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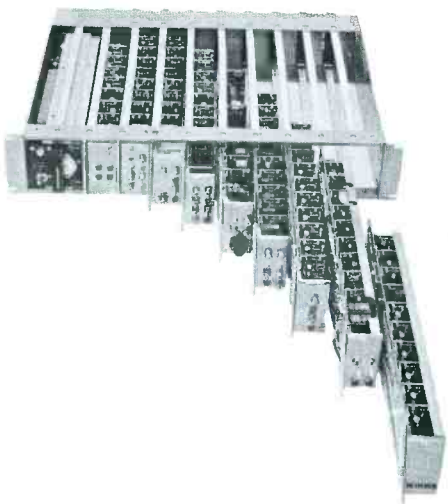

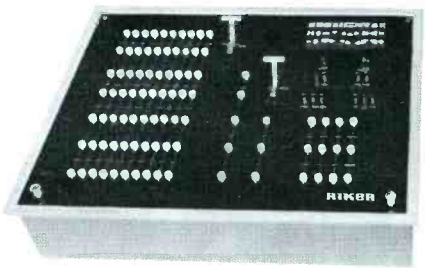

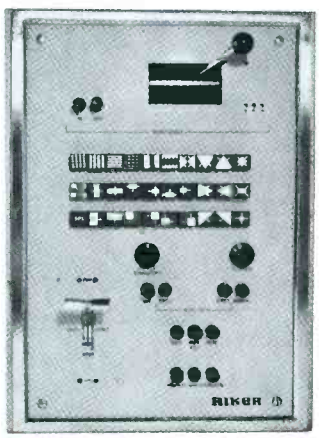

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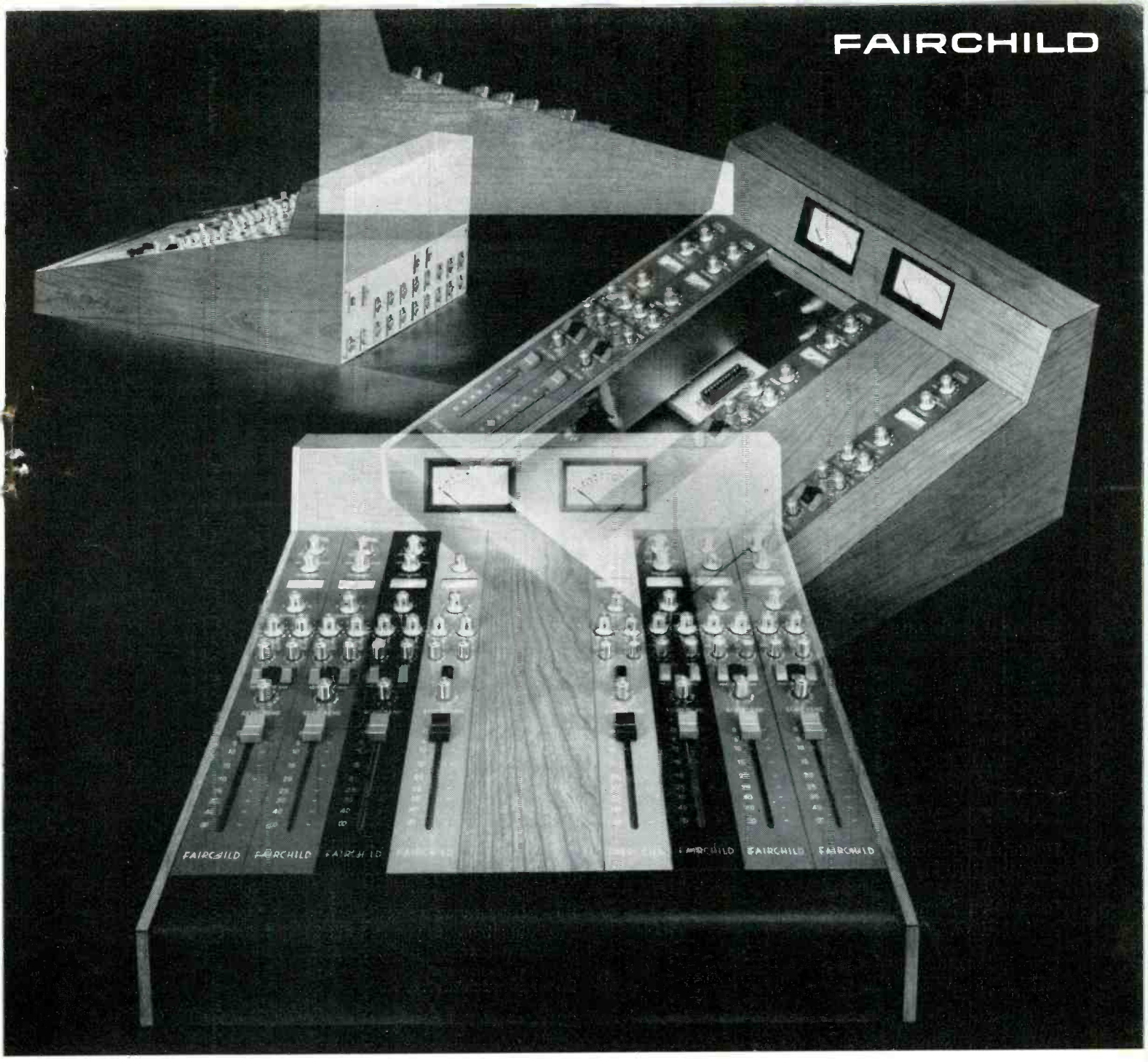

The Desktop Console above is comprised of

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Contact your Fairchild Recording Distributor or write Fairchild for more data.

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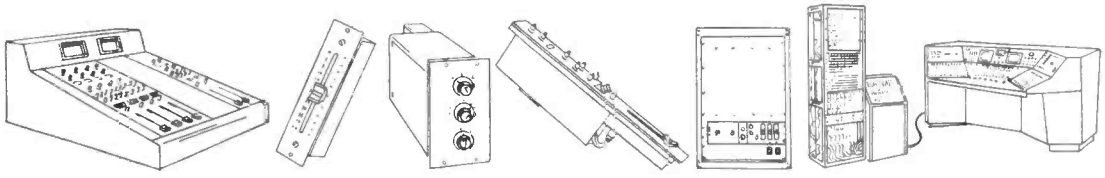

DESKTOP MODULE CONSOLE / LUMITEN / REVERBERTRON 658B / INTEGRATED CONTROL MODULE / REVERBERTRON 658A / REMOTE AUDIO CONSOLE

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NOVEMBER 1968/VOLUME 4/NUMBER 11

BM/E

BROADCAST MANAGEMENT/ ENGINEERING

This month's cover: Kids love TV, even in school! A basic ETV-oriented instructional program uses building blocks of system equipment and instruction schedules—as depicted by the TV sets stacked up in building-block fashion. The "living color" fingerpaint doesn't represent color phosphors; the Admiral sets shown are mono only (model E2206T) and were designed specifically for classroom use. For a special report on ETV/ITV and some new techniques, see pages 33-55. Cover photo by Cailor and Resnick.

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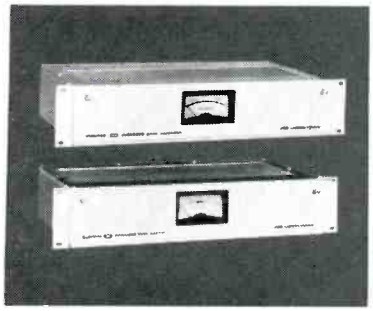
Comes the Evolution



Audimax and Volumax

Television Mobile Vans

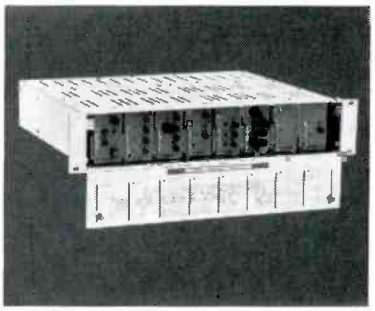
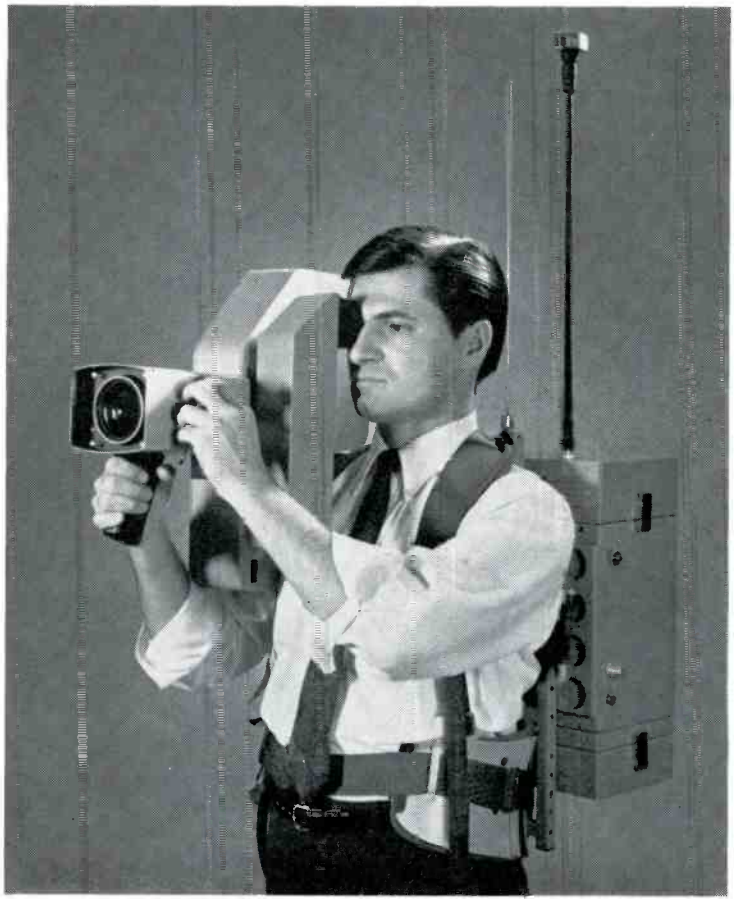


Image Enhancer

...and now the Minicam VI



The new Minicam VI is just one more innovation from CBS Laboratories—the organization which has researched, developed, produced and marketed such remarkable advances in the science of sight and sound as the Audimax and Volumax, Mobile Television Vans, and the Image Enhancer. The organization with vision on the move. Now the new Minicam is free to go anywhere: land, sea or air—riding easily on the shoulder of a single cameraman. And brings you studio-quality color pictures live right from the scene of action! Look to CBS Laboratories for tomorrow's electronics today.

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BROADCAST INDUSTRY NEWS

Equipment highlights NAEB convention

McGeorge Bundy, president of the Ford Foundation, New York, N.Y., will deliver the keynote address November 20th at the 44th annual convention of the National Association of Educational Broadcasters. The meeting, expected to draw over 4000 educational broadcasters and representatives from allied industries, will be held at the Washington, D.C. Sheraton Park Hotel.

A comprehensive program of continuing meetings throughout the convention has been planned by the Engineering Professional Interest Section. Topics which are slated for discussion are videotape, TV reception and distribution; automation and interconnection. Other activities of interest will encompass the categories of graphic arts, production/direction, television teaching, utilization and research.

Hardware on display at this year's meeting will fill three halls at the Sheraton Park Hotel—the largest hotel exhibit space in the world. The exhibit space is 75-percent larger than last year's NAEB convention space, and is the largest in NAEB history.

Dr. Sterling M. McMurrin, dean of the Graduate School, University of Utah, Salt Lake City, will address a luncheon meeting at the convention on November 21. Dr. McMurrin is currently chairman of the convention of the Commission in Instructional Technology which is evaluating the present status and future needs of instructional broadcasting recommended in Title III of the Public Broadcasting Act of 1967.

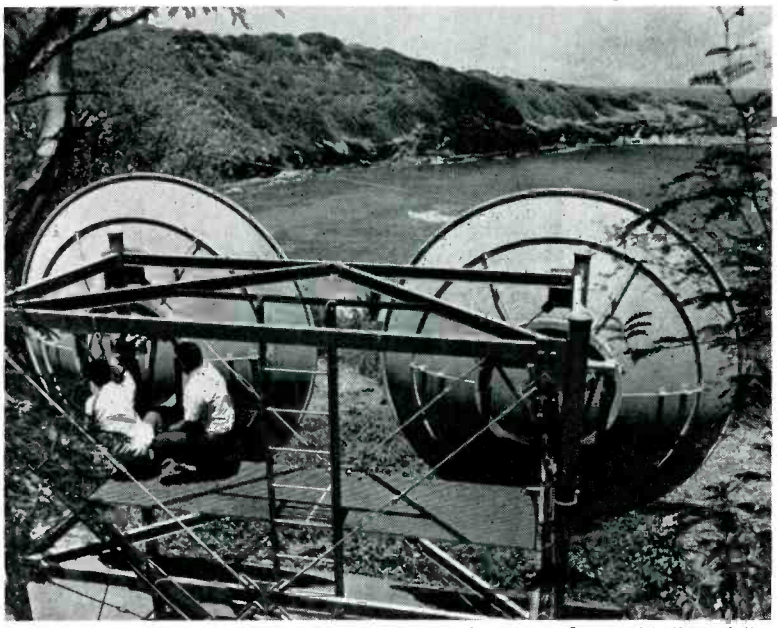
The final luncheon of the convention will be addressed by Frank Pace, Jr., chairman of the Corporation for Public Broadcasting and president of International Exchange Corps, New York. Pace was appointed to his CPB post by the President in mid-February.

Opening day of the convention —November 19—has been planned for the delegates. The theme of this year's meeting, "Educational Broadcasting and the Fifth Freedom," was inspired by President Johnson's education message to the Ninetieth Congress when he coined the term "Fifth Freedom" and defined it as freedom from ignorance.

This year's NAEB Man of the Year Award for distinguished service to educational broadcasting will be presented to Ralph Lowell, chairman of the board of Boston Safe Deposit and Trust Co. Lowell has had a lengthy association with educational broadcasting and is the past Educational TV and Radio Center chairman, now serving as president of the WGBH Foundation, Boston.

For the first time at an NAEB convention, news information will be available to educational and commercial radio stations via prerecorded summaries. Two different feeds will be provided each day including actualities from the convention speakers.

Microwave . . . Hawaiian-style



Twin dishes peer out over Hanuama Bay on Oahu—part of a multimillion-dollar microwave system that will upgrade system capacity from 48 to 600 voice-grade channels among the Hawaiian Islands. The system, produced for Hawaiian Telephone by Lenkurt Electric Co., will also be able to relay television signals. When completed in mid-1969, the microwave links will cover a total of 388 miles—mainly over water—between Hilo, Hawaii and Kauai, via 16 relays and terminals. In the photo, engineers from Lenkurt and Hawaiian Telephone are shown examining a waveguide connection.

NAB president defends broadcasters

"Broadcasters cannot soften reality to suit audience tastes," stated NAB President Vincent Wasilewski at the Federal Bar Association convention.

Wasilewski added that TV's most serious problems occur when it becomes involved in the problem of our time. The emotions that are provoked in the audience are usually directed not so much at the problem as at television itself.

In discussing television's role during the Democratic Convention, the NAB president stated that the question of whether it was fairly covered will probably never be resolved because emotions make a detached evaluation nearly impossible. "One thing is clear though," he said, "and that is that the news media were placed under restrictions that can't be defended and should never be repeated. Perhaps a new pattern of news coverage will develop in the next few years,"

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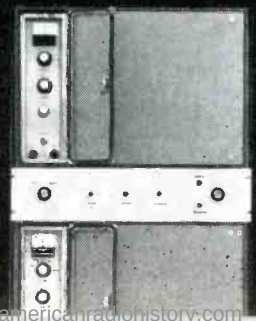
Losing money on interrupted programming? Don't! ☐ Switch to the ultra-reliability of dual STL microwave TV systems . . . total solid-state B-Line fixed links from Microwave Associates. ☐ Performance like nothing you've seen or heard before. Superb color, sharp images, audiophile sound, unbeatable reliability. Plus double protection . . . from solid-state circuitry and highly dependable hot standbys. ☐ Other bonuses too. Solid-state RF sources instead of klystrons . . . no tube replacement costs, no bulky power supplies, no heating problems, no harmful voltages. ☐ Interested? B-Line dual STL's (and TSL's) are in volume production for 2, 7 and 13 GHz auxiliary broadcast bands. With options like multiple-channel audio, automatic hot-standby switching, accessories, and complete RF system engineering assistance. Write or phone for details. (617) 272-3000. ☐ Have the last word!



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he added. "A starting point for such change might be a clear distinction of function."

Uhf spectrum squeeze prompts ACTS action

The developmental air-ground radio telephone service, scheduled to terminate by 1970, has been extended by the FCC. Frequency allocation are in the 454.6625- to 455.000-MHz and 459.6625- to 460.000-MHz remote pickup bands. No cutoff date has been set.

In addition, the Commission proposes to expand the developmental service by splitting channels, increasing them from 6 to 12.

The developmental air-ground service is a radiotelephone service for airplanes to communicate with ground stations. It began in 1957. The eventual goal is for a regular public service to extend telephone communications to commercial and private passengers.

In July 1965, the Commission had denied reconsideration for establishment of nationwide air-ground service. It said that because of land mobile congestion, no more frequencies could be made available near those already in use.

Reflecting the continuing concern over land mobile needs for uhf frequencies, the All-Channel Television Society recently urged the FCC to withdraw channel-sharing and reallocation proposals now pending. In a letter to Chairman Hyde, ACTS asked that no final decision concerning regulation and reallocation of frequencies for land mobile use be made until studies authorized by the Commission (dealing in part with restructuring land mobile for more efficient use) have been completed and the results evaluated. ACTS quoted a recent report by the FCC which stated that for the most part "Land mobile radio service is characterized by transmissions having a low duty factor; there are frequent periods of inactivity when . . . no transmissions are taking place. Transmissions are relatively short and intermittent."

Pointing out that alleged "shortages" in land mobile spectrum are apparently due more to inefficient use and allocation of presently assigned frequencies than a to dearth of space, ACTS stated that the Commission should assure itself that land mobile is being used to the fullest extent before interfering with uhf channels.

Court condemns FCC censorship

The so-called "fairness doctrine" and its implied FCC censorship of broadcast news media has been dealt a severe blow by the U.S. 7th Circuit Appeals Court in Chicago. The Court's unanimous opinion declared unconstitutional any FCC attempt to censor controversial programming.

With this decision, the Court came close to telling FCC that its jurisdiction over stations is limited to technical, financial and ownership regulation. Under the First Amendment's aegis, broadcasters should have the same freedom as printed news media. The decision is now headed for review by the Supreme Court.

Presunrise rules amended

Presunrise rules for a-m stations have been amended by the FCC. The change substitutes "6 A.M. local time" for "6 A.M. local standard time." The amended rule, which became effective Sept. 1, covers about 1400 stations on regional channels, mostly daytimers. Now a reasonably early uniform sign-on time can be maintained throughout the year. Many secondary stations on Class I-B channels also benefit. The FCC emphasized, however, that this sign-on time adjustment will affect only those stations holding supplemental Presunrise Service Authority. It does not change the nonadvanced "sun" times specified in licenses.

NAB convention plans approved

Preliminary plans have been approved for the NAB's 47th annual convention slated for Washington March 23-26, 1969. The meeting, which is to be held at the Shoreham and Sheraton Park Hotels, will place less emphasis on internal industry issues and more on broadcasting's role in national and world affairs.

A reception for Congressmen and other top Washington officials will be held Tuesday, March 25.

Tests urged for modulation monitor

Joint industry/government tests should be run to determine indicator light system viability as an a-m modulation monitor, according to the NAB.

The monitor presently in use relies on a semipeak meter for reading modulation percentages. The new monitor replaces the meter with four indicating lights which glow successively as peak modulation equals or exceeds 25, 50, 85 and 100 percent.

In considering approval of the new monitor, FCC called for comments from interested parties. Most respondents agreed that before an indicator light system can be substituted for the amplitude modulation metering, joint tests should be run to check out the indicating light system's parameters.

8-month network TV billings surpass '67

Businessmen invested 3.4 percent more money in network television during the first eight months of 1968 than in all of 1967, according to TV Bureau of Advertising.

August showed a 1.4-percent decline in investments, due mainly to telecasts of the Republican and Democratic national conventions.

Once again, weekend daytime garnered larger billings with August showing a 35.2-percent increase. This trend can probably be attributed to greater advertising investments in weekend sports programs, says the TvB.

NAB opposes narrowed TV monitor range

The NAB is urging rejection of the proposal to narrow the range of aural frequency monitors for TV.

FCC rules for type-approved equipment now require a 3000-Hertz range above and below assigned center frequency in aural frequency monitors. The Commission is considering an amendment to permit a minimum range of ±2000 Hertz.

Douglas A. Anello, NAB general counsel, believes that such an amendment would present difficulties in determining correct performance of TV transmitters.

FCC rebukes NBC for conflict of interest

Conflict of interest has been cited by the FCC in commentaries by newsman Chet Huntley because of his meat industry affiliation. The Commission cited five broadcasts Mr. Huntley made while he owned

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hurry...time is your enemy!

the catel corporation

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517 marine view avenue, belmont, california 94002

a cattle ranch and was also vice president of a cattle-feeding corporation. Huntley had attacked certain meat inspection requirements, implying that they adversely affected cattle growers.

An FCC letter to NBC has requested the network to submit a statement on this matter within thirty days. The letter also contained a discussion of licensee responsibility for the integrity of news operations.

Outstanding coverage award to WIOD

Award for outstanding coverage of the Economic Opportunity Program, Inc., of Dade County was made to radio station WIOD The award was presented by Dr. H. Franklin Williams, president of EOPI at the October 8 meeting of the agency's board of directors. Newsman Henry Barrow received the award on behalf of the station.

Spot TV billings up; automotive gains

Spot TV billings have advanced 18.1 percent from the second quarter of 1967 to the second quarter of 1968. The automotive industry registered the largest gains during that period both on a dollar and percentage basis: up 58.2 percent, according to the Television Bureau of Advertising.

Nighttime television reflected the largest dollar gain and the largest percentage gain over that one-year period. The 30-second commercial continued to attract most advertiser investments.

Memorex-Technicolor merger approved

Combining magnetic products and equipment with a photographic line, the merger of Memorex Corp. and Technicolor, Inc. into the Memorex Corp. has been approved by both firms' boards of directors.

The merger, when approved by the shareholders of each corporation, will create a diversified company specializing in the user-oriented information handling and image recording media and equipment businesses. The Technicolor photographic products business will be operated as a subsidiary of Memorex under the name Technicolor, Inc.

Reply date for FCC proposal extended

Reply filing time to the proposed multiple-ownership amendments has been extended to Jan. 28, 1969. This extension was granted by the FCC in answer to the NAB's petition.

Supporting its petition, the NAB announced plans for research aimed at developing accurate data on concentration of control media in local markets. Also under study will be opportunities for opinion manipulation by broadcasters in local markets.

CCTV equipment sales edge up in 1968

U.S. factory sales of closed-circuit TV and supporting equipment increased by 3.3 percent in the first half of 1968, according to the Electronic Industries Association. Approximately $12.4 million worth of CCTV and supporting equipment were sold during the first six months of the year compared to $12 million in sales during the same period in 1967.

Video monitors showed the largest percentage gain, rising by 15.6 percent to reach $2.8 million during the first six months of 1968.

Sales of supporting equipment climbed 13.1 percent to reach $3.8 million, while camera sales declined by 6.7 percent during the same period.

WBDO to install butterfly antenna

The first installation of RCA's new "butterfly" broadcast antenna is slated for WBDO-TV, Orlando, Florida. The antenna will be mounted on a 1484-foot tower and is expected to increase the station's Grade B coverage by 24 percent.

The six-bay panel antenna gets its name from the wing-like radiating elements that are placed backwards towards the reflectors for optimum impedance and radiation characteristics.

Advantages of this antenna include its ability to permit operation of an elevator inside the tower to facilitate inspection, servicing and changing tower lights. The new antenna can also be field modified for omnidirectional service should the station's needs change.

MM-Transam. proposal has 4th net potential

On October 10, John R. Beckett, president and chief executive officer of Transamerica Corporation and John W. Kluge, chairman of the Board and president of Metromedia, Inc. announced the approval in principle of a merger of the two companies.

While Messrs. Beckett and Kluge will not presently admit that they are planning a fourth full-time network with all the trimmings, they do say "that the joint resources of both organizations could provide Metromedia the capability for an alternative program service for television stations lacking network affiliations."

The resources referred to in the statement amount a combined net worth of about $700-million.

The merger agreement calls for Transamerica to exchange ¾ share of its common stock for each outstanding share of Metromedia common. Transamerica proposed a 2-for-1 stock split the day before the merger announcement, subject to stockholder approval. If approved, the exchange would become 1½ shares of Transamerica stock for each share of Metromedia.

Beckett and Kluge hope to avoid the fate of the ABC-ITT merger by attempting to convince the FCC and the Justice Dept. that competition will be stimulated, rather that stifled by the merger.

Transamerica is a San Francisco based corporation. Its holdings are in the fields of insurance, finance, real estate, air transportation—and somewhat out of step with the merger, entertainment services.

The entertainment services interests of Transamerica, represented by United Artists Corporation, is in apparent competition with Metromedia's Music Group —Metromedia Music and Metromedia Records. Mr. Kluge stated, however, that UA and the Metromedia Music Group would, at least for the foreseeable future, operate independently.

Mr. Kluge, who will become a director of the Transamerica Corporation and continue as chairman, president and chief executive officer of Metromedia, stated that discussions had been in progress four or five years.

Meredith acquires WNEM-TV

Meredith Corporation has purchased from Gerity Broadcasting Co. the assets of WNEM-TV, serving the Flint, Saginaw and Bay City, Mich. areas.

Announcement of the purchase, subject to FCC approval, was made October 9 by Darwin Tucker, Meredith president and chief executive officer, and James Gerity, Jr., president of Gerity Broadcasting.

FCC ACTIONS

Application reinstatement has been made to Apple Valley Broadcasting, Inc., for a new TV station to operate on channel 35 at Yakima, Washington. Application had been blocked initially by Cascade Broadcasting Co. (KIMA-TV, channel 23, Yakima), which had petitioned for review of the Board's action. The new TV channel is a joint venture, and action has been blocked pending hearings on the merger. Result: green light for channel 35.

Irresponsible contest advertising by NBC affiliate WKYC a-m and fm, Cleveland, Ohio, has been cited by the Commission in a letter to NBC in New York. The contest, called a "Million-Dollar game" in station advertising, was in fact statistically rigged. The FCC stated, "Although these statements are not technically false, they were deceptive and misleading, since the chances against WKYC's awarding $1,000,000 in prize money, or any sum near that size, were extremely remote." Actual cash outlay in the contest: one winner at $1,000.

WSUR-TV, Ponce, Puerto Rico, has received permission to change its facilities and use a directional antenna system with maximum lobe visual ERP of 57.5 kw. WSUR-TV's antenna is 2270 feet above the ground, and this change will prevent increase of common Grade B overlap with WKBM-TV, Caguas, Puerto Rico.

Radio station KDKO's request for expedited consideration of its application tendered June 19, 1968, has been "favorably considered." A dam soon to be built will flood the present KDKO property. The tendered application requests increase in nighttime power of the station from 1 kW to 5 kW on 1510 kHz, and change in daytime radiation pattern at a site 1.4 miles east of its present location. The station is now operating unlimited time on 1510 kHz with power of one kilowatt, directionalized.

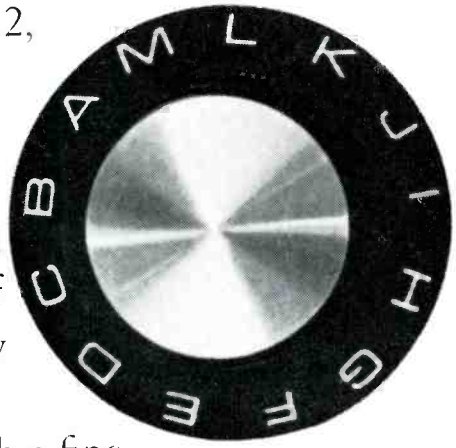
The Greater Toledo Educational TV Foundation, Inc. has been granted permission to change the facilities of its educational station WGTE-TV. Section 73.685 (e) was waived. The Foundation plans to operate with a directional antenna system and maximum lobe visual effective radiated power of 1170 kilowatts. Operations will be moved to a site approximately 5.5 miles east of Toledo.

Anti-CATV petition by KAKE-TV, Garden City, Kansas, has been denied. The petition called for a review of an application grant given to Mountain Microwave Corp. permitting the CATV operator to import Denver signals into Dodge City via microwave. FCC did modify the grant to say it will be automatically cancelled if the Commission prevents importation of Denver signals to Dodge City after notice is given that service is to begin.

Request of Voice of Dixie, Inc. for waiver of Section 73.207(a) has been granted. Application for a construction permit for a new Class C fm broadcast station in Birmingham, Ala. was also accepted. Voice of Dixie plans to broadcast on fm channel 258. A rules waiver was needed because the new station is about four miles short of the 150-mile spacing required by the Rules.

You can count on us. Up to 25.

That's our T.P.I. Gamut 25 channel converter. Part of a fine line of converters for CATV, CCTV and ETV that you used to know as the ITC Focus 12, Plus 13 and Gamut 25 converters.

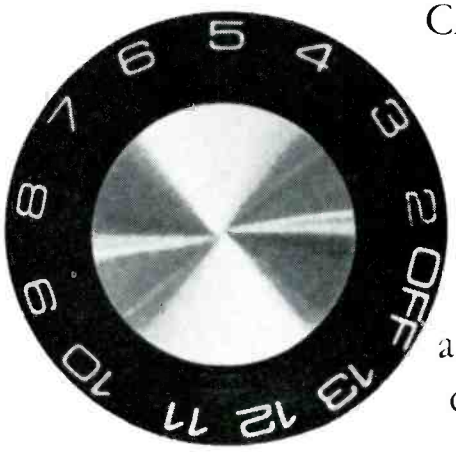


Each and every one of them is now better than ever . . . with a fine tuning control. And, with an award winning design appeal.

We're giving you someone to turn to, also. About on-time delivery, dependability, anything that might affect our product's performance. And your subscribers' satisfaction.

We believe our converters are the best ghost breakers, and the most versatile means of adding new channels of telecasting in the business. They're made to our patent specifications by the Oak Manufacturing Co., the best producers of tuners in the business.

CATV and the best interests of CATV is our particular specialty. Starting with the automated, all-electronic cablecasting service that pays for itself — Alphamatic News. Going on to the full Gamut 25 channel converter.



Start counting on us now. Use this phone number (212) 421-9665 to call us collect. Or, write us, today:

Television Presentations, Inc., Dept.
375 Park Avenue, New York, New York

- ☐ Send literature about TPI converters.
- ☐ Send me information about Alphamatic News cablecasting.
- ☐ I want to know more about both.

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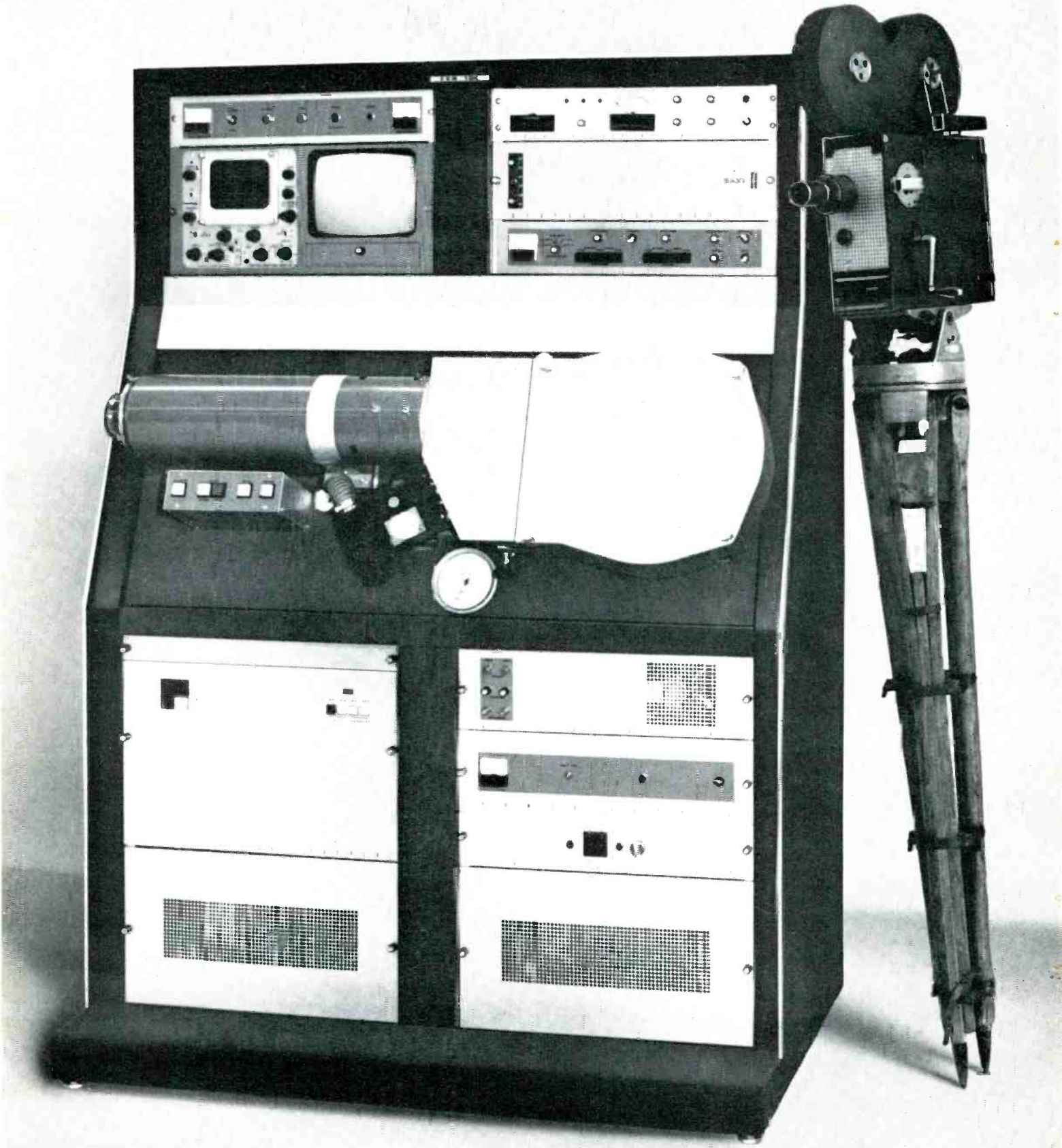
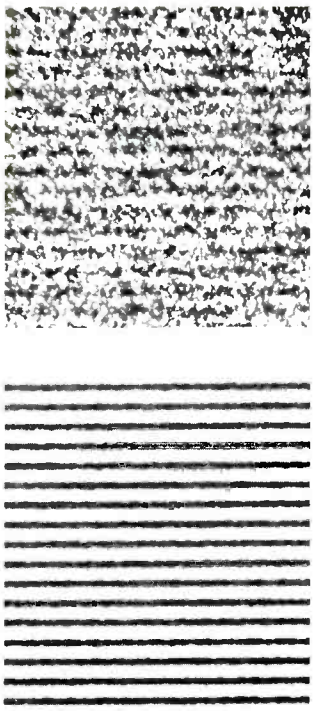


GOOD-BYE KINE
HELLO EBR-100



Television raster lines (right) enlarged from 16mm film frames. Lower: EBR-100 recording on 3M fine-grain (less than 0.1 micron) electron recording film. Top: kinescope recording on television recording film. Line-to-line spacing in both pictures is approximately 0.00058 inches or 14.7 microns.

TRANSFER LIVE OR TAPE TV TO 16 MM FILM ELECTRONICALLY AND GET PRINTS WITH 1000-LINE RESOLUTION.

3M's new Electron Beam Recorder is the first system to produce 16mm monochrome film copies comparable to the original live or video tape signal. It has no optical system. It employs direct electron bombardment from subject to film without face-plate halation of camera-lens light losses.

In most applications the EBR-100 far surpasses the conventional kinescope in reproduction quality. Since it costs no more than the conventional kine, it opens new horizons for TV taping and mass film distribution for educational and training use.

The EBR-100 is a machine that every major TV studio, dubbing center, film lab and government communications center will want to employ. Easy to install, completely self-contained.

You can choose between a positive or a negative film print with the flick of a switch. The EBR-100 is switchable from 525 line 60 field/s at 24 frames/s, to 625 line 50 field/s at 25 frames/s.

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INTERPRETING THE FCC RULES & REGULATIONS

The broadcaster's responsibility to ascertain community needs reemphasized

SINCE ITS 1960 TREATISE ON PROGRAMMING (Report and Statement of Policy re: Commission En Banc Program Inquiry, 20RR 1902) and its 1965 issuance of the program form (Parts IV-A and IV-B of the renewal, transfer and construction permit forms), the Commission has demonstrated an increasing interest in the licensees' efforts to seek out and meet the programming needs. On August 22, 1968, the Commission again manifested its concern in a Public Notice (FCC 68-847) captioned "Ascertainment of Community Needs by Broadcast Applicants." Therein, the Commission observed that broadcast applicants (for new licenses, renewals, transfers and assignments) frequently tender deficient showings in these areas.

The Commission restated its 1968 holding *(in Andy Valley Broadcasting,* FCC 68-290) that:

> A Survey of community needs is mandatory and that Applicants, despite long residence in the area, may no longer be considered *ipso facto,* familiar with the programming needs of the community.

Apparently, numerous broadcast applicants fail to follow the edicts of the 1960 treatise on programming, the prolific case precedent, and/or, more saliently, do not respond fully to Parts IV-A and/or IV-B of the FCC forms.

In its determination to force broadcast applicants to provide this data, in its 1968 *Minshall Broadcasting* case (11 FCC 2d 796), the Commission articulated the four elements necessary to respond to Part I of the "new" (1965) Section IV-A and IV-B:

(a) Full information on the steps taken to ascertain community needs;
(b) Program suggestions received from listeners;
(c) Applicant's evaluation of suggestions; and,
(d) Programming to be offered in direct response to those needs.

Numerous broadcasters have charged that (1) the Commission is attempting, and has practically accomplished, a "back-door" entry into control of their program content and (2) promulgation of the aforementioned notice further undermines their basic rights of free speech. It appears that the 1960 Program Inquiry, the 1965 issuance of new program forms (Parts IV-A and IV-B), and the August 1968 Public Notice all portray an inexorable trend towards ultimate governmental control of programming. In any event, it is important that all licensees understand (1) their responsibilities and (2) analyze the Commission's requirements as to broadcaster's programming.

This section, providing broad interpretation of FCC rules and policies, does not substitute for competent legal counsel. Legal advice on any given problem is predicated on the particular facts of each case. Therefore, when specific problems arise, you would be well advised to consult your own legal counsel.

Analysis of the Commission's reemphasized programming goals

The Commission's August 1968 reemphasis of the importance of ascertaining community needs should not be taken lightly. For years, the Commission has gradually intensified its interest in this area and augmented its determination that licensees will comply. To wit, the foundation of the American system of broadcasting was laid in the Radio Act of 1927; therein, Congress placed the basic responsibility for all matter broadcast in the hands of the station licensees. That obligation was carried forward to the Communications Act of 1934, and remains unaltered and undivided.

In the sense that his license to operate his station imposes upon him a nondelegable duty to serve the public interest in his community, the licensee is, in effect, a "trustee."

In the 1960 programming treatise, the Commission stated that it had a statutory responsibility to review and pass upon a licensee's program proposals. Section 307(b) of the Communications Act requires the Commission to "make" such distribution of licenses . . . among the several States and communities to provide a fair, efficient and equitable distribution of radio service to each of the same. Under this section, the Commission has consistently licensed stations with the end objective of either providing new or additional programming service *to* a community, area or state, or of providing an additional "outlet" for broadcasting *from* a community, area or

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state. Implicit in the former alternative is increased radio reception; implicit in the latter alternative is increased radio transmission and, in this connection, appropriate attention to local live programming is required.

Formerly, by reason of administrative policy, and, since September 14, 1959, by necessary implication from the amended language of Section 315 of the Communications Act, the Commission has had the responsibility for determining whether licensees "afford reasonable opportunity for the discussion of conflicting views on issues of public importance."

Prior to 1960, this meant a review, usually in terms of filed complaints, in connection with the applications made each three year period for renewal of station licenses. However, that was a practice largely traceable to workload necessities, and was not limited by law. Today, the Commission examines renewals in depth—with or without complaints.

The confines of the licensee's duty are set by the general standard "the public interest, convenience or necessity." The initial and principal execution of that standard, in terms of the area he is licensed to serve, is the obligation of the licensee. The principal ingredient of such obligation consists of a diligent, positive and continuing effort by the licensee to discover and fulfill the tastes, needs and desires of his service area. If he has accomplished this, he has met his public responsibilities.*

Major elements to meet local needs

The major elements usually necessary to meet the public interest, needs and desires of the community include: (1) opportunity for local self-expression, (2) the development and use of local talent, (3) programs for children, (4) religious programs, (5) educational programs, (6) public affairs programs, (7) editorialization by licensees, (8) political broadcasts, (9) agricultural programs, (10) news programs, (11) weather and market reports, (12) sports programs, (13) service to minority groups, and (14) entertainment programming. While the Commission does not

*Historically, it is interesting to note that in its review of station performance, the Federal Radio Commission sought to extract the general principles of broadcast service which should (1) guide the licensee in his determination of the public interest and (2) in evaluating the licensee's discharge of his public duty. The Commission attempted no precise definition of the components of the public interest; it left the discernment of its limit to the practical operation of broadcast regulation. It required existing stations to report the types of service which had been provided and called on the public to express its views and preferences as to programs and other broadcast services. It sought (1) information from as many sources as were available in its quest of a fair and equitable basis for the selection of those who might wish to become licensees and (2) the supervision of those who already engaged in broadcasting.

The spirit in which the Radio Commission approached its unprecedented task was to seek to chart a course between (1) the need of arriving at a workable concept of public interest in station operation, and (2) the prohibition laid on it by the First Amendment to the Constitution of the United States and by Congress in Section 29 of the Federal Radio Act against standards or guidelines which evolved from that process were adopted by the Commission and have remained as the basis for evaluation of broadcast service. They have mainly been incorporated into various codes and manuals of network and station operation. The Commission emphasized that these standards or guidelines in no sense constitute a rigid mold for station performance, nor are they considered as a Commission formula for broadcast service in the public interest. Rather, they should be considered as indicia of the types and areas of service which, on the basis of experience, have usually been accepted by the broadcasters as more or less included in the practical definition of community needs and interests.

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intend these elements as all-embracing or constant, nor does it claim to dictate the amount that licensees shall carry of each, the Commission has felt for years that licensees generally don't do an adequate job of meeting the local needs. As a result, the Commission has become more determined each year to force the licensee to ascertain community needs. Even the responses to the new program form have not proved, to the Commission's satisfaction, that licensees generally seek out and meet community needs—particularly as to local programming. The August 28th notice is further evidence of that concern.

Failure to provide enough detail may result in hearing

The Communications Act provides that the Commission may grant construction permits and station licenses, or modifications or renewals thereof, only "upon written application" setting forth the information required by the Act and the Commission's Rules and Regulations. If, upon examination of any such application, the Commission shall find the public interest, convenience and necessity would be served by the granting thereof, it shall grant said application. If it does not so find, it shall so advise the applicant and other known parties in interest of all objections to the application, and the applicant shall then be given an opportunity to supply additional information. If the Commission cannot then make the necessary finding, the application is designated for hearing, and the applicant bears the burden of providing proof of the public interest. It is not inconceivable that, in the future, hearings may be ordered on the renewal questions concerning the sufficiency of program surveys.

The amount of necessary program survey data

The Commission desires documented program submissions prepared as the result of assiduous planning and consultation covering two main areas: first, a canvass of the listening public (who will receive the signal) and second, consultation with leaders in communty life. As to the latter, while the Commission's August 28th Notice does not define the degree of specificity required, it appears to expect renewal applications to (1) give the names and addresses of those personally contacted or surveyed and (2) list a respectable number of contracts. The desired number would vary with the size and affluence of the licensee; the number required can best be ascertained by consultation with your attorney.

To date, the Commission has applied an "even hand" on the tenuous dividing line that runs between its licensing responsibilities and the broadcasters' constitutional right to free speech. So long as the licensee can show reasonable effort to ascertain his local community's and service area's tastes, needs and desires, he will fulfill his obligations to the public and, hence, meet the Commission's requirements. Nevertheless, in light of the Commission's August 28th Notice, all licensees would be well advised to take another look at their policies regarding program surveys and consider possible expansions thereof. Consultation with appropriate attorneys is recommended. **BM/E**

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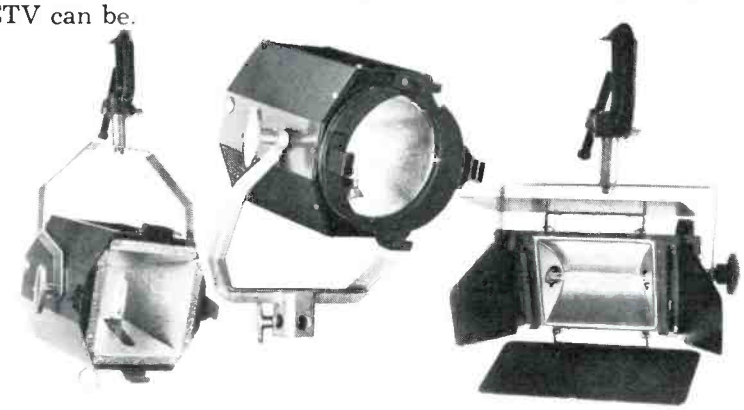

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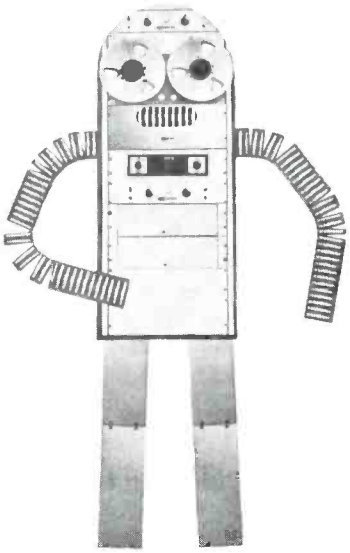

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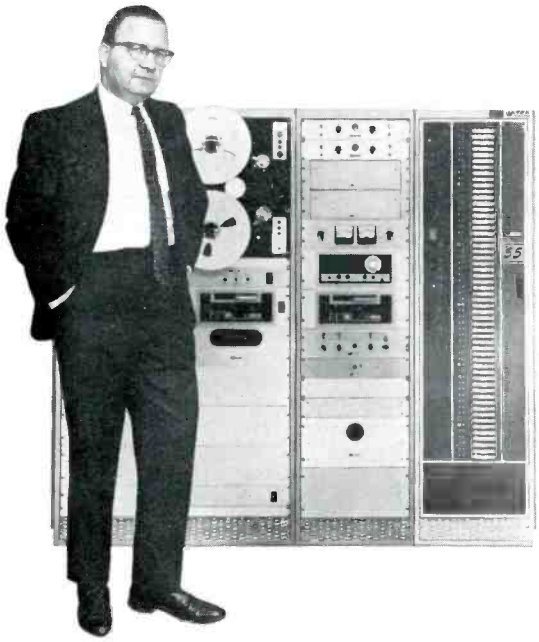

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BRIGHT, 9" VIEWFINDER with built-in, extendable hood for outdoor operation; VAROTAL XX, 10:1 ZOOM LENS with local or remote servo-driven iris; 3-STEP GAMMA CORRECTION (0.5, 0.65, 1.0) for natural gray scale rendition in any light level; FULL SHADING CORRECTION for complete compensation of color-shading effects; BUILT-IN FILTER WHEEL, operable from camera exterior, provides selection of neutral density and/or color correction filters; NEGATIVE REGISTRATION FEATURE allows sensitive, accurate and rapid color image alignment on viewfinder monitor; RGB SEQUENCER OPTION for convenient signal amplitude adjustment via waveform monitor display.

Other IVC-200 features include: totally solid-state design with low-noise FET preamps (3 special vidicons and viewfinder CRT are ONLY tubes in camera); compatibility with popular image enhancers; high-visibility camera tally light; multiple outputs for picture and waveform monitors.

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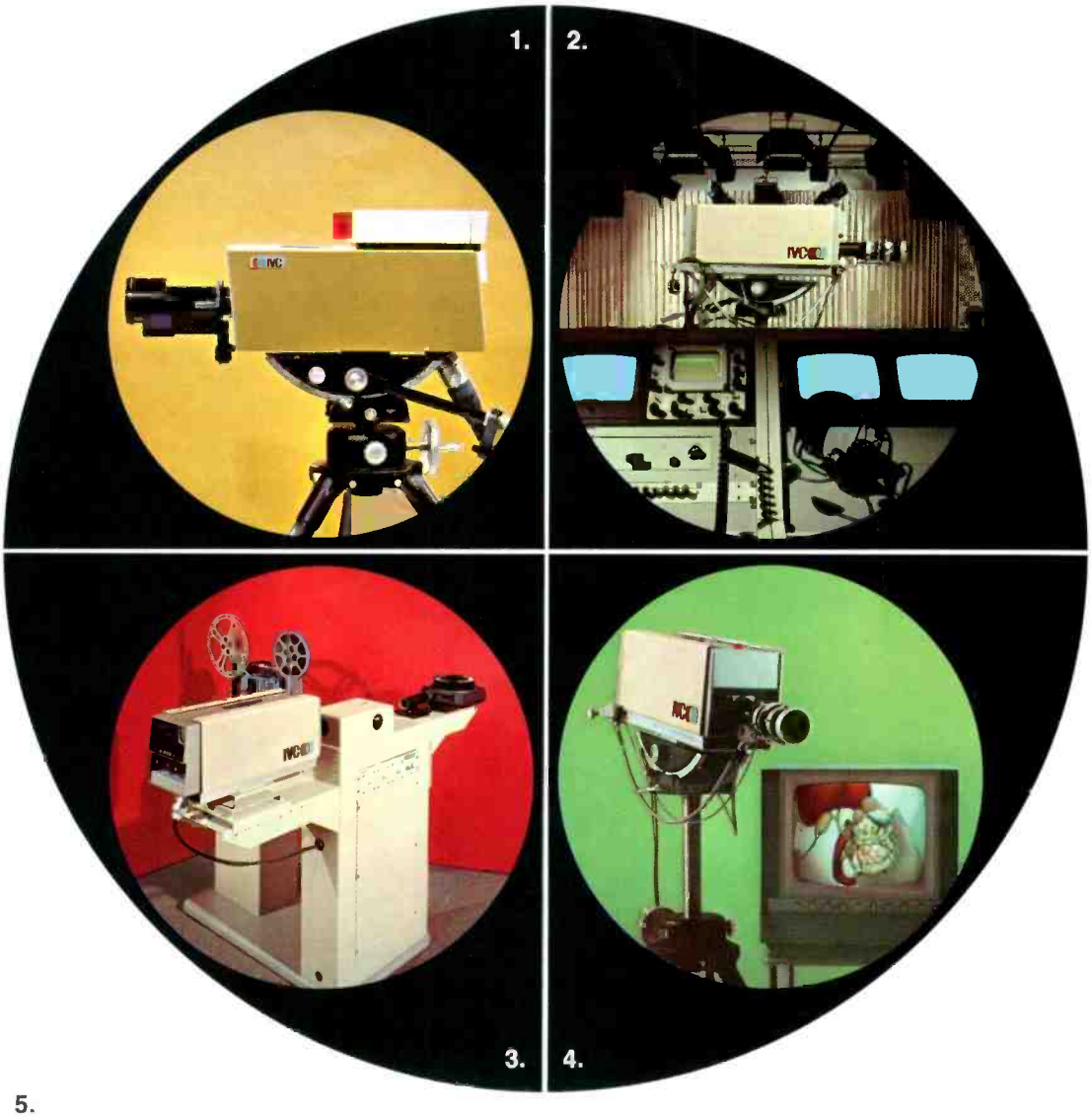

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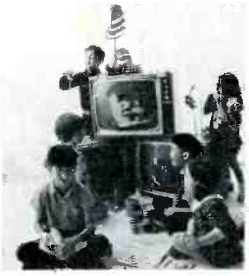


Anomaly in Boston: The Prodigy Called WGBH

Working for the only station in the country to garner both an Oscar and an Emmy, WGBH's youthful staff races pell-mell through a world peopled by experimentation, innovation, high esprit, near-recklessness, and a level of professionalism that's second to none.

AMONG THE BEST-EQUIPPED ETV stations in the country, WGBH/WGBX in Boston is the hub of an ever-expanding educational forum. Many network programs originate here, and the station's directors are constantly seeking new ways to get the message across—constantly experimenting with unusually daring and provocative techniques.

Two guys and a gal form lighting crew, setting up studio for taping session. Gal is summer help, in blue jeans.

Public programming is geared to capture and hold audience interest in far-reaching public affairs programs. Audience response is encouraged and is usually encouraging. For WGBH presents programs with a special kind of flair that not only puts it at the forefront of ETV stations, but is the envy of many commercial broadcasters.

Humor Mixes Well

The high humor (some insist high-handedness) and élan that pervades backstage is perpetuated by the youth of station personnel. The staff of 175 full-time employees is augmented by many part-timers and other student help. College kids are in and out of studios, control rooms, set storage and a very informal vending-machine-fed cafeteria. The young set is everywhere, underfoot, overhead, attired in blue jeans, miniskirts, long hair, beards, bangles and just about anything else that's stylish on campus.

Typical of some of the station's antics: when a Boston commercial station announced (with lots of fanfare) that it was going color—the first in Boston at the time—someone at WGBH took this as a direct challenge. One day before the scheduled color startup, WGBH very discreetly and quietly aired a color slide, taking the wind out of a few sails.

Massive Technical Capabilities

The color slide was no fluke; WGBH had been planning for color for some time. Today it has an impressive equipment lineup that outdistances the gear in many commercial TV stations. Cameras include 10 RCA monos and 6 Marconi colors. The ground-floor equipment "cavern" houses some 4 mono VTRs and another 4 color recorders and 3 film/slide chains. The transmitting plant has an impressive brace of RCA and Marconi gear, belting out 50 kW visual and 5 kW aural on channel 2 and a hefty 371 kW maximum visual and 74.1 kW max. aural on channel 44—this from an antenna system that soars 1195 feet above the ground.

All of this equipment lends itself very readily

← Circle 20 on Reader Service Card

Master control for two TV channels is a hodgepodge of added-on gear and can select any source for either channel.

to a variety of professional-caliber programming. But the technical expertise doesn't end there. WGBH finds itself very often acting as a production house, turning out tapes and films for educational institutions—programs which may end up at a duplicating house for ultimate distribution all over the country.

The station's present facilities are so extensive that it can feed network programming to the Eastern Educational Net 24 hours a day. It can also act as the originating or feed point for various live, coast-to-coast NET programs and numerous PBL coast-to-coast hookups.

In addition to its production for channels 2 and 44 and the fm outlet, WGBH produces motion-picture films, research documents for the government and a gargantuan amount of network programming. The Boston station was the first ETV outlet in the country to go color, and its technical staff is constantly upgrading mono equipment for color work. Of the station's 9 VTRs, 3 are Ampex VR-2000's, one is an Ampex 1200, one "old" 1000 which has been updated to high band, two old RCA's, one old Ampex 1000-1 sitting idle, one Ampex 1000-C which has been converted to 7½ ips. The high-bands are used for most production work.

Gargantuan Mobile Van

The station's new 40-foot mobile unit contains some of the most sophisticated switching and backup equipment on wheels. The van itself is enormous, and is in frequent use. It will hold four color cameras (pirated from the studio for the purpose) or four monochrome cameras, instead of two of the color chains.

Operating from the country's largest ETV station, WGBH's production people have their hands in a lot of pies. The station's education division (with a 30-man staff) handles all instructional TV for the area, working in conjunction with elementary and secondary schools and on up through university graduate level. The station has been doing engineering consulting work in TV for: MIT's Center for Advanced Engineering Studies, for the University of Massachusetts' new medical school and the new Christian Science Church complex being developed in Boston. A WGBH-designed system at Harvard links 28 classroom buildings and is switched through the station's master control.

Computer Center on TV

"One of those 28 buildings is a computer center," explains station operations manager Jack Caldwell. "The hardware's working and now we're developing the best uses for the system." Caldwell says that "It's possible to carry six simultaneous television programs from any building to any other building in the system—all at the same time." WGBH is discussing similar work with MIT and with hospitals and medical schools.

The Boston station's production facilities have also done work on government contracts. These have included such subjects as neurosurgery—designed to alleviate the crush of time on resident

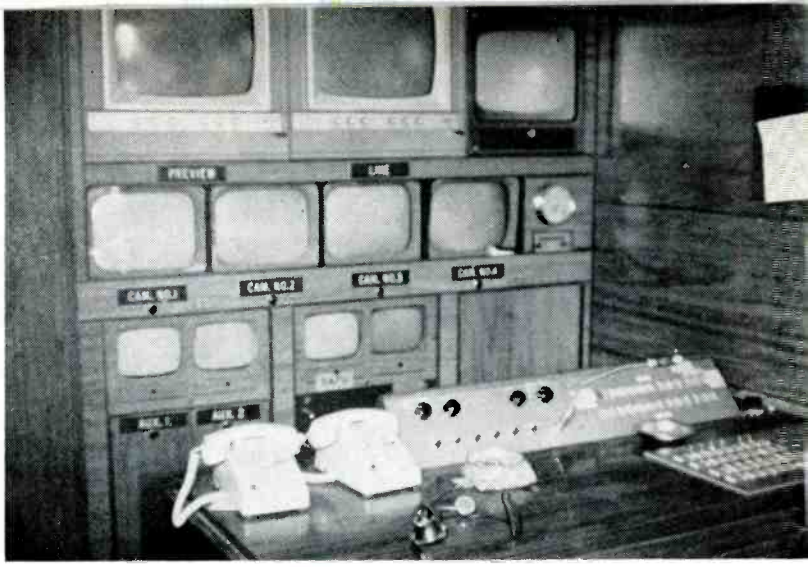
physicians. Says Caldwell, "Residents in neurosurgery spend up to 50 percent of their waking hours commuting—driving from one hospital to another, parking, running from one part of the hospital to another—fully half their time spent moving somewhere. What we determined was the feasibility of conducting neurosurgery seminars without requiring doctors to leave their resident hospitals. Research in this area is still going on.

"Another area is what we call 'Telediagnosis.' Here, we're trying to find out if we can have a doctor diagnose a patient who's physically separated from the physician by a distance of some miles." Telediagnosis has already racked up some impressive results, using a closed-circuit TV link between the patient treatment point (the first-aid room at Logan Airport, for example) and the doctor's office in a major hospital. This method relies on the presence of a qualified nurse at the treatment point, but it allows a busy physician to diagnose and prescribe treatment—making "house calls" by TV—without ever leaving his office. So far, the results have been very encouraging, and the technique has won a high degree of patient acceptance.

Sailors kept isolated from society during 3-month cruises on Polaris submarines can take college-level courses via videotape and kinescope recordings—all produced by WBGH. "When the submarine surfaces at the end of the semester," says Caldwell, "the students transfer to an aircraft carrier where a Harvard professor gives the final examination. We fly the professor out to the carrier for the exam."

Simulcasts Add Dimension

This past summer, WGBH remote crews winged live concerts of the Boston Symphony Orchestra from Tanglewood, along with an fm-stereo simulcast for a double treat. Viewers had the option of watching the concert and listening to high-quality stereo audio on their fm equipment. Telco provided two 15-kHz lines from Tanglewood to Boston for the audio, which was matrixed at the studio. Video was carried in color.



Production control in new mobile van can accommodate 4 color cameras or 4 monos or a combination of both.

A WGBH version of "stereo video" uses the station's two TV channels to transmit two different but associated programs. One such program, featuring dancer Gus Solomons, is all on videotape that's been edited specifically for this special medium. The viewer uses two TV receivers—one tuned to each of the broadcaster's two channels. The tapes for the two channels are exactly synchronized, and the viewer will see Gus walk out of one screen and into the other. As Caldwell describes it, "One picture will counterpoint the other. We may also feed the sound on stereo fm, along with the stereo effect of the TV speakers, for a total of four channels of audio. This is way ahead of what the average viewer can or is willing to set up in his home. We may have only a few viewers properly set up for this."

Another trick possible with this setup, according to production services director Al Potter, is to have the dancer shake hands with himself. He can hand himself something (from one screen to the other), while at other times the two screens simply act as a cinerama-like setup. At times, there would be two entirely different pictures that form a kind of counterpoint to each other.

Newest of the Nets

The Eastern Educational Network, which started out as simply a tape exchange operation, is now a live, interconnected system. It's in full duplex operation from Washington, D.C. to Philadelphia, to New York City to Boston. Its duplex nature permits transmission in both directions at the same time. A full-duplex "spur" connects New York City to the New York State system—a state-owned network that stretches from New York to Albany, Schenectady, and on to Syracuse and Buffalo. The state's network operations control center is in Albany. This system makes it possible for a program originating in Buffalo to be received in Boston or even Washington.

A one-way circuit connects Boston with all state stations in New Hampshire, Vermont and Maine. These stations don't send; they just receive whatever is sent to them on the network from any originating point in the system. All the network relays are via telco microwave.

Some programs are taped at the recipient station for delayed rebroadcast, while others are carried live in traditional network-type operation. Live shows have included recent tennis matches and the evening news program originating in New York.

The network also makes possible some unusual experimental programs. Recent network-wide war-games had active participants all over the net. The UN-like session featured ambassadors reporting back to central headquarters, with classroom students acting as the constituency. Classroom students in Buffalo would affect classrooms in Syracuse and Boston—all live and on the air. This experiment sparked a very interesting public affairs program in many of the affiliated school systems.

Big Rich Kids

Funding is a major problem for WGBH, but for an ETV station, the plant on Western Avenue is exceptionally well-financed. The annual operating budget was $3.6 millions last year.

"I think the reason we have the money that we do is because we do good work, we're leaders, and when people want a quality product turned out, they turn to Boston," says Caldwell. Principal income sources are dues from member institutions (Lowell Institute Cooperative Broadcasting Council), public contributions, special grants for program production. Commercial TV stations help out with promotional announcements and a partial contribution of antenna space on WBZ-TV's sky-scraping transmitting tower.

Zany Auction

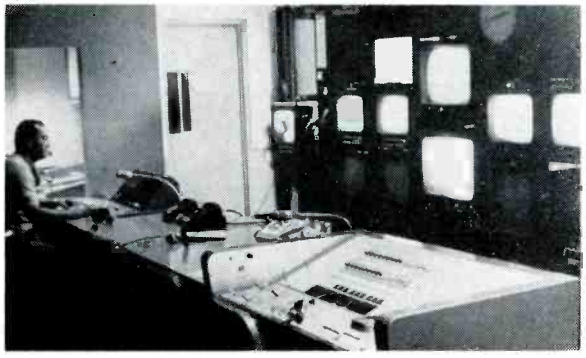
Probably the zaniest element in the Boston station's fund-raising mystique is its annual auction. All scheduled public programming shuts down for six days while the station stages a marathon telethon auction. Past auctioneers have included airline presidents and board chairmen of some of New England's biggest industrial firms. At last year's auction, participants even included economist John Kenneth Galbraith and the bearded Schweppes man, Commander Whitehead.

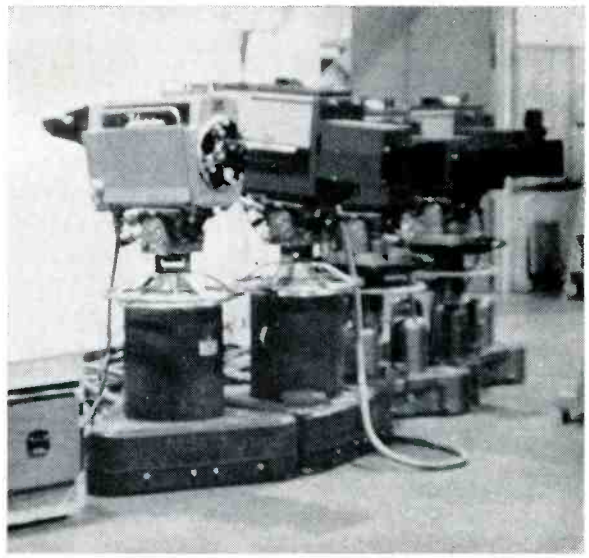
Articles to be auctioned are contributed, and have included trips to Hawaii, TV sets, Governor Volpe's tie clasp, a ceramic leopard, and hundreds of other equally varied fare. Many firms contribute special services to the station for the auction; one company donated warehouse space to store the goodies last time around; another shelled out $1000 toward the auction's massive phone bill. Add to this the fact that such contributions (and purchases) are tax deductable, and you have a formula for raising nearly a quarter of a million dollars in a week's frenzied time.

Experimental Channel

The station's second outlet, uhf channel 44, is still not completely on its own as a separate entity. "Channel 44 is a special-purpose channel," says Al Potter, "and it's in the process of building a program schedule. We were simulcasting a lot of channel 2's programs, especially during the summer. Now we're up to seven hours a day on channel 44." Channel 2 and 44 can be switched simultaneously, in or out of lock or completely separately. WGBH expects to semi-automate some of its switching functions at some point in the near future.

Typical production control is one of three identical such systems for the station's major studios.





Lined up in military formation are one old mono camera and three new Marconi color systems with zoom lenses.

Proud Technical Achievement

Quality workmanship is evident in all segments of Boston's ETV station. Most of the equipment has been installed by station technical personnel. Proudest of these achievements has been the complete installation of new Marconi transmitting equipment for both channels 2 and 44. The cooling system plumbing alone prompted technicians to learn a few new skills, including silver soldering.

WGBH proudly points out that it is the only TV station in the country, educational or commercial, to hold both a TV Emmy and an Oscar. The Oscar was for a film documentary, "Robert Frost—A Lover's Quarrel with the World." The Emmy was for Julia Child's cookery series. Julia's effervescent personality smooths over on-camera disasters with earthy witticisms.

Julia Child is one of several out-of-the-ordinary personalities who appear regularly on WGBH. Horticulturist Thalassa Cruso, who thinks nothing of bashing a crawly slug (in front of the camera) that happens to poke its head out of a flowerpot, holds forth on a twice-weekly program of gardening hints.

Audience response is gratifying. Mail pours in at astonishing rates—much of it addressed to specific TV personalities. And this audience involvement is bound to mushroom as WGBH tries more experimental and earthy programs. Whether it's an insect being bashed by a flowerpot or a modern dancer shaking hands with himself, if it's innovative, chances are it'll be seen first on WGBH, the *wunderkind* of ETV. **BM/E**

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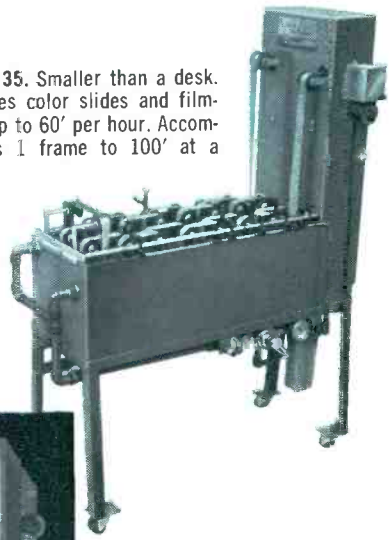

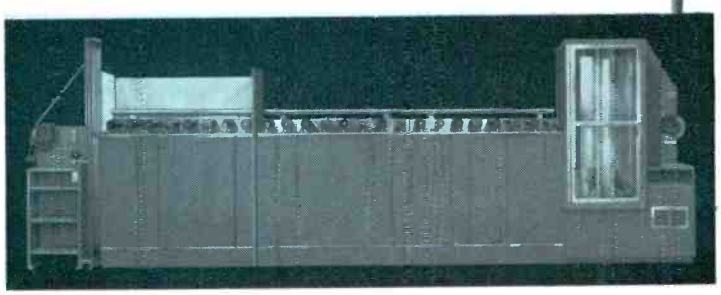

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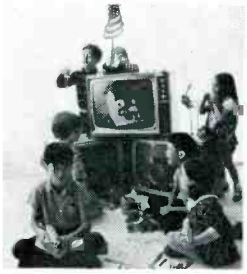
1968-1969: Instructional TV

Survey: BM/E set out to find examples of maximum use of instructional TV. Result: unmistakable conclusion is that a lot of instructional TV is by and for teachers. Students are benefiting, however.



EDUCATIONAL TV, in contradistinction to instructional TV, has long since been written off as for adults, not kids. As Father John Culkin puts it, "Producers and performers in educational TV are only interested in prime-time and praise from their peers. They could care less about what some eight-year-old critic thinks of them."

If the classroom is to be more than just a boring interruption in the real learning* of a youngster, then instructional TV has a big job to do. Right now the teacher controls what goes on in the classroom.

TV (and media other than chalk board and book) is coming, but slowly. Only after the teacher is converted to use multimedia can television and the full use of visuals begin to supplement the talking lecture. Only when the teacher sees herself as a director of learning, rather than the fount of learning, can learning catch up with 20th century communications.

The 19th century concept of a bell-oriented building of classrooms occupied by a teacher who takes 20-30 pupils through a curriculum lock-step is obsolete, though not dead.

There are those who are impatient to move ahead with the mid-20th century concept of individualized instruction. This vision sees the classroom giving way to an electronic study carrel connected to a library resource center rich with film and videotapes made by specialists. The general classroom teacher becomes an education counselor or director.

Envisioned, now, is a resource center containing a computer that is programmed to display increments of instruction and to feed back positive reinforcement for right answers. The computer will engage in a two-way conversation with the student.

But this modern concept, however attractive it may look to the layman, represents change which is difficult to cope with in today's learning institutions. Schools, basically, aren't research-oriented, or change-oriented. What progress ITV makes, therefore, will come from teachers who learn or decide for themselves that a lesson organized, rehearsed and edited for TV presentation can be better than a live performance delivered in classrooms largely devoid of effective communication aids. Such recognition or acceptance is painful to make.

Blake L. Reed, instructional media production director, Thorton Township High School, Harvey, Illinois, points out that a 30-minute videotape presentation takes over 40 hours of teacher preparation plus 16 hours of time for a graphics artist. Such an effort calls for dedication, possibly some "ham" in one's blood, and positive encouragement from the administration in the form of release time or salary advancement credits.

That ITV will come slowly is a conclusion drawn from a *BM/E* survey of thirty-odd schools and colleges. We sought comments on:

1. Integration of TV into curriculum when TV was the most logical medium, i.e. application of TV as the principal medium for a learning task as opposed to a supplemental or enrichment resource.

*School as an interruption is a McLuhanism. **Laugh-In** recently philoso-quipped the concept another way: "I'm for bussing. I learn more facts of life in a school bus than in class."

Impact of Instructional Technology

Excerpted from talk by George L. Hall, Associate Director, R&D, NAEB, delivered at Production '69

The application of technology to the teaching/learning process within the next half decade will cause a significant emphasis shift in the roles taken by teachers. Individual direction and learning management will largely replace "talking-presentation" as the primary activities of the classroom teacher. At the same time most schools and colleges will have staffs of competent paraprofessionals assigned to relieve teachers of burdensome clerical, proctoring and media-operation duties.

One effect of all these changes will probably be a fortunate reversal of the current drift by teachers into a narrow, craft-level "guildism," which has thus far tended to block the technological takeoff under the fallacious presumption than an individual teacher in a self-contained classroom should be the basic unit of all educational operations at all levels.

There is no question but that the so-called media field will be professionally upgraded to enable those in it to assume a variety of different roles. Some persons in the field will undertake to become "learning systems" designers, supervising psychometrists and systems managers. These will constitute some of the highest professional positions in the whole educational realm.

Other persons in the area of media specialization will undertake somewhat less sophisticated —but nonetheless consequential—roles as producers, storage-and-retrieval specialists, transmission planners and the like. Of course, there will also have to be a large number of media paraprofessionals to facilitate an increased output of television programs, printed support materials and the like.

is for the 'teach,' not kids.

2. More effective use of teachers as a result of using TV.
3. Maximum use of TV equipment for minimum dollars.
4. Use of TV either to (a) improve instruction, or (b) reduce pupil cost per hour.

Direct answers reveal that:

- Rarely is TV considered the principal medium. In fact, it is anathema to refer to it as such. If teachers are to accept TV, it is as an "enrichment" or "supplemental" device—never a replacement.
- Teachers do become more effective either as a result of seeing themselves on TV when they do a program, or as a result of taking a course given by TV.
- There's little concern over maximum or optimum use of TV equipment per se. Mobile vans are getting a good workout by some who stress local programming.
- No educator is currently inclined to view TV as a means of reducing pupil cost per hour. All justification for expenditure comes from improving instruction.

The full replies of a number of elementary and high schools are reported along with condensations of others. Edited replies of several colleges and universities are included, along with excerpts from others. Extensive data on use of TV in medical schools and institutions were gathered, but will be reported in a future issue because of space limitations.

As you read these reports, you will note that they are not particularly directed to the points raised. We prefer to think our respondents did not evade our direction, but rather "told it like it is." We must add, however, that several institutions known to be in TV declined to comment by saying, "We do not think your request covers our situation." This, we take to mean "we really aren't maximizing our use of TV." One-hundred schools or colleges were asked to respond (via a form letter). These were picked from 812* listed in "A Survey of Instructional Closed-Circuit Television," 1967, prepared by the Department of Audiovisual Instruction, National Education Association. Replies were received from one-third of those queried.

Maximizing Instructional TV at Huntsville

What is taught successfully "by" television is debatable. What can be taught more effectively "with" television is practically unlimited. How much television is used depends on the depth of involvement of teachers, supervisors, and administrators with the production personnel. Huntsville has ITFS channels plus a uhf-ETV station.

SELECTION AND DEVELOPMENT of a TV course require supervisory, administrative and instructional staff working closely with television production personnel. The depth of use which is made of the subsequent television course throughout the school system depends directly on the breadth of this involvement.

The TV teacher who has special skills and training in the subject area and in communications is released from the classroom to focus her full attention on the single course with the assistance of production specialists. Her time is divided between television center and the classrooms of the school system where she coordinates use of the TV lessons and gains information and ideas for further course development and refinement.

TV is used as the principal medium of instruction (major resource) in several courses where this proves most logical.

- **Handwriting.** TV provides a uniformity of method and progress throughout the school system. This reduces problems and frustrations among students who change schools during the year. It simultaneously provides exemplary demonstration lessons for all classroom teachers.
- **Local History.** TV provides an in-depth study for which no text is available. Full community resources are drawn upon, and mobile TV facilities are used for videotaped lessons with the television teacher "on-site." A packet of materials is provided for each classroom teacher to help her use the television lessons most effectively. The TV series helps off-set the problem of the many new teachers in the system each year who have not had an opportunity to prepare themselves to teach this specialized subject.
- **New Math.** TV is used for grades one through four to make the transition from traditional methods of teaching this subject. The lessons were developed and produced under the supervision of an internationally renowned professor of education and mathematics at a leading university. Our classroom teachers participated in field testing and evaluation of the series, so they gained substantial experience in teaching the "new math." Final results indicated significant gains of students as compared with those of previous years when traditional methods were used.

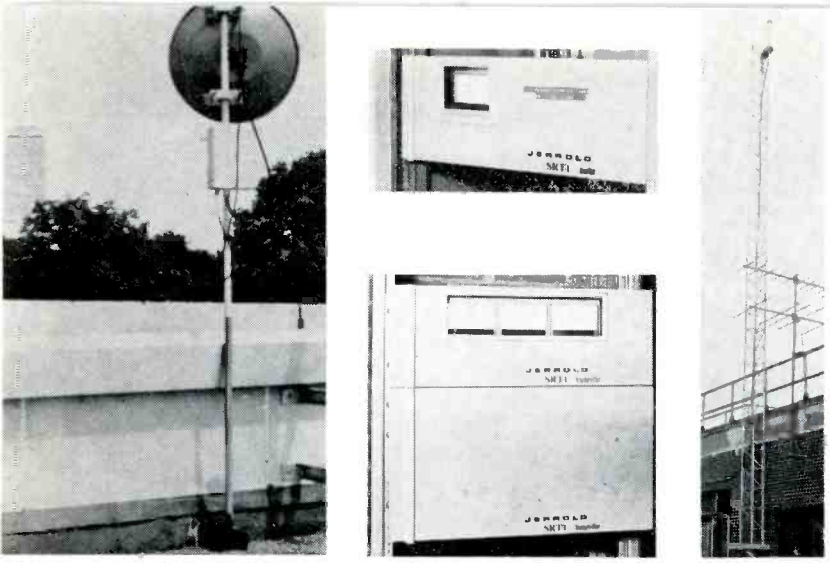
More effective use of teachers as a result of using television is accomplished in several ways.

Classroom teachers depend on television to provide resources which would otherwise be difficult, or impossible to obtain. Duplication of effort and materials is greatly reduced, allowing the teacher time for individual attention to students.

The teacher with particular skill and training is released from the classroom to focus full efforts through television on her specialized subject. Consequently all students benefit, and the classroom teacher has subject matter specialists on her teaching team.

Television is used for administrative purposes and in-service training, making maximum use of special resource personnel and consultants.

*The National Compendium of Televised Education, Vol. 14, (copyrighted) compiled by Dr. Lawrence McKune, Michigan State University, reports 1,826 elementary school districts and 2,726 institutions of higher learning comprising a school enrollment of 19,232,584, use ITV in some part of the formal education of their students.



Boston Archdiocese programs are microwaved from Prudential Tower (above, left) processed by Jerrold SRT-1 exciter (center, top) and transmitter (bottom). Omnidirectional Jerrold Antenna is at right.

Most importantly, more effective learning by the students results by using TV.

Maximum use of TV equipment for minimum dollars can best be accomplished by:

- Planning the educational program which is to be accomplished with television, and then acquiring adequate staff and equipment.
- Involving educators at all levels to develop the program with the cooperation of the professional TV staff.
- Conducting periodic workshops and training sessions for classroom teachers on the best practices and procedures for most effective uses of television.
- Having an adequate field staff in the schools to assure full and proper use of television lessons.
- Providing a capable engineering staff to assure prompt repair and minimum down-time of all equipment.
- Combining the best principles of broadcast management and educational administration.

The Huntsville Public Schools Education Television Center, established in 1966, is a communications complex which consists of three major elements:

1. WHIO-TV, channel 25, a 500 kW uhf transmitter operated by the Alabama ETV Commission, with full-time, two-way interconnection with the State ETV Network.
2. A four-channel ITFS system operated by the Huntsville Public Schools as *an adjunct to the State Network*.
3. A production facility operated by the Huntsville Public Schools which serves both the ITFS system and the State Network.

Huntsville currently has a population of about 150,000, with over 34,000 children attending the 36 public schools this fall in grades 1 through 12. A four-channel ITFS system was installed during the summer of 1966 to serve all but seven of our schools. It will be extended to every school in the Public School System.

The use of TV to improve the learning process is our major objective, and costs can be justified through results of a thoroughly planned and executed program. Reduction of per-pupil cost can then be best accomplished through maximum use of quality television instruction, for it costs little more to serve many classrooms than few.

We feel that the use of TV purely to reduce instructional costs in general will result in a decrease in effective learning in our school system.

Instructional television, whether it is a major resource, a supplement, or an enrichment, must be *used* by the classroom teacher to effect desirable learning results. What can be taught successfully *by* television is debatable. What can be taught more effectively *with* television is practically unlimited.

—material supplied by **David W. Marxer**,
Director of Educational Media
Huntsville Public Schools

New Trier Instructional Television Systems

By the end of the first year, the broadcasting average was 16 hours per day. Grass-roots involvement led to more teachers' program ideas than could be produced. The idiot box had doffed its dunce cap.

IF ITV IS TO BE AN EFFECTIVE TEACHING TOOL it is absolutely vital that the system aspire to meet these goals:

- Curricula integration on a planned insertion basis
- Flexibility in scheduling
- Effective local production
- "Tapping" the resources of not only a great metropolitan community but the country as a whole
- Development of useful teacher in-service programming
- Utilization of local teaching personnel in planning and coordination
- Community support

In its first full year of programming, the New Trier Township (4-channel, 2500 MHz) System has endeavored to reach these goals. With some we've been quite successful; in others we're still working hard.

A brief background

The New Trier Township ITV System serves six elementary districts (Avoca, Glencoe, Kenilworth, Sunset Ridge, Wilmette, Winnetka) and the New Trier High School District on the north shore of Chicago. The system began broadcasting in the fall of 1966. The 1967-68 school term was its first full year of programming. A Township ITV Center containing studio-control room facilities, graphic arts area, offices, etc., is maintained at New Trier High School East in Winnetka. Besides these permanent facilities, the System also operates a remote production van with self-contained power and environmental controls. During the 1967-68 school year, a 16mm sound unit was purchased to further improve production flexibility. To meet demands additional playback equipment was also added during this first year. The system now has three videotape recorders and two film chains.

Executive functions, actual production, direction, art coordination, existing course or lesson procurement, engineering servicing, secretarial functions, public relations, and other duties are handled by the Township ITV coordinator and the six-member full-time ITV staff. In addition to the coordinator, there is a production coordinator, chief engineer, operations coordinator, producer-director, office manager, and a clerk-typist. ITV coordinators in several districts, a pool of Township production specialists, resource personnel, and more than 100 New Trier High School students complete the direct ITV personnel team.

First-year programming

In the first full year of programming more than 300 programs were locally produced. Subject areas ranged from sex education to music, from biology to geology, and from mathematics to computer programming and standardized testing (complete timing and test instructions for certain standardized tests, i.e., Iowa Tests of Basic Skills, SCAT, are presented via ITV). The system encountered a tremendous growth in viewing. In September 1967, the average broadcast day was about 3-5 hours. By May and June of 1968, the system was broadcasting about 14 hours per day. In the first two weeks of September, 1968, the average has been about 16 hours per day.

On-location stressed

Fully 70 percent of local programming is produced on-location. Cameras worked in such places as the Field Museum of Natural History, the Museum of Science and Industry, the Chicago Art Institute, O'Hare Field, the Brookfield and Lincoln Park Zoos, etc. On one occasion the entire citizen naturalization ceremony in the Federal Court was filmed for a junior high school social studies unit. It is this on-location work that enables ITV truly to bring the "outside world" inside to the classroom. New Trier has found that community agencies, educational, political, and social figures, and commercial firms are eager and willing to assist in program production and development.

In-school, in-service telecasts

About 50 percent of what the system broadcasts is locally produced; the rest is obtained from existing tape libraries, etc. Of the *total* output, half is in-school telecasting; the other half is in-service for teachers. This in-service telecasting is very important. ITV can present outstanding educators, ideas, discussions, and techniques to the New Trier teaching staffs—presentations that cannot be duplicated any other way when considering both time and money. Since all New Trier programs are videotaped, teacher in-service programs, once produced, are available on a request basis.

Local programming examples

Some representative titles from the 300 locally produced 1967-68 programs show the wide range of New Trier's use of outstanding personalities as guests and resource personnel: Melvin Tuman on *Making School for Students;* Father John Culkin on *Media and McLuhanism;* Bob Newhart on *Satire in American Life;* Earl Wrightson and Lois Hunt on *The Fine Arts in American Life;* B F. Skinner on *Motivation in the Classroom;* Robert Havighurst on *The Crisis of Our Cities; The Suzuki Violins at New Trier.*

Program development contracts from the Office of the Illinois State Superintendent of Public Instruction were received to produce two local programs, *Focus* and *Your World and You*

Purpose of the weekly *Focus* series is to help keep educators informed of local, state and national developments in the teaching profession in particular and education in general. It covers news about curricula, legislation, salaries, and professional negotiations.

Your World and You is a weekly K-3 news and topical events program. Current events are brought to the K-3 student population in understandable terms and concepts. Through a feature personality as well as puppets and a robot, the news becomes alive and relevant for the K-3 age group.

Curricula control scheduling

New Trier maintains a flexibility in its use of ITV. It is used primarily on a planned insertion basis within the total curriculum when needed and as needed. As such, certain students may not view ITV in specific subject areas for a whole year. Moreover, there may be certain days when the system broadcasts few programs—other days may be heavily scheduled. New Trier does not hold to a rigid "course concept" often prevalent in ITV. At New Trier, if ITV can fill a specific need (whether supplemental, enrichment, or the primary medium for a learning task) in a subject area on a particular day, it may be used.

Programs are broadcast on a repeat basis so that certain offerings may be shown 20, 30, or even more times during the week. Teachers also have the option of requesting ITV lesson units at times other than originally scheduled. At the close of the school year the system was averaging between 10 and 20 teacher requests per day for additional programming. With the system now organized and certain practices established, an in-depth evaluation is underway for the 1968-69 school year.

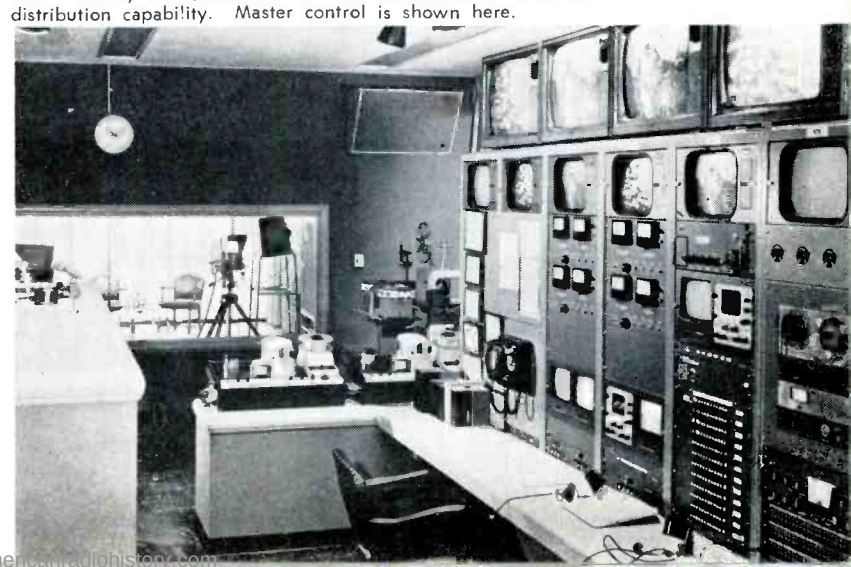
Involvement of personnel

Teacher participation in planning and preparation of programming are vital for the success of an ITV system. Teachers must also be trained to use ITV, and the preparation of programming affords them an opportunity to be heard on most portions of an ITV system.

As far back as 1966, New Trier developed a system of School, District, and Township ITV Committees and Councils. The objective was maximum involvement from teachers, curriculum specialists, and administrators. ITV workshops and utilization sessions are held regularly. At New Trier, programming ideas begin with the *teacher* or group of teachers and curriculum specialists.

Unfortunately or fortunately, depending upon how one views it, New Trier was *too* successful in promoting teacher involvement. Such an outpouring of program ideas and projects occurred that the system could not handle the local input with available staff, time and equipment. Production methods

New Trier system (Winnetka, Ill.) has simultaneous 4-channel distribution capability. Master control is shown here.



Teacher ITV use workshops are held regularly in the New Trier Township. Here, coordinator Pirsein leads session.

were improved late in the school year. This, plus production personnel adjustments and priorities enables New Trier to continue to involve personnel on a meaningful basis. It is the "grass-roots" approach that has helped New Trier ITV to become as successful as it is.

The system is yet in its infancy and has stumbled in the past and is prepared to stumble in the future. But ITV has made great strides in the 1967-68 school year as summed up by one of our teachers: ". . . all in all, ITV is an accepted fact of life around here now—and an important one. The "idiot box" has doffed its dunce cap!"

—material supplied by **Robert W. Pirsein,** ITV Coordinator, New Trier Township, Illinois

Complete TV Courses at Cleveland

Cleveland Public Schools with both open- and closed-circuit facilities have access to much instructional TV material. Examples of direct instruction courses rather than supplemental or enrichment courses are described by Ed Potokar.

THE CLEVELAND PUBLIC SCHOOLS in cooperation with WVIZ, channel 25, receive broadcasts during the school day. The station has an enrollment of 44 different school systems, including the Cleveland Public Schools. As a member system, we may use any or all of the programs developed by this community station.

However, our own staff produces a number of series specially tailored for the Cleveland Public Schools. We have a production staff which includes a producer, director, art department, film bureau, TV teachers, script writers, and other talent.

Examples of programs intended for direct instruction rather than supplemental instruction include:

The Cleveland Museum of Art—an art series designed for grades 5 through 9. This series brings the "Art Museum" to the classroom and serves as a vehicle to demonstrate and explain the many facets of art. Fine art instructors and museum personnel are used and busing of students to the museums has been eliminated after an intitial orientation.

Mathematics—a series of mathematics topics produced on film and broadcast on open-circuit TV. After the broadcast, film prints are made and distributed to the various mathematics departments for both direct and in-service work in the various buildings.

Let's Talk—a pre-kindergarten speech therapy series designed to show audibly and visually, the proper speech patterns. The program is planned to strengthen and reinforce Title I projects of ESEA of 1965.

Family Life Education—a sex-education series for upper elementary classes, written and presented by an experienced school nurse who has taught many of the television lessons. Additional programs planned for junior and high school levels will deal with the detrimental effects of smoking, and the facts of venereal diseases. The use of an experienced medical person gives the finest authority in this delicate area.

Science-in-service—a teacher-oriented program planned by the Elementary division of Science to introduce new science equipment and its uses. This equipment was not available at the elementary level in the past. Cleveland schools are national leaders in the use of latest science equipment.

Closed-Circuit Television Teaches CCTV

At the present time, four buildings are equipped with closed-circuit installations. All have Sony 200 videotape machines, cameras and lighting equipment. However, some studios are more sophisticated than others.

Glenville High School is using television in a two-fold way: teaching television production as a vocation and producing instructional programs for the teachers and students.

In the vocational training course, the students gain practical experience in the areas of writing, producing and directing television programs. Five different courses in radio and television are offered.

Other closed-circuit ITV programs for direct instruction include: library orientation, art appreciation, science, music, shop, social studies and dramatics.

At Charles A. Mooney Junior High, an entire 9th grade algebra class of 275 students viewed over 100 telecasts. The program was divided into 1) review of homework and introduction of lessons, 2) telecast of new lesson and material and 3) completion of TV problems, answering student questions and assigning homework. A complete program guide was developed for this class and presently a development for an 8th grade class is now under way.

The Supplementary Educational Center, operated by the Cleveland Public Schools, is unique in that it serves both parochial and public school children in both the inner-city and the suburbs.

The use of CCTV allows teachers to make more effective use of their time. A pretaped demonstration can be shown while the teacher is present to answer any questions. No demonstration setup time in the classroom is lost.

Many in-service programs are viewed by the teaching assistants as training aids.

Television plays an intracommunication role. Speeches by the Center's director and guests can be televised for routing to remote parts of the building.

—material submitted by **Ed Potokar,** Television Production Coordinator, Cleveland Public Schools

San Antonio Rewrites and Retapes For High Quality

No group is prouder of its accomplishments than the Edgewood Independent School District, San

Antonio, Texas. Team teaching is the concept with the TV teacher member spending full time on the curriculum.

IN 1966 EISD RECEIVED an ESEA grant for the installation of the first three-channel closed-circuit instructional television facility west of the Mississippi River. The grant covered the development of "A Model Language Program Utilizing Instructional Television." The San Antonio community has a unique linguistic situation. Living within a ten-square-mile area can be found the Spanish-speaking bilingual child, the monolingual child who speaks only English or only Spanish, and the child who must be termed alingual because he speaks neither Spanish or English efficiently enough to communicate.

The goal of the language-oriented program is to encourage students to improve their use of English in both oral and written communication.

The philosophy of instruction is principally that of team teaching. Either total teaching or enrichment teaching is used depending on the needs of the student. Under the team-teaching approach, the language specialist, as a TV teacher, may devote full-time attention to the language curriculum. Through coordination with the classroom teacher, the language program gives the student the benefit of more knowledge, more preparation, and more opportunity for learning. The TV specialist has the time to prepare and present high quality lessons. Because of the care spent in preparing them, they have high content and teaching-learning potentiality.

Successful integration of ITV into the total curriculum is achieved through discussion at preplanning conferences, classroom visitations and post-viewing written evaluations. In-service-training programs and the publication of a teacher's guidebook for each series also help. The guidebook also contains goals, prelesson suggestions, lesson outline and followup activities.

General benefits accrue when ITV is used. For example, the climate of research and educational progress promotes growth. Classroom techniques in general are improved through the exemplification of model teaching on TV.

The most important benefit of ITV, however, is the enhanced learning situation. The medium itself creates a new avenue for education growth. Because of its strong appeal to several sensory avenues, TV is an attention-getter and can be used to refine and define the focus of attention. New, different and often otherwise inaccessible material can be brought into the classroom.

Lessons can be taped, evaluated, rewritten and retaped so that both the lesson content and manner of presentation are of the highest quality. Reinforcement techniques can be scheduled for example.

The KHS-77 curriculum, although language oriented, has expanded to include math, science, music, history, story telling, driver's education and guidance.

—material submitted by **H. H. Bobele**,
TV Coordinator,
Edgewood Instructional Television,
San Antonio, Texas

Houston Studio Production

Now in its fourth year, the Spring Branch School District of Houston claims its programming exemplifies the best studio production techniques. Teachers like it.

Spring Branch studio during production of "Moving with Mathematics" series.

John Benner, Spring Branch ITV producer/director, working with 2-inch viedotape equipment.

THE EXCELLENCE OF AN INTENSIVE TV PROGRAM depends largely on correlation of the program with classroom curriculum materials, timing of broadcasts, teacher interest and involvement in TV lesson preparations, interesting and entertaining presentations, uniformity of school bell schedules, a continuous evaluation program and, last but not least, the teacher's presentation of the material.

Instructional television in the Spring Branch District is designed solely for the classroom teacher and his students, not the producer's ego. Program development groups, made up of teachers, meet a year in advance of actual broadcasts to develop a curriculum-oriented television teaching program.

Such advanced planning permits every district teacher to have a listing and description, including broadcast times, of every program presented for the entire school year. Advanced scheduling assists the teacher in pacing his classroom work, so that ITV can become an integral part of it.

Television lessons, when correlated with the classroom lesson, become valuable enrichment material. Television does not lend itself to total teaching nearly so well as to being an enrichment device.

Television is not used in Spring Branch to reduce the number of classroom teachers, but to assist the classroom teacher by adding the extra teacher, the extra specialist, the extra guest, or the extra dramatization that is so often needed to complete the learning situation adequately.

Throughout the district of approximately 36,000 students, supplementary enrichment series are broadcast for secondary and elementary mathematics, language arts, science, social studies, elementary art, music and handwriting. Only through closed-circuit multiplechannel television can so much programming reach so many students per dollar.

A $350,000 Setup

The Spring Branch two-channel television oper-

ation represents a $350,000 installation. Included are a spacious studio, down converter installation and 600 classroom receivers. The station, whose call letters are KRZ-68, supports a staff of seven adults and two students. Staff members include a director of televised instruction, secretary of director, producer-director, art director, technical engineer, and two production engineers. High school students work as studio cameramen and projectionists. The studio operates on a $50,000-a-year budget. During the 1967-68 school year, approximately 950 different programs were broadcast with multiple performances of each program of three to seven times.

Instructional television is no longer a new teaching tool; however, a special continuous ITV evaluation program keeps all lessons fresh and enlightening. Each teacher is supplied with special computer cards for evaluating each lesson viewed. Through computer analysis, programs can be retired, improved, or updated.

Instructional television becomes an integral part of the curriculum only through the cooperation and dedication of the television studio personnel, school administrators, school maintenance engineers and classroom teachers. Each is a major factor in a curriculum-oriented television program. It takes a congenial blend of talents and dedicated effort to come out with the best.

—material submitted by **Henry L. Thomas,** Director of Instructional Television, Spring Branch Independent School District, Houston, Texas

Three-Hundred Hours/Month by L.A. Archdiocese

Going into its second year, the Archdiocese of Los Angeles is broadcasting 39 curriculum courses at a cost of less than 5 cents per pupil per day. Television in the classroom is not considered a time-out period for the teacher. Rather, more preparation is needed.

THE ARCHDIOCESE OF LOS ANGELES, 2500-MHz, 4-channel system broadcasts from Mt. Wilson, California, and presently serves 51 schools located within a 50-mile radius of Mt. Wilson. No repeater sites are used. The signal-to-noise reading at the farthest outlet within the farthest school is 43 dB.

During the 1968-69 school year, 39 curriculum courses are broadcast for grades one through eight. These materials, prepared by specialists from sources, are obtained from tape libraries. The individual classroom teacher must integrate this material into into her regular curriculum course.

The operating cost of the instructional television system (this involves every phase of operation, including salaries, equipment, cost of programming) based upon per pupil cost, per school day, is $.0476.

It is anticipated that an additional 25 schools will be added to the Archdiocesan system in the next few months, thus reducing the per pupil operational costs.

An extensive evaluation study was made following the first full year operation of the school year 1967-68, and the following data was validated, namely:

- Individual classroom instructors were particularly satisfied with curriculum areas such as science, in which they did not specialize.
- The teachers themselves enhanced their professional growth by observing the methodology of the television instructor.
- The student response indicated a deeper understanding of the subject because of the visual techniques ITV can offer.
- At the same time the teachers expressed a certain difficulty in coordinating existing material rented from tape libraries into their standard syllabus of instruction. Consequently, our programming staff must plan and produce for curriculum subjects, subject material locally identified with particular needs.
- Schools in poverty areas had some difficulty with program content specified for a particular grade level, in view of the fact that some of the students had not reached the academic plateau which the televised programs contained.

The Archdiocesan system presently operates three channels with a fourth channel to be activated within a year's time. Three vhf stations and ETV station KCET (channel 28) can be received on the system. It is anticipated that the system will air 300 hours per month, not only providing programming for the classroom, but also teacher training credit courses, adult education at the church sites, as well as administration material.

At Loyola University's Foley Communications Center, the Archdiocese has installed its microwave link to Mt. Wilson. The Communications Center also houses the essential equipment for broadcasting.

The operation and maintenance of the transmission system are under the supervision of three full-time engineers.

The success of televised instruction depends upon its efficient use by the classroom teacher. When curriculum courses are offered the teacher must integrate the telelesson with the remainder of time allotted for that particular subject. In many cases this will involve more preparation on the part of the instructor, particularly if television courses are obtained from outside sources. Therefore, television in the classroom should not be considered as a "time-out period," whereby the teacher does not attempt to correlate the televised material with the rest of the subject matter assigned for that day.

—material submitted by **Rev. John C. Urban,** Dept. of Communications, Archdiocese of Los Angeles 1531 West Ninth St., Los Angeles

Seven Channels at Altoona

TV will not replace the teacher in Altoona Area School District classrooms, but it will add visual enrichment to all curricula.

IN SEPTEMBER 1965, the first contracts were awarded for the installation of a 28-room closed-circuit system consisting of 28 receivers, a video recorder and a single vidicon camera.

From this simple beginning, the system has grown to the point where today there are: 300 receiver locations, four video recorders, four viewfinder cameras, a microscope with camera, a telebeam projector, a film chain with camera, complete switching console, turntable, special effects generator and monitors and a 28-room talkback system.

The system boasts a production studio, three closed-circuits within the high school and four 2500-MHz transmitters for beaming programs to

Learning Resources Centers

Up to half of ITV telecast hours are directed to teachers about ITV. In-service courses are essential and standard practice at schools using ITV.

In **the fall of 1967** the Tulsa Public Schools launched a Learning Resources Center. The program retrains teachers and other school professional personnel so that they might work more effectively with educationally and culturally deprived children. The project is funded by ESEA, Title III.

The program is structured around an in-service workshop which eligible teachers attend on a voluntary basis. The workshop covers the gamut of learning problems encountered by disadvantaged pupils. By means of demonstrations with Lowell Elementary and Junior High School pupils, the LRC staff suggests appropriate teaching methods and materials to resolve heretofore problems. These demonstrations are videotaped and replayed for evaluation and discussion. LRC has a 17-point check list to aid self-evaluation.

Jack L. Griffin, research assistant, Tulsa Public Schools, reports the videotaping unit at the LRC is mobile and consequently used in many other situations. For example, tape is fed to two local television stations in Tulsa which sponsor educational programs.

In addition to teacher self-evaluation and dissemination of information to other stations, the videotaping unit is available for other programs.

An on-going need for in-service training is underscored by Betty Smith, communication coordinator for Mineola Public Schools, Mineola, N.Y. The Mineola school offers immediate accessibility of local production facilities to teachers to develop important lessons. When this is coupled with involvement with other teachers and administrators in developing and scheduling courses, teachers come to interpret their role as director of learning.

COMMUNITY LEARNING CENTER

A Learning Center at Tenafly, N.J. is unusual in several respects, not the least of which is its location. It's a converted Grand Union supermarket in the heart of Tenafly.

The Learning Center "P.D.Q." is not a school, not a theatre, not a laboratory, not a television studio—not any of these—but a little of each. Its diverse facilities are intended to provide better education for the children, youth and adults in New Jersey. "P.D.Q." stands for Project Developing Quality. It is a Title III ESEA project.

The center has a large, fully equipped and active classroom; comfortable seating in an observation "deck" for an audience of 140; a 36-ft. wide by 6-ft. high one-way viewing glass. Equipment includes cameras, monitors and 2- and 1-in. videotape recording equipment.

Tenafly public school authorities, in conjunction with the New Jersey State Department of Education, are seeking ways at the Center to improve teaching and learning. Videotape assists in the demonstration, experimentation, and dissemination of new methods and techniques. Tapes can be viewed at the center or they are distributed via mobile van.

Over 100 videotapes are currently available for a broad variety of disciplines and subjects including drug abuse, sex education, linguistics, foreign languages, the handicapped child, Suzuki violin, and many more.

Project authorities have issued an invitation to educators in other districts to avail themselves of the center's facilities. 1968 current projects underway or under consideration include editing and disseminating videotapes currently available; assistance to New Jersey teachers in preparation of project proposals which may qualify them for $1000 experimental grants under A410 recently passed by the New Jersey legislature; a project to explore and design new teaching-learning ideas in race relations, film education, and sex education. The latter project is coordinated with the New Jersey State Department of Education, Rutgers, the State University, the American Film Institute, the New Jersey Institute for Film Arts, the New Jersey Division on Aging, and the Bergen County Cooperative Extension Service.

Other projects include a weekly teenage film makers workshop; "minicourse micro teaching" for veteran teachers and teacher trainees; projects relating to continuing education for adults; teacher-produced videotapes and films; a Science Curriculum Improvement Study project involving elementary school classes; and aid to culturally disadvantaged in urban centers.

COMPUTER USED IN BROOKLYN

In-service teacher training at Diocese of Brooklyn Catholic schools uses instructional television, a computer and a telephone.

Courses taught in the experiment go beyond teaching by television, but the project is an example of what may be coming in the future. The system is geared to permit individual study.

One night a week 70 parochial school teachers in Brooklyn and Queens turn on their classroom TV sets to watch a half-hour lecture. Then they call in to a remote computer and use their pushbutton phones to take a multiple-choice quiz and hear an evaluation of their answers.

After the test, the teachers request more information about subjects covered in that evening's lecture through their telephone. To reply, the computer has been programmed to select the appropriate recorded message and illustrate it with a related TV picture flashed on the teacher's television screen.

A series of videotaped lectures entitled **The World of Computers** is part of an educational experiment being conducted with IBM.

Brother Austin David, FSC, the Diocese's data processing consultant, said the purpose of the eight-week telecourse is to learn more about the practicality of using a computer with television as a means of providing individualized instruction.

An IBM System 360, located at IBM's Mohansic Laboratory in Yorktown Heights, N.Y., is linked by telephone lines to special equipment in the Diocese's educational TV studios at Bishop Ford High School in Brooklyn.

The video lectures are beamed into Diocesan schools over one of four educational 2500-MHz TV channels operated by the Diocese.

40 schools located within the Altoona Area School District. In addition, contracts for 50 receivers have been let for installation during the 1968-69 school term.

Staffing of the television department calls for:

Electronic Technician I—chief of operations
Electronic Technical II—operations assistant
Maintenance Technican—studio and field maintenance
Director—program consultant
Studio Aide I—clerk and video playback
Studio Aide II—graphic artist
Student Assistants (7)—art work and production helpers

Programming seven channels of television presents quite a challenge. At the elementary school level, we employ two teachers to develop and produce programs. Additionally, subject supervisors, nurses, dental hygienists and librarians are scheduled one-half day every other week in the studio for videotaping programs.

Secondary school programs are not so diversified as the elementary school programs. Programs for social education were the first target, followed by the language arts and science areas. Three social educational teachers have reduced classroom teaching loads and are thereby free to develop social education programs.

English I (composition, tenth grade) schedules one day per week for large group instruction and the science teachers have scheduled many slides, filmstrips, and 16mm films to supplement their programs. WPSX-TV (Penn State University) programs are carried and serve as a valuable aid in programming.

CATV used

To keep the public informed on classroom activities, an Administration goal, a repeater that will feed a signal to the head end of the Altoona Video Corporation's community cable system has been installed. The cable company has provided the necessary antenna and down convertors to translate 2500-MHz signals to vhf signals, and has provided time on the system for school programs to be carried to the homes of the community.

TV has made it possible for subject specialists and supervisors to visit the 26 schools in the district. Ideas that were slow to spread throughout the district now may be quickly disseminated.

In-service programs for the teachers are aided by TV. In-service meetings formerly requiring teachers from a large area to congregate in one location are being replaced by television programs that are transmitted to all schools.

—material submitted by **Dr. Ardell L. Feeley**, Altoona Area School District, Altoona, Pennsylvania

Videotape Ideas: Instant Victory

Instant victory through videotape replay solved a problem for Corona High School, Corona, Calif. At Abilene, Texas, lab chains are devoted to aiding and abetting individualized instruction.

EVERY SPRING the student body at Corona High School has an old fashion political convention with everything from banners to bunting and balloons. All aspects of a political convention are included in this learning experience except the smoke-filled rooms.

The problem was how to involve the entire voting 1600-student body in the main stream of the excitement when the assembly hall seats only 250. As in regular politics each class was represented at the convention but everyone wanted to see and hear the proceedings. The solution was to prepare a videotape of the morning session. The keynote address, nominating speeches and general bedlam was recorded for afternoon viewing. By the end of the school day, every student had had an opportunity to view the convention and evaluate all of the candidates.

All that was needed was one camera with zoom lens, a VTR and one operator. The cost of four hours labor is a small price to pay for reaching 1600 students. So if you ever have the problem of packing 1600 kids in a room designed for 250, try instant victory: videotape.

Although this project may seem like a one shot deal, Robert Rybicki, AV coordinator, reports secondary benefits resulted. The videotape was used for evaluating speeches, and most important, the following-year convention organizers had a ready reference to procedures and were able to evaluate methods of improving the up-coming convention.

Use lab chains and CATV facility

At Abilene, the Public School System is trying to break away from using ETV broadcasts. They need more local control and they want to promote individualized instruction.

Lab chains are being considered. A television camera, monitor, and videotape recorder representing one lab chain will be used in such curriculum areas as speech, psychology (testing and evaluation), physical education (development of motor skills), music, and teacher in-service training. Immediate playback provides individualized instruction.

Ron Moore reports Abilene's television efforts are still in their infancy. More than one channel for broadcasting will be needed. Cable TV, Inc. makes its studio and one channel available to the school.

Minimal Maximization At Several Schools

While **BM/E's** survey would tend to discourage negative responses, two schools that replied showed, if not a decline, no great move towards ITV.

ROBERT S. EDELMAN, reporting for the Southwestern Indiana Educational Television Council (SWIETVC), says his system has gone to all radio and a "difficult" uhf pickup. But he suggests the programming available doesn't really meet the needs of teachers. "What is offered on television must come out of a need by the teachers in the classroom who will use it. Otherwise, like commercial television, the viewer, in this case the teacher, will not turn on the program. Then all of the production time, rehearsal time, research time and transmission time, is just so much waste of time."

Edelman says the classroom teacher is the only qualified person to determine quantity, quality and frequency of instructional material for a given class at a given day in a given unit. No one can

determine that from some remote point. When this fact is learned by colleges and television stations offering enrichment programming to the schools, there will be better educational television. Edelman appears to believe there is too little contact with teachers in the classroom.

ETV stations replace local programing

The Palo Alto Unified School District is a system doing less today than before. Fred Harding, consultant, Instructional Materials Center reports: "Several years ago we produced lessons in music and foreign language which were distributed to our twenty elementary schools. Because of the production expense we have ceased this operation. Instead we now receive a smorgasbord of lessons from educational stations KOED-TV, San Francisco and KTEH-TV, San Jose. Use of these programs is at the option of the classroom teacher as is use of current events broadcasts over the local commercial television stations."

Harding reports his department videotapes behavior at the request of a teacher. In a situation where the action of participants is to be studied, either a demonstration with a consultant or by the participants themselves, a videotape is made. Examples of this mode of operation are speech therapy, sensitivity training and teachers' evaluations. These tapes are not stored or circulated. **BM/E**

Young Teachers Sold on TV at colleges

Happy learning experience with TV in college makes young teachers ITV disciples. Count on them to accelerate the new medium on the job. Some take entire courses by CCTV.

THE "OVER-THIRTY" classroom teacher may resist instructional television as an intrusion on her autonomy in the classroom, or as a threat to replace her. It's for this reason that schools which are using ITV successfully spend so much time on building up teacher cooperation. It seems essential, too, that these schools view ITV as strictly enrichment or supplemental material.

Under-thirty teachers, who have used TV in college, have no fears or apprehensions. If they've benefited by a videotape analysis, or if they took an interesting course by CCTV, they are eager to use the medium.

In the examples that follows, heavy use is made of videotape for self-improvement instruction, or as a "canned course" which frees instructors for better use of their time.

Micro-teaching at University of Minn.

The videotape recorder is indispensable in teacher training at University of Minnesota, Duluth campus.

MICRO-TEACHING has been one of the most meaningful TV projects undertaken to date at the University of Minnesota, Duluth. The intern teacher uses one particular skill, such as positive reenforcement, and presents it before a peer group for five minutes. This lesson is recorded on videotape and played back so that the intern teacher may evaluate the method.

After playback, the intern is subjected to a critique by the instructor and the individuals in the peer group. The intern teacher also writes his own evaluation of his performance. Generally, two or three five-minute sessions are recorded and evaluated. When a particular skill has been developed to the satisfaction of the instructor and the intern, a twenty-minute micro-teaching sessions is undertaken. The project has included secondary math teaching, secondary English, secondary foreign language, elementary social studies and aerospace studies, to name a few.

The students who have participated in the micro-teaching experience have had nothing but praise for it, even though they were all less than enthusiastic about it when first exposed to the idea. But mike fright and camera shyness soon disappeared.

Videotape is also used successfully in the student teaching program. A tape record is made of student-teachers in action. Tapes are brought back to the college and the faculty member in charge of supervising that particular student views the tape with the student.

The program proved so successful last year on a pilot basis, that it will be expanded this year.

Full courses given by CCTV: Anthropology, Psychology, Journalism, Marketing and Education.

Stretching Equipment Dollars

An educational television center using broadcast quality equipment has been assembled at Memorial University of Newfoundland for under $250,000. Equipment was purchased from many suppliers and advantage was taken of the used monochrome market during the time Canadian TV stations were converting to color. Here's a partial list of the University's equipment purchased by John Parker, chief engineer, and Duane B. Starcher, director, educational TV.

- Four EMI 203 4½-inch image orthicon cameras
- One RCA TK 21C film chain
- Two Bell and Howell 614 projectors
- One Spindler-Sauppe 332 slide projector
- One TP-11D multiplexer
- One two-studio General Communications vertical interval switcher
- McCurdy audio
- ColorTran quartz lighting
- ColorTran dimming facilities
- Richmond Hill test and distribution equipment
- Ampex special effects generation
- One Ampex VR 1000HB quadraplex videotape recorder
- Three Ampex VR 7500 helical videotape recorders (for CCTV distribution)
- One three-camera mobile van using RCA PK-302 vidicons with remote controlled pan-tilt-zoom
- Arriflex-Moviola 16mm film equipment
- Nagra film studio and Magnasync 16mm soundtape
- Full darkroom facilities for black-and-white, including Hasselblad, Nikon and Leica copy equipment
- Full television graphics facilities
- One 35- × 45-ft studio
- One 20- × 30-ft studio

At Southern Colorado State College, James A. Dryden reports they beat the high professional monitor price tag by purchasing low-cost portable receivers and, for roughly $20 per unit, added composite video, noncomposite video (with external drive), off-the-air video output, audio input, and switchable raster. Dryden found the modified unit to compare very favorably with the professional device especially in the field.

As another example, the chief engineer at Southern Colorado State has designed and built a manual rear control for a popular zoom lens for less than one-tenth the cost of the commercial product. Because of a limited equipment budget, the college regularly scours various sources for used and surplus equipment that can be converted to meet the television center's requirements. A mobile van is the end result of several such "treasure hunts."

CCTV was used either because of lack of teaching staff in these areas or as an experiment looking at the differences, if any, in material learned and retention.

We learned students retained as much, and in some cases more, of the factual material because the courses were generally better prepared when put on CCTV. More visuals were used, more attention was paid to course outlines due to the production techniques, and the teacher always looked at the tape after completion and found areas that needed revision or deletion. With this amount of time devoted to the production of a lecture, it is natural that a better product will come forth.

Spring Branch studio during production of **Fun with Music** series—Mrs. Virginia Hunt, TV teacher.

These tapes can, at the discretion of the teacher, be used the following year. Most of the teachers, however, redo or modify the tapes to bring them up to date.

The teacher using tapes, rather than lecturing three times a day, finds more time for direct contact with the students. In other words, the machine does the repetitious work and the teacher does the human job.

Not only is the teacher freed from repeating himself, but the student can call in and say he didn't understand the lecture and ask for a repeat at an "off" hour. In the conventional classroom, the student gets the lecture but once, and in many cases is unable, due to class size, to ask questions of the lecturer.

Students' reaction to a course in Psychology presented winter quarter of 1968 is interesting. Before having had a CCTV course, 187 to 107 felt a large lecturer session would be better than a CCTV session. After having had a CCTV course, 158 to 135 felt the CCTV course was more interesting.

Aside from the large lecture versus CCTV, students (154 to 120) originally thought they would learn more in a conventional class. After CCTV, this preference switched to a TV class, 140 to 132.

A number of single-concept videotapes have been made for the Education Division. These tapes show experienced teachers in action in the classroom facing the everyday problems of being a professional

teacher. These tapes are shown only partially. When the teacher on the screen gets to a point where a problem has come up, the tape is stopped and the students are polled regarding their feelings on the proper way of handling the situation.

After the students have voiced their opinions, the tape is continued and the students see how the experienced teacher handled the situation. Then students discuss, with their professor, the pros and cons of the total situation. This method allows a real opportunity for the students to "try their wings" in a situation that will have meaning for them once they are the teacher in the field.

A student responder and automatic tally system has been used to see how effective videotapes are in getting points across to students. If a tally shows that only 60 percent understand a concept, this subject can be reviewed or the videotape modified.

Our facilities include two recently completed studio control complexes. Equipment includes two RCA PK-330 vidicon cameras, one RCA TR-3 videotape player, two Ampex 660-B videotape recorders, special effects, 12 input video switcher, slide and film chain, and all associated power supplies, patch bays, etc. The studio is 24 × 48 and is equipped with quartz lighting. Audio equipment is Gates, RCA and Shure.

In addition to the studio facilities, we have seven portable videotape packages including the Ampex VR-5000 VTR, Ampex CC-324 camera, 4:1 zoom lenses, Bogan audio mixers, and Setchell-Carlson 23 in. video-rf monitors.

—material supplied by **Donald L. Monge**, Director of Broadcast Engineering, University of Minnesota, Duluth

TV Teaches Teachers at San Francisco State

Active and positive program for five years in teaching teachers.

SINCE 1963, approximately 100 half-hour telecasts have been viewed by some 3000 teacher trainees taking courses in social studies, math and language arts.

Many students preparing for a teaching career have worked with the Radio-Television Department in preparing videotapes.

Videotape programs have included specialists covering special topics such as working with hard-of-hearing children, working with head start programs and testing. Freshman orientation video tapes have been made.

A special summer six-unit educational workshop for teachers has been offered since 1961. Additionally, four annual one-week Instructional Television Institute courses have been offered. This Institute is a joint effort of KOED, the School of Education, the School of Creative Arts and the Summer Session Office of San Francisco State College. Over 400 teachers in the Bay area have registered for the Institute.

In cooperation with KPIX, channel 5, San Francisco, 13 half-hour programs on the *World of the Teacher* were broadcast during the summer of 1963. Kinescope recordings are still being used.

—material supplied by **George E. Steiner**, Coordinator, Educational Television, San Francisco State College

ITV is Big at Big MSU

At least 4.6 percent of all credit hours are given by CCTV at MSU. Nearly half (34,726) of all students are enrolled in one or another TV course.

THE INSTRUCTIONAL MEDIA CENTER of Michigan State University can deliver a CCTV picture to any of the buildings on campus. Currently, lessons are distributed to 134 viewing areas located in classrooms, laboratories, and dormitory classrooms via an eleven channel rf distribution system leased from the Michigan Bell Telephone Company.

During the 1967-68 school year, 70,362 MSU students were enrolled in classes using CCTV. Of these students, 34,726 were enrolled in courses using closed circuit television as the major medium for the presentation of course material. (MSU had an enrollment of 38,000 for the 1967-68 academic year. Some students took more than one course on CCTV.)

Broadcast quality equipment

MSU operates four studios for the production of instructional television materials: two professionally equipped studios, one with two vidicon cameras, the other with two 4½-inch image orthicon cameras; both have quartz lighting systems, film/slide chains, effects amplifiers, audio consoles, etc; a teaching auditorium with two 3-inch image orthicon cameras located in the rear, an instructor-controlled overhead vidicon camera with a 10 to 1 zoom lens mounted on a specially designed teaching console, film/slide chain, effects amplifier, shotgun microphone, etc; a small veterinary surgery operating room equipped with two vidicon floor/overhead cameras and associated control equipment.

A mobile unit, equipped with two image orthicon cameras, switcher and a quadruplex videotape recorder makes it possible to collect teaching materials in remote locations on and off campus

The CCTV videotape center consists of seven quadruplex videotape recorders, one of these equipped with electronic editing. In addition, one-inch helical scan editing and copying equipment is operated in the center. Forty-four additional helical-scan videotape recorders and camera systems are maintained by CCTV for twenty-eight on-campus departments.

CCTV studio at the University of Minnesota, Duluth.

Texas Shares Faculty

TEMP is the acronym for Texas Educational Microwave Project, which uses closed-circuit microwave transmission over a 70-mile path from Austin to San Antonio, Texas, to provide its member colleges and universities with instructional television programs.

The basic idea of TEMP is still the sharing of faculty resources—the bringing of the best teachers in any given field into the participating colleges via television. Originally, the emphasis was upon videotaped courses for total teaching. When the network began operation in 1961, it transmitted eight videotaped courses which had been produced by Radio/Television, The University of Texas. Additional courses were later locally produced or acquired from other sources. The emphasis has shifted in recent years to the use of television as an aid or supplement to classroom instruction.

The schools involved in TEMP are: The University of Texas at Austin, Huston-Tillotson College, St. Edward's University, Southwest Texas State College, Trinity University, San Antonio College, Our Lady of the Lake College, St. Mary's University, and Texas Lutheran College.

The first three institutions named are located in Austin. Southwest Texas State College is in San Marcos, approximately 30 miles to the south. Texas Lutheran College is located in Seguin, a county seat about twenty miles from San Antonio. The other four institutions are all located in the Alamo City.

The deans of each school constitute the Program Planning Council of TEMP. They control its budget, select curriculum areas, appoint the curriculum committees, and approve the program schedule. Faculty curriculum committees with representatives from all schools meet regularly to plan and evaluate the use of televised instruction in their fields. The University of Texas, which also maintains a three-channel CCTV system on its own campus, serves as production agency for TEMP through the facilities of its Communication Center.

More than 32 hours of instructional programming is scheduled per week during this fall semester, serving an enrollment in excess of 30,000 students with courses in English, Anthropology, Art, Music Appreciation, Psychology, Economics, and Science for Elementary Teachers on a budget of approximately $90,000 per year. The secret of TEMP's success has been cooperative planning among institutions of higher learning.

Full time staff members at MSU CCTV number twenty-nine, with eleven in the engineering division, ten in production, and eight in operations and administration.

Heavy use of the medium

During the last academic year, twenty-nine courses used CCTV on a regular basis and 32 on an occasional basis to teach approximately 4.6 percent of the total graduate and undergraduate credit hours produced by the University. CCTV carried 10.4 percent of all freshman and sophomore student credit hours.

Courses are not taught on television merely to extend the classroom though several have enrollments approaching 800 each term. Rather, the potential of television to improve instructional effectiveness is an important justification for its use. For example, television allows the instructor in a Fortran programming course to show in detail the computer printouts of the previous day's problems to all students in the course without costly reproduction of the printouts. The professor of a basic geography course can easily integrate slides, film, maps, photos, etc., into his presentation.

A music appreciation course, committed to videotape, presents examples of various forms of music played by recognized artists, thus eliminating amateur performances and scheduling problems when graduate students were used to perform these examples in person. Two basic accounting courses are taught live on television with the use of a talk-back system from the viewing rooms. Students can ask questions of the professor (or respond to questions) and all other students enrolled in the course can hear both sides of the discussion.

Programmed videotapes to guide students through laboratory setups and procedures are used by the MSU Chemistry Department.

By transmitting a course live in the morning with videotape playbacks in the afternoon and again in the evening, one highly qualified faculty member can reach a large number of students in a variety of campus locations without the need for repeated presentations on his part. The advantage to the students is convenience in accessibility. The advantage to the University is more efficient use of its facilities and staff. Lessons produced and videotaped during previous terms are also played back on such a schedule. Usually senior faculty and specialists cannot be scheduled for large undergraduate courses. With CCTV and videotape it becomes possible.

Although the majority of CCTV instruction at MSU is of this large-class variety, a number of experiments are being done. In the planning stages is a completely programmed course in textiles which will be a multimedia approach to the subject.

Student attitudes and cost effectiveness

Students select television courses over conventional instruction if the instructor for TV is known to be a superior teacher. If the alternative is 600 students in an auditorium on the campus, students will choose a televised lecture in a dormitory classroom everytime.

Students continue to prefer seminars or small class meetings with top notch instructors, but this is not a realistic possibility in large undergraduate courses. Our experience has been that the best instructor and the best-instructed course will be chosen whether televised or live.

Our studies of the large-class television courses confirm the hundreds of effect comparisons made since 1950—student achievement is not significantly different in TV courses as compared to conventional instructional patterns. This should not surprise us.

The instruction in these comparisons is typically not different.

It is difficult to assess costs of instruction. Each course has different factors influencing costs. However, on two occasions careful studies of ITV costs have been made. Large lecture ITV courses are cheaper than traditional instruction when enrollments exceed 500. For courses with fewer students, costs can be high initially but if repeated use is made of the course by tape, costs drop quickly.

Music Appreciation and English Literature are examples of MSU courses in which advantage has been taken of TV's ability to lower costs by repetition. At the end of two years of use, TV costs in the music course are down to $6.29 per credit hour versus $11.98 per credit hour for non-TV instruction.

Organized for innovation

At Michigan State University, Closed Circuit Television is part of the Instructional Media Center. The IMC, together with Learning Services and Evaluation Services, form the Instructional Development Service of the Provost's Office. This administrative organization, established in July 1965, has led to an accelerated growth of all instructional media at Michigan State but particularly for CCTV.

—material supplied by **Erling S. Jorgensen**, Associate Director, Instructional Media Center

TV for Everyone at San Mateo

The College of San Mateo operates a College of the Air which serves many interests.

THE COLLEGE OF SAN MATEO, San Mateo, California operates the College of the Air and the twin stations, KCSM-TV and KCSM-FM.

Four functions of the College of the Air include: instruction in telecommunications, production of ITV courses, closed and open-circuit TV, and public service broadcasting.

In the Telecommunications Division, courses are offered in radio and television broadcasting for students interested in entering this field.

Students trained in the Telecommunications Division provide the crews for the production of instructional television material. The evening educational programming likewise is crewed by students in the Telecommunications Division and this function serves as the laboratory for both day and evening students. A total of 250 students enrolled in the day and evening classes of the two-year program just ended. Over 30 students were placed in responsible positions in radio and television broadcasting facilities.

The College of the Air operates as a service to all divisions on the campus to produce professional telecourses for closed-circuit and open-circuit broadcasting. Instructors are chosen by their respective division chairman and faculty and the remuneration is in terms of release time granted by the College through the division.

The engineering facility and the personnel to operate the closed-circuit and open-circuit broadcasting facility is the third function of the College of the Air. A total of three closed-circuit channels are available and there are three videotape recorders and three film chains. Additionally, programs may be piped into the closed-circuit system from directly off the air pickup. The open-circuit facility likewise can operate from two videotape recorders and from two film chains to provide material required by the College in its educational program.

San Mateo's fourth TV operation, the television broadcast station, operates as a public service broadcast facility for the community. Programs of local interest are produced for evening broadcast. As mentioned, students enrolled in both the evening and day telecommunications courses help produce these programs.

Professional quality videotapes that may be played back over other television broadcast stations can be produced. A less expensive but useable videotape recorder is available for programs that are distributed only on campus. A still far simpler facility in the form of two portable television cameras and videotape recorders is available to faculty for use in classrooms and at athletic events.

A community college has the responsibility to provide education for all who have the capacity to learn. Television makes it possible to provide a learning experience outside of the formal classroom —wherever there is a receiver. TV offers an opportunity to experiment with college courses, to use a limited number of hours during the day for self-improvement, or to combine the tasks of a housewife and student.

Ideally, a College of the Air would provide college-level courses in all the major areas of education. A bright high school student could well sample a number of college programs before deciding what field interests him most. A high school dropout likewise could sample the variety of college experiences and make a positive decision to continue with his education.

A basic policy of the College of the Air is that the use of television must result in more effective teaching. Television instructors have access to graphics, models, motion pictures and slides, and the expert services of technicians to build sets.

To encourage TV course preparation, the College of San Mateo has a very generous policy with respect to release time. Based on a three-unit course, an

Continued on page 64

Instructional system technology

Research in what might be called the system engineering of education is underway at Chapman, Orange, Calif. A master's program, Instructional System Technology, is under the direction of Drs. Robert E. Corregan and Robert A. Kaufman.

A mission analysis is made first to identify the desired learning outcome. Then, functional, task and means-methods analyses are made to determine validity of approach and to help select methods and media for achieving the greatest cost-effectiveness.

Dr. Kaufman reports this approach reduces the application of solutions which are not relevant or well matched to the problems to be solved. It also reduces the incidence of "solutions in search of problems."

Systems analysis reduces guesses and hunches. Cost benefits for various modes of ITV use is being studied by Frank Robles.

Grass-roots TV includes dairy farming demonstration

What's Ahead for ITFS

By Thomas B. Petry

As conceived by the FCC, the ITFS channel allocations should have been a boon. Intsead, school systems are suffering from overcrowding in their TV allocations every bit as severe as their classroom crowding. The answer will lie ultimately in large-scale cooperative efforts and central pools for equipment, personnel and talent.

EDUCATIONAL INSTITUTIONS AND ORGANIZATIONS have a special TV allocation, officially designated Instructional Television Fixed Service. The ITFS covers some 31 channels in the 2500-to-2690 MHz range, as provided by the FCC in 1963.

The Service is defined as a "fixed station operated by an educational organization and used primarily for the transmission of visual and aural instruction, cultural and other types of educational material to one or more fixed receiving locations." The FCC limits the ITFS signal power to a relatively short distance from the transmitting site (5 to 20 miles), requiring the use of special equipment and a private distribution system to connect receiving points. ITFS transmission is neither a broadcast nor a closed-circuit cable system.

In 1963, the FCC opened 30 ITFS channels to qualified applicants. By July, 1967, more than 120 construction permit requests for over 330 ITFS channels were on file at the FCC. A study of the Los Angeles area alone revealed the need for over 600 ITFS channels. Similar needs can be cited in other parts of the country. In one region, the Central New York ITFS Committee has initiated a study of channel allocations, funding possibilities, and plans to start a pilot project to demonstrate ITFS use and application to area educators.

Thomas Petry is vice president and general manager of the ETV Council of Central New York, based at WCNY-TV, Syracuse, N.Y.

Critical Channel Shortage

The potential ITFS channel shortage is critical, since only 31 channels are available for a given area, with little likelihood that additional channels will be opened—although some channels may be re-used if the necessary technical limitations are taken into consideration. Educational broadcasters must face this problem with a program for careful technical planning and engineering of all ITFS proposals and applications. One approach is for all potential users to analyze eventual needs at all locations, grade levels, and subject areas and to initiate a joint search and application for ITFS assignments. The Central New York ITFS Committee is currently in this evaluation and "search" phase.

WCNY-TV is deeply concerned with the need for communications at all levels and increased teacher in-service training. Workshops, ITV associate programs, guest lectures by national authorities, a USOE Title XI, National Defense Education Act, summer institutes for educational media specialists, (emphasis on evaluation and utilization of television) to be conducted by Syracuse University, expansion of school participation at the Board, School Planning and ITV school representative committees—all are being used to stimulate awareness and greater interest.

Again, by careful screening and on-air previewing of ITV programs, the schools together with the staff have been able to maintain a high level of educational and production quality and to weed out inappropriate materials quickly. While local ITV productions have been relatively few (75 during the past year, with 20 in various stages of development), the emphasis here too has been on careful preparation, research and presentation.

Inadequate System

A recent study of ITV use in about 30 school

districts revealed: inadequate receiving facilities and conditions; lack of use; lack of preparation; lack of leadership; a general feeling that one-channel ITV broadcast is at best a compromise. As a result, high school, teacher training and special programs for advanced or slow learners, pupils with special interests or requiring skill development, have presented almost insuperable scheduling problems and have generally been avoided. Everyone agrees that the solution lies in applying a variety of technical, administrative, and educational remedies which may be beyond the reach of an individual school system. In an effort to surmount this impasse, an intensive evaluation of the various alternatives is underway by: the School Planning Committee; the WCNY-TV staff together with representatives from the New York State Education Department; the New York Bell Telephone Company; New Channels Corporation; General Electric Company; The State University of New York; and the Federal Communications Commission.

Initial planning has focused on a centralized 2500-MegaHertz transmission and production center to serve three major area school districts, Syracuse, North Syracuse and Liverpool. The ITFS Committee is now exploring the economic, technical, programming, production and administrative aspects of such a joint core facility.

The proposed facility would provide a maximum number of available 2500-MHz channels for exclusive or computerized shared use (depending on technical considerations). The broadcast type video tape recorders and necessary film and slide originating equipment, as well as the more sophisticated production equipment and studios would be shared by the participating school districts. It would be operated in conjunction with the existing community television facility WCNY-TV. This way, the already significant capital investment (close to $1,250,000), represented by channel 24 could be used as the nucleus for the new 2500-MHz channel. Expensive backup, replacement, and test equipment could be centralized and shared between the two (community and school) operations. Replacement and maintenance parts and tools and even personnel could be shared to reduce costs.

Greater Flexibility

The major breakthrough would be multi-channel capability with far greater programming flexibility than presently exists. The chief distinction would be that the 2500-MHz channels would be programmed directly by the user school district. Since channel 24, because of its community commitments, can provide only one channel with school program priority and during school hours only. This channel is shared by almost 30 school districts; it's limited in scope.

At present, all ITV programs must be accepted by a majority of teachers of member school districts. With "private" 2500-MHz channels, each channel can be programmed by a given district and tailormade service can be provided. By careful engineering and cooperation between districts, a maximum number of channels could be provided, and this is the major concern of the ITFS Committee.

Key to this proposal would be partial sharing of facilities and personnel within the core facility, which in turn would share resources with the community TV station. This would be much more economical and flexible than separate CCTV systems for each school district.

The plan would provide effective control, flexibility, and autonomy where it is most needed—in the programming area. Administration, transmission, and production facility pools would help economize. Other pooled facilities would include tape and film resources, screening, purchasing, personnel and facilities.

The number of quality tape and film ITV libraries and distribution centers, quite apart from existing ETV networks, is rapidly growing, as is the number of outstanding ITV materials. With major software manufacturers being established, the available programs will probably mushroom within the next few years. There is no reason why a pooled staff of professionals employed by the schools and the central ITV unit could not jointly research available programs to meet local needs, screen such programs, select and order them, and coordinate use of the various private channels whenever more than one district required a given series or program.

These proposals will not impede or replace plans that individual schools have for closed-circuit distribution and video tape recorders. In fact, such systems at the individual school level will become all the more important if maximum advantage is to be taken of the combination of ITV services.

Each school that is equipped with one or more video tape recorders can record programs: distributed via channel 24, the multi-channel ITFS service, the existing commercial stations. Teachers can also play tapes recorded in the core facility studio or in the studios of their own school district.

Hopefully, we can look forward to the day when a classroom will be equipped with a TV receiver that can draw on a great variety of ITV channels; a mini-recorder to record certain materials for playback and drill; a mini-CCTV camera unit for experiments, enlargements and microscopic transmission; interconnection from these to an internal distribution system which can draw on a variety of inputs from vhf and uhf broadcast channels, 2500-MHz channels, and elaborate distribution systems.

Whatever the outcome, the mere fact that so many institutions and agencies including the State Education Department, the Northeast Regional ITFS Committee, area BOCES, and Title III groups are making a very real effort toward eventual coordination, can only result in greater efficiency, less duplication of equipment and personnel, and hopefully, better education in the long run. **BM/E**

Instant Animation Brings

Aniforms operator works simple system of knobs and levers and talks into lavalier or boom microphone.

Usually prohibitively expensive, cartoon animation is possible on a slender budget with the Aniform process. Shows can be pretaped or even run live, with the cartoon character carrying on two-way conversations with the audience. It may be the answer for programs begging for a format.

CARTOON-TYPE ANIMATION is traditionally a prohibitively expensive commodity for the broadcaster—especially so for ETV operations. But there's always an element of involvement with cartoons that captures the immediate attention and interest of the viewer. Such a device offers a potentially excellent medium for ETV.

A possible answer to the cost problem is a new type of cartoon animation system. Called "Aniforms," the system can be used "live" or for pretaping instructional programs. The cartoon characters are hand-manipulated by simple controls, and educators can learn to operate them with relatively little instruction and practice.

Negative Picture

The Aniform character is basically two-dimensional, made of hinged elements and mounted on a black- felt-covered board. The cartoon character's mouth, eyes and body movements are controlled by several levers at the top of the board—out of sight of the TV camera. The image is negative (white outline on black) and is changed to a positive image by a polarity-reversing circuit. The reason for the negative image: the black background hides props and assistant's hands (in black gloves) as controls are moved into and out of the picture.

The operator talks into a lavalier or boom mike while manipulating the controls. With a little practice, it becomes easy for him (or her) to synchronize lip motion with speech. A small TV monitor screen is always close at hand so the operator can keep tabs on the action.

Aniforms have already had an auspicious television debut. Cartoon characters can be made in a variety of proprietary forms or can use well-known standard comic-strip personalities or trademarks. Bullwinkle the moose has held forth on a children's television show for several years. The electric power companies' Reddy Kilowatt has appeared in numerous spot commercials all over the country. Many other companies have used Aniforms in TV commercials, in sales meetings and at conventions.

Because the cartoons can operate live, Bullwinkle can carry on conversations with people watching the TV screen at a convention or other closed-circuit setup. This interaction is an excellent attention-getter, and has also been used successfully with the Cartoon Mobile—an Aniform installation on a pickup truck. TV screens outside the truck attract appreciative audiences in the street wherever the Cartoon Mobile goes. In New York City recently, the Uniformed Fire Officers Association used this truck to carry its message to children in ghetto areas. The cartoon character—a helmeted fireman named Mike the Faithful Fire Fighter—explained to ghetto residents that firemen were there to help them in emergencies and pointed out the dangers of false alarms and hostile acts against firemen. The Aniform process has not only won a wide degree of acceptance among commercial users, it's currently in use for a variety of instructional programs.

Learning to operate the system "is not as involved as it seems," says Aniform creator Morey Bunin. "It would probably take a good week's training to get somebody started. It's a question of practice and getting someone who has a feel for it."

Bunin feels that using a teacher as an operator isn't necessarily the best possible course. "Actually, I think you should use an actor, with a script written by the teacher. I think an actor can communicate much better. It's difficult to find teachers

Live Cartoons to TV

who both know their subject and can compete with the outside entertainment world. To use a teacher in this, you have to find one with a lot of ham in him, and that's what you need—somebody who's an outgoing type and who can put the necessary drama and show-business knowhow into teaching."

Mobile Units for Hire

Bunin explains, "We have three mobile units right now that we have franchised out to the Boy Scouts, a drug-addiction group and the League of Women Voters. These trucks have all the equipment on them—a television screen on the side, a slide screen for color slides. They can run up to a neighborhood; a cartoon character attracts the people and talks to them. It's a two-way conversation with the cartoon character. The technique's extremely effective on the street."

The cartoon characters are often bilingual; in Spanish-speaking neighborhoods, the cartoon must speak Spanish or whatever the local language is.

Color Being Tested

While most Aniforms are suitable only for monochrome at this point, Bunin indicates that some experimental work is being done in developing color cartoon characters. The reversed-polarity technique can be used here too, and color originals would use complementary colors. Again, the background would be black, permitting easier character manipulation. Some experimental work has been done at NBC along these lines. The complementary colors are exactly the same as those appearing in a photographic color negative film, and such film is used as the starting point in designing a new color character.

Bunin feels that a color character isn't that important in the educational field right now. He believes that, "The fantasy figure of a cartoon doesn't have to be in color. In fact, in the University of Arizona program, the cartoon is being used in a color show. The only part that's not in color is the cartoon itself, but the rest is an all-color show, and the viewer doesn't even notice."

The Cost Factor

The Aniform cartoon brings animation within the financial reach of most educational broadcasters and can be a major cornerstone of broad instructional programs. Actively engaged in animated tape production, the Radio-TV Bureau of the University of Arizona is using the Aniform process. A far-reaching program of English instruction for Mexican-Americans is being produced under contract for the Southwest Cooperative Educational Laboratory—funded by the Division of Adult Education, U.S. Office of Education.

Used in University of Arizona's English language program for Mexican - Americans, **el bocaton** is an old-fashioned gramophone with human traits.

Material at the University is all put on videotape, and production personnel are still working at the experimental level. As explained by Executive Producer Marvin Duckler, the material must be oriented to a non-academic group—a group that has little or no motivation and might not be at all interested in attending a conventional class. "We're in competition with commercial TV programs," says Duckler, "and we must meet that competition." Once a sufficient number of programs is ready for use, the material will be used on both educational and commercial TV stations.

Three cartoon characters are being used in the Arizona taping sessions. "One of them is called *el bocaton,* which in Spanish implies 'big-mouth.' " Bunin explains. "This is an old-fashioned gramophone with a very large horn. The large horn is the mouth that articulates the words, and it's very amusing. Another is *el profesor,* a professor who talks to the teacher about the lesson surprises of the day. The third is *el colonel*—an authority figure and signal device.

"They're using the Aniform figures to vary the lesson format by inserting humor to enrich the otherwise monotonous drill sequences. I think that Europeans and Spanish-speaking people tend to relate very well to a fantasy figure, possibly even faster than we do here."

Dr. Guido Capponi, the University's project coordinator, feels that the taped programs won't be ready for general use until after February, 1970. "The programs are in 30-minute segments," he explains, "and involve a lot of research, evaluation and other needed spadework.

"The whole idea," Dr. Capponi explains, "is to use Aniforms for both pedagogical and entertainment impact. Aniforms act as a teaching vehicle. We also try to integrate the Aniforms with real-life situations." If the production time per half-hour program seems over-long, try to imagine how long it would take using conventional animation techniques! **BM/E**

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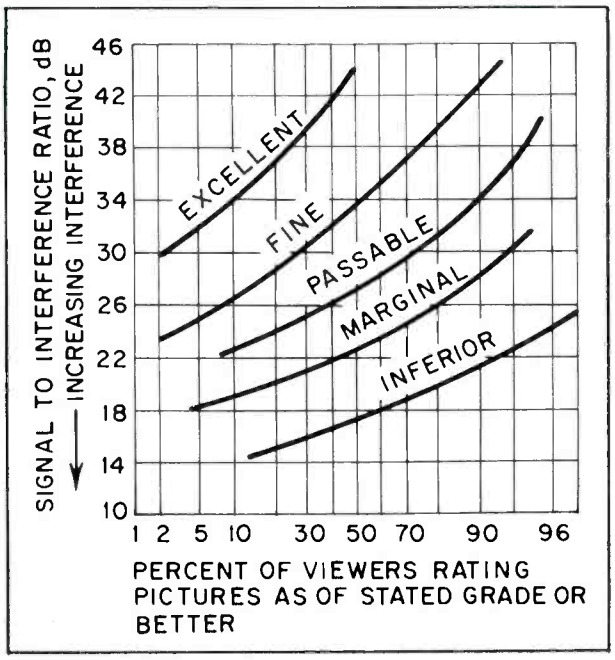
Choosing the Right

Picking through the incredible morass of incomplete and difficult-to-compare spec sheets can be a major headache for the CATV operator. Here are some guidelines for interpreting the data on those spec sheets. Specific types and models will be discussed in Part II next month.

Test results for grading picture quality "Fine" grade is excellent in most cable TV systems.



TRUNKLINE AMPLIFIERS in a cable TV system have the responsibility of transporting complex video signals without distortion and at suitable levels for distribution to subscriber sets.

The advent of solid-state amplifiers, now standard in the industry, has made this job easier. The main advantages of solid-state amplifiers: they're reliable, and can easily be cable powered. With a dozen or so manufacturers offering a wide variety of equipment, it's difficult to choose the right amplifiers for each specific CATV system.

Amplifier Criteria

Choosing a CATV amplifier intelligently demands understanding of the significance and the interrelationships behind the specifications. The major factors to be considered include: signal-to-noise ratio, distortion, cascadability, 20-channel capability, tilt and slope, automatic gain control.

Signal-to-noise ratio. As the term implies, the signal-to-noise ratio (SNR) is the ratio between the picture carrier rms signal (at sync tips) to rms noise (at 70°F) measured across a 4-MHz bandwidth. Several things determine SNR, including:

- The amount of signal and galactic noise picked up by the antenna.
- The noise contributed by the head end.
- The noise generated within the CATV plant.
- The noise generated by the TV receiver.

The SNR picked up at the antenna can never be improved upon. When you amplify signal, you amplify the noise just as much, and every amplifier adds its own noise.

Amplifiers do help, though. They keep the signal level high enough so equipment-generated noise is relatively insignificant.

The signal-to-noise ratio is far more important than the signal level sent to a TV receiver. Most sets will display an equally good picture whether they get a 1000 microvolt signal or a 10,000 microvolt signal because of their automatic gain controls. A poor SNR will result in a "snowy" picture (noise shows up on the TV screen as white dots) no matter how high the signal level is.

The aim of a CATV system is to deliver excellent pictures to all subscribers—but how good is excellent? To answer this question, the Television Allocations Study Organization (TASO) tested individual reactions to pictures produced by various signal-to-noise ratios. TASO used a five-grade scale to rate picture quality:

1. **Excellent**—Picture is of extremely high quality, as good as you could desire.
2. **Fine** —Picture is of high quality

CATV Amplifiers—Part I

providing enjoyable viewing. Interference is perceptible.

3. **Passable** —Picture is of acceptable quality. Interference is not objectionable.
4. **Marginal**—Picture is poor in quality and you wish you could improve it. Interference is somewhat objectionable.
5. **Inferior** —Picture is very poor but you could watch it. Definitely objectionable interference is present.

Based on subjective tests, TASO Grade 2 (Fine) pictures are what most CATV subscribers would describe as excellent. The CATV system that can deliver TASO Grade 2 pictures to the poorest receiver at the worst location is excellent indeed. It takes an SNR of about 34 dB for half the subscribers to rate a picture as "Fine," and an SNR of almost 43 dB for 90 percent of the subscribers to rate the picture "Fine."

Naturally, the less noise a CATV plant adds relative to gain, the higher a signal-to-noise ratio it will produce. The amount of noise added by a CATV trunk line is determined primarily by the amount of noise added by each individual amplifier. This factor is specified by the *noise figure* of the amplifier. The noise figure of any unit is a comparison of how much noise the unit generates than does an ordinary 75-ohm resistor across a 75-ohm line. The electrons in any resistor move around, causing themionic noise. The higher the temperature, the faster the movement and the greater the noise. The amount of noise caused by this 75-ohm resistor is the reference point, designated as 0 dB. If an amplifier causes twice as much noise as a 75-ohm resistor, its noise figure is specified as 6 dB (6 dB$=2\times$ voltage).

Noise figures are always higher at the higher channels. A TV receiver itself generally has a noise figure ranging between 4.5 dB and 10 dB for the vhf low band, and 6.5 to 12 dB for the vhf high band. A good mast-mounted solid-state preamplifier may have a noise figure of 4 dB (low vhf band) and 6 dB (high vhf band). The noise figure of a good CATV trunkline amplifier will generally run about 8 dB (low vhf band) and 9 dB (high vhf band).

Fortunately, the noise figure of a complete trunkline is not the sum of the noise figures of all the amplifiers in cascade. Rather, the noise figure increases by only 3 dB every time the number of amplifiers in cascade doubles. Thus, the noise figure of two 9-dB amplifiers in cascade is 12 dB, while four such amplifiers have a 15-dB n.f., eight will produce 18-dB noise. Similarly, the system signal-to-noise ratio decreases by 3 dB each time the number of amplifiers in cascade is doubled.

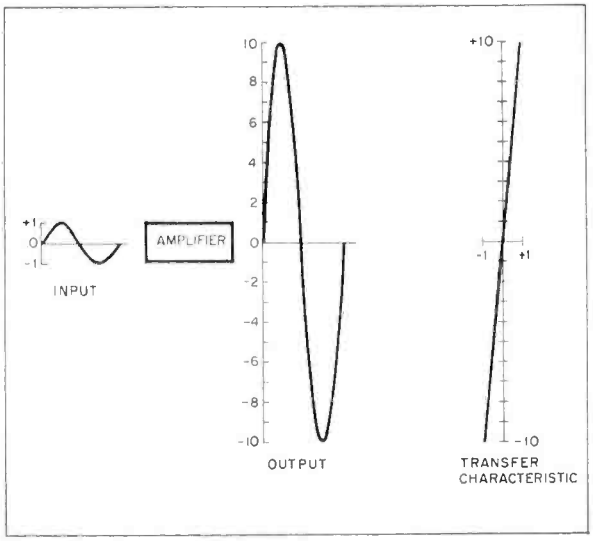
To a great extent, the noise figure of a CATV trunkline determines its input capability. The lower the noise figure of the amplifier, the less signal you can safely feed it.

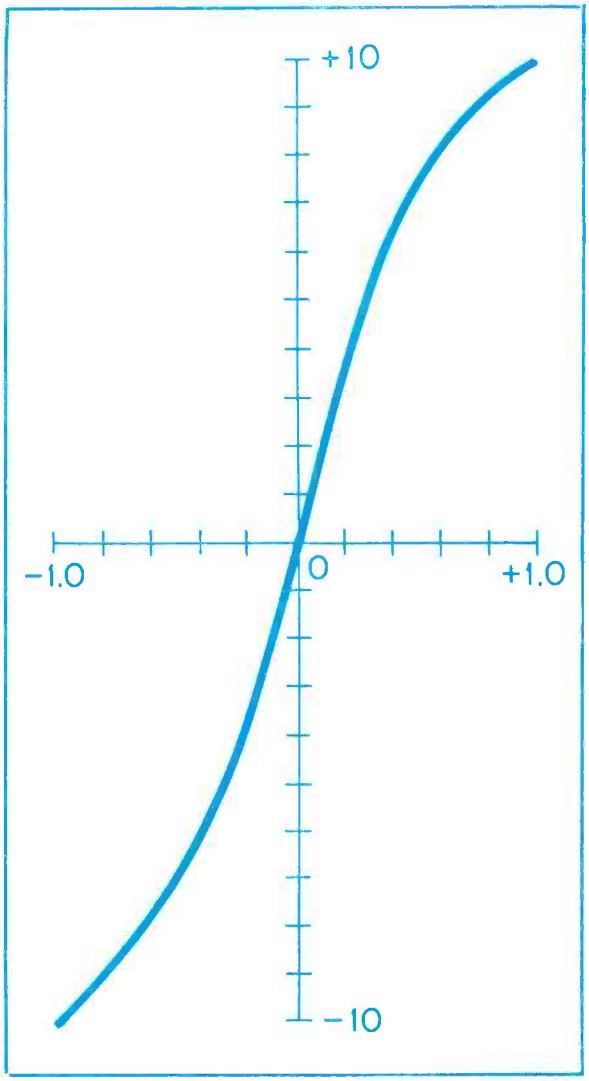
Distortion. The output capability of an amplifier, on the other hand, is inseparably related to the amount of distortion it causes. The perfect amplifier would cause no distortion. It would simply make the signal stronger, without changing it or adding to it in any way. In distortionless amplification, the output voltage at any instant is exactly "n" times the input voltage, where n is the amplification factor. The transfer characteristic, when graphed, is a plot of input voltage against output voltage, and is a straight line.

Unfortunately, no amplifying device on the market today provides a straight-line transfer characteristic. Instead, the plot is a curve, with a linear center section. The curves at the extremities result in distortion. The output of such an amplifier would have the peaks rounded off. The output of such an amplifier would not only be bigger than the input, it would be different. If the signal is kept to a low level, the output will be quite similar in shape to the input. Thus, the more signal we try to get out of an amplifier, the more distortion it will cause.

It's possible to operate on a different portion of the transfer characteristic curve. If we vary the input around −0.5 dB instead of 0, only the bottom half

Distortionless amplification—the ideal in which output signal is always exact'y 10 times the input.





Nonlinear transfer characteristic typical of most amplifying devices—unlike the straightline graph on page 59.

of the output curve would be flattened.

For many years, CATV equipment manufacturers have been specifying their amplifiers in terms of output capability vs distortion. A typical specification might read:

> OUTPUT CAPABILITY: 50 dBmV per channel for 12-channel operation, for −57 dB cross-modulation distortion.

The NCTA, however, feels that "The concept of output capability appears to be obsolete and limited in applicability."

The NCTA has proposed a standard form for specifying distortion:

> .....% (−.....dB) cross-modulation ratio, and .....% (−.....dB) spurious signal ratio under the following manufacturer's recommended operating conditions:
>
> a. output level: ..... dBmV
> b. Number of standard TV channels: ....
> c. Output tilt (describe). .....
> d. Amplifier slope:.....
> e. Amplifier gain: .....

This is a rather definitive way to describe an amplifier. Unfortunately, no CATV manufacturer has yet seen fit to adopt the NCTA standard, but hopefully all will do so at some time in the near future. When this happens, it'll be much easier for the prospective buyer to compare amplifiers intelligently.

In the meantime, an understanding of the reasoning behind the NCTA proposed standard will help us to compare amplifiers as they are currently specified.

The NCTA recognizes two forms of distortion as acting to limit the useful output of a CATV amplifier:

- Cross-modulation—the transfer of modulation from one channel to another.
- Spurious signals—Signals occurring within any of the test channels at frequencies differing from the frequencies of the test channels.

Cross-modulation is closely involved with second- and third-order distortion. Second-order distortion is so called because the equation describing it includes the input voltage raised to the second power. A spectrum analyzer can break up a second-order distortion into three components:

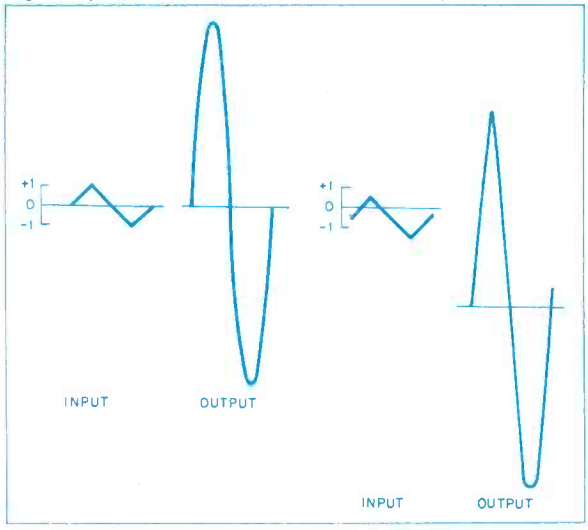
- The fundamental frequency.
- The second harmonic of the fundamental frequency plus sum and difference beats between voice carriers.
- A dc component.

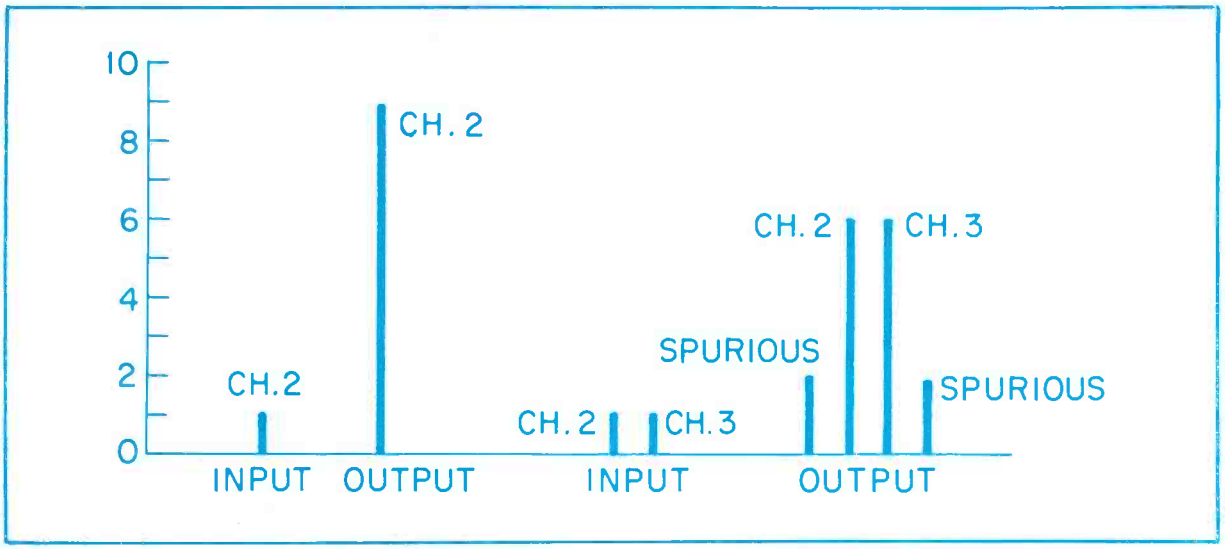
Naturally, the fundamental and dc components cause no problems. But surprisingly, the second harmonic frequency causes no distortion in a conventional CATV system either. This is because none of the second order frequencies falls within any channel allocated by the FCC. If you double the picture and sound carriers of channels 2 through 6, you'll find that all the second harmonics fall between 110.5 and 175.5 MHz. The only one that causes any trouble at all is channel 6 aural, whose second harmonic (175.5 MHz) falls within channel 7's fundamental bandwidth. Since sound carriers are generally attenuated to at least 15 dB below picture carriers in any CATV system, the interference caused here is negligible.

The difference frequencies between the low-band frequencies falls below channel 2 and the sum frequencies fall in the midband. Similarly, the second harmonics and the sum frequencies of the high band channels fall above channel 13, and the difference frequencies all fall in the midband.

This is not just a happy coincidence. It happened

Left curve shows how nonlinear amplifier rounds peaks. If amplifier operates on different part of transfer curve, only negative peak will be rounded as shown at right.





Spurious signals/on both sides appear of channel 2 and 3 fundamentals.

because the FCC, in its wisdom, made the vhf low band and high bands each less than an octave wide, and separated them by more than an octave. Thus, second-order harmonics cause virtually no distortion in 12-channel CATV systems.

Third-Order Distortion

This brings us to the problem of third-order distortion. This is the type of distortion where both signal peaks are flattened. The equation describing it includes the input voltage raised to the third power and the interfering frequencies generated are the third harmonic of the input frequency.

Unfortunately, when low vhf band picture carriers are multiplied by three, the resulting frequencies are smack dab in the middle of the vhf high band. These spurious third-harmonic signals cause trouble, but not nearly as much trouble as another effect of third-order distortion—cross-modulation.

Cross-modulation is important because its effect can be seen on a TV screen before the effect of spurious third-harmonic signals. If a given CATV amplifier causes perceptible cross-modulation distortion on the TV screen at 60 dBmV output, it won't show third-harmonic spurious signal distortion on the screen until the output is increased. Thus, cross-modulation is a limiting factor.

TV picture carriers are relatively close in frequency. If we send channel 2 alone through an amplifier with very poor third-order distortion characteristics, the gain should increase the channel 2 signal by a factor of 10, but it actually increases it only by 9. This is called compression.

Compression generally causes no difficulty in broadband amplifiers, since cross-modulation occurs so much sooner. However, if single-channel head-end amplifiers are driven too far, this effect causes flattening of the sync pulses and is known as sync compression.

If we send channels 2 and 3 through the same amplifier, the output signals are decreased significantly (to about 6 times the input signals) and two spurious signals are produced. This is cross-modulation.

The proposed NCTA specifications include a method for measuring cross modulation. Essentially, they call for a measurement of the amplitude of each video carrier. The carrier is measured unmodulated and with all other video carriers turned off. Then, the other carriers are turned on and each is modulated by a 15-kHz signal.

The letter "b" is used to represent the amplitude of the unmodulated video carrier with all other carriers turned off and the letter "a" is used for the amplitude variation caused by turning on the other 15-kHz modulated carriers. Using this method, cross-modulation can be expressed either as a percentage (%CM—cross-modulation—=100 a/b) or in decibels (CM in dB=20 $\log_{10}$ a/b).

Cascadability. How many of a given type of amplifier can you cascade and still get good pictures at the end of the line? This is a lot like asking "How hi is fi?" The answer depends not only on the characteristics of the amplifier, but on their spacing, the cable used, and most important, how bad a picture your subscribers are willing to accept.

Unfortunately, CATV equipment manufacturers have been playing the game of cascadability in much the same way that hi-fi manufacturers have played the game of wattage. With no industry standards of system performance or amplifier specifications, some manufacturers have simply tried to claim more than their competitor's claim.

Cascadability is important only in the long CATV system, but manufacturers have made it a selling point because CATV systems are getting longer. Also, greater cascadability makes it easier to add on to a system as the population of the area, or an adjacent area, grows.

Cascadability is determined by a number of other factors including SNR, cross-modulation and flatness. All but one manufacturer today spaces amplifiers at about 22 dB of loss, in large systems and small. This simplifies CATV system design. However, you can cascade more amplifiers if you space them more closely.

You can take a CATV trunkline the longest possible distance at given distortion levels if you space them at about 8.5 dB. This method uses a lot more amplifiers per mile, but you can cascade quite a few amplifiers if you space them that closely. Some manufacturers specify how closely the amplifiers are to be spaced, while others do not. Also, some manufacturers specify theoretical cascadability,

while others specify only the number they have actually been able to cascade in a controlled test or an actual CATV system.

20-channel capability. The CATV industry has been increasing the number of channels offered to subscribers steadily throughout its history. For a long time, 12-channel systems were thought to be the ultimate step in this evolution, since there are only 12 vhf channels. But 12-channel systems had hardly become a reality when talk began of expanding to more channels. Some manufacturers talk about 18 channels, others talk about 24, but 20 channels seems to be the approximate goal at this point.

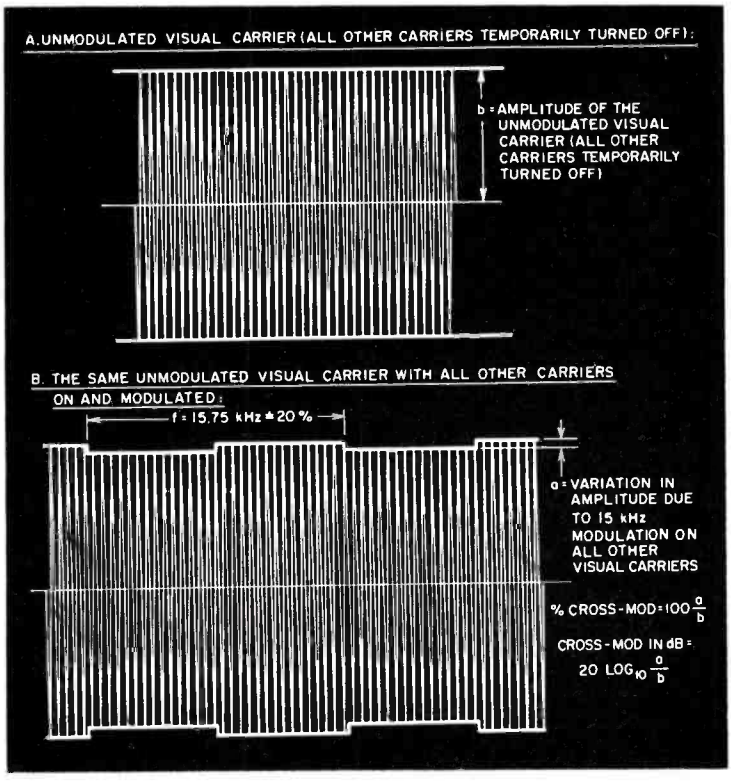
Extra-channel capability is important to the buyer of CATV equipment because it's hard to predict just what systems will carry in the future. One of the real problems is that the industry as a whole can't decide where to go or how.

The CATV industry, like the videotape recording industry, is in a state of chaos because of lack of standardization. Each manufacturer proposes his own system. The major types of 20-channel systems proposed include:

- Midband Method—using the spectrum between 108 MHz and 174 MHz. It has the advantage of using the same amplifier spacing as current 12-channel systems, but is subject to second-order distortion. Thirty-two-amplifier systems have been operated in which the second harmonic beat frequency is well below the visible threshold.
- The Ultra-Vhf Method—using spectrum above channel 13, generally 220 to 270 MHz. Less second-order distortion problems, but since cable attenuates high frequencies more, spacing between amplifiers would have to be reduced.
- Two-Cable Method—few interference problems, but costly and requires double maintainance.
- Combinations of the first and second methods.

Some manufacturers say it's best to install amplifiers with 20-channel capability right away, to be prepared for the future. Others say it's cheaper to install 12-channel amplifiers now and replace them with 20-channel units when required.

Unmodulated carrier (below) and modulated rf (bottom) as used in new NCTA spec for measuring cross-modulation.



Automatic gain control. There are almost as many automatic gain control (agc) systems as there are 20-channel systems. Fortunately, each agc works only with the equipment for which it is designed.

Since the CATV system head end keeps all signals constant and balanced, why do we need agc in the trunkline? The answer is that cable attenuation varies with temperature. During the course of the year, temperatures may change very little in Los Angeles or by a great deal in Fairbanks, Alaska. Attenuation increases by 0.1 percent for each 1°F increase in temperature and decreases by 0.1 percent for each 10°F decrease in temperature. Thus, the system set for 22 dB spacing at 70°F will actually have only a 20.6 dB spacing at 0°F.

In addition to an attenuation changes at channel 13 (the channel at which attenuation is generally specified) there is also a change in the slope caused by the cable. The agc compensates for these factors.

An agc system may be open-loop, closed-loop, or a combination of both. Open-loop systems use thermal sensors. These units detect the change in temperature and cause a change in attenuation equal and opposite to the change expected in cable attenuation. But if the thermal sensor is in the shade and most of the cable is in the sun, compensation may be incomplete.

Closed-loop systems don't make any assumptions. They sample the input or output of the amplifier and adjust gain accordingly. Some agc units sample a TV channel, while others work from pilot carriers generated at the head end.

Many industry experts feel that the best CATV systems sample two signals simultaneously, one in the low vhf band and one in the high vhf band. The two signals then provide separate gain control of high- and low-band channels. Thus, the agc can compensate accurately for slope changes as well as changes in overall attenuation.

Tilt and slope. As the recently amended NCTA standard points out, the terms "tilt" and "slope" Here are the definitions offered by the NCTA:

> *Tilt* refers to the actual signal levels from channel to channel.
>
> *Slope* refers to amplifier gain from channel to channel. Cable attenuation can be considered to be "negative gain." Thus trunk amplifiers will normally have positive slope equal in magnitude to the negative slope of the associated span.

Suppose we send channels 2 through 13 through a given length of cable, and channel 13 is attenuated 10 dB more than channel 2. The signal level at the end of the cable is "tilted" by 10 dB. On the other hand, the "slope" of that particular cable is −10 dB. It's the −10-dB slope of the cable that caused the 10-dB tilt in output signal levels. To overcome this tilt, we'd use an amplifier with +10-dB slope. To remember the distinction between slope and tilt, think of slope as the cause and tilt as the effect.

The slope of a given amplifier is easy for the design engineer to change, and in some cases, slope can be adjusted in the field. The sole purpose of amplifier slope is to compensate for the slope of the cable between amplifiers. **BM/E**

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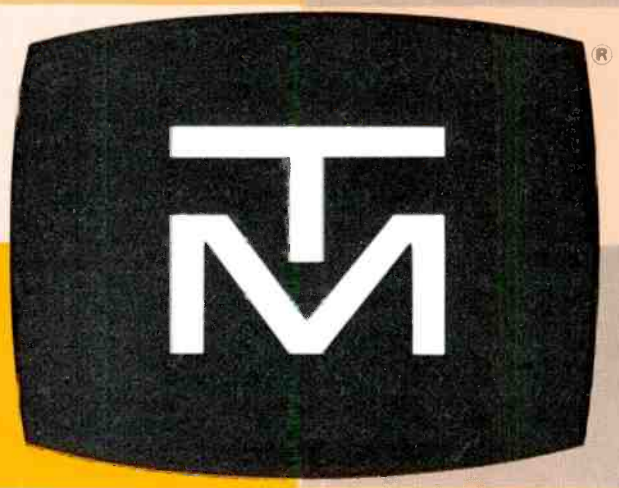
PORTA-SYNC™ EIA Generators			MULTICASTER™ Video Control Center
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College ETV . . .

Continued from page 51

instructor is given four-fifths' release time during the semester the material is produced and two-fifths' release time for the first and any subsequent semesters the material is used.

—material submitted by **Jacob H. Wiens,** Director, College of the Air

Variety in California

A Broadcast Service Center helps instructors and students to take advantage of TV.

THE BROADCAST SERVICE CENTER at California State College, Los Angeles, produces telecourses, enrichment modules for individual instructors, student self-evaluation videotapes and educational television programs for airing on broadcast stations.

At the present time three telecourses are in production: Physiological Psychology, Fluid Mechanics, and Psychological Foundations of Education. During 1967-68, 36 faculty members and 862 students used the television facilities for enrichment purposes, and 56 half-hour ETV programs were produced.

All individual uses of television, whether in terms of a telecourse or merely a series of five-minute speeches by students for our basic speech course, begin with a "felt need." Faculty members use TV because they *want to*, it helps to solve instructional problems that have been difficult to overcome in a regular classroom situation. The concept of "using the medium as it can best be used" is stressed in all contacts with faculty.

An example of taking advantage of television's unique characteristics is found in our college's Department of Guidance activities. Fourteen 3-hour production sessions were devoted to counseling Mexican-American high school dropouts. The sessions involved intensive discussions about the problems faced by these former students, and they were able to see their reactions played back via videotape. The ability of the medium to show faces and physical reactions closeup was very beneficial to the participants. A one-hour tape condensation of these sessions, with post-recorded narration, is being made for future instructional use. Even though the tape will be used as "enrichment" and not as part of a telecourse, the faculty users believe it is the best way to communicate the desired information. This particular use of TV also illustrates our continual involvement in ITV serving more than one purpose.

Our television operation is caught between the same two opposing forces that confront most ITV operations: the desire to improve the quality of instruction and the need to show cost savings of instruction. At Cal State, L.A., we try to do both. It is fairly easy to accomplish the first when faculty and producers are experienced.

It is very difficult to accomplish the second: television is expensive, and it is only with many large, multiple-section telecourses that savings can be realized. However, we believe that the need to save money should never mean that quality of instruction be sacrificed. Every production session in the studio must take advantage of what television can offer. Any other approach, we believe, is death to ITV. **BM/E**

—material supplied by **Donel W. Price,** Director, Broadcast Service Center

What ETVers Are Doing

As part of an industry-wide survey, **BM/E** polled some 115 ETV stations currently on the air in the U.S. At press time, 60 replies were in. Here's what they had to say.

Equipment breakdown was varied. Cameras were evenly spread, with 9 stations working with 1 or 2 units, 18 stations with 3 or 4, 14 stations with 5 or 6, and 20 stations more than 6 cameras. 15 stations have 1 or 2 VTRs, 45 have more than 2; 39 have 1 or 2 film/side chains, while 21 have more than 2 chains. Of the stations polled, 13 are now colorcasting, 3 have an affiliated a-m operation, 21 have an fm outlet, 4 are broadcasting fm stereo, and 1 is carrying an SCA channel.

Just 26 have received contributions of equipment (mostly tax-deductable hand-me-downs from commercial broadcasters) and 27 have mobile vans. Of these, 15 double-duty their van equipment by using it in the studio. To maximize effective equipment use, 22 stations rent or borrow gear, while 31 stations rent out their own faciliites from time to time. It seems few ETVers are completely satisfied with their current setups, and 44 respondents plan to upgrade with new equipment within the next year.

Nine stations indicated they have 1 to 10 permanent salaried personnel, 13 have 11 to 20, 23 have 21 to 40 and 12 have more than 40. Part-time personnel fared best with the smaller stations—33 stations have 1 to 10 part-timers, 11 have 11 to 20, 6 have 21 to 40 and 2 have more than 40. Nonsalaried student personnel work in 31 of the responding stations.

Virtually all respondents wanted to expand their broadcast schedules, and all of them have been restricted in this because of lack of funds. Actual hours of instructional programming: 5 stations, 1 to 2 hours per day; 5 stations from 3 to 4 hours, 18 carry 5 to 6 hours and 26 do more than 6 hours instructional broadcasting per day. Public programming per day: 4 stations, 1 to 2 hours; 10 stations, 3 to 4 hours; 19 stations, 5-6 hours and 22 carry more than 6 hours daily. In spite of the financial squeeze, 43 stations replied that they do in fact plan to expand their programming.

On the financial side, principal income sources stated were: grants, 15 stations; universities, 10; state government, 22; local government, 6; school systems, 17. Soliciting public contributions was cited as another income source by 27 stations, while 25 are aided by commercial TV broadcasters. Some operating costs are defrayed by having certain programs underwritten, and this is done by 11 ETVers.

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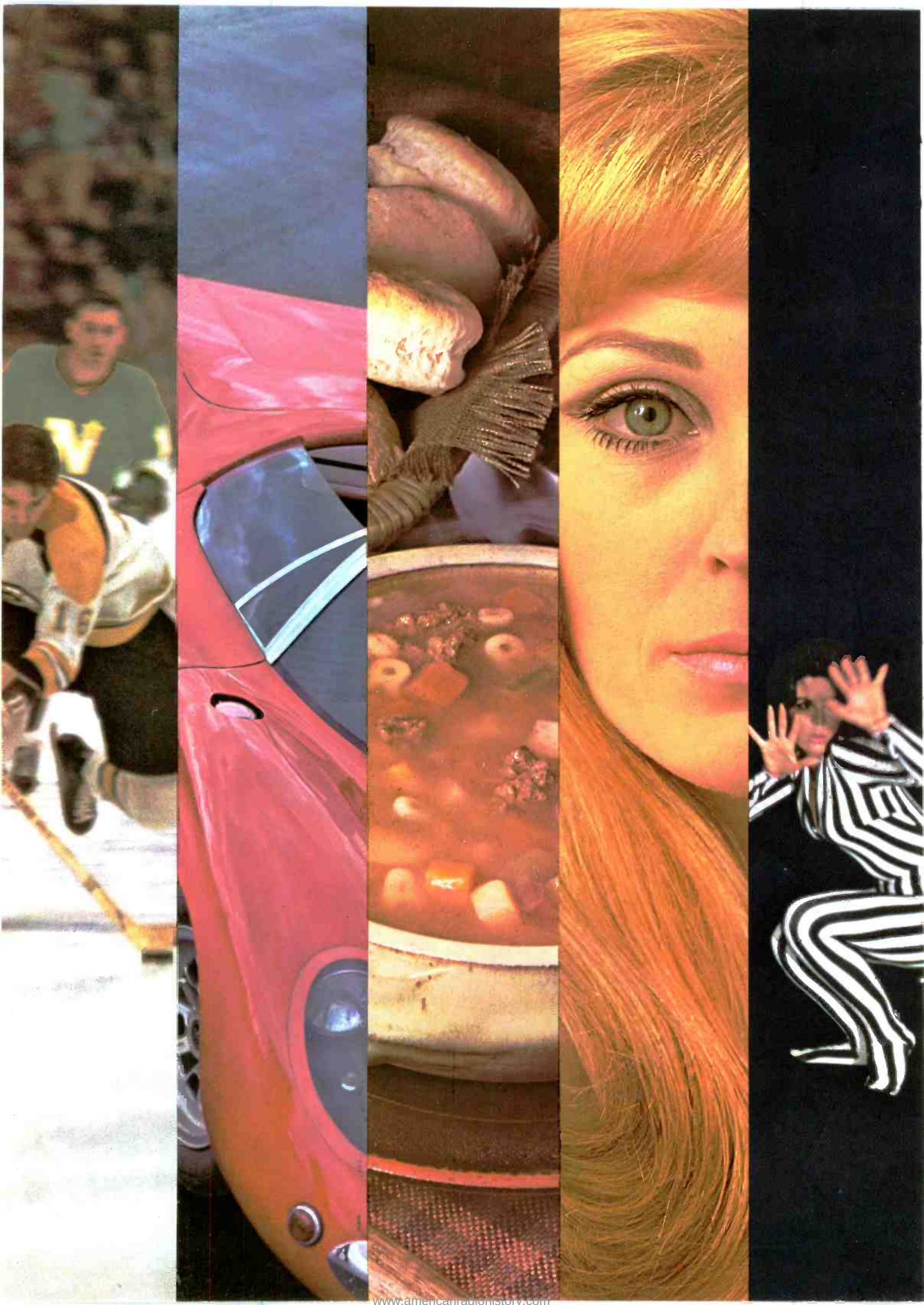

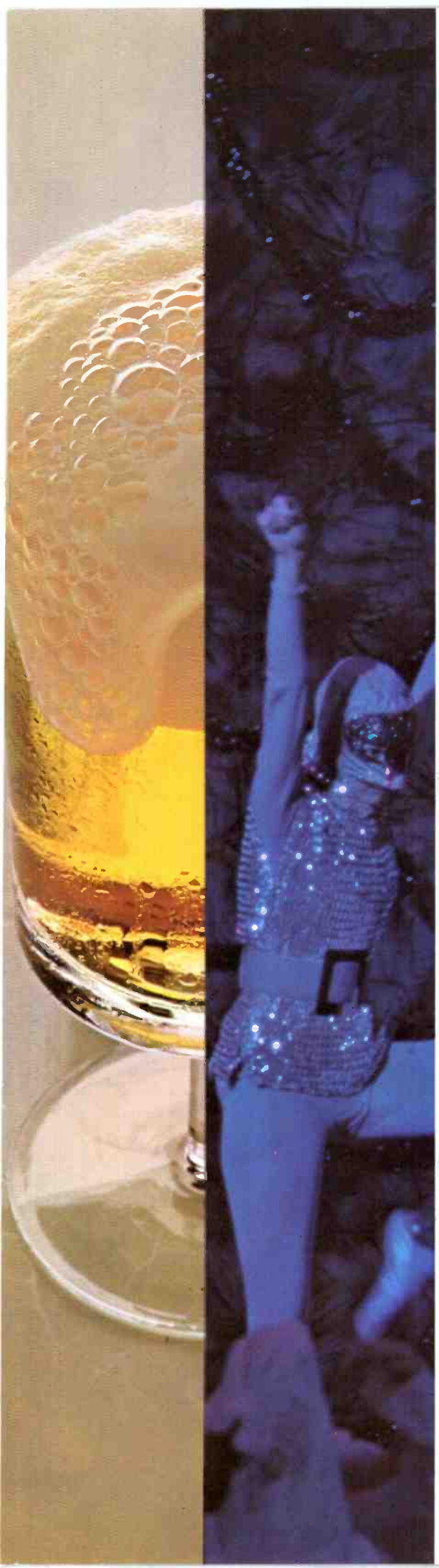

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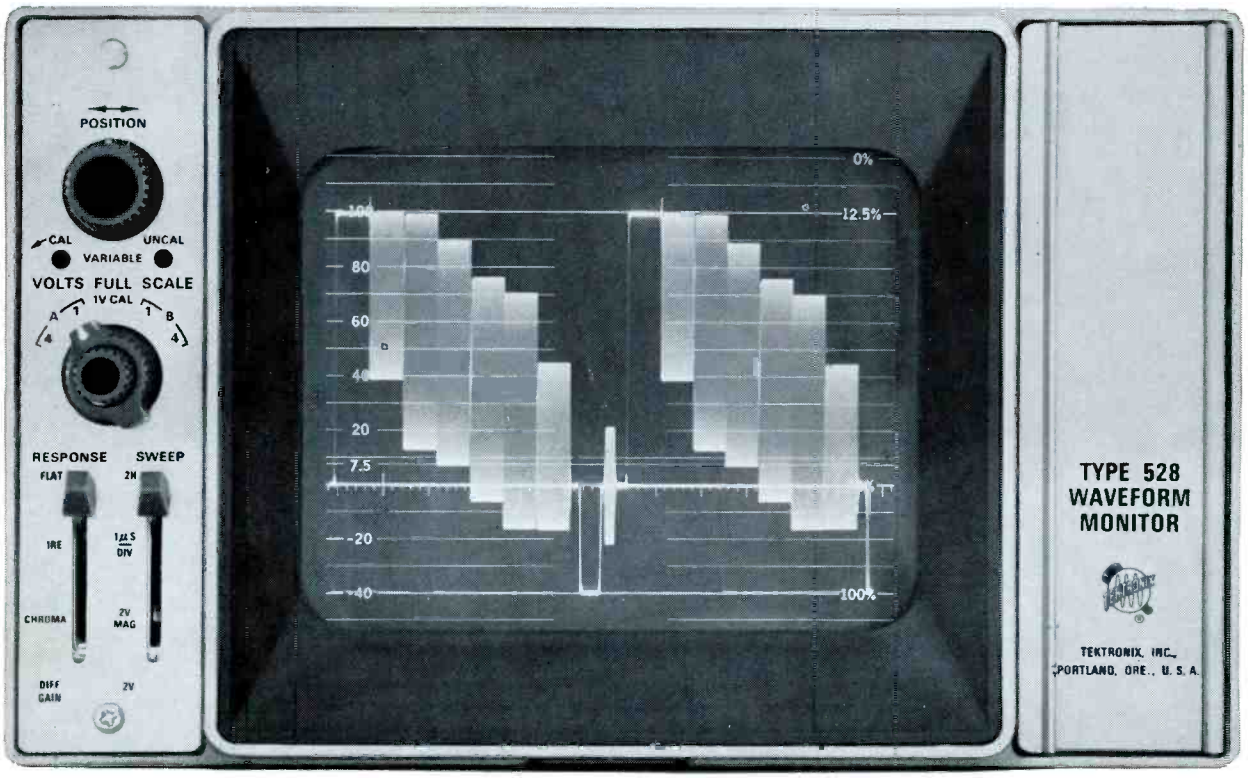
NEW television waveform monitor



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BROADCAST EQUIPMENT

At press time, in excess of 70 broadcast equipment manufacturers have indicated they will exhibit their products at the 44th annual National Association of Educational Broadcasters Convention at Washington, D.C.'s Sheraton Park Hotel, November 19-22. The list of those attending appears below. Descriptions of portions of the exhibits and equipment to be demonstrated at the NAEB Convention are presented in this section together with the regular new product reports. Company-name headlines indicate NAEB Convention products.

Albion Optical Co.
Alma Engineering, Inc.
American Telephone & Telegraph
Ampex Corp.
Audio-Video Industries, Inc.
Ball Brothers Research Corp.
Bell & Howell Co.
Bardwell & McAlister, Inc.
Berkey-ColorTran Co., Inc.
Borg-Warner/Ingersoll Products
Boston Insulated Wire & Cable
Canon USA, Inc.
CBS Labs
Central Dynamics Corp.
Century Lighting, Inc.
Cleveland Orchestra Syndication Service
Collins Radio Co.
Communications Satellite Corp.
Conrac Div., Conrac Corp.
Davis & Sanford Co., Inc.
Diamond Power Specialty Corp.
Dynair Electronics, Inc.
Eastman Kodak Co.
Educational Instructional Broadcasting
Educational Television
Electronics, Missiles & Communications
Encyclopaedia Britannica
Gates Radio Co.
GBC Closed Circuit TV Corp.
General Electric Co., Visual Communications Dept.
GPL Div., General Precision Systems, Inc.
The Grass Valley Group, Inc.
Great Plains National Instructional Television Library
International Video Corp.
Jamieson Film Co.
Jerrold Electronics Corp.
Kalart Co., Telebeam Div.
Kliegl Bros.
Listec Television Equipment Corp.
Manufacturers Sales Distributors Assn.
Memorex Corp.
Micro-Link Systems
Microwave Associates, Inc.
3M Co.
MTI, Div. KMS Industries, Inc.
D. B. Milliken
National Aeronautics and Space Administration
National Instructional Television
Packard-Bell Electronics Corp.
Panasonic Video, VTR Special Products Div.
Philips Broadcast Equipment Corp.
QTV Sales & Distributing Corp.
Quick-Set, Inc.
RCA, Broadcast & Communications
Raytheon Learning Systems Co.
Reynolds Printasign Co.
Jack A. Rickel Associates, Inc.
Sarkes Tarzian, Inc.
Service Master Communications, Inc.
Shibaden Corp.
Shure Brothers, Inc.
Sony Corp. of America, Industrial Div.
Sylvania Electric Products, Inc.
Sylvania Commercial Electronics Div.
Technical Materiel Corp.
Tele-Cine Co.
TeleMation, Inc.
Telemet Co.
Telesync Corp.
Television Digest, Inc.
Tracor, Inc.
Technical Literature Exhibits
U.S. Army Command Teleradio Branch Information Unit
Vikoa, Inc.
Visual Dynamics Educational Film Library
Visual Electronics Corp.
Vital Industries, Inc.
WTTW Recording Services
Western Video Industries, Inc.
World Video, Inc.

NAEB: Ampex Corporation

The Ampex display will be in two parts. Features on the exhibit floor will be one or two BC-200 studio color cameras. The BC-200's will feed pictures to a 40-foot mobile van parked outside the exhibit hall,

Ampex BC-200 color broadcast camera.

which will house a HS-100 slow motion recorder, a VR-1200B high band color videotape recorder, a VR-3000 back-pack high band color videotape recorder and companion BC-300 monochrome camera, BC-200 camera control units, VR-7800 and VR-7500 closed-circuit VTRs. Also in the van will be a series of audio recorders, including the AG-440, AG-500 and AG-600, plus AA-620 speaker/amplifiers and AM-10 mixers. Also featured will be Ampex 161 Series 1-in.-wide CCTV tape, Ampex transmitters and translators (formerly made by Townsend).

Circle 100 on Reader Service Card

NAEB: Century Lighting

Century Lighting is showing a 1000-W tungsten-halogen Fresnel

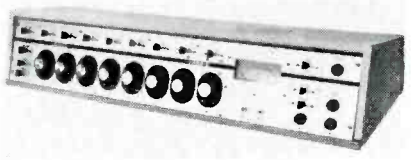
Century 1000-W tungsten-halogen lamp.

lamp with a completely new optical system with efficiencies up to 60 percent. Memo-Q—a new "infinite" preset lighting control—will be demonstrated. Memo-Q uses all solid-state memory cores for storage of lighting cues with instant retrieval. In addition, a complete line of tungsten-halogen studio lighting equipment will be on display.

Circle 101 on Reader Service Card

NAEB: Gates Radio Company

Gates is previewing Yard II—an eight-channel solid-state console, just



Gates Yard II 8-channel console.

a yard wide. Yard II offers 12 inputs to 8 mixing channels. The eight mixing channels are in the center of the board with the meter to the right, along with master, monitor and cue controls. A duplicate of the automation system supplied by Gates to the Indianapolis School District will be demonstrated. The Gates FM-20H 20-kW transmitter, a complete line of fm monitors with the type-approved SCA modulation monitor and an operating TE-1 exciter display

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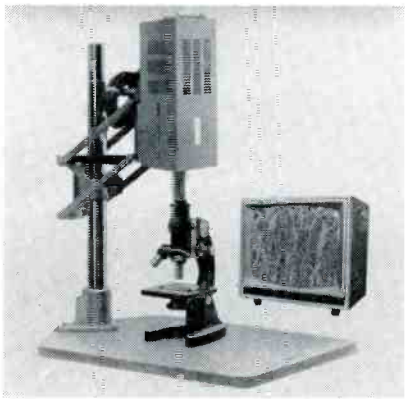
RCA Electronic Components, Harrison, N.J. 07029.

*Bialkali photocathode, electronically conducting glass target image orthicon

RCA

will round out the Gates exhibition. Other Gates gear will include the TV-15 audio control console for TV and the Criterion cartridge tape system.
Circle 102 on Reader Service Card

NAEB: GBC Closed Circuit Corp.
New products to be shown include the industry's first wireless CCTV camera, a closed-circuit TV microscope system to sell for under $700 and two viewfinder cameras for ed-



GBC TV microscope system.

ucational application. One camera is available with 2:1 interlace; the other with random interlace. GBC will also show a complete line of closed-circuit TV cameras, lenses and accessories for use in ETV applications.
Circle 115 on Reader Service Card

NAEB: General Electric
GE's 1600-square-foot exhibit area will include demonstrations of Model PJ-400 color and PJ-700 mono-

GE large-screen projector.

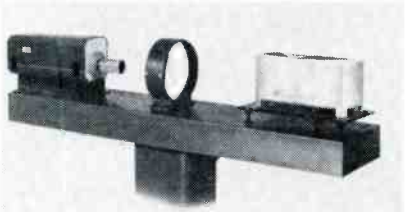
chrome large screen TV projectors and the PE-350 color camera. A PE-240 color film camera will be operating in the Eastman Kodak exhibit area. Other GE products on view will be TV pickup tubes and Quartzline lamps for TV lighting.
Circle 116 on Reader Service Card

NAEB: Kalart Company
Highlighting the Kalart area will be a demonstration of a new 16mm TV Uniplex film chain and a Tele-Beam

Kalart/Tele-Beam large screen projector.

large screen projector. Other products on display will include a video level meter, 16mm TV projector, 16mm sound motion picture projectors, dual purpose 16mm TV projector and film editing and viewing equipment.
Circle 103 on Reader Service Card

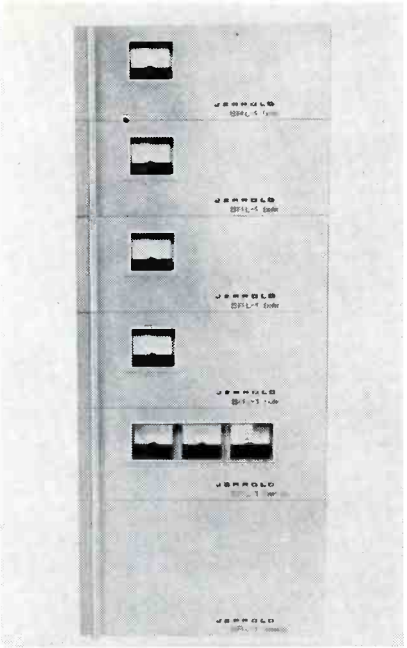
NAEB: General Precision Systems
The 990V viewfinder and 995 film chain cameras will highlight the GPL display. The 995 reproduces 16mm and 35mm film, 2 × 2 slides and



GPL 995 film chain camera on multiplexer.

35mm film strips. Other equipment will include the 1200 viewfinder camera, 1000 microscope camera, the VR-400 videotape recorder and the 1200 Educational TV System.
Circle 104 on Reader Service Card

NAEB: Jerrold Electronics Corp.
Announcement and demonstration of a new 2500-MHz ETV relay and transmission system will be the key attraction of the Jerrold area. The system will include: an operating new ITFS heterodyne repeater system; an operating new Modline solid-state; modular vhf/fm/uhf MATV system head end, with all-channel color capability; an operating new J-Jacks distribution system with two-way closed-circuit color uhf capability. Ultra-Tap all-channel tapoff units also will be demonstrated. An operating and new concept in rf carrel systems will be unveiled. Jerrold's long distance transmission systems will be displayed as well, both the 440 Series microwave and the Star-



Jerrold SRL-1 multichannel system.

line cable systems. In addition, Jerrold will announce a new multichannel, low-power link transmission system, the SRL-1.
Circle 105 on Reader Service Card

NAEB: Memorex Corp.
Memorex will be conducting live demonstrations of its 79 Series helical scan videotape on three major helical scan color VTRs. Monitors will show performance of tape. In addition to closed circuit products, 78V color broadcast videotape and the video storage and shipping containers will be on display.
Circle 114 on Reader Service Card

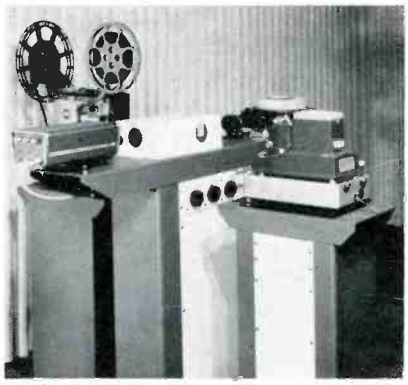
NAEB: Micro-Link Varian
Test equipment recently developed for 2500 MHz will be the highlight of the Micro-Link Varian display. The equipment includes a solid-state, lightweight oscilloscope and a test set designed the make special checks required by the FCC for a 2500-MHz system. Micro-Link will transmit live and in color via 2500 MHz. Also to be demonstrated will be a low-power transmitter, a high-power transmitter, receiving equipment and transmitting antennas.
Circle 106 on Reader Service Card

NAEB: D. B. Milliken
Milliken will be showing the DBM-R1 video film recording system. The DBM-R1 is designed specifically to fill the requirement for a simple, low-cost television recording system

capable of producing quality 16mm film from a video display.
Circle 107 on Reader Service Card

NAEB: Sylvania Lighting Products
The Lighting Products Division of Sylvania will exhibit tungsten-halogen lamps for use in TV lighting systems. Several new families of tungsten-halogen replacement lamps for direct replacement of standard incandescent lamps presently used in TV lighting. The Sylvania booth will feature a demonstration of user benefits of tungsten-halogen lamps.
Circle 108 on Reader Service Card

NAEB: TeleMation,, Inc.
TeleMation's exhibit will feature a complete television production studio. Principal video sources will be new TMC-2100 monochrome vidicon cameras and two film chains, one incorporating an IVC-100 color camera. Also to be demonstrated will be the TMM-212 Optical Multiplexer. It will be shown with an IVC color camera, the TMC-2100 camera, two film projectors and two slide projectors. For the first time at

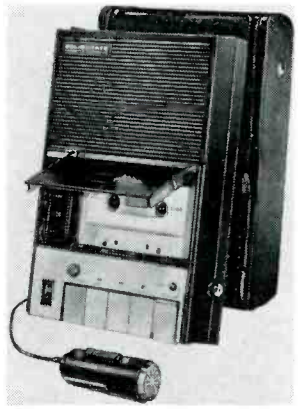

TeleMation's multiplexer system.

NAEB, TeleMation will display a full line of switching equipment, including broadcast program switchers, passive video switchers and crossbar switchers. Also new from TeleMation will be the TMV-550 video distribution amplifier and TPA-550 pulse distribution amplifier. The TMV-550 is designed to meet broadcast requirements for good color performance and long-term stability. The TPA-550 reshapes incoming pulses, providing clean output transitions with 100-ns rise times.
Circle 109 on Reader Service Card

NAEB: Telesync Corp.
Feature attractions at the Telesync booth will be 1) a retro reflective front screen projection system, 2) horizontal-vertical color effects crawl, 3) television and film prompting equipment.
Circle 110 on Reader Service Card

Portable Cassette Recorder

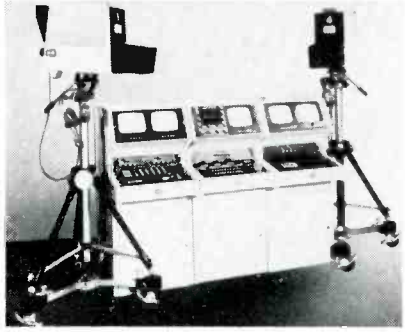
Allied Model 1150 cassette recorder features solid-state circuitry and "pop-up" cassette loading and removal. It operates either from low-priced batteries or ac and records and plays up to 2 hours of monophonic sound on two tracks. Standard Philips-type tape cassettes are



used. Response is 200 to 11,000 Hz. Recorder is operated with keyboard-type pushbuttons, including a pause button and fast forward and rewind. Switchable automatic level control is provided. Other features include tone control, monitor switch, battery level meter and provision for recording from electronic sources. Size is 9⅜ × 2⅝ in.; weight, 4 lb. $89.95. Allied Radio Corp.
Circle 119 on Reader Service Card

ETV Control Console

A console providing complete control of two studio camera chains, the "ETV 1200 Educational Television System," is designed to operate in conjunction with GPL cameras, videotape recorders, film chains and multiplexer. Console contains all necessary equipment for professional programming, including switcher/



fader, special effects generator, waveform monitor, film projector control and a 7-input audio mixer. Five solid-state displays monitor output of two cameras, film camera, preview buss and program line. Console conforms to EIA RS 170 standards. Features include grouped control and modular design. GPL Division,

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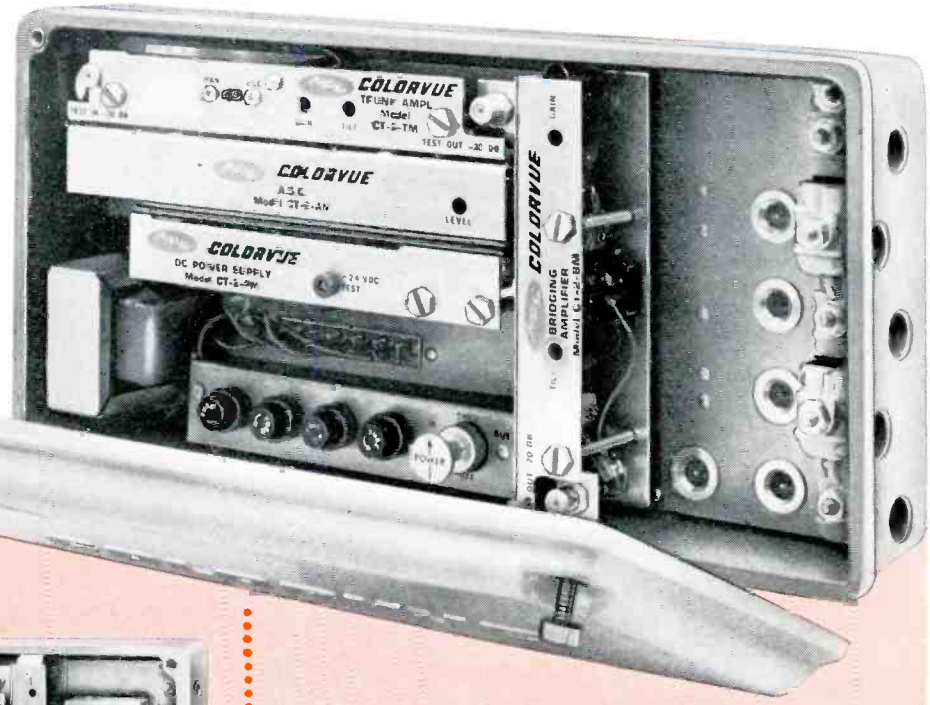
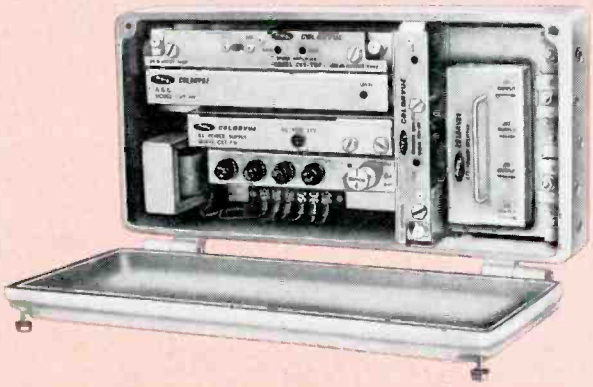
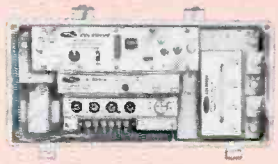
At last, 20 channels is a reality, with SUPER-BAND™ . . . AEL's complete line of CATV equipment *...with the widest bandwidth available!* Now you can have extra channels for time, weather, stock market programming, FM radio and a wide variety of local origination programs. And you get exceptionally clean signals — full color fidelity, high reliability and stability with AEL special circuitry, Auto-Slope temperature compensation and true plug-in modularity for quick in-field maintenance.





COLORVUE 50 to 220 MHz TRUNK LINE AMPLIFIERS

For high-grade color distribution, easy field maintenance (only two bolts open/close the housing cover), plug-in modularity and moisture — radiation-proof construction. COLORVUE solid state amplifiers provide high output, high gain and ±0.25db frequency response flatness for true studio-quality color fidelity.



SUPER-BAND™ 50 to 270MHz INTERMEDIATE BRIDGING AMPLIFIER

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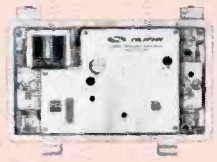

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General Precision Systems, Inc.
Circle 120 on Reader Service Card

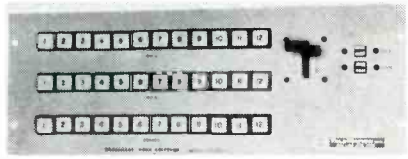
Programmable Counter/Timer

Totalizing direct from 0 to 10^7 and prescaled from 10 to 10^{15}, Model 110A is a dc- to 50-MHz counter/timer with simplified remote programming. Frequency ratio is measured from 10^{-7} to 10^7. Period average is from 0.1 μs to 1 s. Period is measured from 1 μs to 10^8 s. Time interval is measured from 0.1 μs to

10^8 s. Time base function, function selection, start/stop, trigger level, slope selection and display are remotely programmable. Instrument provides 7-digit display and an 8-digit option is available. BCD output is 1-2-4-8 code, positive true. Outputs include time base, 1-MHz standard, A&B marker pulses and gate. Price is $1185. Monsanto Electronics.
Circle 121 on Reader Service Card

One-Piece BC Video Switcher

Model TPS-12X3 is a one-piece switcher, requiring no separate rack equipment. Each of twelve inputs is supplied with synchronous/nonsynchronous selection switches. Input-to-input crosstalk is better than 60-dB down. Video outputs include MIX A and MIX B busses, preview



buss, and program and preview amplifiers, all 75-ohm terminated. Each buss has extra 75-ohm output for preselecting video or key inputs to a special effects generator. Video processing is included in both program and preview amplifiers. Processors include pedestal, video level and sync level controls. Fader is split-arm type. TeleMation, Inc.
Circle 123 on Reader Service Card

Pilot Frequency Monitor

Frequency monitor TBM-3019 is designed to meet FCC regulations requiring stereo fm stations to measure the 19-kHz pilot frequency at least once a day. Monitor works in conjunction with any fm stereo modulation monitor with a 19-kHz

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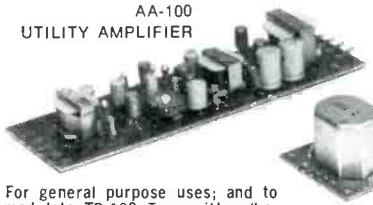
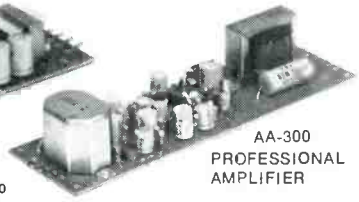
Make intercoms, line amplifiers, mixers, monitors, turntable pre-amplifiers, stereo amps, language labs, etc. They'll be better, cost you less.

AUDIO AMPLIFIERS

AA-100
UTILITY AMPLIFIER



For general purpose uses; and to modulate TR-100 Transmitter (below). Includes volume control and input (low Z) and output transformers.

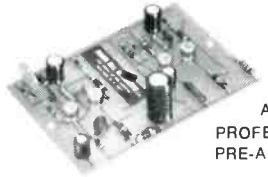


AA-300
PROFESSIONAL
AMPLIFIER

Designed for broadcast/recording/TV uses. Includes input and output transformers.

AA-400
PROFESSIONAL
POWER AMPLIFIER

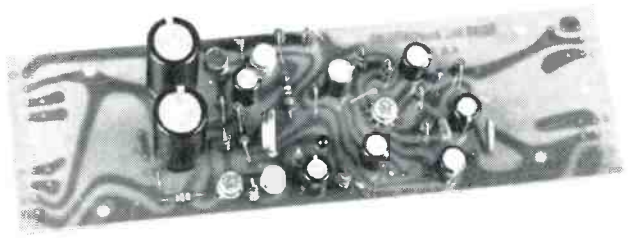
When driven by AA-100 or AA-300, a hi-gain 1-watt audio system results.



AA-500
PROFESSIONAL
PRE-AMPLIFIER

Specially designed for broadcast/TV/recording/hi-fi/commercial usage. With any low-level hi-Z input device, they deliver undistorted 5VRMS to drive a hi-Z input power amp. Usable with low-level low-Z mikes if fed by quality input transformer (150 to 50K Ω balanced). To feed 600 Ω lines, use a transformer (2.5 to 600 Ω balanced) in the output stage.

An IC Line/Monitoring Audio Amplifier that delivers 1-watt output.

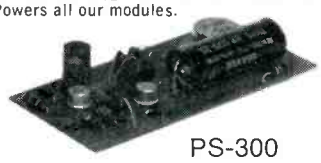


High-reliability, professional amplifier excellent for broadcast/TV/recording use and general audio OEM and hobbyist applications. Only 1 millivolt of input signal can produce a full 1-watt output. The 2000Ω input impedance is changeable by utilizing suitable input transformer.

Technical specifications:
Frequency response: ± 1 db, 20-20,000 cps (OTL). Power output: 1-watt RMS into 8 ohms. Harmonic distortion: Less than 0.5%, 20,20,000 cps at 1-watt. Input level: 1 millivolt for 1-watt output with 25db dynamic range. Input impedance: 2000 ohms unbalanced. Gain: 70db. Output impedance: 4 to 8 ohms (OTL). Circuit: 5 transistors, 1 integrated circuit. Power supply: 14-16 volts DC at 200 mA. Size: 8½" Long, 2½" Wide, 2" High. Weight: 4 oz. Accessories: BC-10 Steel Case with Barrier Strip, $5.95.

REGULATED POWER SUPPLY

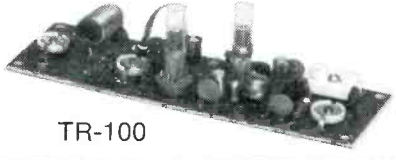
Zener-referenced, delivers highly stable, extremely low ripple DC output of 9VDC with loads up to 200MA; and unregulated 14VDC at 1 Amp. For wherever well-filtered regulated DC is needed. Input: 105-120VAC, 60cps, 5W. Regulation: Line + load 5MV. Ripple: Under full load 10MV, p-to-p. Max. Load Current: 200MA. 4½" L x 2" W x 1½" H. Wt.: 23 oz. Powers all our modules.



PS-300

TRANSMITTER

Complete crystal controlled 3-transistor transmitter for Citizens' Band. Factory pre-tuned for any CB channel; supplied with crystal. Modulation: CW or AM with external modulator such as AA-100. RF output: 100MW, 50Ω load. Power: 9VDC, 50MA. 5½" L x 1¾" W x 2" H, 3½ oz. Add. CB Crystals: $3.00 ea.

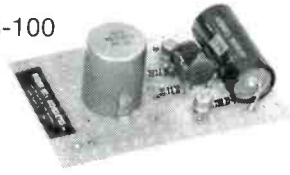


TR-100

POWER OSCILLATOR

All-transistor push-pull sine wave oscillator, 20KC-150KC, 1% harmonic distortion. Power needed: 18-22V, 100MA. Input terminals permit AM modulation (by amplifers AA-100, 200, 300). Uses: biasing recorder heads, powering tape erasers, signal generator/transmitter. 5" L x 3" W x 2" H.

OS-100



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Model	Qty.	Price ea.	AMOUNT
AA-100 Utility Amplifier		$ 7.95	$
AA-300 Professional Amplifier		16.95	
AA-400 Professional Power Amplifier		10.95	
AA-500 Professional Pre-Amp (Linear)		23.95	
AA-500N Professional Pre-Amp (NAB equal.)		23.95	
AA-500R Professional Pre-Amp (RIA equal.)		23.95	
AA-700 IC Line Audio Amplifier		28.50	
BC-10 Steel Case for all Amplifiers		5.95	
PS-300 Power Supply		18.95	
TR-100 Transmitter		10.95	
OS-100 Power Oscillator		21.95	
		TOTAL	

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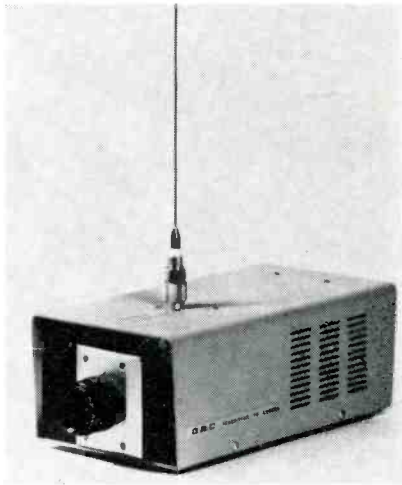
Circle 30 on Reader Service Card

external frequency to an internal 19-kHz standard, which has an accuracy to ±0.25 Hz. Difference is displayed on a front panel lamp which blinks at the error frequency rate. $125. McMartin Industries, Inc.

Circle 124 on Reader Service Card

Wireless CCTV Camera

Operating on unused TV channels without connection by wire, Model WS 822 uses a crystal-controlled transmitter that sends video signal through the air to standard TV receivers where the picture is received on either channel 5 or 6. Camera has outputs for video and rf,



switchable to either video monitor or to standard TV receiver. Unit has movable vidicon and lens focusing. Horizontal resolution with video monitor is 550 lines. Automatic light compensation adjusts for intensity variations over a range of 4000:1. $495. GBC Closed Circuit Corp.

Circle 122 on Reader Service Card

ITV Viewfinder Camera

Model 705 camera contains completely enclosed integral zoom lens, nine-in. viewfinder and complete rear-mounted controls. Camera operates on 110 V ac, 60 Hz. Patented

feature called "Electronic Compensation" automatically adjusts for fluctuations in scene brightness. Weight is 35 lb. Raytheon Learning Systems Co.

Circle 130 on Reader Service Card

B&W TV SET SALES ARE AT A LOW POINT IN HIGH POINT, N.C.

THAT'S WHY WGHP-TV WENT FULL COLOR.

"We didn't want to get behind in our market," explains Chris Shaw, WGHP Business Manager. "We know that every time a consumer makes a major TV purchase in our area, it's a color set. So why continue with black-and-white news and documentary filming when your viewers expect to see color?"

Shaw explained more about the station's switch to Kodak Ektachrome color film and the Kodak ME-4 Process. "It was time to go color. Our ABC Network was full color, and coming on with local events in black-and-white would have left us flat-footed. The Kodak experts came down to help us set up the process. We get all of our Ektachrome films and processing chemicals from Kodak. We've been processing right to Kodak recommendations."

Has color film paid off for WGHP-TV? "It sure has. We've had increased advertising revenue since we went full color. We shoot color spots for local advertisers, too. As far as the quality of the footage we've been getting—it's all good. It's a tough job to figure out what to put on the air."

Shaw tells more about the timing of the color switch. "I'd like to say we were first in our market—but we weren't. Actually, each of the three stations here went full color almost simultaneously, without knowing what the other stations were doing. That's an indication in itself that it was time to go to color. Any station that hadn't would have been behind."

Don't let your station get behind. Everyone will be full color sooner or later. Don't be later. Contact Kodak now.

Kodak

EASTMAN KODAK COMPANY

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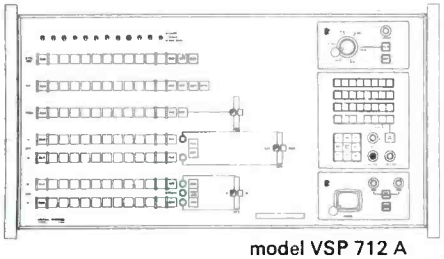
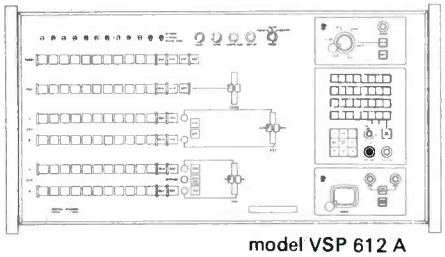
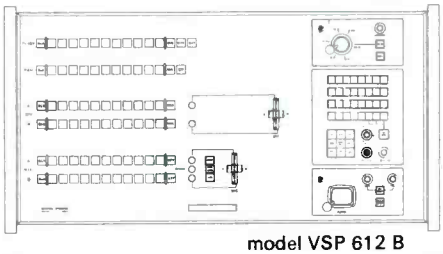


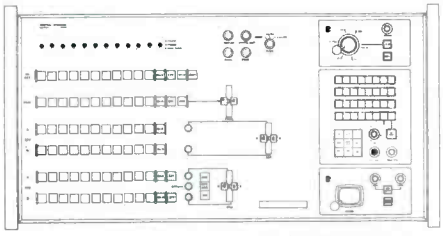
model VSP 712 A



model VSP 612 A



model VSP 612 B



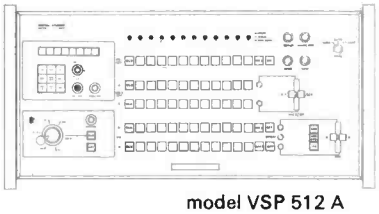
model VSP 612 C

New from Central Dynamics!

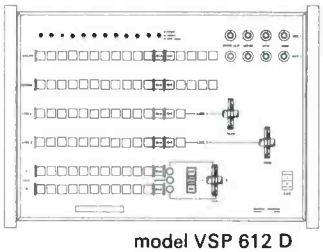
Custom-engineered switching systems available as "standards"

—in 10 different models, each with a broad range of options.

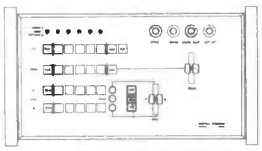
Every switcher in the group has proved its worth in actual operation. Whatever your requirements, you are sure to find the system that's exactly right for *your* station. Write for illustrated catalogue.



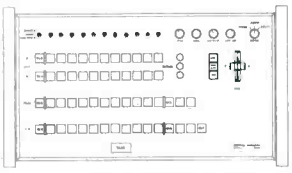
model VSP 512 A



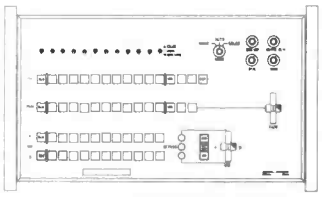
model VSP 612 D



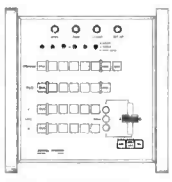
model VSP 406 B



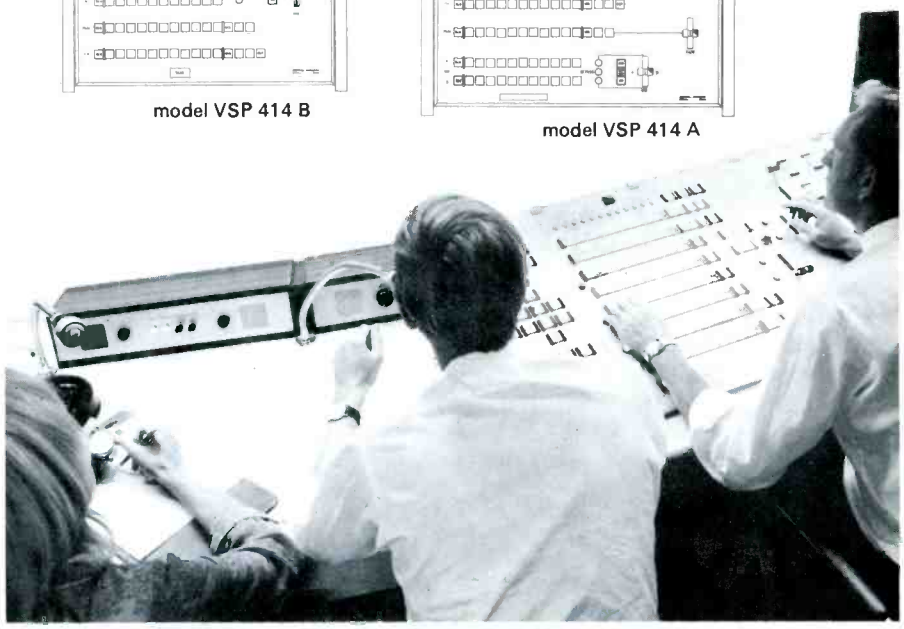
model VSP 414 B



model VSP 414 A



model VSP 406 A



See us at
the N.A.E.B. show
booths 28 & 29
Washington
Nov. 20, 21, 22

CENTRAL DYNAMICS CORPORATION

Cherry Hill Industrial Center, Cherry Hill, N.J. 08034. Phone (609) 424-3900

Circle 32 on Reader Service Card

BROADCASTERS SPEAK

Sirs:
I have been a regular reader of your fine publication for well over two years and find your articles to be both timely and interesting.

In your September *BM/E* I believe a slight error has been made. I refer specifically to the item beginning on page 8 which deals with WNYW election coverage.

In the item it states that WNYW "is the only privately owned and commercially sponsored shortwave station in the U.S." This is not completely true. Radio station WINB operates from Red Lion, Pa. on shortwaves, and has quite a number of programs sponsored by various groups and companies. WNYW is owned by the Mormon church and WINB is owned (80%) by a Rev. John Norris. I refer you specifically to the "Broadcasting Annual and the World Radio TV Handbook 1968," as my reference sources.

While WNYW is the most active commercial SW station in the U.S., it is not the only such station. I hope this information will be of some use.

William A. Matthews
Houston, Pa. 15342

We queried WNYW *about this, W.M., and they refer you back to your "World Radio TV Handbook." This book lists* WINB *as a private international station, not as a commercial station. The handbook states that the purpose of this station is to promote the God of the Bible, while* WNYW *promotes industry.* WNYW *spokesmen feel that* WINB *is not truly a commercial station, in the proper sense of the word.*

Sirs:
For the past few years I have been impressed, or rather depressed, by the chaos that passes for a record library in many stations. In visiting a number of radio stations, I have observed various systems of record filing, including numerical ordering, divisions by individual programs and the system which seems to be the most characteristic: "pile-'em-on-the-studio-floor-until-you-can't-walk."

In an effort to eliminate confusion in the library of the station I have been associated with for three years as record librarian and program director, several colleagues and I devised a system of filing and cataloging which has been extremely successful. This system has proved very time-saving in aiding personnel to locate records for their air shifts, as well as for fulfilling listener requests quickly.

Your article in the May issue of *BM/E* about KTLN's accounting sys-

tem indicates broadcaster interest in the field of data processing. Our filing and cataloging system also provides an additional use for data processing equipment.

Paul L. Howard
Cornwell-on-Hudson
New York

Tell us about the system, P. H.

Sirs:

Our manager was recently discussing with me an article which appeared in *BM/E*, possibly two or three years ago. The article dealt with a discussion of the various types and brands of audio peak limiters and level controllers.

I have looked through our back issues of *BM/E*, but have been unable to locate the article. If the article to which we refer was in *BM/E*, would it be possible to get a reprint of the article or purchase a copy of the edition?

Benjamin J. Boothroyd
Chief Engineer
WOKW Radio
Brockton, Mass.

The Dec./65 issue of BM/E *is on its way, B.B. The article you were referring to is entitled "Making Use of Limiters and Compressors."*

Sirs:

Of late I have been doing research in the uses of fm. I am interested in facsimile and the uses of multiplex. Current information is extremely limited and older volumes are of little use. I'd like to make an appeal to your readers to share any experiences or information on the more "off beat" uses of fm. Any information would be greatly appreciated.

Jerry V. Haines
Lieutenant
U.S. Navy
USS Saratoga
FPO New York 09501

Watch future issues of BM/E, *J. H.*

Sirs:

I have been a regular reader of your useful magazine since the preview issue. *BM/E* is truly the most informative and educational magazine for broadcast engineers.

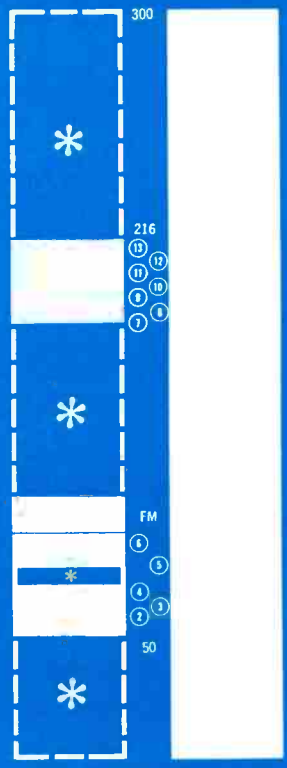
I am assistant engineer of radio station PRL-6/ZYK-33 located in North Brazil. I was very interested in your article "WRIZ Offshore Transmitter" by Jack Roth in the June 1968 issue. I would like you to send me Mr. Roth's complete address. Thank you for your cooperation and I shall be looking forward to receiving your very fine publication.

Arthur S. Miranda
Station PRL-6/ZYK-33
P.O. Box 1332
Recife, PE, Brazil

Happy to give you the address, A.M.:
WRIZ
1699 SW Coral Way
Coral National Bank Building
Miami Beach, Fla.

Room at the top.

(At the bottom and in between, too!)



* Standard coaxials have limited range with many hidden gaps.

Superior Extended Spectrum Coaxials cover the full range to 300 MHz and beyond with no discontinuities.

Specify Superior Extended Spectrum Coaxials for continuous coverage to 300 MHz and beyond.

Only Superior Extended Spectrum Coaxials give you a full, continuous transmission range to 300 MHz and higher. That's *84 MHz more* than you get with most standard coaxials. And with no discontinuities at any frequency.

This broad-range transmission capability is built-in today. And it gives you ample room to grow tomorrow. With new CATV channels. Broader ETV and ITV programming. More CCTV for business and industry. Data transmission. Remote control telemetering. Alert and alarm systems. Traffic and highway control networks.

Extended Spectrum Coaxials are now available in the right construction for every application. With exclusive Coppergard or Alumagard shielding. In aerial or direct burial types.

When you buy coaxials today, be sure they offer full-range performance with *no gaps*. Specify Superior Extended Spectrum Coaxials. The ones with the extra room built-in.

For information and prices, write or call:
Superior Sales and Service Division
P. O. Box 2327 Hickory, North Carolina 28601
Phone 704/328-2171

SUPERIOR CONTINENTAL CORPORATION

Circle 36 on Reader Service Card

NAMES IN THE NEWS

Lt. Gen. K. B. Wolfe

William S. Ivans

Cohu Electronics has announced the election of **Lt. Gen. K. B. Wolfe** as board chairman and **William S. Ivans** as chief executive officer.

James B. Tharpe, president of Visual Electronics, made it known that **Philip E. Silberberg** has joined the company as vice president and general counsel. Within the same company **James A. Kraenzel** was appointed sales representative for New England.

Herman Kornbrodt, has been appointed chairman of the recording and reproducing systems component committee of the EIA.

Richard W. Harbison and **H. B. Watson** has been elected to the board of directors of Houston Fearless.

Leonard S. Levy will join Metromedia as president of Metromedia Records.

NAB has designated **Robert R. Pauley** as the network's representative on NAB's Radio Board of Directors. NAB has also announced the appointment of **Richard K. Burch** as manager of the Television Code.

Jack Daniels

Ted Eiland

The post of operations manager for TeleMation has recently been filled by **Jack Daniels.**

Roger G. Berk, president of Group One Broadcasting, announced the appointment of **Ted Eiland** as gen-

eral manager of WAKR-TV, Akron.

John L. Buchanan has been elected to the board of directors of Ameco.

Charles S. Dolk

Duane M. Weise

Charles S. Dolk was named marketing manager for the industrial and educational products division of Ampex.

Arden C. Boland, president of Central Dynamics, has appointed **Duane M. Weise** as vice president of marketing-television.

Warren Cannon has joined the executive board of directors of the NAEB as a public member.

The appointment of **Richard W. Loftus** as marketing manager for Spencer-Kennedy Labs was announced recently.

Jack Wiedemann was named general manager of WXEX-TV, Knoxville.

The appointment of **William J. Robins** as sales manager at Sylvania Electric Products has been announced.

Louis A. Falcigno has joined Management TV Systems as manager of operations planning.

Walter Kisluk

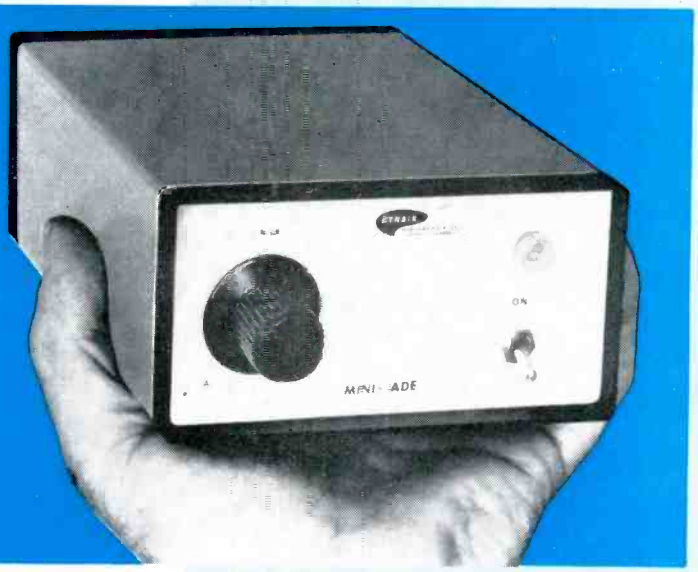
Michael Stoll

Walter Kisluk has been elected vice president of Alpha Wire. William R. Leverich has been elected vice president of manufacturing and engineering.

Michael Stoll has been appointed to the position of assistant manager, Field Engineering/Customer Service Dept. of Sarkes Tarzian.

QUALITY LOCAL-ORIGINATION PROGRAMMING

Just $220 starts you on your way

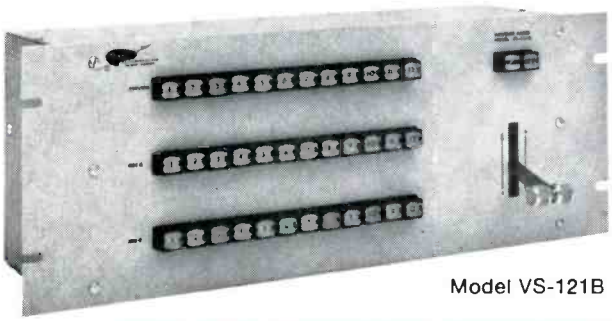


LOW COST... FIELD-PROVEN DESIGN... EXTREME FLEXIBILITY

If you are planning a local origination studio, you'll need all three. And you get all three in DYNAIR equipment, which provides professional quality and professional effects in your local-origination distribution and programming at true budget prices.

Want to start small? For just $220 you can use the VS-220A MINI-FADE (above) to mix or fade between the outputs of two cameras or other non-composite video sources.

Or would you like complete color-compatible facilities for any degree of fade-in, fade-out, lap dissolve or superimposition, with up to 12 inputs and preview buss? The solid-state VS-121B Broadcast Switcher-Fader (below) will do it all for just $1750.



Model VS-121B

FOR THE IMPORTANT EQUIPMENT BETWEEN CAMERA AND MONITOR...

Switches... Sync Generators... Video and Pulse Distribution Amplifiers... Screen Splitters... Audio/Video Modulators...

LOOK TO DYNAIR

HERE'S WHAT TO DO:

First: Send today for a set of DYNAIR Application Engineering IDEAS. Second: Outline your requirements. Third: look over our firm quote on a programming system designed specifically for your *job*. Finally: just turn on the equipment and send your subscribers programs equal to the best.

DYNAIR ELECTRONICS, INC.
SAN DIEGO, CALIFORNIA

6360 Federal Blvd., San Diego, Calif., Zip 92114
Phone (714) 582-9211

Name _____

Title _____

Company _____

Address _____

City _____

State _____ Zip No. _____

Circle 42 on Reader Service Card

LITERATURE of INTEREST

For additional data, circle number shown on Reader Service Card.

"Uhf-TV, vhf-TV Sweep Generators" is the title of Catalog No. 82 from Telonic Industries Inc. Contained are descriptions of three basic generator series: 1006, 1010 and 1011. **150**

Model AC-296 video control center is subject of data sheet made available from Ampex. **151**

"Book size" scope is presented in bulletin from Measurement Control Devices. A complete list of specifications and data on Model 100 TransiScope are included. **152**

Media trends and reports on the scope of TV today as well as comparisons with previous years are presented in brochure from the Television Bureau of Advertising. Booklet has sections on how adults allocate their time to media and use of TV by department stores. **153**

Programming boards and switches are the topic of handbook published by Sealectro. **172**

High intensity slide projectors, spotlights and accessories are presented in Catalog G6808 from Genarco. **154**

Seven major accessories for broadcast TV are presented in a five-unit series of technical data sheets (2610 Series) from Cohu. Specs and photos are included for black burst generator, dotbar generator, colorbar generator etc. **155**

Prerecorded videotape libraries are listed in guide from Ampex. Guide has short descriptions of available tapes. **156**

Monolithic i-f strip for a-m/agc applications is topic of data sheet now available free from National Semiconductor. **157**

Series of numerical displays, counters, drivers, memory devices, display tubes, power supplies and bezel configurations are described in brochure from Integrated Circuit Electronics. **163**

Monolithic agc/squelch amplifier is discussed in data sheet from National Semiconductor. **158**

Electronics equipment for industry and government is subject of Allied's 1969 catalog. The book, the largest issued by an electronics supply house, lists over 50,000 stock items from 500 manufacturers. Listings show prices for purchase in various amounts of every type of component. **159**

Cable wire is topic of indexed, looseleaf catalog from Rome Cable. Catalog contains sections on bare wire, building wire, conduit, underground cables and others. **160**

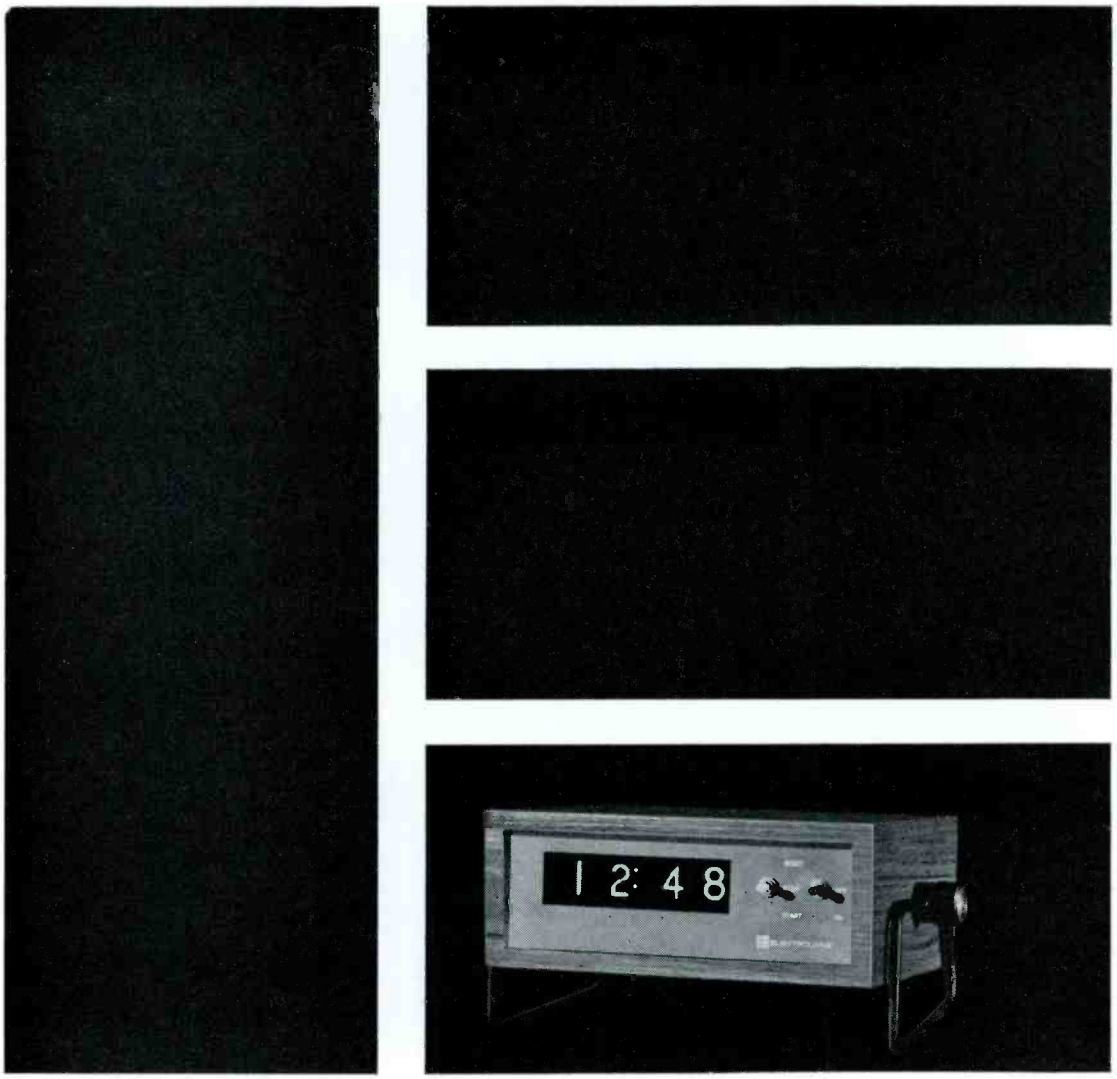
Vacuum power tubes are basis of booklet from International Telephone and Telegraph. A section describing tube accessories and a section on application maintenance are included in brochure. **161**

Electromagnetic Compatibility Designer's Guide is available from Electronic Industries. Ten-section guide provides fundamental EMC design answers in detail. **162**

Integrated circuits are topic of brochure from Allied Radio. Replete with tables, photos, graphs and sketches, this book is available for 75¢. Write Allied Radio Corp., Chicago, Ill. 60680. **185**

Latest state-of-the-art advances in rf techniques are discussed in brochure from Applied Research. Specs and

continued on page 91



It's time you stopped squinting and got a new electronic stopwatch by Electrodyne.

That old clock, timer, or stopwatch of yours is certainly some sort of an anachronism in the midst of all your modern electronic gear. Besides that, it's getting just a little bit harder to read every year, now isn't it?

That's why we're bringing out our new electronic stopwatch. It times continuously up to an hour and forty minutes, reads out in minutes and seconds—in big, bright digits. And has just two controls—one for start/stop/reset, the other for power on/off. Completely self-contained in its own handsome Teak cabinet, this new electronic stopwatch by Electrodyne is readily rigged for remote control.

Our optional tape motion sensor lets you use it for direct timing of magnetic tapes—even at high speed.

We call this piece DC-900. You'll call it the best thing that's happened to timing since the sundial. Get one no later than Tuesday.

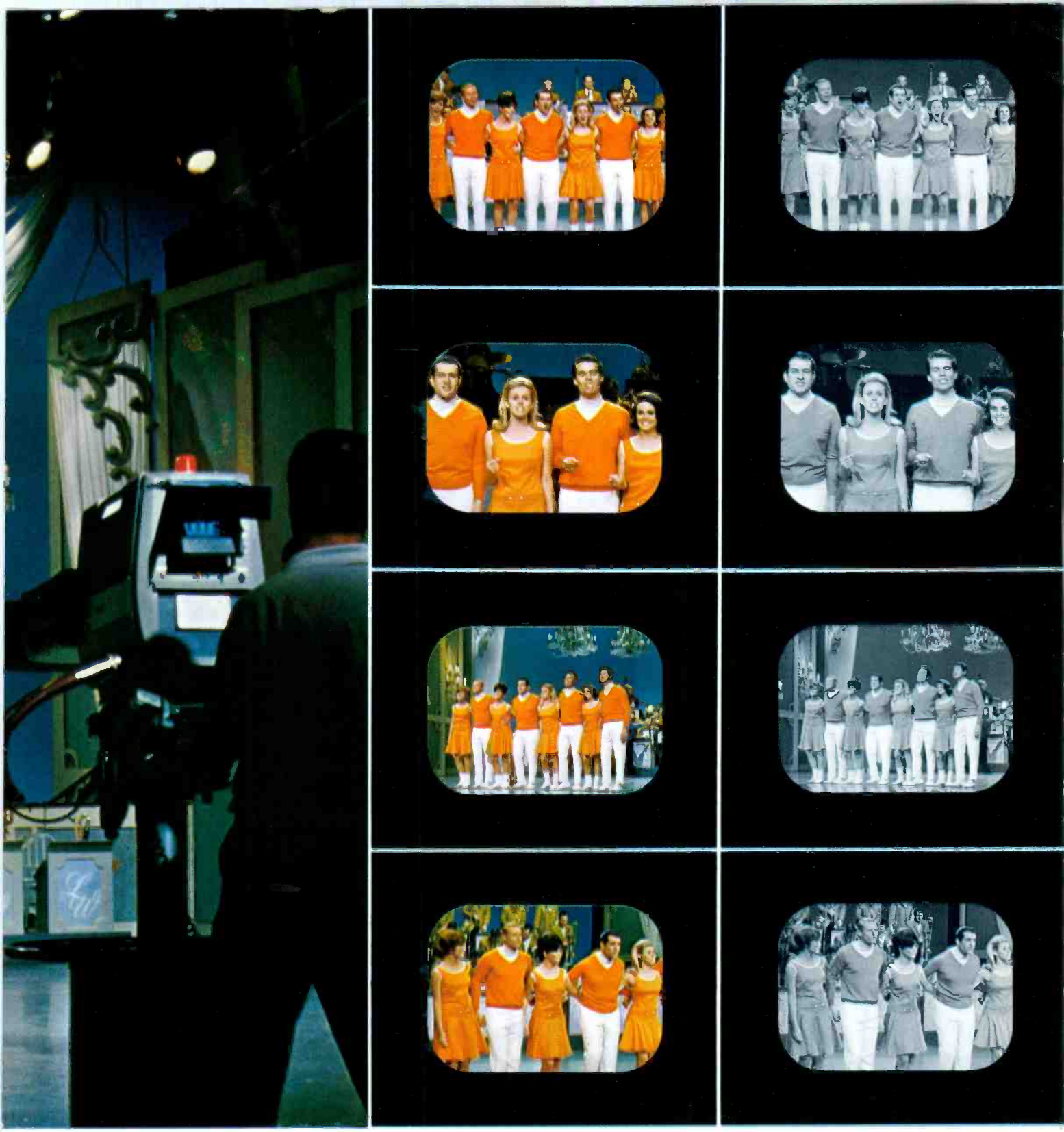
ELECTRODYNE CORPORATION
7315 Greenbush Avenue ■ North Hollywood ■ Calif. 91605
Phone: (213) 875-1900 ■ Cable Address: "ELECTRODYNE"

Circle 45 on Reader Service Card

Circle 46 on Reader Service Card →

ABC's "Lawrence Welk Show." Video taped on Memorex 78V.

When the show's rolling,



the tape must not fail.

If it does, you have trouble. Time and money trouble.

Think what your actors, singers, dancers and directors are costing you. Not to mention cameramen, lighting men, sound technicians, floormen, and all the other people who put your show together.

Plus your equipment. Cameras, cables, spotlights, sets. They're expensive, too.

We make our Memorex 78V high-chroma video tape for people who don't want trouble. Who are impatient with re-makes and don't want to waste the time or money.

Of course, if time and money are no problem, then you don't need our non-fail 78V.

Only patience.

(For information, write us: Memorex Park, Santa Clara, Calif. 95050.)

MEMOREX

If you like Audiopaks our lubricated Audiotape will really be your cup of tea.

Broadcast engineers all over the country like our Audiopak® cartridges so much, we've been using their comments in our advertising. And, we've been giving each one an inscribed cup as a token of our appreciation.

Now, with our Audiotape Formula 17 Lubricated tape designed especially for continuous loop cartridges, their cup will really runneth over.

Here's why:

It provides excellent high end response and signal-to-noise ratio. The long wear, high temperature binder won't soften or gum up heads.

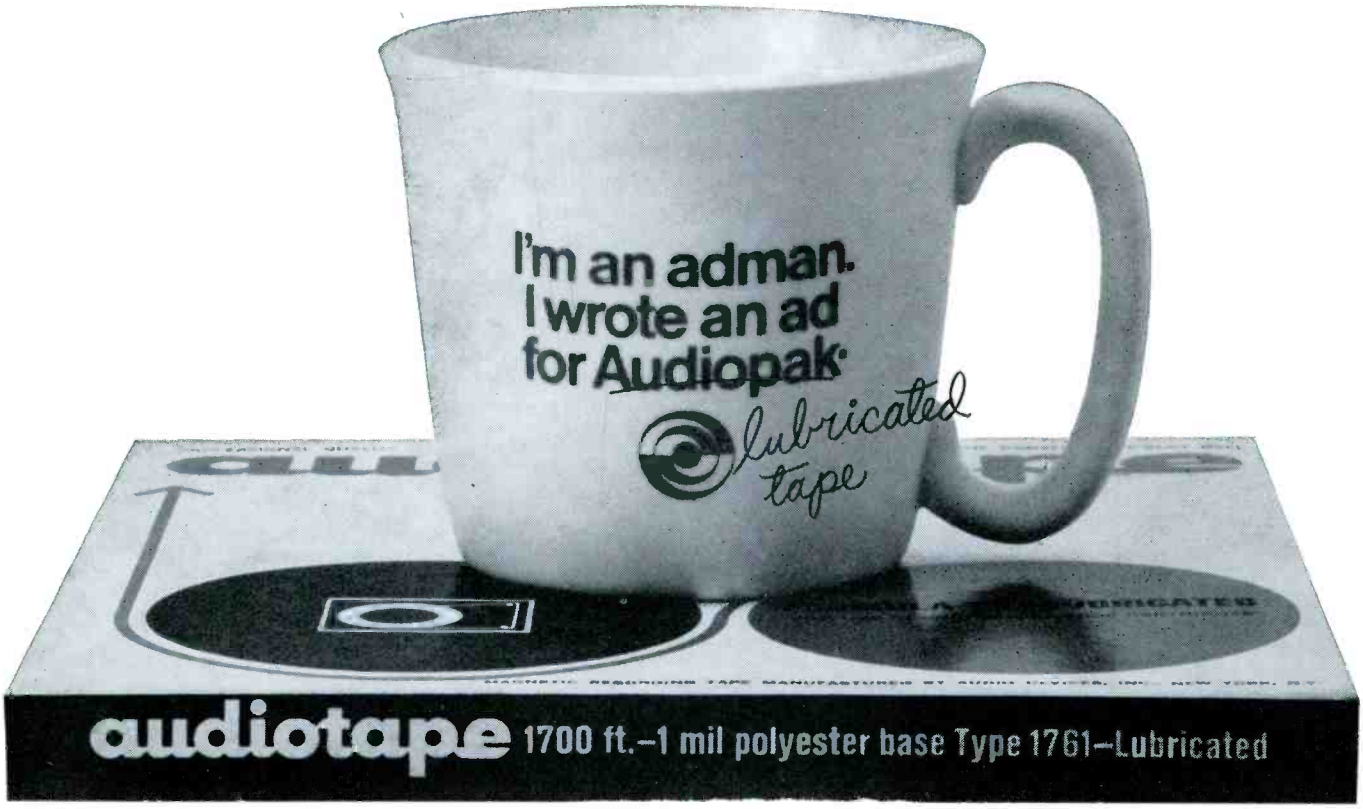
The lubricated coating is permanently bonded to the base. Can't wear off and cause jamming; won't dirty heads and capstans.

Very low abrasion properties reduce head wear and premature failure, assures smooth tape motion with negligible wow and flutter.

Audio is the only cartridge manufacturer who also makes tape. (We are the largest supplier in the world.) So, you can be sure our cartridges and our tape match each other perfectly. But regardless of cartridge make, Formula 17 is the best tape you can use.

Why not find out about Audiotape Formula 17 for yourself.

Audio Devices, Inc.
A SUBSIDIARY OF CAPITOL INDUSTRIES, INC.
235 E. 42nd St., New York 10017



Circle 47 on Reader Service Card

descriptions for wide range of product capabilities and signal sources are included. **164**

Model AA-620 audio amplifier/speaker system is subject of data sheet from Ampex. **165**

Buried cable system hardware is topic of catalog from Preformed Line Products. Catalog contains product photos, specifications, ordering information and price data. **166**

TV videotape production is topic of "how-to-do-it guide" available to audio-visual directors and educators from 3M Company. Glossary of terms along with graphs and charts are provided for reference. In-depth treatment is given to such subjects as use of visuals, lighting and production team. **167**

Closed circuit studio TV camera, Model CC-327 is described in brochure from Ampex. **168**

Frequency response tracer, Model 4712, is subject of data bulletin from B&K Instruments. Bulletin also describes an optional, external module that reduces high frequency signal ranging from 200 Hz to 200 kHz by factor of 10. **169**

Production head mechanical specs and electrical and performance data are discussed in catalog from Michigan Magnetics. **170**

First commercial SEC television camera tube is topic of bulletin from Westinghouse. Brochure details principle of secondary electron conduction and how it is applied to the operation of this tube. **171**

Neon glow lamps are the topic of eight-page illustrated brochure from Signalite. **184**

Recessed wall intercommunciations stations from Altec Lansing Division —are presented in 4-page brochure 2101, AL-2103 and AL-2108. **173**

Coax, mic, audio intercom, guy, hookup and other types of wire are listed in 48-page catalog from International Wire & Cable Co. **174**

Monochrome/color fm microwave relay equipment made by RHG Electronics Laboratory is described in data sheet now available. **175**

Tape cartridge machines—Series 700 —are presented in a 4-page brochure from Tapecaster. **176**

"Lighting Handbook," 1968 edition, from Sylvania, contains 90 pages of notes, text, tables and illustrations pertaining to television, theater, motion picture and professional photography. **177**

Test Equipment products of major manufacturers are listed in catalog put out by Lectronic Research Labs. Special sections are included on blowers, bridges, constant voltage transformers, etc. **178**

"Show strobe lighting flasher" is discussed in literature from Power Instruments Inc. Flashing baton fills the need for special stage lighting effects. **179**

Projectors for professional high speed viewing are described in data sheet available from Lipsner-Smith Corp. Outstanding features such as optical sound head and solid-state amplifier are described. **180**

A VTR and a video camera are the topics of catalog from Sony Corp. of America. Pictures of the devices and accessories, components and general and electronic specifications are included. **181**

"The CATV Industry & Regulation" is title of National Cable Television Assoc.'s authoritative brochure. Various aspects of CATV are discussed from the significance of the services it performs to price schedules. **182**

Towers—3- and 4-legged types in 8 basic configurations, in 128 heights from 40 to 310 feet—are included in a 16-page catalog from Microflect. **183**

Attention TV Stations:

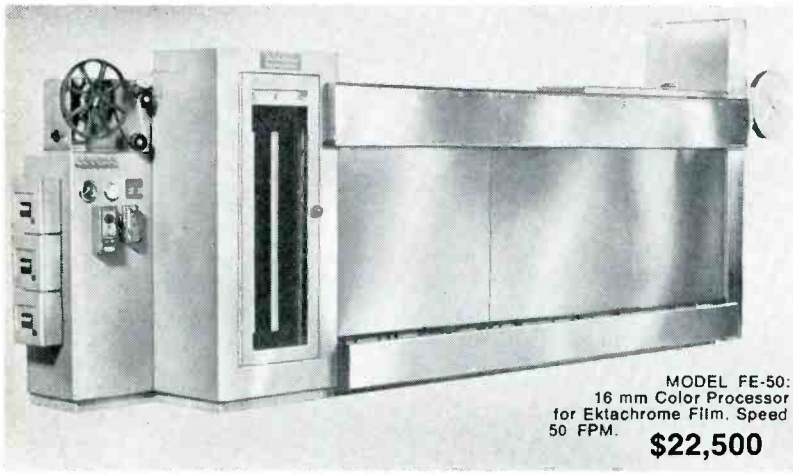
We've got news for you!

FILMLINE'S professional color film processors now available for TV NEWS

The FILMLINE Models FE-30 and FE-50 are exciting new color film processors designed specifically for use in television station news departments. The design is backed by Filmline's reputation as the world's leading manufacturer of professional film processors for the commercial motion picture laboratory industry.

Now for the first time the television industry can enjoy the benefits of professional caliber equipment incorporating exclusive FILMLINE features that have paced the state-of-the-art in commercial laboratories, at a cost lower than processors offering less.

After you check these exclusive Filmline features you'll want to install a Filmline processor in your news department ***NOW!***



MODEL FE-50:
16 mm Color Processor for Ektachrome Film. Speed 50 FPM.
$22,500

MODEL FE-30:
16mm Color Processor for Ektachrome film. Speed 30 FPM. **$16,400**

- **"FILMLINE OVERDRIVE FILM TRANSPORT SYSTEM"** This marvel of engineering completely eliminates film breakage, pulled perforations, scratches and operator error. The film can be deliberately stalled in the machine without film breakage or significant change of film footage in solutions. The heart of any film processor is the drive system. No other film drive system such as sprocket drive, bottom drive or simple clutch drives with floating lower assemblies can give you the performance capability of the unique Filmline Overdrive Film Transport System.
- **"TORQUE MOTOR TAKE-UP"** gives you constant film take-up and does not impose any stress or strain on the film itself. Completely independent of the film transport system. This FILMLINE feature is usually found in professional commercial processors but is incorporated on the FE-30 and FE-50 models as standard equipment. Don't settle for less!
- **"TEMP-GUARD"** positive temperature control system. Completely transistorized circuitry insures temperature control to well within processing tolerances. Temp-Guard controls temperatures accurately and without the problems of other systems of lesser sophistication.
- **"TURBO-FLOW"** impingement dryer. Shortens dry-to-dry time, improves film results, and carefully controls humidity content of your valuable (and sometimes rare) originals. Immediate projection capability is assured because the film dries flat without the usual curl associated with other film processors.
- **"ZERO DOWN TIME"** The reputation of any film processor is only as good as its reliability. The combination of the exclusive and special added Filmline features guarantees trouble-free operation with absolute minimum down-time and without continual operator adjustments. Recapture your original investment in 2 years on maintenance savings alone. Filmline's "Push the button and walk-away processing" allows inexperienced operators to turn out highest quality film.
- **"MATERIALS, CONSTRUCTION AND DESIGN"** All Filmline machines are constructed entirely of metal and tanks are type 316 stainless steel, heliarc welded to government specifications. The finest components available are used and rigid quality control standards are maintained.

Compare Filmline features to other processors costing more money. Feature-by-feature, a careful evaluation will convince you that Filmline offers you more for your investment.

Additional Features included in price of machine (Not as extras).

Magazine load, daylight operation ■ Feed-in time delay elevator (completely accessible) ■ Take-up time delay elevator (completely accessible) ■ Red brass bleach tank, shafts, etc. Prehardener solution filter ■ Precision Filmline Venturi air squeegee prior to drybox entry ■ Air vent on prehardener ■ Solid state variable speed D.C. drive main motor ■ Bottom drains and valves on all tanks ■ Extended development time up to two additional camera stops at 50 FPM ■ Pump recirculation of all eight solutions thru spray bars ■ Temperature is sensed in the recirculation line ■ All solutions temperature controlled, no chilled water required ■ Built-in air compressor ■ Captive bottom assemblies assure you constant footage in each solution ■ Change over from standard developing to extended developing can be accomplished in a matter of seconds ■ Impingement dryer allows shorter put through time.

Partial listing of Filmline Color Installations: — NBC- New York, NBC- Washington, NBC- Cleveland, NBC- Chicago, CBS & ABC Networks, Eastman Kodak, Rochester.

Laboratories: De Luxe Labs, General Film Labs (Hollywood), Pathe-Labs, Precision Labs, Mecca Labs, Color Service Co., Capital Film Labs, Byron Film Labs, MGM, Movie Lab, Lab-TV, Technical Film Labs, Telecolor Film Labs, Guffanti Film Labs, A-One Labs, All-service Labs, NASA Cape Kennedy, Ford Motion Picture Labs.

TV Stations: WAPI-TV, KTVI-TV, WXYZ-TV, WTPA-TV, WBTV-TV, WEAT-TV, WMAL-TV, WSYR-TV, WDSU-TV, WVUE-TV, WJXT-TV, WTOP-TV, WAVY-TV, KTAR-TV, WTVR-TV, WFBC-TV, WMAR-TV, WCKT-TV, WAVE-TV, WCPO-TV, WAPA-TV, WCIV-TV, WJIM-TV, WWL-TV, KYW-TV, KETV-TV, WNBQ-TV, KSLA-TV, WSAZ-TV, WHP-TV, WHCT-TV, WTWO-TV.

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BM/E, Monterey and Pinola Avenues, Blue Ridge Summit, Pa. 17214 Phone 717/794-2191

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STATION MANAGERS: Why not turn your idle time to money making time simply and easily. Reputable old established company seeks to promote sales of their exclusive patent medicines on a per-inquiry basis. Here is a good deal and good money maker. Write for further information to: Box 1168-8, c/o BM/E, Blue Ridge Summit, Pa. 17214.

HELP WANTED

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With thorough knowledge of video distribution and switching equipment and experience in closed-circuit TV system layout. Broadcasting and CATV system experience also desirable.

See us at Booth 49—NAEB Convention, Washington, D.C.—or send your resume to:

R. L. Paullus,
Vice President, Marketing
DYNAIR ELECTRONICS, INC.
6360 Federal Blvd.
San Diego, California 92114

OPPORTUNITY

Experienced TV Engineers wanted for expanding Midwest station originating big ten sports. Opportunity to advance to supervisory post. FCC first phone license required. $500 up depending on experience with VT, Color, Microwave, and transmitter maintenance. Reply to Box 1168-1, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Representatives to sell spot TV commercials to advertisers/agencies. We're really different. We use a unique technique—FSP* which sells itself. Makes our product most imaginative and price most competitive in spot tv market. We supply everything needed to facilitate sales. We pay highest commissions. Write with references: HASHBERRY, 38 E. 57 St., N.Y.C. 10022. *Patented front screen projection.

HELP WANTED—TWO POSITIONS IN RADIO BROADCASTING—FM FINE ARTS STATION HAS OPENINGS FOR A CHIEF ENGINEER AND A PRODUCER-WRITER. Located near Traverse City, Michigan. Salary typical of educational broadcasting station; excellent fringe benefits. Write or phone Director of Personnel, Interlochen Arts Academy, Interlochen, Michigan 49643. Phone Area code 616, 276-9221. Inquiries will be treated confidentially.

Immediate opening for full time announcer at a strong mid-Atlantic FM. Looking for talent in MOR, semi-classical area. Fine working conditions, attractive compensation and future for someone willing to work. Conscientious applicants only—service obligation or discharge necessary. Tape, resume, photo first letter to Operations Manager, WGH-FM, 711 Boush Street, Norfolk, Virginia 23510.

Chief engineer for KMNS Radio, Sioux City, Iowa. Stuart Broadcasting Co. Group. No announcing. Work with 2 other fulltime engineers. Best equipment, e.g. 3 Ampex, 4 super "B" Spotmasters. Contact Frank Gunn, General Manager, Box 177, Sioux City, 712-258-0628.

Immediate opening in northwest Florida on the Gulf Coast for mature, experienced professional M.O.R. announcer for mid-day and evening work. Send tape, resume and salary required to WFTW AM & FM, P.O. Box 10, Fort Walton Beach, Florida 32548.

Need transmitter supervisor and VTR man for new UHF station. Good opportunity to get in on initial construction. Contact Lionel Wittenberg, Chief Engineer, WREP-TV, 1168 Commonwealth Ave., Boston.

HELP WANTED (cont'd)

Need experienced announcer with ability to "sell" on the air, on and off camera. Good news and/or weather background preferable. Write or call James Tighe, General Manager WJHG-TV, Panama City, Florida. Box 2349. 904-763-7651.

North Carolina single market needs announcer-salesman. $100 weekly plus commission. Opportunity for excellent earnings if willing to work. Write Box 1168-9, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Expanding group operation. News and production openings. Salary commensurate with experience. Fringe benefits. Personal interview required. WEOL-WBEA, E.S.T. Building, Elyria, Ohio 44035.

Engineering position available to work with PC-70's, VR-2000's and TK-27's in outstanding metropolitan VHF operation. First Class license required. Write Box 1168-10, c/o BM/E, Blue Ridge Summit, Pa. 17214.

MOR first phone announcers. No maintenance. Permanent position. Apply WETT Radio, Ocean City, Maryland 21842.

POSITIONS WANTED

Soul jock—3rd endorsed, tight board. Draft exempted. College training, relocate. Box 1168-13 c/o BM/E. Blue Ridge Summit, Pa. 17214.

Seeking challenging on-air/production or creative management position in Tokyo. Nine years, U.S. radio, three newspaper, two television. Multiphase education and experience all three areas. Currently in Far East, news/production director, ten-man staff. Available November 1st. Box 1168-2, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Chief Engineer position desired. 12 years experience. All phases Television, ex-chief, Manufacturers representative, strong planning and construction. Will manage your Engineering Department. Box 1168-3, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Art director: 15 years experience. Seeking position in larger market with aggressive sales promotion dept. Photography and graphic design background. Prefer south. Box 1168-4, c/o BM/E. Blue Ridge Summit, Pa. 17214.

Beginner . . . female dj/announcer, broadcast graduate, Negro, third. Seeking work as contemporary jazz or MOR disc jockey—willing to learn. Box 1168-11, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Female—40—December grad of Broadcast school. Desire work in copywriting, commercials or production commercials. Relocate. 3rd. Box 1168-12, c/o BM/E, Blue Ridge Summit, Pa. 17214.

DJ/announcer, newscaster, salesman. Negro, experienced, versatile, creative. 3rd endorsed. Tight board, authoritative news any format. Mature. Box 1168-5, c/o BM/E, Blue Ridge Summit, Pa. 17214.

EQUIPMENT FOR SALE

ANTENNA FOR SALE

1 RCA TFU-24BLS Antenna (Ch. 27) with ½ degree electrical beam tilt. Good condition (VSWR 1.1 to 1 or less). 28 sections RCA MI 19089 UHF Trans. line. 3⅛ inch—20 ft. sections.

Contact: R. J. Wickham,
Dir. of Eng. WKOW-TV
Madison, Wisconsin 53701

TRANSLATOR POWER now put your translator where antenna should be for best coverage not where power line happens to be . Use a TELAN thermoelectric generator. No moving parts, simple to operate, leave unattended 6-12 months. General Instrument Corp., Thermoelectric Division. Dept. BM, 65 Gouverneur St., Newark, N.J. 07104. 201-485-2100 ext. 481.

Whatever your equipment needs . . . check first with Broadcast Equipment and Supply Co., Box 3141, Bristol, Tennessee 37620.

EQUIPMENT FOR SALE (cont'd)

Scully tape recorders, finance and trade. Two Spotmasters Playback, and one record/playback, all three, $38.25 monthly. New equipment. QRK or Russco deluxe turntables, $10.80 monthly. Write for list. New cartridges shipped freight prepaid. Audiovox, Box 7067-55, Miami, Florida 33155.

For Sale: Tower 140 ft. self supporting extra heavy duty construction, galvanized steel, recently painted, complete with lights and insulators, disassembled and ready to ship. SNOW SHOE T.V. CABLE CO., SNOW SHOE, PA. 16874. Phone 387-6871 or 387-4961. Area Code 814.

Brand new remote amplifiers, 2 channel remote microphone amplifiers. 2½ inch VU, battery operated, 7 transistors $95.00 FOB Kokomo. **GREDCO, INC.** 1830 S. Webster, Kokomo, Ind. 46901. Area 317-883-5688.

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

Color video tape recorder/RCA TR-4 available Sept. 1st for $20,500. Unit has air bearing headwheel panel, line-lock. Mono and color ATC modules and accessory tool kit. Box 1168-7, c/o BM/E. Blue Ridge Summit, Pa. 17214.

Remote control—RCA BTR-20A studio and transmitter control units with instructions. Five years old. KMER, Box 432, Kemmercer, Wyoming 83101. Phone: 307-877-4422.

FM antenna: Jampro 4-A. 4-section, tuned 95.7 mHz, excellent condition with 130' 1⅝" heliax and gas barrier. KIKK, 2016 Main, Houston, Texas.

For Sale: WE 405 B-1. Still in service as alternate main. Good for parts only. Being disassembled end of October. Make offer. Box 1168-16, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Gates cartritape II one record/playback one playback. Solid state, like new, best offer. VHSA, Box 616, Warrenton, N.C. 27589.

Complete kit audio proof forms $3.50 postpaid. Specify AM/FM. Box 2605, Corpus Christi, Texas 78403.

MAZE offers some of America's greatest buys in new and used broadcast and recording equipment. Write Box 6636, Birmingham, Ala. 35210.

6 element circular vertical and horizontal antenna. Price $2,400.00. Box 1168-14, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Towers, broadcast, microwave, CATV, TV, new and used. Phone 224-9922. Tower Maintenance, Inc., 2408 Old St. Rd., Tallahassee, Fla.

BARGAINS: CCTV Cameras, monitors, send for free list. Box 1168-15, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Protect your records. Send for our free LP supply lists. Record Supplies, Hillburn, N.Y. 10931.

EQUIPMENT WANTED

Wanted: audio console in operating condition, for CCTV studio. Must have: inputs for five microphones, one turntable, one audio tape recorder, two 600 ohm lines; 600 ohm line output, monitor amplifier, muting relays. Low budget, can offer up to $200.00. Rev. Herman Huttinger, St. Fidelis College and Seminary, Herman, Pa. 16039.

Wanted: 3 used Roberts recorders. Send price and condition to Grace Bible College, Albany, Ga. 31702.

Wanted to Buy—Equipment—SCA Generator to fit Collins FM Transmitter. Box 1168-17, c/o BM/E, Blue Ridge Summit, Pa. 17214.

MISCELLANEOUS FOR SALE

Japanese Electronics. New products monthly! $1.00. Money-back guarantee. DEE 10639 BM Riverside, North Hollywood, Calif. 91602.

Professional Electronics Projects — $1 up. Catalog 25¢. PARKS, Box 25665-B, Seattle, Wash. 98115.

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TECHNICAL SERVICES

DON'T BE AN AUDIO DROPOUT in your market area. Let BROADCAST EQUIPMENT REBUILDERS take care of your tape cartridge rewinding needs. Call or write Quin Morrison for further information. Route 8, Box 718, Fayetteville, N.C. 28304. B-E-R . . . THE SPECIALISTS!

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Relapping and replacement head service for all AMPEX professional studio model recorders. Our precision relapping extends head life for maximum use. Brand new shelf stock replacement heads of our manufacture available when relapping not advisable. Prices include thorough assembly cleaning, optical and electrical inspection and complete testing on Ampex equipment. Monaural assembly relapping . . . $35.00 complete. Monaural assembly replacements . . . $119.50 complete. "Loaner" assemblies available. For more data, contact LIPPS, Inc., 1630 Euclid St., Santa Monica, Calif. 90404 (213) EX 3-0449.

IN CANADA...

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Agencies beg broadcasters for depth information about both market and station. Our in-depth marketsheets tell the total story . . . and you get them at a fair price . . . 1,500 units printed 2 colors on best quality 70# white stock for $135 . . . bonus is 550-name ad agency list. Write for free presentation. ALLIED, Drawer 1991, Prescott, Arizona 86301. (Serving Broadcasters since 1952).

"DEEJAY MANUAL" is a folio of Gags, Ideas, Breaks, Gimmix, Fun for the working deejay. Special $3.00 with this ad. Write for free "Broadcast Comedy" catalog. Show-Biz Comedy Service (Dept. E) 1735 E 26 St., Brooklyn, New York 11229.

DEEJAYS! 6000 classified gag lines for radio, $5.00! COMEDY CATALOG FREE! E. Orrin, Boyer Rd., Mariposa, Calif. 95338.

Add six voices to your station. D. J. PRODUCTIONS, P.O. Box 281, Auburn, Washington 98002 for complete details and sample.

INSTRUCTION

R.E.I.'s famous (5) week course for the First Class Radio Telephone License is the shortest, most effective course in the nation. Over 98% of R.E.I. graduates pass F.C.C. exams for 1st class license. Total tuition $350.00. Job placement free. Write for brochure Radio Engineering Incorporated Schools, 1336 Main Street, Sarasota, Florida—or 3123 Gillham Road, Kansas City, Missouri—or 809 Caroline Street, Fredericksburg, Virginia.

First phone in six to twelve weeks through tape recorded lessons at home. Sixteen years FCC license teaching experience. Proven results. Bob Johnson Broadcast License Training, 1060D Duncan, Manhattan Beach, Calif. 90266.

INSTRUCTION (cont'd)

FCC License in six weeks from the nation's largest license school. Compare reputations and success rates before you invest. Professional announcing training on the nation's only fully school-operated commercial station used solely for training. School locations in Dallas, Atlanta, Chicago, New Orleans and Minneapolis. Write Elkins Institute, 2603 Inwood Road, Dallas, Texas 75235.

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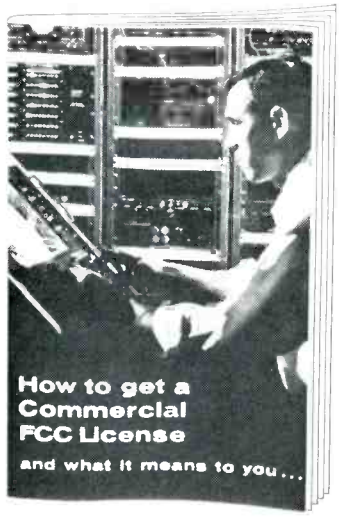
BM/E, Classified Advertising Department, Blue Ridge Summit, Pa. 17214. 717/794-2191.

BROADCAST EXECUTIVES—show this ad to the up-and-coming young men on your staff.

Want to move up fast in broadcasting?

This free book may change your life



It takes the mystery out of getting the FCC License you need for security and success

NO WONDER you're interested in a career in broadcasting. It puts you right "where the action is"—behind the scenes of show business, news reporting, politics. You meet famous people. You're the first to know the big news about fires, riots, plane crashes. You get to hear wonderful music. You feel in contact with an audience of thousands.

And one of the most secure high-pay jobs in the field is that of the licensed Broadcast Engineer. He's the key man required on the job by the United States Government

New job opportunities are opening up constantly for qualified license-holders. Many more will be needed to operate and maintain the countless new UHF-TV stations expected to begin operation, now that all new TV sets can receive UHF.

So if you dream of making broadcasting your life work, you need that Government FCC License.

But how do you go about getting it? Where do you apply, and when? How do you get ready for it?

To help you, we have published a 24-page booklet, "How to Get a Commercial FCC License." It tells you exactly which types of licenses and permits are issued by the Federal Communications Commission, and what kinds of electronic equipment each type allows you to operate and maintain.

You will learn which subjects must be mastered for each kind of license. Thirty typical exam questions will give you an idea of the level of training required. You'll be told where and how often the exams are held, and how to find out about the exams held nearest your home.

Frankly, the FCC exams are rough if you're unprepared. Two out of three applicants fail to pass. Some fail seven or eight times.

But with the right preparation, it's easier than you would imagine. Better than 9 out of 10 CIE-trained men pass the exam with no difficulty. Our record is so good that we are able to promise every student in writing: *after completing your CIE course, you'll be able to pass your FCC exam, or CIE will refund your tuition in full.*

We'll send you a free copy of our school catalog in addition to your free FCC booklet. Then you can see for yourself how thorough our home study courses and teaching methods are. No obligation, of course.

To receive both books free, just mail coupon below. If coupon is missing, write to Cleveland Institute of Electronics, 1776 East 17th Street, Dept. BM-15 Cleveland, Ohio 44114. Do it right now—if you want a solid career in broadcasting, this could be the turning point in your life.

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says Matt Stuczynski, senior transmitter operator, Station WBOE. "Even though I had only six weeks of high school algebra, CIE's AUTO-PROGRAMMED ® lessons make electronics theory and fundamentals easy. After completing my CIE course, I took and passed the 1st Class FCC Exam. I now have a good job in studio operation, transmitting, proof of performance, equipment servicing. Believe me, CIE lives up to its promises. I really enjoy my work and I'm on my way up."

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Please send me, without cost or obligation, your 24-page booklet, "How to Get a Commercial FCC License," together with your school catalog of license-preparation courses.

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(Please Print)

ADDRESS _____

CITY _____ STATE _____ ZIP _____

☐ **ADVANCED COURSE FOR LICENSE HOLDERS.** Check box if you already have an FCC License and desire information about our Advanced Communications Engineering Course which has helped many broadcast engineers reach the top of their profession.

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BM/E ADVERTISERS' INDEX

*Also in Broadcast Equipment Buyers' Guide

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JAPAN
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Central Tokyo, Japan
Yoshi Yamamoto

Once upon a time there was a small but worthy communications engineering company (Multronics, by name) that had an rf contactor problem.

No matter where they turned or what they offered, they could NOT find an rf contactor they could count on.

Bad enough, they bemoaned, that an rf contactor should chance the pyrotechnics of recoil. Or the ineconomies of interrupted closure. Or the actual shaking loose of supposedly unloosable connections.

Bad enough, indeed, but worse when they arrived with broken connector arms (painful!) or ceramic-shatttered insulators (messy!).

Why not, mused John *Mul*laney, enterprising entrepreneur and (as you may have guessed) President of *Mul*tronics, Inc., design a new rf contactor. Which is just what they did. Which is just why they bring you this exciting tale of the Multronics Model 160 Double Pole, Double Throw RF Contactor.

Yes, the Model 160 has proved the very "model" of efficiency. A 20 pound spring absorbs all recoil. (Known worldwide as the Multronics BREECH-LOCK Mechanism.) It features two heavy duty solenoids able to do their heavy duty even when voltage varies widely. Hang-up-proof contact sleeves. Shakeproof, self-locking hardware. Microswitch voltage control. Specially-treated Melamine instead of ceramics and micalex. . . .

Oh, there wasn't a THING the Multronics engineers overlooked. The Model 160 a true gem in every respect . . . save one. It costs 58% percent more. Alas!
"So be it," commented John Mullaney. "One must be willing to pay more for top quality. Furthermore, I'll wager there are innumerable rf contactor buyers willing to pay $185 if they once learn the truth.

"Indeed, why not tell the anxious communications world about the Model 160 and its as-yet-unnamed-110-volt companion contactor. Tell people to contact me personally (nothing too good for the Model 160) at 5712 Frederick Avenue in Rockville, Maryland. Remind the few who might not know that our Zip Code is 20852, our telephone 427-4666, Area Code 301." "After all," he concluded, "news of this consequence demands immediate action."

Circle 56 on Reader Service Card

FROM THE EDITOR

Why So Much Attention to ETV/ITV?

It's possible that you will react to this issue with "Why all the fuss over ITV? What's it got to do with me?" It's possible, but we hope not true.

It could very well be that you are one of the growing number of broadcast engineers employed by a public or parochial school. The National Education Association estimates 1000 CCTV or ITFS systems in operation in 1968. The FCC reports 39 ITFS stations on the air as of September; 96 authorized; 19 pending applications.

If you are a program director or producer doing essentially the Madison Avenue thing, you may wish to volunteer your talents to the cause of better education.

Short of such direct involvement, you ought to be interested as a parent of a school-age youngster or simply as a citizen. Most of our school systems are failing to meet the needs of most youngsters. The graded subject-oriented school is fun only for bright students. Most other kids hate school.

Educational Consultant Edwin F. Shelley says the current ferment in education revolves about three needs:

- The need for vastly increased education and training for all members of our society
- The need for truly individualized attention to each student to permit him to realize his full potential
- The need for higher productivity in the teaching and and learning process to eliminate the economic barriers to universal education.

Our present approach to education is not meeting these needs. Instructional TV alone is by no means the total answer, but it can be used to meet the needs described by Shelley.

Use of TV as described on pages 38 to 51 of this issue indicates how TV can increase educational opportunities. Examples of individualized attention are sparse. Better examples were reported in *BM/E*, August 1967, pages 33 to 42. As a means of higher productivity in teaching, current use of ITV fails. Teachers view ITV as a threat to their classroom autonomy and, therefore, permit it only as a resource material.

Before ITV can be used in any optimum way, schools will have to accept as a research goal the needs described above. Then multimedia approaches, ITV, programmed instruction, computer-assisted instruction and other means can be tried. Assuming teachers, nationwide, gain their current salary and tenure demands, they should feel more secure and open to experimentation.

So, although you may not be in ITV directly, you should be aware of the contribution it can make to national educational goals.

If nothing else, keep your Board of Education alert to the potentialities of ITV.*

James A. Lippke

**To appraise yourself of new solutions, read "Innovation in Education: New Direction for the American School." Price $1.00. Committee for Economic Development, 477 Madison Ave., New York, N.Y. 10022.*

TDA2D VIDEO/PULSE DISTRIBUTION AMPLIFIER

The now-famous TDA2 Distribution Amplifier, in use at most television stations and networks, has a recently added feature. The "D" stands for Differential Input, which we added to the TDA2. And not only did we add a differential input, we subtracted $30.00 from the price. Instead of $325.00, we're selling the new improved TDA2D for $295.00 F.O.B. Nashville, Tennessee. The compact TDA2D fits neatly into 1¾ inches of panel space and produces virtually no heat. For complete information, write to:

INTERNATIONAL NUCLEAR CORPORATION
608 Norris Ave • Nashville, Tenn. 37204 • Ph.: (615) 254-3365
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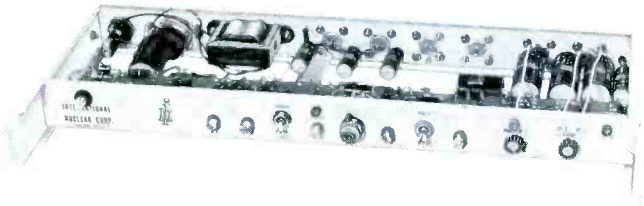
TDA5 BALANCED/UNBALANCED VIDEO/PULSE DISTRIBUTION AMPLIFIER



For the many occasions when signals must be transmitted balanced, yet must be fed to other equipment unbalanced, International Nuclear offers the TDA5. Two inputs are provided, selection of which is accomplished by a front panel switch. The balanced input is the bridging type and may be terminated in 124 ohms. The unbalanced input is high impedance and may be terminated in 75 ohms. The TDA5 serves both video and pulse functions at the flip of a switch. The TDA5 sells for $400.00 F.O.B. Nashville. For additional benefits of this system and complete information, write to:

INTERNATIONAL NUCLEAR CORPORATION
608 Norris Ave • Nashville, Tenn. 37204 • Ph.: (615) 254-3365
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TDA7 VIDEO/PULSE DISTRIBUTION AMPLIFIER

The TDA7 is a completely transistorized distribution amplifier constructed as a plug-in module. The rack will hold 10 TDA7's and occupies only 5¼ inches of panel space. Each plug-in unit provides the video and pulse functions with the flip of a switch. Provision is made to add a sync-adding circuit directly to the TDA7. This is specified as TDA9. The individual TDA7 plug-in units are $295.00 each F.O.B. Nashville, Tennessee . . . with sync-add feature $320.00. The mounting frame accommodates up to 10 units and sells for $270.00. For complete specifications and information on other accessories, write to:

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608 Norris Ave • Nashville, Tenn. 37204 • Ph.: (615) 254-3365
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TDA26 HIGH GAIN VIDEO AMPLIFIER

The TDA26 is a compact, completely transistorized Pulse Distribution Amplifier designed to be used at the output of camera branching pads or in any application where 28 DB gain is required. The TDA26 mounts in a standard 19-inch rack, using type 83 connectors throughout. It has 3 signal outputs, weighs less than 4 pounds, mounts in 1¾ inches of panel space. The TDA26 sells for $400.00 F.O.B. Nashville, Tennessee. For complete information, write to:

INTERNATIONAL NUCLEAR CORPORATION
608 Norris Ave • Nashville, Tenn. 37204 • Ph.: (615) 254-3365
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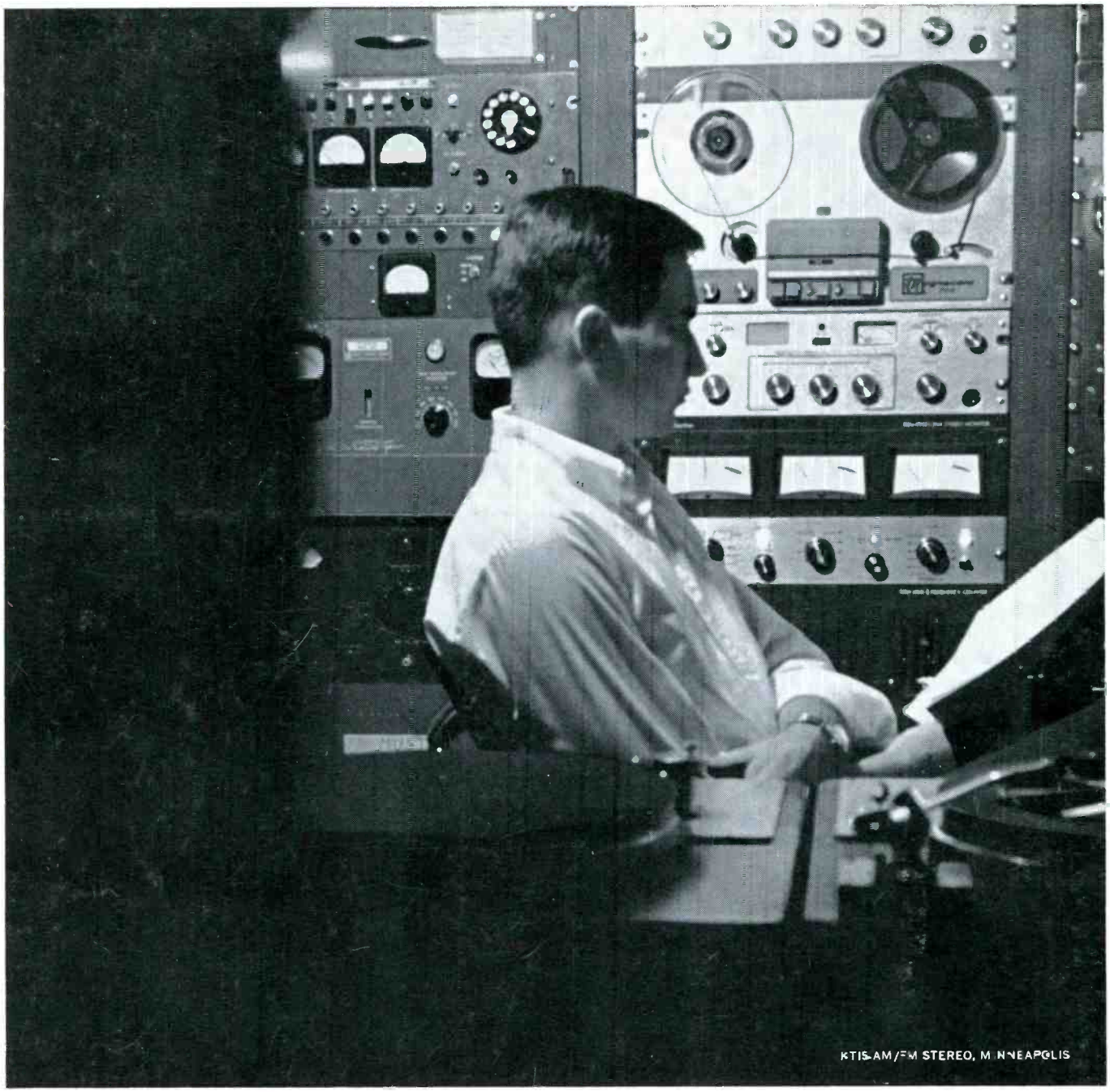

Every Hour of Every Day

Magnecord tape recorders run hour after hour, every day, under the toughest broadcast conditions. The die-cast mainplate assures permanent mechanical alignment. Timing accuracy is constant with the hysteresis synchronous capstan tape drive. Payout and take up reels have their own heavy duty split-capacitor motors. In short, solid state Magnecords are built to take it, day after day. You can depend on it.

The quality of a Magnecord does not vary from model to model. Features do:

MODEL 1021. Monaural broadcast unit. Inputs: Mixing bridge and choice of Lo-Z microphone or balanced bridge or unbalanced bridge. Cue Speaker. Monitor Amplifier. Two speeds. Balanced 150/600 ohm output.

MODEL 1022. Studio or broadcast stereo unit. Inputs Per Channel: Auxiliary bridge and choice of Lo-Z microphone or balanced bridge or unbalanced bridge. Separate Playback and Record/Gain Controls for each channel. Master Playback and Record/Gain Controls. Balanced 150/600 ohm output. Choice of speeds and head configurations. Full remote option.

MODEL 1024. Commercial or personal stereo unit. Inputs Per Channel: Hi-Z microphone, mixing bridge, auxiliary bridge. Full mixing facilities. 1K ohm emitter follower output. Choice of speeds and head configurations.

Write for the full story on a Magnecord tape recorder. You can depend on a prompt answer.

PRODUCTS OF SOUND RESEARCH

TELEX®

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