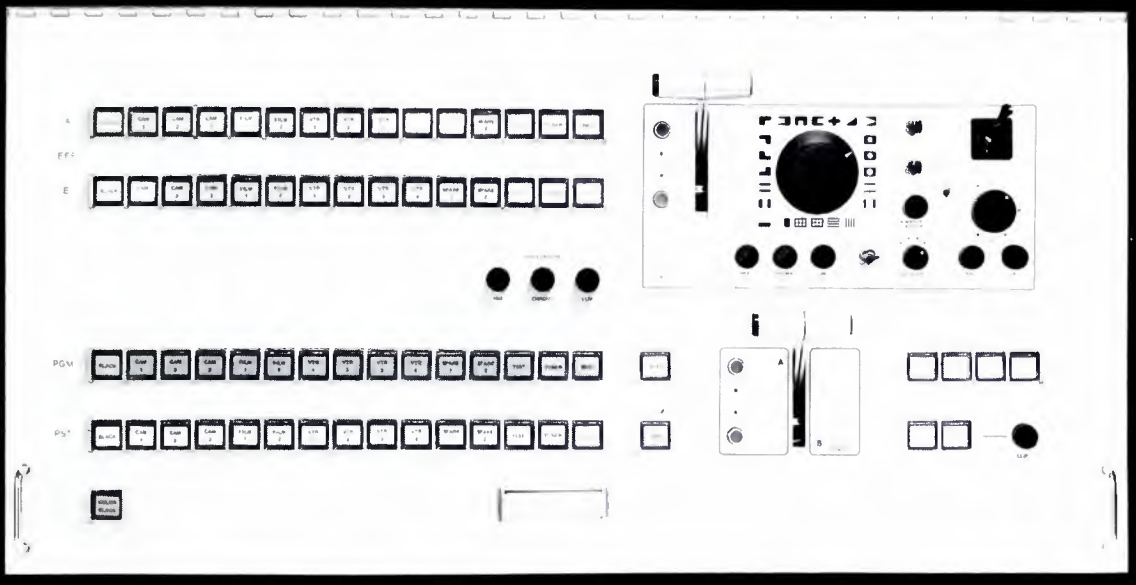
NEW! MODEL 1400-11 SWITCHING SYSTEM



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BROADCAST INDUSTRY NEWS

NCTA Convention: Forward Into the Unknown

"Freedom now" had been the rallying cry at NCTA conventions for half a decade. This year, cable operators had a Bill of Rights and a Constitution which "desegregated" the cities for them. The 1972 Cable Television Report and Order lays down the ground rules and, while they do not guarantee prosperity, they do offer the cable operator the opportunity to pursue happiness. But the future destiny of cable was certainly not manifest at Chicago.

For one thing, the states righters are still at work, and states such as Illinois, Wisconsin, and New York continue moratoriums until they can decide what cable's responsibility for corporate citizenship should be. The technology for future ecstacy was all there at Chicago, but how to convert "Blue Sky to Cash Flow" (title of a session paper) was a matter of concern to both operators and bankers (who were there in large numbers).

The fuzziness that lies ahead was perfectly articulated by NCTA's new president, David H. Foster, who said the only certainty was that the future "is almost totally uncertain . . . that it is almost totally ambiguous." The regulatory environment vis-a-vis exclusivity, sports blackouts, copyrights, public access, and special relief, was cited, as well as future relations between education, minority groups, and public access advocates. Foster said new technology alone was no solution to social ills and injustices, and that "unfulfilled expectations will be around to haunt us forever."

Foster also spoke of uncertainty and risk in investments, but the financial institutions at NCTA continued to express their confidence in the industry and stories of "commitments" circulated widely. And certainly the youth there—"The Young Communicators"—had a vision of what could be. Operating as a loose collective or cooperative, youths from around the country were at many sessions making statements, some demands, videotaping what they saw and heard. They brought, and offered to cable operators, videotapes of what they thought cable ought to be all about. And they offered themselves, and their equipment, for public access. (For a list, write to The Dumping Place, 339 Lafayette Street, New York 10012—ask for the April video contact list.) At times it seemed their zeal to see public access work exceeded the zeal of cablemen for profit making, leaving the possibility of a funding gap. Certainly a future conference will need a paper entitled "Optimizing the Trickle Down Theory for the Public Good."

Many viewpoints were expressed at NCTA in sessions designed to draw out diversity. Among the surprises were the views expressed by George Barco of Pennsylvania and George Sisson of Rhode Island, that state regulation of cable might be a good thing. State regulation can be helpful if it 1) doesn't simply become another tier of regulation, but genuinely simplifies relationships with the many municipalities a system owner now has to work with, and 2) improves relationships with other utilities, speeding up pole agreements, etc.

Public access hasn't created the problems of control envisioned earlier. Those who use cable have not been profane, obscene, or libelous, and there has been no public backlash. So far the demand has not created scheduling problems. However, the public access advocates say the real job is to educate the public that they do have access and that it is a good thing. They want a greater commitment from operators for education and production equipment.

Spokesmen for the new Cable Television Information Center came in for a lot of sharp questioning from operators and legal counselors. Fear was expressed that CTIC will make policy detrimental to the cable industry. The Center's representatives stated that they want to make sure the community considering cable considers all of the alternatives.

A report on technical and marketing developments at the NCTA Convention is found in the *CM/* section of the magazine.

Broadband Communications Report Covers Cable TV, BCNs, Info Systems

Designed to serve as a much neede clearinghouse of information on broa band telecommunications activitie **Broadband Communications Repo** made its debut last month. The twic a-month newsletter, published b Broadband Information Services Inc covers systems planned or being buil local, state and federal regulation and financing.

The publication is interdisciplinar in scope to keep policy makers, user and systems manufacturers abreast o important interrelated development taking place in Washington, town hall state capitols, think tanks, universitie corporate offices, and labs.

The first issue discussed new privat over-the-air TV systems, the need fo improvement in graphics systems, ho Arlington, Virginia, will select a fran chise. The second issue reports o the Wisconsin Cable Communication Commission, the need for urban com munications systems, thrust of th international switching symposium, an others. Write for a free copy: **Broad band Communications Report,** 27 Madison Avenue, New York 1001 (212) 685-5320.

PBS President Asks Engineers To ImproveTV Audio

Noting that nothing has been don to improve the quality of audio net working since the first intercity hookup 50 years ago between Nev York and Cape Cod, Hartford N Gunn, Jr., president, Public Broad cast Service, asked that the SMPTE do something about it. He proposed at the 111th SMPTE Technical Con ference that a joint engineerin committee be formed includin broadcasters, manufacturers an common carriers to recommend im provements. Gunn volunteered th PBS network for experimentation He said that the quality of TV au dio is so horrendous that some seri ous musicians do not wish to per form on TV.

continued on page 8

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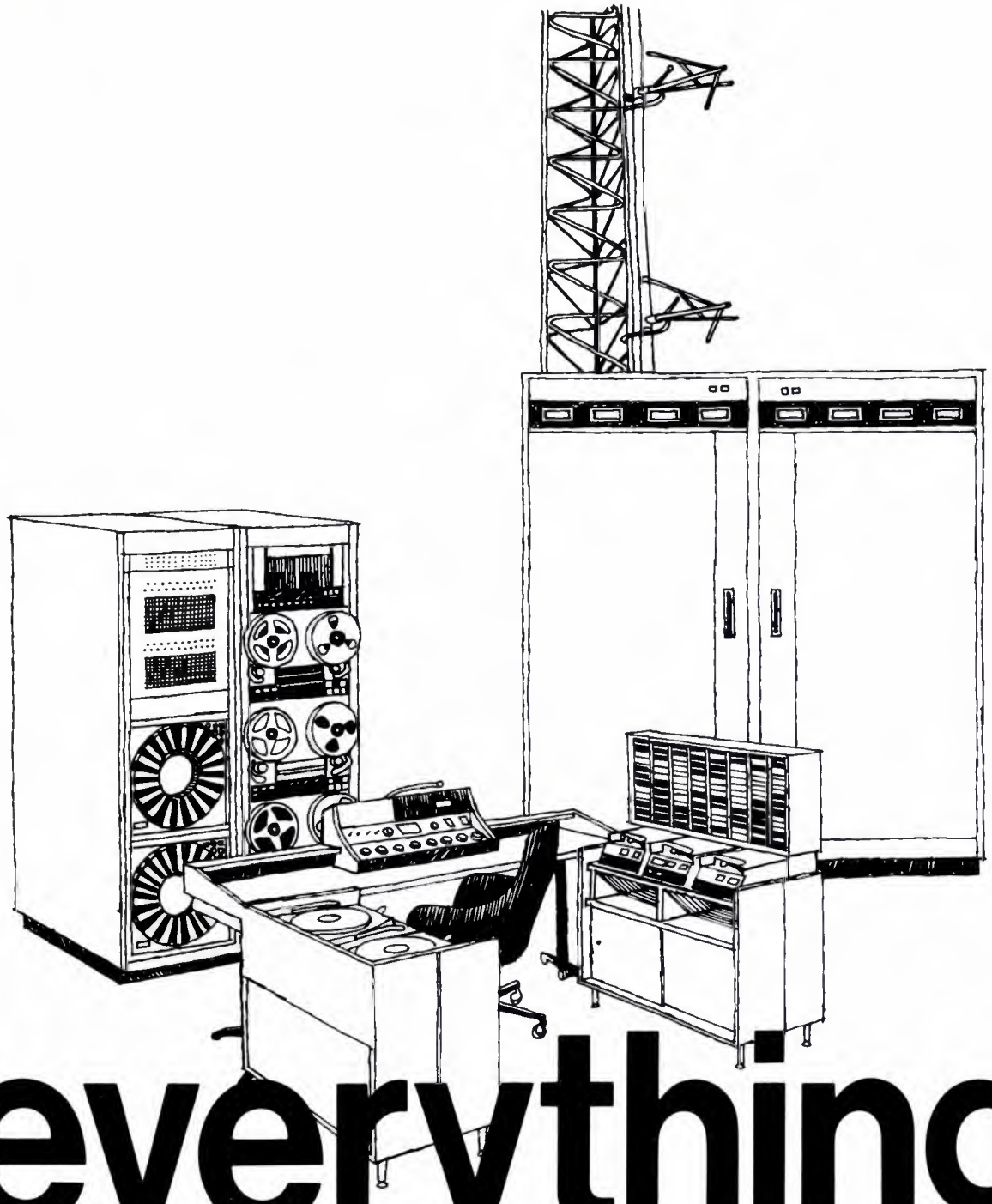

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NEWS

OTP Issues Study Proposing Pilot Broadband System

The Office of Telecommunications Policy released a study, conducted by the firm of Malarkey, Taylor and Associates for OTP, evaluating proposals for testing the demand for, and utility of, various cable TV services. Major proposal is that industry and government jointly set up a pilot two-way cable system, serving a test group of 1000 or more homes, to try out a variety of cable services.

Western Union Seeks Permit For Computer Mail Service

Western Union International has asked the FCC for permission to begin a computerized wire mail service between New York, San Francisco, and Washington, D.C., on the mainland, and Hawaii, Puerto Rico and the Virgin Islands, off-shore. Messages filed by WUI subscribers in any of the mainland cities would be wired to teleprinters in the off-shore locations, for delivery by the next scheduled U.S. mail; the reverse service would also be furnished. WUI says that, if the FCC approves, it will begin the service in July 1972.

Japanese, Swiss, British Join for World-Wide EVR Sales

A powerful Japanese consortium has agreed with The EVR Partners —Imperial Chemical Industries of Britain and CIBA-Geigy of Switzerland—to exploit the EVR system jointly on a world-wide scale. The Japanese are said to have evaluated all videocassette systems and selected EVR. An EVR processing plant will be set up in Japan in the near future. Included in the Japanese group are Teijin, Hitachi, Mitsubishi Electric, and Mainichi Broadcasting System.

Listing of Religious Programs Compiled

A brochure listing nationally-available religious television programs from 63 different agencies has been prepared by the Broadcast Institute of North America (BINA) at 147 East 81st Street, New York City. Nearly 180 programs are shown in the first comprehensive compilation of programs of this type.

EIA Group to Evaluate Quad Radio Systems

A National Quadraphonic Radio Committee, sponsored by the Electronic Industries Association, held its organizational meeting in May, and created six panels to consider major aspects of the subject and to advise the FCC on preferred systems. Representatives of more than 25 companies and organizations went to the meeting, and several firms presented their proposals for four-channel broadcasting. Other organizations wanting to submit proposals are invited to do so by July 15. Address: E. Tingley, EIA Consumer Group, 2001 Eye Street N.W., Washington, D.C. 20006.

RCA To Market Quad Disc and Tape Player

Another development on the four-channel front was the announcement by RCA of a combination phonograph-tape cartridge player, to be put on the market later this year, which will play the new RCA discrete four-channel disc as well as the four-channel Q8 tape cartridges which have been available since last year. The machine will be designated the VS-7000 and will be the first of a line of models, according to the announcement, to be introduced as the supply of recordings and the public demand increase.

Dayton Blacks, Cypress Agree on Joint Cable System

Cypress Communications Corporation, operator of cable systems in 17 states, and leaders of the Black community in Dayton, Ohio, have agreed on joint ownership between Cypress and Citizens Cable Corporation, a local group owned solely by residents of the Black community of a $2-million cable system which will serve the community. Another $5.5-million system will be built by Cypress to serve other sections of Dayton. The jointly-owned system will be programmed, at least initially, solely by Citizens Cable Corporation. The proposal is subject to the approval of the Dayton City Commission.

CPB Asks FCC to Let In More Public Radio

A petition for rules changes which would allow many additional cities to have public radio services has been filed with the FCC by the Corporation for Public Broadcasting, with the support of the National Educational Radio Division of the NAEB. Major thrust of the petition is for joint use of channels now assigned to limited-time use by schools. Public radio would take over the channels, under the proposal, after the schools sign off, thus making much fuller use of the available spectrum. Among other requests was a plea for a new FM channel on 87.9 MHz, to be granted on a basis of non-interference with TV channel 6.

Canadians Define "Joint" Programs for Quota

Programs produced by cooperation between Canadian and foreign organizations and personnel, which are to be deemed domestic for the 60-percent-domestic quota imposed on the Canadian broadcasting industry, have been defined in a statement issued by the Canadian Radio-Television Commission. Major criterion is that at least 50 percent of the cost of artistic and technical production be paid to Canadian organizations and personnel. Further requirement is that there be "significant" involvement by Canadians in artistic control and among the principal performers.

RTV, New York-Based Firm, Builds Stations in Bahrain

RTV International, Inc., with headquarters in New York, will build radio and TV stations on the island of Bahrain in the Persian Gulf, according to a company announcement. Operation will be by RTV Bahrain, Ltd., a new firm to be owned 80 percent by the New York company and 20 percent by the Government of Bahrain. Target date for the TV station is June or July 1973, with the radio station coming later. Most programming will be in Arabic, and commercials will be accepted under a government-approved advertising code.

Improvised Lens Puts Apollo Separation on TV

National TV coverage of the separation of the Apollo 16 space capsule from the launch module was accomplished with an International Video Corp. TV camera coupled to the NASA optical tracking telescope, using a field lens improvised by IVC personnel in Florida, according to an announcement from

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that company. Jim Holladay, IVC southern distributor manager, and Alan Jester of Lykes Electronics, Tampa IVC distributor, connected the IVC-500 camera to the telescope in three days of frenzied work, after being told that television through the tracking telescope was years away. All three major networks used the picture during the launch.

Animated Spots Explain News, Equal-Time Rules

Two 30-second animated spots, produced by the Television Information Office, which explain important issues to the television audience on behalf of the industry, are now being distributed by TIO. One, titled "Candidates/Issues," tells that stations must give fair and equal coverage to all qualified candidates, and must present all sides of important controversial issues. The second spot, "More News," explains that the industry is putting more and more effort into news coverage, particularly at local levels. Main "characters" in the film are animated TV sets, which make the points with a light touch. Distribution is free to TIO sponsors; to others cost is $15 each or $25 for both. TIO is at 745 Fifth Avenue, New York 10022.

Great Plains Releases Courses on Videocassettes

More than 100 telecourses and instructional presentations, comprising over 3000 individual lessons, are being released on Sony U-Matic videocassettes by Great Plains National, information distributor based at the University of Nebraska in Lincoln.

GPN and the Nebraska ETV Network have installed Sony duplication equipment. Courses can be rented, with the videocassette supplied, or they can be bought, with the purchaser sending a cassette for the dubbing if he so desires.

Oklahoma ETV System Buys Collins Equipment

The Oklahoma Higher Education Television Instruction System, which interconnects by microwave a number of colleges and universities in the state, has signed a contract with Collins Radio Company for $200,000 worth of microwave equipment to expand the facilities of the network. The equipment, consisting mainly of high frequency service channels and radio equipment, will raise the hop system from 14 channels to 32 channels, and bring in several additional institutions.

PBS To Add Saturday Night For Full-Week Coverage

The Public Broadcasting Service announced that it would add Saturday night prime-time programming to its service in the fall of 1972, to bring its night-time coverage to a full seven-day week. Five new series and a major collection of specials will be included. Among the programs is an experiment in opening communication between young and old; an examination of justice in America; a collection of best performances from European television; and a magazine covering the contemporary scene.

Markle Foundation Funds Investigative Journalism

A grant of $100,000 was made by the John and Mary R. Markle Foundation to the Fund for Investigative Journalism, Washington-based organization which underwrites individual journalists in the preparation of investigative articles and books. FIJ grants have produced many articles in national magazines and newspapers in recent years, including the original exposé of the My Lai massacre by Seymour Hersh, which got him the Pulitzer prize. Broadcast journalists with proposals for serious investigative projects should address FIJ at 2933 Ordway Street, Washington, D.C.

McGraw-Hill Agrees To Limit Station Purchases

The trend toward concentration of station ownership in the top 50 markets, which has had the de facto blessing of the FCC in spite of an expressed policy against it, may have received a setback from the precedent of an agreement between the McGraw-Hill Co. and community groups in three midwestern cities, which limits McGraw-Hill's station purchases to two of a planned three. The FCC had approved McGraw-Hill's purchase of the three stations from Time-Life Inc. on the grounds of "compelling public interest." The stations are in Denver, Grand Rapids and Indianapolis. A wide-ranging consortium of Black and Mexican-American groups sued in the United States Court of Appeals to block the sale. The court action was withdrawn when McGraw-Hill agreed to limit the purchase and also to set up a comprehensive plan for minority representation in control and programming.

Stations Must Notify Callers At Once of Call Airing

The FCC reminded broadcasters in a Public Notice issued in May that they must notify and get permission from a telephone caller *in advance of* using the call on the air, or of recording it for future airing. The action was stimulated by several cases in which stations did not notify callers at the outset of conversations that they intended to put the conversations on the air or record them for future use.

FCC Relaxes Bank Stock-Holding Rule

The Commission raised from one percent to five percent the amount of stock in a broadcasting enterprise that a bank may hold in its trust department, when it has the right to determine how the stock shall be voted. In the same action the FCC removed the rule requiring banks to file trust agreements or abstracts with the FCC. Banks were given three years (to May 1975) to bring themselves into compliance with the new rule.

FCC Cable Committees Start Organization

Two committees which will advise the FCC on cable matters got a start toward organization in May at the NCTA Convention in Chicago. With FCC Chairman Burch and Cable TV Bureau Chief Schildhause meeting with ad hoc steering committees from the industry, plans were laid for both the Advisory Committee on Technical Standards and the Committee on Federal/State/Local Relationships, with criteria established for the various assignments. More than 200 cable industry names were submitted as possible members. Committees will also draw on government groups, public interest groups, and the FCC staff.

FCC Proposes Change in Sponsor Identification

The Commission proposed a rule

continued on page 41

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If the Edipro-300 is so advanced- how come it's so simple?

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INTERPRETING THE
FCC RULES & REGULATIONS

Charges For Political Use

Last month, *Interpreting the FCC Rules* examined the Federal Election Campaign Act of 1971 (Public Law 92-225) which amended sections 312 and 315 of the 1934 Communications Act. Therein, we covered: (a) the definition of and provisions applicable to "legally qualified candidates," under section 315; (b) the procedure for station certification requirements re candidates, under section 315; and (c) station responsibility for providing access or permitting purchase of time by candidates, under section 312.

This month, *Interpreting the FCC Rules* turns to the critical topic of *rate charges* for political use under section 315 as applicable to broadcast licensees and CATV operators. In the overview, amended section 315 requires that charges by broadcasters and cablecasters for use by political candidates not exceed 1) charges made for *comparable use* of such station for other users, and, more definitively, 2) during the pre-primary and pre-election period, charges not exceed the "lowest unit charge" of the station for comparable "use" class, length of time and period of year.

Specifically, amended 315(b) 1) and 2) reads:

> The charges made for the use of any broadcast station by any person who is a legally qualified candidate for any public office in connection with his campaign for nomination for election, or election, to such office shall not exceed—1) during the 45 days preceding the date of a primary runoff election and during the 60 days preceding the date of a general or special election in which such person is a candidate, the lowest unit charge of the station for the same class and amount of time for the same period; and 2) at any other time, the charges made for comparable use of such station by other users thereof.

The import of this law is the burden charged to station licensees and CATV operators to assure that rates charged to political candidates be uniform, both as between candidates and advertisers and among the candidates themselves. Broadcasters and cablecasters may charge candidates no more than the rate the station would charge if the candidate were a *commercial advertiser* whose advertising was directed to promoting its business within the same area as that encompassed by the particular office for which such person is a candidate. Consistently, all "discount privileges" offered by a station to commercial advertisers must be made available, on an equal basis, to all candidates for public office. As to charges, practices, and services, no licensee shall exercise any form of discrimination between candidates in making time available for political use.

The aforementioned guidelines on rates and use do not apply to appearances by a legally qualified candidate on any 1) bona fide newscast, 2) bona fide news interview, 3) bona fide news documentary (candidate's appearance "incidental" to subject covered by news documentary), or 4) on-the-spot coverage of bona fide news events (political conventions, caucuses and the like). Rather, the guidelines are restricted to application for sale of time. Also, no station licensee or cable operator may make any charge for the use of such station by or on behalf of any legally qualified candidate unless such candidate or authorizee *certifies* to the licensee, in writing, that such charge will not violate any Federal or State limitations.

In amending section 315 to restrict broadcasters and cablecasters from charging in excess of the "lowest unit charge of the station for the same class and amount of time for the same period," the architects of the FECA stimulate many questions. What is the meaning of "lowest unit charge?" To whom does it apply? To what does it apply? What are the boundaries of such charge? What are the bases of such charge? Are there variances in these charges?

Determining the subject of charge

Most importantly, the "lowest unit charge" provision applies *only* to broadcasts or cablecasts by *candidates* for public office. Such does *not* apply to political broadcasts or cablecasts by groups, organizations, or persons other than candidates. Rather, whenever a candidate *personally* participates through use of his voice or image, live or taped, or through film or picture, two things happen. First, his opposing candidate is *entitled* to an equal opportunity to respond. (*Note:* it is not necessary that he *actually* respond.) Second, once these grounds are

continued on page 14

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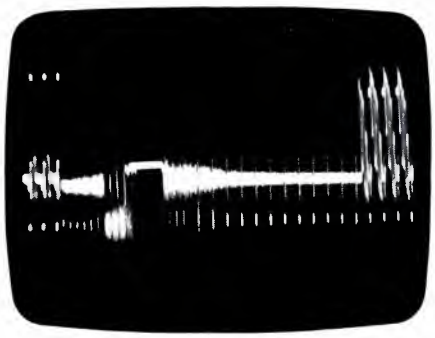
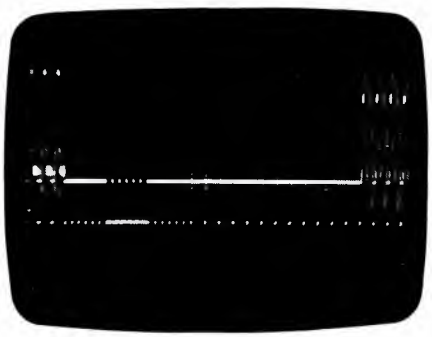


Raw signal.



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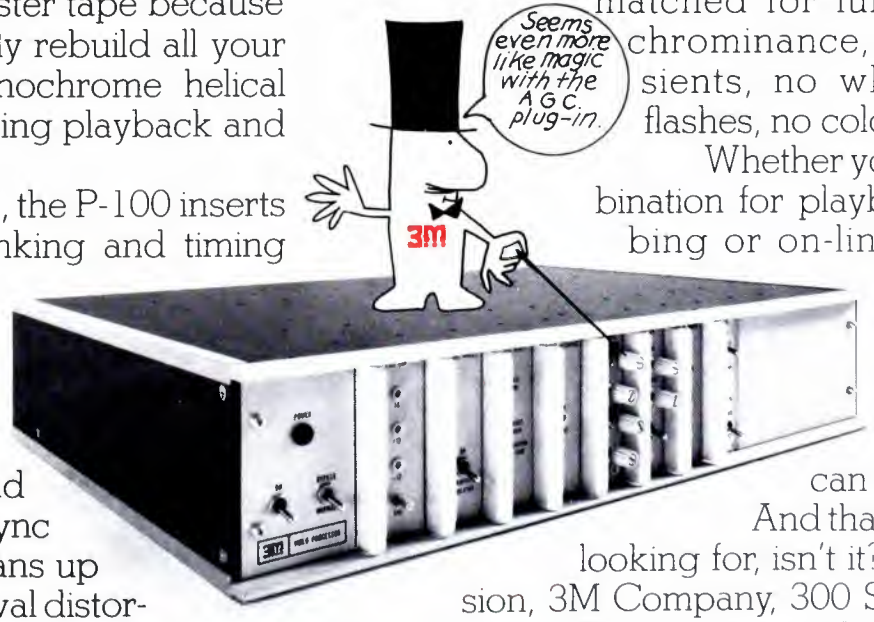

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determined, the station operator is required to apply the "lowest unit charge" provision to each candidate's use.

Determining the boundaries of charge

The station operator is under a duty to assure that, in selling time to political candidates, it levies its "lowest unit charge." For stations employing both "national" and "local" rate schedules, this provision requires the operator to calculate his charges on the basis of its lowest "local" rates. Moreover, in calculating rates for political use, any discrepancies between a station's 1) rate cards and 2) rates actually charged, are to be resolved in favor of the *lower* boundary. *Note:* The provision requires a station not to "exceed" the "lowest unit charge;" a station is permitted to charge *less* than the "lowest unit charge" so long as it does so on an equal basis to all candidates and is in no way discriminatory.

The "lowest unit charge" provision refers only to purchase charges, not production charges. In determining his rates for political use, the station operator *may* fix charges above and beyond those for the purchase of time, including incidental production charges for studio use, technical people, audio- or visual-taping, line charges and the like. A station operator may also make additional charges to a candidate who purchases full sponsorship of an existing program for which there is an established *program* charge in addition to a time charge.

Moreover, if a candidate purchases time from a station through an *agency*, the station may include the agency commission in the "lowest unit charge" it makes to the candidate. However, if a candidate purchases time *directly* from a station without the use of an agency, the station may not include an amount usually paid for agency commission in its charges. Consistently, stations may *not* allow "trade outs" or "barter transactions" to be used as a basis for calculating the "lowest unit charge."

Determining the bases for charge

Once the station operator has determined 1) that a candidate is entitled to the "lowest unit charge" for political use, and 2) the boundaries of specific charges, he must determine the *basis* for that charge. The governing premises upon which rate determinations are based are twofold: First, the candidate should be charged the same rates the operator would charge a commercial advertiser for a comparable use; second, the date of use will be controlling as to charges.

Manifestly, charges for political use may vary with the day of the week on which the candidate uses a station, only insofar as the station varies such charges for commercial use. If a station does not vary its charges with the day of the week to commercial users, it may not do so for political users.

Likewise, these bases apply to purchase of time on *networks*. A candidate is entitled to purchase such time for the "lowest unit charge" *on the date of use*, regardless of the date on which he places or pays for his order for time. Thus, in its guidelines, the Commission cites the following example:

> If $40,000 is the lowest unit charge for a one-minute spot announcement on a particular program in prime time on October 1, and $50,000 is the lowest unit charge for a one-minute spot on that program in prime time on October 22, candidate A who purchases a one-minute spot broadcast on October 1 pays $40,000, and candidate B who purchases a one-minute spot broadcast on October 22 pays $50,000."

Operators should pay special attention to the fact that the above bases for determining "lowest unit charge" for *network* use refer to the *affirmative* purchase of time by candidates and not responses to such uses arising out of the "equal opportunity" provision. Charges to any candidate who purchases network time to *respond* to an opponent's network use via the "equal opportunity" provision must be the *same* as those charges to the initiating candidate. Hence, if the facts in the above example had stated that candidate B purchased network time to *respond* to candidate A (via "equal opportunity" under section 315(a)), candidate B would then be entitled to purchase said time for the same $40,000 charged to candidate A, despite the fact that he is using network time of greater value.

Per contra, responses by a candidate for non-network use do not *automatically* entitle the respondent candidate to the same charges as the initiating candidate. For example, if candidate A purchases prime time spots to be aired *prior to* the 45- or 60-day period preceding an election and candidate B purchases prime time spots of the same character (to respond to A via the "equal opportunity" provision) to be aired *during* the 45- or 60-day period, the station operator could charge candidate B not more than the lowest unit charge prevailing *during* the 45- or 60-day period. With candidate A likely being subject to a lesser charge, candidate B would thus be charged a greater amount for *responding* to his opponent. Rationale: This is not discriminatory since the difference in charges is *set by statute.*

However, in cases where rate discrepancies are determined by factors *other than* by statute (e.g., change from summer to higher fall rates), candidates responding pursuant to the "equal opportunity" provision must be charged on an *equal* basis with the initiating candidate. Like the "network" example above, candidate B, responding *after* the change to higher fall rates to remarks by candidate A made *before* the change, is entitled to be charged on the same basis as candidate A. **Note:** If, in the above situation, candidate B purchases 100 fixed-position, one-minute spots in prime time (to be aired *after* the change to higher fall rates) to respond to remarks made by candidate A made on 50 fixed-position, one-minute spots in prime time (aired *before* the change to higher fall rates), the station operator would be required to charge candidate B summer rates for *50* of such spots and fall rates for the balance.

Accordingly, seasonal factors and television ratings often confuse the station operator in determining the basis for its "lowest unit charge." The Commission clarifies by simply requiring that the prevailing rates *on the date of use* (either summer or fall, pre-ARB/Nielsen report or post-) are controlling. Hence, with the 1972 general election to be held on November 7 and the "lowest unit charge" to be made to candidates during the preceding 60 days (i.e., September 8-November 7), candidates would be charged summer rates from September 8-September 19 and higher fall rates from September

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Professional quality 19″ color video monitors offer broadcast quality at a modest price. Horizontal resolution is 300 lines (color) and all set-up controls are located behind a hinged front panel to prevent accidental misadjustment. Also available in 25″ model.

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Regulated circuitry in the 25″ color monitor provides extremely stable operation and prevents raster size or brightness deviations due to line voltage fluctuations. Horizontal resolution is 300 lines (color). Set-up and operating controls are front-mounted for ease of operation.

"Educator" Monitor/Receiver, 23″ monochrome model, is designed specifically for educational and training applications. Controls are front-located. Tamper-proof control compartment door with lock is optional. Horizontal resolution is 600 lines or better with video signal input. Also available in 25″ color model.

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Videotape Editing Equipment Plentiful

Electronic indexing has greatly reduced post-production time in editing videotape. There are five manufacturers that have editors using time code generators on the market today. There's an editing system to suit your needs and pocketbook.

TWO MONTHS AGO, in May, the National Academy of Arts and Sciences at its 1972 Emmy Awards Banquet, honored EECO (Electronic Engineering Co. of California) with a special commendation. The achievement honored was EECO's development of serial time code editing equipment. The first editor was installed at CBS Studios in Hollywood in 1967.

Other manufacturers who shortly thereafter introduced editing equipment that controlled VTRs were Ampex, Datatron, and Central Dynamics Ltd. The Ampex RA-4000 was announced at the NAB Convention in 1969. Later that year, at the NAEB Convention, Datatron announced the Vidicue-5000. Central Dynamics had custom-built editing equipment during that period, but did not produce an off-the-shelf unit until later. Then, in 1971, the "ultimate" editing machine was announced by CMX Systems, a CBS/Memorex company. It cuts editing time to a bare minimum. However, the CMX-600 is priced at nearly $300,000, meaning its use is limited to busy studios or large production companies.

EUE-Screen Gems makes good use of Ampex RA-4000.

In 1972 there are a variety of devices on the market, making it virtually impossible for you not to afford an editor.

Datatron has announced a Vidicue-5050 system which, while it controls only two VTRs thus not permitting A-B rolls, will cost only about $10,000 (without the time code generator).

A unit to control three machines costs in the vicinity of $30,000. Both EECO and CDL offer various options. CDL's basic system starts about $40,000. And, to reach the broadcasters, CMX Systems announced the Edipro-300 editing system. All of these units use the new SMPTE code, meaning that any tape carrying the standard time code reference can be edited on any machine.

There are variations in the configuration of the equipment which affects operations. The biggest difference is in how much memory is used. You can get to *in* and *out* points on all machines readily (although some machines search faster and cue up faster than others).

But for anything beyond simple adds or splices some bookkeeping on where you are at is necessary unless you have some built-in memory. (All editors remember the in and out point and handle pre-roll calculations, but if you are doing an insert, you might have to do some addition and subtraction.)

Most editors interface with the quad VTRs and the popular helical scan recorders. Ampex's RA-4000 has not been adapted to work with the TR-70, but it may be the only one currently that interfaces with Ampex's slow-motion disc recorder HS-100 and 200. The RA-4000 is designed to handle six machines—three VTRs and three audio recorders—for flexibility in audio editing. The first editor to eliminate both controls and the bookkeeping, which in practice required that all post-production edit decisions be made sequentially dur-

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ng the assembly process (using costly quad machines), was the CMX-600. The CMX-600 combines a mini-computer with new video disc drives. Scenes and takes on tape or film are transferred to the disc packs along with frame code numbers which are stored simultaneously during the transfer process. These scenes can be accessed randomly—a faster process than sequential searching of tape reels —and these desired scene addresses can be stored for later automatic assembly.

The editing console of the CMX-600 has no switches, thumbwheels, or pushbuttons. All control is done with a light pen. Programs controlling all editing processes have been written into the machine and are read out on a CRT. There are four such "menus." Commands are activated simply by positioning the light pen over the proper instruction. All scenes available can be called up by touching the instruction, "Scene." Typical commands in scene search are Fast, Normal, or Slow, forward, reverse or stop. One can jog one scene at a time. Edit decisions are Splice, Edit, Play, or on to the next Scene.

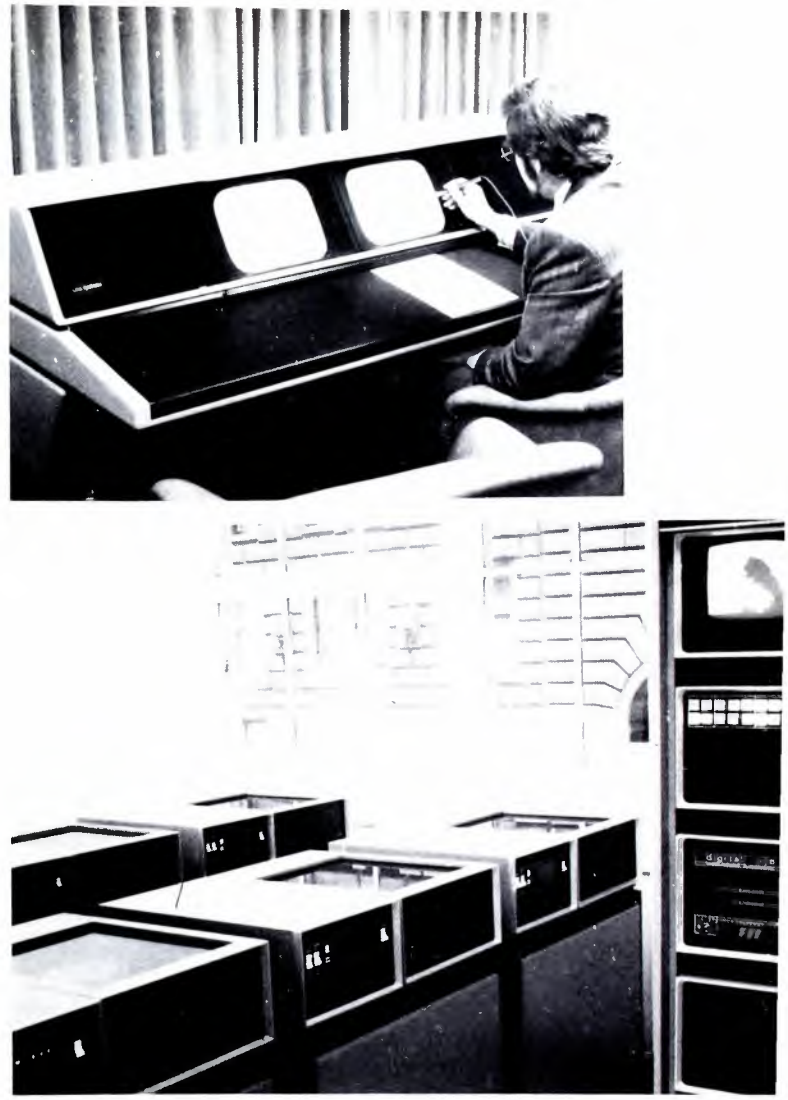
The left-hand monitor shows the last scene of the exit decision; the right monitor shows the entry decision. All edit decisions are stored in the computer processor and the output is available on punched paper or magnetic tape. A master program can be made up for automatic assembly.

The CMX literally saves days over early editing procedures (of film or tape), but because of the high capital investment, hourly costs are high. The independent production houses that own CMX units typically charge $300-$400 an hour, or $1200-$2000 per day. While these costs are low relative to the time saved—editing time of a TV film production is cut by 1/10th—the initial investment is high.

To offer some of the advantages of the CMX approach to a broader base of users, CMX has just announced Edipro-300. It takes advantage of the software program written for the CMX-600, but leaves off the video disc drive and the light pen actuator.

Since the disc feature allowing transfer is missing, editing is expected to be done directly at a studio's VTR facility.

The status of VTRs is shown by a CRT display but controls are made through a keyboard which is patterned after the familiar teletype machine. Three VTRs can be controlled so that dissolve as well as A/V cuts, A-only cuts, or V-only cuts can be made. A mini-computer is part of the system. The software designed by CMX was prepared to minimize the amount of non-creative work asked of the editor. In fact, most edit decisions can be accomplished without entering frame code numbers, setting switches, etc. The computer keeps track of tentative edit decision points entered by the editor whenever he presses a key labeled MARK. Then the editor may check his decision point by pressing the key PREVIEW, and the system will automatically show him his edit as it will appear when finally recorded. If he is satisfied, he simply presses RECORD to command the system to cue the record and playback VTRs and make the recording. Because a small computer is used in the system, it is also possible for the editor to adjust his cut points conveniently and perform other functions not possible with other videotape editing equipment.



CMX-600 at EUE-Screen Gems; editing console (top), computer control and tape decks (bottom).

The system does permit putting edit decisions on punched paper tape in the proper format for use with the CMX Assembler—meaning the final tape can be made up automatically after all editing is completed.

CMX Systems envisions the Edipro-300 being used separately or as a companion unit with the CMX-600. The latter will be advantageous when a large number of cuts, or very critical cutting, is necessary. The Edipro is the logical choice if the number of cuts is relatively low or if a fast turnaround time is an advantage.

For more Editor information, circle corresponding number on the Reader Service Card.

Ampex RA-4000	325
Central Dynamics Ltd. PEC-102	326
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Datatron Inc. Vidicue-5200	329
Datatron Inc. Vidicue 5050	330
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The KTLA Datatron Editing System

By Bill Smith and Don Sinex

BECAUSE OF THE PHYSICAL PLACEMENT of the video erase head, video recording head, and audio/cue heads, it is obvious that these different heads must be energized at different times. Therefore, the electronic editor consists largely of electronic counter circuits whose outputs activate driver circuits that cause the correct events to occur at the proper times.

In the Ampex Electronic Editor, the control track and tachometer pulses control the sequence of events which place the VTR machine in the Record mode and, at the conclusion of an edit, remove it. The Ampex Electronic Editor has two main modes of operation: Insert and Assemble. The electrical difference between these two modes is significant.

In the Assemble mode, a new control track is recorded along with new video. It is extremely important that the capstan oscillator frequency be set accurately when using this mode since there is no servo control over this oscillator during assemble recording. There will always be breakup at the outgoing point of an Assemble/Edit.

In the Insert mode, the VTR machine requires that control track already be present on the tape. In this mode, it is important that the tracking control be set accurately as poor edits will result from misadjustment. Here the editor is accurately turned off when coming out of record so there will be no video breakup at the outgoing point.

A modified editor control panel

To provide remote control of the Electronic Editor at the Vidicue unit, KTLA reworked the Ampex Editor Control Panel. Now there is only one Mode Switch, which has the following five positions:

OFF/REMOTE: The editor is disabled unless the VTR machine is assigned to REMOTE, in which case it is under control of the Auxiliary Panel.

INSERT-AUDIO/VIDEO: The editor is in the Insert mode, and will make an Audio/Video edit.

INSERT-VIDEO: The editor is in the Insert mode, and will make a Video-only edit.

ASSEMBLE-AUDIO/VIDEO: The editor is in the Assemble mode and will make an Audio/Video edit.

ASSEMBLE-VIDEO: The Editor is in the Assemble mode and will make a Video-only edit.

The meter, HØ, and Tach Ø, are disabled when the editor is operated in the Remote mode from the Auxiliary Panel.

Auxiliary control panel for convenience

The Auxiliary Control Panel allows the operation of three VTR machines from a central control point. There are three groups of almost identical controls. PLAY 1 and PLAY 2 controls are identical, while the controls for the recorder do not include video gain or pedestal but, instead, allow control of the Ampex editor. Each group of controls is activated only when that particular machine is assigned to REMOTE. They are in the circuit in such a manner as to over-ride Datatron commands. These controls may not be used in lieu of the Datatron controls when looking for edit points etc., since the Datatron does not receive logic from them.

Most of the controls are self-explanatory and consist of the following:

STOP, PLAY, FAST FWD & REWIND

RECORD (Audio/Video Record): Must be pressed simultaneously with PLAY to activate.

AUDIO ONLY, CUE RECORD, RECORD LOCKOUT: Locks out A/V record.

MASTER STOP: Stops all functions and transports simultaneously. However, this control does not, at this writing, cancel the Datatron FUNCTION controls. MASTER STOP is not enabled unless the recorder is assigned to REMOTE.

CODE: A code detector circuit will indicate whether or not Datatron time code is actually present on the cue track on the tape. A false indication on the tape indicator that code is present is possible because the Datatron unit has a fail-safe circuit (Error Bypass). If time code is present, the button marked CODE will be illuminated. If there is no code, or if the code runs out, the code lamp will go out and the Sonalert will sound. Pressing the appropriate code button will cause the Sonalert to go off, thus saving your nerves, but the CODE button will now flash, indicating that there is no code present and that the alarm is disabled.

AUDIO MONITOR GAIN CONTROLS: Provide remote control of the audio monitor amplifier gain when the associated machine is in REMOTE.

S.C. INV (Playback only): Inverts reference subcarrier to Colortec for editing purposes. (This feature may be made automatic at a later date.)

VIDEO GAIN (Playback only): Controls the gain of the processing amplifier and can be used to make video fades. (Activated only when the Proc Amp is assigned to REMOTE.)

PEDESTAL (Playback only): Controls the pedestal level of the processing amplifier. (Activated when the Proc Amp is in REMOTE.)

INSERT (Record only):* Switch enables the editor in the INSERT mode. The lamp will be on.

* These controls are activated when the recorder is in REMOTE, with the editor in REMOTE, and the servo in AUTO.

Mr. Smith is assistant maintenance supervisor, KTLA-TV, Los Angeles, and Mr. Sinex is from Golden West College.

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ASSEMBLE (Record only):* Switch enables the editor in the ASSEMBLE mode. The lamp will be on.

If neither editor lamp is illuminated, the editor is not activated, and the recorder will go into normal A/V record when the record button is pressed. INSERT or ASSEMBLE, once activated, may be cancelled only by pressing its own switch to the OFF position. When activated, the playback machines are automatically placed in a Record lockout configuration. If you wish to use one of the playback machines for recording, while the recorder remains in the Editing mode, the Record lockout may be cancelled by pressing its button *twice*.

PLAYBACK HØ: This is a duplicate of the red button on the VTR machine's editor control panel and is used in conjunction with the meter, and Tach, and HØ controls when the editor is in REMOTE.

The above auxiliary controls are adjuncts to the controls on the Datatron. To relieve operator fatigue and to speed up the editing session, they may be used, for example, while the Datatron is manipulating the tape in preparation for an edit.

Vidicue 5000 videotape editing control system basics

The Datatron Electronic Editing Control System is a small computer designed to relieve the operator of many of the tedious mechanical operations normally associated with electronic editing. The unit is not an editor itself: it does control the Ampex Electronic Editor mounted in the VTR machine. In performing its various functions, the Datatron takes control of the tape transports of both the Record and Playback machines, automatically rewinding, cueing and starting the machines for an electronic edit. (The VTR machine must be assigned to REMOTE.)

The operational portion of the Datatron unit consists of a control console and a graphic display panel. The operator uses these controls to select the mode of operation, the locations of desired edit points, and to initiate a preview or an actual edit at the chosen plant.

The Datatron operates by comparing the playback of pre-recorded time code from the videotapes to times which have been entered in its storage regis-

Evolution of Videotape Editing at KTLA

By John Silva, Chief Engineer

Soon after the introduction of videotape recording in 1956, it became apparent that there was a need for some means of editing. In the beginning, editing equipment consisted of an aluminum block, a straightedge, a razor blade, and Edivue solution. Field pulses were recorded on the tape as a guide to proper edit locations, or so they thought. Early edits may have given continuity to the recorded program material, but they caused havoc during playback on the VTR machine. The inaccuracy of the aluminum block-straightedge method led to the development of several sophisticated mechanical splicers. KTLA participated in the development of the Smith splicer, which included a powerful microscope to increase the accuracy of editing. In 1960, field pulses were discontinued as it was discovered that better edits would result if only frame pulses were recorded and used as editing guides. In order to further refine videotape editing, KTLA developed the TV-ola, which provided one-frame accuracy. With the advent of color recording, the tolerances of mechanical splicing were no longer adequate.

About this time, Ampex developed the Electronic Editor. However, the first units were somewhat unstable, and mechanical splices offered some advantages. During these early days, the limitations of low-band color recording also contributed to a poor, if not intolerable, end product.

With the introduction of the Ampex VR-2000 recorder in 1964, electronic editing became practical, due to a new, solid-state servo, solid-state signal system, and, or course, high-band recording which made multiple-generation copies possible.

But all was not solved. Due to the position of the video erase head with respect to the video recording head, the operator had to anticipate the edit point by two-thirds of a second. Since human reaction time varies, edits could not be made accurately. Furthermore, there was no means to rehearse an electronic edit and duplicate same when actually recording. Several methods were devised to program an electronic edit and allow it to be rehearsed or repeated with accuracy. The first of these methods was Ampex's Editec. This system recorded a pulse on the cue track which was used to activate the electronic editor.

In 1967, CBS, in conjunction with EECO, developed the time-code method of editor control. This approach recorded a digital time code on the cue track so that edit points could be selected with accuracy. The location of the desired edit point could be "frozen" on a time-code readout and entered into the EECO unit via thumbwheel switches. This edit point could then be rehearsed and repeated or modified with accuracy. Since electronic editing normally required the use of two machines, it was necessary to also have an EECO transport control on the playback machine for accurate editing. Although it did the job, it was necessary for the operator to do a lot of mental arithmetic and to perform many mechanical functions. As a shortcut, operators did not bother to set up the second machine with controlled accuracy. Further, the early EECO system suffered from electronic difficulties. The integrated circuits used were of the older RTL type which are susceptible to noise, heat, and other factors which caused the unit to lack reliability.

About this time most editing equipment manufactured began working on models that would use a small computer. to perform the mechanical operations.

KTLA elected to use the Datatron Model 5200 Vidicue System. This unit uses the latest state-of-the-art electronic methods, including TTL logic and offers high reliability. The Datatron system eliminates thumbwheel entry of time code and, instead, enters all eight digits through one button. The unit allows one to select the edit or pickup point on the playback machine with accuracy. The internal computer deducts the roll-up time, rewinds both machines, starts them, and makes the edit. This system is a sit-down operation in front of the control console.

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ters by the operator. The four storage registers shown on the display panel may control different functions depending on the mode of operation selected. This time code is an amplitude-modulated code recorded on the cue tracks of the VTR machines. (*Editor's Note:* Vidicue 5000 is now available using the new SMPTE code.)

DISPLAY PANEL: The operating portion of the Datatron unit consists of a control console and a graphic display panel. The three horizontal strips represent pieces of videotape and the vertical stripes indicate the edit points on these tapes. Depending on the mode selected, indicator lights will show which strip represents which videotape. The numbers next to the edit points correspond to the EDIT POINT switches, which are used to select the edits.

The display panel also contains five Nixie readout displays. Four of these are associated with storage registers, while the TAPE TIME display reads time from the selected videotape.

The display panel also contains three rear-illuminated legends, not normally visible. These legends are in the lower left-hand corner of the panel. The white EDIT INTERVAL light will come on during a preview or actual edit during the time of the edit. The red EDIT INHIBIT light will come on if there is a discrepancy and the computer decides that it is necessary to abort the edit. If you are using the SYNC option so that the record and playback machines are locked together, the green SYNC light will come on when the machines have achieved sync.

CONTROL CONSOLE: There are four modes of operation; CUE PREVIEW, ADD-ON, INSERT, and A-B ROLL.

In the CUE PREVIEW mode, whichever machine has been selected by the VTR SELECTOR controls will appear on the TAPE TIME indicator and EDIT POINTS 1 and 2 will be available for preview purposes. In this mode, we will also be concerned with a second group of controls, PREVIEW SEQUENCE. There are two PREVIEW SEQUENCE switches, BVB, or Black-Video-Black, and VBV, or Video-Black-Video. In reality, the BLACK is whatever EE signal is going through the VTR machine.

The BVB position will be used when selecting a segment on the playback tape, so that you will see black up to the start of the segment, the segment itself, and black. The VBV position may be used when selecting the locations of edit points on the recorder for preview purposes only. (This procedure has a few disadvantages over another method which will be explained under the MANUAL CUE section.)

In the ADD-ON mode, the Datatron unit is set up to make open-end edits. The Ampex editor is normally operated in the INSERT mode. This requires a prepared tape, recorded with black, control track and time code. In the ADD-ON mode, EDIT POINT 1 indicates the beginning of the playback, while EDIT POINT 2 indicates the actual edit on the recorder. Edit points 3 and 4 are not used in this mode.

In the INSERT mode, you have the capability to insert new material in a pre-recorded tape. The existing control track and time code are used. The INSERT mode of the Datatron unit should not be confused with the INSERT mode of the Ampex editor. EDIT POINT 1 indicates the beginning of the playback, while EDIT POINT 2 indicates the INGOING EDIT on the recorder. EDIT POINT 3 indicates the OUTGOING EDIT on the recorder.

The A/B ROLL mode involves the control of three machines—two playbacks between which an effects edit is to be made, and the Record machine. All four edit points are used in this mode, but as of this writing, KTLA does not have the ability to utilize this mode due to the requirement that a programmable video switcher be in the circuit.

The LIVE INSERT feature may be used in either the ADD-ON or INSERT modes. When the LIVE INSERT lamp is lit, by pressing the switch, the playback machine is not controlled by the Datatron. Instead, the recorder will cue itself and edit to the incoming feed. EDIT POINT 2 is the ingoing edit, while EDIT POINT 3 is the outgoing edit (in the Insert mode only). This feature may be used when working with live productions or for adding simple material such as a slide.

There are three switches to control the type of edit. AV stands for audio-video, V stands for video only, while A stands for audio only.

VTR SELECT controls operate the VTRs. The machine transport controls may be assigned to either of two playback machines or the recorder by means of the PLAY 1, PLAY 2, or RECORDER switches. These controls also determine which time code appears on the TAPE TIME INDICATOR. The controls are used to search for edit points and manipulate the tape transports in preparation for an edit. However, once an automatic edit sequence is started the computer takes these controls for its own use in cueing the tape.

A group of PLAYBACK SELECT switches allow you to edit using two playback machines. For example, if you were editing a musical show, you might have one machine loaded with a reel of tape containing introductions, and the second playback machine loaded with a reel of songs. By using the PLAYBACK SELECT SWITCHES, you could assign first one playback machine and then the second playback machine to EDIT POINT 1. This would allow you to

Console and graphic display units of the Vidicue 5200 system.

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semble a complete show on the recorder without loading playback tapes.

tering edit points

The edit points may be entered in one of two ays. First, and more convenient, is the Automatic dit Point Entry. To activate the Automatic mode, e AUTO switch must be depressed. The desired pe is then played and the appropriate EDIT OINT switch is pressed at the point of the proposed dit. The time will be entered in the corresponding gister. If, after previewing the edit point, it is deter-ined that it should be moved, it may be done by ing the EDIT SHIFT switches and the keyboard. he edit point may be advanced or retarded up to 99 ames by pressing the plus or minus EDIT SHIFT vitch, entering the desired number of frames into ie keyboard, and again pressing the same EDIT OINT entry switch. The register will then show the ew time.

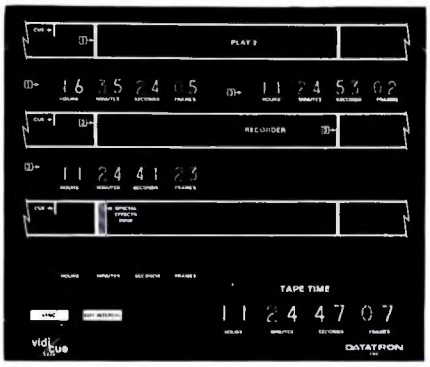
If the exact location of an edit is known before-and, the time may be entered into the register man-ally via the KEYBOARD LOAD switch.

Once the edit points have been selected, it is ecessary to instruct the Datatron as to whether you ish to *preview* (rehearse) an edit, actually *make the dit* or *cue* the VTR machines to the minus-ten-econd point and wait for further instructions. To review an edit, one presses the PREVIEW switch in ie FUNCTION group. The playback machine will hen rewind, cue itself to minus ten seconds, and top. Next, the Recorder will do likewise. When both nachines are at the cue point, they will start togeth-r and make a simulated electronic edit. If the edit oints are satisfactory, you may proceed with the ctual edit. This is done by pressing the PREVIEW nd AUTO EDIT switches simultaneously. The pre-iously described sequence of events will be re-eated, but this time an actual edit will be made.

You may instruct the Datatron to cue both ma-hines and wait. This is done by pressing the CUE witch.

The MANUAL CUE switch allows the operator o quickly preview an edit point without waiting for he VTR machine to cue itself. To preview an edit n the recorder to black, for example, once the edit oint is selected, the recorder is rewound to a point hree or four seconds before the edit point. Press the IVE INSERT switch so that the playback machine s out of the circuit. Then press the MAN CUE witch. This will advance the electronics within the nachine to make it think that it has already cued tself. Then press the PREVIEW switch in the UNCTION group. The VTR machine will start nd preview the edit point. (Unless you plan to make ive insert edits, the LIVE INSERT switch should be urned off as soon as you stop the recorder's trans-ort so that you do not destroy the edit sequence when you get ready to actually make the edit.)

The MANUAL CUE feature may also be used in he CUE PREVIEW mode, by rewinding the play-back machine prior to the first edit point, pressing MAN CUE and then PREVIEW. For this type of preview, you will want to be in the BVB PREVIEW SEQUENCE mode.



Display panel organized to depict strips of tape.

Control console; edit points are added by keyboard.

Other controls

The PREROLL CUE thumbwheel switch determines the point to which the VTR machines are cued before an edit. The PREROLL CUE may be set up to 50 seconds, although 10 seconds is usually adequate.

The ERROR BYPASS thumbwheel switch controls the updating of a counter which reads the time code from the tape. The switch may be set from 0 to 3 seconds. If the time code on the tape reads out well, the 0 position should be used for the most accurate editing. If, however, the time code appears to be garbled, the switch may be set to update the code at 1, 2, or 3 second intervals. Usually, the ERROR BYPASS switch can be left in the "1" position without degrading the performance of the Datatron, while making up for any small time code dropouts which might come along.

The Datatron may be used to achieve exact sync between VTR machines, if desired. This is useful for extremely accurate editing and audio overlay work. The unit is placed in the SYNC mode by a setting on a circuit card board.

When the VTR machines roll up to an edit, the playback machine will speed up or slow down to sync to the recorder. The time code on both tapes does not have to be identical. Once the machines have achieved sync, the green SYNC legend will be illuminated on the display panel.

The SYNC feature has the disadvantage of requiring longer time for the VTR servo to lock up since the playback machine is slewed to catch up with the recorder. This does not leave much time between servo lockup and the edit point. Quite often, therefore, the operator may choose not to use the SYNC feature if the editing session will permit. **BM/E**

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Editing Videotapes Easy With SMPTE Code

The SMPTE Code and low-cost indexing and editing equipment is a long step from earlier "razor blade and microscope" techniques.

By George Swetland

EDITING USING CONVENTIONAL TECHNIQUES has been a prohibitively complex and costly task. A quality show might require the splicing together of as many as three videotapes (one dress rehearsal, one live run in front of an audience, and one tape of retakes) with as many sound tracks and, perhaps, audio "sweetening." Until recently, videotape editing was a great deal more cumbersome, time-consuming, and expensive than film editing. Today, however, with the new SMPTE Edit Code and the development of low cost indexing and editing equipment to take advantage of it, even small studios and producers can use electronic editing to improve program quality while lowering their editing costs.

Mr. Swetland is product manager, Broadcast/Timing Products, EECO (Electronic Engineering Co. of California), 1441 East Chestnut Avenue, Santa Ana, Calif.

The SMPTE Edit Code

The new SMPTE Edit Code is a time code recorded on the second audio or cue channel of the videotape. The code uses 80 binary bits to identify every frame recorded by hour, minute, second, and frame count, as indicated in Fig. 1. The time recorded can be elapsed time from the start of the tape or the time of day.

Eight four-bit words are left blank and can be programmed by the user with additional identification or control information to be used during the editing process. A 16-bit sync word indicates both the end of the tape and the direction of tape travel.

Data is recorded with a self-clocking bi-phase mark technique. Since there is at least one transition per data bit, there is no need for external timing circuitry.

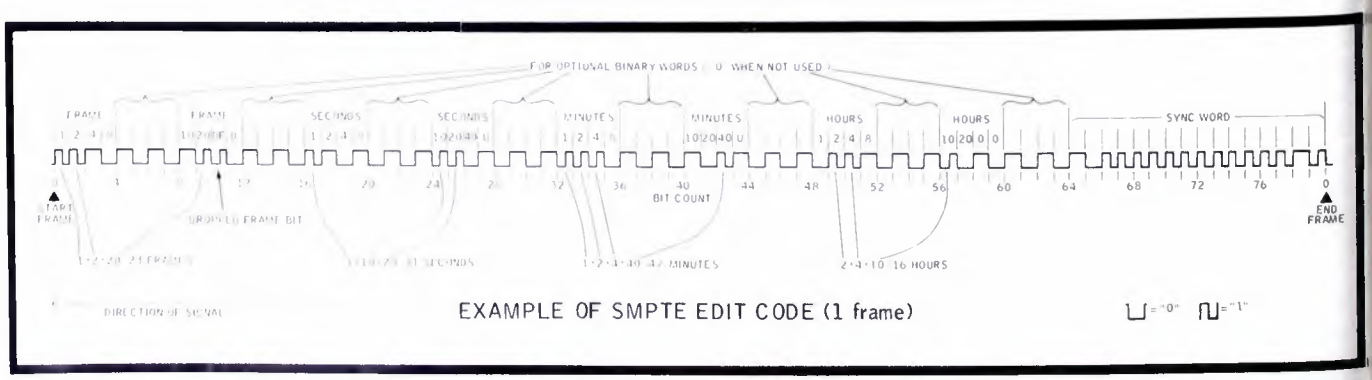

Fig. 1: The SMPTE Edit Code provides complete frame-by-frame identification of video and audio tapes and offers a control capability for fully-automated electronic editing.

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The SMPTE Edit Code accommodates both monchrome signals at 30 frames/second and NTSC olor signals at 29.97002618 frames/second, while ill maintaining an accurate time-of-day reference. Vith NTSC color signals, a drop-frame reference gnal (shown in the third four-bit word in the illusation) is used to drop two frames every minute, xcept the tenth minute, automatically.

plit-second, single-frame accuracy

Code indexing can be done before, during, or fter the recording of scenes. Once indexed, fast and ccurate access to all material in a library of video nd/or audio tapes can be made because every segent of every tape has an absolute time and frame dentification. There is no need to count feet, frames, procket holes, or electronic pulses from some referince point. Sequences and scenes or single frames an be examined rapidly in terms of actual time with plit-second, single-frame accuracy.

The flexible control capability of the SMPTE Edit Code allows full automation of all editing functions, ncluding search, cue, edit-point selection, preview nd equipment synchronization. The edit code is also eing used today in elaborate computer systems for eference indexing, storage, retrieval, and programning.

With or without the computer, the SMPTE Edit Code offers time and cost savings over alternative diting methods.

A typical system

A fast, flexible, and easy-to-use system that would provide all the benefits of the SMPTE Edit Code nd electronic editing might be the one shown in Fig. 2.

With this system, if the time code is recorded and a scene log made while the material is shot, the edit code represents a real-time reference. The log then allows rapid manual or automatic location of specific scenes—for previewing prior to editing or for showing in a news program.

If the original is recorded on a quadruplex recorder, it can be copied onto a helical recorder with the time code intact. Alternatively, the time code could be indexed onto the tape during the transfer process. In either case, low-cost equipment can be used for previews and pre-edit scheduling of scenes at a more convenient location, freeing expensive studio equipment and time for other uses.

During the previewing session, exact splicing decisions can be made without concern for the mechanics of editing. Precise edit points can be developed by the most concerned party involved—editor, writer, director, or even advertising agency creative staff.

A detailed program schedule is written with selected scenes in a proposed sequence. Start and stop times can be approximate minutes and seconds or exact to a single frame. Whether the code is in real or elapsed time, it has the advantage of direct time measurements and assures rapid, economical editing and a high-quality finished tape.

Subsequent editing is performed on the original (or a duplicate) quadruplex recording using the edi-

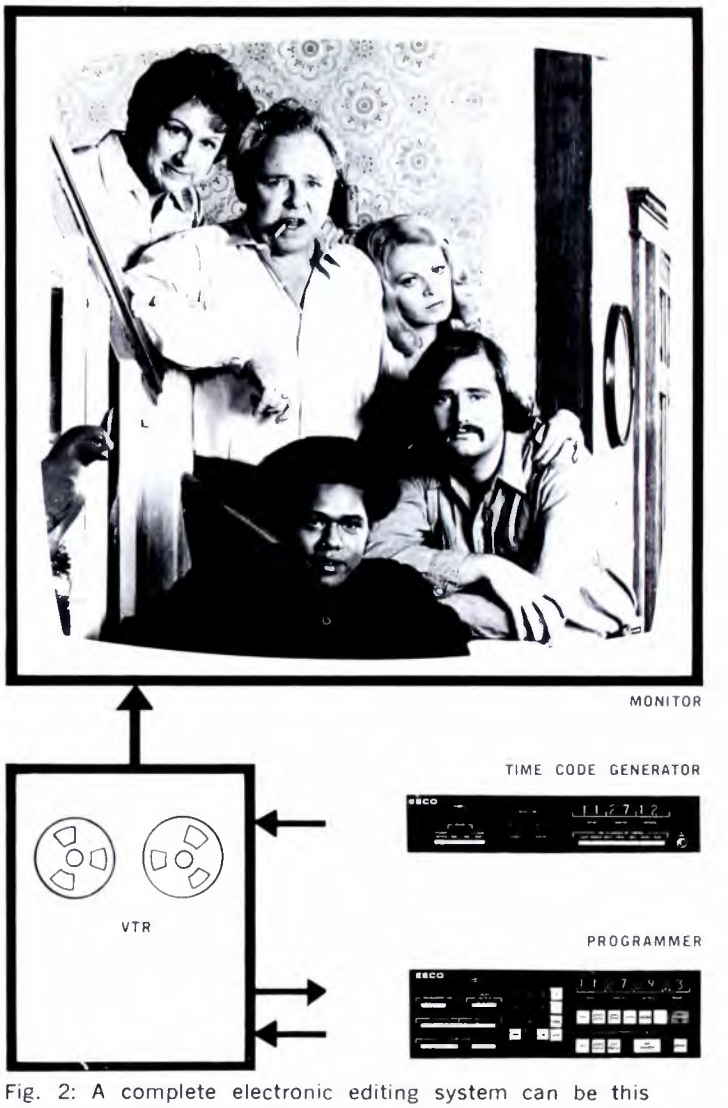

Fig. 2: A complete electronic editing system can be this simple, yet offers substantial savings and program benefits to the user.

tor programmer shown in the block diagram. (Similar equipment is available for helical recorders.)

The programmer locates taped scenes automatically; synchronizes two or more audio or video recorders; automatically transfers scenes with single-frame accuracy; and stores and displays ingoing and outgoing edit points as hour-minute-second-frame-count.

Editing can be handled manually in a step-by-step manner or in an automatic sequence mode. In the latter mode, times from the preview program log are entered into the programmer, which automatically controls the tape and recycles through the selected portion so that changes can be made in the start and stop times until the preview is completely satisfactory. The EDIT button is then pushed and the VTR's are automatically controlled for an edit exactly as last previewed.

Sound sync

Most major studios do a double edit of videotape, i.e., independent editing of pictures and sound.

After the videotape has been edited, the sound track and edit code are transferred to a multi-track audio recorder. The master tape at this point might have two dozen electronic splices, with changes in

continued on page 37

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Videotape Editing With Computer Control

The low cost minicomputer is ideal for keeping track of segments, edit points and transitions. And a CRT gives a graphic picture of it all. It makes videotape editing as simple as film editing. But unlike film, you can employ the full range of mixing, effects, and titling features of TV.

By H. A. Shepard

A NEED CLEARLY EXISTS for a system which will render videotape editing at least as simple as film editing and which will make use of the mixing and effects capability of the television system.

The requirement of an editing system can be summarized as follows:

- Find any programming segment which has been recorded on any videotape quickly and accurately.
- Select a spot on the master of "record" tape to determine the exact positon of the edit.
- Select a spot on the tape containing the raw program material to determine the exact position of the start of this material as it is transferred to the master tape.
- Allow a preview of the edit.
- Shift the edit point selected on both the record and replay tapes so that the edit may be adjusted to produce the exact result desired. The Audio Edit point must be shifted independently of the Video Edit point.
- Synchronize all of the videotape machines so that they will consistently reach the edit point at the same time.
- Provide an automatic transition feature which will allow the production of edits involving dissolves, effects and titles.
- Store the edit information automatically so that a second master tape may be produced.

Systems capable of the above have been in operation since the late 60's. High costs, however, limited their practical use to only a few large production houses. The advent of the low-cost minicomputer now has made possible a new second-generation system that is economically feasible for many users.

Mr. Shepard is manager, Television Proposals, Central Dynamics Ltd., Montreal, Canada.

Early systems used numeric indicator tubes for readouts. The new system from Central Dynamics Ltd., the PEC-102, uses a CRT Character Generator display system. The data displays are thus not restricted.

The new system uses the new SMPTE time code. Such coded tapes can work with editing equipment made by other manufacturers, as indicated in another article in this issue.

The time code[1] uniquely identifies each frame of information in hours, minutes, seconds, and frames using an 80-bit per frame serial digital code.

The modulation technique used is known as "bi-phase mark."[2] A transition always occurs at the beginning of each bit period and a binary "one" is represented by a second transition one-half a bit period later. A binary zero is represented by the absence of a second transition. The direction of the transitions do not matter for zero or one identification, so the code is completely immune to 180° phase reversals.

The time code may be recovered from the tape cue track at speeds from one-tenth play speed up to about 30 times normal play speed in either the forward or reverse directions. The normal machine cue replay head may be used, however a specialized wide-band preamplifier is used to achieve the desired result. Because the code carries direction sensing bits, there is no need to monitor the machine transport tallies to determine the forward or reverse status of the machine.

A special real-time software program has been produced which controls all aspects of the system, including all mathematical routines, data entry/error control and transport control. The computer used is a commercially available 16 bit/word machine. Peripheral equipment, in the form of printers, discs, etc., is readily available and allows easy modular

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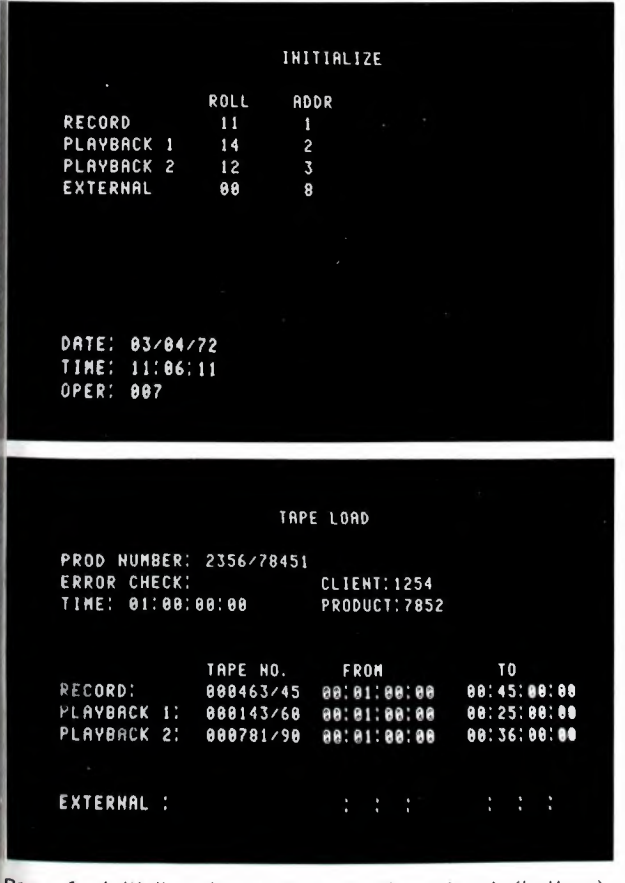
xpansion of the system to provide facilities such as ıass storage files and hard copy logging. The com- uter itself is very compact and only occupies 5¼ ıches of space in a standard EIA 19-inch rack.

our pages of data

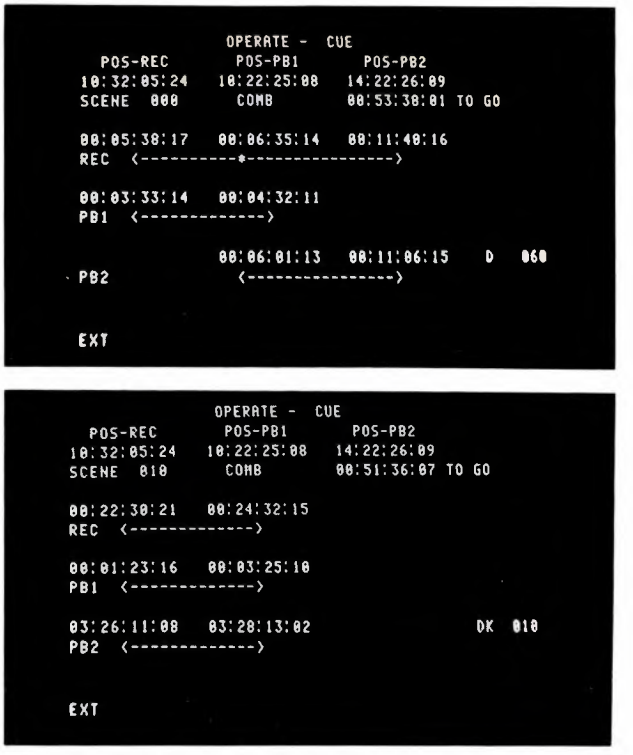
The editing system CRT display has four pages of ata available for different purposes:

Page 1 (Initialize) lists the machines to be used for n edit sequence and their preroll times and also the ate, time of day, and operator's identification code or logging purposes. The editing system may be nterfaced to eight machines, any three of which may e assigned for a particular sequence by means of a oftware control delegation feature. The machine ontrol follows the assignment made on the Initialise isplay. The choice of machine may be changed by ositioning the character generator cursor on the ap- ropriate machine address field and entering the new nachine number from the decimal keyboard. System ontrol is automatically directed to the new machine. n a similar manner, the preroll time for each ma- hine may be altered by entering the new time in econds from the keyboard.

Page 2 (Tape Load) provides for the presetting of ata for the particular edit sequence and includes ape numbers, valid time code entry limits, and de- ails such as product number, client number, etc. The esired total running time of the edited program may e entered to establish a reference for the time-to-go alculation which is displayed on the third page of he display (Operate). The valid time code entry imits place effective electronic tabs on the tape by



Page 1, Initialize (top); Page 2, Tape Load (bottom).



Page 3, Operate A-B Roll (top); Simultaneous Roll (bottom).

disallowing an invalid address entry on the Operate page. (If the operator were allowed to enter an address that was not recorded on the time code track of the tape, the tape would spool off the transport during the search mode. In addition to such an annoyance, damage to the video heads could be caused as the end of the tape whips out of the transport at high speed.)

Page 3 (Operate) is the main editing readout and it simultaneously displays the current time code addresses (positional information) for all three machines selected, along with a graphic mimic diagram accurately describing the type of sequence and the start and finish addresses for each piece of tape. Other information conveyed to the operator includes: type of edit (Audio, Video, or Combined Audio and Video), the time-to-go (time remaining to complete the program) and the video transition type (wipe, dissolve, cut, key, etc.), and duration (in frames).

The mimic diagram graphically represents, in real-time, the relative positions of the tapes involved in an edit sequence. Simultaneous rolls between two or more machines, A-B rolls and B-A rolls, are all shown logically and clearly in a form easily recognized by editing personnel. Dissolves or wipes between tapes are indicated by overlapping the two playback segments.

Start and finish addresses for each tape may be entered directly from the decimal keyboard or "on-the-fly" while the tape is playing back the video information. Furthermore, with the computer monitoring each entry and performing automatic interactive calculations, if an address may be defined by another set of addresses then it is automatically calculated. For example, if the record "in" address and playback "in" and "out" addresses are defined, then

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the record "out" address is automatically calculated and displayed.

Following the rehearsal pass of an edit sequence, the operator may wish to alter the position of a particular edit point. Here again the interactive mathematics routine is brought into action. A set of rules have been established to govern the effect that an edit shift on one address has on the other addresses. For example, if the record tape "transition" address is shifted then both the A roll "out" time and the B roll "in" time will automatically be shifted by an equivalent amount.

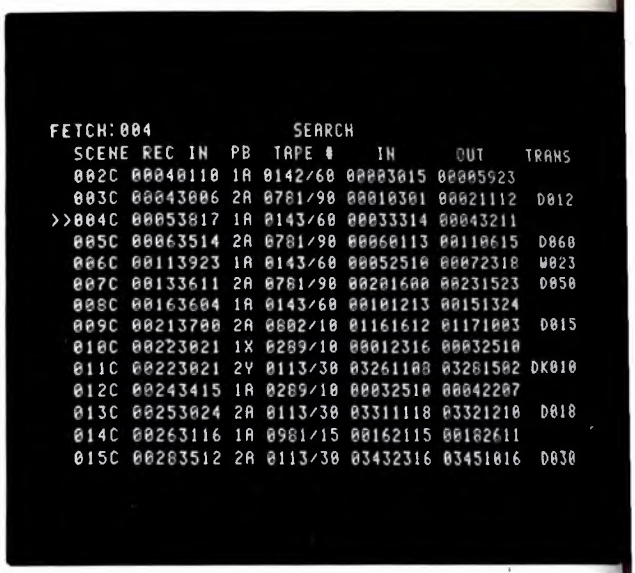
Page 4 (Search) display allows the operator to monitor an ordered listing of the details of a sequence of edits with fourteen scenes being displayed at a time. The active scene is displayed on the third event line, identified by the characters » at the left side of the display. The active scene corresponds to the A roll scene on the Operate page. Any scene out of a total of 600 from the storage file may be recalled by entering the scene number desired alongside the FETCH heading, in the top line of the display and operating the FETCH pushbutton. The Search display then displays the scene desired on the active line with the two scenes preceding it displayed on the two lines above, and the eleven scenes following displayed below in logical sequence. Any data editing required is done by switching to the Operate page and performing edit shift etc., in the normal manner. Any corrected data may be transferred back into the file by operating the STORE control. If the corrected data affects the RECORD addresses for the following scenes in the file, they will be recalculated automatically.

Each scene displayed on the Search page conveys to the operator the following information: scene number, type of edit, record tape start address, playback source, playback tape number, playback tape start and finish addresses, transition or effects type, and transition duration. Scenes may be deleted or backspaced to insert new scenes. In either case the record addresses throughout the file which have been affected by the change will be recalculated automatically.

The editing information may be entered into the file directly from the decimal keyboard and transferred from the Operate page on a one sequence at a time basis or it may be read in via punched paper tape run on a teletype. The data within the edit file may also be outputted to the teletype, after satisfactory completion of the program, where it will simultaneously prepare a punched paper tape record and a hard copy listing of all edits with the correct program titles and headings. The final paper tape may be fed back into the system at a later date and the program assembly repeated, with corrections if desired.

Using special effects

The editing system has been designed to interface with a video production switcher, and will provide, via the interface, precisely frame accurate digital controlled ramps for wipes and dissolves, effects mode selections, and direct crosspoint control. The system will store the following transitions and effects: cut,



Page 4, Search.

dissolve, wipe (A-B rolls), key, color matte key, split screen, dissolve key, wipe key, dissolve matte key, wipe matte key, dissolve split screen and wipe split screen (simultaneous rolls). The transition duration may be adjusted from four frames in single frame increments up to 299 frames. The color matte hue, key level and wipe pattern selections must be manually set by the operator.

Machine control capability

The system will control the three machines selected for a sequence simultaneously in all modes, including high speed search. During the search mode the system uses proportional velocity control which cues each machine to the desired position without overshoot on a computer calculated trajectory. Handling of tape at all speeds is achieved by shuttling the fast forward and rewind controls thus avoiding any possibility of tape damage.

Six adjacent cue points are calculated by the computer in case the desired address is obliterated by a bad dropout on the tape. Any discrepancy in positioning of the tape is taken up during the preroll synchronizing. Synchronizing is achieved by overriding the capstan speed on the playback machines during the preroll period until they are in perfect synchronism with the record machine. If a machine does not synchronize and lock in time the edit will be automatically aborted and the machine that caused the abort will be identified by a flashing visual alarm. The preroll of that machine may then be increased or other corrective action taken.

The system will automatically sequence scenes out of the file allowing continuous operation provided each segment is of sufficient duration to allow the next segment to recue. If the next playback segment does not recue in time, the system will automatically stop, memorize the record and playback addresses and then restart and edit when the next machine is ready. Other causes for stopping the automatic sequence are machine reassignment or tape loading requirements.

continued on page 40

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The long and short of it.

First, the long story. That sleek beauty on the left, Eastman 16mm television projector, model CT-500, is the latest in videofilm projector design. Some of its features: channel threading (the first real breakthrough in film transport in many years), rapid forward and reverse, solid-state circuitry for sound reproduction, automatic shutdown at the end of a film, and a tungsten-halogen projection lamp.

Not that we mean to sell our newest Eastman 16mm videofilm projector short. Model TV-12M6 is ideal for a lower cost videofilm projection system. It offers both magnetic and optical sound playback and magnetic recording. It has a five-blade shutter, twenty-four frames per second, synchronous projection, and is wired for remote control. Of course it has the same extra gentle film-handling system our projectors are famous for. In short, it's long on performance and high on economy.

For full details on either projector, call or write your nearest Kodak Sales Engineering Representative.

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Audio File: Cheap, Simple, and Efficient Ways To Feed To and From Standard Telephone Lines

By Steve Miller,
Program Director, KUSC,
University of Southern California,
Los Angeles.

There are three ways the standard telephone, with available telephone company options, can make life easier for any radio station. You can: 1) use the standard dial-up circuit as an incoming audio source—a popular way to air or record news reports, remote broadcasts, and last-minute or emergency remotes; 2) use the standard dial-up circuit as an outgoing audio line, to originate on a two-station network, to feed air-monitor signal to a remote, or feed news reports to a sister station, and 3) form a simple, clean, efficient unit for telephone-talk programming.

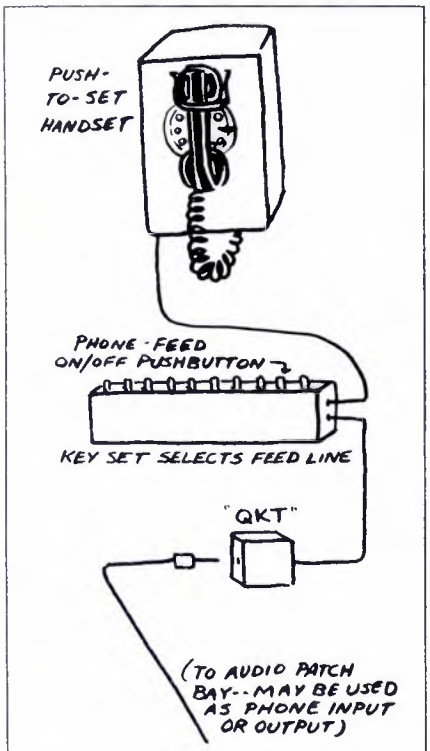
We use just one device at KUSC to perform the first two functions, incoming and outgoing audio feeds: the Bell System's voice-connector arrangement, designated QKT. This is a small box about the size of a package of cigarettes, which contains just a single printed circuit board. It matches impedances between your audio equipment and the telephone, and improves audio response somewhat. It also keeps the telephone company happy, since you don't play around inside their phones. The QKT rents for 50 cents per month.

The business end of the voice connector is a simple quarter-inch phone jack, which is the station's input/output connection. All you need to do is connect a shielded audio pair from the phone jack to your audio patch bay.

By setting up the appropriate patch, you can record an audio signal from anyone whose number you call, or who calls you. Be sure you know the law on recording telephone conversations. It is *not* necessary to use a beeper for normal radio station broadcast operations, such as a newsman's field report.

In our operation, the QKT in master control is hooked up (by the phone company) to a standard key-type telephone which can access any one of our station's telephone lines (including our regular listener number, our transmitter hotline, and the comline). The handset on this particular phone is equipped with an optional push-to-talk button, so that noises in the control room will not go onto the audio feed. This also eliminates any danger of feedback. This rack-mounted telephone is not used for any purpose except sending and receiving feeds.

By connecting the QKT patch to an audio output, you can feed a signal out of your station to any distant location. In addition, the QKT is normally installed with an on/off pushbutton switch which is mounted on or near the telephone. To interrupt a feed, you don't pull the patch cord, you just push the button.



Audio Feeds Layout

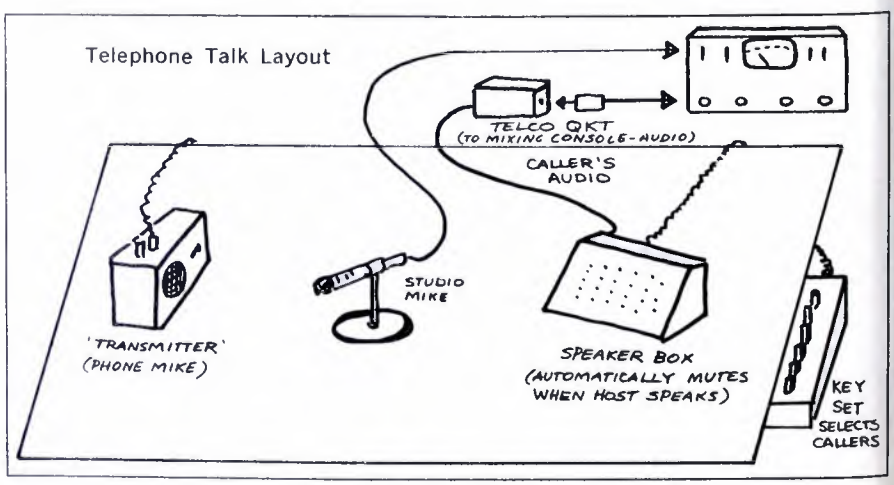
We have used the QKT-equipped phone on many occasions to bring in remotes on dial-up lines for broadcast with generally very good audio quality.

Telephone talk programs

We have been programming telephone-talk every night for three years now. When we built new studios last year, we spent a lot of time visiting other stations to inspect their telephone-talk hookups. We believe the one we finally installed is the simplest and least-likely to break down of any we have seen.

There are many approaches to telephone-talk hookups, as every audio man knows. Several basic requirements must be kept in mind. *1.* Your in-studio participants should be picked up on broadcast-quality microphones, and not on the telephone circuit. Otherwise the studio people will sound very tinny. *2.* All in-studio people must be able to clearly hear the callers. Some systems require all participants to wear headphones throughout the program; ours does not. *3.* Callers must be able to clearly hear all in-studio participants. *4.* The audio engineer

Continued on page 38



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CM/E
CABLE MANAGEMENT / ENGINEERING

July 1972

NCTA Show-In-Print

Also: • **Financial Outlook** • **Budgeting and Production Logs**

Growth Showed At NCTA: Exhibits were larger; new companies (MPI, right) sprung forth. More on following pages . . .

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It Was An Expansive, Expansion-Minded NCTA Convention

Unending succession of speakers, giant exhibits, and newly-unveiled products bore witness that cable TV is on its way. However, "Mom" was missing, and some of the "Pops" too.

CONSUMERIST RALPH NADER CHARMED the 1972 NCTA Convention with his approbation of the fledgling industry that promises to serve the public and he impressed cablemen with his knowledge of CATV. But Nader missed a salient observation which he undoubtedly would have made had he spent a little time on the exhibit floor.

Nader would have been surprised by the exhibit area because it looked as much a *consumer* show as an industry show. Booths were filled with devices and gadgets all basically designed to draw more dollars out of the pocket of cable subscribers.

Nader liked cable because he saw it fitting into his scheme for a reduced GNP and conservation of natural resources. Cable TV as an electronic highway could replace expensive air and ground transportation. Soft-copy electronic news could replace hard-copy newspapers and save a lot of timber.

Were Nader to foresee, instead, pay cable as a means of extracting higher prices for entertainment and sports, or home cable merchandising as a means of upping compulsive buying, he might have sounded a warning of sorts. There can be no doubt—the 21st NCTA Show and Convention premiered new products and services that will have a profound effect on all of us, be we consumer, cable operator, or cable equipment manufacturer.

In the broad context, it was an info-packed convention. The theme was "The New Communicator" and every effort was made to maximize communications, including sessions before breakfast and even *during* lunch. (Programming and public relations award presentations were served along with the main entree!)

Whether it was the new theme, or the earlier-in-the-year date, there were fewer ladies (often partners in cable operations) present. The general impression was that fewer small operators were there. Overall attendance was higher than before, but the first day (Mother's Day) was light.

There was a feeling of expansiveness present by virtue of the large display areas taken by manufacturers. Jerrold, as might be expected, had a giant display, but Magnavox, Laser Link, and Theta-Com reserved a lot of turf. Elaborate displays were staged by Abto, Anaconda, Optical Systems, TOCOM, TeleMation and others.

In marked contrast with the NAB Convention a month earlier, which revealed no new equipment of major importance, NCTA was the scene of a series of press conferences.

- General Cable disclosed a new fused disc coaxial cable.
- TeleMation unveiled a new automatic programming system using the new Sony videocassette player.
- Jerrold issued a series of "dramatic announcements" covering products (30-channel set-top converter, an interactive information delivery system, others), and services (a new construction company, computerized system design).
- Magnavox introduced a new amplifier and a host of related passive components.
- Sylvania unveiled a frame grabber.
- Eduplex announced an instructional support system for schools/cable.
- Both Optical Systems and Laser Link (TheatreVisioN) announced noteworthy new expansions in pay cable.

TOCOM's computerized two-way system was one of several.

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In the pay cable area, Optical Systems signed an agreement with Corplex of Chicago to use its system to reach hotels and 15,000 apartments in Chicago with pay programs. Laser Link announced an agreement with Storer Broadcasting to try pay TV over Storer's CATV facilities in Sarasota, Florida. Laser Link also announced a joint venture with the Northrop Corp. to develop a long-haul digital microwave system.

The 21st Convention was earmarked by several impressive simulations of things to come. Theta-Com "hopped" Lake Michigan with LDS microwave and came back from Indiana through 16 cascaded amplifiers with signals originating in a living room on the distant shores. EIE brought a computer and software along with a full line of distribution equipment to show a bi-directional system which can deliver now a variety of services. To show off its pioneering efforts as a forward-looking MSO, LVO Cable Inc. bussed visitors 60 miles northwest of Chicago to demonstrate a security system in operation. Participating with LVO Cable were Oak Security Inc., a subsidiary of Oak Industries, and Scientific-Atlanta (which has developed the sensor and central monitoring computer). There were, of course, other demonstrations of two-way at the convention.

LDS microwave was more of less "old hat" at this convention as the way to achieve long runs, but a new alternative appeared at the Ameco exhibit. Called Flexicade at the show, but since changed to Metro-Com, it's a space and frequency division system for signal transportation using sub-bands. Subband frequencies require less amplifiers—almost four times less. Thus you can get a distance of 20 miles with 16 amplifiers, or over 40 miles with 32. Spectrum used is between 6 and 48 MHz. The user has the option of four channels per cable, or seven.

Ameco has developed the SUBNOVA amplifier to cover the lower band and the Mark II Channeleer heterodyne signal processor to convert standard frequencies down. The Mark II has a good S/N ratio (59dB) and good adjacent channel selectivity. To get back to normal VHF, Ameco provides a strand-mounted hub converter called a Univerter. (A choice of Univerters is available to accommodate midband frequencies for special programming, if desired.)

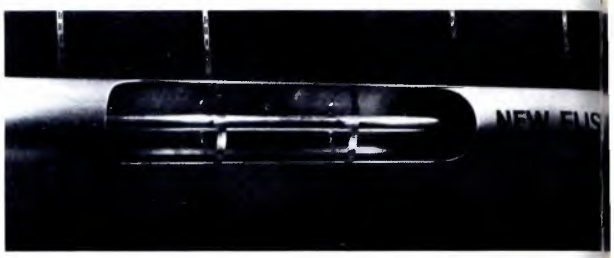
The system can readily work into Ameco's Discade distribution system (or feed out of it if one needs a hop to a remote neighborhood). Or, it can be integrated with standard systems. A salient feature of the Metro-Com is that it provides TV signals unaffected by local high ambient signal levels. Further, reverse channel capacity is achieved simply by plugging in a standard amplifier in reverse. It thus does not have the limitations of microwave systems in handling locally-originated signals.

Ameco reports that there are numerous metropolitan situations where Metro-Com is cost-competitive with LDS microwave (direct comparison is difficult since cable routes and equipment are more complicated). In some cities, the flexibility of Metro-Com is a decided advantage. In others, of very large size, the microwave band is crowded and potential interference is a problem. Metro-Com may be the only alternative.

Something new in cable

The new fused disc cable introduced at NCTA by General Cable Corp. was called a fifth generation* development in cable TV. It offers new levels of quality at competitive prices, and technical specs are improved.

The fused disc approach leads to a more uniform cable. The specially compounded polyethylene discs are sealed on the center conductor at ¾-inch intervals and, when the outer conductor is extruded on, it is fused solidly to all discs—there is no chance for creep. The result is a greater uniformity than that achievable with chemically-blown foam dielectrics. This yields an attenuation variation that is less than two percent—a 2½ to 5 x improvement; a characteristic impedance tolerance of ±½ ohm vs 2 ohms typical for foam cable; and a SRL level of at least 35 dB compared to 26 to 30 dB normally advertised for foam.



General Cable's new fused disc cable provides higher performance and uniformity.

Single-frame grabber was shown by Sylvania. It was an experimental model.

Another major feature is a moisture-tight structure (making it ideal for burial). The fusion of each disc to the outer conductor creates a series of hermetically-sealed cable lengths preventing moisture migration (fusion is achieved by flash heating; the disc is sealed to the inner conductor during molding). The inclusion of air spaces between discs lowers attenuation losses—a .412 fused disc is equivalent to .500 foamed polyethylene. (The attenuation slope is

*1. Twin lead; 2. military coax; 3. foamed dielectric; 4. aluminum sheathing; 5. fused disc.

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he same, thus permitting standard equalizers.)

The new cable is low in cost—on an equivalent oss basis it is lower than foam dielectrics. Outer liameters are .412 and .500 (.750 is being de-veloped). Only constraint in using the new cable is hat a minimum bending diameter of six inches must oe used. The cable has had field tests for 15 months n Orange, Texas, and General Cable plants are iow producing it.

Other cable manufacturers stressed those attributes which make them each a good source: Belden, drop cable that is fully SRL tested; Cerro, automated production and testing for high QC; Comm/Scope, more dB per dollar; Essex, 100 percent shielded drop line; Systems Wire and Cable, 10,000 miles delivered as promised; Times Wire & Cable stressed its volume mileage record and Theta-Com the fact that it is a new source.

Two-way, push-pull amplifiers everywhere

No startling announcements were made in the amplifier field. Just about everybody was trying to show that no manufacturer had a technical advantage, thus there was much stress on the use of hybrid or integrated circuits and push-pull circuitry (usually at single-ended amplifier prices).

Everybody was stressing two-way capability all the way (bridgers, splitters, line extenders and tap-offs) for either single or dual cable systems. Everyone offered the option of adding two-way later. A lot of housings looked alike—many were finned.

The press release for AEL Communications Corporation's new Super-Band Challenger Mark V sums up what is typical:

"It permits conversion of a single cable forward-only system to a single cable bi-directional system without any change in the housing or base plate . . . it can accommodate dual cable in a single housing . . . with one bidirectional . . . designed with completely modular, push-pull, hybrid microcircuit methodology, the Mark V Series of equipment includes a basic trunk amplifier with the complete bandwidth of 50-300 MHz in the forward direction on one or two cables, and 5-32 MHz in the reverse direction . . . the Mark V amplifier is available with ASG on both cables in the forward direction, and AGC in the reverse direction . . . other equipment such as intermediate and terminating bridging amplifiers and extended amplifiers have also been designed with bi-directional capabilities—however, the bi-directional equipment can be added at any time. What you want is what you get!"

Not everyone claimed the broad bandwidth of 50-300 MHz although Magnavox was one who did. A long-time leader in two-way, through its purchase of HTV Systems, Magnavox introduced this year an entirely new unit MX-303 "one and two-way wideband push-pull amplifiers" using plug-in modules. Another company rounding out its line purchased elsewhere was Scientific-Atlanta (which picked up the SKL amplifier).

C-Cor, which last year tried to play down the fuss over two-way, was back on the band wagon with a new line tagged the Olympic Series—push-pull, two-way *and* high output. TOCOM had a new bi-directional series, the 2000, on hand. The redesigned electronics system used slim modules plugged into a mother board. The housing included the TOCOM indicia replacing CAS.

Although there was a lot of similarity in amplifiers, manufacturers tried to stress difference. Vikoa stressed "two-way plus fail safe reliability" for its Futura 2-300 series. Fail safe means you can add a standby amplifier module in the housing that will automatically switch over should the on-line amplifier fail. Redundant sensors and power supplies can be added if desired.

Theta-Com CATV featured the former Kaiser XR-2 line but had some additional options available. A Mini-Mainline trunk amp for forward-only systems featuring push-pull and hybrid circuitry was offered at a price comparable to single-ended amplifiers. To convert existing one-way systems to two-way, Theta-Com displayed a self-contained reverse amplifier and filter housing that could be bolted onto existing forward trunk amplifiers.

Jerrold did not show new amplifiers, but it put great emphasis on the dual trunk single feeder two-way configuration, in combination with its new set-top converter, as the most economical, flexible, and safe way to go.

Anaconda, the pioneer in hybrid circuits two years ago, was stressing the installations it made last year. Sylvania, early in two-way but not yet an industry "biggie," was stressing turnkey help. Its "advanced concept" trunk amplifier 2052-B (along with all accessories) was displayed in a fully-operating mode. Both Cascade and EIE, pioneers in two-way, stressed that they had already arrived and showed no new models.

For interesting comparison purposes, NCTA visitors could look at a British-designed amplifier, the Teleng. The Oxford series (which is available for sale in the USA and Canada) is a 50-300 MHz unit with a very flat response ±.25 dB. It can convert to two-way and includes a dual pilot as well as automatic level and slope control. The output is push-pull using discrete components which Teleng claims

Biggest impact items in 1972 were pay TV by cable. 1. TheatreVisioN announced signing up a Storer Cable system; 2. Optical Systems stressed its black box brought theatre to the home; 3. Programs were played in Optical Systems' demo on Sony videocassette recorders automated by TeleMation.

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produce superior intermodulation characteristics.

Passive components plentiful—lower prices

Active interest in passive components was a promotional line used by Jerrold to draw attention to itself, but the statement was generally true as attendees studied price and specs. Jerrold, smarting from losing its position of dominance in the passive area, showed a series of new products (taps, balanced shielded transformers, splitters, connectors and grounding blocks) designed to be low in cost. Such items add up in cost in high density markets, Jerrold pointed out, causing operators to take a close look at prices. Jerrold had not only the big user in mind, but also the small customer, and announced a pricing policy attractive to the individual operator—e.g., the T-4000 transformer at 41 cents.

Two new companies were exhibiting, Coral and MPI. Coral offered a free matching transformer (four types). Its line is housed in a zinc diecasting for rfi protection. Coral also has a full line of single and dual bi-directional taps and splitters. MPI billed itself as a whole new line from a whole new company. The line includes directional taps, hybrid splitters, multi-taps, splitters/couplers, a four-way coupler and repeater amplifiers.

Entron, only a vestige of its former size, proudly called its passive products (that's all it displayed), the world's best. It featured two-way capability devices, as well as its patented features—built-in test points and seized center conductors. Just about everybody, though, was boasting about being able to seize the conductor. LRC made this claim in their connectors which are part of their taps. Small size was also LRC's stong point (along with splitters that screw onto the tap).

A passel of passive devices were introduced by Magnavox. One unique unit was the power passing splitter which would pass over 10 amps. The company also introduced power passing directional couplers. A subminiature two-way splitter designed to occupy "an absolute minimum of space" was also introduced by Magnavox. (Specs are min. return loss of 20 dB, insertion loss of 3.5 dB and tap-to-tap isolation of over 30 dB.) Subminiature directional couplers were also among the new products. Other items include a corner-molding coupler, line-pads and an expanded line of rfi-proof connectors, the 990 series. The units feature an extra-long sheath, coaxial seizure scheme, an rfi gasket, and a ferrule-mandrel combination that prevents dielectric distortion during installation.

View-all stressed a variety of new products and two-way. Lindsay Products and Delta-Benco were showing both passive and distribution amplifiers. In the active area, Lindsay stressed indoor units; Delta-Benco, outdoor. Delta-Benco emphasized high directionality and high VSWR. Dolphin, showing connectors and passive devices, stressed delivery.

Connectors were the exclusive products shown by Gilbert and ITT Gremar. Anixter-Pruzan, as a supplier of passive devices as well as other cable hardware, celebrated its breadth of line and breadth of coverage by passing out flag decals of all 50 states. Tidal Sales Corp. was present with a line of passives, but stressed a new aluminum CATV connector.

Test equipment for field use

Test equipment displayed at NCTA revealed gear designed specifically for cable technicians who really want to know what's going on. Avantek's star product was its Remote Automatic Sweep System which puts out such a low level test signal that frequency response can be measured without interference to the subscriber's reception. The cable receiver portion of the test set could also function as a spectrum analyzer. It takes less than five minutes to look at signal levels, spurious radiation, return loss, S/N, and other characteristics.

A look at the spectrum was possible with the Jerrold/Texscan new visual signal meter (model VSM-1). The VSM-1 allows the observer to scan all signals between 5 and 300 MHz or to look at any portion for detailed observation. Simultaneous observation reduces the amount of time to balance amplifier stations and the system.

Last year Helwick Douglas Electronics, Inc. showed a combination field strength meter and a television monitor. This year, the product was refined for simplified field use. Signal strength can be measured while picture and sound is observed. Noise and interference, or interference in the video or audio signal, can be spotted. The unit can also look at the vertical blanking pulse and vertical sync pulse. Lampkin Labs wasn't an exhibitor, but was demonstrating in its hotel suite a digital frequency meter/generator which helps one realign transmitters, receivers, and signal processors to FCC standards and keeps one on frequency, thus upping the signal level. A companion piece, a TV Preselector, isolates any channel in a cable system and provides adjustable gain.

A series of test instruments were shown at St. Petersburg Communications' booth and by Tektronix. Tektronix demonstrated how to make in-service noise measurements using the Tektronix 147 signal generator. Wavetek showed sweep generators and Sadelco field strength meters and an inexpensive spectrum analyzer which uses white noise as a wide-band signal.

Signal processors reflect trends

In the signal processing area, newest items of note were the down converters shown by Ameco and Jerrold for distribution of sub-band frequencies and the headend systems from Phasecom Corp.

Modulators and heterodyne processors are available from Phasecom with internal phaselock loops which permit output carriers to phaselock with external reference signals—thus reducing interference caused by off-frequency signals. The miniature design of the Phasecom equipment also permits seven channel modules to be located in one 19-inch rack, thus cutting down on headend space requirements.

TV modulators and demodulators introduced within the last year were shown by Dynair, EIE and Scientific-Atlanta. Dynair showed a new envelope delay filter to be inserted in the video input line of a modulator to provide the standard FCC envelope

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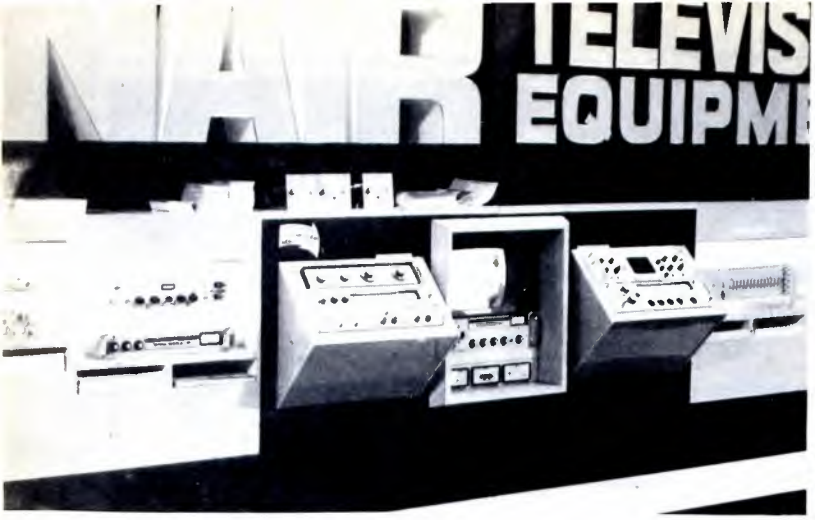

Dynair showed TV demodulators (above) and switchers.

Jerrold showed a new set-top converter (L) and experimental interactive terminal (R).

delay and pre-distortion needs for color TV sets.

New set-top converters

In terms of *new* converters, news was made by Oak, Jerrold and Hamlin. Oak announced a varactor-tuned set-top converter with automatic frequency control which ensures frequency stability and reduces the possibility of a subscriber incorrectly tuning either the converter or the TV set. The unit compensates for TV set drift, thus offering a good selling tool to the cable operator. Jerrold revealed a 30-channel varactor tuner (push-pull) set-top unit. Units and sets were in bountiful supply at the Jerrold booth and passed the test-under-fire (a few were dropped with no ill consequences).

Hamlin's unit, on display at the St. Petersburg Communications' booth, took the prize for attractiveness. It looked every bit like those personal telephone directories with a sliding index-selector—slim, compact, stylized. Hamlin said it could deliver any number, but needed advance notice to set up the proper final testing stations which include a cross-mod generator and a spectrum analyzer.

A new 24-channel block converter was shown by Teleng.

Programming emphasis

The most conspicuous new piece of hardware at this year's NCTA Convention was the Sony Videocassette player. The videocassette emerged as a reliable, easy way to play taped material. To make the process even easier, TeleMation automated the videocassette with its T-MATIC concept. The T-MATIC system is a rack of four cassettes that can be turned on by mechanical fingers which in turn are controlled by a programmed memory/switcher. The T-MATIC system showed the promise of providing an input capacity that would keep ahead of system channel capacity.

What you put on the automated videocassette is another matter. Pay movies and sports were the most exciting prospects since they promise extra profit. As noted earlier, Optical Systems and TheatreVisioN announced expansion in this area. Computer Cinema also used the Sony Videocassette to play its pay TV fare. It, too, modified the Sony Videocassette for automatic switching between machines but, unlike TeleMation, did so electrically inside the machine. (Computer Cinema's approach was more elegant, but TeleMation's external mechanical fingers offered the advantage of permitting any player to be dropped in the rack.)

The number of program suppliers who took exhibit space was only three: Modern Video Programming, Videomation, and Official Films, not counting the news services and bingo. There were others, including some brand new ones, in hotel suites but it was that clear that supplying programming to CATV is not big business. Modern Video was promoting an inexpensive 35-mm sound film strip for children, "Polkadot School," plus a practical series, "Walt's Workshop."

The automated information services devices which were unveiled last year—MSI Television's data machines (weather, news, stock, TV guide), and TeleMation's Money Machine, drew crowds and several cable operators will take delivery this year. Concise Instrument Design Ltd. showed a compact solid-state Weathereye unit (slides plus cards).

There was little new at the exhibits showing cameras, switchers, lights, etc. Nor did any exhibitor go all out to stop traffic. IVC, Ampex, Dynair, and Philips had modest working displays. So did Commercial Electronics, which showed its new camera, the CEI 280, unveiled at NAB. Magnavox's local origination gear was a prominent part of its overall exhibit, but GBC, Dage, Riker Communications, and Panasonic had modest booths.

Abto put forth a strong effort to get across the message that its color-TV-from-black-and-white-film process is a simple practical possibility. Abto announced a national service that would convert black-and-white film shot by cable operators (on cameras leased from Abto) to color videotape for playback on videotape or videocassette players.

A new company, CAM, that would like to equip cable operators with mobile vans, drew attention to itself by colorful brochures and two spanking-clean vans on the floor. They offered a lease price of $392 a month.

Microwave gear (to get from a remote location to the headend) was offered by Microwave Associates, Soladyne, and Communications Carriers.

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Market Considerations from the Lender's Viewpoint

Second of a Series

By J. Howell Kelly

Historically cable financing has shown little sophistication. Loans have been modest relative to total capitalization and frequently have been backed by collateral. This approach to financing will hardly suffice for current and future needs. To insure that adequate funds will be available on acceptable terms, financial institutions are now looking at the specifics of cable operations more closely.

The single factor which is looked at most and least understood is the market area itself. As a consequence, very few single-system loans have been made except to the largest, experienced MSO's. Whether business entrepreneurs without experience in CATV, but holding franchises for non-traditional development areas, get the funds they seek will be in large part determined by the financial institutions' satisfaction with the market potential of the franchise area. Although certain basic areas are covered in any market study, the viewing angle of the financial institutions is somewhat different from that of an owner.

Most market studies cover the market rank, franchise, terrain, and signal characteristics, population (present and potential), and income range. Important to financial institutions are the ways in which these areas interact with one another to create a market profile. Once a profile is established, financial institutions will more than likely compare this market with the most closely aligned market that already has a cable system. While this seems hardly fair, in many circumstances without specific experience it is the only way in which financial institutions can hope to make a sound evaluation of a loan prospect.

Generally, a financial institution evaluating a request for financing for a specific market will look at the present market character and expect that with only modest growth the operator should be able to service the requested financing over the proposed term. Lenders are most concerned with the stability of population and its income range. Because of this, lenders tend to look more closely than others at the economic base of the community and its key industries.

Another factor which is of paramount importance to financial institutions is the political stability of the franchise area. While operators are generally confident of their ability to work with local authorities, financial institutions for the most part would rather have uncontested franchises with little possibility of political problems over the lending term.

The ability of a franchisee to attract necessary financing on satisfactory terms depends in large part on the ability to generate the foregoing type of information for the financial institution. All too frequently the franchisees spend a lot of their time trying to convince the financial institution that certain factors are unimportant. It would be much easier to dig out the information requested. Remember that cable financing is still relatively new to most financial institutions. They are willing to participate for long terms, but they must be satisfied at the outset with the information provided on the market. **CM/E**

Mr. Kelly is assistant credit officer of The Bank of New York. This is one of a series of articles on the financial outlook in preparation by The Bank of New York.

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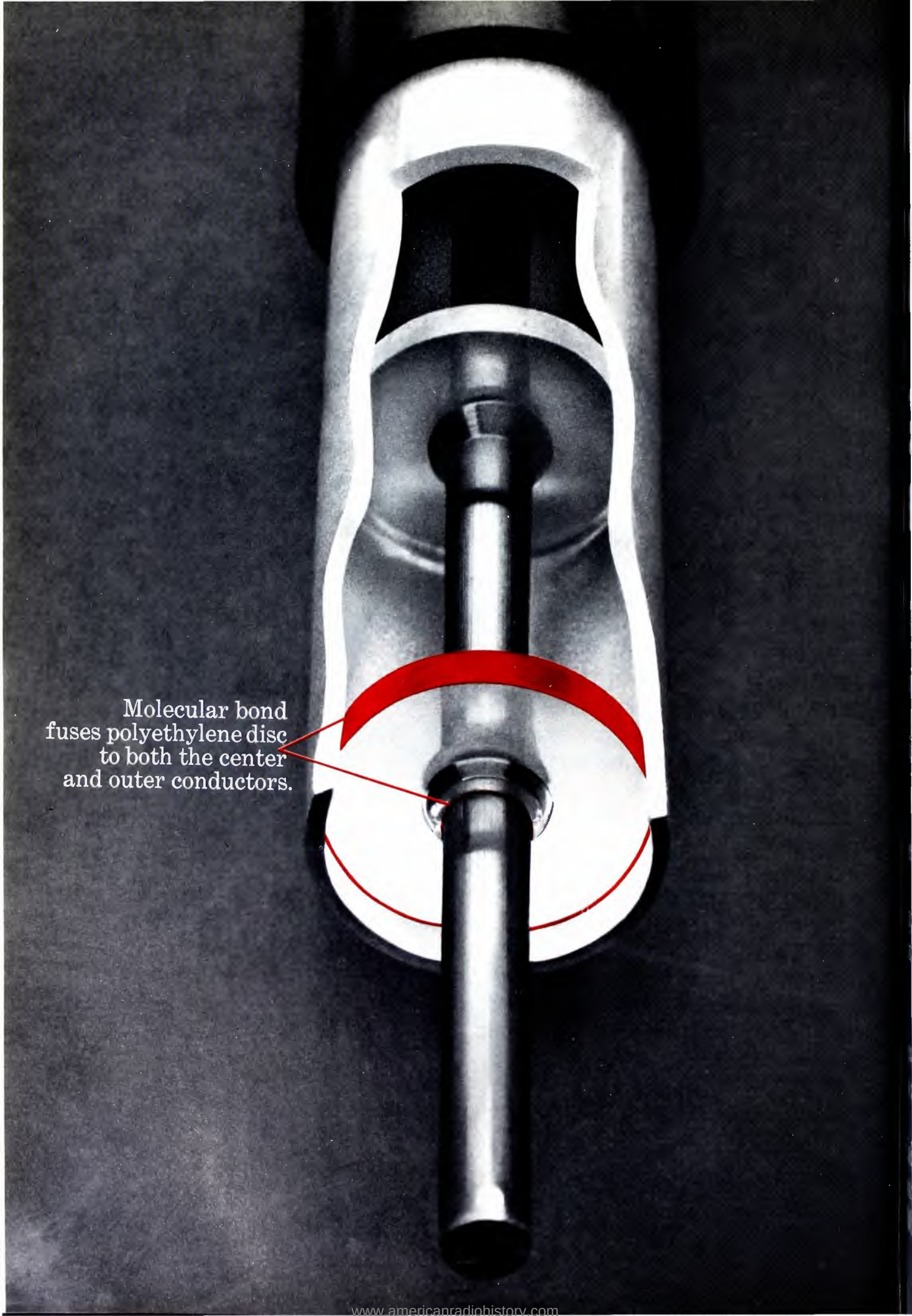

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All You Ever Wanted to Know About Production—Just Ask

Part Eight of a series—

Budgeting and Production Logs

by Douglas Gratton

As I promised in the penultimate column, I would like to get down to some hard and practical advice on the administration of the production effort from the point of view of the Producer/Director and Floor Manager.

The first stage is that of budgeting. Even if you do not have an accountant who has supplied you with an internal rate card, you should try to do some ready reckoning on your costs. Add up the cost of your equipment, rent, and salary (yes, I know, we are all underpaid), and you should be able to come up with a rate per hour for your fax. I am not trying to slip over this subject, but it would take at least one column to cover it in detail. So let's suppose that you come up with a fax rate of $45 per hour which includes all personnel, both above and below the line. That is the base rate for your card. Now break all your production projects down into the Holy Trinity—pre-production, principal production and post-production. The rate card will begin to look thus:

Pre-production:
- $10/hr. man hour plus out-of-pocket costs

Principal production:
- $45/hr. for fax
- Tape
- Visuals
- Trucking
- Props
- Set design and construction
- Miscellaneous

Post-production:
- Editing
- Dubbing
- Tape-to-film transfers
- Miscellaneous

So if you create your rate card with these extremely basic headings, i should be possible to make a pretty good estimate of your production costs. Now don't start writing in and telling me that I have forgotten this o that item. The above list is basic bu complete. If you are interested, a net work estimate form has over 11(items!

Now, the next form. What's that' Do you hear some groans! Listen your memory is, like other parts o you, not what you think it to be. Ad ministration on paper is here to stay The rationale of this whole series is t adopt the best of the professiona practices for the cable business and judging by what I saw of productio at NCTA, we've a long way to go.

To continue. The next form that recommend is a Production Fax Req uisition Form. This is a *productio* form that is made out to the *engineer ing* personnel. I have too, too man stories of the Producer arriving for hi day in the studio to find one of his tw cameras in for maintenance! Or on of the mikes is out for a loan! Engi neers are people and they deserv some consideration—but don't spoi them! The producer should make list of all the fax and he simply speci fies what he will need. This form will also help him to settle on th crew-call. How many mikes? An special zoom lens? Perhaps if camera work is a critical factor of the pro duction, then it is worth it to hire hydraulic head. If so, then it should b recorded on the Fax Requisitio Form. This form is also useful to th engineers since it functions as wor

continued on page CM / E—1

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Totally automatic, the CCC has a time clock and Intersperser for programming music and ads. System shown holds 200 music selections and is expandable. Systems also available without Carousel unit for other message inputs. Write for detailed specifications and typical prices.

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Eleven federal user-agencies will hold continuous briefings in the exhibit area on urban-oriented R&D programs, accessibility to federal funds, grants and contracts. The rest of the exhibit area will comprise a technological "supermarket" featuring the latest innovations in high speed ground transportation, "people-movers", computerized traffic monitoring systems, industrialized housing techniques, liquid/solid waste management and recycling, fire-fighting equipment, pollution measurement devices, health care delivery systems, management sciences, computer sciences, CATV, energy generation, conversion and distribution, law enforcement . . . literally every critical area in urban management! Pre-register now and save 50% on the registration fee!

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Mail to: AIAA/UTC
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Att: Meetings Dept.

Please print or type all data and return this form with your remittance.

NAME _____

TITLE _____

AFFILIATION _____

ADDRESS _____

CITY/STATE/ZIP _____

I wish to participate in the following Hard Technology Working Groups:

- ☐ Management Sciences
- ☐ Solid Waste Management
- ☐ Health & Medical Care Delivery Systems
- ☐ Industrialized Housing
- ☐ Liquid Waste Management
- ☐ Energy Generation, Conversion and Distribution
- ☐ Computer Planning Management & Implementation
- ☐ Community Antenna Television
- ☐ Fire-fighting Techniques
- ☐ Law Enforcement
- ☐ Municipal Vehicle Design
- ☐ International Coordination

Registration at the Conference will be $10.00

☐ **Please advance-register me at the reduced rate of $5.00 (non-refundable)—includes two (2) lunches**

Total Remittance Enclosed $ (make checks payable to AIAA)

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control for engineering maintenance. If nothing else, the form can settle a lot of arguments as to whose fault etc. when the production stumbles on account of faulty production-engineering liaison.

The next form covers the actual production. I call it the Production Log. Not only is this a record of the actual taping but it can also record the studio day. Who worked? (Useful information if you have a Workman's Comp. case four months later.) What were the hours? (Useful labor and union data) What VTR was used? (Helps to trace faults.) As I said before, your memory can fade and the answer is to get it down on paper. But most important, the log makes a record of the taping. How many scenes . . . how many takes . . . how long . . . which are the "Hold," "NG," or "Take." I also use the form to get the client's signature when he accepts a program at the conclusion of the taping session. Yes, folks, even the client's memory can dim.

I would be only too willing to send to one and all copies of the above set of forms that I use. The only other bit of paper that I have yet to mention is the Job Register. During the course of one week, you may produce 17 programs of varying length, titles, and subject matter. You can't keep it all in your noggin (that's English english for "head"). So invest in one Charles Dickens-type ledger book called the Job Register and start off with Job #1. Give it an opening date and any other data that you or your management feel necessary and that should permit you, as a producer, to keep track of your work load. Now you can get back to the studio and do the exciting things! **CM/E**

Douglas Gratton is president of Gratton Associates Ltd., 123 East 54th Street, New York 10022, a nonbroadcast videotape production company. He was one of the pioneers in working with one-inch videotape recorders (Reeves Actron—1966) and conducted many elementary and intermediate workshop techniques. He is equally at home with film. His services include scripting and visuals other than "talking face." If you'd like to have your productions critiqued by Gratton, just send him a videotape.

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Three compact Ditch Witch units provide a solid foundation for the Ditch Witch building-block concept of trenching! They're small and compact, yet they're fully self-propelled to deliver big-machine performance on the job. The 7- to 9-HP **C-Series** delivers the lowest cost-per-foot of trench of anything in its class . . . it's so compact it slips through any standard yard gate with ease —and one man can easily load it into compact van or pick-up.

The **M-Series** offers 9- to 12½-HP, and is available in a track-mounted crawler model. With three digging speeds, plus reverse, it delivers as many feet of trench per hour as bigger competitive models costing twice the price.

For utility service installations, you can't beat the **VP12 Vibratory Plow,** with 25-HP capabilities and full hydraulic control. Install service lines or sprinkler systems without trenching, without costly restoration to expensive turf.

Compact, rugged and economical — Ditch Witch handlebar units provide the solid foundation for your entire trenching operation. Let us tell you more about our full line . . . or ask your Ditch Witch man to give you a free demonstration!

MODEL C

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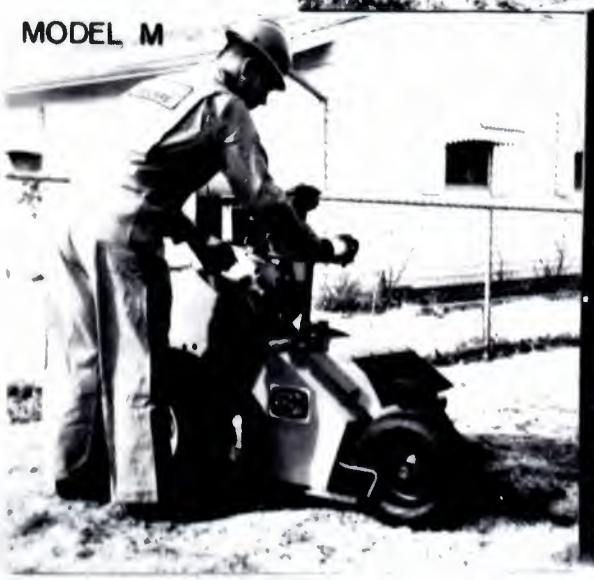

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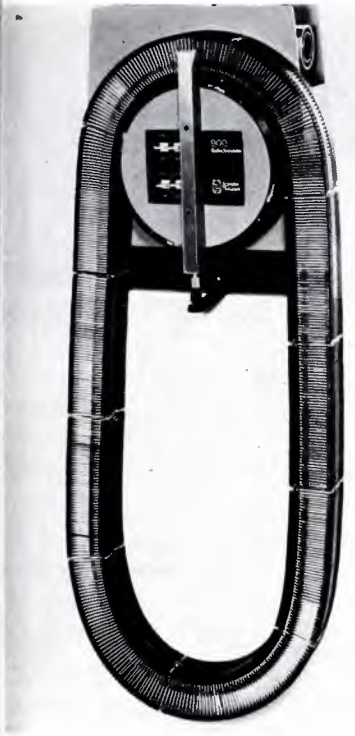
BROADCAST EQUIPMENT

"Serious slide projector" uses flexible, interlocking tray segments that can be assembled to hold various quantities up to 500 slides. Selectroslide 900 has 3500-lumen output with



f/2.5 lenses of any focal length. It changes slides automatically in one-half second, can be used for front or rear projection, has a two-lamp holder that permits instant lamp replacement. SPINDLER AND SAUPPE. **275**

AM frequency and modulation monitor uses no RF amplifier, has sensitivity of 2.5 mv, 40 dB of agc range. Model 713 maintains frequency accuracy of ±2 Hz per year

and provides digital readout of frequency error with 1 Hz resolution. Two peak flashers show positive modulation of 125%, negative 100%. TIME AND FREQUENCY TECHNOLOGY. **276**

Repeater for long-haul television relay service operates in 6 and 7 GHz common carrier bands. Model MA-7H eliminates traveling wave tubes, high-voltage supplies, coolants, fans, uses a single power varactor stage. Output is 3 watts minimum. MICROWAVE ASSOCIATES. **277**

Wideband video amplifier in a 10-pin "TO" can, can be used as a tape head amplifier in video recorder systems, or as video or pulse amplifier in communications equipment, and other applications. Model 592 has differential input (for high Q sources) and output, fixed gains of 100 and 400, adjustable gain with one external resistor. External reactors turn it into a low-pass, high-pass, or band-pass filter. $3.80 each (in quantities over 100). SIGNETICS. **278**

Modular coaxial switching matrix uses 100-crosspoint modules, which can be combined for larger switching capacity. Coax matrix is usable

from DC to 60 MHz, with isolation of 55dB at 60 MHz. Control voltage is 24 VAC nominal, current requirement 1 milliamp per volt per crosspoint. TROMPETER ELECTRONICS. **279**

Video delay module delays wide-band video signals a nominal 64 microseconds. Base modules make image-enhancing feasible with economical CCTV or cable TV cameras, can also be used in video cable equalizing, etc. $800 to $950. CORNING GLASS. **280**

Color film chain camera has single neutral density control disc built in, automatic white and automatic black level controls, all camera and multiplexer controls on a sloping panel at the camera. Model IVC-240 uses three separate mesh vidicon tubes replaceable in minutes without affecting optical alignment. A 14-inch monitor rotates 360 degrees. $24,900. INTERNATIONAL VIDEO CORP. **281**

Video monitor has pulse cross and normal displays, underscan, 10 MHz response. PC-95 comes with 9-in.

diagonal screen, DC restoration, external mixed-sync and vertical-sync inputs. ULTRA AUDIO. **288**

Audio processing units include a four-channel DC-voltage-controlled attenuator-switch with 60dB on/off ratio; 4 × 1 audio crosspoint switch, also DC-voltage-controlled; audio processing amplifier with expansion/compression, hum filter, to normalize difficult audio signals; others. ROH CORP. **283**

Remote telephone line coupler driver has 900-ohm output with DC isolation for direct coupling to telephone lines. Model 285 has Lo-Z microphone and bridging inputs, VU meter. $74.95. PDMC. **287**

Video selector switches any one of six RF or video inputs to single output. Model 649 uses pushbutton switches with automatic lock-out to connect only one at a time. $95. SWITCHCRAFT. **289**

Access floor system provides underfloor space for cables, has perma-

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PRODUCTS

nently applied non-static carpet finish on top. Mini-Floor has 16-in. modules, can be any height above sub-floor from 2 in. up, gives space for air plenum as well as cables. About $2.25 per sq. ft. MINI-FLOOR COMPANY. **290**

Voltmeter measures absolute voltages over range 30 to 1000 MHz. Model USU-1 measures from 3 microvolts to 3 volts, at bandwidths of 200 KHz or 2 MHz. IF outputs are on connectors for driving auxiliary equipment, such as a spectrum analyzer. Two built-in calibration sources give 50 MHz calibration points. $6950. ROHDE AND SCHWARZ. **291**

Signal generator covers range 9.5 MHz to 520 MHz, with AM, FM and pulse modulation built in. Model 750 has five-digit LED frequency readout, direct-reading meter for FM deviation of 10 KHz, 30 KHz, 100 KHz and 300 KHz. Accuracy is ±.001% to .05% of frequency, RF output up to 1 volt, harmonics at least 30 dB below carrier. LOGIMETRICS. **294**

Sound effects system uses a solid-state plug-in card for each sound produced. SS-1000-A has central interconnect assembly which accepts up

to five cards at one time, with outputs selectable by switch, and has power supplies and a 30-watt monitor amplifier. A large library of sounds is available—jet engine, animal growl, bird chirp, locomotive whistle, and many others. Each sound, $35; central unit, $295. UNIVERSAL RESEARCH LABS. **299**

Half-inch cartridge video playback unit and record play deck incorporate EIAJ #1 black-and-white and color standards. Model NV-5110 (play) and NV-5120 (play/record) have one-reel cartridge design with fast forward, rewind, automatic cartridge ejection, hot-pressed ferrite heads, and automatic phase control. Playback time is 30 minutes using ⅔-mil tape. NV-5125 also has built-in VHF-UHF tuners. $950, play only; $1300, play/record, $1450, play/record/tuners. PANASONIC. **295**

Electronically-tuned solid state oscillators cover octave tuning ranges from 10MHz to 2 GHz. VTS Series puts out 600 mw to 500 MHz, 400 mw from 500-1000 MHz and 200 mw from 1 to 2 GHz. Units are 2½ cubic inches, have power response flat to ±1 dB, and spurious output more than 50 dB down. $195, up to 1 GHz; $275, 1 to 2 GHz. TEXSCAN. **296**

Seven-port amplifier for dual-cable CATV two-way trunk systems transfers reverse signals from the "A"

trunk to the "B" trunk through a coaxial jumper. XR2AB4-7 accommodates 2- or 4-output bridges and filters to direct forward and reverse signals. THETA-COM. **300**

Large-screen TV projector puts images on screens from 4½ × 6 ft. to 6 × 8 ft., for audiences up to 500 people. Magna Image I uses 5 in. CRT, 14-in. Schmidt optics and 40 kv power supply to produce bright images. It accepts broadcast, industrial, and CCTV inputs, as well as most ½-in. videotape signals. IMAGE MAGNIFICATION INC. **301**

Cassette recorder/player allows speech on tape to be played back at any speed from one-half to two-and-a-half times original speed. Varispeech does not change pitch or alter individual speech character, allowing rapid scan of recorded material at high speed, careful analysis at low speed. LEXICON, INC. **302**

Low-cost audio consoles have four mixer positions and handle up to 16 inputs. BC-14 series includes mono, dual channel and stereo versions in consoles and rack mount styles, with pushbutton input selection and audition provisions on all input mixer channels. Program and monitor amplifiers are included, as are monitor speaker and speaker muting relays. $795 and up. RCA. **303**

Outboard Dolby "B" unit can be used with cassette or open-reel tape ma-

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...is indexed for ELECTRONIC editing

Today you need faster production, lower production costs and more sophisticated editing. There's only one answer... electronic indexing of all taped frames so that —

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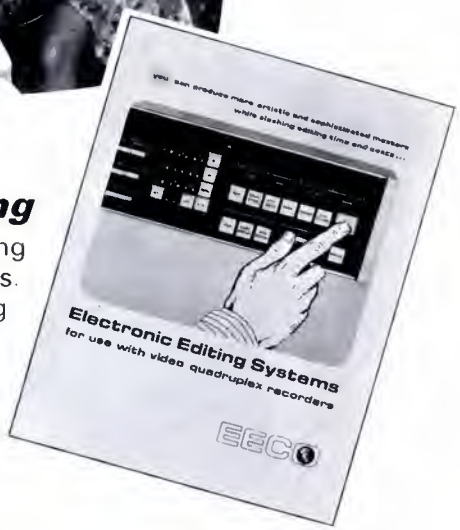

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PRODUCTS

chines for recording and playback. AN-60 provides 5 dB of noise reduction at 1000 Hz and 10 dB above 4 KHz. It has a calibration meter and is supplied with calibration tape. Distortion is below 0.5%, frequency response 20-15,000 Hz ±2 dB, separation better than 50 dB. $89.50. TEAC. **304**

Front-mounted sweeper attachment for R40 and R65 trenchers can be used for clean-up after trenching operations. Ditch Witch sweeper has brush six feet across and 32 inches in diameter; it is raised, lowered and angled hydraulically. CHARLES MACHINE WORKS. **305**

Film processor allows easy plumbing and component changes to handle almost any black-and-white or color process. Minaflex Processor aims to eliminate obsolescence in film processing equipment with design that allows piping in chemicals, water, air wherever needed. TREISE ENGINEERING. **306**

Coaxial connector series has high RFI integrity, is available in models for foam dielectric aluminum sheathed

coax as well as standard cable in .41$_2$, .500 and .750 sizes. The 990 Series includes a splice, feed-thru, chassis type with short pin and chassis type with long pin. MAGNAVOX CATV DIVISION. **315**

High-power amplifiers for range 50 MHz to 1250 MHz use output stage with four channels of hybrid combined RF amplifiers. Model A-2040 (50 MHz to 500 MHz) and Model A-2039 (500 MHz to 1000 MHz) have output powers up to 150 watts. At lower power levels full octave band coverage is achieved. DC-to-RF efficiency is 40% minimum. $2500 to $5000, dependent on bandwidth and power. ACRODYNE INDUSTRIES. **308**

Dynamic microphone has shock mount to eliminate or minimize cable, handling and mechanical noises. SM61 also has "pop" and wind filters to allow outdoor recording, public address and broadcasting applications. $66. SHURE BROTHERS. **309**

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The first family of cameras with interchangeable parts.

We've designed a line of color cameras around an interchangeable modular concept. Every common function circuit board is identical and can be plugged-in any of our cameras. All channel amplifier modules are also interchangeable. And to make things even easier, both the function boards and amplifiers do not have to be individually fine tuned.

This modular concept holds true for all our cameras: the KCU 40, a 3 tube color camera; KCF 40 Film Telecine camera; and the KCR 40, a hand-held reporter camera.

For information about our family of cameras, write for a brochure to Robert Bosch Corporation, 2800 S. 25th Ave., Broadview, Ill. 60153.

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Control Electronics

KCF 40, Telecine Camera

KCR 40, Hand-held Reporter Camera

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NEW LIT

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

Coaxial-connector catalog and price lists cover nearly 200 connectors, terminals, adaptors, and accessories. Magnavox CATV Division. **200**

Audio accessories, including plugs, cables, switchers, connectors, mixers, adaptors, totalling several hundred items, are covered in new A-404A catalog and price list. Switchcraft. **201**

Electronic test and measuring equipment, including automated and programmable equipment, is listed in new condensed catalog. Ballantine Laboratories. **202**

Service and price book shows full range of color and black-and-white film lab services: daily rushes, answer prints, release prints, etc. Bebell, Inc. **203**

All products introduced since March 1971 are covered in 76-page "New Products" catalog. Listing includes oscilloscopes, automated test systems, computer display terminals, others. Tektronix. **204**

Color brochure covers microphone and speaker stands, stand accessories, adaptors, and fittings. Atlas Sound. **205**

"Signs of the Times," booklet showing trends of credit usage, capital expenditures, failure trends, and much other information useful to financial managers, is available in updated ninth edition. American Credit Indemnity Company. **206**

Type 54A FM Program Channel System is covered in complete operations manual; system provides wideband communications on frequencies above the normal baseband of microwave radio, and is used for TV, audio, wideband data, and multiplex. GTE Lenkurt. **207**

Catalog describes all components needed for complete video communications systems; cameras, film chains, lighting kits, sync generators, consoles, etc. GBC Closed Circuit TV Corp. **208**

Data sheets cover mechanical and electrical specifications of special antennas used in measuring electric and magnetic fields from 10 KHz to 100 GHz. Rod, loop, horn, and biconical antennas are included. Singer Instrumentation. **209**

"Quartzline and Incandescent List," "Fixture Relamping Guide", and **"Ansi Cross-Reference List,"** three reference booklets widely used by designers and operators of TV and movie lighting systems, have been revised and updated. General Electric Co. **210**

Directory of world-wide video-cassette systems, including both hardware and software, will be published by Synthedyne, 4731 Laurel Canyon Blvd., North Hollywood, Ca., 91607, at $15.95 for two semi-annual issues. **211**

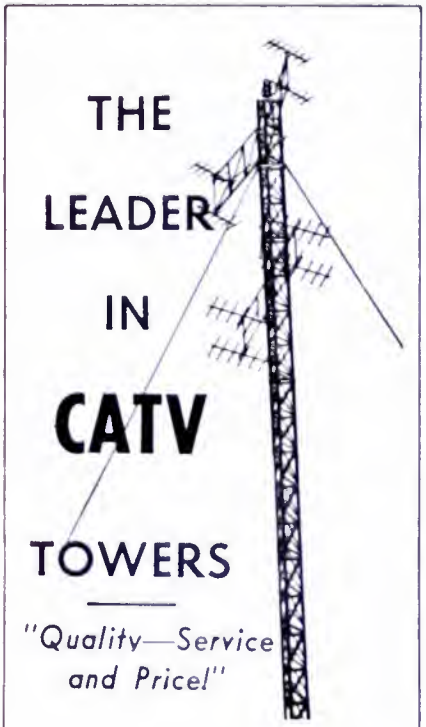
New brochure describes coaxial cable installation procedures, including pressurization, and lists cable accessories. Phelps Dodge. **212**

Cable splicing products and instructions for use are covered in new data sheets: included are power cable kits, universal kits for low-voltage cable to 600 volts, adhesive mastic tape for low voltage splices, encapsulation materials, high-voltage laminate kit. Hexcel Corp. **213**

Solid-state TV monitors with screens from 9-inches to 23-inches are shown in outline drawings, together with complete electrical specifications, in color brochure. Conrac. **214**

Short-form catalog lists over 6000 mechanical and electro-mechanical components—switches, connectors, plugs, cables, etc. Switchcraft. **215**

Television camera cables and connectors are described with specifications and prices in new color data sheets. Mohawk Wire and Cable. **216**



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Yes, quality, service and price on CATV systems are the reasons for Fort Worth Tower's position as the industry's leading supplier. Experience gained as a pioneer supplier of CATV enables Fort Worth Tower to provide you with a quality product at a price that is reasonable and attractive.

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Spotmaster

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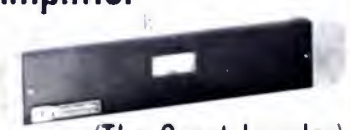

(The Great Leveler)

$445!

You can stop riding gain now, even when a shouter and whisperer are on the same talk show. The Model CLA 20/40 Compressor-Limiter Amplifier does it automatically . . . instantaneously . . . for both AM and FM. Switchable controls permit symmetrical (FM) or asymmetrical (AM) peak limiting; pre-emphasized or flat response; compress limit, compress only, or compress limit off. Automatic gain control range is 40 dB dynamic, and the compression ratio is better than 10:1. All solid state, plug-in modular construction assures trouble-free reliability. Write for complete details.

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the level and quality of the background sound at each edit point. Further, the producer may want to add sound effects, musical bridges, and audience reaction ("sweetening") to produce a smooth, uniform finished track.

Synchronization of the VTR and the sound track has been a problem, usually done by ear and with a great deal of tweaking. A new instrument is now available that uses the SMPTE Edit Code to speed up and simplify the process.

The synchronizer is schematically represented in Fig. 3. The video and audio tapes are first manually "parked" to within ±30 seconds, then put into the RUN mode and the synchronizer is enabled. The time code received from the two recorders is automatically compared, generating an error signal that drives the capstan servo of the audio recorder until sync is achieved. Sync is maintained with no drift adjustments even over hours of program length.

Expandable systems

The basic system just described is easily expanded to handle virtually any load by adding more programmers to handle more recorders; by adding auxiliary, lower cost programmers for simultaneous video and audio editing; by adding remote VTR controls to the editing stations; and by using computers for indexing, storage, retrieval, and scene sequencing. **BM/E**

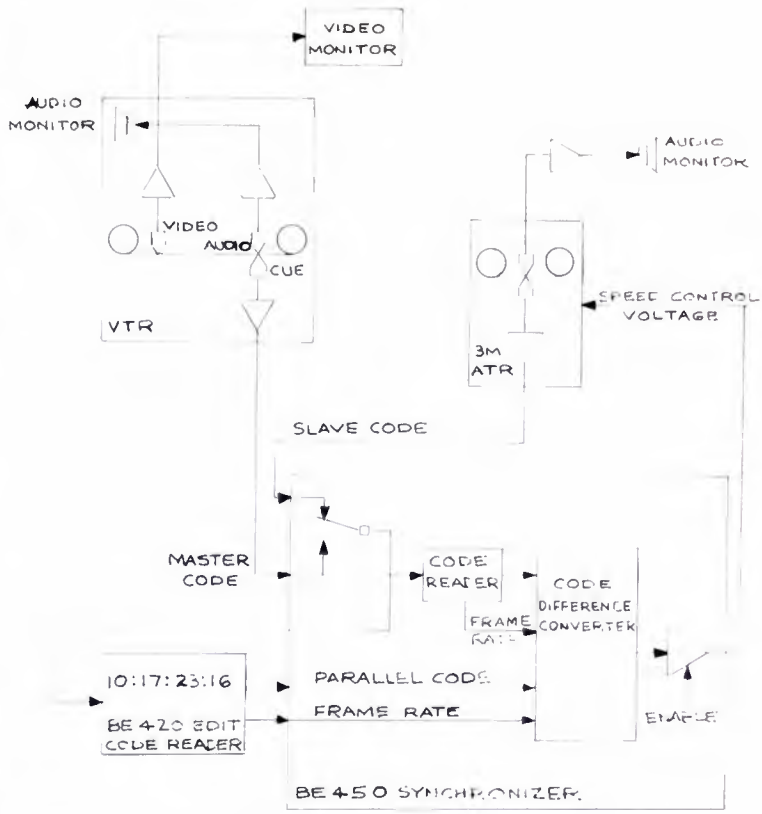

Fig. 3: Sound track synchronization can be automated, too, with the SMPTE Edit Code.

TIRED OF PAYING SHOCKING PRICES FOR ELABORATE WAVEFORM MONITORS OFFERING COSTLY SELDOM-USED FEATURES?

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AUDIO FILE continued from page 28

who is mixing the program should be able to control the gain of the caller's voice separately from the in-studio people. 5. Most stations delay telephone talk programs from 3-10 seconds to protect from indecent language and slander. This is done with a special tape cartridge or loop, and has been discussed in other articles.

One type of telephone-talk system is called the hybrid. This is not standard Telco, and must be custom-built by station engineers. The advantage of the hybrid is that the callers hear the voices of in-studio people directly from their microphones. The disadvantage of hybrid is that if it is not properly adjusted you get horrible feedback. In every hybrid system I have seen, the studio people must wear headphones.

The standard telephone company equipment for talk shows is called the Recorder Connector. It is a bulky box for which you pay a healthy monthly charge. The Recorder Connector output (which is a non-standard connecting plug) gives you *both* sides of any conversation. It also injects a "beep" onto the line every 15 seconds. The disadvantages of the R. C. are that it does not isolate the caller's voice from the studio voices, and it puts that darn beep in. The beep is no longer required by law for a regular telephone-talk program, and it can be turned off by disconnecting one wire inside the unit . . . but the telephone company will not generally do that for you.

Usually the Recorder Connector is used with a standard Speaker Phone, an amplifying device that allows people to hear callers and speak to them from almost anywhere in the studio. The speaker phone is the heart of the telephone-talk system which I recommend.

The normal speaker phone requires two small boxes, placed on a table in a room. One is the speaker, over which you hear the caller's voice. The other is the "transmitter," which is nothing more than a microphone feeding the voices of people in the room to the caller. The speaker phone circuitry (which can be mounted under the table) performs two important functions: automatic gain control for the transmitter microphone, which adjusts for voice levels of people within the room; and muting, which *turns off the speaker whenever anyone in the room speaks in a normal voice*. This means that *the voice of the caller is isolated* on the speaker.

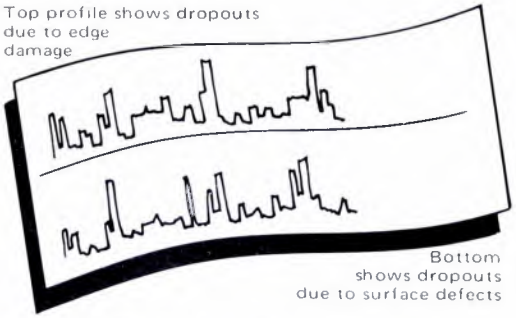
It is a simple matter to tap off the speaker terminals, thereby getting a feed of the caller's voice only. Instead of opening up the speaker box, tap onto the speaker leads at the terminal board inside the speaker phone power supply box (under the table, remember?). They go to terminals 20 and 29.

You now have an 8-ohm speaker-level signal of the caller's voice which can be raised and lowered by a volume control which is part of the speaker phone. To match this signal to our audio console, we brought it into the input side of a voice connector/QKT unit (discussed above). The output side of the QKT is a good line-level signal which goes directly into a line input on the audio console. (The telephone company was a little surprised about all this, but it works beautifully.) The QKT is a passive device that works without any power, so insist that it be installed without an on/off button.

To complete the installation, we added an optional second transmitter (microphone) box to the speaker phone, to make it easier for callers to hear any number of people in the studio.

So now when a studio host talks to a caller, the caller hears him over the speaker phone, and his voice goes through a regular broadcast microphone into the audio console. The speaker phone speaker is muted automatically. When the caller talks, his voice comes over the speaker phone's speaker box, the host hears him plainly, and the same sound that is on the speaker box is fed into the audio console at line level. No one in the studio has to wear headphones; they just sit at a table and speak in a normal voice. The audio engineer can control the levels of each participant separately. **BM/E**

THIS IS A VIDEOTAPE EVALUATION PRODUCED BY THE MAGNETEK CLEANER - EVALUATOR



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VIDEOTAPE EDITING

continued from page 26

Pre-editing off-line

The system has extensive off-line capability augmented by the edit file storage and the teletype. The character generator used for the operator's display has additional outputs which are related to the time code readouts of the three selected machines which appear on the Operate page of the display. All other information that is normally displayed on the Operate page is suppressed on these outputs. The normal character generator output is unaffected. It is a simple matter to superimpose the character generated time code over the video output on the machine replaying the code for subsequent transfer to low cost helical scan tape. Most helical scan machines offer freeze frame capability, it is therefore an easy matter to select a precise frame reference by reading the time code directly from the video output of the machine. By selecting in and out times for various playback segments a schedule of edits may be built up for subsequent entry into the editing systems' file via the teletype paper tape reader. The final assembly using the original high-quality tapes may then be carried out automatically. **BM/E**

References

1. Dahlin, E. K., *Standardization for Time & Control Code for Videotape and Audio Recorders*, 79: 1102-1106, December 1970 Journal of the SMPTE.

2. IRIG Document 106-69, Telemetry Standards, p. 25.

FCC RULES & REGS

continued from page 14

20-November 6 (assuming September 20 is the day of changeover from summer to fall rates).

If a candidate *contracts* on or after April 7, 1972 for a *future* use and the rates have changed by the day of said use, the candidate is entitled to the rates in the contract if the rate changes are *higher*. If the change is lower, the candidate is not bound by the contract and is entitled to the lower rates.

Another, not infrequent variation facing station operators occurs when, faced with having available some unsold time during prime time hours, the operator approaches and sells same to an advertiser at a rate *lower* than the "normal" rates charged. As such, this lower rate forms a *new basis* for the "lowest unit charge" to political candidates and, indeed, is grounds for a refund to candidates who were charged "normal" rates prior to the new basis.

The section 315 amendments of the Federal Election Campaign Act are causing difficulties for many station licensees and cable operators. The Commission's question-and-answer guidelines are informative, but often raise as many issues as they resolve. Punishment to broadcasters and cablecasters who *knowingly and willfully* violate the provisions on "lowest unit charge," "certification," and the like stands at 1) up to $5000, or 2) up to five years imprisonment, or 3) both. To those who *unknowingly and unwillingly* violate said provisions, punishment may come in the form of Commission sanctions at renewal. Accordingly, when troublesome situations arise, close communication with your counsel is imperative. **BM/E**

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EWS continued from page 10

ange in May which will in effect onsolidate the requirements for entifying the sponsors of broadst material. "Sponsor" would be efined simply as "paid for," and e separate paragraphs in the resent rules dealing with commite sponsorship would be elimiated. Political broadcasts would en come under the general rule, d the station would be required to me the committee or group pay- g for a political broadcast, and to ep on file for two years the names chief officers, executive committe, or members of the board of rectors. Comments on the prosed changes were due by July 5, 972.

AB Supports FCC on emote Control Rule Change

he FCC proposal to rescind rules quiring radio stations to man reote control pickups with technical ersonnel got strong support in a atement filed with the FCC by the AB. However, the statement also alled the FCC proposal only a nall part of what is necessary to ring the rules "into harmony with day's operating concepts and chnological advancements." Some ther services that need operator elief, said the NAB, are TV reote control, inter-city relays, and ural station links.

mprove Congress Relations, AB Plea to Broadcasters

n a talk to the Illinois Broadcastrs Association in Springfield, J. . Hulbert, vice president for Pubc Relations of the NAB, told roadcasters that they needed betr and more sensitive Congressionl contacts as a boost toward "poitical success." He advised them to know their product" by having ll information about legislation nd about its effects on broadcastg; and to be candid in Congresional contacts, pointing out daners as well as benefits of stances aken.

roadcasters Told to Fight ny Hobbles on News

ight any government attempt to ontrol or stifle the news, radio and V excutives were told by Bill oberts, Washington manager for he Time-Life stations, at the annual conference of State Broadcaster Association Presidents, in Washington during May. He said that the nation seems to be heading for a "Big Brother Knows Best" philosophy, and urged his listeners to join in helping head off such a catastrophe. "Blow the whistle loud and clear on any attempts to stifle the news," he said, " . . . it's worth the fight."

Burch Tells Grads: "I've No Hunting License"

FCC Chairman Dean Burch, getting an honorary LL.D. from Trinity University, San Antonio, took the occasion to define his role for the graduating class as a mediator " . . . among competing institutions." He said that his Presidential commission was " . . . not a hunting license . . . it gives me no power) to reshape these communications systems into something that comes closer to my own desires . . ." He described himself as a "neutral referee when disputes arise." He said: "By diversifying ownership and control, we seek a system wherein no single voice and no single judgment dominates the mass communications media."

continued on page 42

Spotmaster

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Model 5S11 Stereo

Model 5M11 Mono

SPOTMASTER IS HERE . . .

with outstanding new audio consoles from $775

Here are the audio consoles for stations whose standards are higher than their budgets. Look what you get:

Model 5M11 Mono—11 HI/LO inputs into 5 mixers
Model 8M20 Mono—20 HI/LO inputs into 8 mixers
Model 5S11 Stereo—11 pairs of HI/LO inputs into 5 mixers
Model 8S14 Stereo—14 pairs of HI/LO inputs into 8 mixers

- Electronic switching of input channels via FET's
- Low and high level preamps for each channel
- Top quality ladder attenuators (Daven or equiv.); carbon pots optional at lower cost in mono models
- Identical program and audition output channels for dual console capability
- Individual program, audition, monitor, cue and headphone amplifiers, plus mono mixdown amps in stereo models
- Solid state construction throughout; modular, plug-in circuitry; superb specs; complete with self-contained power supply
- Beautiful as well as functional; wood grain side panels

Write or call for details about the budget-pleasing prices:

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Gates has the most complete line of FM transmitters in the industry. From 10 to 40,000 watts. All with a 100% solid-state exciter employing DCFM (direct carrier frequency modulation) and DAFC (digital automatic frequency control).

The TE-3 exciter is the heart of all H3 series transmitters—one tube (1kW), two tube (2, 3, 5 and 10kW), and three tube (20kW). All FCC-type accepted, ready for prompt shipment.

Tell us the power you need and ask for data on our FM antennas. Write Gates, 123 Hampshire St., Quincy, Illinois 62301, or phone (217) 222-8200 today.

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NEWS continued from page 41

Bresnan is New Chairman of NCTA

National Cable Television's board of directors has selected William J. Bresnan as the national chairman of the organization. Bresnan is New York-based vice president of TelePrompTer Corp., and has been NCTA vice chairman since July 1971. He has served on a number of NCTA committees, and last year was honored as "outstanding committee chairman."

NEWS IN BRIEF

A multi-award winning 16mm film, "Home Sweet Cedar," which traces in 27½ minutes the evolution of shingles and shakes to the present, with interludes on logging and manufacturing, is available free from Modern TV, 2323 New Hyde Park Road, New Hyde Park, N.Y. 11040 . . . **English Electric Valve Co.** has supplied klystrons for the first UHF transmitter to be built in the South African Republic . . . **TeleMation, Inc.** has sold 300 Sony videocassette machines to IBM, for installation in field offices around the country; and 50 to Arthur Andersen & Co. for use in branch offices . . . Philips Broadcast Equipment Corp. became the outlet in the U.S.A. for the Norelco VCR and announced an agreement with Videorecord Corp. whereby the latter will become a prime distributor. The contract calls for 23,000 units with shipments to begin in January 1973.

Photo Research, Glendale, California, won a technical Oscar at the 44th Annual Academy Awards presentation for its Spectra Film-Lens Balanced 3-color Meter . . . **National Kinney Corp.** announced record earnings of $1,987,000 for the quarter ended March 31, 1972; a 2-for-1 stock split; and the acquisition of Holmes Protection Services Corp., a security firm which is moving into the use of CATV and MATV for its services . . . **John B. Farese, executive vice president, RCA Electronic Components,** predicted that 1972 would be a record year for sales of TV color picture tubes, with totals up as much as 25 percent over 1971.

KCNW Radio, Tulsa, Oklahoma, will join the CBS Radio Network . . . **Hewlett-Packard, Palo Alto, California,** has available 106 different videotapes, many of them training tapes on general electronic subjects and on the use of the company's instruments: format is ½-inch EBAJ-1, with others on special order . . . **Sanyo Electric, Inc.,** has appointed sales representatives in the east and midwest for its VTR line, which includes a five motion reel-to-reel video recorder; video camera; electronic viewfinder; 12-inch monitor; and other related units.

PEOPLE

Harry L. Wingfield, chief engineer of WTLV, Jacksonville, Florida, was fatally shot in May in an apparent attempt at robbery of his private workshop. He had been chief engineer at WTLV since it went on the air in 1957 . . . **Richard F. Carr** was named a vice president of Meredith Broadcasting, operator of stations in Syracuse, Omaha, Phoenix, and other cities . . . Manager of the Allband Cablevision system in Olean, N.Y., is **Robert Schenrock;** system is owned by Television Communications Corp.

Robert M. Fisher is the new vice president, engineering/operations, of Trans-World Communications, the closed-circuit TV subsidiary of Columbia Pictures Corp. . . . **George L. Fletcher** has joined Suburban Cable Vision, Inc. as manager of field engineering; firm operates nine cable systems along the east coast . . . **Joseph Hudgens** and **J. W. Sneller** were elected vice presidents of the KRNT Broadcast Division of Cowles Communications in Des Moines.

Nicholas Rabiecki is vice president, planning, of Polygram Corp., international firm owning Polydor, Mercury, MGM, Philips, and DGG Record well as other entertainment firms . . . **James A. Monroe** is manager of Cablevision Properties' system in Waco, Texas . . . **William F. Ryder** was appointed vice president and director of operations for Sterling Television Presentations, Inc., suppliers of alphanumeric news service and character generators to cable systems . . . **David F. Miller** has the new post of director, marketing, for SelectaVision, the RCA videocassette system.

William A. Fink is marketing manager of the Conrac Division of Conrac Corp., responsible for sales of video monitors, computer terminals, and alphanumeric CRT displays . . . **Leon Papernow,** executive vice president of Cypress Corp., received a plaque from the Ohio Cable Television Association recognizing his work for minority representation in cable operation.

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CLASSIFIED ADVERTISING RATES

DISPLAY CLASSIFIED ADVERTISING: $22.50 per inch 1x; $22.00 per inch 3x; $21.00 per inch 6x; $20.00 per inch 12x. ALL OTHER CLASSIFIED ADVERTISING 25¢ per word; minimum $3.00. BLIND BOX NUMBER: No extra charge. Replies sent to address below will be forwarded to you. PAYABLE IN ADVANCE; send check with order. CLOSING DATE: 5th of 2nd month preceding issue date.

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reative and imaginative pacesetter seeks challenging position with progressive CATV firm. years solid experience commercial TV production, 8 years as producer-director, 3 years newspaper advertising sales. Box 772-1, BM/E, Blue Ridge Summit, Pa. 17214.

S. in TV production, need 1st break. Salary open. 24, male, single, steady, can relocate easily. Ed Steinman, 1441 Orchard St., Des Plaines, Ill, 60118 (312-824-0625).

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Seven Years top 40 experience. Desire Permanent location. Tape, resume, "Sunny" Dodd. Anderson's Trailer Ct., Scottsboro, Ala, 35678. 205/845-4158.

Experienced video tape operator/editor RCA and Ampex VTR's for commercial productions work. Tele-Color Productions, area code 703/ 273-3203. Contact Chief Engineer.

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FOR IMMEDIATE DELIVERY: new Ampex AG 440B, AG 500B, AG 600B, AM-10-AA620 CBS Volumtex & Audimax, Russco turntables, Gray tonedrums, E-V & AKG microphones. Fontel Tape Cartridge Equipment & many other broadcast products, SPECIAL package deals. Continental Electronic Wholesale Corporation, P.O. Box 206, Hialeah, Fla. 33012. (303) 822-1421.

SCULLY TAPE RECORDERS: Mono, 2, 4, 8, 12, & 16 track models plus 270 automatic playbacks. Some models in stock now. W.A.L. custom audio control console & console modules. Solid state 120 Watt power Amps. We buy and rebuild Scully lathes. WIEGAND AUDIO LABORATORIES, INC. R.D. 3, Middleburg, Pa. 17842, 717-837-1444.

MOTORS FOR SPOTMASTERS
NEW Papst hysteresis synchronous motor HSZ 20.50-4-470D as used in series 400 and 500 machines. Price $39.00 each prepaid while they last. 90 day warranty. Terms check with order only, no COD's. Not recommended for Tapecaster series 600 or 700.
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Solid-state audio modules-console kits, power amplifier kits, power supplies. Octal plug-ins—mic, eq, line, disc, tape play, tape record, amplifiers. Audio & tape bias oscillators. Over 50 audio products. Send for free catalog and applications. Opamp Labs. Inc., 172 So. Alta Vista Blvd., Los Angeles, Calif. 90036, (213) 934-3566.

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FIELD STRENGTH METER. 540 KHz to 30 MHz, Ten microvolts to 10 volts per meter. New solid state design, long battery life. Stable accurate calibration. Free literature. Solar Electronics, 901 No. Highland Ave., Hollywood, Cal. 90038.

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AMPEX 300, 350, 352, 400, 450 users, for greater S/N ratio, replace first playback stage 12SJ7 with our plug-in transistor preamp. For specification write VIF INTERNATIONAL, PO Box 1555. Mtn. View, Ca. 94040.

The complete and reliable source for new and used broadcast equipment. Request our free listings. Broadcast Equipment and Supply Co., Box 3141, Bristol, Tennessee 37620.

Used Alford model 1051-H Notch Diplexer, 10 KW Peak Visual Power, 20% average aural power for operation on channel 7, 3⅛" unflanged. Gates Division, Harris Intertype Corporation, 123 Hampshire, Quincy, Ill. 62301.

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Any type tower erection finance. Bill Angle, Tel. 919-752-3040. Box 55, Greenville, N.C. 27834.

Printed Circuit Drill Bits. Trumbull, 833 Balra Dr., El Cerrito, Cal. 94530.

One stop for all your professional audio requirements. Bottom line oriented. F. T. C. Brewer, Box 8057, Pensacola, Florida 32505.

Mica and vacuum capacitors. Price lists on request. Surcom Associates, 1147 Venice Blvd., Los Angeles, Ca. 90015, (213) 382-6985.

INEXPENSIVE CARTRIDGE SUBSTITUTE—Ampex Mat System; Like New gear needs attention—you get 2 recorder-reproducers, degausser and 50 mats for $130, freight prepaid, with schem books. David Green Broadcast Consultants Corporation, 6190 Hardy, McLean, Va. 22101. Payment must accompany order. 703/821-2600.

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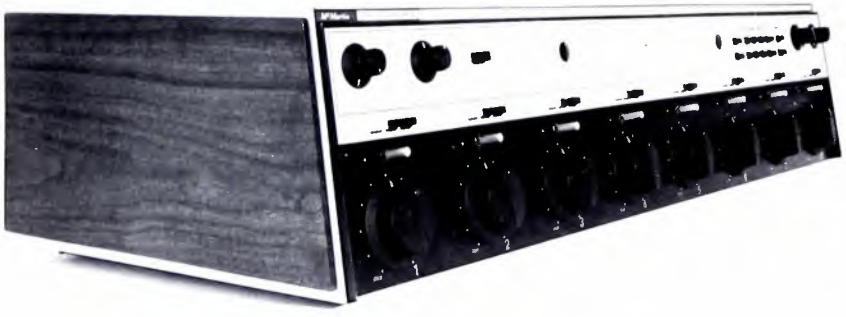

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PULSE RISE TIME:	Typical 100 NS
SC FREQUENCY STABILITY:	± 5 Cycles
SUBCARRIER OUTPUT:	2 Volts P-P
SUBCARRIER JITTER:	Less than 0.5 NS as related to sync
OUTPUT LOAD Z:	75 OHMS nominal
OVERSHOOT AND TILT:	Maximum 1%
OUTPUT SOURCE Z:	75 OHMS ± 5%
STABILITY:	Meets specifications, voltage range 105 to 125 VAC.
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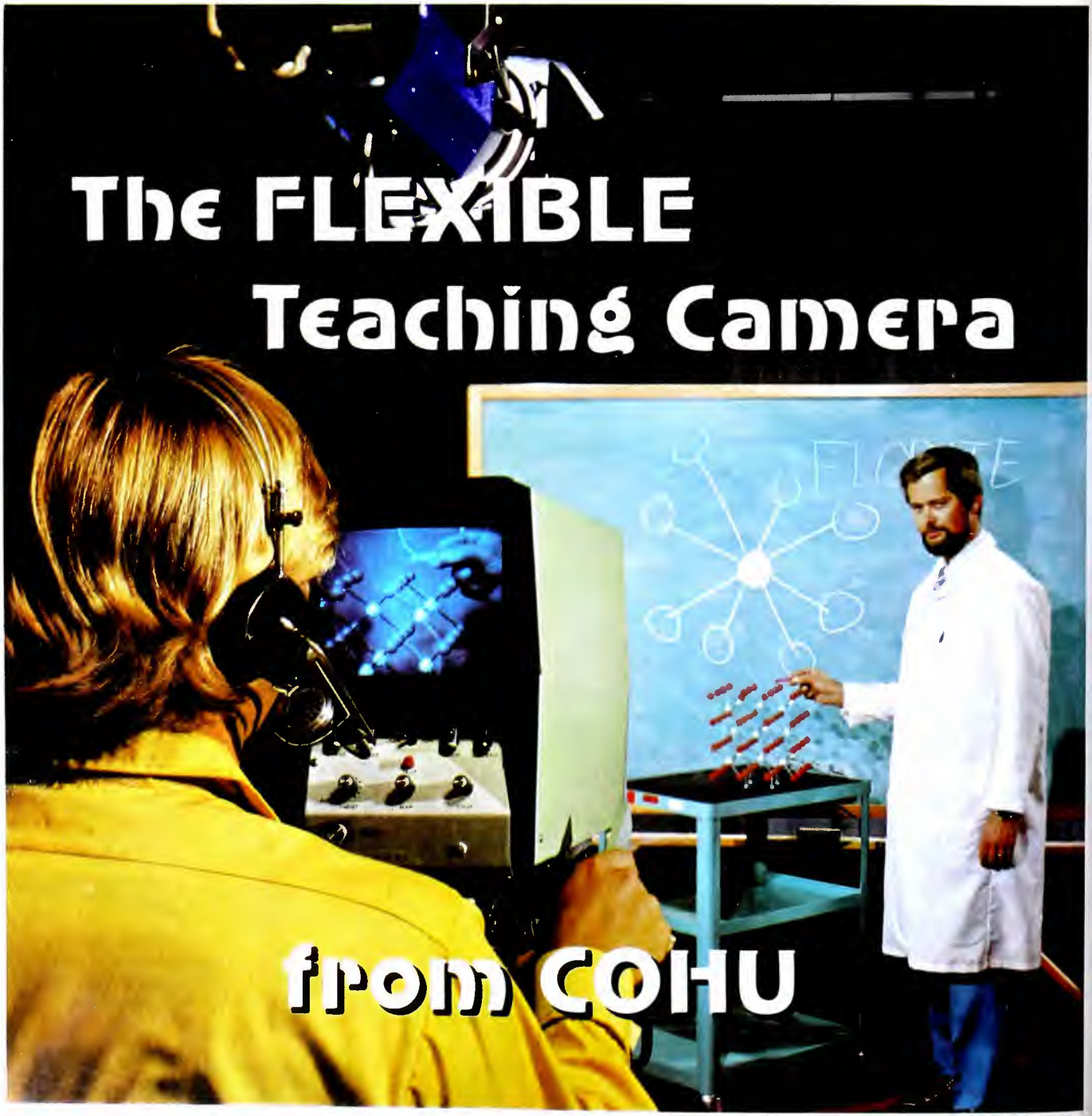

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