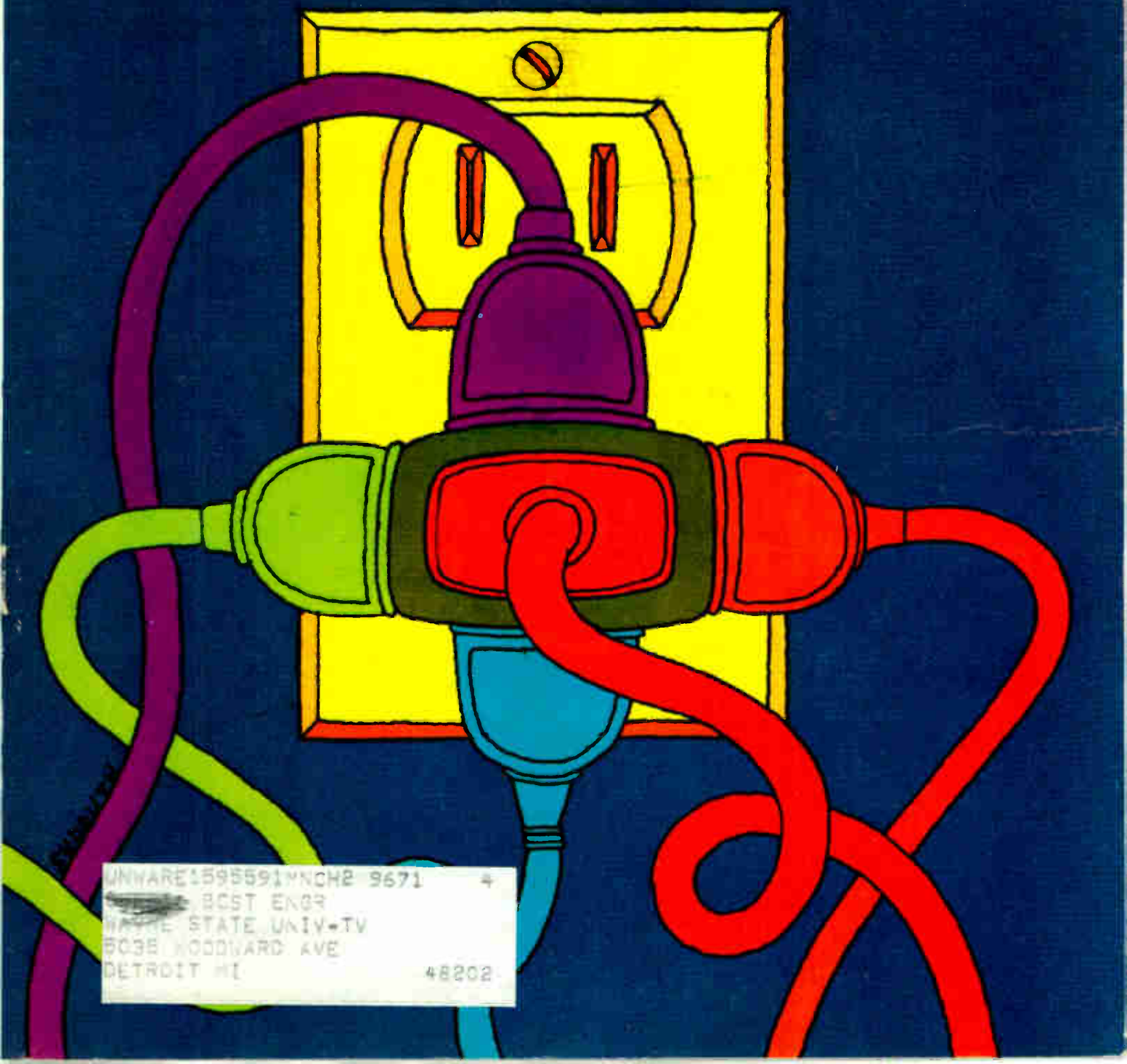
A MACTIER PUBLICATION / NOVEMBER 1967

BM/E

BROADCAST MANAGEMENT/ENGINEERING

STATION PLANNING MODERNIZATION AND CONSTRUCTION



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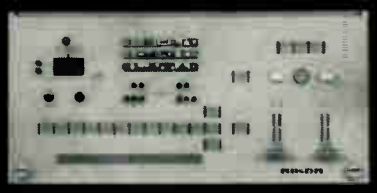

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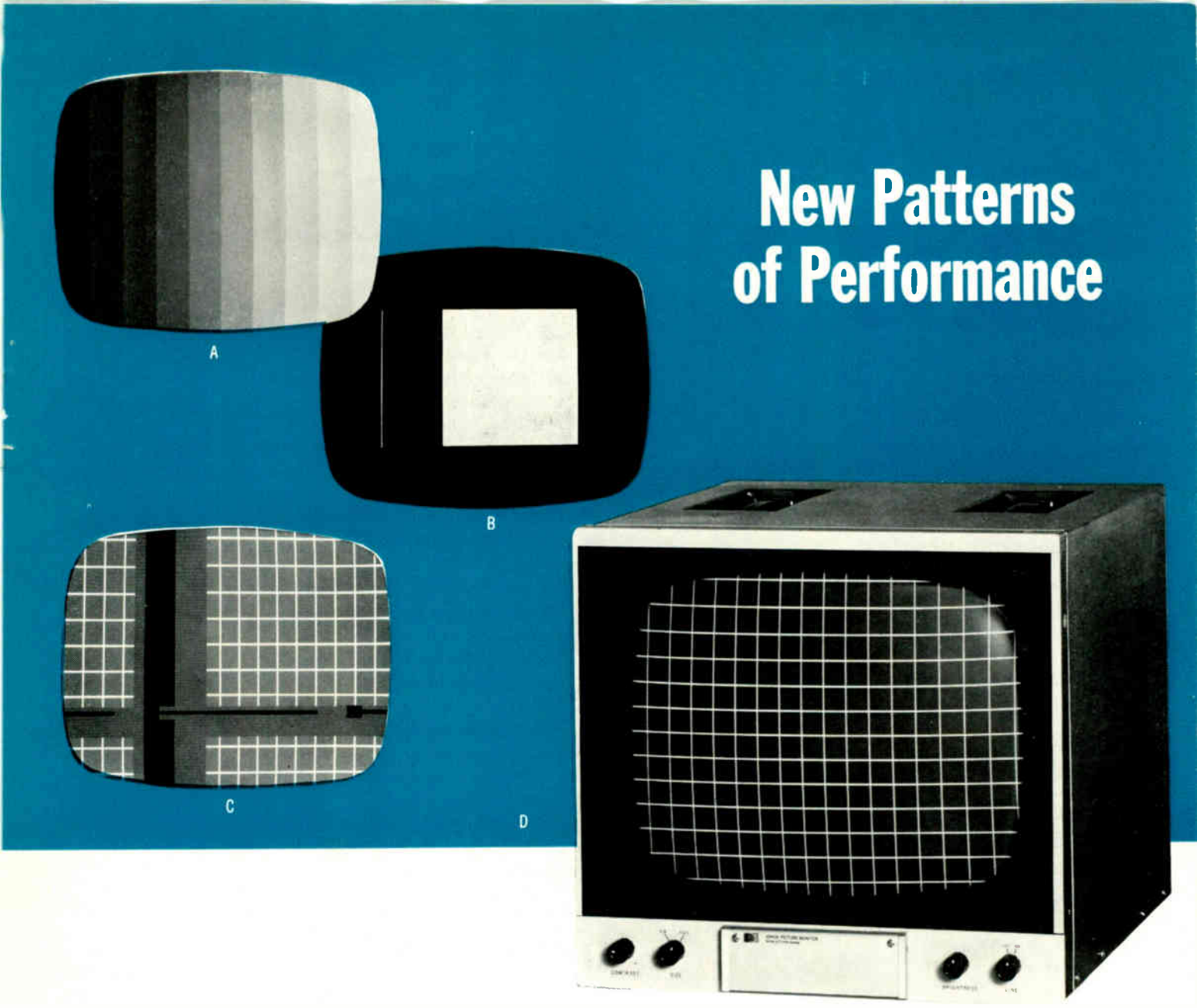

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hp 17" Video Monitor Achieves Increased Reliability and Improved Picture Quality through Advanced Circuit Techniques

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A Keyed back porch clamp assures less than 1% black level shift for 100% video amplitude change.

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COMMUNICATION INSTRUMENTS

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21801

NOVEMBER 1967/VOLUME 3/NUMBER 11

BM/E

BROADCAST MANAGEMENT/ ENGINEERING

This Month's cover: Overloaded outlets are a tell-tale sign that it's time to expand, modernize, or rebuild. Take a look at your outlets and if the message fits study this issue closely for new ideas on new construction or modernization. Next time don't forget to plan for plenty of ac outlets.

Mactier Publishing Corp.
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(Correspondence to Verne Ray may be directed to Monterey and Pinola Ave., Blue Ridge Summit, Pa. 17214. Phone 717-794-2191)

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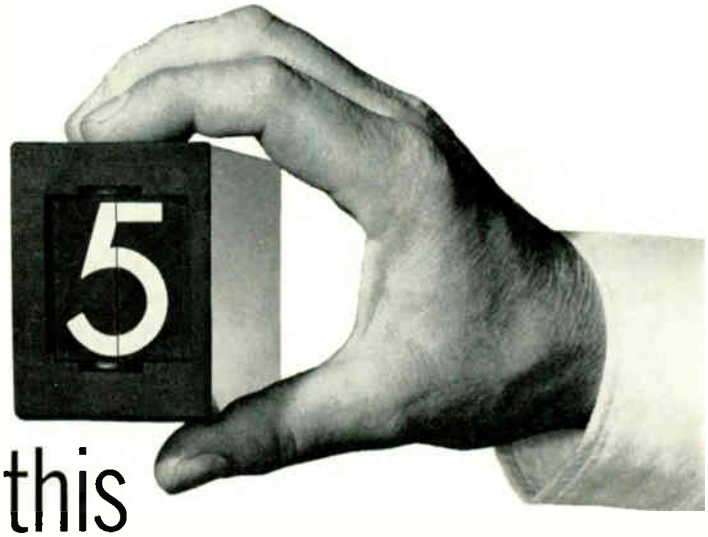
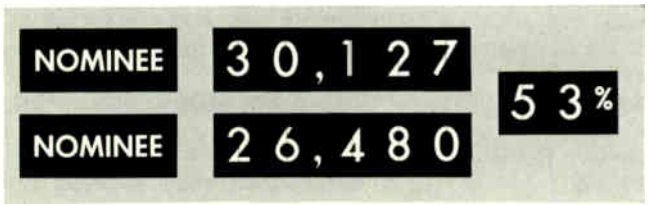
 Controlled Circulation postage paid at Duluth, Minn.

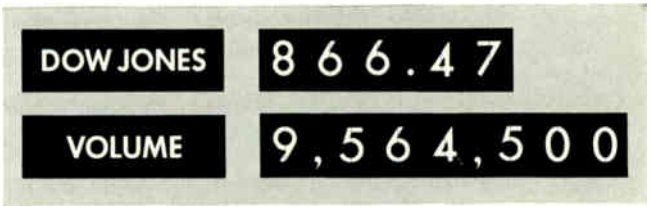
Look what your cameras can do with display units like this



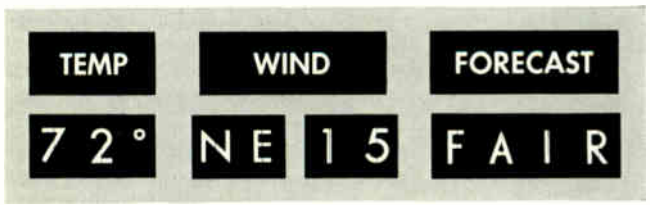
CBS Laboratories' Digital Display Units are part of
a low cost, compact system that works daily wonders in any size TV studio!



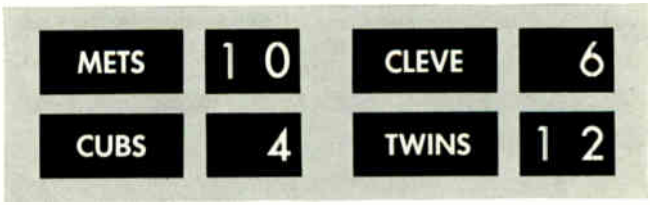
ELECTIONS – No contest.
These modular units were designed specifically for TV use to give optimum clarity up to 70 feet — from any camera angle up to 145 degrees.



STOCK REPORTS – Excellent for the long pull.
Rugged electro-mechanical operation is fool-proof and built to last. No bulb burn-out or the other problems of rear-illuminated displays.



WEATHER – Cool operation.
Only 2.7 watts required per unit, with no power between postings. Glare-free even under the strongest lighting conditions.



SPORTS – An easy set-up.
Just stack these units in a flat to suit any requirement. Custom designed matrix wiring also available for complete flexibility.

And all operated by one Controller that can handle 192 units — as many as 12 groups of 16 units each. This means up to 12 two-candidate election races; or runs, hits and errors for all major league teams; or 40 local stock issues plus volume and Dow Jones closing. A one-time investment for the professional way to take care of all your daily display needs.

Our engineers will even design your system for you. Don't take our word for it. Write or call us collect (203) 327-2000, and let us show you.

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CBS LABORATORIES
Stamford, Connecticut. A Division of
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BROADCAST INDUSTRY NEWS

CATV Steals ⅓ of U market

WBRE-TV, Wilkes Barre-Scranton, has in the past overcome the handicap of a depression economy, a mountainous terrain, and channel assignment in the uhf band but none of these compare with the handicap created by CATV operations said David Baltimore, general manager of WBRE-TV.

Baltimore, also a director of ACTS (All Channel Television Service—a poor man's AMST according to Baltimore) told engineers assembled at the IEEE 17th Annual Broadcast Symposium that CATV had stole one-third of his audience by carrying Philadelphia stations rather than his own. Baltimore said his station was once viewed in 100 to 135,000 homes via CATV when these systems were originally owned by "ma and pa" operators. Now he claims "money grabbing Wall Street financiers trying their darndest to steal TV programs rights have moved in" and of 150,000 homes served by CATV systems within a 75-mile radius of Wilkes-Barre only 19,000 carry WBRE (an NBC affiliate.) The pirates, adding insult to economy injury to WBRE, carry only distant Philadelphia stations, Baltimore said. "They claim 12-channel service but what this means is 3 NBC, 3 CBS, 3 ABC stations, two independents and a time and weather channel. We are being drowned by dilution of signal," he said.

Actually, 12-channel coverage is a fraudulent claim, Baltimore says, since the three networks are duplicated three times and six of the nine are below decent signal levels. Only a minority of sports enthusiasts watch the independent stations, Baltimore claims, thus when the system requires that the home owner remove his roof-top antenna customers are really being deceived on coverage.

The noncarriage of his local station is what really upsets Baltimore. What were once his customers in his defined Grade A contour are now being given to the Philadelphia stations which, on contour maps, really have only 5 percent overlap. Although the FCC has ordered several CATV systems to carry the Wilkes Barre station, they have flaunted the order thus far. Baltimore says he has 25 separate filings before the FCC to protect his market.

CATV Task Force Chief Sol Schildhause, appearing on the same panel, admitted that systems may be operating contrary to FCC intent and rulings but said enforcement couldn't be handled as readily as he'd like to see because of the small staff available to process all CATV matters.

Schildhause in brief remarks earlier predicted that solution of the copyright problem (in which CATV systems would be required to pay for carriage of copyrighted material) would not solve all problems. He said, " It is questionable whether long term characteristics of cable distribution will be solved by that alone." Inasmuch as cable is expensive and can't serve the urban poor or rural wealthy, regulatory problems will exist. Schildhause also envisions a shift in the present structure of communications systems as a result of studies of spectrum usage, satellite development, home video recorder market penetration and other technical developments.

Advice from the floor included

Happenings At The IEEE-GB Symposium . . .

At right, Roy Fullen, chief engineer of WTVD, Durham, N.C., inquires about the Norelco PC-70 3-tube Plumbicon color camera features from Charles Spicer, vice-president engineering of Visual Electronics Corporation at Visual's exhibit suite during the IEEE-GB Symposium recently held in Washington, D.C. For more detailed information see Broadcast Industry News, p 6; Convention Log, p 11; and Editorial, p 86.

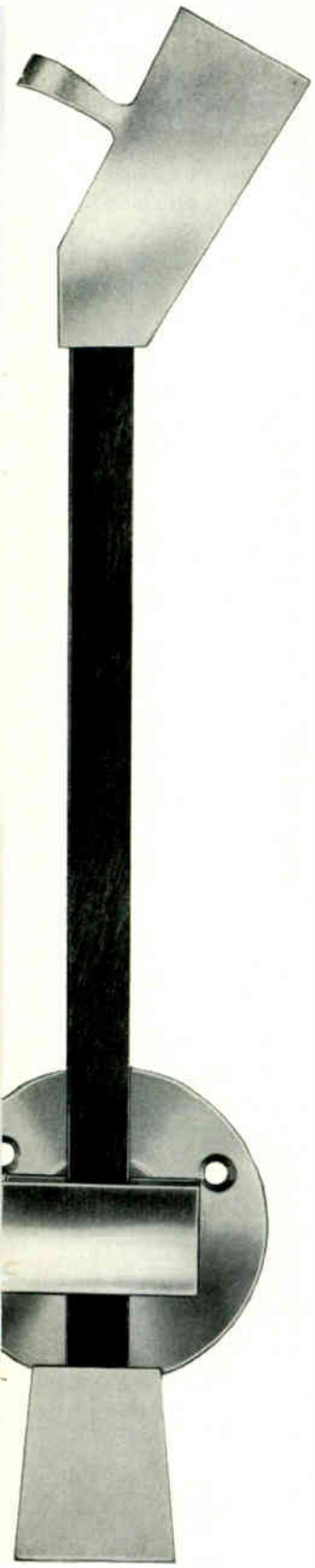
Don't Forget . . .

NAEB Convention
November 5-8
Denver, Colo.

Eighth Armed Forces Television Conference
November 5-9
Lowry AFB, Colo.

Western Conference on Broadcasting
November 9, 10
Los Angeles, Calif.

Don't look now, but...
your tone arms may be obsolete.



Will your present tone arms provide high compliance for stereo—absolute durability — are they engineered specifically for broadcasting — do they have high isolation from resonance — will they track distortion free at micro pressures to 1/10 of a gram — are they memory balanced — do they incorporate fluid anti-skate — are they free from fragile weights and gadgets — are they completely reliable.

Probably not.

Unless you already have **Micro-Trak**! This fine broadcast instrument has been designed by Gray's Research Team to satisfy the new need in the industry for micro pressure cartridges and to provide a stereo tone arm suitable to handle the the finest distortion free reproduction.

With the passing of monaural records your station must be up to the state of the art, and since the **Micro-Trak** is readily interchangeable with your present equipment your first step should be a stop at your Gray Distributor, also for new construction specify Gray **Micro-Trak.**

Incidentally . . . accept our apologies. We didn't set out to make your present tone arms obsolete.

The **Micro-Trak** features a unique system of clean, modern styling, plug in memory balance head, arm body fabrication from epoxy impregnated hard wood—light weight yet highly durable. The cost? Comparable to present professional tone arm prices.

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- **The 206 12-inch Tone Arm**
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- **The 602-C Broadcast Equalizer**
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Write for complete product information

MICRO-TRAK® SPECIFICATIONS

303 12″ PROFESSIONAL TONE ARM

Dimensions: 12-1/2″ overall (317.5 MM)
8-5/16″ spindle to pivot (211.1 MM)
2-7/8″ from pivot to back of arm (73 MM)

Weight: 1 lb. (.454 kg)

Overhang: 0.682″ spindle center to stylus

Resonance: Less than 10 HZ 1/2 Gram at $30x10^{-6}$ CM/DYNE Compliance

Tracking Error: 3.0 in radius 0° 0′
3.75 in radius 1° 28′
4.75 in radius 0° 0′
5.5 in radius 2° 0′

Micro-Trak is also available in a longer version for 16″ turntables, for EMT turntables, and in special lengths for custom table sizes.

GRAY RESEARCH & DEVELOPMENT COMPANY
EAST HARTFORD, CONNECTICUT 06108

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licensing of CATV systems, mandatory coverage of the hinterlands by TV stations holding licenses in prime markets, better local programming by local stations to make them in demand, denial of distant station transmission by microwave.

One major frustration and dilemma with no solution in sight yet is a better method of defining Grade A and Grade B contours.

FCC Approves Digital Meters For Transmitters

On September 20, the Commission amended its rules to permit the use of digital meters, printers, and other numerical readout devices for metering broadcast transmitters (Docket 17338; RM-954, RM-1044). The present rules have specifications only for conventional pointer and scale meters.

The chief use of digital devices is expected to be for automatic logging, in place of the graphical methods.

The amended rules permit digital meter indications to be read and entered on the operations log at the transmitter, but require keeping either conventional meters or an extra digital meter at the transmitter and in the antenna circuit for standby use. Other provisions of the changed rules provide for a readout of three digits, omission of the decimal point, and an accuracy of at least 2 percent.

ETVs Permitted to Air Music In Off Hours

On September 13 the Commission waived Section 73.651(c) of the Rules and granted five educational TV stations authority to accompany their visual transmissions of slides, films, or other visual images with aural music during scheduled breaks in their in-school programming schedule. Section 73.651(c) provides that aural transmitters of TV stations shall not be operated separately from the visual transmitter except for certain purposes.

NAB Station Appeals On Cigarette Commercials

The National Association of Broadcasters and Station WTRF-FM-TV, Wheeling, W.Va., asked the Fourth Circuit U.S. Court of Appeals in mid-September to review the FCC action extending the Commission's "Fairness Doctrine" to product advertising, particularly cigarette.

Growth of CATV Slowed By FCC Order

Cable television is one of the fastest growing industries in the U.S. But its growth rate has been slowed appreciably since the FCC's Second Report and Order, clamping rigid controls on cable TV, took effect 20 months ago, an NCTA tabulation has disclosed.

The activation of new systems this year has proceeded at an annual rate only one-third that of 1965, last complete year before imposition of the FCC controls. A total of 200 new systems were put in operation in 1965, compared with an indicated 67 for the full year of 1967. (In 1966, 350 systems became newly operative but much of this activity occurred during the first two months when cable TV companies rushed to put new systems into operation before the FCC order became effective in March.)

In order to determine the extent and nature of the Commission's growing rules on carriage and exclusivity in the CATV industry as a whole, and to survey suggestions as to how they may be dealt with, the FCC is sending a Notice of Inquiry to licensees of all operating TV broadcast stations and to all CATV operators who filed FCC Form 325. This is a general information form required of all CATV systems in operation by December 1, 1966.

Main thrust of the inquiry will deal with questions on program exclusivity policies; demands of local broadcasters for their rights; private agreements; effects, if any, on subscriber viewing habits; impact on weekly circulation; difficulties and economic effects.

The inquiry also asks for suggestions for rule modifications that would take into account the requirements of stations, systems and viewers.

The order calls for responses to be filed within 60 days of the release date of the Notice. It states that responses need not be limited to specific questions but may include other data considered pertinent to the inquiry. No one will be required to respond, but the Commission hopes that parties with pertinent experience will do so.

CATV industry growth from 1964 till the present tabulates as follows:

	1964	1965	1966	1967
Total operating systems	1200	1400	1750	1817
Total subscribers	1,085,000	1,600,000	2,500,000	3,167,000

Sandwiched between two observatories protected by federal regulation from all but the slightest amount of rf radiation, WVIR-TV (uhf), Charlottesville, Va., earlier this year was faced with shaping their signal in a way that would keep everybody happy. Richard Bogner of Bogner Antenna Systems (center in photo) found the answer to the problem by developing a now patented disc-rod antenna that puts WVIR-TV on the air with a "Y"-shaped pattern. Ira Kamen, vice president of WVIR-TV (l) and Daniel J. Riesner, secretary and director of the station, flank Bogner as he explains the antenna's operation.

Educational Network Interconnection

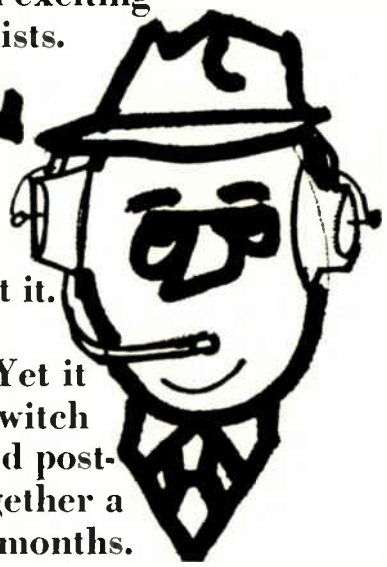
As this issue is distributed, the first fulltime network of noncommercial television stations will begin operations. According to announcement made by the Eastern Educational Network and National Educational Television the network will involve 17 stations in 12 states from Maine to the District of Columbia. Live carriage of regular EEN and NET programs including the new Public Broadcast Laboratory's Sunday series and special programs developed jointly will begin on Nov. 5.

Cost of the first seven months of network interconnection is expected to be about $150,000, according to Gerard Appy, NET vice president for network relations. EEN and NET each will pay half that amount. EEN, however, will receive approximately $30,000 from PBL as 75 percent compensation for the laboratory's savings on interconnection for its Sunday series. EEN will bear all administrative costs, estimated at $30,000 during the seven-month period.

Harvey's is selling stuff you may not know exists.

There's an information gap in the broadcast and recording fields today. Sometimes we find ourselves distributing an exciting new product that many professionals don't even know exists.

For example, did you know that there's a new boom headset with built-in microphone that's so light you can actually forget you're wearing it? It can pick up two different signals at once. It's interchangeable with any standard boom headset. And if you want one now, Harvey's is the only place you can get it.



Also, there's now a complete console mike channel so small, you can hold it in your hand. Yet it includes a fader, program equalizer, line-mike switch with input pad, reverb-send channel and pre- and post-echo switch. With a few of them you can put together a complete console in a couple of days instead of months. It's revolutionary—yet, just about the only people who know of it are Harvey customers. Because just about the only place you can get it is Harvey's.

There's much more that's new. We have several new low-cost microphones that sound just as good as the most expensive mikes of a few years ago.

And so on. And so on.

Harvey's is in the habit of finding new equipment and distributing it before anyone else does. Often before anyone else knows about it, in fact. That's why almost every major sound studio and radio station already deals with Harvey's.

Help us close the information gap in the broadcast and recording fields. Call or write Harvey's regularly.

Open an account, if you want, and we'll start sending you our newsletter.

You don't necessarily have to buy anything. We'll just feel a lot better if you, at least, know what exists.

Harvey Radio Co., Inc.

Professional A/V Division, 2 West 45th St., New York, N.Y. 10036 (212) JU 2-1500

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International Broadcasters Society

On September 1st eleven prominent members of the International Broadcasters Society received the Executive Shield in recognition of their outstanding services to the society and the profession of broadcasting. The ceremony represents the high point of the society's year, at which the world body pays tribute to those members who have appeared on the annual honors list.

The International Broadcasters Society is a global professional organization, serving broadcasting in more than 100 lands.

FCC Proposes Unattended STL Signs

On September 6 the FCC proposed an amendment to Section 74.664 (a) of the Rules to require the call sign and license of unattended studio transmitter links and intercity relay station transmitters displayed on the antenna structure.

Section 74.664(a) governs TV broadcast auxiliary stations and the posting of station operator licenses at unattended TV transmitters.

The Commission issued a Notice of Proposed Rule Making asking for comments on the rule change. The amendment would require the call signs and names of the licensees to be placed on the supporting antenna structure visible to a person standing in an easily accessible spot.

State of Kentucky Awards $4-million Contract. RCA has been awarded more than $4 million in contracts by the State of Kentucky to supply TV transmitting equipment for the 12 broadcasting locations in the state's new educational network.

Barton Kreuzer, division vice president and general manager, Broadcast and Communications Products Division, said the contracts represent the largest single purchase of RCA broadcast equipment in the history of the company.

Largest of the two RCA equipment packages calls for 12 complete uhf transmitting plants, to include at each location a TV transmitter and antenna, antenna power, transmission lines and other items. RCA also will supply approximately $100,000 in film projection equipment for television under a separate agreement.

ETV Stations to Produce Arts Program. Twenty noncommercial (educational) radio and TV stations have been awarded National Endowment for the Arts funds to assist in the production of original television programs on the Arts. The announcement was made by the ETS Program Service which is administering the project under a grant from the National Endowment for the Arts.

The total project involving $342,000 in grant and matching funds will result in at least 40 orig-

Composite Week For Program Log Analysis

The following dates will constitute the composite week for use in the preparation of program log analyses submitted with applications for a-m, fm and TV station licenses which have termination dates in 1968.

Sunday, February 26, 1967
Monday, March 13, 1967
Tuesday, December 6, 1966
Wednesday, May 31, 1967
Thursday, July 13, 1967
Friday, Janaury 6, 1967
Saturday, April 22, 1967

The above information was released by the FCC in Public Notice 67-970 4091, dated August 17, 1967.

inal television programs on the Arts which will be made available to more than 130 ETV stations throughout the nation.

Jerrold Completes Seminars for Engineering-Contractors. The Educational and Communication Systems Division of Jerrold Electronics Corporation recently completed a series of four major technical seminars for its nation-wide engineering-contractor organization.

The two-day regional meetings were held during July and August in Philadelphia; Redwood City, Calif.; Kansas City; and Atlanta.

Nearly 200 representatives of Jerrold's engineering-contractors were briefed on latest product and systems developments for educational television, instructional television, master antenna television and microwave used in schools, colleges, hotels, motels, hospitals, and industries.

LTV Ling Altec, Inc. and Allied Radio Corporation Reach Merger Agreement. A definitive agreement for the acquisition of Allied Radio Corporation, Chicago, by LTV Ling Altec, Inc., Anaheim, Calif., has been reached. Alvis A. Ward, president of LTV Ling Altec, a subsidiary of Ling-Temco-Vought, Inc., Dallas, and A.D. Davis, Allied board and chief executive, pointed out that these are substantially the same terms announced on August 30 when agreement in principle was reached.

Jerrold and General Instrument Announce Formal Merger Approval. Martin H. Benedek, chairman of the Board of General Instrument Corporation, and Robert H. Beisswenger, president and chief executive officer of the Jerrold Corporation, announce that their respective Boards of Directors have approved the acquisition of Jerrold by General Instrument on the basis previously announced. As previously announced, the merger is subject to approvals of stockholders and receipt of a favorable ruling on the Internal Revenue Service.

Governor Opens New BIW Plant. The newest production facility of Boston Insulated Wire and Cable Co. was officially opened in late September by Governor John A. Volpe. Impetus for the new facility stems from growing demands of industry and the military for specialty cables that meet sophisticated electrical requirements and survive rigorous mechanical and environmental conditions. Located in the former Plymouth Cordage plant at Plymouth, Mass., the facility promises economic growth to South Shore area of Mass.

CONVENTION LOG

For Better Pictures More Standards

Better TV monitoring and the need for specification standards was the main thrust of two presentations at the 17th Annual Broadcast Symposium. Archer Taylor called for cooperation between transmitter engineers and CATV head-end operators. A paper by RCA engineers T.M. Gluyas and W.L. Behrend analyzed cross talk as a result of overlapping transmitter and receiver lower band pass characteristics and incorrect predistortion of h-f envelope delay.

The reception of television is not today viewed as part of a broadcasting *system* says Taylor of Malarkey, Taylor & Associates

and as a consequence there is no effective way for getting the proper feedback to know whether picture quality is as good as it might be or should be. CATV head ends should be viewed as part of the delivery system. A wealth of information could be garnered by broadcasters from CATV system operators if the two would cooperate Taylor said.

Broadcasters have never known enough about receivers and tests conducted at head ends now offer the opportunity, Taylor said. Standards are needed. One example of cooperation would be the transmission of the visual carrier without aural signals during experimental hours to learn more about transmission, transmitter tuning, etc. Remarkably low intermodulation distortion (0.005 percent) has been achieved with distribution amplifiers and by comparison demodulators are crude—and definitely contribute to picture waveform distortion. Broadcasters ought to be interested in better demodulation for head ends to facilitate testing, Taylor said.

The demodulator design described at the Broadcasting Symposium by Marvin Davies of Ward Electronic Industries looked promising for such purposes, Taylor thought.

Extensive tests on correlating picture quality to transmitter tests have been conducted by RCA. The problem of demodulator design was underscored by the RCA engineers Gluyas and Behrend who said demodulators should accurately match the inverse of the envelope delay pre-distortion (specified by FCC rules) or, ideally, include all-pass correcting network to ensure compatibility. The RCA engineers demonstrated the effect of various demodulation characteristics on high frequency envelope delays and found all wanting.

At the low-frequency end, the authors found broad diode detectors were unsatisfactory and that linear phase vestigial demodulators are required. A basic problem in relating measurements to picture quality is that receiver standards have never been formulated hence there is no assurance that transmitter delay adjustments made by video to video measurements are correct for all receivers.

The authors pinpointed industry goals that must be met before transmission approaches perfection. *1.* A study of amplitude vs frequency, envelope delay vs frequency and transfer characteristics of TV receivers and the adoption of standards as to what should be the norm. *2.* Establishing standards on desirable transmitter predistortion to compensate for receiver limitations. *3.* Adoption of standards for vestigial demodulators to be used at transmitters. *4.* The development of standard demodulation designs with performance tolerances several times better than tolerances imposed on transmitters which they monitor. Published specifications should be questioned by users and competitors since methods of proving demodulator performance are controversial. *5.* The development of either an economically-priced envelope delay sweep measurement set capable of covering the range of 0.2 MHz to 4.5 MHz or a sideband response analyzer for envelope delay as well as amplitude and frequency response.

Despite the defects and limitations Gluyas and Behrend considered the errors; with the possible exception of color cross talk, surprisingly small.

The Critical Viewer doesn't know CATV equipment from third base, nor does he care, but if Saturday's baseball game goes on the blink, he'll howl long and hard.

CATV equipment is your business, and ours. Assure yourself and your viewers of the best possible equipment performance.

Benco performance.

Benco Television Corporation, *U.S. Sales and Factory Service, 724 Bugbee Street, (P.O. Box 10068), Jacksonville, Florida 32207*

In Canada: *Benco Television Associates, 27 Taber Road, Rexdale, Ontario*

BENCO

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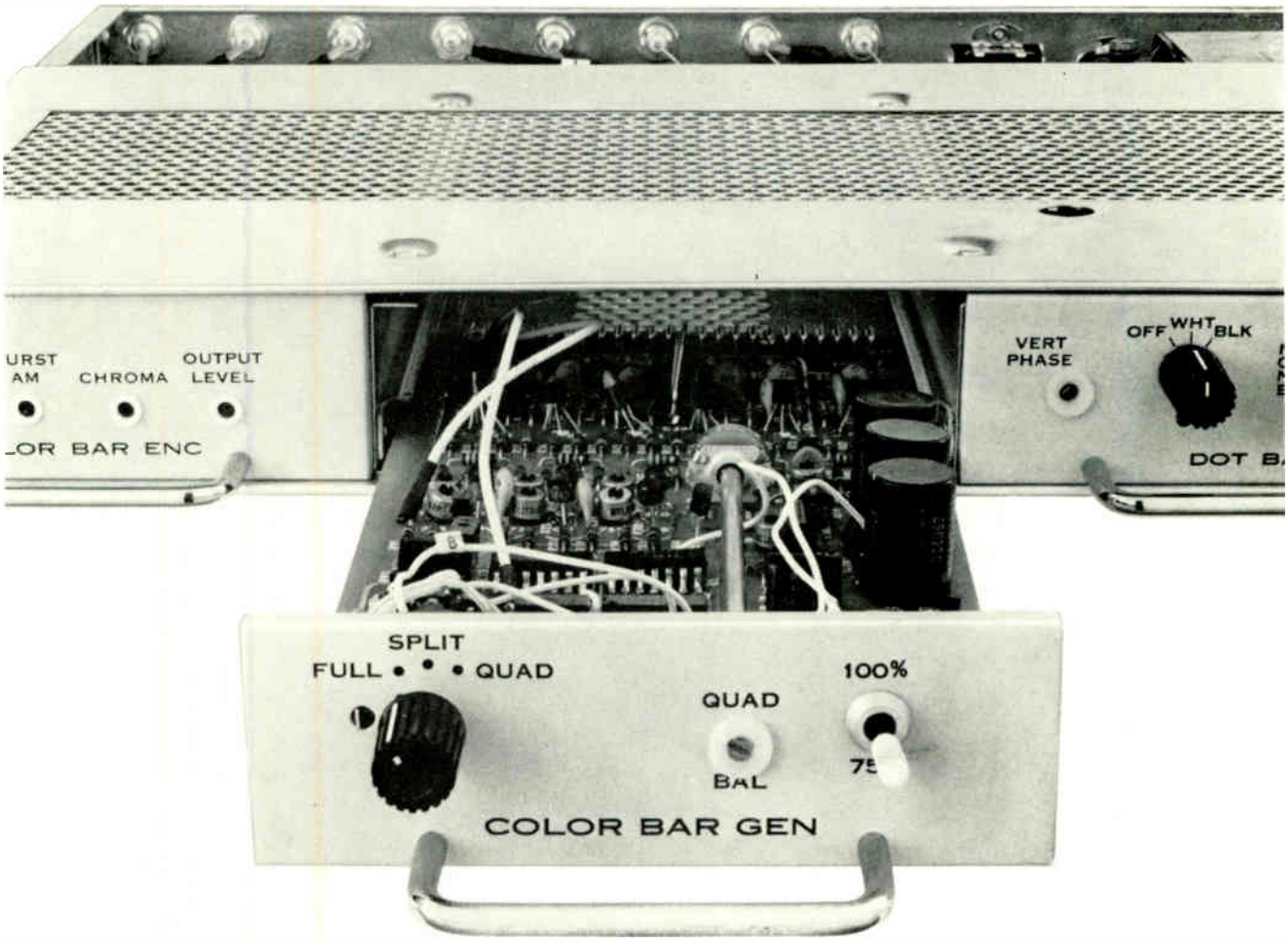
GROOVY!

Cohu's new TV accessory modules fit in anywhere.



Modular construction and solid-state design provide excellent compatibility between Cohu's new 2610/2620 Accessory Series and existing broadcast equipment. Each frame occupies only 1¾" of rack space, has a plug-in power supply, and is prewired for a combination of three modules. Accessories include a drive generator, colorlock, black burst generator, dot • bar • crosshatch generator, color bar generator and color bar encoder.

Also available in the 2610/2620 Series is the chroma detector, which improves the quality of monochrome transmission by automatically removing all chrominance from the encoder output during transition.

For specific data on each accessory, contact your local Cohu engineering representative, or call Bob Boulio direct at 714-277-6700. Box 623 • San Diego, California 92112 • TWX 910-335-1244.

COHU ELECTRONICS, INC
SAN DIEGO DIVISION

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INTERPRETING THE

FCC RULES & REGULATIONS

THE 'PERSONAL ATTACK' RULES

THE SO-CALLED "PERSONAL ATTACK" rules require specific procedures still foreign to many broadcasters. Since violations are increasingly prevalent subject to fines and censures, they warrant careful review.

Adoption of 'Personal Attack' Rules

On April 6, 1966 the Commission adopted a Notice of Proposed Rule Making (FCC 66-291, Docket No. 16574) to provide procedures in the event of certain personal attacks. This Notice was published in the Federal Register of April 13, 1966 (31 Fed. Reg. 5710). On July 5, 1967, the Commission released a Memorandum Opinion and Order revising its Rules by adding Section 73.300, 73.598 and 73.679, all to read identically as follows:

Personal attacks; political editorials.[1]

(a) When, during the presentation of views on a controversial issue of public importance, an attack is made upon the honesty, character, integrity or like personal qualities of an identified person or group, the licensee shall, within a reasonable time and in no event later than one week after the attack, transmit to the person or group attacked (1) notification of the date, time and identification of the broadcast; (2) a script or tape (or an accurate summary if a script or tape is not available) of the attack; and (3) an offer of a reasonable opportunity to respond over the licensee's facilities.

(b) The provisions of paragraph (a) of this section shall be inapplicable to attacks on foreign groups or foreign public figures or where personal attacks are made by legally qualified candidates, their authorized spokesman, or those associated with them in the campaign, or other such candidates, their authorized spokesman, or persons associated with the candidates in the campaign.

(c) Where a licensee, in an editorial, (i) endorses or (ii) opposes a legally qualified candidate or candidates, the licensee shall, within 24 hours after the editorial, transmit to respectively (i) the other qualified candidate or candidates for the same office or (ii) the candidate opposed in the editorial (1) notification of the date and the time of the editorial; (2) a script or tape of the editorial; and (3) an offer of a reasonable opportunity for a candidate or a spokesman of the candidate to respond over the licensee's facilities: *Provided, however,* that where such editorials are broadcast within 72 hours prior to the day of election, the licensee shall comply with the provisions of this subsection sufficiently far in advance of the broadcast to enable the candidate or candidates to have a reasonable opportunity to prepare a reponse and to present it in a timely fashion.

The purpose of embodying the procedural aspects of the Commission's long-adhered-to personal attack principle and political editorial policy in its Rules is twofold. First, it will clarify and make more precise the obligations of broadcast licensees where they have aired personal attacks and editorials regarding political candidates. Second, in the event of failure to comply with these rules, the Commission will be in a position to impose appropriate forfeitures (§503 (b) of the Act) in cases of clear violations by licensees or designate for hearing. Of course, pursuant to §503 (b) of the Act, only the willful or repeated violation of these rules can result in forfeiture. The Commission stressed that the *personal attack principle is applicable only in the context of the discussion of a controversial issue of public importance.*

These rules serve to effectuate important aspects of the well established Fairness Doctrine; they do not alter or add to the substance of the Doctrine. As set forth in the 1949 *Report of the Commission in the Matter of Editorialization by Broadcast Licensees, 13 FCC 1246 at 1249 (1949),* "the development of an informed public opinion through the public dissemination of news and ideas concerning the vital public issues of the day" is the keystone of the Fairness Doctrine. "It is this right of the public to be informed, rather than the right on the part of the government, any broadcast licensee, or any individual member of

1. Note: In a specific factual situation, the Fairness Doctrine may be applicable in this general area of political broadcasts. (See Section 315(a) of the Act (47 U.S.C. 315(a)); Public Notice: **Applicability of the Fairness Doctrine in the Handling of Controversial Issues of Public Importance.** 29 Fed. Reg. 10415.)

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.

the public to broadcast his own particular views on any matter, which is the foundation stone of the American system of broadcasting."

The Fairness Doctrine was given specific Congressional approval in the 1959 amendment of Section 315 (a) of the Communications Act (73 Stat. 557, 47 U.S.C. 315(a)). *The personal attack principle is simply a particular aspect of the Fairness Doctrine.* The principle stems from the Commission's language in the 1949 *Report* that "elementary considerations of fairness may dictate that time be allocated to a person or group which has been specifically attacked over the station . . ." (13 FCC 1252). *The standard of fairness similarly dictates that where a licensee editorializes for or against a candidate the appropriate spokesman for the conflicting point of view is the opposed candidate's representative, or, if the licensee so chooses, the candidate himself.* "These concepts, of course, do restrict the licensee's freedom to utilize his station in whatever manner he chooses, but they do so in order to make possible the maintenance of radio as a medium of freedom of speech for the general public." (1949 *Report, supra,* 13 FCC 1250).

It is the contention of some broadcasters that the Fairness Doctrine and the personal attack principle are unconstitutional infringements of broadcasters' rights of free speech and free press under the First Amendment. Naturally, the Commission believes these contentions are without merit. It discussed the constitutionality of the Fairness Doctrine generally in the *Report* on Editorialization (13 FCC 1246-1270). "We adhere fully to the discussion, and particularly the considerations set out in paragraph 19 and 20 of the Report." *Letter to John H. Norris (WBCB),* 1 FCC 2d 1587, 1588 (1965). The court in reviewing the constitutionality of the personal attack principle of the Fairness Doctrine in *Red Lion,*[1] concluded "that there is no abrogation of the petitioners' (licensee's) free speech right . . . I find in the Fairness Doctrine a vehicle completely legal in its origin which implements by use of modern technology the 'free and general discussion of public matters (which) seems absolutely essential for an intelligent exercise of their rights as citizens,' *Grosjean v. American Public Press, supra at 249." Red Lion, supra,* at 41.

The Commission has emphasized again that the "personal attack" rules do not proscribe in any way the presentation by a licensee of personal attacks or editorials on political candidates. They simply provide that where he chooses to make such presentations, he must take appropriate notification steps and make an offer for reasonable opportunity for response by those vitally affected and best able to inform the public of the contrasting viewpoint within a reasonable amount of time after such a presentation occurs.

The addition of Section 73.123(a), (b) (and also 73.300-FM; 73.598—Educational fm; 73.679-TV of identical language) to the Rules serves to codify what has long been the Commission's interpretation of the personal attack aspect of the Fairness Doctrine. *Report on Editorialization by Broadcast Licensees,* 13 FCC 1246, 1258 (1949); *Clayton W. Mapoles,* 23 Pike & Fischer, R.R. 586 (1962); *Billings Broadcasting Co.,* 23 Pike & Fischer, R.R. 951 (1962). "Thus, the Commission has repeatedly stated that when a licensee, in connection with its coverage of a controversial issue, broadcasts a personal attack on an individual or organization, it must *'transmit the text of the broadcast to the person or group attacked . . . either prior to or at the time of the broadcast, with a specific offer of his station's facilities for an adequate response.'* Public Notice of July 26, 1963; Controversial Issue Programming, FCC 63-734" *Springfield Television Broadcasting Corp.* 4 Pike & Fischer, R.R. 2d 681, 685 (1965). This duty devolves upon the licensee, because other than in the case of a broadcast by political candidates, the licensee is responsible for all material disseminated over his broadcast facilities.

As the Notice pointed out, the Commission has set forth the obligation of a licensee when a personal attack occurs during the discussion of a controversial issue of public importance, i.e., the licensee must notify the individual or group attacked of the facts, forward a tape, transcript or accurate summary of the personal attack, and extend to the individual or group attacked an offer of time for the broadcast of an adequate response. The Commission notified all licensees of their responsibility in this respect by transmitting to them the July 26, 1963 Public Notice (FCC 63-734) and the 1964 Fairness Primer. *Despite such notification and the Commission's rulings, the procedures specified have not always been followed—even when flagrant personal attacks have occurred in the context of a program dealing with a controversial issue. It is for this reason that it codified the procedures* into the "personal attack" rules. These rules will in no way lessen the force and effect of the Fairness Doctrine as it obliges licensees to "withhold from expression over his facilities relevant news or facts concerning a controversy or . . . slant or distort the presentation of such news." (See *Report on Editorialization, supra.)*

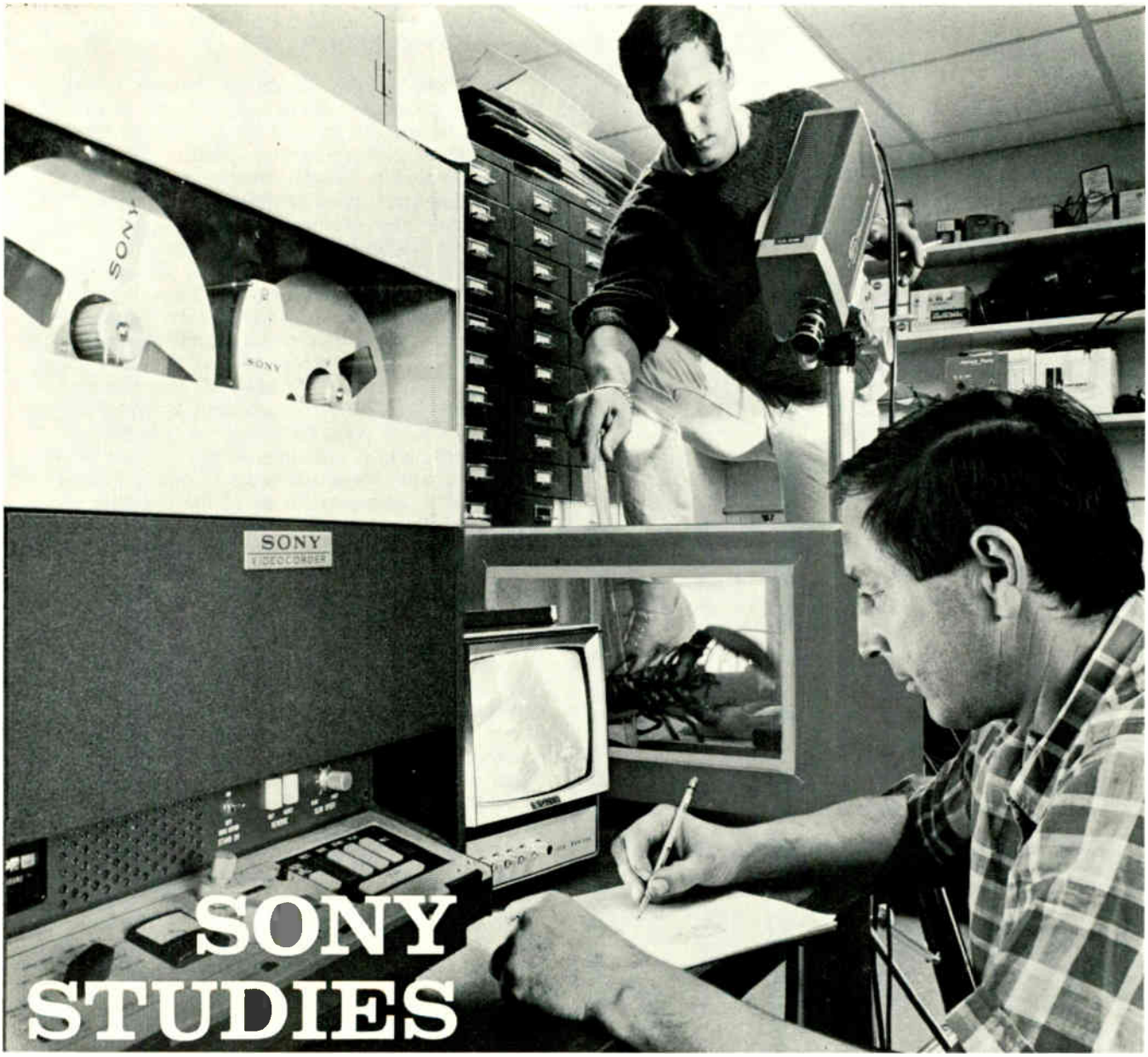
The obligation for compliance with these rules is on each individual licensee at it is for compliance with the Fairness Doctrine generally. *Where a personal attack or editorial as to a candidate on a network program is carried by the licensee, the licensee may not avoid compliance with the rules merely because the attack or editorial occurred on a network program.* Of course, if the network provides appropriate notice and opportunity for response and the licensee carries such response, its obligation under the rules would be satisfied.

Confusing Semantics of the Rules

A major purpose of the rules is to clarify and make more precise the procedures which licensees are required to follow in personal attack situations. *The long-applied standard of what constitutes a personal attack remains unaffected by this codification:*

> (T)he personal attack principle is applicable where there are statements, *in connection with a controversial issue of public importance,* attacking an individual's or group's integrity, character, or honesty or like personal qualities, and not when an individual or group is simply named or referred to. *Applicability of the Fairness Doctrine in the*

1 Affirmed sub. nom. Red Lion Broadcasting Co., Inc. v. FCC, Case No. 19,938, D.C.Cir. (June 13, 1967).



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Handling of Controversial Issues of Public Importance, Public Notice of July 1, 1964, footnote 6.

As stated in the Notice of Proposed Rule Making, the Commission recognized that in some circumstances there may be uncertainty or legitimate dispute concerning (1) whether a personal attack has occurred in the context of a discussion of a controversial issue of public importance, or (2) whether the group or person attacked is "identified" sufficiently in the context to come within the rule. *The rules are not designed to answer such questions.* When they arise, *licensees will have to continue making good faith judgments* based on all of the relevant facts and the applicable Commission interpretations. As stated in the Notice of Proposed Rule Making, the rule will not be used as a basis for sanctions against those licensees who *in good faith* seek to comply with the personal attack principle. The rules are thus directed to situations where the licensees do not comply with the requirements of the personal attack principle as to notification and offer of time to respond—even though there can be no reasonable doubt under the facts that a personal attack has taken place (e.g., a statement in a controversial issue broadcast that a public official or other person is an embezzler or a Communist).

Some broadcasters hold the mistaken impression that an attack on a specific person or group constitutes, itself, a controversial issue of public importance requiring the invocation of the Fairness Doctrine. This misconceives the principle, based on the right of the public to be informed as to the vital issues of the day, which requires that an attack must occur within the context of a discussion of a controversial issue of public importance in order to invoke the personal attack principle. The use of broadcast facilities for the airing of mere private disputes and attacks would raise serious public interest issues; however, such issues are not the focus of the Fairness Doctrine.

Timely Compliance with Personal Attack Rules

Paragraph (a) of the rule places specific procedural responsibilities on the licensee over whose facilities a personal attack has been broadcast. A licensee is required to send the attacked person or group, within a reasonable time and in no event later than *one week after the attack,* a notice of the attack which states when the attack occurred and contains an offer of a reasonable opportunity to respond. *Along with the notice, he is required to send a tape, transcript, or accurate summary of the attack to the attacked person or group.* This time limit should be sufficient to allow a licensee to confer with counsel or with the Commission if there is doubt as to its obligation. In any event, in a doubtful situation, if the person who possibly has been attacked is notified promptly within the time limit and the licensee seeks clarification of his obligations from his counsel or the Commission, no sanctions would be imposed—even if the matter is not finally resolved within the one week period. This one week outer time limit does not mean that such a copy should not be sent earlier or indeed, before the attack occurs—*particularly where time is of the essence.*

Personal attacks (1) on foreign groups or foreign public figures and (2) made by political

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candidates, their authorized spokesmen, or those associated with them in the campaign against other candidates, spokesmen, or persons associated with them in the campaign, are excluded from the rule. *Attacks by candidates against other candidates are covered by the "equal opportunities" provision of Section 315—not the personal attack principle.*

Finally, subsection (c) of the rule clarifies licensee's obligations *in regard to station editorials* endorsing or opposing political candidates. The appropriate candidate (or candidates) must be informed of a station's editorial opposing his (or their) candidacy or supporting the candidacy of a rival, and must be offered a reasonable opportunity to respond through a spokesman of his choice including, if the licensee so agrees, himself.

The phrase *"reasonable opportunity" to respond* is used because such an opportunity may vary with the circumstances. In many instances a comparable opportunity in time and scheduling will be clearly appropriate; in others such as where the endorsement of a candidate is one of many and involves just a few seconds, a "reasonable opportunity" may require more than a few seconds if there is to be a meaningful response. *Notification shall be within 24 hours of the editorial,* since time is of the essence in this area, and there appears to be no reason why the licensee cannot immediately inform a candidate of an editorial. In many cases, licensees will be able to give notice prior to the editorial. *Indeed, such prior notice is required in instances of editorials broadcast close to the election date, i.e. less than 72 hours before the day of the election.* While such last-minute editorials are not prohibited, the Commission emphasized as strongly as possible that such editorials would be patently contrary to the public interest and the personal attack principle—unless the licensee insures that the appropriate candidate (or candidates) is informed of the proposed broadcast and its contents sufficiently far in advance to have a reasonable opportunity to prepare a response and to have it presented in a timely fashion.

As in the case of the personal attack subsection, the licensee may impose reasonable limitations on the reply, such as requiring the appearance of a spokesman for the candidate to avoid any Section 315 "equal opportunities" cycle. (Barring extraordinary circumstances, the choice of the spokesman is, of course, a matter for the candidate involved.) The matter of scheduling responses is left to reasonable judgment and negotiation. Subsection (c) is directed only to station editorials endorsing, or opposing, political candidates. Situations containing aspects of both personal attacks and political editorials may arise, and, in such cases, rulings on the particular factual settings may be necessary.

In summary, the long-standing and seldom-heeded "personal attack" policies have been codified into rules which confusingly overlap with the licensee's obligations under the Fairness Doctrine, editorializing policies, and the statutory political broadcast provisions (Section 315 of the Act). Careful review of the rules, first-quoted-above, and the balance of this article should be of assistance. Individual cases require consultation with your attorney. ●

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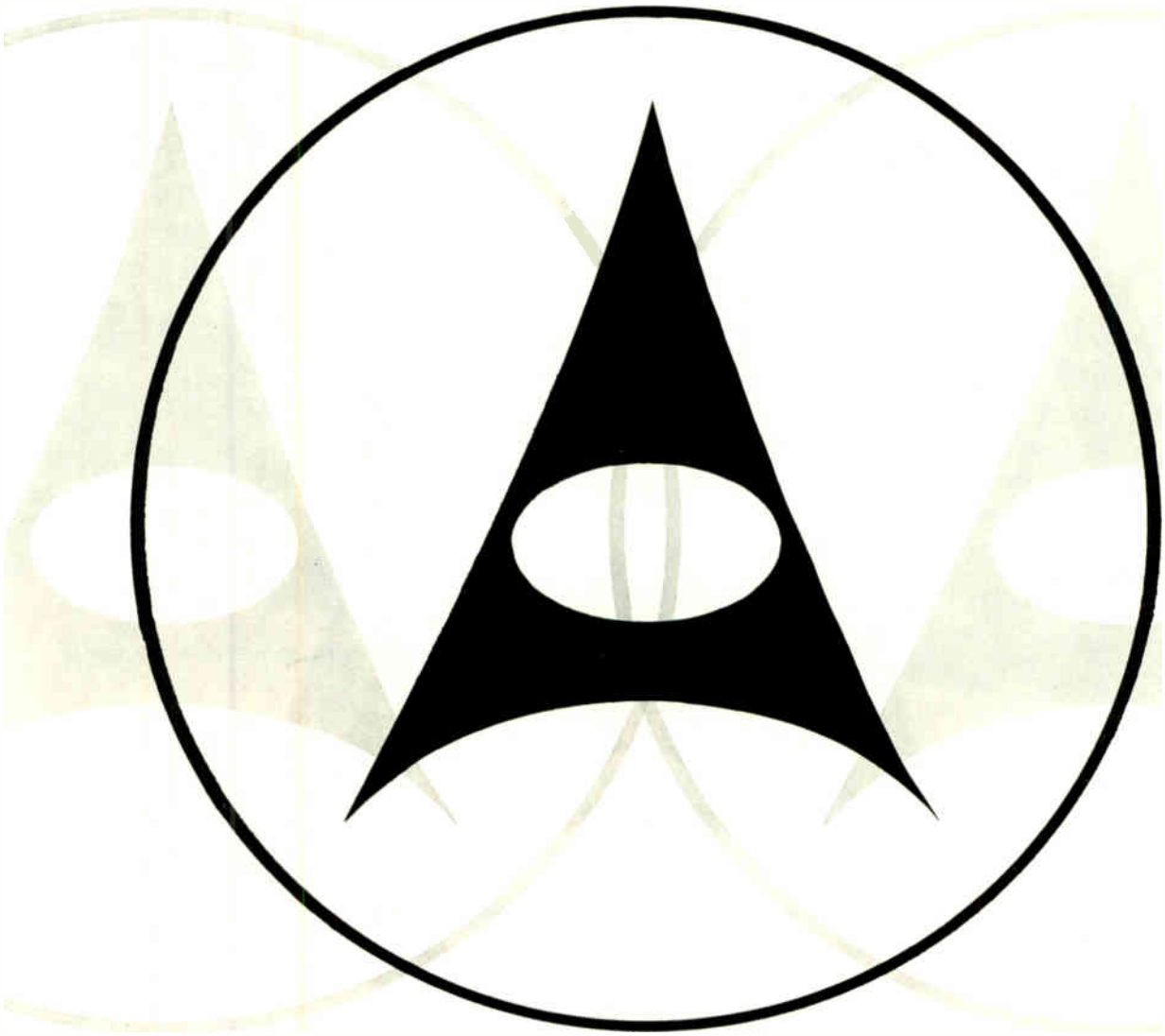

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Economics Of Engineering

by Ben Akerman

Whether for modernization or replacement, equipment purchases should be viewed in the light of sound economics

EVERY STATION ENGINEER must from time to time, recommend the purchase of new equipment, either to fill some new need or to replace equipment now in use. How much do you know about the real cost of equipment during its useful life? The station engineer, may have far different ideas than the station owner, the station manager, or the sales manager. Over the cost and necessity of any new piece of equipment. The station owner looks at the proposal to purchase some new piece of equipment and thinks "Should I buy this, or take the money and get that new 75-horse motor for my boat?" The station manager thinks "Will this proposed equipment help me to make more profit and bonus at the end of the year?" The sales manager thinks "Will this item help me to make more sales, and how many spots do I have to sell to pay for it?" The station engineer often thinks "Boy! This is a slick-working gadget, I sure would like to have one here."

Consider Real Equipment Costs

We must consider all factors that go to make up the real cost of broadcasting equipment, and try to reconcile the various factors that should be considered in the purchase of new equipment. I am not an auditor and do not presume to advise you about methods of bookkeeping suitable for your station; however, for our consideration let us make the following assumptions:

1 The cost of money is 5 percent. Also, money invested will earn 5 percent simple interest.
2 The straight-line method of depreciation will be used, with no salvage values assumed.
3 All equipment manufactures tell the truth about their own equipment, but some do not necessarily tell the truth about their competitors equipment. This is especially true in regard to power consumption, tube life, performance, etc.
4 The station is in business to make a profit. It seems that some engineers don't realize this.

What are some of the reasons for purchasing of new equipment? Replacement because of high power cost, high maintenance costs, too much off-air time with present equipment, the desire to improve the station coverage, to improve the station sound, changing equipment requirements, or obsolescence due to changes in standards? Reasons for the purchase of new equipment must be weighed against the costs involved to determine if they are justifyable. Such decisions cannot be made solely on technical considerations. The economic factors, too, must be weighed, and these are often the deciding factors. One fact that should be made very plain at this point is that every piece of equipment and every employee must pay his own costs and make a profit for the station, or it is uneconomical to purchase the equipment or to hire the employee.

We have been stressing the term real costs. This is the cost of the equipment, including the purchase cost and all other costs charged against this item, such as delivery charges, installation costs, power costs, maintenance costs, depreciation, interest on investment, etc. We can see that the purchase cost is just one of the many items that enter into the real cost of equipment.

Purchase Price

First consider the purchase price. You say that this is obvious. But is it? We must compare specifications of the particular piece of equipment under consideration; not so much the manufacturer's specifications, but our own specifications for the equipment required to fit our present needs. Does the particular piece of equipment exceed our needs in quality or facilities provided? Would a simpler unit serve as well? Can you profitably use the gadgets that the salesman is boosting in his equipment to promote a sale?

If we are considering the purchase of a transmitter or other heavy item, does the supplier pay delivery costs? With large equipment this may be quite an item. Incidentally, it is usually better to purchase heavy equipment delivered, rather than shipped F.O.B. with freight allowed. This makes the supplier responsible for safe delivery, and in case of damage the supplier must deal with the carrier. They usually are in a better position to do this because the carrier wants to continue to get shipping business from them.

Be sure of all details of purchase contract, terms of delivery, terms of payment, special warranty, etc., are spelled out. Including these details in the contract or order is easier before the order is signed when the salesman is eager to make a sale, and it will eliminate a lot of misunderstanding about who does what. In purchasing equipment including several items, it is sometimes possible to get a better price of the supplier bids on the lot and does not itemize individual costs. It is frequently better to order through one supplier, even though he does not manufacture all the items. He may include the items of other manufacturers at near his cost to show a good price on his items. This prevents dividing the responsibility among several companies, and it may simplify financing.

Mr. Akerman is a consulting engineer based in Atlanta, Ga. He serves as chief engineer of WGUN, Atlanta.

Installation And Operating Costs

The cost involved in installing similar pieces of equipment may not be the same. Transmitter requirements, for example, could affect the transmitter building and its cost considerably: Is it self-contained, or will high-voltage enclosures be required? Do the large power transformers mount indoors or outdoors? Are special ducts for cooling air required, special interconnecting conduit, facilities for remote control, etc.? These are factors that make up the real cost of equipment. It might work out to cost less to buy the higher-priced transmitter and save on installation costs.

Power is an equipment cost that should be added to the real cost. The power cost of small items is usually not enough to be considered, however, this is not true of the higher-power transmitters. Let's compare the power costs of several 50-kW and 5-kW transmitters; the same will apply to a lesser degree for smaller transmitters. The two factors that affect power rates are demand and the kilowatt hours used. For example, let's assume that a transmitter is on the air 12 hours per day or 366 hours per month. A comparison is shown in Table 1. To the original transmitter cost we will add the power cost over a period of 10 years, assuming this is the economic life of the transmitter. This gives us a new cost idea—cost-per-unit time. The equipment will decrease in value over its useful life, so we have another factor—depreciation. Using the straight-line method we will allow 1/10 of the installed price each year as depreciation, assuming that there will be no salvage value at the end of ten years (see Table 1).

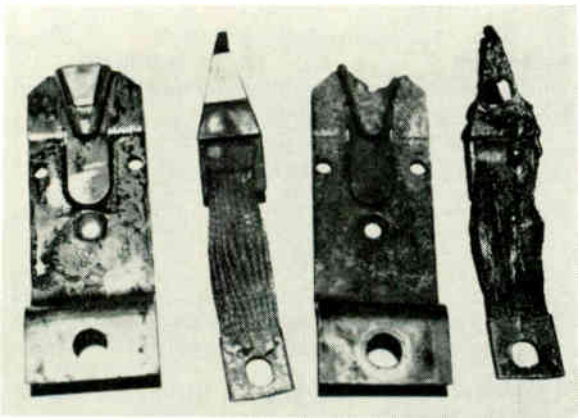
Tube Costs

Now how about tube costs? This is an item to be carefully considered, and it should be thought of not as the tube cost but the tube cost per unit time. In most a-m transmitters, the cost of lower stage tubes is usually so small by comparison that only the cost of the final and modulator tubes, if high-level modulation is used, need be considered. Here is an example of the cost-per-hour concept. Probably a majority of 1-kW transmitters use either Eimac 4-400's or 833's as finals and modulators. The price of these tubes is about the same—around $200 per set. My experience is that the 4-400 tubes will average only about 5000 to 6000 hours, whereas the 833 tubes may give 7000 to 10,000 hours. Using 6000 hours for the 4-400's and 10,000 for the 833's, the cost for the 4-400 is .0333 per hour and for the 833 is .020 per hour. Assuming that the station operates 4400 hours per year, the annual tube cost for the 4-400's will be $146.50 and $88 for the 833's, a saving of $58 per year. Here is another example that clearly shows how the first cost and life enter into the real cost. As supplied by the manufacturer, the WGUN transmitter used two 5736 tubes as drivers for the final rf stage. These tubes cost $165 each, and in this stage gave only about 5000 hours life. Also to be considered is the time outage required to change them. It was decided, on the basis of the following study, to replace these with four 833 tubes with an expected life of about 10,000 hours. The old tube cost was $330 or .067 per hour compared to a total cost or $200 or .025 per hour for the 833's. At 5000 hours per year

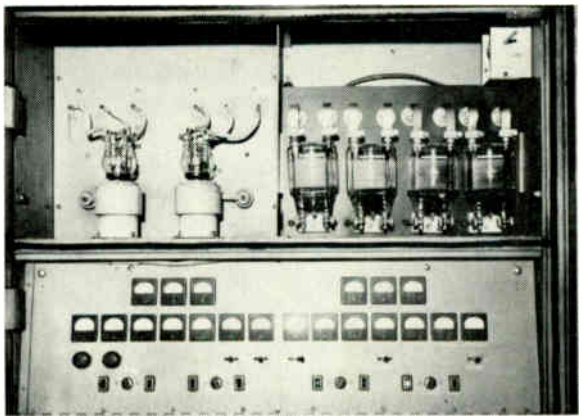
Table 1. A comparison of typical transmitter purchase, operating and replacement costs

	50kW Trans A	50kW Trans B	50kW Trans C	50kW Trans D	50kW Trans E
Cost price	$95,000	$92,000	$85,000	$20,500	$17,745
Delivery cost	300	300	500	250	250
Installation	1,500	1,500	1,000	500	500
Cost installed	96,800	93,800	86,500	21,250	18,495
Tube cost	4,183	3,759	10,000	746	728
Tube cost per hour*	.21	.19	.20	.037	.0365
Tube cost 10 years	8,250	7,120	7,850	1,455	1,445
Power 0% Mod.	82kW	94kW	100kW	10kW	11.7kW
Power ave Mod.	92	100	113	11	12.9
Power kWh per mo.	33,700	36,600	41,400	3,696	4,324
Power cost per mo.	$ 543	568	643	82	95
Power cost 10 yrs.	65,200	67,920	77,188	9,900	11,400
Total cost 10 yrs.	$170,250	$169,270	$171,538	$32,605	$31,340
Total cost per hour	$ 4.33	4.30	4.36	.83	.80
Depreciation per mo.	$ 815	781	728	177	154
Cost per mo.	1,435	1,419	1,450	273	262

*Operating hours assumed at 12 per day 366 per mo. 39,320 for 10 years Tube life for transmitters A, B, D and E assumed at 20,000 hours. Transmitter C tube life assumed at 50,000 hours. This transmitter uses 5671 tubes.



Right hand pair of stationary and movable contacts from a 300 Ampere 460-V circuit breaker are completely burned away, due to lack of proper spring tension. Result is off-air time.



Four 833A tubes are a wise replacement for two 5736's in the exciter unit of Westinghouse 50HG-2 transmitter. Before the change the rf section was similar to the audio section on the left.

this is a cost of $125 for the 833 and $330 for the 5736. Subtracting the cost of new filament transformers and sockets estimated at $100 and labor cost at $50, the net saving for the first year was $55, that is $2310 in ten years, quite a tidy sum. The point of all this is that it is the cost per unit time that counts.

This behooves one to consider life* carefully and simple engineering or operating changes, such as cooling provisions or filament voltage control, that might affect tube life considerably. Tube designs do change also from time to time. It is well to keep posted on products. For example the Penta 6775 is a ruggedized tube suitable in final stage of 1-kW transmitters. The example cited was for 1-kW transmitters operating in the relatively warm southeast. For higher-power transmitters, tube cost per hour and tube life becomes even more important.

The Cost Of Money

Back to our comparison of the three 50-kW transmitters A, B, and C, as shown in Table 1. We must know the estimated tube cost for ten years. We will assume that the three transmitters require the same maintenance costs, except the high power-tube cost. We now are getting close to the real cost, but there is one more item to consider—the cost of money. This is more important than most of us realize. We either have it or don't have it—usually we don't have enough. Money can be rented just as any other commodity, only we call this rent interest. We can either borrow it and pay interest, or lend it and receive interest. We may say that money has time value: $10,000 today is worth $10,000 plus interest next year, or $10,000 plus 10 years interest 10 years from now.

A station may be considering the purchase of some item of new equipment on the premise that it will save money. Let's assume that the cost is $5000 with interest at 5 percent. There must be a saving of $250 per year to make this equipment economical; if not, you could put the money out at interest and get a greater return. Of course, there may be other considerations besides the dollar savings. Reducing costs to a cost per hour, month, or other period of time makes the comparison of costs of various pieces of equipment easier. The hours on the air have an important bearing on the cost per hour. Our cost chart was set up on 12 hours per day, and this amount of operation shows the cost per hour very nearly even; an increase in operating hours would reduce the per-hour cost for the transmitters using the least power.

Engineering is a compromise between the

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*William McAulay—chief application engineer, Eimac Division, takes exception to the author's figures. He says, "No broad, all-inclusive comparison can be used in judging the life of 4-400A's versus 833's. The life factor for any tube depends on how the tube is used, the equipment design and manufacture, and the equipment operator. The amount of cooling available or used, and the closeness of control of the filament voltage.

"We have records on 4-400A's which have averaged 20,000 hours life in 1-kW broadcast service. And it's certainly probable that RCA can show records on 833's with life greater than the 10,000 hours referenced in the article. One great factor bearing on life is how the tube is used—in the molulator, which the easier service, or in the final amplifier, which demands more from the tube. Life comparisons can only be based on the filament temperature necessary to produce a given power output, assuming that the tubes being compared have received equal processing during manufacture.

"It should also be noted that the article compares the 4-400A, a tetrode, against the 833, which is a triode. Tetrodes have inherently higher power gain than triodes, and generally save in design space. Perhaps it is for this reason that there are many more 4-400A's currently in service than 833's.

"While the comparison may very well represent the author's experience, it is misleading unless all other operating parameters and conditions are considered. The comparison cannot be used to represent 4-400A life generally.

"Incidentally, the rounded price figures quoted do not tell the whole story. The published cost of 4-400A's is $48.00 each: A set of four tubes, two in the modulator and two in the final, would therefore be $192.00. The 833's cost $53.65 each, so a similar set would cost $214.60."

Author Akerman comments further: "I agree with Eimac that the 4-400 tube will give longer life under controlled conditions. The life figures given are the result of many contact with station engineers in this area and my own experience in owning a 1-kW station using 4-400 tubes for eight years. Most of the engineers reported 5000 to 7000 hours for the 4-400 in the rf final stage.

"I would like to point out that most of these stations are in small markets in the southeast and operate with high ambient temperatures. Many of these stations are remote controlled and may have poor voltage regulation, also in many the technical adjustment may not be the best.

"Almost without exception the station engineers reported a much longer life for the 833 tubes in the 1-kW rf finals.

"We did not mean to infer that the 4-400 was a bad tube or that the 833 was superior, or that a transmitter that used one tube type was superior to the other. We are endeavoring to show that such items as tube life and cost enter into the overall cost of operation, hence the use of $50.00 per tube rather than the exact current price.

"Eimac's qualifying comments are valuable."

technical aspects and the economic aspects of the problem at hand. The best technical solution is not always the best from an economic standpoint. We must face the fact that station operation must make a profit to stay in business, and to do so costs must be kept as low as practical. We must make a decision when to pay more for equipment to get a lower operating cost. Here the cost of money enters the picture; If the saving in operating costs of higher-priced equipment is less than the interest on the cost difference, it would be indicated to purchase the lower-priced equipment and put the difference at interest. I feel that these factors of cost are often overlooked in the consideration of automation equipment. In many cases the costs involved exceed the savings resulting from automation equipment.

The Economics Of Maintenance

The economics of engineering certainly applies to maintenance, perhaps even more so than to the purchase of new equipment. We must balance the investment in spare parts and the labor cost of maintenance against losses that result if these expenditures were not made. These losses include income lost due to time off the air, and burned out equipment due to lack of proper maintenance. The lack of periodic maintenance may cause excessive wear to equipment such as blowers, generators, etc., loss of prestige and listeners resulting from frequent off-air periods.

The key to economic maintenance is the keeping of proper records, for without adequate records you are shooting in the dark. Records should include tube life, equipment failures and causes of same, equipment replaced and why, and last but not least, a record of routine maintenance listing briefly what was done and when. An example might be "inspected main plate-relay contacts; pitted contacts were cleaned and polished." Reference to this record will point up equipment that needs more attention and pinpoint causes of off-air time. This feedback, as it were, is used to reappraise maintenance schedules, to give more or less attention to the items as they require. A maintenance schedule is very important. A good plan is to have a maintenance sheet with the operation indicated and a place to check when this was performed. It is helpful to keep a maintenance log in a book separate from the regular station log. All major maintenance operations, replaced equipment, etc., are entered in this book, as are all failures, the cause and correction steps taken. This provides one place to review equipment performance without having to dig through a stack of log sheets. We also keep a sheet on all component units, such as line amplifiers, tape recorders, large tubes, etc. This sheet (Fig. 1) lists the purchase date, where and when installed, where purchased, serial number, tube line-up, and a space to note all major maintenance work or changes in this unit. These sheets are kept in two loose-leaf books, one at the studio and one at the transmitter. Our master tube inventory is made from these maintenance sheets.

Equipment Service Record

Equipment ..... When Installed .....
Where Installed ..... Manufactured By .....
Tubes Used; Transistors Used .....
.....
Regular Maintenance Recommended .....
.....
.....
.....

Fig. 1. This service form provides a permanent record of equipment maintenance.

One very important item is the preserving of all of the manufacturer's instruction books. A good way to keep these in neat condition is to place them in hardboard binders; we use Accopress pressboard binders. These should be kept where the equipment is in use, and not, as is frequently the case, in the trunk of the chief engineer's car. The instruction books should be checked when inventory is taken to make certain they are available when needed. It is very important that these instruction books and all blueprints be kept up to date and show the equipment as it actually is, including all modifications. In some stations I have seen the equipment modified so much that the prints were of little value, especially wiring of jack fields, interunit wiring, etc.

From the safety standpoint it is desirable to have two operators present when any major work is done on the transmitter. All personnel working on high-voltage equipment should be instructed as to the importance of using a grounding hook, and cautioned against the jumping of interlocks and disabling of automatic grounding devices. We have seen many transmitters where the interlocks and grounding devices have been disabled. Care should be used, since relays can stick and leave high voltage on when doors are open.

Spare Parts Stock

The decision as to what to stock as spare equipment is important. To stock unnecessary spares ties up money, yet the lack of spares may mean off-air time. A master inventory of tubes and other spares, noting the turnover, will give you control on your spare parts inventory. Parts frequently needed that are not available at local parts houses should be stocked in larger quantity. In considering the stocking of larger and more expensive items, such as plate and modulation transformers, you must consider the probability of failure, the time needed to obtain replacements. (Does the manufacturer stock these parts?) The cost of replacements plus the cost of stocking (interest on money invested) against the risk of long off-air time must be weighed. Catalog all spare parts and label as to where the part might be used in an emergency. A 500 $\mu\mu$F, 20,000-V capacitor might be labeled "Spare for final tank C403, Spare for antenna coupling unit C601, etc." Exchanging spare lists with other stations is helpful.

Consider the cost of an auxiliary transmitter, instead of trying to stock all the parts you might need. Used transmitters in good condition can be obtained at a reasonable price, and they are usually adequate for auxiliary use. The use of an auxiliary transmitter with remote control will practically eliminate off-air time from transmitter failure. The question of whether tubes should be replaced on hourly basis or run to failure is often raised. The decision depends on many factors. The life of the power tubes can be determined from your tube-life records. If your tubes are giving an average life of, say 12,000 hours, and the maximum is around 14,000 hours, the per-hour tube cost will not be increased materially by changing the tubes at 12,000 hours. If the transmitter is not remote controlled, or if the station has an auxiliary transmitter, it might be indicated to run the tubes to failure, since off-air time to change tubes will be short. The Westinghouse transmitter at WGUN has a spare tube in place for each modulator and rf final amplifier. A spare tube can be switched into place in about 30 seconds. The installation of a standby generator set needs economic study. In most metropolitan areas power is so reliable that the installation of a standby generator will not pay out when cost of investment is weighed against loss from power outage. It may be a good investment, though, from a prestige standpoint. The station engineer should remember that equipment on the shelf is the same as money, only if it were money in the bank it would earn interest.

Here is an example of how careful records and maintenance can save money. One station had a transmitter with 14 mercury vapor rectifier tubes. The tube-life record showed the average life was about 4750 hours—rather low for this type of tube. It was determined that these tubes were too cold at sign on, and that most failures occurred at this time. A thermostat was installed on the rectifier-cooling blower to keep it off until the ambient temperature was 70°. As a result, the tube life was more than doubled, so the cost was cut in half with a bonus of less off-air time. Remote-control transmitters with mercury vapor tubes usually experience most off-air time at sign on, especially in the winter due to cold tubes. There are many ways that a study of the economics of operation can save money and off-air time.

To sum it up, careful records let you know where trouble spots are, and they guide you in improving your maintenance schedules. We have endeavored to show that engineering does not involve just equipment, but also a consideration of all cost factors. We must weigh all the costs against the results and arrive at the best solution from an overall business viewpoint. The station engineer should be a part of the management team, and if he shows that he has a knowledge and understanding of the costs of his technical operation, and his ability to keep them in line, the sooner he will become a full member of the management team. •

Cut Out That Noise!

Radio and television producers learn to live with background noises and other disturbances, whether they're on location or in outmoded studios. But there's no reason why they must contend with less-than-ideal conditions when broadcasting from a new or modernized studio. Good acoustics can be achieved in a new or renovated broadcast facility.

Studio walls and paneling with predictable transmission loss ratings do not alone do the job. All portals should be equipped with acoustical door and frame systems of comparable ratings. The closer the ratings between doors and walls, the better the performance balance.

Sound stages at KRLD-TV, Dallas, are near elevated loading ramps frequented by diesel trucks and other noisy vehicles. Two pairs of acoustical doors in tandem manufactured by Overly Manufacturing Co., Greensburg, Pa., reduce exterior noise to tolerable levels. The doors are 2-½ in. thick, with leaded vinyl septums. Overall size of each pair is 10 × 10 ft. with an STC rating of 62 dB for the tandem installation. Concealed hardware permits an uncluttered appearance.

Another bradcasting installation is a KRON-TV, San Francisco, where 4-in. interior acoustical doors maintain quiet in the main studio. The doors block disturbances channeled directly through a busy corridor from the lobby, scene dock, and shops.

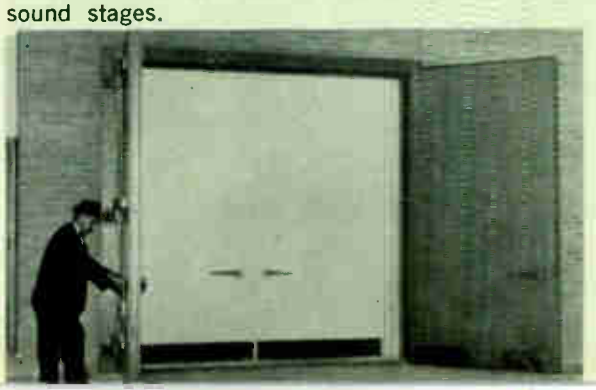
Acoustical testing and rating procedures for doors are important because they provide a valid measure of how a door will perform in the studio. Various products certified by Overly have STC ratings of 35 to 62 dB.

Acoustical doors use rock wool of varying densities as sound-retardant interior material. Overly reports higher acoustical performance is achieved by special doors that have a patented sound-attenuating septum of one or more foam-backed leaded vinyl sheets. Porous acoustical material may be used to fill spaces between door skins, stiffeners and septums.

Acoustical doors are available in full-flush, glazed, and louvered designs. Some carry Underwriters Laboratories fire protection ratings up to a maximum of three hours. The 1-¾ in. doors look like conventional hollow metal doors and are designed for standard hardware. The thicker doors are designed individually for large openings and more critical applications, particularly low frequency. They require compression hardware and double seals.

Acoustical doors should be purchased as complete systems, including frames, seals, and hardware. Unless complete systems are furnished, performance indicated by test reports cannot be expected. Sliding models have acoustical performance comparable to swinging units. Automatic pneumatically operated sliding doors are available.

Two pairs of acoustical doors in tandem reduce noise from loading ramp outside KRLD-TV (Dallas) sound stages.



The Planning Of A

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By Ron Pesha

KFOA's simplicity of operation coupled with careful planning results in efficient low-overhead broadcasting.

HAWAII'S NEWEST FM and first fm-only station KFOA commenced regular broadcasting from Honolulu on June 28, 1967. Entering a crowded market of 17 a-m and 3 fm stations, KFOA's management decided to create its own new radio audience by going stereo.

General Manager John Gregory and Chief Engineer Ron Pesha, picked by the owners, the Golden Pacific Group, arrived in Honolulu on January 5, 1967. For nearly six months the two worked virtually alone building the station. Both studio and transmitter space was leased at the Hilton Hawaiian Village, a Waikiki Beach complex of seven high rise buildings and assorted tourist facilities, offices, and shops. Bare office space was converted into station offices and studios. One high-rise building, surmounted by the self-supporting tower used by a local television station, was selected for the transmitter site. The 6-bay antenna was side-mounted on the tower.

Planning the Station

Limited floor space at the studio dictated careful planning. With only about 750 square feet to house all offices and studios, inefficiency in layout would surely result in personnel stumbling over one another.

Faced with bare office space about 20 by 40 feet, less one corner, one quickly asks, "What rooms are essential to a radio station?" A control room and a main office are beyond question. And as all commercial matter would be recorded with no "live" announcing, we required adequate production facilities. We further felt that a private office for the manager is essential.

We decided to build four rooms: manager's office; main office; production room; control room —and in that order front to back. (See floor plan.)

All inner partitions which stand crosswise have broad windows. The control room operator, from the rear of the station quarters, can see directly ahead through all the windows to the street and outside.

Decor Important

Wood-panelled partitions contrast with the white-painted concrete block walls. Dark-stained woodwork continues the motif, and has practical

Mr. Pesha is assistant manager and chief engineer, KFOA, Honolulu, Hawaii.

'Tight' Stereo Station

advantages, too—stained wooden record shelves maintain their appearance better than paint due to record jacket wear.

The control and production desks are covered with walnut-simulated Formica, and matching cabinets house the boards and other electronic equipment. The Sparta cartridge rack, the AR speakers, and the Sony tape recorder all arrived in similar wooden finish.

As leased, the office and studio space included carpets and fluorescent lighting. We added a variety of lamps, chosen for decorative value rather than general illumination. Assorted table lamps, pole lamps, and inexpensive Japanese-lantern type plastic shades relieve the clinical glare of fluorescent light.

We planned and executed the decor ourselves to keep costs down. A little imagination here goes a long way. The author even painted five simple but colorful oil paintings to break the monotony of the long hall wall.

We feel that time and money spent on decor is certainly worthwhile. Operators perform better and tire less readily in pleasant, uncluttered surroundings. Furthermore the station interior catches the eye of each passerby. As KFOA fronts on a street which offers access to Waikiki Beach 500 yards away, local foot traffic is heavy. Our air personality remains paramount; an attractive appearance is important too.

Versatile Production Room

Most professional visitors, accustomed to large control rooms and closet-size production rooms, express surprise because the KFOA production room is larger than the control room. However, all "announcing" is recorded in the production room, often with two voices. In addition, the production room acts as a sort of multipurpose room. It's sound demonstration room for visitors. A desk and telephone are supplied so the room becomes at times another office. Most of the station's limited storage space exists in the production room closet, including the chief engineer's parts and tools. Furthermore, one switch on the board connects the production room to the transmitter in the event of major trouble in the control room.

The production room is also the only room which has soundproofing. Double walls hang on double studs offering an uninterrupted dead air space inside the walls. The window frame surrounding the two panes of glass in each window is split and separated by a layer of felt. Two panes of glass accomplish nothing if a single window frame or sill allows for the conduction of sound through the wall. A double door helps soundproof the entrance.

As these soundproofing techniques are unfamiliar to the average carpenter—we supervised

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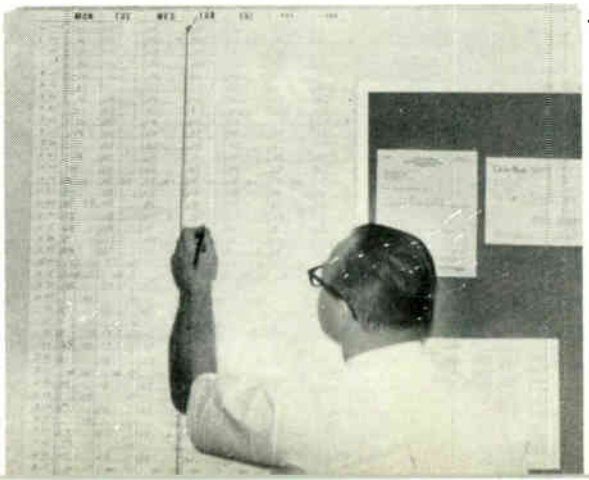
1. KFOA side-mounted its 6-bay antenna on an existing tower atop one of the 7 high-rise buildings at Waikiki's Hawaiian Village.
2. Attractive entrance way features station's call letters cut from a slab of expanded foam plastic. Other decor includes colorful abstract painting.
3. Control room's simplicity and freedom from clutter allows operators to concentrate on musical selection rather than controls and technical adjustments. Note that there is no mic.
4. KFOA's production room features full stereo facilities for creating stereophonic spot announcements on cartridge tape.
5. Wall schedule, as seen from the operator's chair, displays week's complete recorded commercials. Operating log is made from it.



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this work. This is very important. Inadequate supervision during the electrician's work resulted in audio conduit terminating at inconvenient locations on the control room.

Hawaii's climate demands year-round air conditioning. When installed, the cold air register in the production room sounded forth with a steady hiss, readily apparent over a microphone. The remedy was to replace the grill with small openings with a panel having a single square hole in its center.

Simple Control Boards

The solid-state stereo boards for both the control room and the production room were designed and built by the author. The boards are basically alike, and their plug-in preamplifiers and amplifiers also author-made including the fabrication of printed wiring boards in the kitchen sink, are interchangeable. Plenty of spares were made.

We decided in favor of these composite boards rather than commercial boards for the sake of simplicity. We wanted the operator to face only the few controls he actually needed rather than a multiplicity of unused knobs and switches. The production room board features "position" controls for electrical variation of stereo placement, but the control room board has no such controls. In fact, from the operator's standpoint the control room board is identical to a monaural board—it has only 2 turntable level controls and one level control for cartridge playback machines. All controls for stereo are ganged to single knobs.

The production board does have additional controls allowing the announcer to create special stereo effects.

Construction of a full-size control board is a project not to be undertaken lightly. The author, however, has experience designing and constructing boards in past years . . . some less than satisfactory. Design of these stereo boards was undertaken with full appreciation of trouble that could result from ground loops, crosstalk, switching transients and other unwanted problems.

An adequately designed board, however, becomes a pleasure to operate and the KFOA boards, designed for KFOA requirements, have the feel of a custom-tailored suit. Even inexperienced operators can handle the control room board with but a few minutes of instruction. (*Ed. Note: BM/E* pressed Pesha to justify building his own console and boards. He replied, "I suppose the main reason is simply that I wanted to. I have constructed much broadcast-type equipment, but I consider these boards to be my finest . . . transistors are easy to work with . . . I hope to build with integrated circuits some day.")

KFOA considers stereo spots essential. Broadcasting a monaural spot on a stereo station is like inserting a black-and-white commercial in a color television show. Therefore, all clients receive attention-commanding announcements featuring spatially separated voices, or a voice against a background of stereo music.

Although KFOA's schedule is 100 percent stereophonic, the monaural listener is not forgotten. Nearly all fm automobile radios still are monaural, and the pocket sized a-m/fm transistor receiver enjoys increasing sales. Therefore each recorded announcement is auditioned in monaural playback.

Simplicity of Operation

Music is programmed in uninterrupted quarter hour segments, with announcements and commercial matter clustered at the breaks—except for evening half-hour sponsored programs when the segment is 10 minutes. Records are not announced. All spots, promotionals, station identification and even time signals are recorded on cartridge tape. The control room is not soundproofed nor acoustically treated, and has no microphones.

The operators type the program log as they go. A calendar-like wall schedule, divided into 15 and 10 minute segments, indicates by number the cartridges playable at each cluster break. The operator selects the cartridges with matching numbers, airs them, and enters them on a log. A numbered cartridge plus, in the case of commercial announcements, the length in seconds.

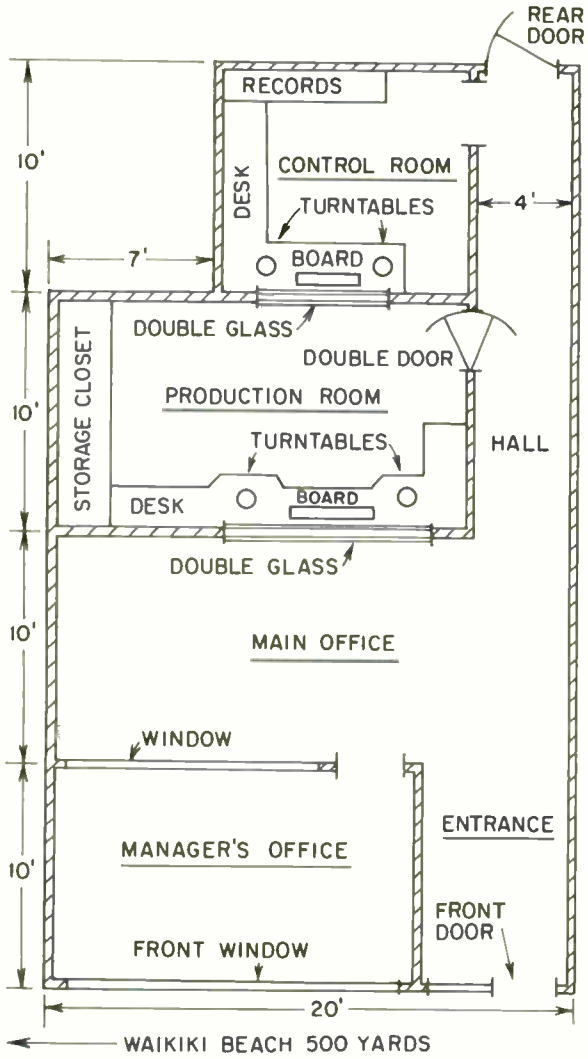
The wall schedule shows an entire week's programs. Covered with heavy, clear sheet plastic, the cartridge numbers are entered with an easily-erased grease pencil. The system may not be practical for a station selling short term saturation packages. But at KFOA most contracts consist of long-term orders for spots and programs. Once entered on the wall schedule, the scheduling remains current for an extended period. Copy changes require merely re-recording the original numbered cartridges.

Modern Stereo Transmitter

KFOA selected RCA's BTF-10 10,000-W transmitter with added stereo generator to feed a 6-bay RCA circularly-polarized antenna. This results in an effective radiated power of more than 59,000 W. The new antenna is not only simpler than antennas with separate horizontal and vertical radiators, but outperforms them as well. The standing wave ratio measures less than 1 to 1.05 for minimum stereo crosstalk.

Although KFOA's antenna is less than 400 feet above sea level, its signal radiates well over mountains ten times higher. Even small transistor receivers pick up a strong KFOA signal at this difficult location. Other Honolulu fm stations, utilizing the same order of height and power but only horizontal radiation, are virtually inaudible at such locations.

Our transmitter is located on the fourteenth floor of a hotel building. These two-thirds of a ton of transmitter had to be moved through a crowded hotel, up a standard passenger elevator, and handjacked the final flight of stairs. We offer this advice to new stations which plan to install transmitters at unusual locations: measure carefully! We were lucky: the transmitter went through all doorways but with fractions of an inch to spare. And several complete door jambs and a massive boiler were removed. One half an inch more in height



Floor plan of KFOA. Scale 3/16 in. equals 1 foot.

The Manager's Outlook on Programming

General Manager John Gregory points out that "because fm stereo is radio and not a background music service, KFOA tailors its programming to the time of day, carefully selecting the music to fit the mood of the hour. KFOA's sound encompasses an all-stereo format, programmed by people who know music and enjoy quality radio.

"Overall, the KFOA musical image is Pop-Standard, Easy-Listening. Music is selected carefully for maximum melodic appeal . . . Mantovani, Lombardo, Kostelanetz, Crosby, Sammy Kaye, Mitch Miller, Freddy Martin, Russ Morgan. Using an hourly quota system for playlist tunes, memory favorites, new albums and standards, KFOA insures variety and balance.

"Daytime programs are characteristically upbeat, sprinkled with easy listening favorites. KFOA evening shows accent the beauty of stereo music as big orchestras are featured in melodic arrangements. The approach, while somewhat segmented, always maintains the pacing and music variety that distinguish KFOA's 'all round sound.'

"Commercial announcements are clustered between quarter-hours of uninterrupted music, enhancing the impact of the sponsor's message, as well as the listener's enjoyment."

and the transmitter could not have been moved through the doorways on even the lowest roller cart.

With the transmitter and studios on the same property, KFOA owns the remote control lines. We installed two audio pairs, a coaxial cable to bring an rf sample down to the studio for the modulation monitor, and a thick multiconductor cable for transmitter control. These cables were run through one quarter mile of unused conduit. Freed of the necessity to use no more than two leased pairs as in the usual remote control system, we did not purchase the usual remote control units. Rather, we ran extensions for all of the transmitter's essential switches and meters. The result is electrical simplicity.

Because of the private program lines there is no limit to the maximum allowable level. Therefore we installed the limiting amplifier downstairs at the studio, driving the transmitter directly through the 1300 feet of line. This keeps as much equipment as possible at the studio where it is more readily accessible for maintenance.

Efficient Planning

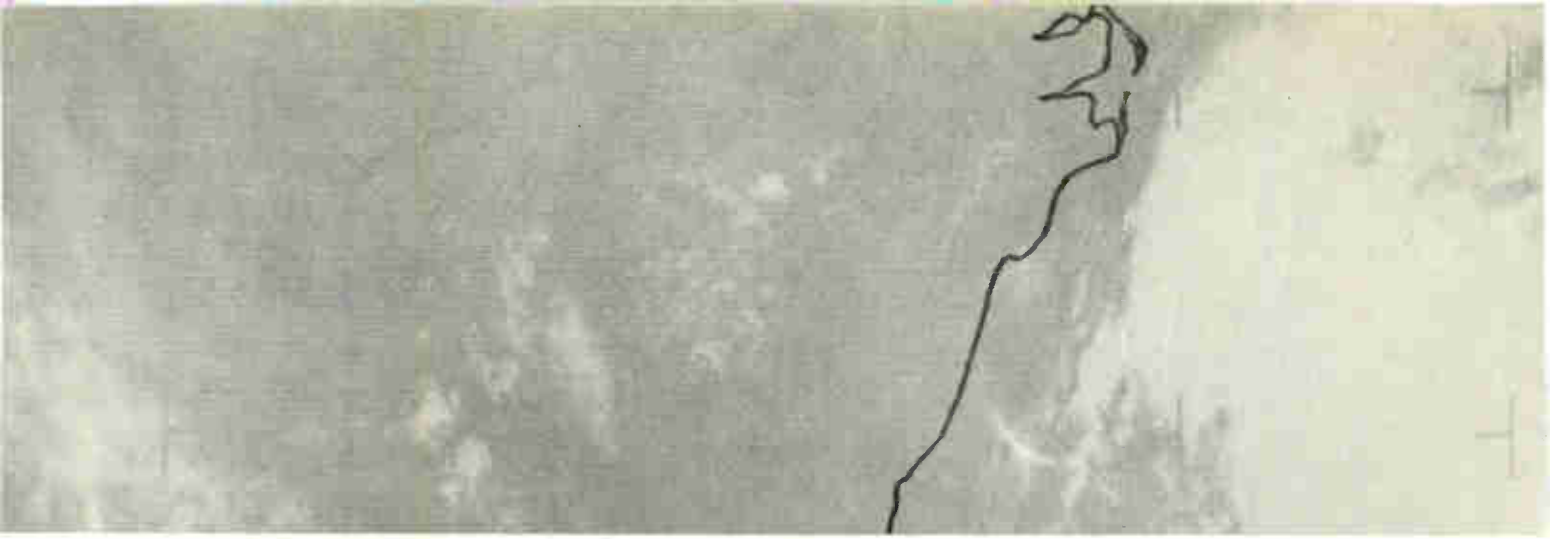
As a small station, KFOA must maintain high efficiency in all departments so that the small staff won't be swamped with work. We like to think that the time used for planning of even "little matters" pays off in accumulated efficiency. A simple format thus keeps operators' duties at a minimum. Simple, uncluttered decor keeps janitor work at a minimum. Simple electronics likewise keeps the chief engineer's maintenance time low.

The installation of the warning lamps at the control room and production room doors illustrates simplified maintenance. Bulb replacement appeared time-consuming; therefore the bulbs operate at half-voltage (obtained through a series diode allowing only half of the cycle to pass), extending their life almost indefinitely. The warning lamps, by the way, are mounted *beside* their respective doors at eye level rather than the usual location above the doors.

As another example of pre-planning, before commencing operation, we prepared an "Operators' Handbook." We worked hard on this handbook, rewriting it several times with an editor's eye. It had to be concise and clear to get operators to use it.

Looking to the Future

KFOA's simplicity of operation, coupled with careful planning, results in efficient low-overhead broadcasting. General Manager John Gregory handles sales, Assistant Manager Ron Pesha operates the technical end, and the two share program and production duties. Four operators (one part time) complete the staff. KFOA will grow along with stereo fm. But with a precedent for efficient operation set at the beginning, orderly growth will keep costs under control. This makes for healthy profits, so KFOA may face the future knowing it can always serve in a quality way. ●



Introducing the Weather Satellites

By Robert I. Kendall

Four satellites currently in orbit which have on board an automatic picture transmission facility (APT). These are the ESSA II, ESSA IV, NIMBUS II, and the ATS-B.

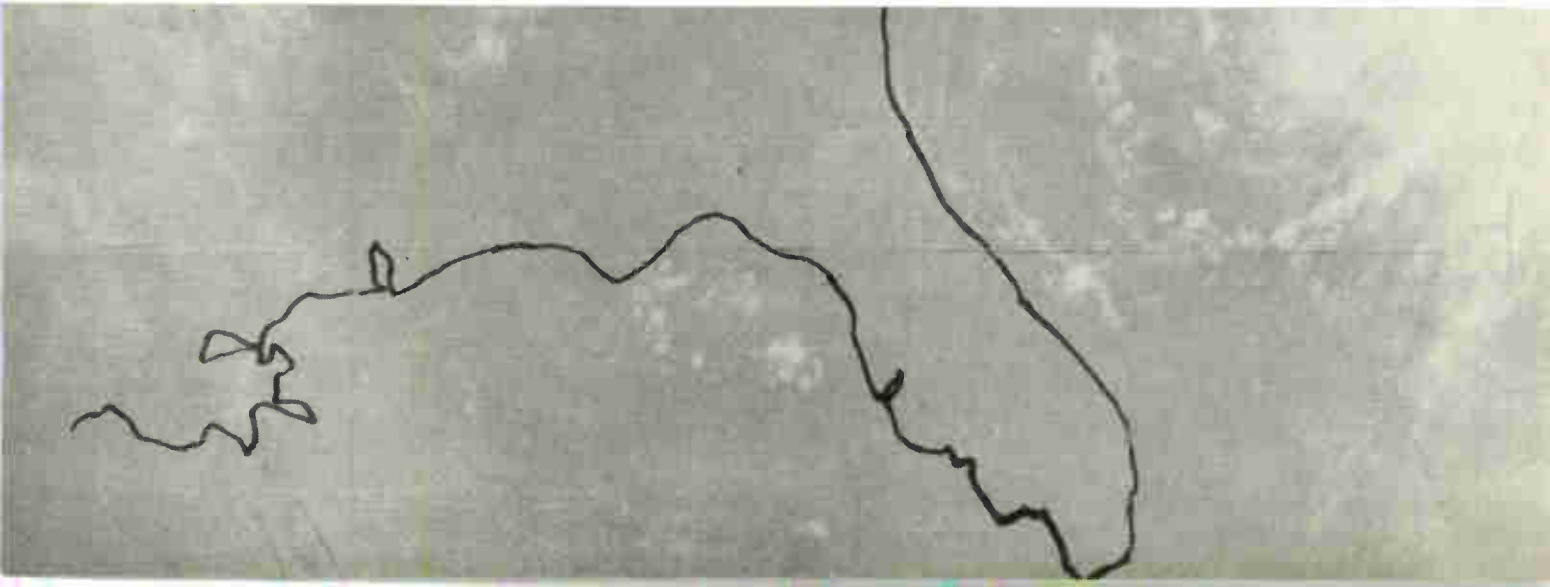
The ESSA II was launched March 2, 1966 into a 750 NM polar, circular orbit. Its period is 113.5 minutes. The ESSA IV was launched January 26, 1967 into a 770 NM polar, circular orbit with a period of 114.2 minutes. The ESSA units are shaped like discs and are stable in two axis so that they "roll" around the earth like wheels at a rate of one "turn" each 5.4 seconds. These satellites carry two APT cameras each on diametrically opposite sides of the "wheels" and carry no other experiments as does the NIMBUS 11. The picture transmissions consist of five W of rf power on a frequency of 137.500 MHz. There are 208 seconds of phasing and picture data followed by 144 seconds of standby operation which produces a total period of 354 seconds per picture sequence.

Each picture covers an area of about 1,960,000 square miles. At the author's receiving station in Tulsa, Oklahoma, an average of eight pictures a day can be received from each satellite and combined to make two mosaics which show the cloud cover from the Pacific to the Atlantic and from the middle of Canada to the Yucatan Peninsula. ESSA II passes overhead at approximately 8:00 A.M., local sun time while ESSA IV passes overhead at approximately 9:40 A.M., local sun time. Ed. Note. ESSA IV has stopped transmitting subsequent to the preparation of this article. ESSA II has drifted and crosses equator at 7:30 A.M. ESSA III and ESSA V satellites are not APT types but their pictures are sometimes relayed by ATS-B.

The NIMBUS II satellite was launched May 15, 1966 in a polar orbit at an average altitude of 600 NM. It makes one revolution around the earth every 108 minutes. This satellite is stabilized in all three axes by gas jets so that its APT camera always points directly toward the earth. This satellite's APT transmissions are with an rf power of five W on a frequency of 136.950 MHz. The picture sequence is 208 seconds of phasing and picture data which is continuously repeated so that there is no standby mode between pictures as the ESSA series has. This would normally be expected to produce more pictures at the receiving station, but due to the lower orbit altitude, the satellite is not received for as long a period of time. This lower altitude also eliminates the overlap between successive orbits thus making the pictures more difficult to place and recognize.

The ATS-B launched December 2, 1966, is in a synchronous orbit at an altitude of 23,000 miles. Its position is 0° latitude, 151° west longitude. This satellite's APT system consists of a transponder that rebroadcasts signals on a frequency of 135.6 MHz that were transmitted from the ground on a frequency of 149.22 MHz. The area of simultaneous reception of this signal extends from the east coast of the United States, west to Japan, and includes eastern Australia. Its time of transmitting is from 9:00 to 11:00 Z. (2 A.M. to 4 A.M. EST) The pictures transmitted include weather charts as well as copies of sections of the "Spin Scan" pictures taken by the camera system on this satellite.

New Nimbus and ATS satellites will be launched this year. The ATS that will be stationary over the Atlantic Ocean will house a color camera.



Three Plans For Receiving Weather Satellite Pictures

You can televise daily your own weather forecasts receiving signals directly from weather satellites. Here are three plans: two facsimile recording systems (one do-it-yourself) and one oscilloscope recording technique using a Polaroid camera.

Part 1

Facsimile Using Commercial Equipment

Alden Electronic & Impulse Recording Equipment Co., Inc., of Westboro, Mass. offers a wide range of automatic picture transmission (APT) recording systems. The systems include antennas, receivers, and facsimile recorders.

Pictures are received ready for instant use and immediate interpretation of cloud patterns and storms as they affect different geographic areas can be made. Approximately 2.5 million square miles of the earth's surface can be covered by pictures.

The facsimile recorder was electrosensitive paper which gives good shade images particularly in light shade areas where 90 percent of the most meaningful cloud formation is formed. Pictures can be enlarged by more than 25 percent for good resolution of small areas.

The Alden equipment by a single switching mode makes it possible to receive all weather bureau, international facsimile or land line facsimile network weather map transmissions.

Alden reports it can provide equipment to meet most every budget requirement—from a basic facsimile recorder to a complete couple self-contained weather recording station. Major users of Alden equipment have been the U.S. Weather Bureau, U.S. Navy and U.S. Air Force, but recently customers include TV stations, universities, ships and amateur weather men.

Systems can run from $5000 on up. Station WTVT-TV, Tampa, Florida, is one station making good use of Alden equipment and has an investment of $10,000 in

Continued on page 34

Part 2

Signal Processor and Oscilloscope Camera Recording.

A weather satellite signal processor, TS2, by International Nuclear Corp., Nashville, Tenn., makes picture reception and photographs possible using an oscilloscope and Polaroid camera.

The complete system includes an antenna (circularly polarized or crossed yagi), an rf pre-amp (also available from International Nuclear), TS2 signal processor and an oscilloscope with a long persistance P11 phosphor CRT. By equipping the oscilloscope with a Polaroid camera attachment, photographs suitable for program presentation can be made.

The techniques used by International Nuclear is the same as that outlined in Kendall's article. A series of pictures is made and combined to make up a composite —North America can be made up from 5 to 10 pictures depending on the satellite's orbit. A transparent overlay is layed over the photos to outline the land area.

A TV camera can shoot the original Polaroid or an enlarged composite Polaroid picture with overlay. Projection schemes are also possible.

The equipment required is shown in the block diagram. All of the equipment diagrammed can be acquired for less than $5000, International Nuclear reports. The TS2 signal processor alone costs $2175. The preamplifier costs $335.

The signal processor has an input signal frequency of 2400 Hz, the base band carrier.

Output signals are a horizontal sweep of 4 lines per second, vertical sweep of 200 second linear

Continued on page 34

Part 3

Facsimile Using Ham And Surplus Equipment

R. L. Kendall

A receiving station for the weather satellites can be made economically by using a piece of government surplus equipment. The quality of this system is completely adequate for the daily use of television broadcasting despite its low cost.

The four weather satellites discussed on the introductory page all have automatic picture transmission (APT) characteristics that are identical. These characteristics are an rf carrier that is frequently modulated by a 2400-Hz subcarrier, which is amplitude modulated by the video and phasing signals. The start of the transmission sequence is a 300-Hz start tone for three seconds followed by 205 seconds of video scans at 4 scans (or lines) per second. The first five seconds of video are 20 scans of 2400-Hz video that are modulated pure white with unmodulated or pure black retrace. The actual picture then requires 200 seconds to scan the 800 line square picture format. The scans are each one-fourth second with approximately 12 ms of it utilized as retrace which is pure white during picture transmissions. The NIMBUS II has a modification of this normal

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Author Kendall is a senior product development engineer with the Magnecord Division of the Telex Corp. He is listed as experimenter by NASA/ESSA and has successfully received automatic picture transmissions since the beginning, August 1964.

Continued on page 36

Part 1 continued

Roy Leep, director of the WTVT Weather Service, stands beside the station's APT satellite tracking antenna. The antenna locks onto the transmitter's signal as the satellite passes above the horizon of central Florida. It is located on roof of WTVT's 2-story Communications Center.

weather satellite receiving equipment.

A vhf-hf receiver feeds the converter portion of an 11-in. recorder. The antenna is a log periodic tracking type (replacing the original yagi type). WTVT-TV receives cloud pictures from satellites daily. ESSA II, Nimbus, and AST are used regularly. WTVT-TV Director of Weather Services Roy Leep reports the station has broadcast weather services for eleven years and satellite pictures since the launching of ESSA II in March of 1966. Current staff numbers five. Over 70 minutes of weather information are broadcast in color each day.

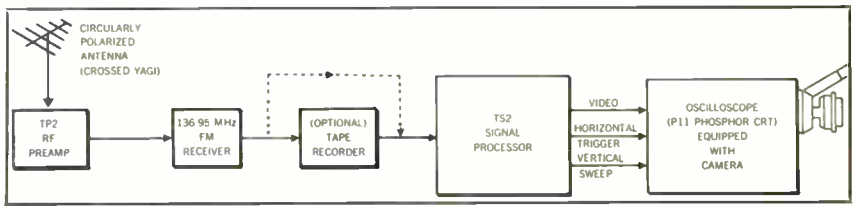
Other weather reporting equipment used includes a radar console, added in 1959, which permits continuous storm surveillance and an additional Alden 19-in. recorder for receiving, radio facsimile chart and land-line facsimile charts from the Weather Bureau and other sources. Once a year WTVT issues a Hurricanes publication which describes hurricanes, warnings and precautions viewers should know.

Nelson Medina of WTVT adjusts the antenna control unit while Peter Giddings removes the facsimile photograph being transmitted directly from the satellite.

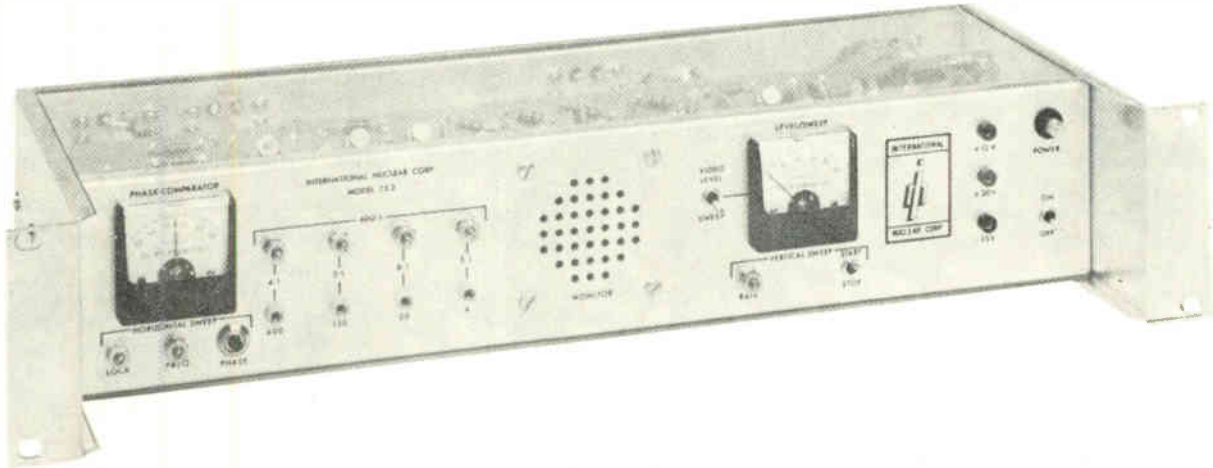
Part 2 continued

sawtooth, and a video signal of 20 V peak to peak. See Kendall's article for the significance of these parameters. The unit takes up a space of 3½ in. by 19 in. with a depth of 7 in.

The pre-amp has an input sensitivity of less than 1 μV at 136.95 MHz. Gain is 12 dB and noise is less than 2 dB. It requires 12 V dc power.



Block diagram of the International Nuclear signal processor and processor itself, below, for receiving APT weather satellite pictures.



Televising Weather Radar

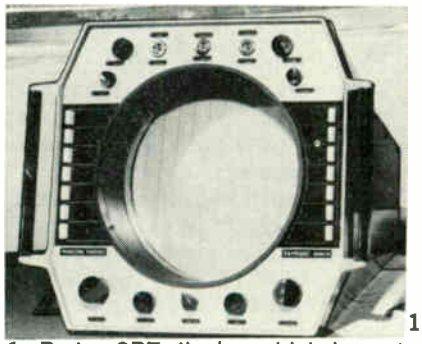
For stations not wishing to invest as heavily in radar as did WTVT, as mentioned on the preceding page, two other alternatives exist. A station can buy today a radar for as little as $5800 or it can tie in with the new U.S. Weather Bureau RATTS/65 service. RATTS stands for Radar Telephone Transmission System which means the Weather Bureau sends out its weather radar scope pictures on telephone lines (using a slow scan TV system).

The TV station can receive this telephone transmission on a new graphic recording system available from Alden. (This same recorder can also be used to receive weather satellite APT cloud cover pictures either from the station's own receiving system, as described in parts I and III, or from a Weather Bureau ground station in the broadcasters area if they are providing telephone drops in that area.

The inexpensive radar system is a simple converted marine radar available from Kaar Electronics Corp. (affiliated with Canadian Marconi), 1203 West St. George Ave., Linden, N.J. 07036. Scanning a 100-mile-diameter circle, the unit observes cloud formations and storm conditions. The 12-inch plan position indicator CRT can be located up to 200 feet from the transmitter-receiver which operates on the 9345 to 9405 MHz band at a power level of 20 kW. The antenna is a 4-foot slotted waveguide type. This band is in the Industrial Radiolocation Class of service. Applicants file on FCC Form 400.

The new RATTS service is currently available in the Texas-Louisiana area. TV stations and CATV operators can contact Mr. Thompson of the U.S. Weather Bureau Regional Office, Ft. Worth, Texas, for more information. A 4B grade transmission line should be ordered from the local telephone company. The 9256 Alden recorder sells for $6950 or it can be leased on a 36-month basis at $235 per month.

The receiver unit will provide up-to-the-minute radar data of local weather conditions annotated by expert meteorologists at the Weather Bureau radar site. See photo. Weather station forecasters can make immediate judgment regarding significant weather pattern changes as they follow a record of trends over a period of time.



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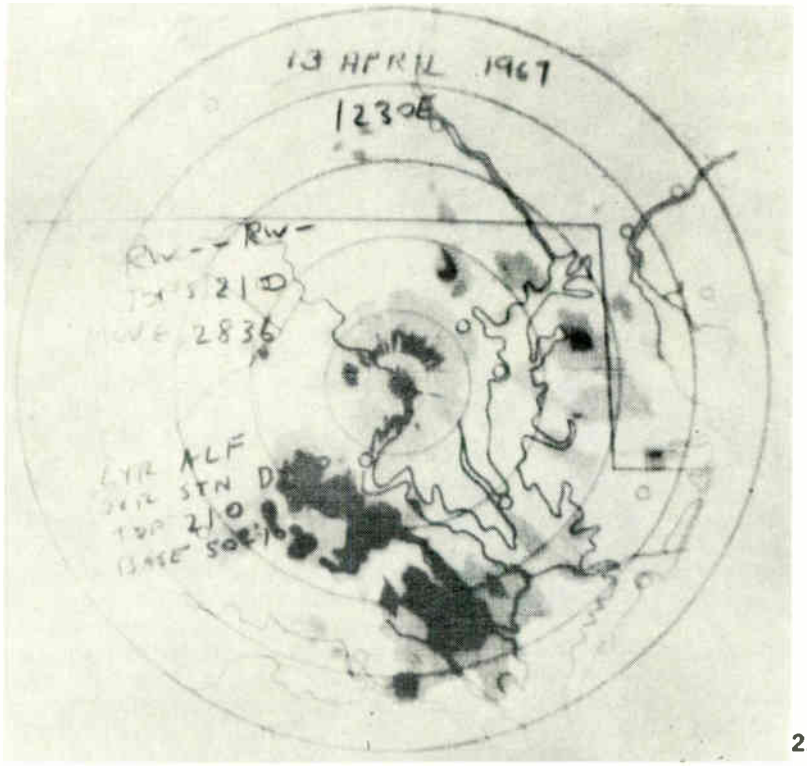

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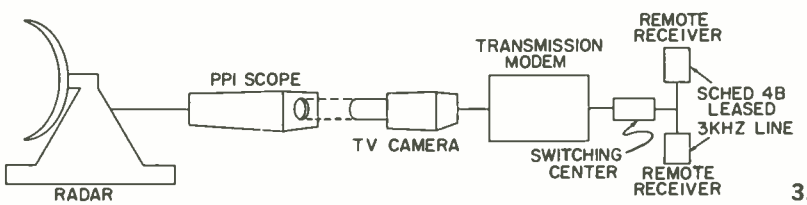
1. Radar CRT display which is part of Kaar's complete radar selling for $5800.
2. Typical radar pattern received on Alden recorder as transmitted by U.S. Weather Bureau over telephone lines by RATTS.
3. Block diagram of RATTS system. TV camera is slow scan so output can be sent over telephone lines. (Camera is part of U.S. Weather Bureau service.)

WB/RATTS 65 WEATHER RADAR REMOTING SYSTEM



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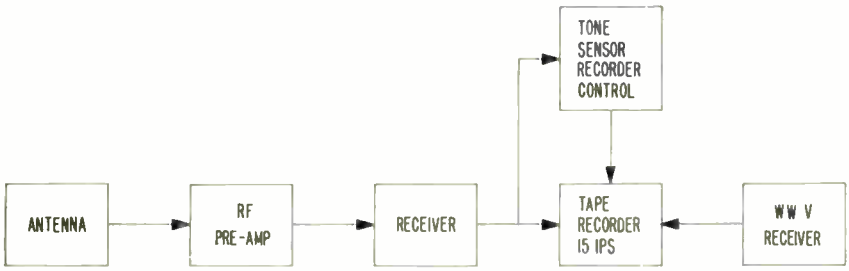
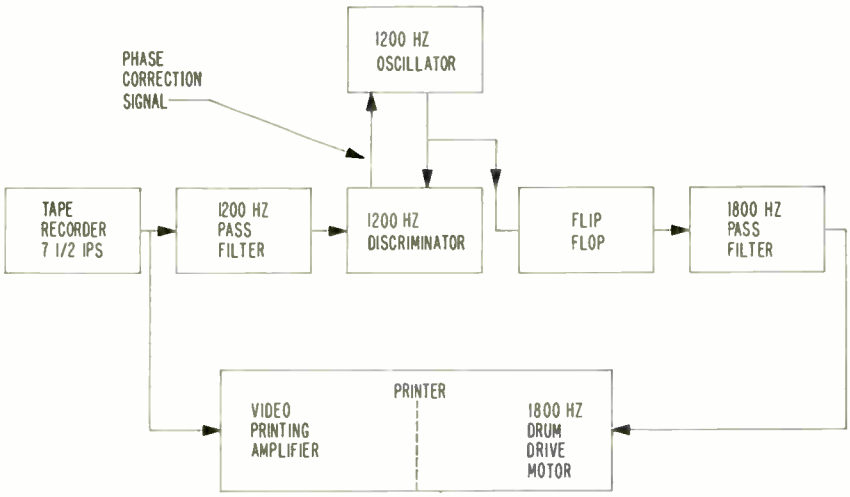
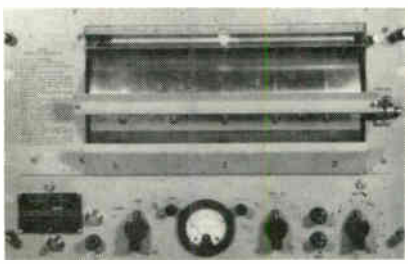
Part 3 continued



1 RECEIVING SYSTEM



2 PRINTING SYSTEM



3

1. The rf signal from the satellite is picked up by the antenna, amplified detected, and recorded. Detection of the 2400 Hz subcarrier starts and stops the tape recorder.
2. The recorded signal is played at one-half speed, filtered, and used to drive the printer drum drive motor. The unfiltered signal is amplified and printed.
3. The government surplus printer utilized in the system described.

format in a code presentation in the retrace area that tells such things as the date and time the picture was taken.

The ground receiving station (see Fig. 1) consists of an antenna, rf preamplifier, receiver, tape recorder, phase lock oscillator, and facsimile printer. The author has been able to purchase this equipment for less than three thousand dollars. (All of it is new equipment except for the facsimile printer which is government surplus.) That is less than the price of a new facsimile printer alone.

The antenna may be a nondirectional ground plane type (for ESSA and NIMBUS and a beam for ATS-B) similar to the one normally used by commercial two-way radio services. The fact that it is nondirectional eliminates the need for tracking of the satellite along with its associated calculations. The antenna location should be a high-elevation, noise-free area. A television transmitter antenna site is not a suitable location because of the desensitizing effect of the high rf field from the transmitting antenna.

The rf preamplifier should be located at the antenna and should be a Nuvistor or low noise transistor type. There are several on the market that are made for radio amateurs that are more than adequate.

The receiver should also be mounted at the antenna or within a very few feet of it. The reason for this is that the signal level is very low and the losses of a long run of coaxial cable are sufficient to degrade the signal to the point of becoming unusable.

The receiver should be of the wide band (2-way radio) type with a sensitivity of less than one-half μV for 20 dB quieting. A tube type may be used but a transistor type is easier to mount at the antenna and supply power to.

The audio output stage should be balanced for long runs to the tape recorder or may be unbalanced if shielded cable is used if the distance is short. This audio level should preferably be about one volt rms to prevent extraneous signal pickup in the audio cable.

The tape recorder used should have balanced or unbalanced inputs depending on the system of the receiver. It should be the "direct drive" type to have a very low value of wow and flutter to maintain the integrity of the recorded subcarrier frequency (the Magnecord model 1028 is ideal.

An automatic feature that is very desirable is a tone discrimination circuit which automatically puts the tape recorder in the record mode when the satellite subcarrier is received. This eliminates the necessity of someone having to be at the receiving station at the very instant the satellite is first received. If the tape recorder is transistorized it is possible for the tone discriminator to apply line voltage to the recorder, but if it is a tube type it will be necessary to leave the filaments on continuously and have the tone discriminator merely put the recorder in the record mode directly from standby. If unattended operation is contemplated the recorder should be capable of two channel operation to permit some type of audio time of day signals to be recorded on the second channel while recording the satellite on the other. This

time signal doesn't have to be extremely accurate but if you have a WWV receiver its signals will suit the purpose. This permits you to know how many minutes after the hour the satellite came within receiving distance and by knowing this its path may be traced on a map.

The tape recording is then played into the phase locked oscillator. (See Fig. 2.) The purpose of the phase locked oscillator is to provide a continuous subcarrier signal during reception fades that may be used to synchronize the facsimile printer drive motor. When playing the signal into the phase locked oscillator the signal should be amplitude limited to protect against noise bursts and all but the center frequency of the subcarrier should be filtered out. The filtered subcarrier should then be applied to the discriminator where it is compared to the local oscillator and a correction voltage applied to the local oscillator keeping it in phase with the satellite subcarrier. This local oscillator is then counted down to meet the signal requirements of the facsimile printer drum or helix drive motor.

The APT system requires a 240 rpm printer with a square aspect ratio (length/width). The video frequency is from 800 to 4000 Hz with at least seven shades of gray. As mentioned, new printers of this caliber cost about $3000. The system described here uses a typical government surplus printer, the Time Facsimile Corp. model RD-92A/UX (see Fig. 3). Its speed can only be modified to 120 rpm which means the tape recorder containing the tape of recorded APT signal should be played at half speed. This causes a corresponding halving of subcarrier and video frequencies. The drive motor requires 1800 Hz at one volt and circuitry to achieve this is shown in Fig. 2. This is obtained by first running the local 1200 Hz locked oscillator into a flip flop and then filtering the output of the flip flop with a resonant circuit for its 1800 Hz component. During periods of reception fade it is necessary that the local oscillator free run at the same frequency since there is no reference frequency from the satellite.

The aspect ratio (length/width) of this surplus printer is normally two to one and is modified to one-to-one which then requires two sheets of paper to print out one picture. The printer comes with a 1200 Hz low-pass filter which uses only the lower side band of the satellites' video frequency.

The paper used is "Teledeltos" type which consists of a sheet of paper covered with lamp black and a white emulsion. The white emulsion is burned off by a high voltage on the printing stylus in porportion to the video amplitude. Since this type of printing paper is a "black or white" process it is not practical to have all the shades of gray.

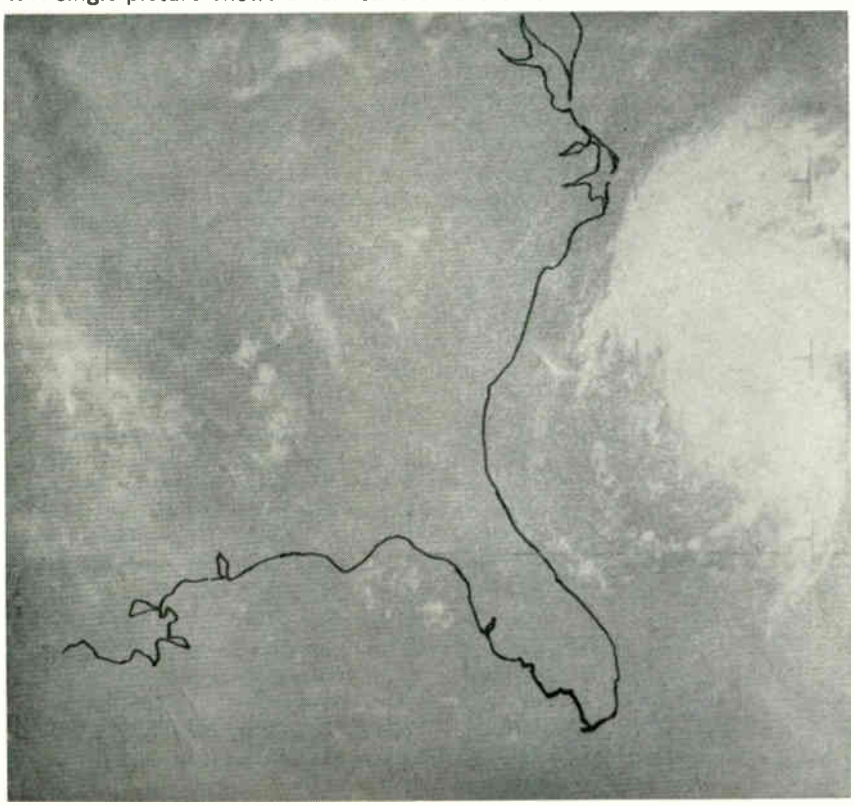
After the individual pictures of the day have been printed they can be overlapped to make a mosaic cloud cover picture of a vary large region. Because of the polar orbits of the satellites there is more overlap between successive orbits in the northern pictures than in the southern ones. (There is about 30 percent overlap at 35° north latitude for the ESSA satellite.) There is almost no overlap in the NIMBUS pictures since its lower altitude results in a smaller picture area. In most cases there will be features common to two successive pictures which makes positioning them for a composite relatively easy.

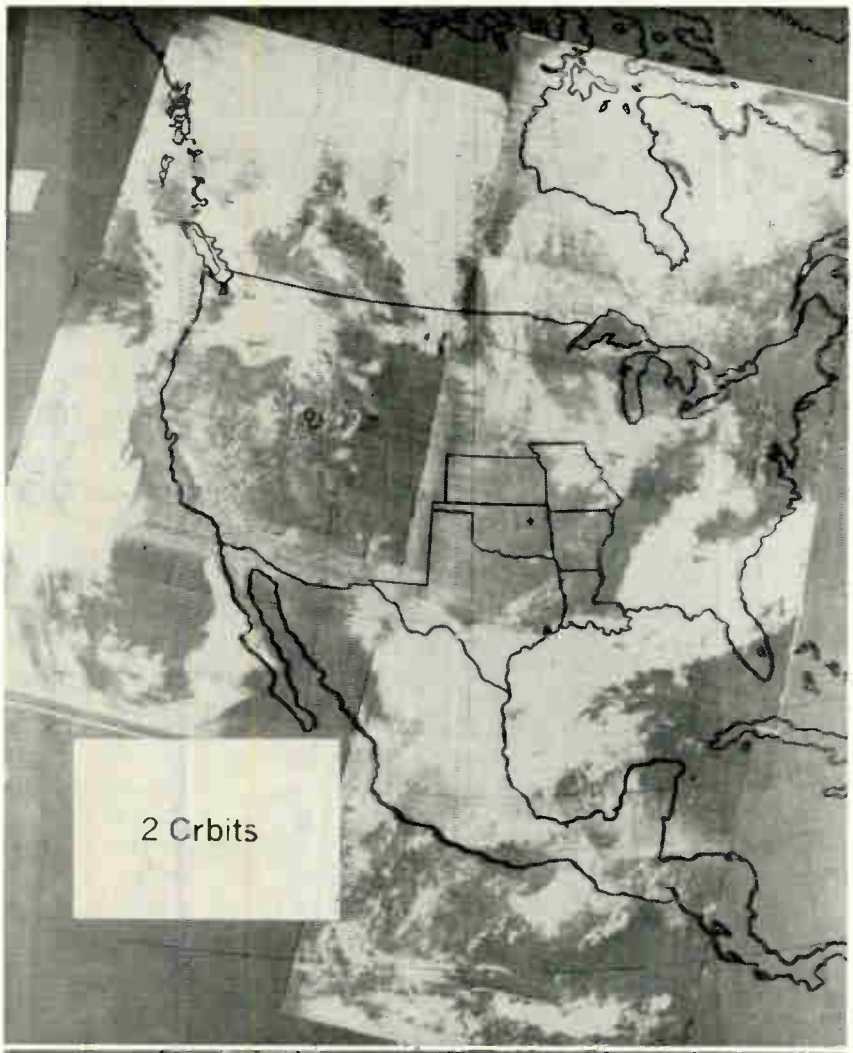
The NIMBUS pictures show land and water masses more clearly than the ESSA pictures because of a haze filter in the camera system. Landmarks which are often identifiable are Baja, California, the Great Lakes, Hudsons Bay, Florida, Cuba and the Gulf of Mexico.

There is a striking similarity of the cloud formations shown in satellite pictures and weather features shown on weather maps. (See Fig. 4, 5, and 6). Cold fronts are characterized by a long curving arc of clouds in advance of the front and clearness in the high pressure area which follows. Low pressure areas such as hurricanes show up as large spirals of clouds. Northern blizzards show a surprising similarity in shape to southern hurricanes. Picture interpretation is best explained in the publication "APT Users Guide" available for one dollar from the Government Printing Office in Washington, D.C.

When the pictures are to be

4. A single picture shows a hurricane off the east coast of the United States.





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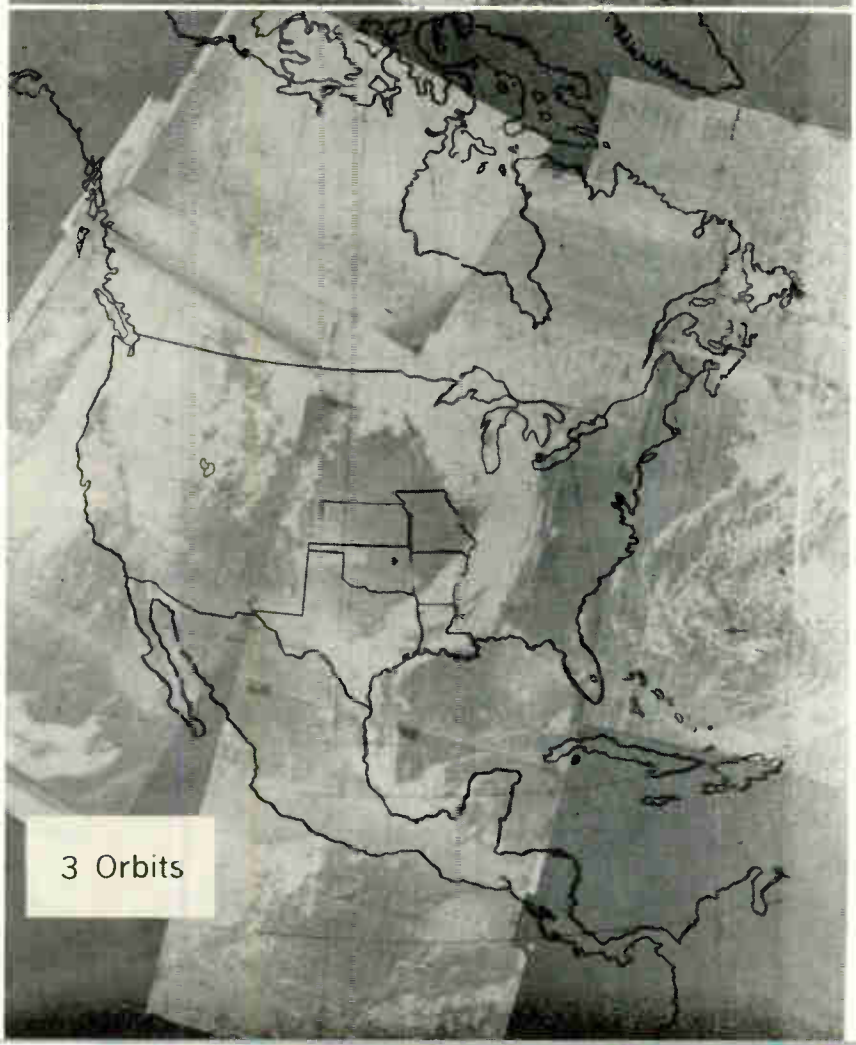

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5. This mosaic consists of 2 successive orbits. The major weather features are a large low pressure area in the Pacific off the west coast of Baja, California and a high pressure center over the mid-west. Snow cover can be seen in the Rocky Mountains. The area of the mosaic shown is approximately three feet on a side.

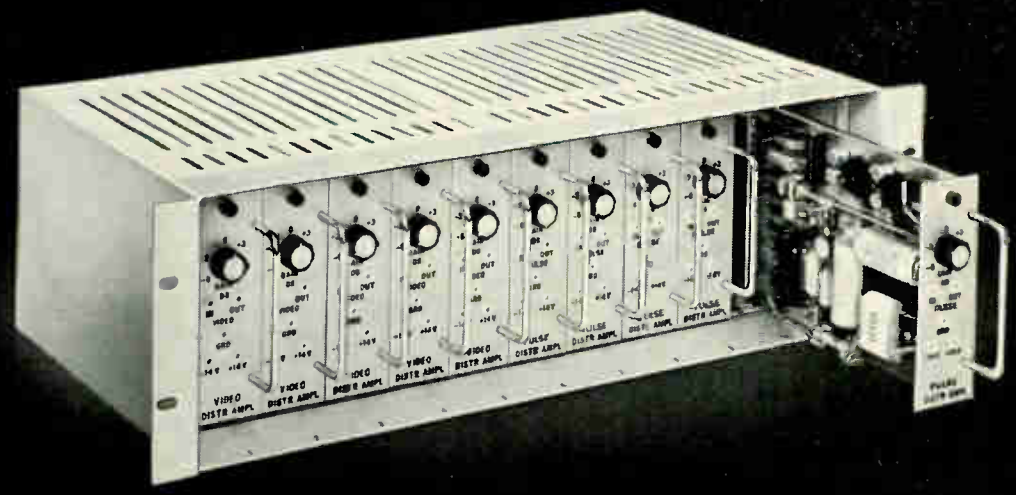
6. This mosaic consists of 3 successive orbits. It shows a Pacific cold front off the coast of Washington state, a high pressure center over the mid-west, a cold front extending from the Great Lakes to south eastern Texas and a high pressure area over Bermuda.

presented on television it is helpful to make an overlay map showing the continent, an outline of the United States, your state line and the location of major cities. It can be drawn with a magic marker on a clear sheet of plastic and used every day since the scale of the pictures does not vary appreciably. If both ESSA and NIMBUS pictures are used, two different scale overlays will have to be made. This overlay map is also useful in finding the location of the individual pictures during assembly of the mosaic.

The pictures can become an integrated part of your weather casts. With the overlay map in position on the satellite pictures, features such as fronts, highs, and lows can be pointed out and similarities to the features on the standard map can be shown. Progression of these features across the continent can be shown by referring to previous pictures.

The weather satellites now in orbit can be received directly by virtually every television station and school in the country. For a very reasonable expense you can have this revolutionary new capability.

For more information on circuit details of help in locating surplus recorders write the author directly. Surplus recorders are available from Newsome Electronics, 2670 Pinetree, Trenton, Michigan 48183. New recorders for this purpose may be obtained from Alden (see part 1), or Telautograph Corp., 8200 Bellanca Ave., Los Angeles, Calif. 90045.



Ball Brothers Research Corporation designed the Mark IX to out-perform any other video/pulse distribution amplifier on the market. And as far as we know, it does.

Video differential gain is 0.25 per cent, and differential phase is 0.25 degrees maximum. These low distortion characteristics provide excellent sub-carrier performance.

Pulse rise time is less than 50 nanoseconds. DA's on the Mark IX are plug-in modules, each with its own power supply.

To make sure they perform the way we say they will, we age them at nominal power for two weeks. Then we sell them like this: Video and pulse DA modules are $255.

Sync-add option is $25. Ten-card chassis is $275. Two-card chassis is $100. Data sheets are free. So is an evaluation of the Mark IX in your operation.

Editor's Note: This article is based on a chapter from the newly revised edition of the author's book, "CATV System Engineering," published June 1967 by TAB Books, Thurmont, Md.

CATV Head-End Concepts

By William A. Rheinfelder

Considerations for the design of Cable TV head ends, from the author's newly revised edition of "CATV System Engineering."

THE HEAD-END EQUIPMENT, located at the start of a CATV cable system, must produce the high quality TV signals which are essential for satisfactory system operation. Because of the unavoidable degradation of signal quality in the cable system, the requirements for the head end are exacting. For example, a high quality, solid-state CATV amplifier has an overload-to-noise ratio of 55 dB. Consequently, a head end overload-to-noise ratio of only 55 dB would, by itself, result in a degradation equivalent to 30 amplifiers, a situation which cannot be tolerated.

Generally, head-end equipment can easily be designed to exceed the dynamic range of the repeater amplifiers. For one thing, only a single channel has to be amplified, which greatly increases the overload capacity. Therefore, we should rightfully expect the overload-to-noise ratio for the head-end equipment to exceed that of the best amplifier in the system. Noise, of course, in a more general and meaningful sense, is meant to include all types of interference. But not all spurious outputs manifest themselves as a degradation of the video dynamic range. Therefore, a 60-dB suppression of spurious outputs is often satisfactory.

The large video dynamic range is achieved by filtering, agc, and circuit concept. Some filtering must be provided in the rf stage and antenna preamplifiers, to avoid difficulties of cross-modulation with other signals, with more filtering in the i-f strip. Agc is provided in both forward and backward directions to keep the output constant for normal variations in signal level. All these functions are performed similarly in a less perfect way in a normal TV set. However, the achievement of a large dynamic range is only part of the function of the head end. Normally, frequency translation (conversion from one channel to another) is necessary in all-band CATV systems to minimize interference problems. Also, any received uhf channels are converted to vhf channels at this point. This conversion is necessary to keep losses in the system within reason. Consequently, no use of the built-in uhf capability of newer TV sets is generally made in CATV system design.

In addition to frequency conversion, the head-end equipment allows for the precise adjustment of the composite signal level for each channel, as well as a separate correction of picture and sound carrier levels. These adjustments are provided to permit the correct balance of the various TV

Mr. Rheinfelder is Director of Research & Development, Anaconda Astrodata Co., Anaheim, Cal.

channels with each other and to reduce interference problems due to the sound carrier in all-band CATV systems. The sound carrier is normally reduced below the picture carrier by about 15 dB. All head-end signals are added in a multichannel combining network which provides isolation between channels and freedom from spurious outputs due to interaction. The combined output signal is then applied to a cable pre-equalizer, which adds the necessary frequency correction for the section of main trunk cable from the head end to the first main trunk amplifier. Any pilot carrier for agc purposes is added after the pre-equalizer, just before the start of the main trunk system.

The complete head-end setup (Fig. 1) may include separate antenna preamplifiers, if the distance between antenna site and head-end building is excessive, in order to keep the total system noise figure at low values. Electric power for head-end equipment is sometimes a problem, particularly on mountain-top locations, and a self-contained motor-generator power station may be required. With transistorized head-end equipment, some form of cable powering becomes a logical possibility.

A number of different concepts for head-end equipment have been developed through the years. These concepts are not equivalent, but rather evolved historically, and knowledge of the various approaches will be of value to system engineers and technicians.

Frequency Conversion

A block diagram of the frequency conversion type of head end equipment is shown in Fig 2. The incoming channel is converted down to a standard i-f frequency, then reconverted up to the desired channel frequency. The adjustment of the sound carrier is performed by adjustable trap circuits in the i-f amplifier. This type of head-end equipment can be perfected to a high degree and may be fully transistorized to advantage.

In order to achieve the high quality essential for CATV, cross-modulation must be kept to a minimum. This requirement necessitates the use of a push-pull mixer. Consequently, two rf stages must be used in the rf amplifier to achieve a low overall noise figure. The oscillator is crystal-controlled for high stability and low maintenance. Generally, no temperature stabilization of the crystal is required for CATV work, particularly with the small heat stress of transistorized equipment. The i-f amplifier has, as a main objective, the removal of interference by its inherently high skirt selectivity. Lower phase distortion results from the use of specially designed double-tuned bandpass filters. Low phase distortion and reduced group delay is important for high quality picture reproduction, particularly for color signal transmission.

An adjustment for the sound carrier must also be provided in the i-f strip. Generally speaking, conventional traps also affect the picture to a considerable degree, and crystal filters are generally too narrow to be useful. Thus, while it is possible to develop a satisfactory circuit at some expense, the control of the sound carrier represents a weak spot in the otherwise advantagous reconversion concept.

For on-channel operation, that is where the output signal has the same frequency as the input, the second oscillator used in the up-converter must be controlled by the crystal of the down-converter to avoid intermodulation beats. This connection is indicated by a dashed line in Fig. 2. The up-converting mixer is followed by buffer and output stages, which are designed to reduce the unwanted mixing products and to provide the necessary output power. It is desirable to have a fairly high undistorted power level out of the head-end equipment, because of the rather severe insertion loss inherent in the following combining network, where all channels are combined to form the single output fed to the cable.

Agc is generally designed to keep the output constant for an input change of 20 dB. This agc action, while not difficult to attain, calls nonetheless for a well engineered concept with the correct amount of forward agc. The reconversion principle has the advantages of simplicity, low cost, and the elimination of possible sources of distortion in demodulator or modulator circuits. It causes difficulties with control of the sound carrier due to simultaneous phase distortion of the picture signal. Reconversion agc requirements are stringent and frequently not met by available equipment. The reconversion principle will not correct inferior modulation, and this concept does not lend itself to adaptation for use with microwave links or program origination.

Remodulation

Basically the remodulation principle involves a receiver or demodulator, and a transmitter or modulator. The demodulator receives its input signal in the same general way as the reconverter; however, the i-f strip is followed by a video detector and amplifier, providing a high level (about 1 V peak-to-peak) output signal at low impedance. Also, a 4.5-MHz sound amplifier with limiters is included to provide a constant, low impedance output of the frequency modulated 4.5-MHz sound carrier.

Generally, a demodulated audio signal is also available from a built-in discriminator. This signal may be used for monitoring purposes or special applications. A separate discriminator is necessary for automatic frequency control if the front end (tuner) is not crystal-controlled; this is shown by dashed lines in Fig. 3. Such a receiver then provides a studio-type video signal and a 4.5-MHz fm sound signal, both held constant by agc and limiters. The frequency deviation of the sound signal is, of course, identical to that of the broadcast station.

The video and 4.5-MHz fm sound output signals are then used to modulate the transmitter as shown in Fig. 4. The picture and the sound transmitters are kept separate to the very end to avoid

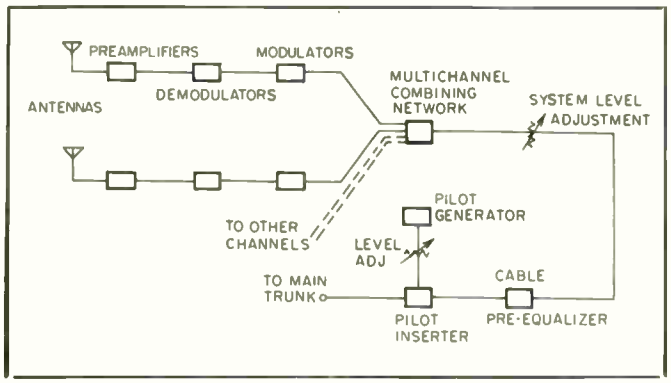


Fig. 1. Diagram of basic head-end equipment.

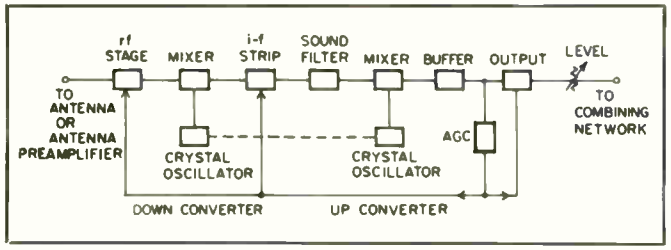


Fig. 2. Block diagram of typical reconversion head end.

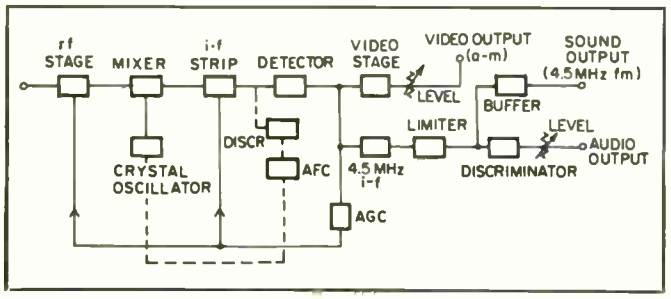


Fig. 3. Block diagram of head-end demodulator.

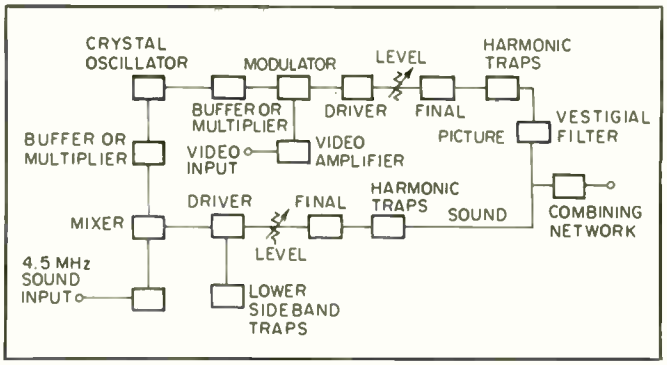


Fig. 4. Block diagram of video and audio demodulator.

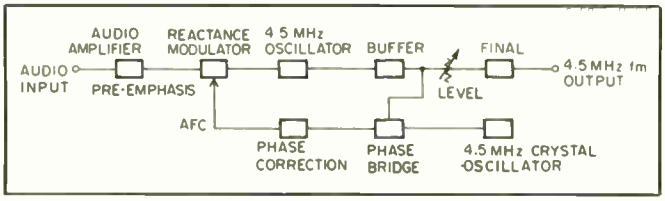


Fig. 5. Block diagram of 4.5-MHz audio modulator.

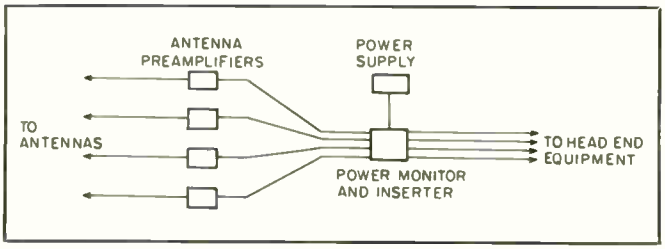


Fig. 6. Method of powering antenna preamplifiers.

intermodulation products. In the picture transmitter, a crystal oscillator and buffer and/or multiplier is followed by a modulator, usually of the push-pull variety. Negative feedback may be included in the modulator circuits to maintain low distortion and wide frequency response. Of particular interest for color is the magnitude of differential phase and gain produced in the modulator and the following stages of the picture transmitter. Considerable engineering effort must be spent in the circuit design of the modulator to obtain flawless picture modulation, and this possibly is one of the shortcomings of this concept. Dc restoration is normally a part of the video amplifier and modulator, enabling acceptance of all kinds of video signals.

The sound portion is relatively simple. The sound carrier is obtained by mixing the picture frequency with the 4.5-MHz fm signal from the demodulator. The resulting sound carrier needs only filtering and amplification, and is ready for combination with the picture carrier. In particular, the lower sideband resulting from the mixing process must be removed by several traps and careful shielding, to avoid interference on other channels.

The advantages of the remodulation concept are obvious. Picture and sound level are inherently constant and easily controlled without interaction. The quality of the video signal may be improved over that available from the station. Also, the picture modulation level may be reduced for decreased cross-modulation in the cable system. Camera signals may be directly applied to the video input for program origination, such as advertising, weather information, news, etc. The sound signal is only reconverted and not demodulated. Consequently, no degradation in sound quality occurs unless the bandwidth of the sound circuits is too narrow. The only critical factor is the picture modulator, but excellent performance is possible with a well-engineered circuit. This concept is also fully adaptable to microwave.

For the remaining function of complete program origination, a separate audio modulator is needed, since this transmitter accepts only 4.5-MHz fm sound. A modulator which converts audio signals to 4.5-MHz fm sound is shown in Fig. 5. The audio signal is fed through a preemphasis network and amplifier to the reactance modulator which, in turn, controls the frequency of a 4.5-MHz oscillator. This frequency-modulated signal is amplified and brought to the output. The only problem with such a modulator is automatic frequency control (afc). Afc may be accomplished by using a discriminator or ratio detector tuned to 4.5-MHz; however, this method is inaccurate because of the limited slope of the control function for these devices. Also, no precise frequency setting is possible due to the poor temperature stability of normal tuned circuits. These problems can be overcome by using the phase-locked afc system shown in Fig. 5. The phase error between a 4.5-MHz crystal oscillator and the frequency-modulated oscillator is measured in a phase bridge, and the output is used to control the reactance modulator. Such an afc system is far superior to other systems since it provides the basic accuracy of a crystal oscillator.

All head-end equipment can be transistorized to advantage. Not only does solid-state equipment result in higher reliability and reduced current drain, but it also leads to performance far superior to that attainable with vacuum tubes. Transistors have far higher transconductance than tubes, a decisive factor for this type of equipment. Also, semiconductor diodes possess far better modulation characteristics than vacuum tubes.

Strip Head Equipment and Antenna Preamplifiers

The previously discussed methods of providing TV signals for CATV systems are capable of the highest quality; however, they are somewhat more costly than individual straight-through rf amplifiers (so-called strip amplifiers) for each channel. This approach is only possible, of course, for on-channel operation—that is, where incoming TV channels can be fed directly into the cable. Anybody familiar with receiver design is aware of the problems associated with this approach, including cross- and inter-modulation, selectivity, stability, sound control and agc. None of these problems can be dealt with adequately by circuit design; if attempted, a far more critical and costly circuit would result than with the methods already discussed. Therefore, it seems that this approach must be left to low quality systems as an interim solution until better equipment is installed.

Antenna preamplifiers, while of similar design, have a different purpose and can be made a part of the highest quality system whenever the need arises. The main function of an antenna preamplifier is to keep the total system noise figure down. The need for antenna preamplifiers arises when weak signals are received from the antenna, when the following head-end equipment has a high noise figure, or when the distance from the antenna to the head-end equipment is excessive. In order to keep the system noise figure low under these conditions, it is necessary that the antenna preamplifier itself be of low noise design and have sufficient gain to override the noise of the following equipment. These objectives are achieved with a noise figure of 5 dB or less and a gain from 14 to 25 dB. Higher gain is of no advantage, and usually causes additional problems due to regeneration. Since some form of interference rejection is desirable, it is common practice to trade gain for increased selectivity. Also cross-modulation and other forms of distortion must be minimized. All these objectives are easily met by a two-stage circuit with a double- or triple-tuned interstage network. By proper circuit design, phase distortion and group delay may be minimized while, at the same time, achieving a flat-topped response with good skirt selectivity.

Antenna preamplifiers are mounted immediately adjacent to, or as part of, the antenna, and remotely powered with dc current from the head-end equipment site (Fig. 6). The remote power supply includes current monitoring to assure proper operation of each preamplifier. Antenna pramplifiers should not be used indiscriminately, but only in cases where an excessively low signal level at the input to the head-end equipment warrants their use.

As with other pieces of CATV equipment, the performance of rf preamplifiers often falls short of what is possible with modern circuit engineering practices. A tremendous improvement in CATV system performance can be achieved by fully integrated system design, where the entire CATV system is based on professional engineering principles. ●

So Which Head End For You?

While Mr. Rheinfelder's article describes the differences between the classic types of equipment one may still be up in the air as to the best course of action to take if one is modernizing his existing plant. To get some advice on this subject we posed several hypothetical situations to manufacturers and asked their comments. Here's the discussion that followed:

1. If one has a 5-channel system, vacuum-tube head-end equipment, and wants to modernize to 12 channels, but thinks he may want 20 channels in 3 or 4 years, what equipment decisions should be made?
   a. Discard tube equipment entirely and buy 12 channel solid-state.
   b. Keep tube equipment and add more tube or solid-state gear.
   c. Buy 20 channel capacity now.
   d. Other

Dwain A. Keller, Dynair Electronics, Inc. The first thing to determine is whether the existing tube-type equipment is adequate specification-wise for use in a 12 or 20 channel system and if it will provide performance compatible with current solid-state standards. Maintenance costs relative to the older tube-type equipment should also be examined. Assuming that the existing equipment meets these requirements, it would seem advisable to add the necessary solid-state equipment for the new channels, since it would provide at least a start on a modernized system.

Much of the older tube-type equipment, however, is not capable of good adjacent-channel or color performance, making it undesirable for use in modern CATV systems. For many people who still prefer tube-type equipment, we have upgraded our tube-type equipment to meet current performance requirements.

John J. Meny, CAS Mfg. Co. Assuming the user has a need for 12-channel capacity, alternative a. would be the wisest one. However, some equipment such as the CAS Channel Control type can be procured on a channel by channel basis, as needed, so that there would be no advantage to obtaining a 12-channel head end if only say 9 channels were needed at the present time.

If one wishes to expand to 20 channels in 3 to 4 years, the basic design of the head end equipment permits this through simple changes in oscillator frequencies and realignment, or in the very extreme case a module change.

Fred J. Schulz, Blonder-Tongue. For economy reasons, add additional individual channel amplifiers as needed. Optimum bandpass filters can keep down crosstalk.

2. What are the tradeoffs involved in selecting frequency conversion (hetrodyne) versus demodulation and remodulation equipment? (For local and distant origination; pickup and microwave pickup, etc.)

Keller. Modulation equipment must be used in local origination and microwave-supplied systems. Therefore, systems utilizing these signal sources in addition to direct off-the-air sources must consider whether or not to intermix types of equipment.

A heterodyne unit would appear to cause inherently less signal distortion than a modulation unit. On the other hand, the problems of signal handling at the i-f frequencies of the heterodyne unit are far more difficult than the video frequencies of the modulator.

Meny. We think the basic design of a Channel Control virtually eliminated any tradeoffs in the selection of heterodyne frequency conversion versus demodulation and remodulation equipment. The best of both can be had. In the antenna pickup configuration, the superior heterodyne conversion method is used, both in the on-channel or off-channel mode of operation. Further adjustments of response to both video and audio at i-f allow close control of this parameter necessary for optimum performance, especially with color signals.

Local origination, both video and audio modulation, can be added at the i-f frequency and then heterodyned up to the appropriate channel. Thus, it is possible with our equipment to interject locally originated audio or video onto a channel normally carrying programs derived from off air or microwave sources.

Gaylord Rogers, Ameco. By using a converter with an i-f amplifier one gets frequency translation, selectivity, picture agc, sound carrier limiting and control of picture to sound carrier level. There is no detection of incoming signal as with demodulators so that distortion is minimized. Further, the unit is less expensive than high quality demodulator-modulators.

In the Channeleer, the input signal is amplified in a low-noise rf amplifier and then converted to i-f frequencies in the input mixer. The signal is then fed to the i-f amplifier where it is filtered to attain adjacent channel selectivity. The sound carrier is filtered out and separately amplified and limited to provide a constant level. The picture carrier is then agc'd to provide a constant level independent of input signal fluctuations. The ratio of picture to sound carrier level is adjusted and then the two signals are added together linearly.

The combined i-f signal is then converted to the desired output channel in the output mixer and then amplified to provide the level necessary to drive the cable system. If the signal falls below the prescribed threshold level, a substitution oscillator is automatically switched into the system.

3. Are there substantial differences in quality or performance of various head-end equipments regarding: a. cross modulation, b. picture and sound adjustment, c. agc operation, d. noise and dynamic range, e. transmission of color, f. uhf reception?

Keller (cross modulation). Both heterodyne and demodulation/remodulation incorporate similar components where cross-modulation can take place. Comparable systems should produce nearly identical results.

Meny (cross modulation). Many of the limitations in previously available equipment have become more pronounced as operators go to more adjacent channels and carry more color signals. Current designs must incorporate

specific features to optimize performance in the areas you mention. Cross modulation is no problem.

Schulz (cross modulation). In the conversionless design there are no beat problems. Adjacent channel rejection is accomplished by strategic location of high-Q bandpass filters following the pre-amp which means less color distortion.

Keller (picture and sound adjustment). The heterodyne unit hopes to deliver a signal which has not been materially changed from its off-the-air state. Few controls are available which will affect picture or sound quality. Maintenance of proper sound trap width and depth is important to both heterodyne and demodulator units to achieve the desired bandpass and envelope delay. The demodulator/remodulator provides the system technician with a greater degree of adjustment through which he may control signal quality.

Meny (picture and sound adjustment). Normal control of picture level is accomplished by agc action. A separate manual control is available on our equipment for set up and alignment procedures where the agc action would be undesirable. There are two optional methods for adjustment of sound level. In high signal strength areas where fading is unlikely, an adjustable trap is incorporated to set sound level in relation to the video level. For fringe area operation, a separate module provides agc of the sound carrier separately and maintains it at a preselected level relative to the picture automatically.

Keller (agc operation). Agc operation of the head-end should be nearly identical in both equipments. During a drastic signal fade, the remodulator has the advantage of maintaining a constant carrier output which will maintain the agc action of certain types of amplifiers.

Meny (agc operation). Agc circuitry provides for a maximum of 1 dB change in output level for a 25 dB change in input. It will further operate over a 55 dB range in input level (−20 to +35 dBmV) and can be adjusted to optimize signal to noise ratio for any given input signal level.

Meny (noise and dynamic range). 55 dB is standard assuming a reasonably acceptable signal level (−20 dBmV) that is not likely to fade beyond the specified agc range. A noise figure of 6 dB maximum on all channels is achievable for both equipments.

Keller (color transmission). It is essential that all current equipment be color-compatible. When properly operated, both heterodyne and mod-remod equipments are capable of delivering color signals which are fully acceptable.

Keller (uhf reception). Uhf reception requires a highly stable crystal local oscillator. Conversion to vhf should take place as near as possible to the antenna. Both heterodyne and demodulator equipments are faced with same requirements.

Schulz (uhf reception). Solid-state converters, as separate units, are available for uhf reception and retransmission on a vacant channel. A vhf converter is used to convert one of two vhf signals operating on the same channel assignment. These converters can be attached to nonconversion systems.

4. What remedies are available for weak signals or poor quality video signals?

Meny. The two major remedies for weak signals or noisy video signals are an antenna mounted, low noise preamplifier and adjustment of agc operating point to optimize signal to noise ratio.

Keller. The ultimate solution to weak signals is microwave service, which greatly reduces the possibility of poor quality video. With a video signal, it is also possible to reduce some types of signal defects by using a processing (stabilizing) amplifier.

5. What general trends do you see taking place?

Meny. Solid-state head-end components provide improved reliability already achieved with line amplifier equipment. Modular construction simplifies the maintenance requirements particularly if modules are widely interchangeable.

Operationally the trend is to allow greater versatility in what the head end can do and to permit future operation in a greater than 12-channel configuration. Designs should allow for local or remote control of nonduplication switching of any or all channels and public service emergency alert command of the voice and video on any and all channels.

Keller. The system operator is becoming more aware of the importance of the quality of the signal at his head end. Manufacturers have been stimulated by this renewed interest to develop better equipments. At the moment we are caught between changing user requirements and an expanding technology that makes it difficult to predict what will happen tomorrow. None of the current equipment is approaching the ultimate in capabilities.

The net effect of the present trend of FCC control over CATV, establishment of copyright payments, etc., indicates that CATV is not considered as an antenna service, but as an extension to the broadcasting station. It does not seem inconceivable that in the future the broadcast station would agree to supply studio audio and video direct or through microwave to the CATV system.

Ed. note: New head-end equipment at the NCTA convention in June included solid-state equipment by Ameco, CAS Mfg. Co. Dynair, and Jerrold. Entron announced a lower mounted vhf-uhf converter which featured maximum noise in the low uhf band and 7 dB and at the high end, a maximum of 9 dB. This is claimed as the best dynamic range and lowest noise figure in the industry.

Some of the best specification quoted (shopping various spec sheets) include these: overall sensitivity: 100/V (−20 dBmV) input for +54 dBmV output; maximum input +36 dBmV; noise fiugure, 6 dB maximum all channels; adjacent channel rejection 50 dB minimum; spurious emission, down 60 dB below visual carrier; sound if limiting 10 dB; agc sensitivity ±½ dB over entire range of 56 dBmV. Electrical specifications do not tell the entire picture. Prices ranges from $995 (12 channels) to nearly $3000. For more information on head-end equipment, circle the appropriate number. •

200 Ameco **202 Dynair**
201 CAS Mfg. Co. **204 Jerrold**

World's Largest Broadcast Center Under Construction

Construction began during October, 1966, on the Canadian Broadcasting Corporation's Place Radio-Canada in Montreal, a 25-story, $71 million center which, when completed, will be the world's largest broadcasting center. It will house CBC's radio and television French and English networks, as well as the CBC international service, northern service and armed forces service.

The building, which is to be named Place Radio-Canada will be situated close to the foot of the Jacques Cartier Bridge, in the area bounded by Dorchester Boulevard East, Craig Street, Papineau Avenue and Wolfe Street. The overall plan calls for all the studios, workshops, and technical control rooms to be constructed on the ground floor or below ground, so that the operational part of the building will form a low, broad structure. A tower some twenty-five storys high will rise out of the center of the studio complex. The major part of this space will contain offices for production, engineering and administrative staffs.

The Place Radio-Canada will contain nine television studios and twenty-five radio studios. Two of the TV studios and one radio studio will be equipped with permanent seats to accommodate audiences. All of the studios will be built wholly or partly below ground level, the TV studio floors being two storys below, and the radio studios one, and will be therefore easier to soundproof. The larger studios will rise some thirty feet above ground level. Some of the TV studios, therefore, will be the equivalent of five storys in height to provide for the "flying" of scenery and space for complex lighting grids, etc. The TV workshops—for sets, costumes, properties, etc.— will all be on the same level as the TV studio floors, and will be connected with them by fifteen-foot-high corridors. This will eliminate the need for large freight elevators and will make for the rapid flow of materials to and from the studios. Some of the workshops, notably those designed for the preparation of sets, will extend northward underground, totally invisible from the outside. The purpose of this arrangement is partly practical—the conditions of the site make deep excavation necessary—and partly aesthetic in that the need to construct high, windowless walls along the Dorchester Boulevard sidewalk will be obviated. The visible walls of the building will be set back from the sidewalk at a distance of at least 100 feet. Consideration of appearance have also dictated the construction of truck ramps leading down from the sides and rear of the building to the workshop floor, so that all loading and unloading can be carried on out of sight.

In front of the entrance a large plaza, about 200 feet square, is planned. Parking lots for visitors and staff will flank the building on the east and west sides. The central tower, a hexagonal structure rising about 320 feet above the ground, will house the offices. The hexagonal shape eliminates the need for corridors, pemits easy partitioning, while allowing general office space to be free of supporting columns, and affords all occupants a view of the outside. The elevator shafts will rise through the center of the tower.

CBC engineers have designed all the television studios for color production. The purchase of color equipment will be made following precise studies of production needs, and of the rate of growth of public interest in color television.

The design was developed in the CBC Architectural Department and was arrived at only after intensive studies had been made of CBC Montreal's operations, and of the designs of other modern broadcasting centers throughout the world. The architect's intent has been to design a completely up-to-date and efficient broadcasting center which will at the same time reflect the importance of CBC in the life of the nation, and enhance the beauty of the city. Their guiding principle has been as complete a marriage as possible between efficiency and beauty. Thus, for example, the striking contrast between the horizontal lines of the studio complex and the vertical lines of the central tower is certainly pleasing to the eye, but the arrangement also serves to even out the flow of traffic within the building. The same principle, along with the general intent to make the staff's physical surroundings as pleasant as possible while keeping costs down, will govern the choice of materials, and interior decorating and lighting. The overall design was conceived by Tore Bjornstad, and detailed planning is being executed by E.E. Sidney, under the direction of P.G. Leger, chief architect for the CBC.

It is hoped that the outer shell will have been completed by autumn, 1968, when installation of the equipment can begin. If all goes according to plan, work on Place Radio-Canada should be completed by late 1970. The estimated cost is $71,000,000, including $4,160,000 for the land. The figure represents a $11,000,000 increase over the 1963 estimate, and reflects the added cost of equipping for color as well as a rise in the costs of labor and materials.

Canadian Broadcasting Corporation's Place Radio-Center in Montreal, when completed, will be the world's largest broadcasting center. Structure, rising 25 stories, will cost in excess of $71-million and house CBC's radio and TV French and English networks as well as the international, northern and armed forces services.

measuring picture quality in terms of K-factor

...with a Tektronix Type 529 or RM529 Waveform Monitor

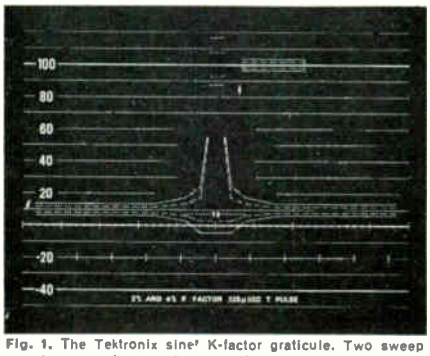


Fig. 1. The Tektronix sine² K-factor graticule. Two sweep speeds are provided on these waveform monitors so that this graticule can be used for 0.125 μs T-pulse testing on such applications as studio and network transmission lines, and for 0.250 μs 2T-pulse testing on such applications as video tape recorders and transmitters.

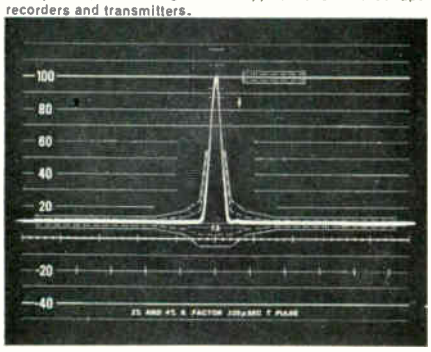


Fig. 3. Display of an undistorted 0.125 μs sine² pulse at 0.125 H/cm magnified 25X. A T-pulse with its base on the +10 IEEE unit line will reach the +100 IEEE unit line if the video system has 6.7 MHz equivalent bandwidth. At 4 MHz, pulse height will be reduced by 18%.

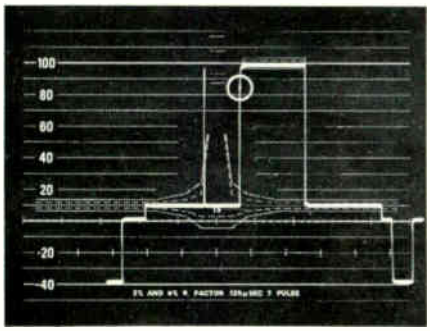


Fig. 5. Display of a bar signal at 0.125 H/cm with the base on the +10 IEEE unit line and the rising edge aligned with the arrow (encircled). The top of the bar signal should be at the +100 IEEE unit line. The inner and outer lines of the box at this point show the 2% and 4% K-factor limits.

Measurements of TV picture quality in terms of K-factor can be made simply and precisely using the sine² graticule of a Tektronix Waveform Monitor. These measurements can be made when a sine² pulse and bar is transmitted during the vertical blanking interval of normal broadcast operation.

Figure 1 shows the sine² graticule — marked in percent of K-factor for signal-distortion measurements when using a sine² pulse and bar and also marked in standard IEEE units for normal signal-level measurements. Figure 2 shows an undistorted sine² pulse and bar.

T-pulse measurements. The phase response of a video system can be determined by observing the leading and trailing edges of the sine² pulse. Figure 3 shows an undistorted pulse. Phase distortion causes asymmetrical aberrations, such as shown in Figure 4. Any display of symmetrical ringing on both the leading and trailing edges of the pulse indicates bandpass degradation without phase distortion.

Bar Measurements. The critical mid-band frequency and phase response of a video system can be determined by observing the amount of tilt in the flat-topped portion of the bar. If the video system has ideal response, the bar will be transmitted as shown in Figure 5. Impaired response in the system will cause tilt or sag, such as that shown in Figure 6, with streaking or smear in the picture.

Type 529 Waveform Monitor $1085
(8¼" high, 8½" wide, 19" deep, weighs 24 lb.)
Rack Mount Type RM529 . . . . . $1135
(5¼" high, 19" wide, 20" deep, weighs 27 lb.)
Power consumption of each model is ~80 watts — no fan used.
U.S. Sales Prices f.o.b. Beaverton, Oregon

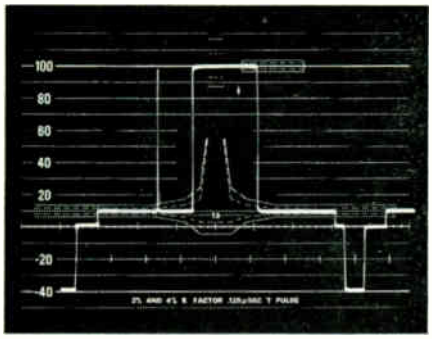


Fig. 2. Display of a sine² T-pulse and bar. Waveform shows the following: the horizontal sync pulse on the —40 IEEE unit line, the backporch on the 0-level line, the 10% offset or base for the pulse and bar, and the sine² or T-pulse on the +10 IEEE unit line, and the bar on the +100 IEEE unit line.

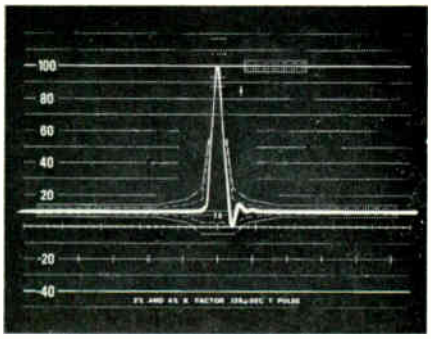


Fig. 4. Display of a sine² T-pulse showing some phase distortion. Phase distortion will appear as aberrations on the leading or trailing edges of the T or 2T-pulse. The K-factor system relates the amplitude of ringing vs the displacement of the ring from the transient in terms of picture degradation.

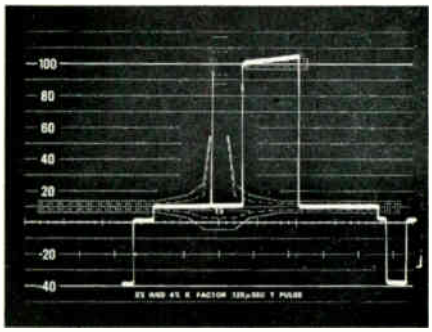


Fig. 6. Display of a bar signal at 0.125 H/cm, showing tilt which exceeds the 2% to 4% K-factor tilt limits.

For a demonstration, contact your nearby Tektronix field engineer or write: Tektronix, Inc., P. O. Box 500, Beaverton, Oregon 97005.

Exacting standards of component manufacture

... part of the Tektronix commitment to technical excellence

Circle 20 on Reader Service Card

Circle 21 on Reader Service Card for Albion ➔

If you make (or use) educational TV cameras, here's good news.

There's a new Taylor-Hobson-Cooke family of lenses for Image Orthicon, Plumbicon, or Vidicon Cameras, both color and black and white. We call them the Varotal XX series of Zoom Lenses. These lenses do just about everything our other Varotals do for more than 600 professional broadcasters, but are lighter, smaller, and considerably lower-priced.

And they work equally well inside or outside. For instance, since there's no movement of external glass components during focusing, there's no change in air volume within the lens. This means no change in pressure to cause spongy movements. No pumping action to permit entry of dust or humid air. At last, a zoom lens sealed as tightly as one with a fixed focal length.

But don't think the lower price was made possible by fudging on quality. Our cantankerous English craftsmen wouldn't stand for that. Every lens still has to pass some 450 inspections before it reaches your camera. The optical axis must be centered to less than .0005 inches. The coating has to give better than 83% light transmission.

What are the specs? The lens for the Image Orthicon Camera ranges from 40 to 400mm at f/5.6 and weights 10 lbs. The lens for the Plumbicon ranges from 21 to 210mm at f/2.8 and weighs only 7 lbs. The Vidicon lens ranges from 16 to 160mm at f/2.2, and also weighs only 7 lbs.

So if you sell color or black and white cameras, the Varotal XX gives you a competitive edge when you're bidding. And if you buy cameras, congratulations. You're on the receiving end.

For more information, call Jim Tennyson at 914-358-4450. Or write Albion Optical Company, Inc., 260 North Route 303, West Nyack, N.Y. 10994. Telex 137442.

albion

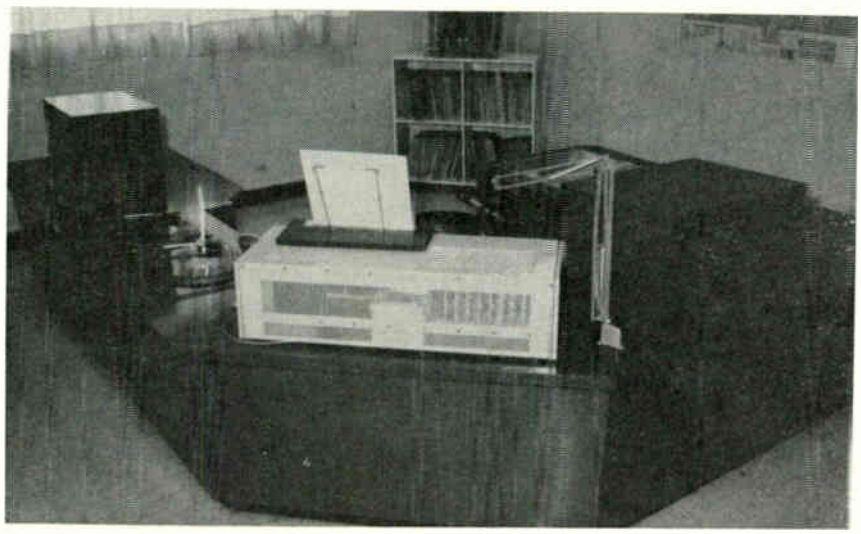
SOLE U.S. AGENTS FOR RANK TAYLOR HOBSON

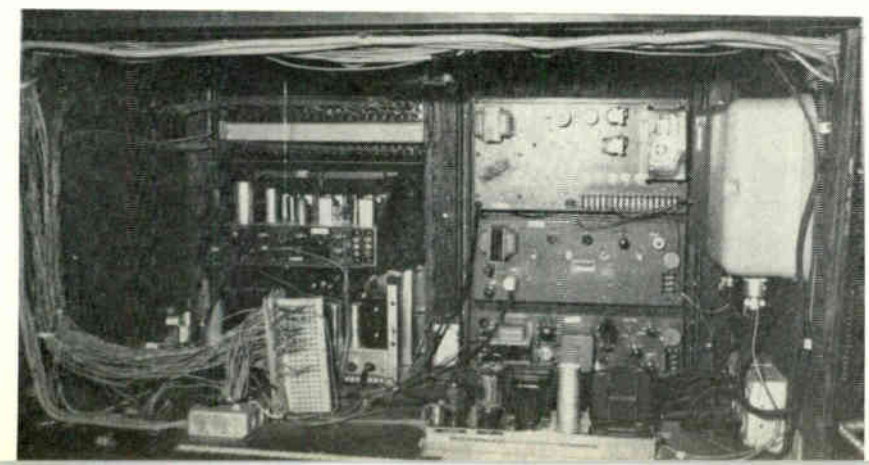
ENGINEERING
CASEBOOK

An Electronic Control Center

By Robert E. Gilbert and Kenneth E. Karge

Top. Everything within arm's reach is the design concept beautifully carried out by KLTZ's electronic control center.
Center. View of console from production/standby studio shows disc storage cabinet and clean, functional appearance of console's walnut cabinetry.
Bottom. Among the pieces of equipment that can be seen through access panel in long leg of console are remote control chassis, frequency monitor, sta-level, patch panels, receiver monitor and two-way remote unit, etc.





A CONTROL CENTER is usually functionally designed for the station's needs and it is considered nearly perfect—until five years later when the station's needs have changed. KLTZ found itself in that position.

The problem presented itself when a new solid-state console (Collins 212M-1) was ordered to replace a trustworthy but old Collins 212B unit. Several plans were drawn up but all showed that space in the existing control room would be tight. The dilemma was solved by deciding to convert a large but seldom-used studio to the control center. The large area permitted us to create the control center as an island in the center of the room. This gives the operator good room for control and a direct view of the two adjacent studio. The old production room became one of these studios to replace the one converted into the control center. Although this new studio was small, its only purpose was to serve as an announce booth hence size was not a problem. The old control room became the new production room/standby studio.

Plans were drawn up and put out for bid. The low bid came from a good cabinet maker so the product exceeded expectation in quality appearance. Walnut Formica was the color scheme selected.

Our control center a la 1966 was designed to hold all of the equipment a modern control room could possibly need. This included two remote controlled relay-operated start/stop turntables (RCA), remote controlled tape recorder (Magnecord PT6); remote controlled Magnecord 1021R recorder; two cartridge machines (Gates-ATC); utility switches (six); telephone keys (two banks); and a modulation monitor meter.

Equipment was divided into: 1) the panel rack containing the two

Continued on page 50

Messrs. Gilbert and **Karge** are members of the engineering staff of KLTZ, Glasgow, Montana.

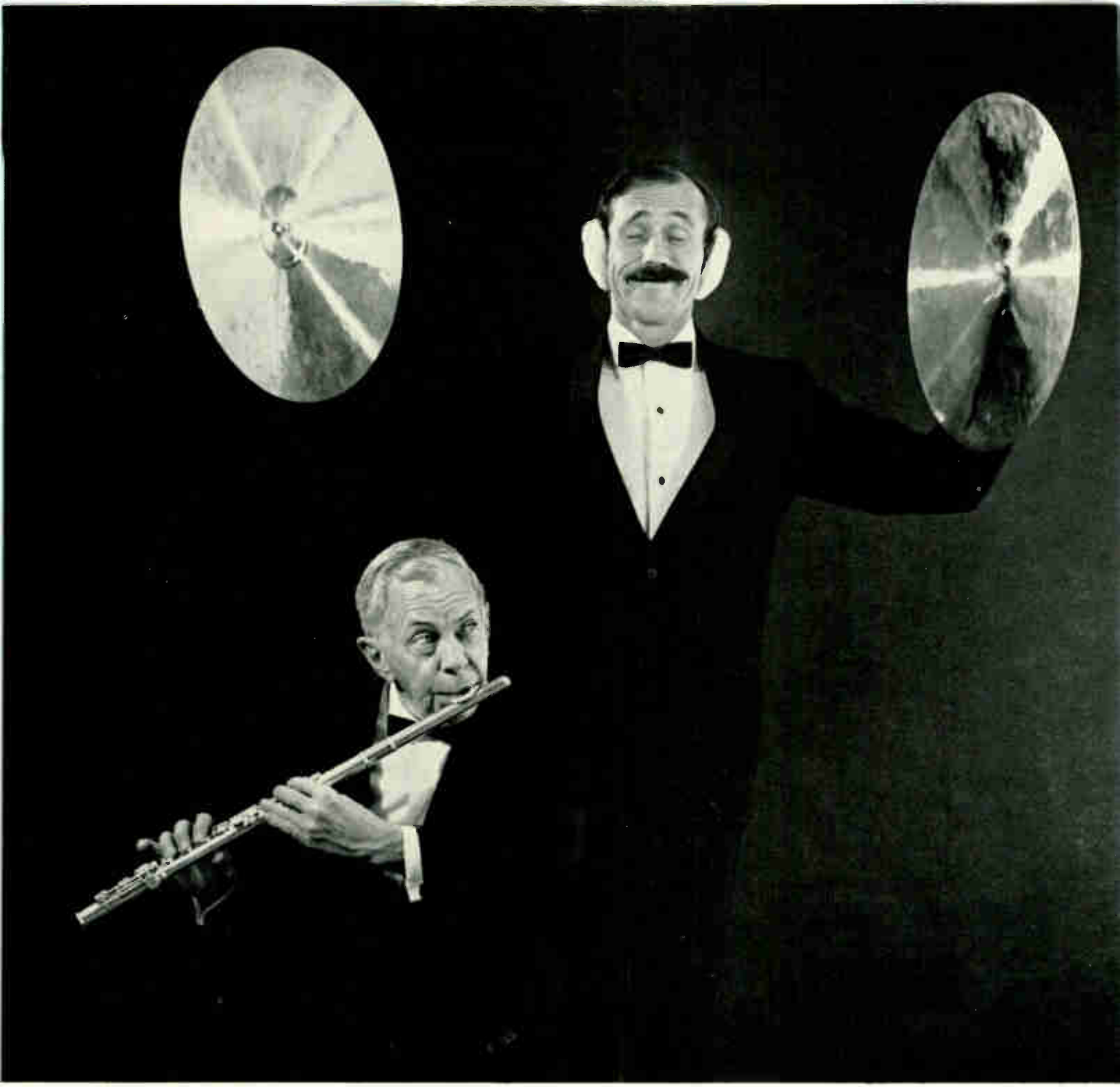
cartridge playback units, modulation meter, switches, tape recorder remote and telephone beep, and 2) main equipment rack (the long leg of the cabinet) containing a remote control chassis, frequency monitor, sta-level, patch panels and, off-the-air receiver monitor and two-way remote unit.

The custom cabinet design incorporates many special features.

- A three-in. overhang on the rack section was added so operators wouldn't accidently run into patch cords.
- A custom appearance was gained by sloping a section to which the tape deck was mounted (The amplifier is flush mounted directly below.)
- Next to the recorder a small phone box was incorporated to hold our push-to-talk telephone. The phone is cradled on a hook rather than a switch.
- The operator's knee well is spacious allowing about a 90-degree angle for mobility.
- Beneath the cabinet near the operator an office-type letter bin was installed for "dead" copy, news, phone books, etc.
- The tape cartridge rack of our own design was made of sheet aluminum seated in a plywood well. The rack holds 325 tapes.
- Beneath the tape rack is a storage area which we use for records, etc. It features two sliding doors on each side of the cabinet.
- On the corner of the cabinet we've a built-in guest knee well. A microphone receptable has been installed in the well so that a guest may be interviewed by the operator on duty *in* the control room.
- The long leg of the cabinet which serves as equipment closets contains two removable panels with no handles, knobs, hinges or other hardware exposed. The panels are held in by clips.
- No audio cable, telephone cable or electrical wire is exposed. It's all concealed either in the cabinet or in conduits.

We have completely duplicated our system through the patching panels. All functions that appear in the new control room appear in the old control room—now our production room/standby studio. Both consoles are wired to receive major functions. If the functions don't appear in the production room (such as the telephone system) they can be trunked there from the master patch panel to the production room patch panel. This, of course, presented some problems in duplicating the system. We had to consider impedance probing telephone company repeat coils (line equalizers). In duplicatlems—and have padded here and there for balance as well as utiliz-

Continued on page 52



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Its new small-particle oxide meets or surpasses the most demanding low-noise specifications. Holds inherent tape noise ("hiss") far below the level of your most delicate musical passage. Yet from this same quiet tape comes *greater high frequency response* and *broader undistorted dynamic range* —qualities previously sacrificed in low-noise tapes. So the silence has more silence. The flute sounds sweeter. *And* the cymbals crash louder, without distortion — on Ampex 404 Series low-noise tape.

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AMPEX

Circle 23 on Reader Service Card

Continued from page 50

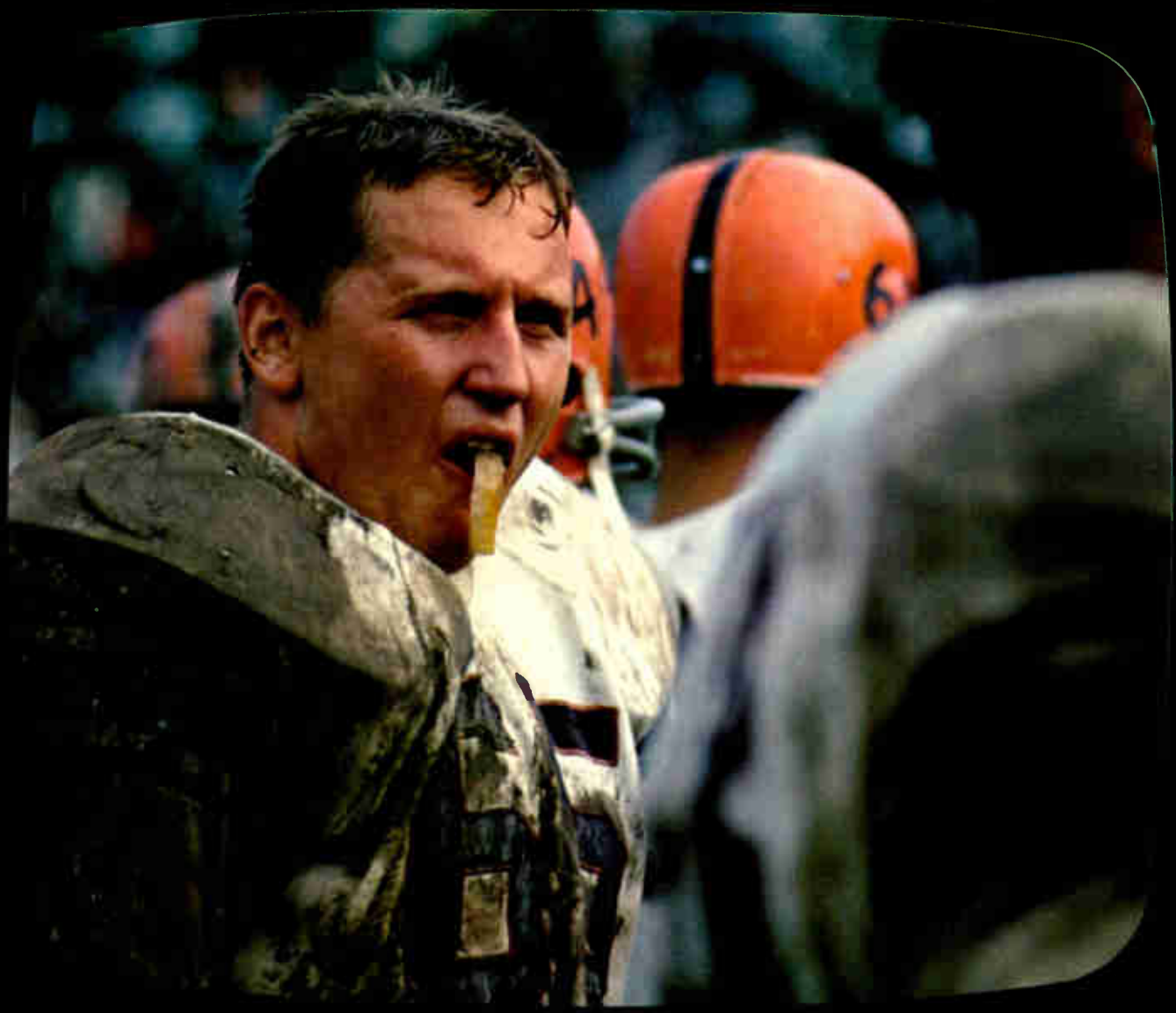
ing the system we had to consider duplicating monitor and on-the-air lighting systems. This was all worked out, however, and is now functioning smoothly. During all this wiring and shuffling around of equipment the station had to remain on the air broadcasting normally. This meant that in many, many instances a lot of temporary wiring had to be done. Later when both control rooms were functioning normally, the extra wiring had to be removed. So it was not just a matter of wiring in a new control center and changing over; because of the duplicating factor special consideration had to be given to many circuits so the station wouldn't lose any air time. We're happy to say the transistion took place without a single minute of broadcast time lost. This, in itself, we considered quite a challenge on wiring ingenuity. The modifications were started in May; final completion was in October.

A word about the remote controlled turntable and tape recorders. The operator doesn't have to reach for a turntable switch, possibly getting off the mic. It's right there in front of him. As mentioned, a Magnecord PT6 recorder can be remote controlled from the console. Since the recorder is also used to dub network and record other programs another utility switch is incorporated from the remote panel so that the two-function console switch won't be tied up. A third start/stop switch is located in the production room in the event the standby studio is being used for programming on the air. Network is bridged into this same machine through a switch installed on the front panel. This allows the operator to dub net without having to make a "patch."

A remote control unit is also installed in the remote panel for a Magnecord 1021-R. This allows the operator to start, stop, fast-forward, cue, record, or rewind within an arm's reach from his console position. This machine is also wired to accept the telephone "beeper" system which can be started from the 1021-R remote unit, or from the remote panel telephone key. The "Beeper" could be patched in too. The 1021-R's inputs and outputs appear in the patch panel also.

The telephone recorder connector is the conventional tube type working in conjunction with a solid state telephone amplifier. We have on order a new recorder connector unit that will allow the "beep" to be heard *only* by the caller and *not* by the receiver. This will eliminate one of our pet peeves—that of loud "beep" overriding program material. The record connector and amplifier are mounted on a wall in our equipment rack closet.

We are happy to report KLTZ's electronic control center was judged by the Greater Montana Foundation to be the best original idea used in the development of Montana broadcast communications in 1966. ●



Local color can do a lot for your profit picture

Now that you're transmitting network color, the next step is obvious—and necessary and profitable. You should be filming your news in color and broadcasting it to a rapidly growing TV audience that appreciates this extra concern you show for local events. Kodak makes it all possible with a versatile new system: *Kodak Ektachrome* EF Films and a virtually foolproof process with easy-to-use chemistry. Immediate laboratory processing is available in many areas. But if not in yours, consider processing the film yourself. Kodak engineers will "fine tune" your process. They'll provide your cameramen with technical information, your lab technician with training and reference materials. Naturally, they'll always be available for continued service. For complete information, call your nearest Eastman Kodak motion picture engineer.

Eastman Kodak Company

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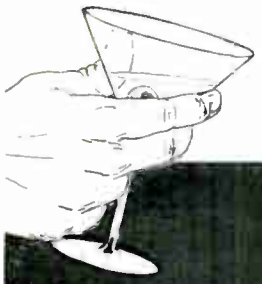
Dallas: 214/FL 1-3221 Hollywood: 213/464-6131
New York: 212/MU 7-7080 San Francisco: 415/PR 6-6055

Kodak
TRADEMARK



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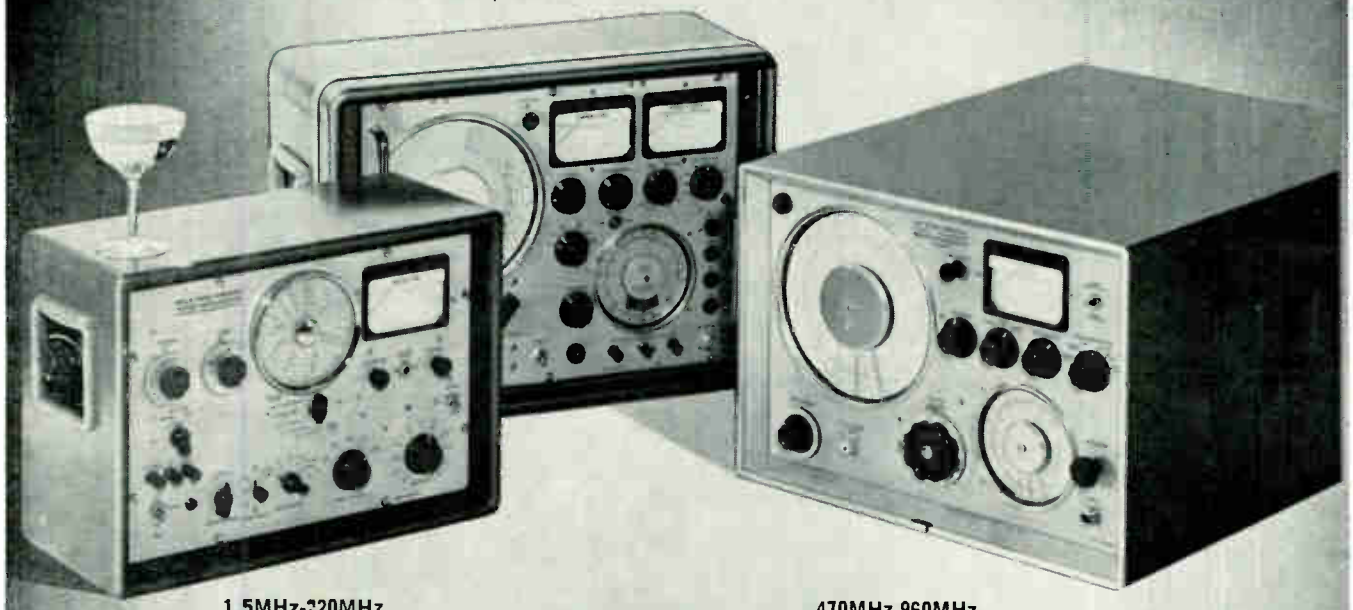

1.5MHz-220MHz

A multiplier generator used in FM/AM broadcast, stereo and FM/AM communications, wide range, good AM and FM.

Model 995A/Series.

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A tuned line covers channels 14 thru 83 for FM sound, also telemetry, with FM deviation to ±300KHz, mod. rates to 100KHz.

Model 1060/3.

A taste for dry martinis makes friends...so do these Marconi Signal Generators make friends. Some of the reasons are listed in these specs.; most of the reasons are listed in the literature. Write for it today.

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Circle 25 on Reader Service Card

BROADCAST EQUIPMENT

Digital Readout Panel

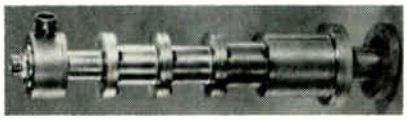
Model DRP-2 all solid-state digital readout panel is designed by Rust Corporation of Everett, Mass. to operate in conjunction with the RC-2400 series of remote control equipment. It may, however, also be used

with other models under most conditions. Digits measure ⅝ in. high and can be read at greater distances than conventional meters. Readout unit is designed to drive digital printout systems which comply with FCC requirements for automatic operator logs.

Circle 99 on Reader Service Card

Dummy Load Takes 25 kW

The "Omegaline" Model 5725, made by Altronic Research Corp., is designed to terminate 50-ohm coaxial lines in the power range of 25 kW and frequency range of 60 Hz to 2.2 Gc. Maximum vswr is 1.10 to 1 GHz; 1.15 to 1.5 GHz; and 1.2 to 2.2 GHz. Unit uses ordinary tap

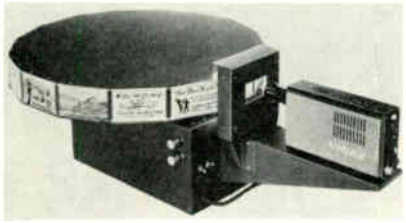


water circulated at 6 gal/min as both dielectric and coolant, and may be operated in any position. Resistor element is a cylindrical film type and may be replaced easily in the field. Model 5725 weighs 9½ lb and has dimensions of 17 × 3¾ in. at its widest dia. Price is $875, with 1⅝-in. flanged connector.

Circle 103 on Reader Service Card

Channel Originator Has 16 Positions

Vikoa, Inc. of Hoboken, N.J., has developed a simplified channel originator. Named Minicaster, it comprises a vidicon TV camera focused on a 16-position rotary card holder.

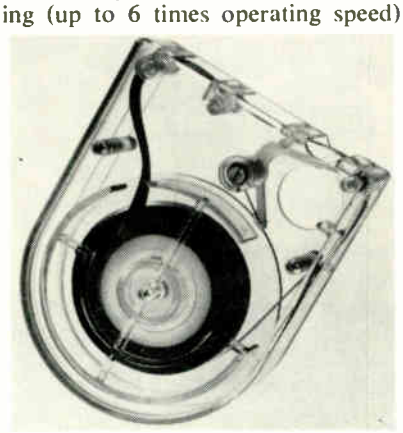


Each position is viewed for 15 s. Thus, all 16 cards are viewed every 4 min. Unit was designed as a local channel originator for CATV, but it can also be used in MATV and CCTV systems. Minicaster uses 3- × 5-in. cards and photos. Camera uses a class A vidicon (7735A) and has resolution of 500 lines and a 12.5mm close-up lens. Output of Minicaster is video, for modulation on any available channel. However, unit also puts out rf which can be tuned to any low band (2 through 6) channel, allowing ordinary TV receivers to be used as monitors. Price is $1100.

Circle 105 on Reader Service Card

Constant Tension Cartridge

Constant tape tension and automatic positive positioning of cue and brake are design features of three new continuous tape cartridges made by Marathon Broadcast Equipment, Danvers, Mass. Cartridges meet NAB standards and have differential hub and ring which allow for immediate compensation of tension or slack in tape loop. Outer portion of pulley turns at same speed as central portion until there is a requirement to speed up. Then it is free to turn more rapidly, thus affecting the entire tape mass and relieving tightness. This permits fast-forward winding (up to 6 times operating speed)

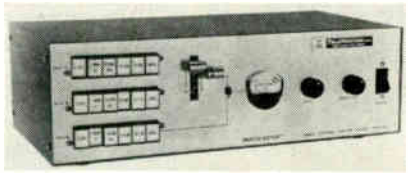


without spew-out. Cartridges are wound without need for gaps to be incorporated into tape mass. Cartridges are available in three sizes (Models 300, 600, and 1200) with tape capacities of 25 to 1200 ft or playing times (at 7½ in./s) from 40 s to 32 min respectively. Cartridges are available either empty or loaded with desired length of tape.

Circle 101 on Reader Service Card

Multicamera Control Unit

TeleMation, Inc. of Salt Lake City, Utah, has announced the development of a six-input video control center. Applicable to any type of TV system, the Multicaster will operate in three modes: synchronous industrial, external EIA or internal EIA. The Model TMV-650 features two program buses with solid-state crosspoint switching and a split-arm fader control. In any mode, unit



ties as many as four inexpensive industrial type vidicon cameras to one central system for smooth, synchronous switching. Drive pulses generated at one master camera are carried to all other cameras for synchronous industrial 2:1 interlace operation. For EIA synchronization and drive, an external EIA sync generator may be used. The TMV-650 is housed in desk-top cabinet measuring 3½ × 17 × 8 in.

Circle 102 on Reader Service Card

I.O. Camera Has Viewfinder

Maryland Telecommunications, Inc., Cockeysville, Md., announces the availability of the Model Orth IX image orthicon TV camera system. Camera weighs approximately 40 lb and is readily adaptable to accept any 3-in. I.O., and a wide variety of fixed and zoom lenses. Two basic versions are offered: Model Ort IXA, designed to accept full EIA external synchronization is priced at $12,725;

Model Orth IXB is complete with self-contained fully-interlaced industrial synchronization and is priced at $13,075. Both versions are priced less I.O. and lens.
Circle 106 on Reader Service Card

CCTV Zoom Lens

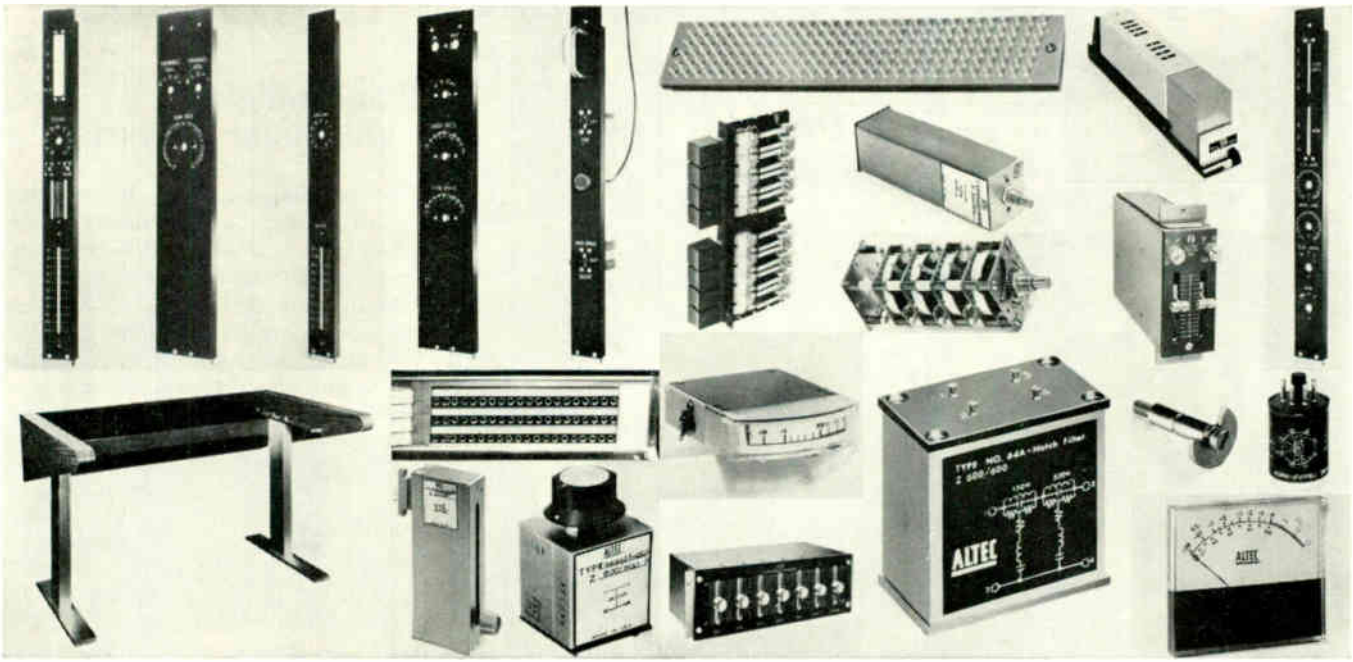
Zolomatics of Hollywood, Calif., announces a new 10 to 1 zoom lens for CCTV. The lens covers the

vidicon format and has a focal range 15 to 150mm and a maximum aperture of f2.4. Lens is available in both manual and motorized versions.
Circle 104 on Reader Service Card

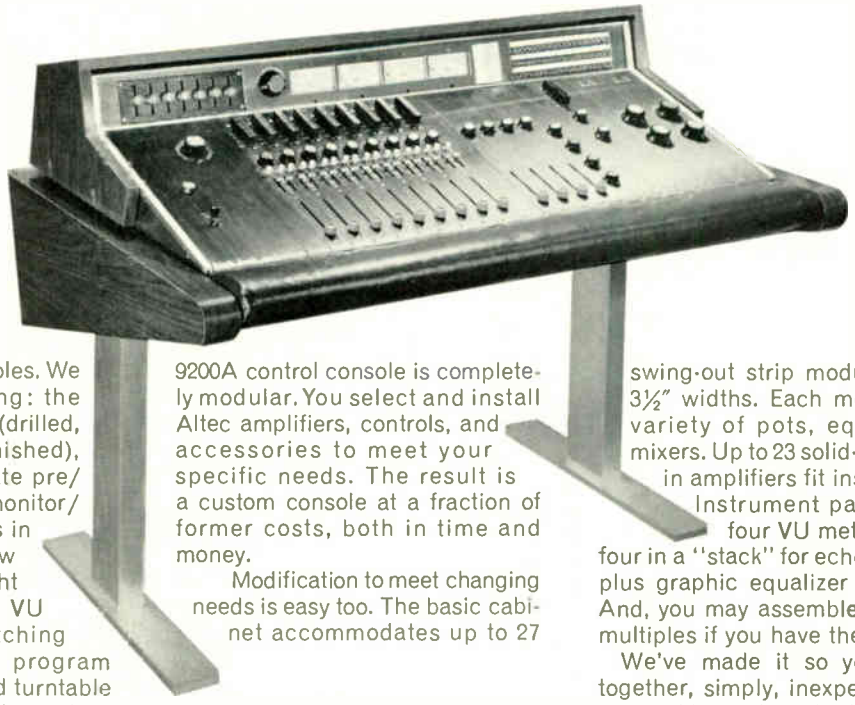
CCTV Camera

XL-1 CCTV camera, made by Unimetrics of Charlotte, N.C., can be used with either a video monitor or a standard TV receiver. An audio channel is provided for intercommunication between camera and TV receiver location, or to permit simultaneous pick-up of sound with TV pictures. Both audio and video are transmitted through same coaxial cable. Camera's sensitivity to light is automatically adjusted. Horizontal resolution is better than 400 lines at center. Video output is 1.4 V to 2.2 V peak-to-peak. Video-modulated rf output on TV channel 4 or 6 is more than 50 mV. Camera's

We've got it made.



You put it together.



It's a new idea in custom consoles. We furnish just about everything: the basic cabinet and hardware (drilled, punched, and beautifully finished), plus your choice of solid-state pre/line/booster/program and monitor/cueing amplifiers; attenuators in any configuration; high and low pass filters; rotary or straight line controls; mixer networks; VU meter range extenders; matching networks; stereo pan pots; program equalizers; motion picture and turntable faders; slating and talkback keys; jack fields for any function; matching transformers; and any keys and switches you may need.

The big idea is this: This new Altec 9200A control console is completely modular. You select and install Altec amplifiers, controls, and accessories to meet your specific needs. The result is a custom console at a fraction of former costs, both in time and money.

Modification to meet changing needs is easy too. The basic cabinet accommodates up to 27 swing-out strip modules of 1¾" and 3½" widths. Each module accepts a variety of pots, equalizers, keys, mixers. Up to 23 solid-state Altec plug-in amplifiers fit inside the cabinet.

Instrument panel holds up to four VU meters for program, four in a "stack" for echo send channels, plus graphic equalizer and jack panel. And, you may assemble the consoles in multiples if you have the need.

We've made it so you could put it together, simply, inexpensively and just as you like it. And that's always a good idea. You'll get more ideas by calling your Altec Distributor, or for a very complete technical kit on the console, write Dept. BM/E-11.

ALTEC LANSING

A Division of LTV Ling Altec, Inc., Anaheim, Calif.

Circle 26 on Reader Service Card

circuitry employs 19 transistors and 17 diodes. XL-1 consumes approximately 12 W, and weighs approximately 6 lb, 13 oz.
Circle 111 on Reader Service Card

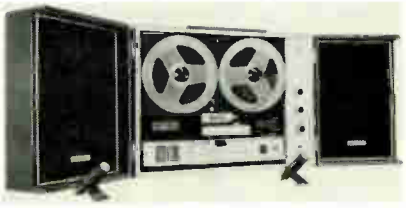
Lightweight Videotape Recorder

Model 800, made by International Video Corp. of Mountain View, Calif., is a 5-MHz full NTSC color videotape recorder weighing 52 lb and measuring 19 × 12¼ × 9⅝—half the weight of units presently available. Sixty min of recorded time requires only 2150 ft of videotape, resulting in a savings of 30 percent

on tape costs over competitive units. Full remote control, a precision timer reading in min and tenths, fast forward and rewind times of less 90 s are standard features. Coupled with optionally available electronic editing, dial access, and slow motion, unit has all features required for ETV/ITV. Model 800 is available for less than $4500.
Circle 100 on Reader Service Card

Stereo Tape Recorder Has 3 Speeds

Model 1040 stereo tape recorder from Allied Radio Corp. of Chicago, Ill., records and plays back 4-track stereo and mono at speeds of 7½, 3¾ and 1⅞ in./s. An instant stop feature permits edit-as-you-go operation. Same single control is used for REWIND, STOP, PLAY and FAST FORWARD. Stereo amplifier is solid-state and has peak power of 10 W. Automatic tape lifters prevent head

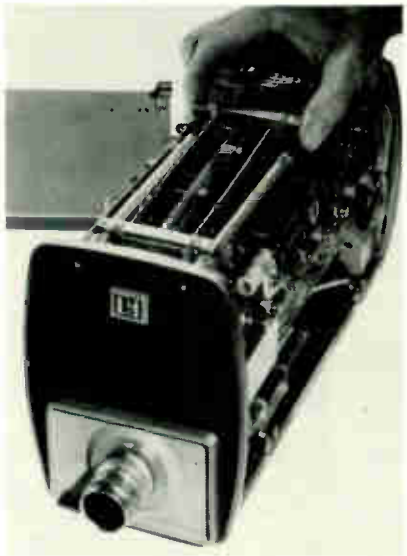


wear during rewind. Volume and tone controls are provided for each channel. Shutoff is automatic. Two mic and two auxiliary inputs are provided. Outputs are preamp for use as deck, headphones, and dual external speakers. Response is 30 to 18,000 Hz at 7½ in./s. Flutter and wow are less than 0.15 percent at

7½ in./s. Price of Model 1040 with dual speakers, dual mics, 7-in. reel and patch cords is $169.95.
Circle 112 on Reader Service Card

Low Cost Camera

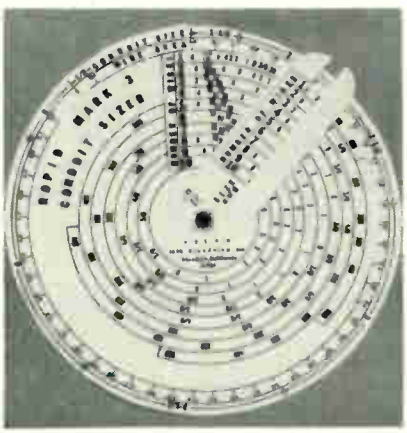
A low cost camera with positive 2:1 interlace has been announced by Packard Bell, Newbury Park, Calif. Listing for $1044, the 950 Sync-Lok is self-contained and transistorized. Two counters (21:25) include dual



in-line integrated circuits except for power supply, which uses silicon transistors. Employing a 12-MHz bandwidth, 920 Sync-Lok produces 650 lines of horizontal resolution.
Circle 113 on Reader Service Card

Conduit Calculator

Mark III calculator, made by Resco of Glendale, Calif., determines the size of conduit required to accommodate any combination of conductors from #16 to 500 MCM (AWG). One setting of a disc and a cursor gives an immediate answer for the conduit size required for two different sizes of wire. A secondary setting gives answers when additional sizes of wires are involved. Con-



ductors on the first setting are limited to 10 conductors of any one size. Colored zones on upper disc permit use of calculator for determination of conduit for up to 10 wires of a single size. Calculator is 4 in. in dia and is priced at $4.50.
Circle 114 on Reader Service Card

Quarter-Mil Recording Tape

A new ¼-mil magnetic recording tape called Quadruple Play, has been introduced by Robins Industries Corp., Flushing, N.Y. It permits up to four times more recording and playing time than standard thicknesses on the same size reel. Made of tensilized Mylar, ¼-mil is available as part of Robins' Brand 5 line on 2½-, 3¼-, 5-, and 7-in. reels.
Circle 115 on Reader Service Card

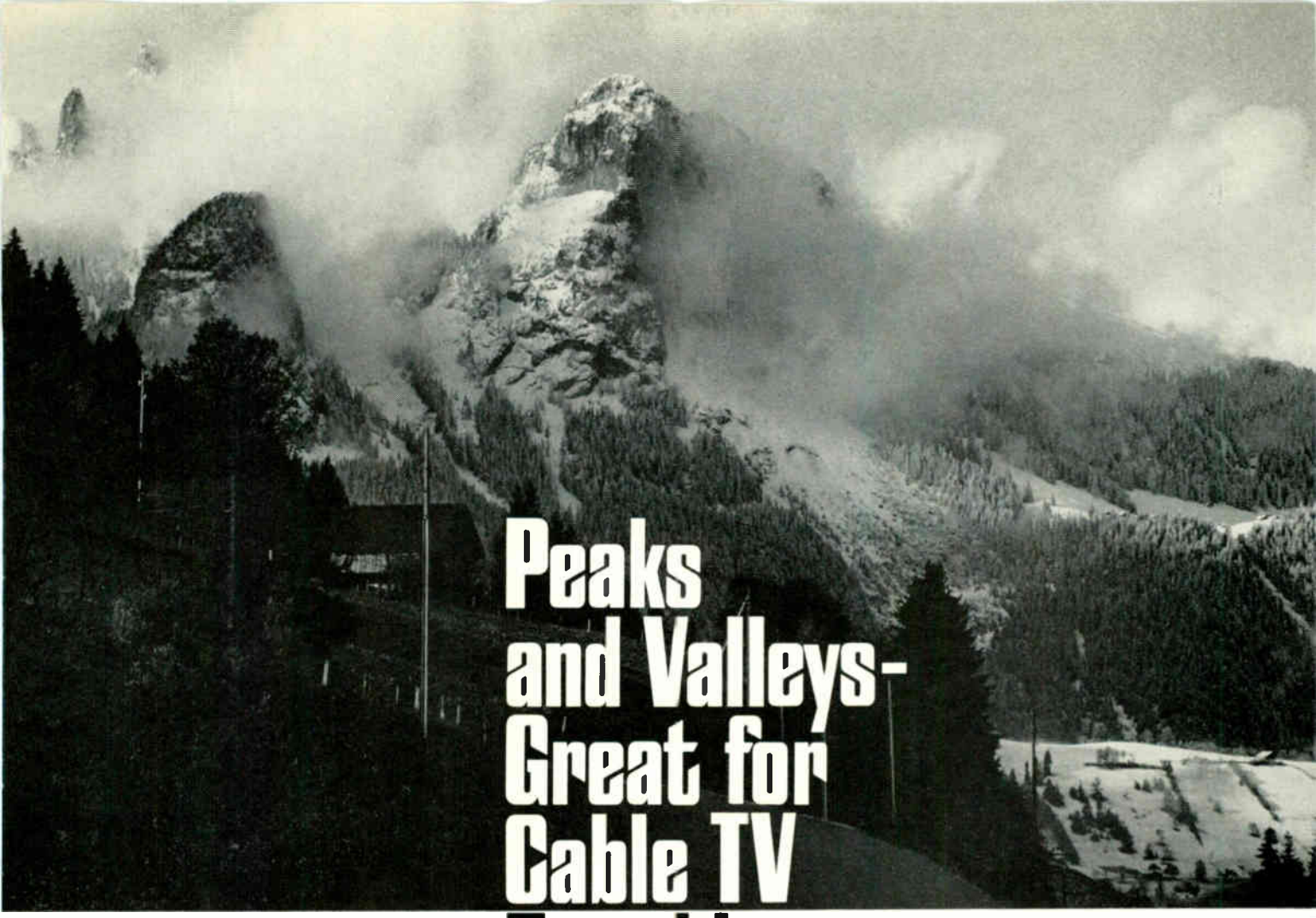
Quartz Focusable Lamp Has 2000-W Output

Molequartz Mighty-Mole Type 4091, made by Mole-Richardson Co., North Hollywood, Calif., features a top rating of 2000 W of high intensity, variable beam illumination. Lamp uses 3200°K and 3350°K quartz tungsten-halogen globes in

2000-, 1500-, and 1000-W ratings. Spot to flood control of its variable beam is accomplished by moving only the reflector by turning control knob at rear of housing. Globe sockets remain stationary for maintenance-free operation. At 10-ft, using the 2000-W 3200°K 500-hr globe, light intensity may be varied from 200 to 280 fc—a ratio of 8½:1.
Circle 109 on Reader Service Card

Portable Antenna Mast

A recent development in transportable antenna equipment by Andrew Corp. of Chicago, Ill., is a manually-



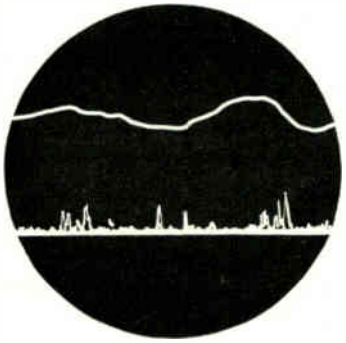
Peaks and Valleys- Great for Cable TV Terrible in a CATV Cable

Peaks and valleys in the terrain usually indicate a need for a CATV system. In the uniformity of a CATV cable, they indicate the need for better cable.

Times Alumifoam® (the trade name for our seamless aluminum tube sheathed coaxial cable) flattens out the topography in your return-loss sweep generator with a calm uniformity that's making believers out of everyone in the CATV business. We can guarantee a 30 db worst point for this cable and back it to the hilt. That means first-quality cable every time, and smooth functioning transmission right from the start.

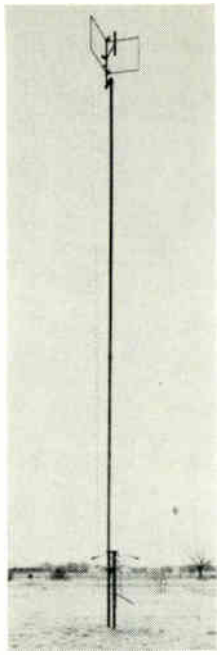
No costly ship-backs. No costly re-installation. There are fewer splices, fewer trouble points, less maintenance and less labor costs with Alumifoam because it's made in continuous seamless lengths up to ½ mile. Because it's seamless, it's waterproof and vapor-proof. And Alumifoam's long life is a real bonus—continuous high-performance quality for years and years.

Be sure of the cable in your Cable TV. Get in touch with Times. Times Wire and Cable/a division of The International Silver Company/Wallingford/Conn.



TIMES WIRE & CABLE
DIVISION OF THE INTERNATIONAL SILVER CO

Circle 30 on Reader Service Card

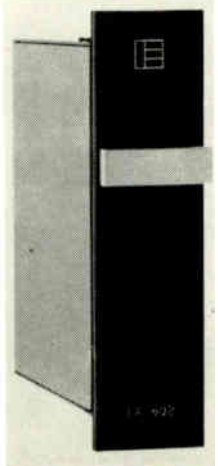


erected, 50-ft, lightweight aluminum mast. The mast (Type 70942) consists of ten sections and a manually-operated launcher assembly. Assembly features sliding brake ring design operated by a lever arm. Mast may be raised to full height by two men in 15 min or to intermediate heights below 50 ft by omitting mast sections as required. After erection it may be turned 360° to allow for orientation in azimuth of antenna and will support equipment having projected area of 16 ft² with a wind load of 20 lb/ft². Weight of complete mast including guy wires and guy anchors is about 225 lb.

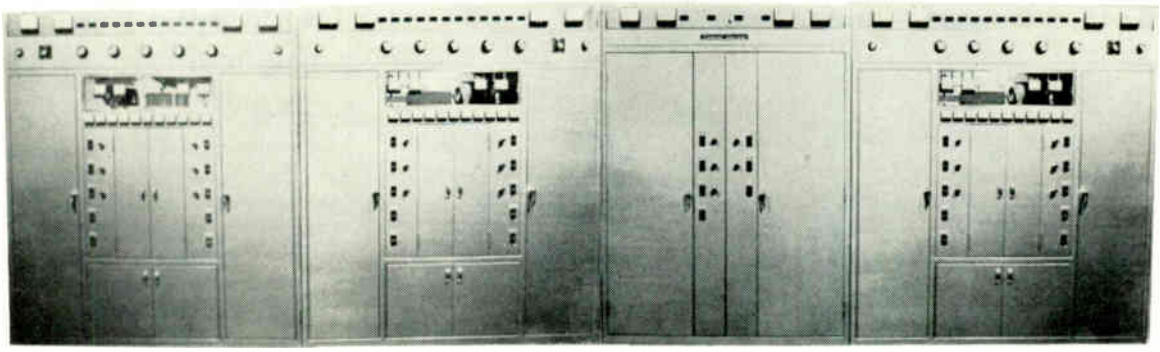
Circle 110 on Reader Service Card

Integrated Circuit Program Amplifier

Electrodyne of North Hollywood, Calif. recently introduced the LA 602 integrated circuit program amplifier. Unit can be strapped for 35, 45, or 55 dB of gain. Distortion is less than 0.5 percent at +30 dBm



NOW
A 100 K.W. UHF TRANSMITTER
WITH ONLY 4 TUBES



We have read with some amusement the recent advertisements by UHF transmitter manufacturers for their 100 kilowatt transmitters. The advertisements seem to imply that parallel operation for 100 kilowatts is a major technical breakthrough.

In reality, there is nothing mysterious about generating 100 kilowatts of UHF klystron power. A 100 kilowatt operation simply requires parallel operation of klystrons, the output of which is combined by a wave guide combiner and diplexer. The basic technology involved for such a parallel operation was developed well over a decade ago.

It was thus a simple matter for us to develop a 100 kilowatt transmitter. Parallel operation of two of our type accepted TA-55-BT visual amplifiers has resulted in the development of our 100 kilowatt transmitter type number TA-100-BT.

While the ability to operate a UHF television transmitter at up to 100 kilowatts output power is important, it does not evolve as the result of a recent technical breakthrough. The real breakthrough in UHF television transmitter technology is our transistorization of the driver which is used with all models of our klystron transmitters, including the 100 kilowatt model.

When we can produce 100 kilowatts with only 4 tubes as opposed to 4 or 5 dozen tubes necessary in our competitors' transmitters, we obviously have the technology on our side. More and more UHF broadcasters are also joining our side—why don't you?

Townsend Associates' transmitters are F.C.C. type accepted at all common power levels.

For more information write today to:

TOWNSEND ASSOCIATES INC.

HOME OFFICE
P. O. Box 215
Feeding Hills, Massachusetts 01030
(413) 733-2284

LOS ANGELES OFFICE
8846 Delco Avenue
Canoga Park, California 91306
(213) 822-0732

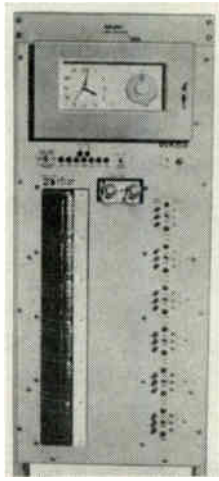
Circle 32 on Reader Service Card

output. Frequency response is ±1 dB from 30 to 20,000 Hz. Noise level is equivalent to an input of −127 dBm, unweighted (20-20,000 Hz). Input impedance is 37, 150, or 600 ohms. Two isolated outputs are provided. One 600-ohm balanced or unbalanced with output capability of +30 dBm, and one single-ended output capable of +18 dBm. Power requirement for the LA 602 is 24 V dc. Price is $158.

Circle 107 on Reader Service Card

Automatic Non-duplication Switcher

A new nonduplicating CATV switcher has been announced by Vikoa of Hoboken, N.J. Completely automatic and self contained, the new unit, named Diplomat, handles up to 12 channels, permitting CATV operators to comply with FCC non-duplicating requirements. Unit requires setting once a week, storing information for several days and

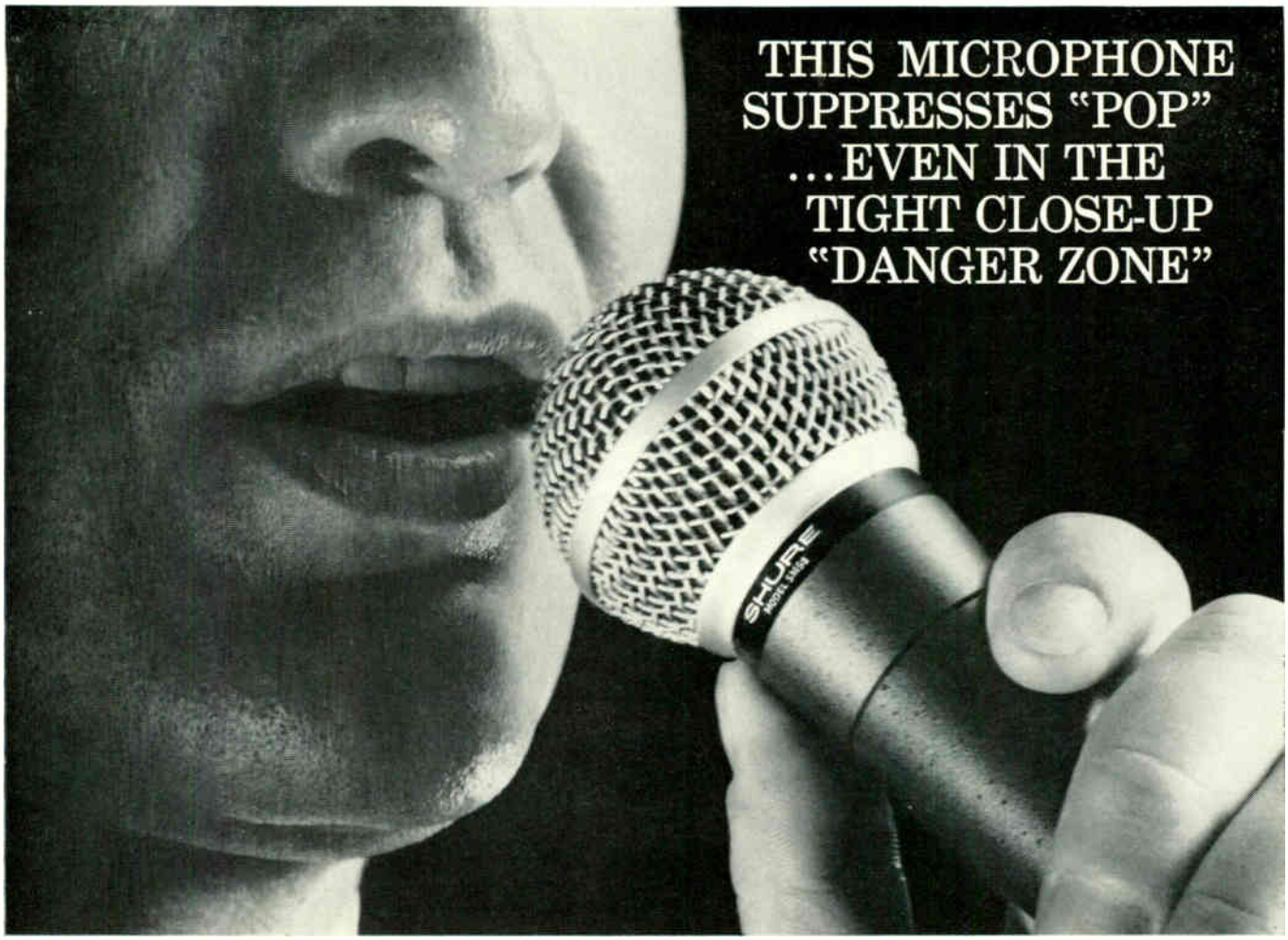


providing split-second switching at 15-min intervals. Timing is accomplished by a heavy-duty synchronous electric clock motor. However, in case of power failure, a mechanical clock mechanism takes over. When power is restored, a "catch-up" mechanism moves entire system rapidly into correct position, performing all missed functions. Price of the Diplomat is $2000.

Circle 108 on Reader Service Card

3250-W Daylight Booster

Primarily for supplementing daylight on outdoor locations, type 5511 Molequartz Five-Light Molefay, made by Mole-Richardson of Hollywood, Calif., accommodates five 650-W FAY tungsten-halogen 5000°K globes having dichroic coated lenses. With all globes burning, typical per-



The Shure SM58 *self-windscreened* unidirectional microphone is ideal for broadcast uses such as remote news, sports, interview and vocal recordings because it eliminates or minimizes the irritating "pop" caused by explosive breath sounds. With the SM58 you will have the peace-of-mind assurance that you're delivering the quality audio that goes with pop-free pickup. It's great for studio announcing, too—or wherever the announcer or vocalist has the audio-degrading habit of "mouthing" the microphone. Of course, the same filters that eliminate pop also do away with the necessity for an add-on windscreen in outdoor uses.

On the other hand, the unusually effective unidirectional cardioid pickup pattern (uniform at *all* frequencies, in *all* planes) means that it is a real problem-solver where background noise is high or where the microphone must be operated at some distance from the performer. Incidentally, but very important, the SM58 tends to control the low frequency "boominess" that is usually accented by close-up microphones.

All in all, close up or at a distance, the Shure SM58 solves the kind of ever-present perplexing problems the audio engineer may have felt were necessary evils. The SM58 might well be the finest all-purpose hand-held microphone in manufacture today. And, all things considered, it is moderate in cost.

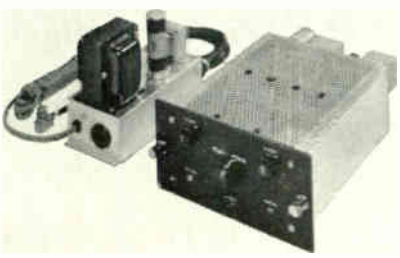
Other features: the complete pop-proof filter assembly is instantly replaceable in the field, without tools. Filters can be easily cleaned, too. Stand or hand operation. Detachable cable. Rubber-mounted cartridge minimizes handling noise. Special TV-tested non-glare finish.

For additional information, write directly to Mr. Robert Carr, Manager of Professional Products Division, Shure Brothers, Inc., 222 Hartrey Ave., Evanston, Illinois 60204.

SHURE SM58

SELF-WINDSCREENED UNIDIRECTIONAL DYNAMIC MICROPHONE

SHURE STATION-TESTED AUDIO CIRCUITRY EQUIPMENT

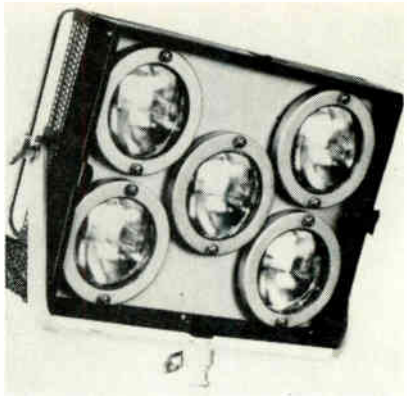


Shure stereo equalizer and preamplifiers are praised as MAJOR contributions to upgrading station quality by broadcasters.

SE-1 Stereo Transcription Preamplifier
Provides precise RIAA equalization from magnetic phono reproducers at line levels. Separate high and low frequency response trimmers. Lowest distortion, noise level, susceptibility to stray RF fields.

M66 Broadcast Stereo Equalizer
Passive equalizer compensates recorded frequency to three playback characteristics: RIAA, flat, roll-off. Provides precise equalization from magnetic pickup at microphone input level.

Circle 34 on Reader Service Card



formance is 4500 fc at 6 ft over a width of 4¾ ft. Individual switches permit five levels of illumination without changing color temperature. Booster weighs 12¼ lb and operates on 120 V ac or dc.

Circle 116 on Reader Service Card

Improved Telephotos

Improved versions of Pano and Panso 300mm f4 telephoto lenses, now available from Zoomar of Glen Cove, N.Y., have greater flexibility in that they adapt to 35mm and 2¼ × 2¼ in. slr, and 16mm "C" mount motion cameras. Panso model has quick focusing level and close focusing range of 3½ in.; 5½, Pano. Both models have large, easy-read

scales; red index for infra-red photography; preset diaphragm; built-in sunshade holder with slot for 2- × 2-in. gelatin filter; rubber grips for focusing and distance rings; and built-in tripod sockets. Specifications include apertures of f4 through f32 and field angles of 8° (24 × 36mm) and 16° (2¼ × 2¼ in.) Reproduction ratio is 1:4, Pano and 1:3, Panso. Pano lens is priced at $430; Panso, $535.

Circle 117 on Reader Service Card

Tape Playback Unit Has 15-W Amplifier

Produced in two versions for 7- and 10½-in. reels, Models 702-7-A15 and 702-10-A15 from Tape-Athon Corp. of Inglewood, Calif., are available with speeds of 1⅞, 2, 3½, and 7 in./s. Amplifier has separate bass, treble, and volume controls, a tape

Circle 36 on Reader Service Card ➔

Your Sylvania distributor can give you a technical library. For fast answers to difficult electronic problems.

Nobody beats Sylvania when it comes to up-to-date technical information—for *your* applications. And your Sylvania distributor has it all for you.

You can get data sheets and catalogs on industrial receiving tubes, transmitting tubes, industrial control tubes, counter tubes, cathode ray tubes, flash tubes, gauge tubes, photosensitive devices, microwave devices and all semiconductors.

Your Sylvania man also has inventory programming forms—and many types of application information. Plus other kinds of free technical materials.

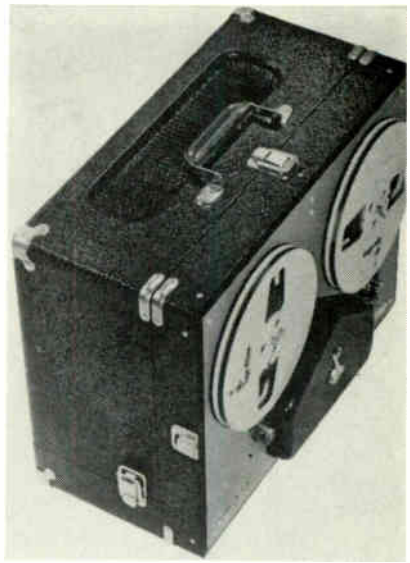
And he's a tube expert. He can analyze your tube and semiconductor replacement needs. He can prevent emergencies, take an inventory and save you time and money.

Call him for these services—and for the best technical literature in the tube industry. And depend on him for fast delivery—in any quantity.

Sylvania Electronic Tube Division, Electronic Components Group, Seneca Falls, New York 13148.

SYLVANIA

SUBSIDIARY OF
GENERAL TELEPHONE & ELECTRONICS GT&E

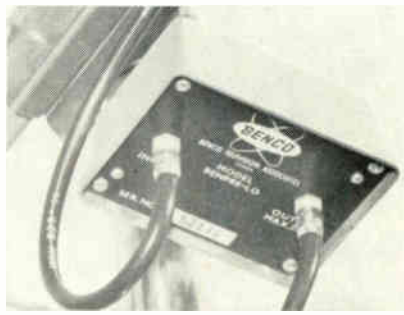


equalization switch for various tape speeds and outputs of 25 and 70.7 V at 4 and 8 ohms. A microphone input with remote cut in/out control is also included. Frequency response and signal-to-noise ratio exceed NAB specifications. Unit measures 14 × 16¾ in., weighs 23 lb, and comes equipped with a carrying handle and case.

Circle 118 on Reader Service Card

Solid-State Broadband Preamplifiers

Benco Television Corp. of Rexdale, Ont. recently added a solid-state broadband preamplifier to its line of CATV equipment. The Benpre H (high band and Benpre L (low band) units are powered by 24 V ac and designed for low intermodulation performance. Filters and traps, if necessary, can be installed after amplification without affecting per-



formance. The low-band unit has a gain of 16 dB minimum (channel 6); the high-band, 19 dB minimum (channel 13). Specifications include: noise figures, 5 and 6 dB maximum; bandwidth, 54 to 110 MHz and 174 to 217 MHz; and output handling capacity (2 carrier for 60-dB cross modulation), 41.5 and 50 dBmV, respectively for the low- and high-band units.

Circle 119 on Reader Service Card

NAMES IN THE NEWS

Marvine and Udell advertising agency of Chicago announces the appointment of **Mort Butzen.**

Byron D. Carr

William F. Boucher

Byron D. Carr has been appointed customer service manager of International Video Corporation, according to Ronald H. Fried, vice president/marketing. IVC also announces the appointment of **William F. Boucher** as quality control manager. His appointment was made by Carl W. Claras, director of manufacturing.

John G. Thompson

John B. Mandle

John G. Thompson has been named manager of manufacturing, planning and control in an annoucement by Ameco Inc.

John B. Mandle has been appointed director of quality control, Memorex Corp., it was announced by Stanley W. Meyer, vice president, technical staff.

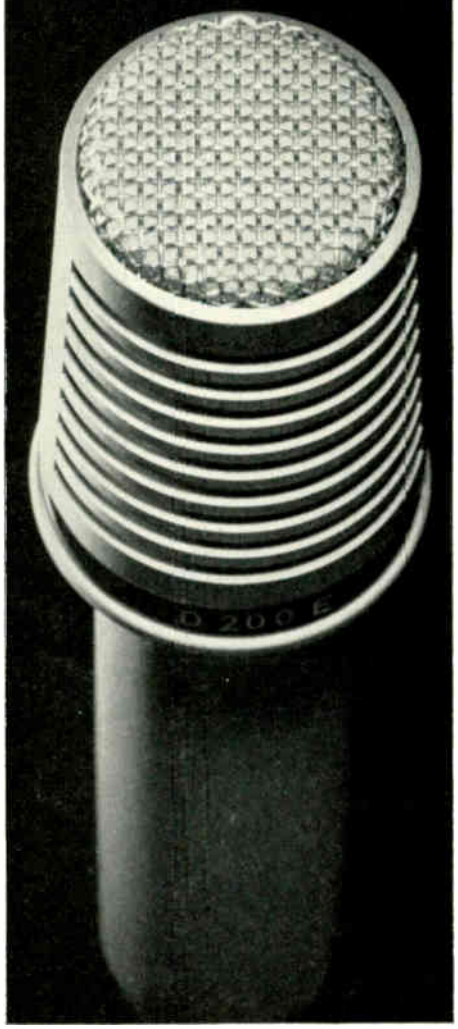
Kaiser Broadcasting announces that **Jay Q. Berkson** has been promoted to general manager of WKBF-TV, Cleveland, and the appointment of **L. William White** as general manager of KBHK-TV, due to begin programming early in 1968.

Gene Ellerman, vice president and general manager of WWTV/WWUP-TV, Fetzer Television, Inc., Cadillac and Sault Ste. Marie, Mich., was elected president of the Michigan Association of Broadcasters, at the association's annual meeting.

Howard Browne has been appointed news and public affairs director of WWTV/WWUP-TV, it was announced by Gene Ellerman, vice president and general manager.

The NEW two-way microphone system

Might look like other microphones... but it's totally different!



You're looking at a revolutionary concept in cardioid microphone design — actually two microphones in one. It is a microphone system with two independent capsules. Like a high-quality two-way speaker system, one capsule responds to low and the other to high frequencies with a built-in crossover network at 500 cycles.

Go ahead . . . pick up the new AKG D-200E two-way microphone and try it! Then ask your most severe critic to listen.

Look for this symbol! It signifies this exclusive concept — a product of AKG research.

MICROPHONES • HEADPHONES

DISTRIBUTED BY

NORTH AMERICAN PHILIPS COMPANY, INC.

100 EAST 42nd STREET, NEW YORK, NEW YORK 10017

9-67

Circle 40 on Reader Service Card

A. H. Christensen

Richard L. Paullis

A. H. (Chris) Christensen has been named general manager of KZAZ-TV, it was announced by Walter J. Stiles, project manager and partner of the firm.

E.G. Gramman, president of Dynair Electronics, Inc. announces the appointment of **Richard L. Paullis** to the position of vice president of marketing.

Herbert M. Holzberg

Charles E. Irvin

Herbert M. Holzberg has been named northeast regional sales manager, and **Charles E. Irvin** has been appointed applications engineer for Philips Broadcast Equipment Corp. The announcements were made by Anthony R. Pignoni, director of marketing.

Louis C. Stephens has been appointed to a new position as major projects counsel in the Rules and Standards Division of the Broadcast Bureau of the FCC.

Lester B. Key has been appointed facilities engineer for Superior Cable Corporation, it was announced by L.J. Styles, vice president in charge of manufacturing.

Robert E. McIlvane

A. L. Landsperger

Robert E. McIlvane has been elected a director of the Anaconda Wire and Cable Co., R.B. Steinmetz, chairman of the board, recently announced.

A.L. Landsperger has been named director of marketing of the Conrac Division of Conrac Corporation, it was announced by William J. Moreland, Conrac vice president and division general manager.

You can earn more money if you get a Government FCC License

...and here's our famous CIE Warranty that you will get your License if you study with us at home

Cleveland Institute of Electronics

WARRANTY

OF SUCCESS IN OBTAINING A GOVERNMENT FCC LICENSE

A Cleveland Institute of Electronics FCC License course will quickly prepare you for a Government FCC License. If you don't pass the FCC exam after completing your course, CIE will refund all your tuition. You get an FCC License...or your money back!

NOT SATISFIED with your present income? The most practical thing you can do about it is add to your Electronics know-how, pass the FCC exam and get your Government License.

The demand for licensed men is enormous. Today there are over a million licensed broadcast installations and mobile transmitters on the air, and the number is growing constantly. And according to Federal Law, no one is permitted to operate or service such equipment without a Government FCC License or without being under the direct supervision of a licensed operator.

This has resulted in a gold mine of new business for licensed service technicians. A typical mobile radio service contract pays an average of about $100 a month. It's possible for one trained technician to maintain eight to ten such mobile systems. Some men cover as many as fifteen systems, each with perhaps a dozen units.

Opportunities in Plants

And there are other exciting opportunities in the aerospace industry, electronics manufacturing, telephone companies, and plants operated by electronic automation. Inside industrial plants like these, it's the licensed technician who is always considered first for promotion and in-plant training programs. The reason is simple. Passing the Federal Government's FCC exam and getting your License is widely accepted proof that you know the fundamentals of Electronics.

So why doesn't everybody who "tinkers" with electronic components get an FCC License and start cleaning up?

The answer: it's not that simple. The Government's licensing exam is tough. In fact, an average of two out of every three men who take the FCC exam fail.

There is one way, however, of being pretty certain that you will pass the FCC exam. That's to take one of the FCC home study courses offered by the Cleveland Institute of Electronics.

CIE courses are so effective that better than 9 out of every 10 CIE graduates who take the exam pass it. That's why we can afford to back our courses with the iron-clad Warranty shown above: you get your FCC License or your money back.

Mail Coupon for Two Free Books

Want to know more? Send the coupon below for free copies of our school catalog, "How To Succeed In Electronics," describing opportunities in Electronics, together with our special booklet, "How To Get A Commercial FCC License." If coupon has been removed, just send your name and address to us.

ENROLL UNDER NEW G.I. BILL
All CIE courses are available under the new G.I. Bill. If you served on active duty since January 31, 1955, or are in service now, check box in coupon for G.I. Bill information.

Matt Stuczynski, Senior Transmitter Operator, Radio Station WBOE: "I give CIE credit for my First Class Commercial FCC License. Even though I had only six weeks of high school algebra, CIE's lessons made Electronics easy. I now have a good job in studio operation, transmitting, proof of performance, equipment servicing...and am on my way up."

Thomas E. Miller, Jr., Engineer, Indiana Bell Telephone Company: "I completed my CIE course and passed my FCC exam while in the Navy. On my discharge, I was swamped with job offers from all over the country. My only problem was to pick the best one, and I did—engineer with Indiana Bell Telephone. CIE made the difference between just a job and a management position."

CIE Cleveland Institute of Electronics
1776 East 17th Street, Cleveland, Ohio 44114

Cleveland Institute of Electronics
1776 E. 17th St., Cleveland, Ohio 44114

Please send me without cost or obligation:

1. Your 40-page book "How To Succeed In Electronics" describing the job opportunities in Electronics today and how your courses can prepare me for them.
2. Your book "How To Get A Commercial FCC License."

Name _____ Age _____
(Please Print)

Address _____

City _____

State _____ Zip _____

☐ **Check here for G.I. Bill information**

Accredited Member National Home Study Council
A Leader in Electronics Training...Since 1934
(BM-4)

Circle 44 on Reader Service Card

BROADCASTERS SPEAK

Sirs:
Enclosed is my check for $9.00 for a two-year subscription to your magazine. Although I have been receiving it free in the past and still qualify under the free circulation policy you have established, I want to be certain of not missing any issues. . . .

May I congratulate you on the fine job you do in reporting industry news. I never fail to read *BM/E* carefully from cover to cover.

James C. Pollack
Law offices of
Resnick and Spiegel
Washington, D.C.

Sirs:
My colleagues and I would be most grateful for available past, present and future issues of *BM/E*. I feel that your publications may be of interest, importance and significance to us in developing our new program in audio video medicine, especially television, etc.

Thanking you in advance,
Sumner Wood, Jr., M.D.
Asst. Prof. of Pathology
Johns Hopkins University
Baltimore, Md.

Never thought of ourselves as a medical magazine, S.W. But, then, I suppose you never thought you'd become so involved with TV. Our Circulation Director says BM/Es *soon will be on their way to you.*

Sirs:
We have read with considerable interest your articles in the June, 1967 issue of Broadcast Management Engineering, entitled UNDERSTANDING COLOR VIDEOTAPE RECORDING, and THE PROPER CARE AND HANDLING OF VIDEOTAPES.

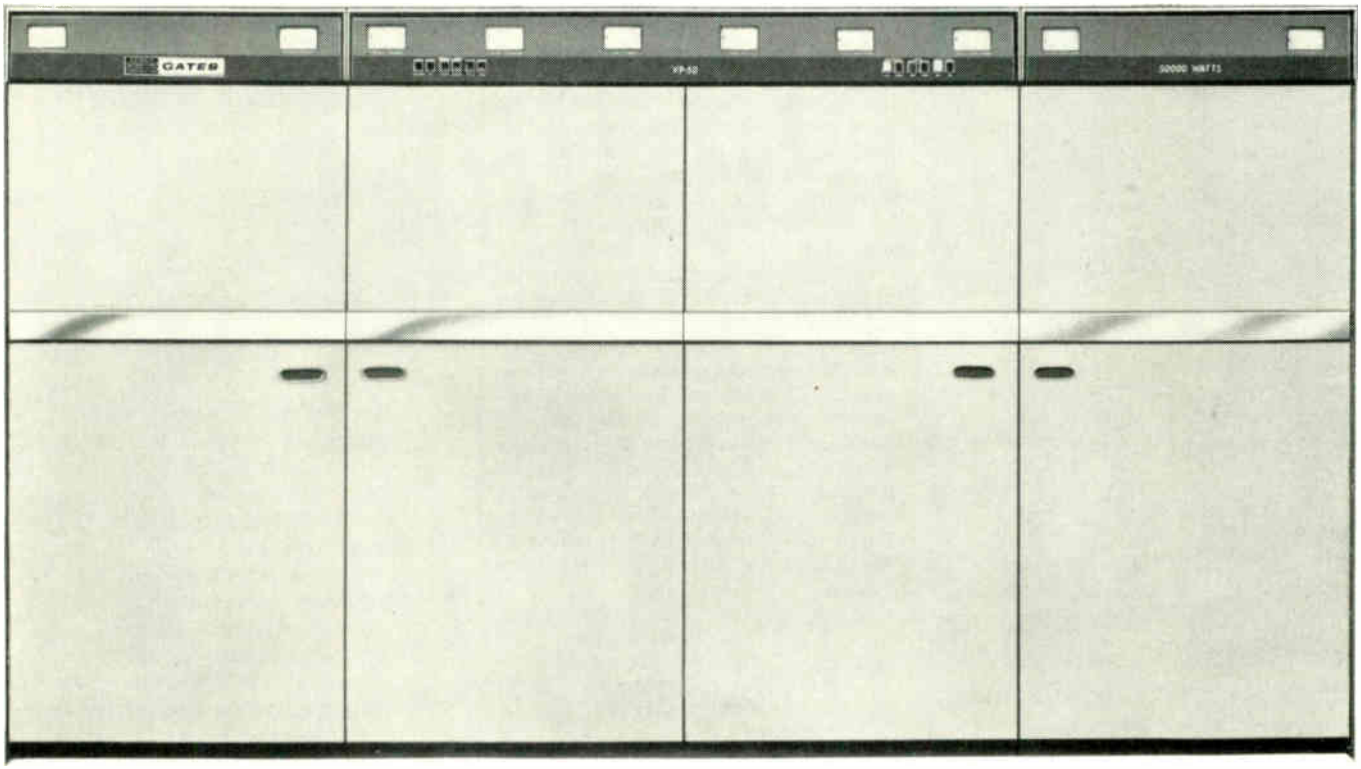
We would like very much to have approximately 12 reprints of these articles if they are available.

We will appreciate hearing from you as to the cost of the above since we would like to use these in our training program of operating personnel.

Henry C. Mattingly
VTR Supervisor
Bonneville International Corp.
Salt Lake City, Utah

Sirs:
Would you please send me a copy of the August, 1967, issue of *Broadcast Management/Engineering*

First in its class... a vapor-cooled, high-efficiency 50,000-watt AM transmitter by Gates



Inside and out – the VP-50 is the first really new 50,000-watt transmitter in years . . . a breakthrough in engineering design utilizing vapor cooling.

Superb fidelity is combined with operating economy in the VP-50 transmitter.
Lowest power consumption with only 80 kW at 0% modulation.
Lowest tube cost of any 50 kW model.

Newest solid-state design with all-transistor circuits up to RF driver.
Quietest operating transmitter in its class with no large blowers.

FCC-type accepted.

Want more information and complete specifications? Write or call (217) 222-8202 for complete information.

HARRIS INTERTYPE CORPORATION

GATES

GATES RADIO COMPANY
QUINCY, ILLINOIS 62301, U.S.A.
A subsidiary of Harris-Intertype Corporation

Circle 47 on Reader Service Card

magazine? There are several articles in this issue in which I am interested, and I have been unable to obtain a copy through our company library.

Thank you for your consideration.

Richard H. Bell
Corporate Education Counsel
Ampex Corp.
Redwood City, Calif.

On the Way, R.B.

Sirs:
May I congratulate you and the *BM/E* staff for a most valuable publication. It has been extremely helpful in our Programming course and should be an integral part of our Radio and Television Station Management course this fall. I was most impressed with your articles on ITV/ETV in the August issue.

BM/E has also provided program suggestions for use on our educational radio station, WGSU-FM. We have been on the air since March 1963 and this fall we will increase our power to 2 kw. Last year we were designated Station of the year by *College Radio* magazine. This was due mainly to our extensive community affairs programming including live coverage of urban renewal and zoning board hearings, high school football games, high school and college basketball games, centennial celebrations, parades, and various documentaries focused on community issues such as Genesco's need for a doctor. Would you be interested in a feature article with pictures on WGSU-TV? I would be happy to submit such an article of designated length in the very near future.

Thank you for your consideration.

Myron B. Shaw
Associate Professor
State University College
Genesco, N.Y.

Glad you liked our focus on ETV/ITV in August, M.S. We'll be touch with you about the story.

URGENT

Sirs:
We are most interested in your September, 1967, issue of *BM/E* magazine.

Would you please *RUSH* twelve copies of the above issue to us?

We shall be happy to pay whatever the postage and cost per issue may be and would honor your invoice as soon as received.

May we recommend that you airmail the 12 copies as we would like to receive them as soon as possible.

A.D. Pettersen
Secretary-Treasurer
CFAC Radio
Calgary, Alberta

On the way, A.P. We must've done something right in the September issue!

General Electric adds 15 KW to their VHF transmitter line. That's important even if you need 30 KW output.

The new GE 15 KW VHF transmitter, TT-515, takes up only 24 square feet of floor space. The TT-515 combines economical operating characteristics with no-fight maintenance, and quality performance.

Need 30 KW output? Install two TT-515 transmitters in parallel operation. It's the ideal solution for power cutback flexibility, lower operating costs, and minimum floor space.

The TT-515 has remote control capability via required external landline and/or microwave terminal equipment.

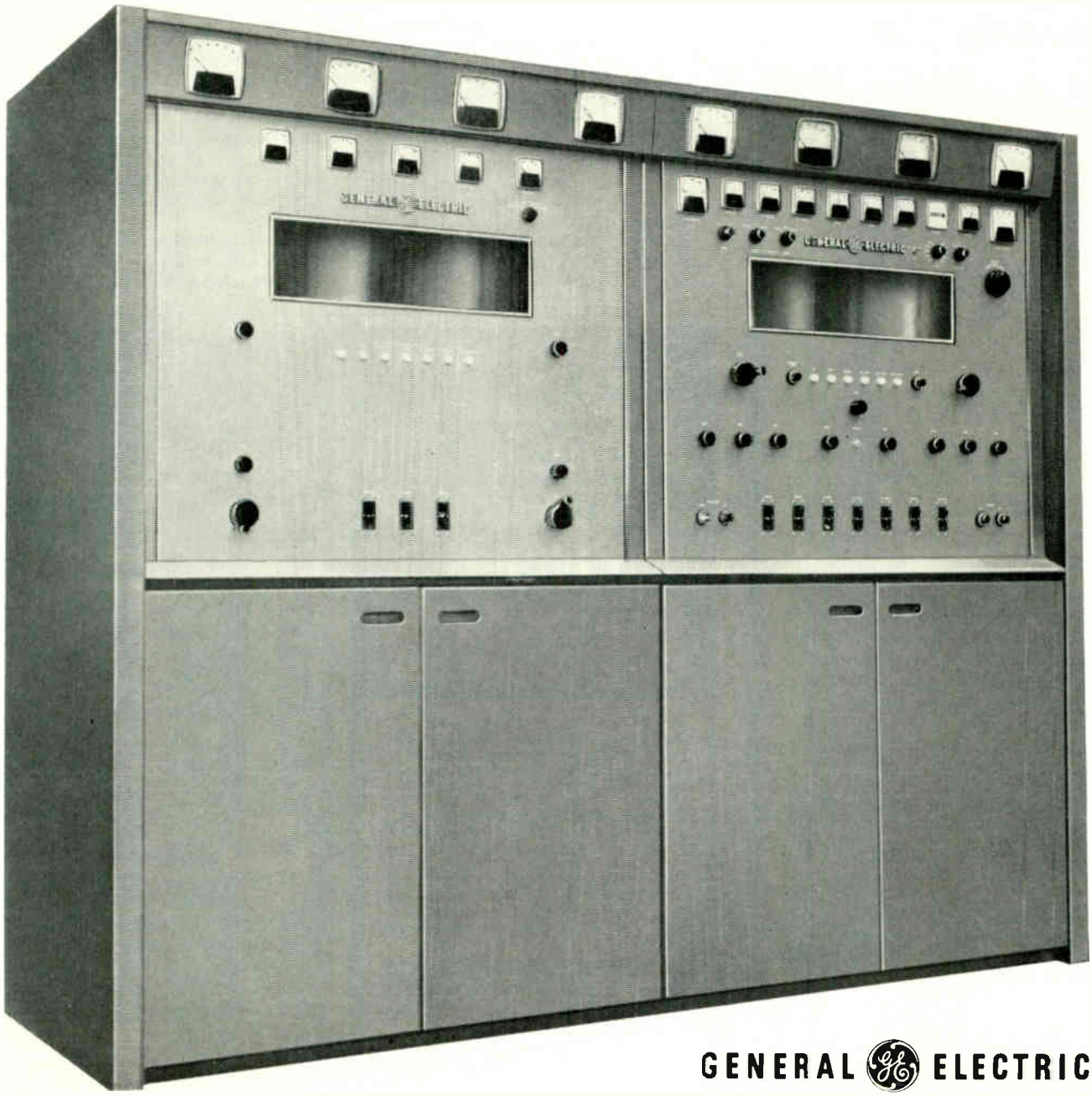
Motorized controls are provided within the transmitter for aural and visual power output.

GE VHF Transmitters: 1 KW TT-49-A/B; 5 KW TT-50-A/B; 10 KW TT-510-A/B; 15 KW TT-515-A/B; 30 KW TT-530-A/B; A/B = Low Channel/High Channel

Write General Electric Co., Visual Communication Products Department, Electronics Park, Syracuse, New York 13201 GE-52

TT-515 A/B (5-1) 15 KW

Frequency Range	—A Channels 2-6 (54-88 MC) —B Channels 7-13 (174-216 MC)
Visual Output	15 KW Sync Peak
Aural Output	3.3 KW Nominal
Output Impedance	50 Ohms
Power Consumption	208/230 Volts, 3 phase 50 or 60 cycles, at approximately 35.5 KW Average picture (0.9PF) 42.0 KW Black picture (0.9PF)
Convenience Outlets and Cubicle Lights	117 Volts, single phase, 50 or 60 cycles, at approximately 500 watts.
Compliance	Complies with applicable FCC and EIA Specifications.
Dimensions	96" wide x 37" deep x 83" high



GENERAL ELECTRIC

Circle 50 on Reader Service Card

LITERATURE of INTEREST

For additional data, circle No. shown on Reader Service Card.

TV projector (16mm) for TV distribution systems which show films in educational, broadcasting, industrial and military markets is presented in brochure from Kalart Co. **150**

TV camera cable is the topic of a folder from the Brand Rex Division of American Enka Corp. Folder contains chart which tabulates specifications of monochrome and color camera cables. **151**

Profit package from Ameco contains issue 31 of "Tech Topics" and "Business Booster." A comparison of heterodyne receivers and modulator-demodulators, and a discussion of public education and CATV are the topics. **152**

Image orthicons in 3- and 4½-in. sizes for color and monochrome application are presented with illustrations and specifications in 7-page booklet from English Electric. **153**

Drop wire designed for use as service drop from cable terminals is technically described in Bulletin T-867 from Brand Rex Div. **154**

Connector flange gaskets—135 types—are presented in tabular form on Data Sheet EMC-451 from Tecknit. **155**

Plastic drop wire samples are included with tabulated specifications in folder from Brand Rex Div. **156**

"Dc Voltage Regulator Modules" is the title of 32-page application note from Bendix Semiconductor Div. **157**

Rf coaxial load resistors—4 sizes—handling inputs of 5 to 50 kW are illustrated and technically described in data sheet from Altronic Research Corp. **158**

Aluminum electronic enclosures in rfi shielded vertical, slope front and low silouette configurations are presented in 12-page Catalog SS-67 from Zero Mfg. Co. **159**

Microwave components and equipment are presented in 32-page Bulletin "89" from Lectronic Research Laboratories. **160**

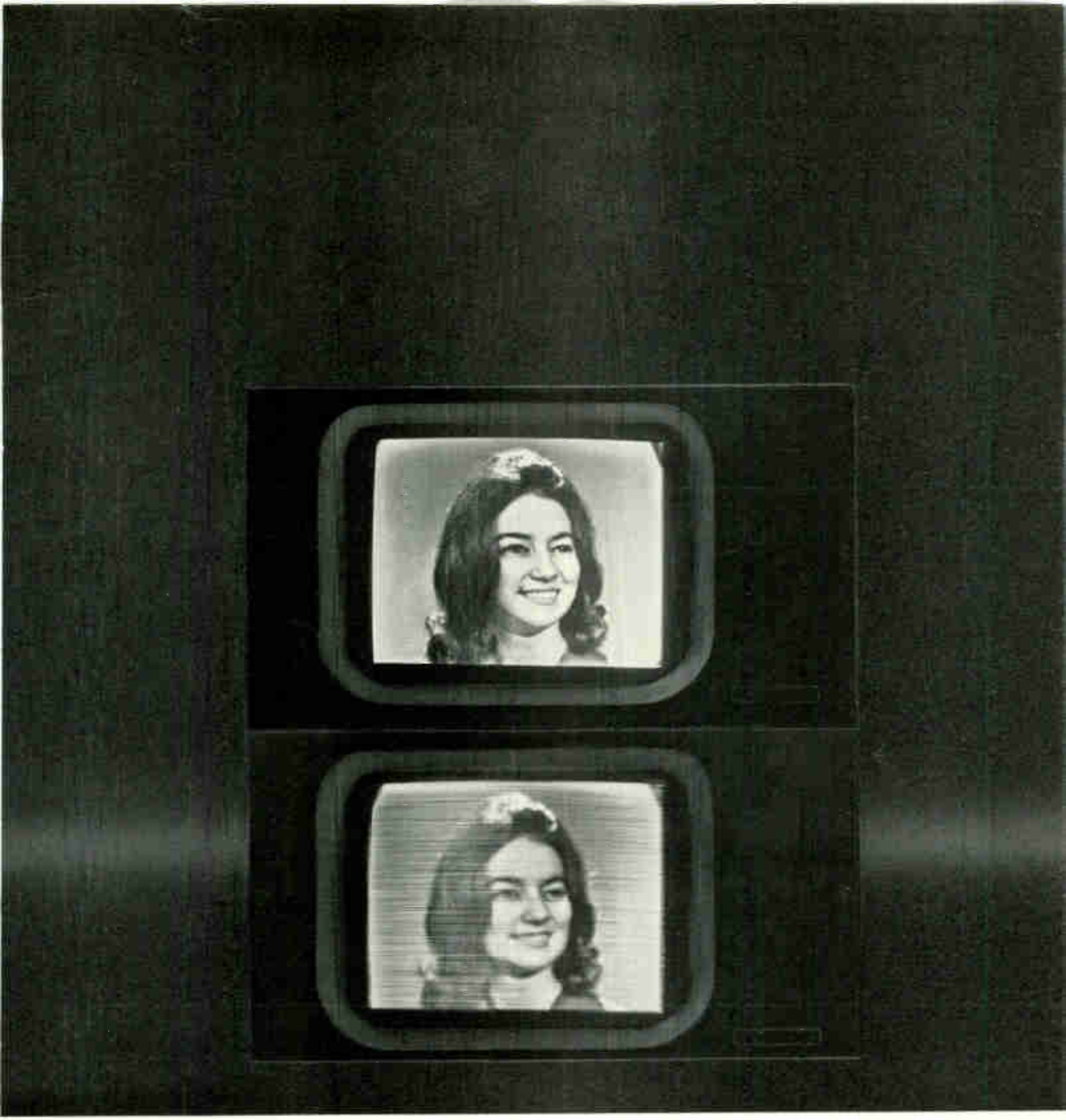
Order wire panel with carrier equipment test facilities is described with specifications and an illustration in product bulletin from Lynch Communication Systems. Bulletin also includes order wire and test panel application data. **161**

Color camera (4 tube) and associated equipment are fully described and illustrated in brochure prepared by CSF, and available from American Radio Co. **163**

Voltage tester that fits shirt pocket and measures voltage levels to 750 V dc is described in Catalog sheet AAD-56 from Amprobe Instrument Div. **164**

Stainless steel pliers (with or without locking device) for working in tight areas are presented in data sheet from Allis Industries. **166**

Pedestal mounting for underground CATV systems is described in brochure from Jerrold Corp. **171**



Which twin has the heterodyne?

IF you want to carry color programming for any distance at all you need clean color tones like those of our heterodyne "twin" in the top set above. (It *is* in color, in case your magazine's monochrome.)

Lenkurt's 75A microwave relay system will deliver color or black and white TV clear and sharp because its heterodyne repeaters are especially designed for heavy-duty long-haul routes.

Since there's *no* baseband demodulation enroute, there's less chance for degradation of signals on a long-distance hook-up. Yet you have the capability to drop TV channels for CATV or ETV operations along the way, which greatly extends the 75A's flexibility. It exceeds CCIR specs for noise performance, and meets both CCIR and NTSC requirements for monochrome and color television transmission. Frequency stability is held to within ±0.002%. And one-for-three path protection is available.

If top performance is what you're looking for, ask us about our true blue (not to mention red and green) 75A Microwave Radio. Lenkurt Electric Co., Inc., San Carlos, California. Offices in Atlanta, Chicago, Dallas, and New York City.

LENKURT ELECTRIC

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GENERAL TELEPHONE & ELECTRONICS GT&E

Circle 54 on Reader Service Card

If Jim can use Audiopaks exclusively, I suppose I should sample one. Send it to:

Name_____ Title_____

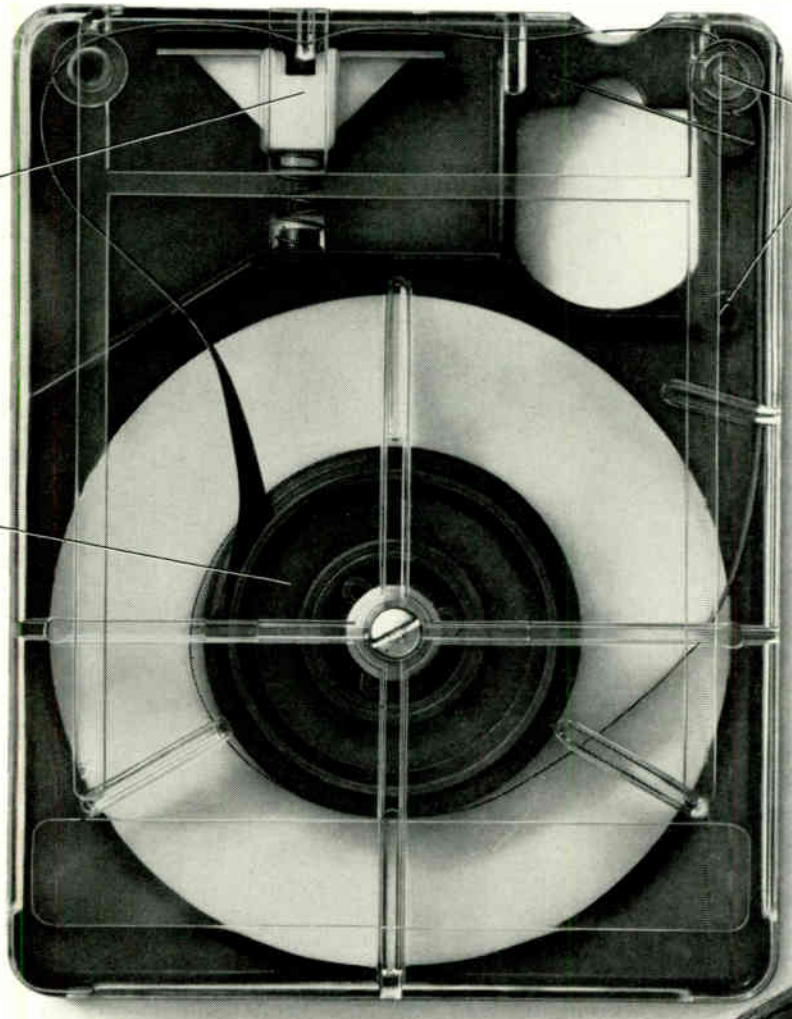
Station_____ Address_____

City_____ State_____ Zip_____

Uni-tension felt pressure pads keep tape in constant, intimate head contact to assure steady output.

Patented free-floating hub increases tape life by freeing it from friction and drag; reduces internal-parts wear.

Conforms to standard NAB cartridge specifications.



Precision-molded guides control tape along path to true fidelity.

Warranty: We are so sure that you will be satisfied with the results obtained with this tape cartridge that we will replace it free if defective in manufacture, labeling or packaging. No other warranty or liability is expressed or implied.

Audiopak™

Audio Devices, Inc.
235 E. 42 St.
N.Y. 10017.

James Gabbert

Co-General Manager,
KPEN, San Francisco, Calif.

"I like the way they handle tape—no mechanical drag. "Interesting to note, KPEN has used Audiopaks exclusively since they were released."

Circle 55 on Reader Service Card

BM/E CLASSIFIED MARKETPLACE

CLASSIFIED ADVERTISING RATES

SITUATIONS WANTED: 15¢ per word; $2.00 minimum
HELP WANTED: 20¢ per word; $2.00 minimum.
ALL OTHER ADVERTISING: 25¢ per word; $3.00 minimum.
BLIND BOX NUMBERS: No extra charge. Send replies to address below.
DISPLAY CLASSIFIED ADVERTISING: $21.50 per inch 1x; $20.00 per inch 6x; $18.50 per inch 12x. Professional Cards $15.00 12x.
CASH DISCOUNT: 2% cash discount if remittance accompanies order.
CLOSING DATE: 5th of the second month preceding issue date.

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

BUSINESS OPPORTUNITIES

FRANCHISE DISTRIBUTORSHIPS FOR SEEBURG BACKGROUND MUSIC

We are expanding our distributor territories, and offer to those who qualify franchises for background music, with phone lines, FM Multiplex, or on-premise systems.

Complete details forwarded on request: Address:

Joseph F. Hards, Vice Pres.
SEEBURG MUSIC LIBRARY, INC.
1500 North Dayton Street
Chicago, Illinois 60622

POSITIONS WANTED

HELP!! Producer/Director now stuck in non-challenging civil service position. Extensive background in all phases and types studio, remote and film production going down the drain. Willing to relocate for chance to become part of active TV organization which offers opportunity to use skills gained over the past nine years. Not afraid of hard work and long hours. Want to move as soon as possible. Box 1167-29, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Twenty-three years ownership, management news, production, programming, personnel selection, supervision, sales. Mature direction, delivery, thoughtful editorials, inquisitive news. Third. Endorsed. Organize or supervise station departments. Community-active sober, reliable, dependable. Personal interview at my expense. Box 1167-30, c/o BM/E, Blue Ridge Summit, Pa. 17214.

General Manager: currently general sales manager excellent property one of the top three markets. Desire General Management (full responsibility) large market, Aggressive, responsible creative & top salesman. Organizer. 40, with family, A-1 character. 18 years radio. Rounded background. Box 1167-1, c/o BM/E, Blue Ridge Summit, Pa. 17214.

"Let's Talk" Have profitable idea for talk show. Need station with eye for talent ideas, profit to air show. Have talent, know how, ambition, ideas to put show over for a mutual profit. 1-302-475-4825 or Box 1167-31, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Newswoman — announcer — DJ — experienced. Public relations: writing: advertising. Currently employed. Available ninety days. Will relocate. Tape available. Box 1167-32, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Beginning broadcaster with MA in journalism. 1st phone, and 6 mo. experience in Radio School, wants chance to begin career. I am 26, married draft exempt, and will work hard to prove an asset to your station. Box 1167-2, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Hardworking mature salesman making top dollar in million plus metro market. No future. Seek management position. Background includes programming, news, announcing. College, family. Box 1167-3, c/o BM/E, Blue Ridge Summit, Pa. 17214.

POSITIONS WANTED (cont'd.)

Chief engineer desires chief engineer's job. Experienced in AM-FM automation and directional antennas. Also two way radio maintenance. 8 years at one station. Box 1167-4, c/o BM/E, Blue Ridge Summit, Pa. 17214.

First phone engineer—2 years experience in large midwest AM-FM operation. 5 kw remote control XMTR's, automated FM stereo. Desires position in New York City. Box 1167-5, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Award winning newsman with degree and second phone . . . Seeks a permanent position as a News director or PD . . . Full details in first letter. PD position preferred. Box 1167-6, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Former owner, 39, has put three country music stations on. DJ, sales, and 1st phone. Wants chance to earn part ownership. If your market needs country music, reply to Box 1167-7, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Production Administrator, network TV and film experience, desires similar position with station or production house. Prefer NE area. Degree, veteran, married, dependable. Box 1167-8, c/o BM/E, Blue Ridge Summit, Pa. 17214.

One of the finest on-camera news directors in the nation seeks change. Associated Press award winner. Box 1167-33, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Young, sincere, and experienced newscaster-announcer with third phone seeks work New York-New Jersey area. Tape and resume available. Box 1167-34, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Disc jockey. Announcer, newscaster, control board operator, FCC permit, creative, versatile, authoritative, aggressive, salesman, tight board. Box 1167-35, c/o BM/E, Blue Ridge Summit, Pa., 17214.

Negro Announcer D.T. wants a start none floater sports comm. news music good voice tight board 3rd class permit will relocate anywhere U.S.A. Box 1167-36, c/o BM/E, Blue Ridge Summit Pa. 17214.

Disc jockey, announcer, experienced, authoritative, newscaster, tight board, personable. Family man. Desires sales. Box 1167-37, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Radio-tv broadcaster-newsman with New York experience and top ratings at midwestern clear channel interested in management position on West Coast. Box 1167-9, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Experienced in TV and Radio news and announcing. Plus writing. Documentaries, special events, M.C. Seeking position in metropolitan area. Box 1167-10, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Desire management trainee position, ownership participation. College, tech school grad. First phones. Broadcast background. Some capital. Box 1167-11, c/o BM/E, Blue Ridge Summit, Pa. 17214.

3rd Phone endorsed, D.J., announcer, authoritative newscaster, tight board. Graduate Broadcast school, personable, not a floater, Desires sales. Box 1167-12, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Announcer, newscaster, exp. authoritative crisp delivery. Not a prima donna or a floater. Married, will settle. Personable. Box 1167-13, c/o BM/E, Blue Ridge Summit, Pa. 17214.

DJ announcer—Temple University graduate (radio-TV). 3rd phone, endorsement. AFRTS. TV production. Experienced. Box 1167-14, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Prima donna university. AFN trained, deep resonant voice evokes credability confidence. Wants night jazz, classical. MOR. I sell. Thomas D. Rood, 7 Jerben Drive, Stony Point, N.Y. 10980.

DJ-newscaster, authoritative, artistic, 3rd ticket, military complete. Will relocate. Box 1167-38, BM/E, Blue Ridge Summit, Pa. 17214.

Authoritative newscaster, announcer, DJ. Will relocate, Personable, married. Box 1167-39, c/o BM/E, Blue Ridge Summit, Pa., 17214.

POSITIONS WANTED (cont'd.)

A well trained announcer seeking position in radio or nightclub MC. NY or Conn. area. Box 1167-15, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Young man draft exempt. First phone Midwest preferred. Experienced. Write to 740 Brighton, Toledo, Ohio 43609.

Management—outstanding record creative sales, Sales-management, radio, TV. Box 1167-16, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Manager—proven record of success in programming and sales that make and maintain a profit. Box 1167-17, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Talented newscaster writer with degree, experience, seeks larger market. Box 1167-18, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Negro D.J. announcer newscaster top 40 MOR, recent grad, family man, 3rd endorsed. Box 1167-19, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Proven sales manager seeks challenging opportunity Southeast. East. Box 1167-20, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Announcer. Negro. Modern approach. Some experience. Tape available. Box 1167-21, c/o BM/E. Blue Ridge Summit, Pa. 17214.

HELP WANTED

TELEVISION ENGINEER — Expanding instructional television system requires engineer with broadcast or ETV experience. Equipment includes three studio cameras, film chain, four VR660's programming to two channels on campus cable system. New remote truck equipped with vidicon cameras. Applicant will aid and assist in design, installation, and maintenance of the system, part time assistance with studio and remote operations as needed. Salary in the $700/mo/range. Send resume, address, and phone number to Dr. Ralph Smith, Director of Radio and Television, Illinois State University, Normal, Illinois 61761.

Energetic Sales Manager, with experience, ideas, ambition, ability and proven sales record. Single station in market of 13 thousand in Rocky Mountain area. Want man who has eye to becoming station manager upon proof of performance over a period of time. Good town. Good climate. Better than average operation with good staff and equipment. Contact Box 1167-23, c/o BM/E, Blue Ridge Summit, Pa. 17214 with full details. Announcing experience would be helpful.

Director of Engineering, senior position with developing full color state ETV system. Will be responsible for large engineering staff, technical operation and maintenance of new state production center and nine-station network. Must have extensive and successful professional background. Send resume and salary requirements to The Director, Mississippi Authority for Educational Television, Box 2470, Jackson, Mississippi.

ENGINEERS—TV—Sunny California. Discover job security, and a new way of life in California. Have top openings for qualified **Maintenance Engineers, especially Video Tape and Live Color Video. Send resume or letter to** The AMPS Agency—3924 Wilshire Boulevard, Los Angeles, California 90005. 388-3116

By Broadcasters — for Broadcasters

"Immediate opening for morning personality. NO ROCK! Mature approach to copy, friendly approach to listeners, involve yourself in friendly community. Congenial working conditions, fringe benefits. Forward tape, pix, resume, salary to Ralph Allinger, Production Manager, P.O. Box 950, Utica, New York 13503."

IMMEDIATE OPENINGS — Qualify for any of the following positions: Technicians for RCA closed Circuit Television equipment — Camera men — Maintenance men — Video Tape men — Video Engineers. RCA Rep. 143-08 94th Ave., Jamaica, New York, or (212) 297-3344.

HELP WANTED (continued)

Broadcast Equipment Service Manager

A major manufacturer of broadcast equipment requires a Service Manager with the ability to develop and maintain a field service organization to support rapidly expanding product lines. This is an opportunity to accept management responsibility with a growing electronics firm. Technical broadcast field service and supervisory experience required.

Headquartered in midwestern city. Limited travel. Compensation commensurate with background and capabilities. Full company benefits. Send resume to Box 1167-22, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Bright-sounding morning man, midwest market! Number one station for eight years. Growth and opportunity with an expanding chain. Good starting pay. Send tape and short resume to Box 1167-40, c/o BM/E, Blue Ridge Summit, Pa. 17214.

First Class engineers, maintenance background, no board work. Immediate openings. Excellent growth opportunity with independent group. Rush reply by letter to C. Dingmen, WCTC, 385 George St., New Brunswick, N.J.

If you have a First Class license, experience and ability, and are worth $150 per week to start, a well-run east coast station would like to hear from you. Box 1167-41, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Needed-Experienced combination salesman & announcer. Good future, security, living conditions, hours & pay. Excellent recreation. Southeastern location. Box 1167-42, c/o BM/E, Blue Ridge Summit, Pa. 17214.

ENGINEER in charge of maintenance. Top 10 market, 1st class license, experienced in all solid state color UHF operation. Good pay. Career with opportunity to advance. Send reply to Box 1167-43, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Looking for experience. Live color, color VTR, and color film with new modern equipment, WREX-TV, Rockford, Ill. has an opening for a first class engineer. TV experience desirable but not necessary. Contact Chief Engineer WREX-TV.

Announcer with sincere showmanship including production; sales experience preferred, or available for sales training. Active market, nonmetropolitan. No tapes, just a letter; confidential. Box 1167-24, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Immediate opening for engineer-first phone Television Station, operation—no announcing. Location—Northern Lower Michigan. Box 1167-44, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Rapid advancement for management potential announcer-salesman with growing company. Send tape and resume to Boyce Hanna, Box 199, Shelby, N.C. 28150.

Wanted! Broadcast technicians to enter aircraft electronics. Numerous jobs everywhere. Write: Avionics, Reno/Stead Airport, Reno, Nevada 89506.

Immediate opening for Chief Engineer. Experienced only, Salary open. Many fringe benefits. Call or write, Manager, WITY, Danville, Illinois.

Needed immediately — Experienced announcer with first phone. 5000 watt NBC affiliate with MOR adult format. Good pay and fringe benefits. Contact Larry Collins, WBCK, Battle Creek, Mich. 49015.

"Number one" station in Southwestern Louisiana needs experienced salesman. Must have good references. Sportsman's paradise! Send resume to Bill Edgar, KLOU, Lake Charles, La.

"First Class Engineers" — Maintenance Background — VTR Experience. Immediate openings with excellent growth opportunity. Box 1167-25, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Experienced announcer with First. No maintenance. News or Production experience desirable. Afternoon air shift. WNRK, Box 425, Newark, Delaware.

Opportunity at S.E., AM-FM-TV, for operator engineer. Good pay, insurance, other benefits. Chief engineer, WAIM-TV, Anderson, South Carolina.

Chief for 5,000 watt directional—Midwest—excellent facilities. Box 1167-26, c/o BM/E, Blue Ridge Summit, Pa. 17214.

"N.M. CATV group desires producer-salesman-announcer; double commissions: "505-437-7258." Box 1167-27, c/o BM/E, Blue Ridge Summit, Pa. 17214.

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A Trusted Name in Electronics Since 1925
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Spotmaster cartridge equipment and accessories, Crown tape recorders, QRK, REK-O-KUT, RUSSCO (turn-tables and preamplifiers) Gray and Euphonics tonearms, Metron modulation monitors, Universal audio products, Pultec, Norelco-AKG microphones, Fidelipac and Audiopak cartridges. Write for special money saving offers. Audiovox, Box 7067-55, Miami, Fla. 33155.

EQUIPMENT FOR SALE (cont'd.)

4 RCA TR-22 TV tape recorders with monochrome ATC, color ATC, and non-phase color. Three also include line lock and modified head cover. One (with all modifications) available now. Others this fall. 1 RCA TK-41C color studio camera chain. George C. Wetmore, Director of Project Engineering, WTOP-TV, Washington, D.C. 20016.

RCA Equipment—2 TM21 color monitors @$1,000 each, 2 TG2 sync generators @$1,000 each, 2 frequency standards @$350 each, 1 TA9 stab amp @$450, 4 aperture equalizers @$75 each, 3 BK5B microphones @$100 each, Also 3-500' Marconi Mark IV camera cables @$700 each. All equipment is in perfect working condition. Write John Blades, LOGOS Teleproductions, 3620 South 27th Street, Arlington, Virginia 22206. Phone: 703/671-1300.

AMPEX authorized Sales and Service. New and used equipment for sale. 48 hour service on most repair including head rebuilding. Other professional equipment also available. ACCURATE SOUND COMPANY, 15 N. Tyler, San Angelo, Texas AC 915 949-1904.

Largest supply of G.E. & Motorola radio and mobile telephone equip. in the U.S. (30-50), (150-174), (450-470), Base, repeater, and dial equip. Dealers invited. Western Mobile Telephone Company, 200 South Anaheim Blvd. Anaheim, Calif. (714) 774-0520.

For Sale . . . TR-22 tape recorder. Fully colorized. Three years old, excellent condition all modifications. Highest offer above $40,000. Avail. July. Call 717 823-3614. Or Box 1167-45, c/o BM/E, Blue Ridge Summit, Pa. 17214.

TUBES—Complete Stock From #10 to #89, 1AB5 to 38022, OC3 to 117z6, and most of the rest. List free. Harold Goldman, 43 Clinton Ave., Rockville Centre, N.Y. 11570—Phone 516-536-6697.

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.

Coax cable, 75 ohm, Armor-covered, type 85 A/V in 3-2500 ft. at 400 mhz. $1.00 per ft. complete reel—$1.50 per ft. random lengths—f.o.b. Washington, D.C. James Murray, 140 Sumner St., Newton Centre, Mass. 02159 (617) 244-0450.

Two modified RCA TK-40A color camera chains in working condition. Exceptional value. Inspection invited. Write P.O. Box 18151, Tampa, Florida 33609, or phone area 813, 253-0447, Tampa.

CARTS, CARTS, CARTS, CARTS, CARTS. LIK-NU Cart Corp. re-builds your cart tapes lik-nu. New pads, tape for as low as 90¢ for 70 sec. 5-day service. Box 2608, Fort Wayne, Ind.

EQUIPMENT, Audio, Broadcast, Video, Bought-Sold-Traded through our national listing. Contact: The Maze Corporation, Box 6636, Birmingham, Alabama 35210.

POLICE — fire — aircraft — amateur calls on your broadcast radio! Tune the band with TUNAVERTER. Free catalog. Salch Company, BM/E, Woodsboro, Texas 78393.

Conrac TV Tuner, 12D, $150.00 Miratel K59 monitor, $100.00. Hughes Memo-scope, no probes, $100.00, all for $300.00. Write Box 211, Moultrie, Ga. 31768.

50,000 S0239 & PL 259A UHF Coaxial Connectors stock. AVA Electronics & Machine Corp., 416 Long Ave., Upper Darby, Pa.

Gates MO-2639 Modulation Monitor, $125.00. GE BA 9 Limiter, $125.00. 125 Feet RG50V Coax, New, $75.00 WCIR, Beckley, West Virginia.

Jampro JA-4B, 4-bay FM antenna tuned to 89.3. Deicers included. Francis Murphy, Canton, New York, 315/386-4551 extension 265.

TRT-1B video tape pixlock-ATC, excellent condition, reasonable price. Contact WBJA-TV, Binghamton, N.Y.

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

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

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

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GOVERNMENT Surplus Electronic catalog — 25¢. Meshna, Nahant, Mass. 01908.

New & Used tower ground wire available. Bill Angle, Box 55, Greenville, N. C. Tel. 752-3040.

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SALE ON ELECTRONICS BOOKS! 5 for $3.98! Guaranteed retail value of $16.50! Grab Bag of 5 electronics books on testing, test equipment, TV, radio, hi-fi, stereo, etc. Clearance of books which sell for as high as $4.50 each. Send check or money order to: Grab Bag, Dept. BO7, Box 304, Emmitsburg, Md. 21787.

Increase sales! Over 40 proven radio and TV sales promotions. Seasonal and year round. For all markets. Fully detailed $3. Broadcast Service Enterprises, Box 9274, Denver, Colorado 80209.

SIGNS, NAMEPLATES, LABELS, Decals, Badges, Trophies, Plaques. Seton Corp., Dept. BME, New Haven, Conn. 06505.

Professional Electronics Projects — $1 up. Catalog 25¢. PARKS, Box 15265, Seattle, Wash. 98115.

Japanese electronics catalog, $1.00. Dec, 10639A Riverside Drive. North Hollywood, California 91602.

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Wanted. Harmony Isle 15 minute transcriptions. (Macgregor?) 2889 21st Street, San Pablo, Calif. 94806.

EQUIPMENT WANTED

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Radar for TV meteorologist and on-air use. Between 3.2 and 5 centimeter wave length. Minimum range 150 miles. Please send description, condition of equipment if used, specifications and price to Box 1167-46, c/o BM/E, Blue Ridge Summit, Pa. 17214.

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AMPEX HEAD ASSEMBLY 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.

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TECHNICAL SERVICES (cont'd)

VIDEO TAPE RECORDER
AUDIO HEAD ASSEMBLY SERVICE
Precision relapping of all heads and supporting posts, includes cleaning and testing. AMPEX VTR audio assembly . . . $75.00 complete. Brand new shelf stock replacement heads of our manufacture available when relapping not advisable. RCA units also serviced. LIPPS, Inc., 1630 Euclid St., Santa Monica, Calif. 90404 (213) EX 3-0449.

Swift, professional service on all your tape cartridge rebuilding needs! All work fully guaranteed — virtually no audio dropout with our splicing technique. Write Broadcast Equipment Rebuilders, Route 2, Box 723, Connellys Springs, N. Carolina 28612.

TALL TOWERS, Guyed, Self-supporting, Inspections—Registered Engineer, Antenna, Tower repairs and painting. Globe Industrial Contractors, Inc., Henderson, Ky. AC 502-827-1831.

Broadcast maintenance — five inspections $30.00 week plus hourly. Mailtronics, 109 Pinetree Drive, Woodbridge, Va.

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"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.

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American Diversified Services
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Live and lively TV children's show. 4½ years on station in top 50 market. Pulled top ratings last 3½ years. SELLABLE. All three producers/personalities wish new location, bigger market. Color films and VTR's available. Box 1167-28, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Deejays! 6000 classified gag lines, $5.00! Comedy catalog free. E. Orrin, Box 679 Boyer Road, Mariposa, Calif. 95338.

INSTRUCTION

FCC License preparation by correspondence. Also, associate degree in electronics by three semesters in correspondence and two semesters in resident classes. Free details on either course. Write: Grantham Desk 7-B, 1505 N. Western Avenue, Hollywood, Calif. 90027.

REI First Class Radio Telephone License in (5) weeks Guaranteed. Tuition $295.00. Rooms & Apts. $10-$15 per week. Job placement free. Two Schools—Sarasota, Florida & Kansas City, Mo. For information contact R.E.I., 1336 Main Street, Sarasota, Florida.

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BM/E

ADVERTISERS INDEX

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BBRC/Miratel's *TU Monitor*

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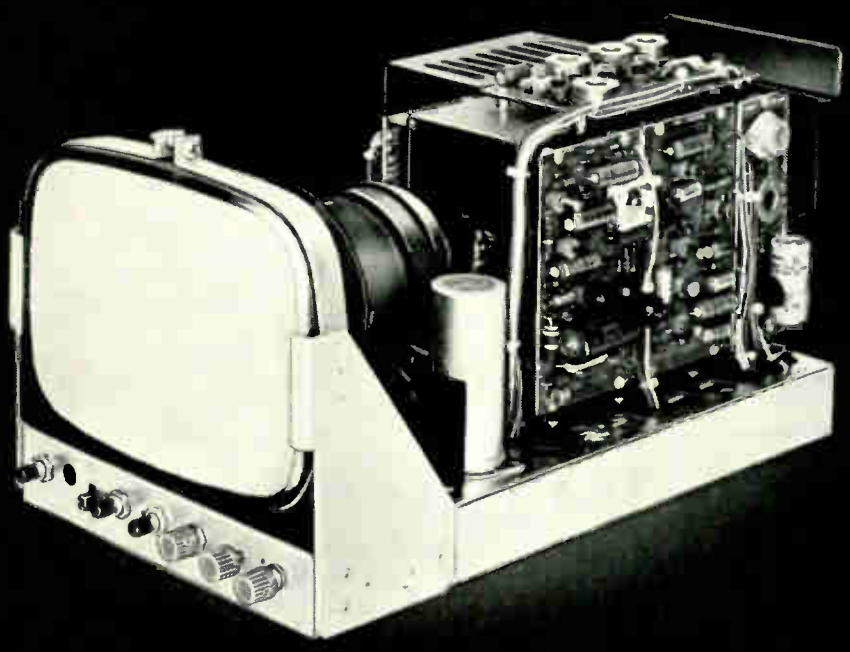

This is a TU Series eight-inch b/w utility monitor from Ball Brothers Research Corporation's Miratel Division. Miratel makes the TU with transistors for added reliability, and reduced heating. No big array of vacuum tubes. No heating problem. TU monitors have regulated power supplies, and are available with display tube sizes from eight through 27 inches. They are NASA proven and competitively priced. We could go on and on about solid state quality and performance, but our monitors can say it better than we can. Contact us for data sheets and an evaluation of the TU in your operation.

Ball MIRATEL

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Circle 59 on Reader Service Card

FROM THE EDITOR

EOTV – Economic Opportunity TV

Departing from an assigned topic at the recent 17th IEEE Broadcast Symposium, Dr. William Hughes, head of the electrical Dept. of Oklahoma State University talked about ETV as a means of preventing riots in the future.

The typical rioter, said Dr. Hughes, is 25 years old and has a vocabulary of 800 words — 400 of them profane. This vocabulary is symptomatic of unpreparedness to perform any utilitarian function in our space-age society. He may be beyond redemption or renewal. But this young brick-thrower is also the father of several kids who also will be brick-throwers if they too grow up to be unemployable misfits. Intensive ETV/ITV is one answer to breaking the riot child out of his illiterate and violent world. Dr. Hughes would put a steel-caged TV set in every Harlem-Watts, connect it to a cable and fill the cable with special Disney productions aimed at teaching reading and speaking, if nothing else. A head start program for a mass audience, so to speak.

TV could also be used to prepare one for a job, teach vocational skills, etc. en masse.

FCC Commissioner Nicholas Johnson, in a speech last month, suggested that the Office of Economic Opportunity might be able to use cable television to communicate with its constituency about its program and services.

Schools that have demonstrated that TV could help disadvantaged students have received ESEA Title I funds for TV. But, ETV/ITV has not yet been totally unleashed as a weapon in the war against poverty, and we think it should.

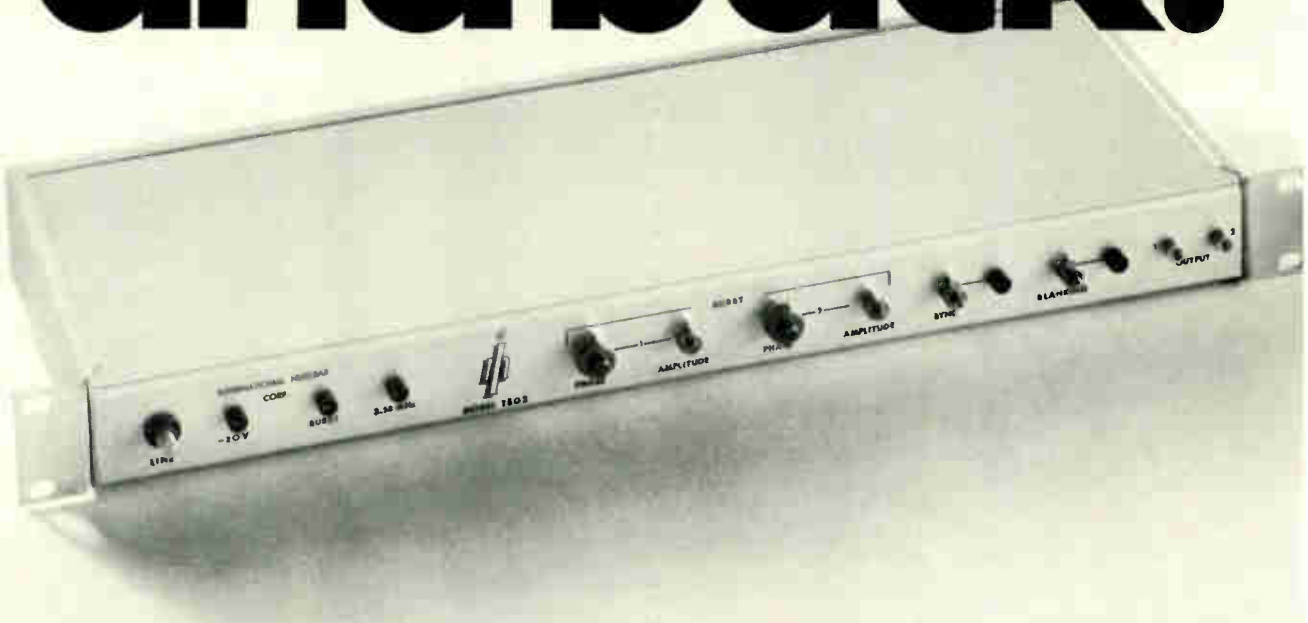
Speaking of serving large audiences efficiently leads us to call attention to a new approach in presenting technical articles in *BM/E*. This approach is to present one resource paper followed by a dialogue or discussion of questions or issues that the article evokes. This month the article and discussion is on CATV head-end equipment.* We didn't get all of the support from manufacturers that we'd like, but we will keep plugging. Readers can help by sending in questions on technical equipment that they'd like to see answered. We'll poll the manufacturers and publish the results. Your question(s), please.**

James A. Lippke

* Broadcasters who see red at the mention of CATV might be interested in the Convention Log item, page 11.

**You friends who have been circling 199 on the bingo will shortly receive a letter indicating several ways you can help *BM/E* help you.

To Black and back.



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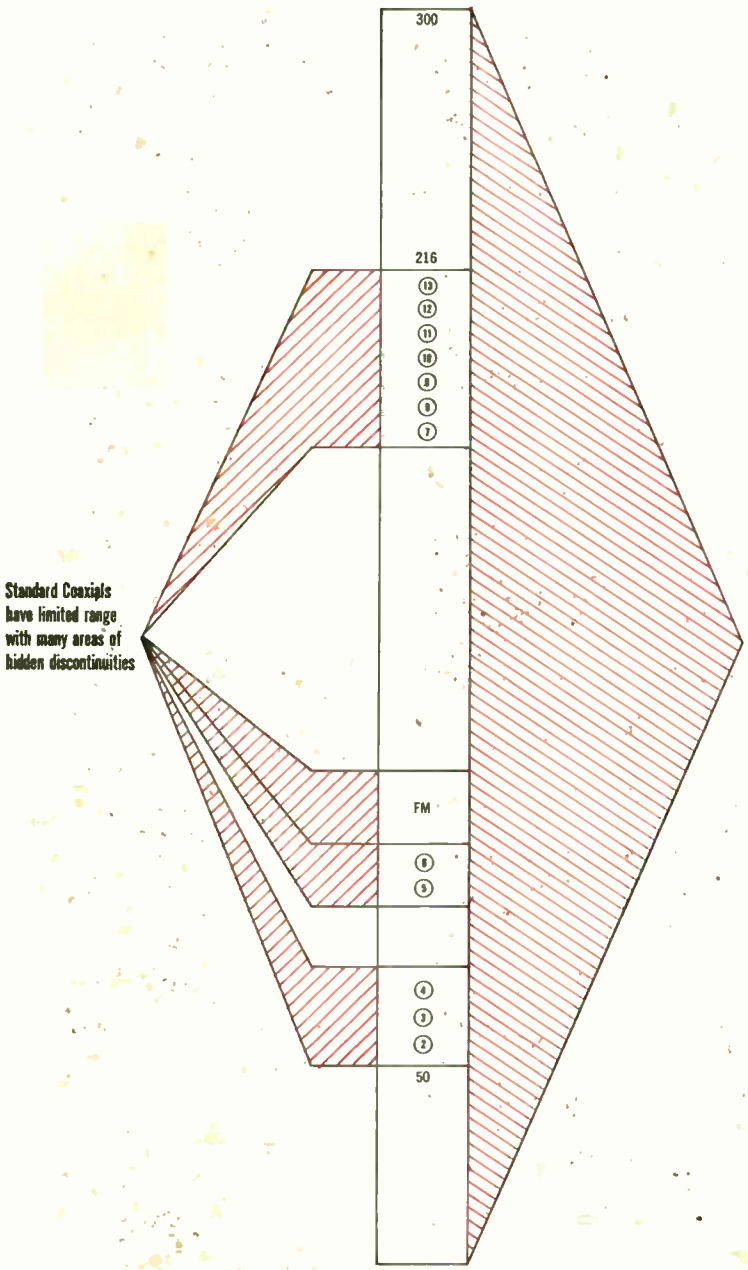

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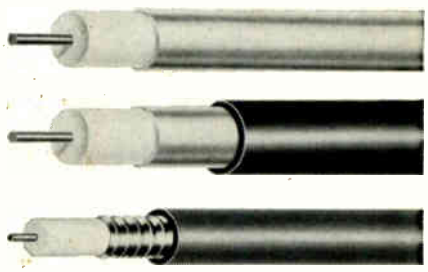

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