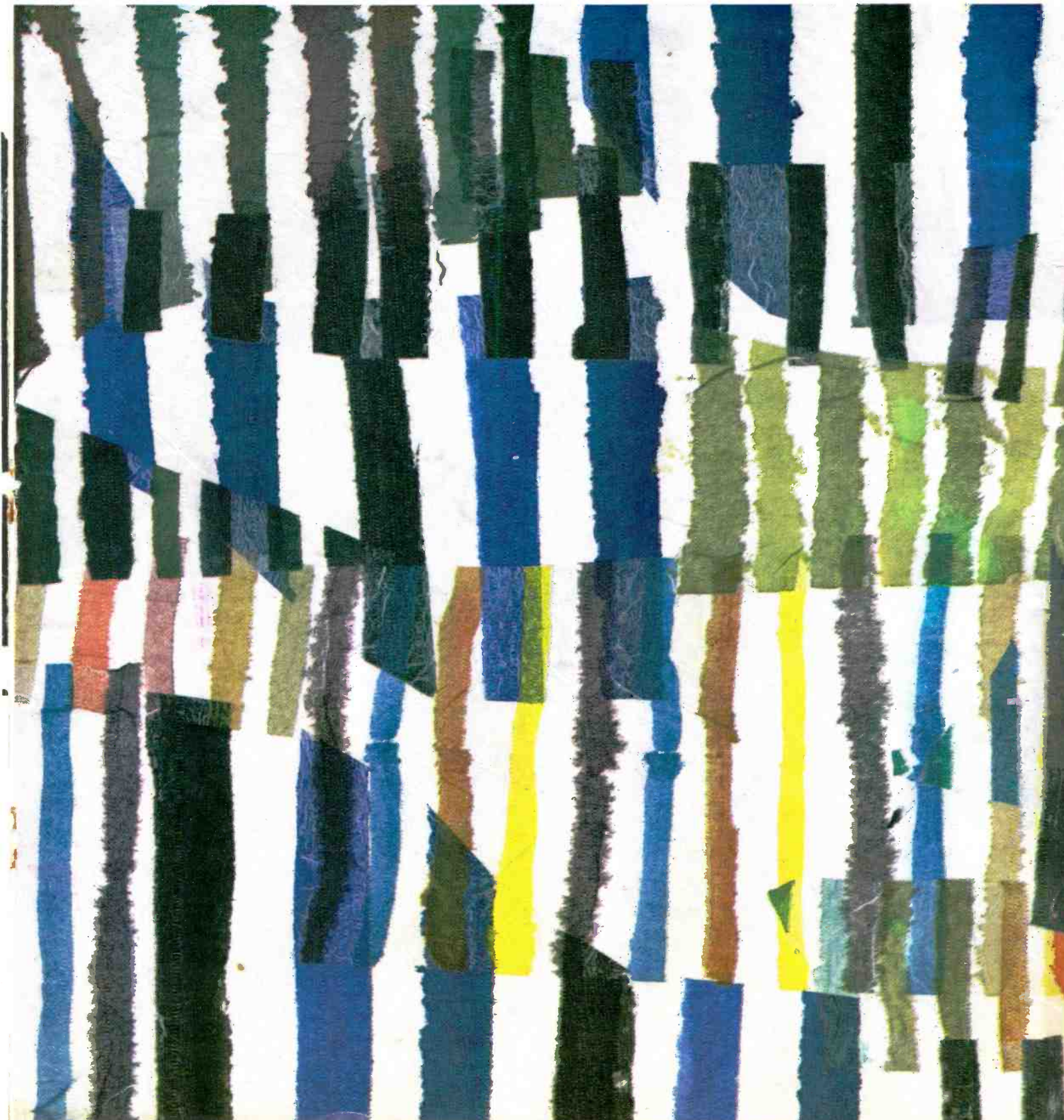
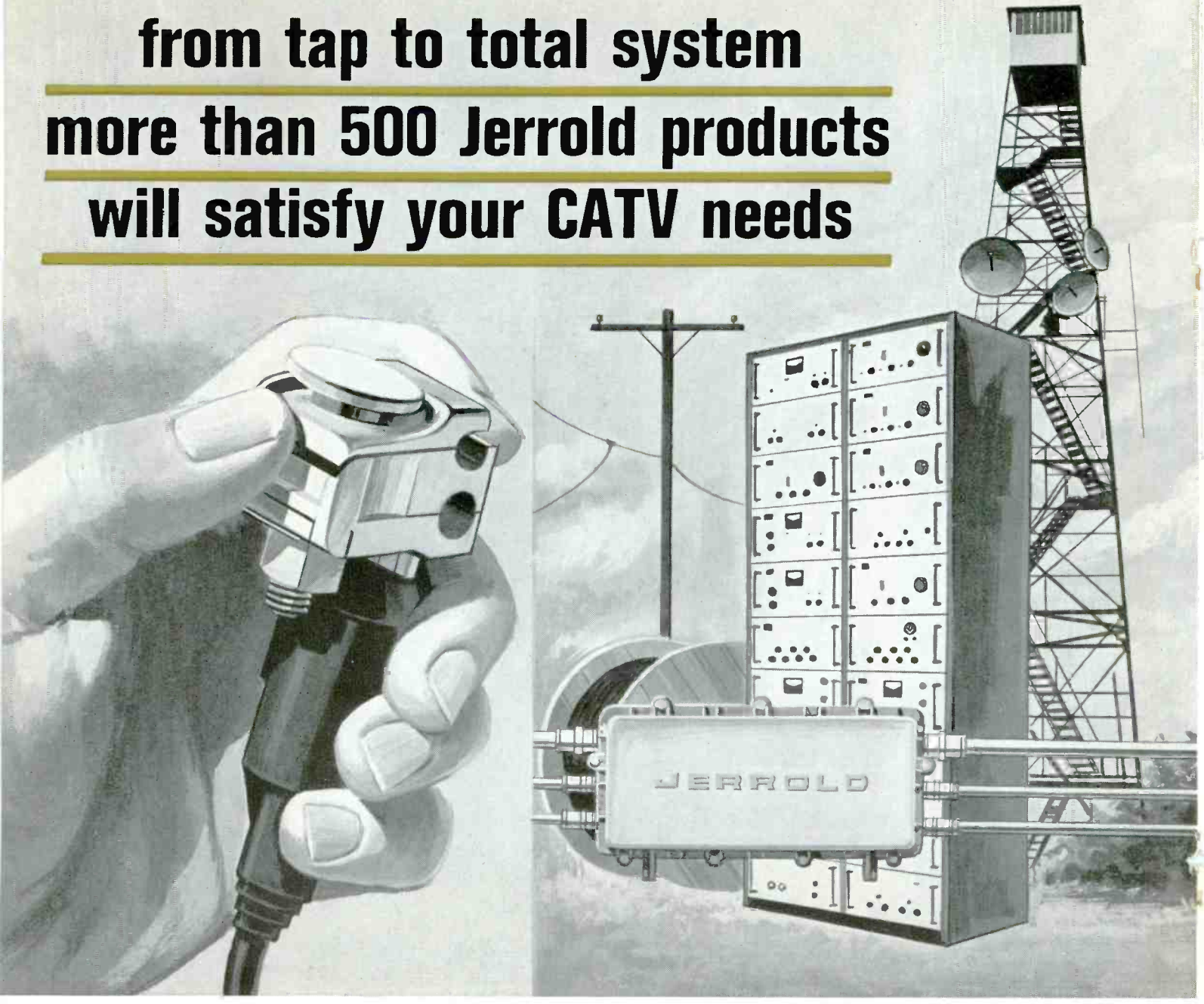
A MACTIER PUBLICATION / APRIL 1966

BM/E

THE MAGAZINE OF BROADCAST MANAGEMENT/ENGINEERING



from tap to total system more than 500 Jerrold products will satisfy your CATV needs



Only Jerrold offers a complete line of compatible CATV equipment from head end to subscriber.

Take antennas as an example—we manufacture more than 100 types. And you'll find our microwave equipment ideal for a short one-hop or a complex multi-channel, multi-hop link. At the head end we offer everything from preamplifiers to the Channel Commander signal processor that made 12-channel systems a commercial reality. For the *criterion* of all-band distribution "Look to Starline" the solid-state, 12-channel system.

The main point is: Jerrold is your *one best,* single source for everything in CATV—including cable, subscriber hardware, and test equipment. If more than 500 dependable products are not enough, our extensive engineering facilities stand ready to design, manufacture and, if necessary, modify any component to meet your unique requirements. When in need, simply phone 215-925-9870, or write:

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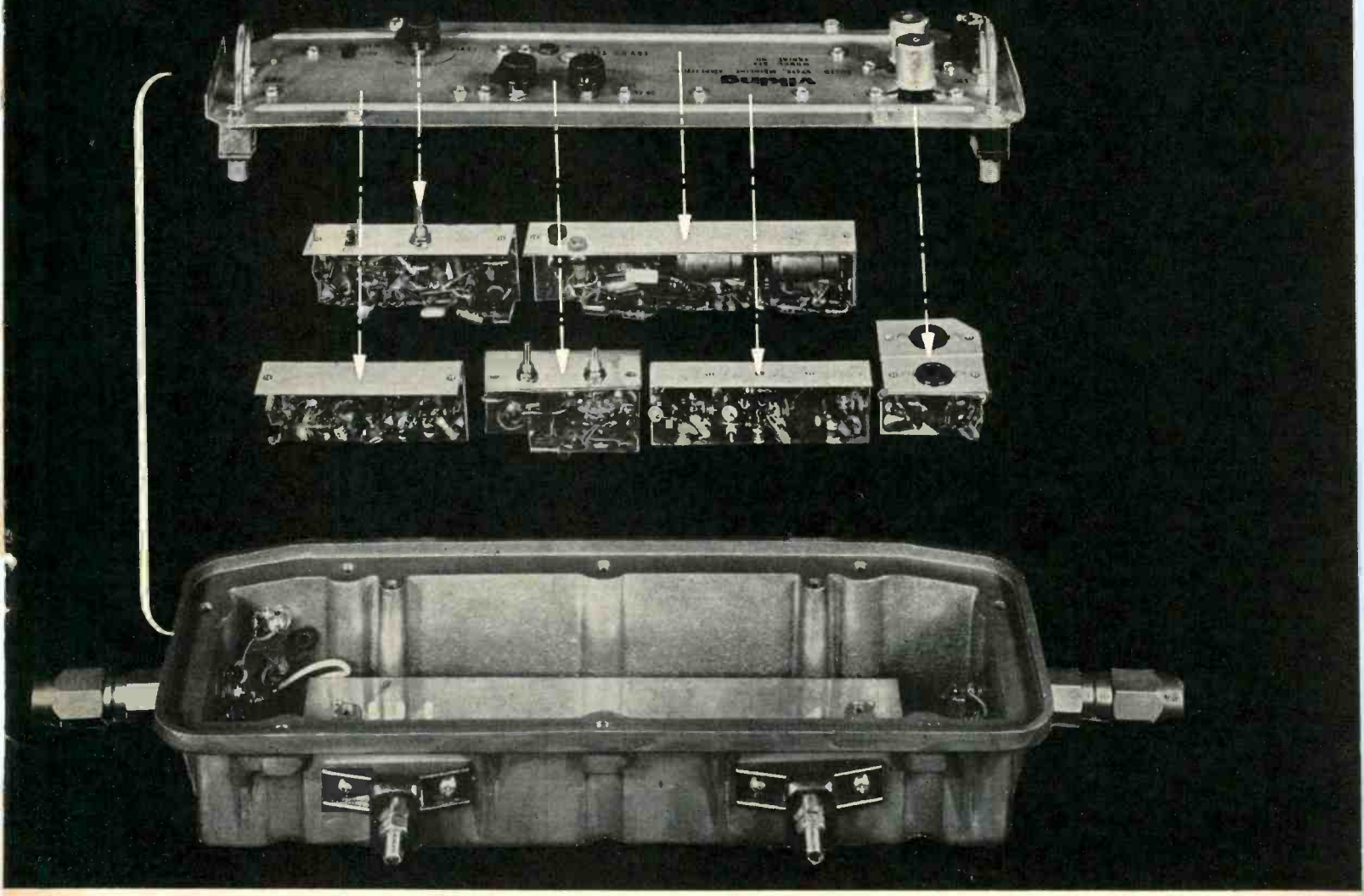
unequaled for performance, versatility and design



Viking's "Goldline Series" of HIGH LEVEL INLINE MODULAR SOLID STATE AMPLIFIERS are the most advanced concept in CATV equipment design. Modular design provides for the simple exchange or upgranding of the internal amplifier components to keep pace with "improved innovations in research and development."

The revolutionary new Viking "Push-Pull" construction allows one man to remove and replace the entire internal amplifier unit without having to unscrew or unsolder terminals nor disturb the weather-proof die cast housing or cable fittings. Viking has brought forth a new dimension of low cost and easy maintenance in Solid-State Amplifier engineering.

The "Goldline Series" provide greater cascadability, higher gain, more output capability, and a lower noise figure than has ever before been available in CATV amplifiers.

For your free catalog "Viking High Level Inline Modular Solid State Amplifiers" write: 830 Monroe Street, Hoboken, New Jersey; or phone collect to: New York (212) WH 3-5793; or Hoboken (201) OL 6-2020.

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APRIL 1966 / VOLUME 2 / NUMBER 4

BM/E

THE MAGAZINE OF
BROADCAST
MANAGEMENT/
ENGINEERING

This month's cover is artist Ed Countey's abstract representation of the 44th Annual NAB Convention. Colorful exhibits, competing for attention, broadcasters scurrying to catch meetings and keep appointments, confidential discussions—with a little imagination you can see them all, and more.

And to help you see more while you're touring the Convention itself, we've again provided you with a handy 16-page pull-out Guide. It's the center section of this issue. We're in Suite 1106A, if there's anything else we can do for you.

MACTIER PUBLISHING CORP., BRYCE GRAY, JR., President
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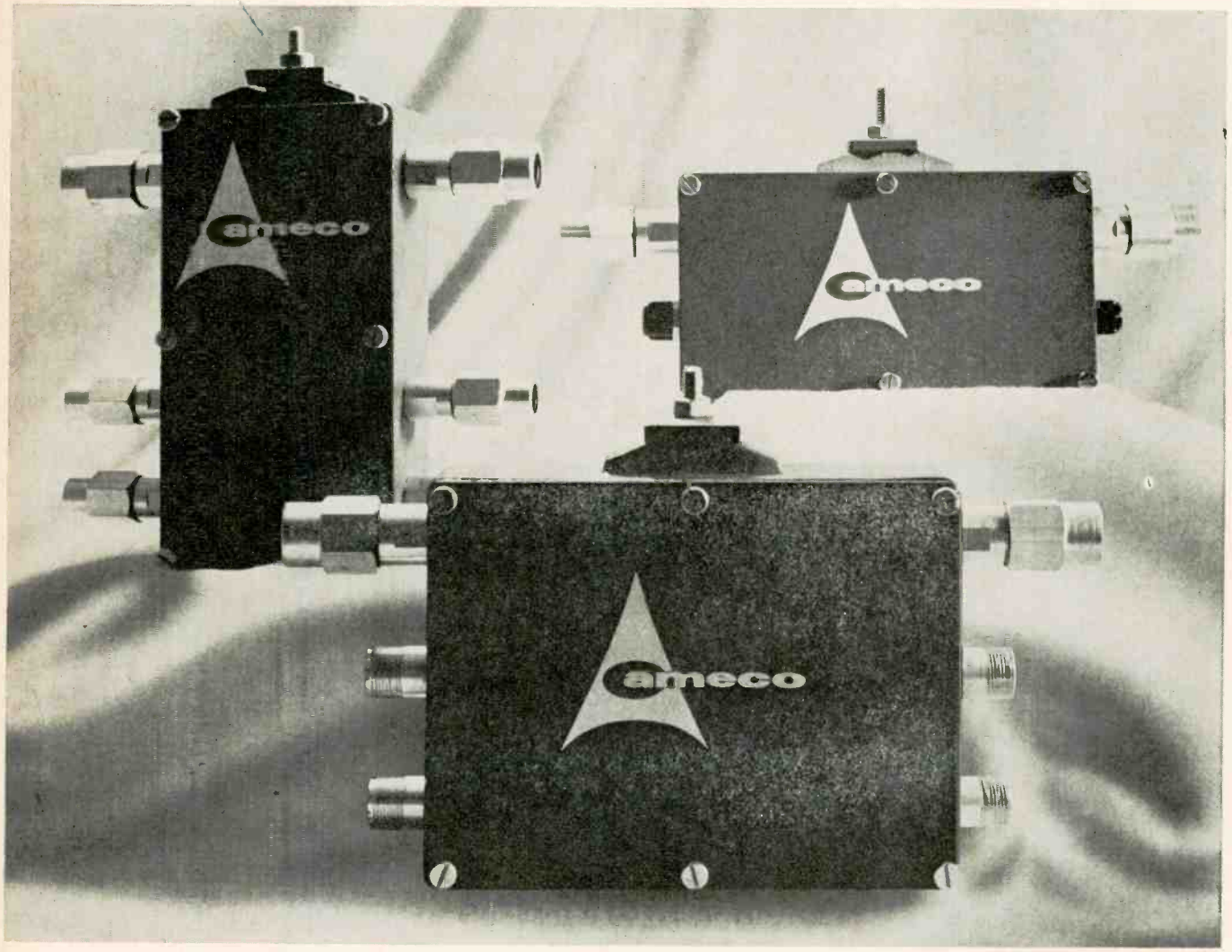

Why wait for unproven amplifiers . . .

when you can count on immediate shipment of Ameco's Performance-Proven 70 Series amplifiers. These units are performance tested in hundreds of CATV systems across the nation and are ready for "off the shelf" delivery. 6,000 Ameco units are now being used in CATV systems throughout the United States and Canada. Is your system ready to make profits? *It can be with Ameco amplifiers!* For immediate delivery — call our sales order department today.

Performance-Proven Products

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OFFICES IN ALL PRINCIPAL CATV AREAS

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BROADCAST INDUSTRY NEWS

FCC Warns of Forfeitures

It appears from a Field Engineering analysis that some standard broadcast station technical violations are on the increase. The analysis compares the last 6 months of fiscal '65 with the same period a year earlier. In view of this, the Commission has instructed the Chief of the Broadcast Bureau to begin isuing Notices of Apparent Liability for repeated or willful violations which may have, in the past, resulted only in the issuance of Violation Notices. Most significant increases were noted in violations of Sections 73.114 and 73.284, maintenance logs; Section 73.47, equipment performance measurements; and Section 73.39, indicating instruments. The Commission has indicated its belief that increased forfeiture assessments will bring about a higher level of compliance by broadcast licensees.

A fleet of TV Antenna Research Lab. vehicles, operated by Blonder-Tongue, Newark, N. J., is cruising the country helping to test UHF/VHF/FM reception, with particular emphasis on new UHF stations. Equipment on the vehicles consists of a 50' crankup tower, rotor, and a complete amplifier and accessory line. Inspecting one of the labs is (left to right) Isaac S. Blonder, Board Chairman; David Rubin, vp Purchasing; Richard B. Heloski, Dir. of Marketing; and Harry A. Gilbert, vp and General Manager.

Remote-Operated UHF-TV Xmitter

WKBS, Burlington, N.J., has become the first TV station to operate an RCA UHF-TV transmitter from a distant location. Transmitter control equipment is located in the Kaiser Broadcasting station's S. Philadelphia studios, approximately 10 miles from an antenna farm in the Roxborough Section. E. N. Luddy, Mgr., RCA Transmitting Equipment Merchandising, said other broadcasters had remotely controlled RCA UHF transmitters from within the same building, but that the WKBS installation marks the first such control from a distant point.

Jack Beasley, pres. of KPLR-TV signs equipment order with Visual Electronics in the presence of James A. Phillips, Visual treas. Observing (l to r) are George H. Wagner, Visual sales mgr; Omer Thompson, gen. mgr. of the new Oklahoma City Channel 14 station; and Linton D. Hargreaves, also of Visual. The order includes Mark 10 I.O. cameras, Allenized VTR systems, video switching system, vidicon film chain with slide and film projectors, a Townsend 30-kw transmitter, Jampro 40-gain zig-zag antenna, studio consoles, and all terminal gear. The station began operation the end of March. BM/E will carry a feature story on this country and western UHF next month.

Color Mobile Units Sold

F&M Systems Co., Dallas, division of Fischbach and Moore, Inc., has received a contract exceeding $1 million from the American Broadcasting Co. to design and fabricate three complete mobile color telecast facilities. Each facility will consist of two 40-foot vans and will be used to originate live color telecasts of sports events, parades, and special on-the-scene news reports. Delivery is expected to be completed this summer.

British Co. Opens U.S. Plant

Eversheld Power Optics, Ltd., Brentford, Middlesex, Eng. has established Power Optics, Inc., with facilities at the James E. Biddle Co. plant, Plymouth Meeting, Pa. The 100,000 sq. ft. Biddle plant has been associated with the parent company for over 60

This is the new FM Volumax.
It prevents FM overmodulation without distortion.
It eliminates SCA crosstalk.
It solves your pre-emphasis problem.

It is yours absolutely free.
(for 30 days)

Overmodulation. An FM station engineer's headache. Use a clipper and you get distortion. Use a common limiter and you get pumping. You could reduce modulation levels. But that's not the answer.

So CBS Laboratories developed something new. A solid state FM limiting device that replaces common limiters and clippers. And it is unconditionally guaranteed to prevent FM overmodulation and SCA crosstalk *without distortion.*

Hard to believe it does everything we say? Just send this page and your station letterhead. We'll send you the FM Volumax free. (For MPX stations we'll send the stereo model.)

Use it 30 days. After that, send it back if you can part with it. We'll even pay the freight. Or keep it for only $695. Double that if you want the stereo model.

AM broadcasters were quick to respond to our free 30-day Audimax and Volumax offer. Now with the new FM Volumax we can make you the same offer. Be the first on *your* band.

CBS LABORATORIES
Stamford, Connecticut. A Division of Columbia Broadcasting System, Inc.

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years and has been manufacturing many of the parent company's products. Power-Optics systems are in use at ABC, CBS, and NBC, and the first Marconi Mark V I.O.s to be exported anywhere in the world, shipped to WFLD Chicago, were equipped with Angenieux zoom lenses and Ever-shed Power-Optics servo drive pan and tilt heads.

SONY up $10 Million

A $10 million sales increase has been predicted for Sony Corp. during 1966. The 30% increase over '65 sales is expected in view of stepped up production and delivery. To meet the rise, Sony has embarked on an expansion move; a $1.5 million building in Long Island City is under construction and will triple facilities in the Metropolitan N.Y.C. area. In addition, regional offices have been established in Chicago and Los Angeles.

Kaiser-Cox Increases Space

Plant facilities will be increased by 28,500 sq. ft. for Kaiser-Cox and Kaiser Aerospace & Electronics, Phoenix, Ariz. A large portion of the new building will be used for production, but will also contain administrative and sales offices, a CATV technician school and system design department.

New CATV Systems

Georgia Cablevision Corp. (80% owned by Cox Cablevision and 20% by an affiliate of a Georgia Theatre Co.) has been granted a permit by the City of Atlanta to build a CATV system. Signal surveys are now being conducted to determine how many channels can be made available. It is hoped that as many as 8 channels, including an educational station and an information channel, can be provided.

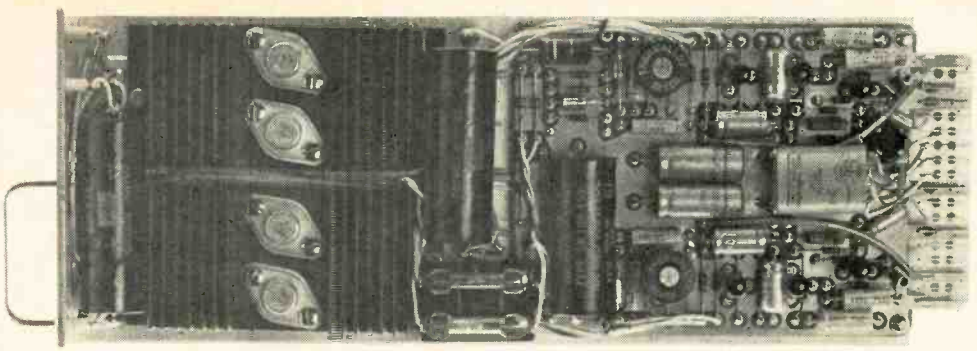
Entron, Inc., Silver Spring, Md., has entered into a $325,000 contract to construct a turnkey CATV system for Pacifica (Cal.) Cable TV Co. The system will have over 65 miles of plant and will carry 7 TV signals and a weather-time information channel. Service is scheduled to begin shortly.

Systems Construction Co., Dallas, a Viking Industries subsidiary, has been awarded a contract to build the Enterprise, Ala., cable TV system. Six channels and a Viking Weatherama information channel will be offered to subscribers. Installation fee will be $10 and monthly service fee will be $5.

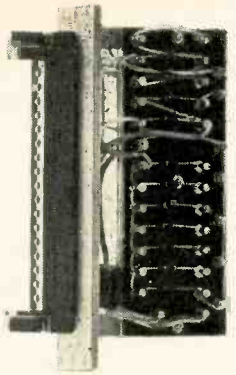
Construction began March 15 on a CATV system at Gettysburg, Pa. Owners Mr. and Mrs. William Warren signed a turnkey contract agreement with Ameco, Inc., for construction of a solid-state system to serve a potential 1,800 subscribers. Plans call for providing seven television channels and a broad-band FM channel.

A 37-mile microwave system installed by Lenkurt Electric Co. provides two-way ETV transmissions between the University of Kansas Medical Center in Kansas City and the campus at Lawrence. Dale Scannell, professor of education and associate dean of the graduate school, is shown conducting a class in statistics at the Lawrence campus. The lecture is also being monitored by a class at the medical center, which is visible on the TV receiver. Because of the need to highlight tiny details in courses such as anatomy, the system transmits a 625-line resolution image.

Mayor Milt Graham breaks ground for the new 30,000 sq. ft. Ameco Cable, Inc., plant in Phoenix, Ariz. As a wholly-owned subsidiary of Ameco, Inc., the new company will produce a complete line of CATV cable including solid-sheath aluminum cable. Newly-appointed president J. R. "Jack" Woods supervises as Ameco prexy Bruce Merrill watches the ceremony.



AA-601 Plug-in Audio Distribution Amplifier Module (with cover removed) — self contained, solid state design. Each module provides up to 6 outputs (60 in a 5¼" frame) at +24 dbm, 600 ohms balanced.



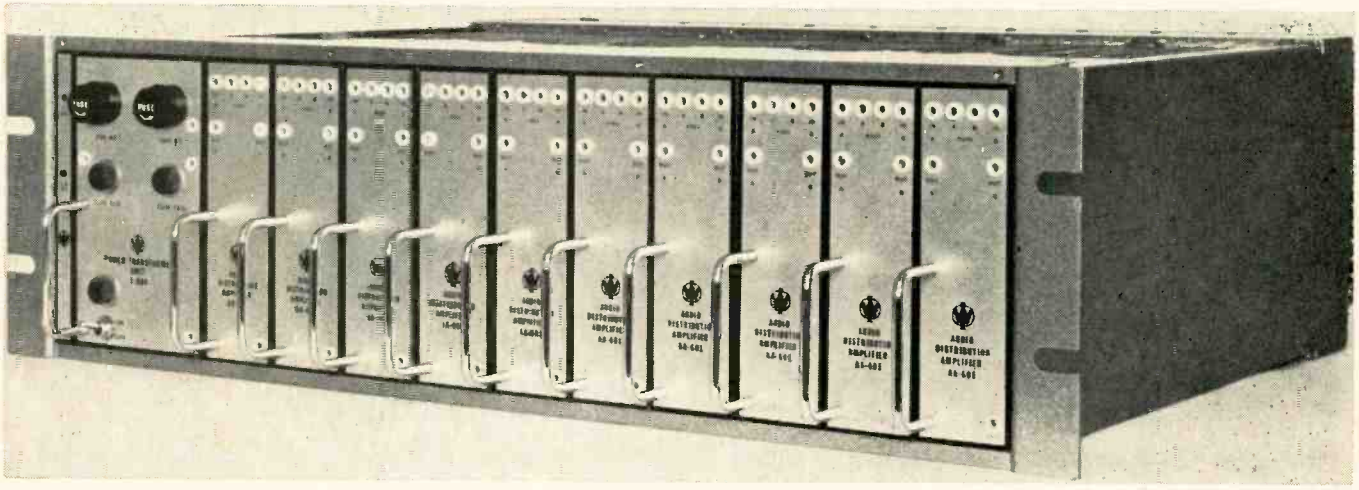
Connector Assembly mounted on rear of rack frame determines input/output configuration and provides all connection terminals needed.

The Audio Equivalent Of A Video Distribution Amplifier—Avoids Cross-Talk – Provides High Quality Performance and On-Air Reliability

AUDIO DA

- HIGH ISOLATION BETWEEN OUTPUTS AVOIDS CROSSTALK — 60 db or better across entire audio band width, balanced or unbalanced.
- ADVANCED, HIGH-RELIABILITY. SOLID-STATE CIRCUITRY — minimizes possibility of failures that interrupt or degrade audio.
- RESPONSE ±0.25 db 30-15,000 CYCLES — less than 0.5% harmonic distortion.
- INPUT MATCHING OR BRIDGING, BALANCED OR UNBALANCED, 600 or 150 OHMS.
- WIDE VARIETY OF OUTPUT NUMBER/IMPEDANCE/LEVEL CONFIGURATIONS AVAILABLE.

Write for literature on this and other WARD Broadcasting Equipment



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NAMES IN THE NEWS

Gerald H. Reese has been appointed advertising manager of Gates Radio, assuming responsibility for advertising, publicity, and sales promotion.

W. B. (Burt) Gore has been appointed national service manager for the Magnecord Div. of Telex.

Two new product divisions have been organized by Ampex Corp. **Thomas E. Davis**, former vp-marketing, has been named general manager of the new audio/visual communications

T.E. Davis

Robert Owen

div. **Robert J. Weisman**, former vp-manufacturing of the video and instrumentation div., has been appointed general manager of the new instrumentation div. **Robert R. Owen**, former national sales manager, moves up to general manager of the marketing div.

Joel P. Smith has been named assistant to **Robert H. Beisswenger**, Pres., The Jerrold Corp. **Elmer W. Metz** will replace Mr. Smith as Manager of the Community Operations Div.

Jack W. Savidge was named marketing manager of 3M Co.'s Magnetic Products Div., according to **Daniel E. Denham**, general sales and mar-

J. W. Savidge

Wm. H. Madden

keting manager. **William H. Madden** has been promoted to national sales manager audio and video tapes.

James A. Landon joins Cox Broadcasting as manager of research, working at the corporate level for all Cox properties. **Doug Talbott** has been named vp of Video service Co., a wholly-owned Cox subsidiary.

Robert W. Louth has been appointed product development manager—education, Commercial Electronics Div. of Sylvania. He will plan and develop electronic education systems.

Sherrill D. Dunn has been named advertising director of Ameco. Mr. Dunn moves up from sales promotion manager.

Continued on page 89

Only complete test equipment line designed especially for 75 ohm cable distribution

finest all solid-state all-channel sweep generator on the market

U/V sweep generator, model 4122

Solid-state. Has two switch-selected electronically swept ranges: entire UHF TV spectrum (470 to 890 mc); entire VHF TV spectrum including subchannels (20 to 240 mc).

Sweep widths are continuously variable from 5 mc to the entire VHF or UHF range in one sweep. Center frequency can be tuned across the complete band on each range regardless of the sweep width setting. An output level attenuator is adjustable over a 60 db range. Automatic Level Control (ALC) on both ranges assures constant output. Fully regulated power supply for stable operation.

The sweep oscillator is varacter tuned (no moving parts) for silent operation and long life. For VHF output the UHF sweep is mixed with a fixed oscillator signal at 900 mc and the resultant difference signal is amplified and level controlled to cover the complete VHF TV spectrum.

The horizontal sweep rate of 60 cps, derived from the power line, is available as a sine wave at the front panel for connection to the oscilloscope. Use of the sine-wave horizontal permits oscilloscopes to be fed by available local line voltage for summation sweeps of large distribution systems.

UHF sweep generator, model 4114

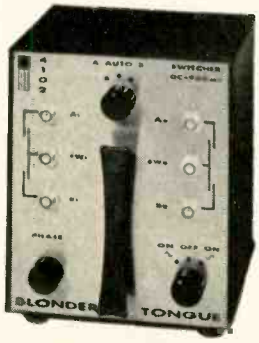
Same quality features as the Blonder-Tongue 4122 UHF/VHF Sweep Generator but covers range of 470 to 890 mc only.

only all-channel field strength meter in a single unit

UHF/VHF field strength meter, FSM-2

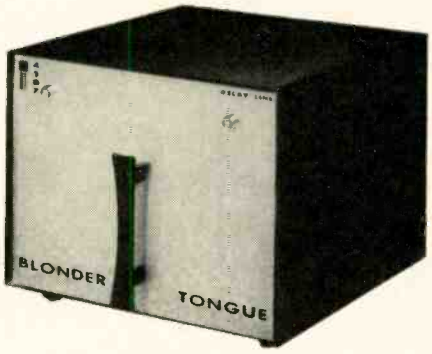
Solid-state superheterodyne circuitry. Accurate enough for the lab. Portable enough for field work. Instantly convertible from VHF to UHF with the flip of a switch. Measures RF signals at 75 ohm impedance (VHF/UHF balun supplied for 300 ohm measurements) in two ranges: VHF (52 to 216 mc) and UHF (470 to 890 mc). Sensitivity variable from 100 microvolts to 3v. for full scale meter deflection. Reads both average and peak level. AC line or integral battery operation. Fully regulated power supply. Indispensible for field strength surveys, MATV/CATV system maintenance, loss and gain measurements and percent modulation tests. Precise amplifier gain and attenuation measurements.

RF switcher (dc to 900 mc) 4102



Electronically-actuated, high-speed switch, solid-state, permits two signal tracings to be simultaneously displayed on an oscilloscope, either superimposed or alternately, at the rate of 30 cps. Either tracing can be seen independently for making direct, immediate comparisons between input and output voltages of any circuit under test for precisely measuring VSWR, amplifier gain, or attenuation and other applications involving equipment performance evaluation against given standards. Provision for 360 degree phase adjustments.

Delay line (dc to 900 mc) 4107



Compact and portable, fully shielded, precision 75 ohm coax delay line for use as a match cable for impedance measurements and other laboratory applications where a standard cable of superior quality is required. Designed primarily for use in conjunction with the Blonder-Tongue 4102 RF switcher, this delay line provides an accurate impedance standard to make fast and precise VSWR measurements over a very wide bandwidth. Designed to be one half wave length at 5 mc, the line allows convenient measurement of bandwidth, sweep width and sweep linearity.

Blonder-Tongue offers a complete line of color-approved products for CATV: Amplifiers (trunk line distributed, high output, single-channel and broad band); converters (crystal-controlled); accessories (Tap-offs, splitters, mixers, matching transformers) and the famous "Stinger" pressure taps. For details write.

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CAS Combines Reliability with Competitive prices for your best buy in CATV equipment

Whether you are building, modernizing or extending a CATV system, your best combination of reliability and price is CAS performance-proved solid state CATV equipment. Low initial cost keeps your installation expenses down . . . high unit reliability keeps your profits up!

New Low Prices for CATV "System Operators"

Write today for this *CATV Systems and Accessories* brochure. It contains special new "system operator" prices, operating specifications and descriptions of the full line of CAS products.

CAS reliability costs no more!

You can be "reliability conscious and cost wise" when you depend on CAS for your CATV equipment. Competitively priced, it functions reliably regardless of environmental conditions . . . cuts maintenance costs, reduces system downtime and keeps subscribers happy!

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INTERPRETING THE

FCC RULES & REGULATIONS

Changing and Correcting Logs

For many years the broadcast industry lived with logging requirements, particularly for program logs, that were completely out of step with industry practice. In particular, the now extinct Section 73.111 (c) placed a heavy burden on licensees and applied without distinction to program, operating and maintenance logs:

☐ No log or portion thereof shall be erased, obliterated, or willfully destroyed within the period of retention provided by the provisions of this part. **Any necessary correction may be made only by the person originating the entry** who shall strike out the erroneous portion, initial the correction made, and indicate the date of the correction.

The old Section 73.111(c) did not clearly define "the person making the originating entry." Some argued it meant only the person preparing the "pre-log." Others asserted it referred to the announcer on duty. In any event, according to the old rule, no one else could correct the logs.

As a practical matter, the industry virtually ignored the rule for years. The equities and common sense dictated that, to assure accuracy on the logs, corrections could not be limited to the typist or announcer. So, after years of justified abuse, the rule was amended to adjust to the times. On January 12, 1966, the Commission adopted revised requirements (FCC 65-40) pertaining to methods used for changing and correcting logs. The revisions affected AM, FM, and TV log maintenance, and the effective date was February 21, 1966. The Notice of Proposed Rule Making was released on May 10, 1965. A total of nineteen comments were filed in the proceeding, including statements by the NAB, two of the major networks, and a variety of multiple owners.

The sections of the rules first quoted below refer to all broadcast services (AM, FM, Educational TV and TV); however, the content of each rule and the discussion and citations thereafter refer specifically to the AM sections. Nevertheless, the same changes and amendments apply to the corresponding sections of the rules for FM and TV.

The New Rules

☐ **Section 73.111 General requirements relating to logs.**

(a) The licensee or permittee of each standard broadcast station shall maintain program, operating, and maintenance logs as set forth in Sections 73.112, 73.113 and 73.114. Each log shall be kept by the station employee or employees (or contract operator) competent to do so, having actual knowledge of the facts required, who in the case of program and operating logs shall sign the appropriate log when starting duty, and again when going off duty.

"An Employee Competent To Do So"

On several occasions, questions have been raised as to whether or not someone other than an employee of the station was considered "competent" to keep a program log under this paragraph. The Commission decided—and the new rule so provides—that, *with the exception of contract operators under Section 73.93* (applicable

Summary

(1) The revised sections of the Rules now permit correction or changes of logs *by anyone prior to broadcast,* provided the operator keeping the log initials all such corrections. Additional information need not be initialed.

(2) The making of changes or additions to the logs *after* the operator has signed the logs and gone off duty are limited. *There must be a written explanation*; however, rather than require a separate memorandum, an explanatory statement may be placed *on the log.* Additionally, the *explanation must be signed and dated either by the person who keeps the log, the station program director or manager, or an officer of the licensee.*

(3) Except as stated in paragraph (4) below, no obliterations shall be allowed.

(4) *The limitations as to log changes apply only to matters required by the Commission.* Internal matters of interest only to the station may be obliterated, changed, or added at any time without complying with the limitations set forth in the revised Rules.

(5) Except for contract operators allowed under Section 73.93 for low power non-directional AM stations, the person keeping the log must be a station employee.

(6) The recording of information in rough form for later transcription to a finished program log is not allowed; however, it is allowable for operating and maintenance logs.

(7) *Program and operating logs* must be signed and dated by the operator at the beginning and termination of his tour of duty. *Maintenance logs* need be signed and dated by the inspecting operator only at the conclusion of each inspection.

(8) Daily tower light inspections must be entered in the operating log.

(9) *Automatic program logging* is permitted but is still subject to further rule making. Those using automatic devices are still under a continuing obligation to furnish all the information required to be logged.

to non-directional low power AM stations), *the person or persons keeping the log must be station employees.* In addition, since maintenance inspections are not correlated to tours of duty, the Commission determined that the requirement for signing the log—when starting duty and again when going off duty—is appropriate in the case of program and operating logs, but not in the case of maintenance logs. This difference has been recognized in the new paragraph as adopted, as well as in the appropriate paragraph under Section 73.114.

☐ **73.111(c) Obliteration.** No log or preprinted log or schedule which becomes a log, or portion thereof, shall be erased, obliterated, or willfully destroyed within the period of retention [two years] provided by the provisions of this part. Any necessary correction shall be made only pursuant to Sections 73.112, 73.113 and 73.114, and only by striking out the erroneous portion, or by making a corrective explanation on the log or attachment to it as provided in those sections.

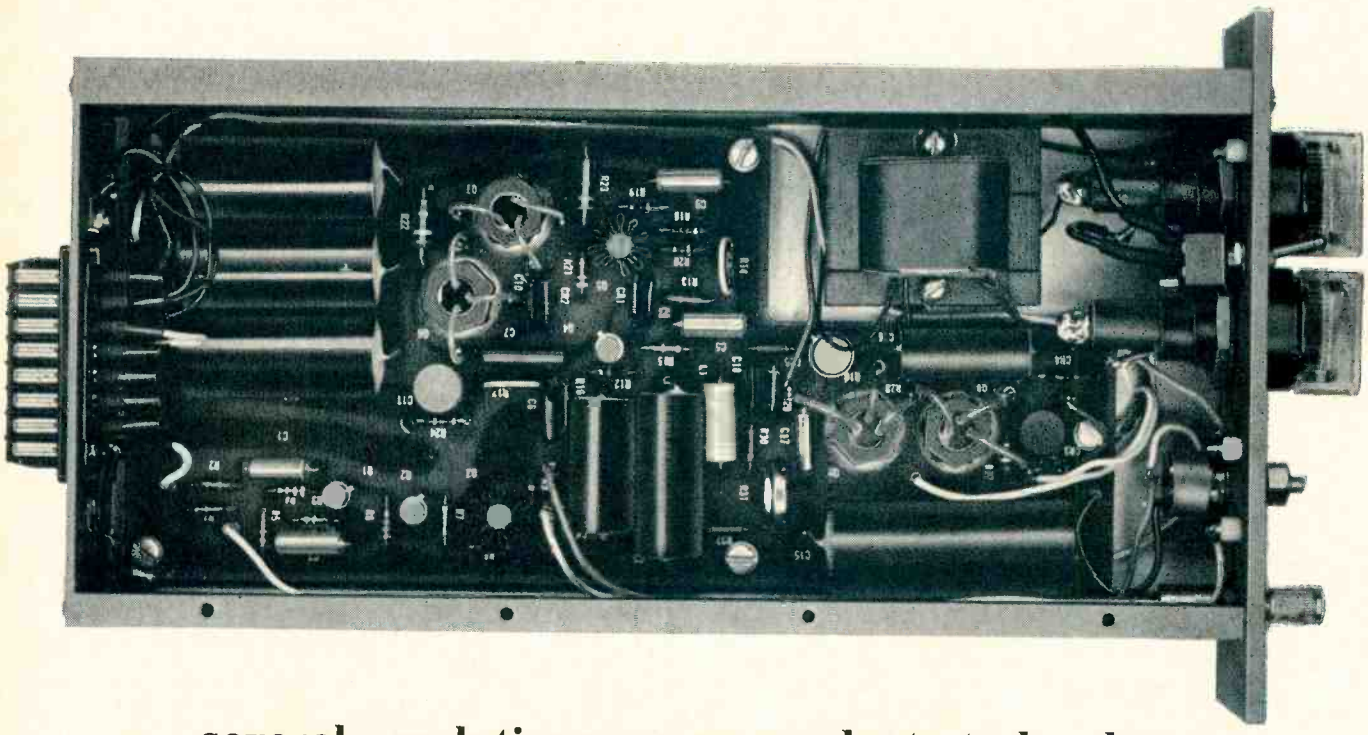
The Commission has been concerned about the practice of obliteration of entries on program schedules which upon completion become program logs. It believes that such a practice is clearly in conflict with its interpretation of the logging rules in *Triad Television Corp. et al.*, 25 FCC 848 (1958). *The clear intent of the prohibition against obliteration is that none should appear on a log, irrespective of when made.* Consequently, it amended this paragraph so that it specifically refers not only to logs, but to preprinted logs and schedules which eventually become logs, as well. However, the Commission adopted more liberal provisions with regard to program logs as evidenced by the last sentence of Section 73.111(c), above.

Additional Log Data Not Required By FCC

☐ **73.111(d)** Entries shall be made in the logs as required by Sections 73.112, 73.113 and 73.114. Additional information such as that needed for billing purposes or for the cueing of automatic equipment may be entered on the logs. Such additional information, so entered, shall not be subject to the restrictions and limitations in the Commission's Rules on the making of corrections and changes in logs.

As explained in the Notice of Proposed Rule Making, the provision for the recording of information in rough form and later transcribing it to a final log is neither necessary nor appropriate to the program log. Therefore, it has been removed from this general section and instead added to the specific sections dealing with operating and maintenance logs. Consequently, the original paragraph (d) of Section 71.111 has been deleted. However, many of the comments pointed out that *there is often information on a station's logs, particularly program logs, which is not required by the Commission* but which is there for the convenience of the station staff. Typical of such information is billing data and, for example, the notification of cues for automatic equipment. The Commission, consequently, adopted a new paragraph (d) to Section 73.111 *sanctioning the inclusion of extraneous information on the logs and excluding such information*

DYNAIR does it AGAIN!



...several revolutionary new products to be shown for the FIRST time at the 1966 NAB convention!

Yes, DYNAIR — as usual — is setting the pace when it comes to TV accessory equipment. We look for a need and then fill it; it's the secret of our success! Our latest equipment, to be demonstrated at NAB, consists of:

Sideband Analyzer. A low-cost, solid-state TV sideband analyzer which is very compact and operates on all VHF channels. This device is ideal for both the broadcaster and the CATV operator.

AGC Amplifier. A solid-state modular TV AGC amplifier with self-contained power supply.

Sync Delay Unit. A solid-state modular device which allows sync to be delayed up to 91 μSEC. Adjustable in .1 μSEC increments with front panel controls!

Video and Pulse DA's. Solid-state modular DA's with built-in power supply. These are the amplifiers the broadcaster has been waiting for.

Along with these, we will also demonstrate our BU-1029A Balanced Universal Amplifier — the inexpensive hum-cancelling device you've been hearing so much about — and our TX-4A Solid-State Audio/Video Modulator, TX-1B Audio/Video Modulator and the RX-4A Solid-State TV Tuner.

Don't miss us. We'll be in booth 211 at the NAB convention, Chicago Hilton Hotel, March 27 thru 30.

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DYNAIR ELECTRONICS, INC. SAN DIEGO, CALIFORNIA

Circle 14 on Reader Service Card

from the limitations and restrictions proposed by this and the succeeding sections.

Procedures For Correcting Program Logs

☐ **73.112(d) Program Log.** Program logs shall be changed or corrected only in the manner prescribed.

(1) **Manually kept log.** Where, in any program log, or preprinted program log, or program schedule which upon completion is used as a program log, a correction is made before the person keeping the log has signed the log upon going off duty, such correction, no matter by whom made, shall be initialed by the person keeping the log prior to his signing of the log when going off duty, as attesting to the fact that the log as corrected is an accurate representation of what was broadcast. If corrections or additions are made on the log after it has been so signed, explanation must be made on the log or on an attachment to it, dated and signed by either the person who kept the log, the station program director or manager, or an officer of the licensee.

The majority of comments filed opposed the amended paragraph (1) to the extent that it prohibits corrections or changes on the log after the operator has signed the log when going off duty, and requires that any subsequent corrective explanations be made the subject of a separate memorandum.

The arguments were persuasive that the proposed separate memoranda would be a burden, and, consequently, the Commission departed from the original proposal and adopted a provision which would permit corrective explanations to be made on the log. *However, it provided that they be dated and signed by either the person who kept the log, the station program director or manager, or an officer of the licensee. At the* same time, the Commission stressed that the log keeper must make every effort to see that the program log is accurate before signing the log when going off duty.

In this connection, it should be noted that another licensee expressed the opinion that the *interpolation of additional information (as contrasted with crossed out information) on a program log is not a "correction" and need not be initialed by anyone.* The Commission agreed with regard to the schedule or log until the time it is signed by the operator when going off duty. *However, additions made after the log has been signed by the operator when going off duty shall be subject to the same restrictions as any correction. This is specifically provided for in Paragraph 73.112 (d) (1).*

Operating Logs

☐ **73.113(1) Manually kept log.** Any necessary corrections in a manually kept operating log shall be made only by the person making the original entry who shall make and initial each correction prior to signing the log when going off duty in accordance with Section 73.111(a). If corrections or additions are made on the log after it has been so signed, explanation must be made on the log or on an attachment to it, dated and signed by either the operator who kept the log, the station technical supervisor or an officer of the licensee.

☐ **73.113(2) Automatic Logging.** No automatically kept operating log shall be altered in any way after entries have been recorded. Any errors or omissions found in an automatically kept operating log shall be

noted and explained in a memorandum signed by the operator on duty (who, under the provisions of paragraph (b) (7) of this section, is required to inspect the automatic equipment), or by the station technical supervisor or an officer of the licensee. Such memorandum shall be affixed to the original log in question.

One of the telling arguments in the comments against the requirement of a separate memorandum (in the case of errors found in the program log after the log has been signed) was that the effect of placing such a burden on the licensee would be to tempt the log keeper to violate the rule by merely making a correction and initialing it after he had signed the log. The Commission believed that a similar provision in the operating log rule would have a similar result. Consequently, it relaxed the requirement of paragraph (d) of Section 73.113 in a manner similar to the relaxation of the comparable provision in the programming log. Additionally, to clarify further the requirement set forth in Section 73.111(a) (that the operating log shall be kept by the person competent to do so who has actual knowledge of the facts required), the Commission stated that the rule clearly means that the operating log may be maintained only by the properly licensed operator in actual charge of the transmitting apparatus. Also, a new sub-paragraph (a) (6) concerning daily tower light inspections, as discussed below, was added.

Maintenance Log

As noted in the discussion of Section 73.111-(a), since maintenance inspections are not correlated to tours of duty in the same sense as are the keeping of program and operating logs, the Commission decided that the requirement for signing the log when starting duty and again when going off duty was inappropriate in the case of maintenance logs. Consequently, in that paragraph, the requirements for signing of logs were limited to the program and operating logs. Therefore, the Commission added to paragraph (b) of the amended Section 73.114 a requirement that the inspecting operator sign and date the maintenance log at the conclusion of each inspection.

Tower Light Inspections

Present Section 73.114(c), which the Notice proposed to re-designate as 73.114(a) (3) without other change, requires an entry in the maintenance log of tower light inspections as required by Section 17.38, thus requiring an entry in that log of daily inspections (17.38(a) and (b)) as well as tri-monthly inspections (17.38(d)). One party suggested that the operating log, rather than the maintenance log, might be the appropriate place for entries required by Section 17.38 (a), (b), and (c); also, they should be included among the entries listed in Section 73.113, with a proviso that they may be listed, if desired, in the maintenance log instead of the operating log. The Commission agreed and, accordingly, added a new sub-paragraph (a) (6) to Section 73.113 requiring their entry therein. However, the proviso giving an option was not adopted. Daily tower light inspections are required and the operating log is a daily log, whereas the maintenance log is not. ●

WKLS—Georgia's 1st FM—Only Station

By Don Kennedy

Using automated programming and a large measure of "horse sense," WKLS has made a success of an independent FM operation.

IN 1960, THERE were only a few FM stations enjoying any measure of financial success, except those tagging along on the skirts of a successful AM sister. This gloomy outlook did not, however, deter the establishment of WKLS. On December 2, 1960, WKLS became Georgia's first independent commercial FM outlet.

When WKLS went on the air, Atlanta's FM programming was haphazard. There were no independent FM stations, with the exception of an educational FM. The others duplicated their AM rock n' roll and network broadcasts. Our initial programming consisted of a limited number of tasteful commercials, easy-listening instrumental music, and adult-slanted programs.

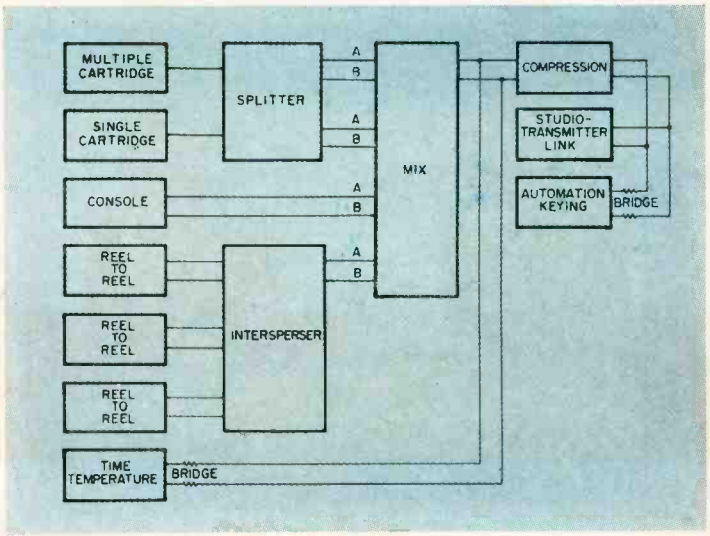
During the past 5 years, WKLS has grown from a 6350-watt monaural fledgling to a maximum power stereo outlet with dual antenna polarization. WKLS was the first FM station in Atlanta to limit the number of commercials each hour, the first FM station to play mostly instrumental music, the first to feature a weekly Broadway Show, the first to present a full 4 hours of dance band music on Saturday night, and the first to broadcast in stereo. On Nov. 11, 1965 WKLS began broadcasting with 100,000 watts horizontal and 100,000 watts vertical, to become the first

Continued on page 23

Mr. Kennedy is general manager, WKLS Atlanta, Ga.

For dual polarization, the Jampro 8-bay vertically-polarized antenna was mounted beneath the existing 8-bay horizontally polarized antenna on the 270' tower.

Georgia's Governor, Carl Sanders, delivering congratulatory remarks during WKLS dedication. Sales Manager Jim Lathom is at right, Manager Don Kennedy at left.



Block diagram of the WKLS automated programming equipment setup.

Atlanta FM station to make use of the new twin antenna idea using present maximum allowable FM radiated power in two different planes.

Certainly the ideas used by WKLS were not new or unusual for FM. The fact is, many of the nation's successful FM operations were visited, and techniques and ideas were borrowed from various operations in different parts of the nation.

Programming

In 1960, FM radio in Atlanta was simply a duplication of AM programming, except one which carried classical music. It was our feeling that we should appeal to the large middle segment of the audience—the general area between rock n' roll and classical. We further reasoned that there were persons at each end of the music lover's spectrum who could be wooed away to middle-of-the-road type music at least part of the time. Then, too, since we were the lone FM-only service, we knew that we were destined to make our program service fairly general, with, perhaps, later specialization to reach particular audience segments.

Our decision to make our programming all-instrumental, with the exception of special shows, was a result of this thinking. Many persons may be thrilled when, say, Frank Sinatra sings; others may detest him. We simply decided to avoid this choice. Cowardice, maybe . . . but remember, we had to reach a maximum number of a very small potential audience at that time. Since most of our potential audience would be in their late twenties, thirties or forties, we planned to liberally sprinkle our programming with big-band music of the '30s and '40s, mixing this with standards by Percy Faith, Montovani, Andre Kostelanetz, etc., plus bright little groups and some novelty music to inject the "pepper" to what would otherwise be a bland dish.

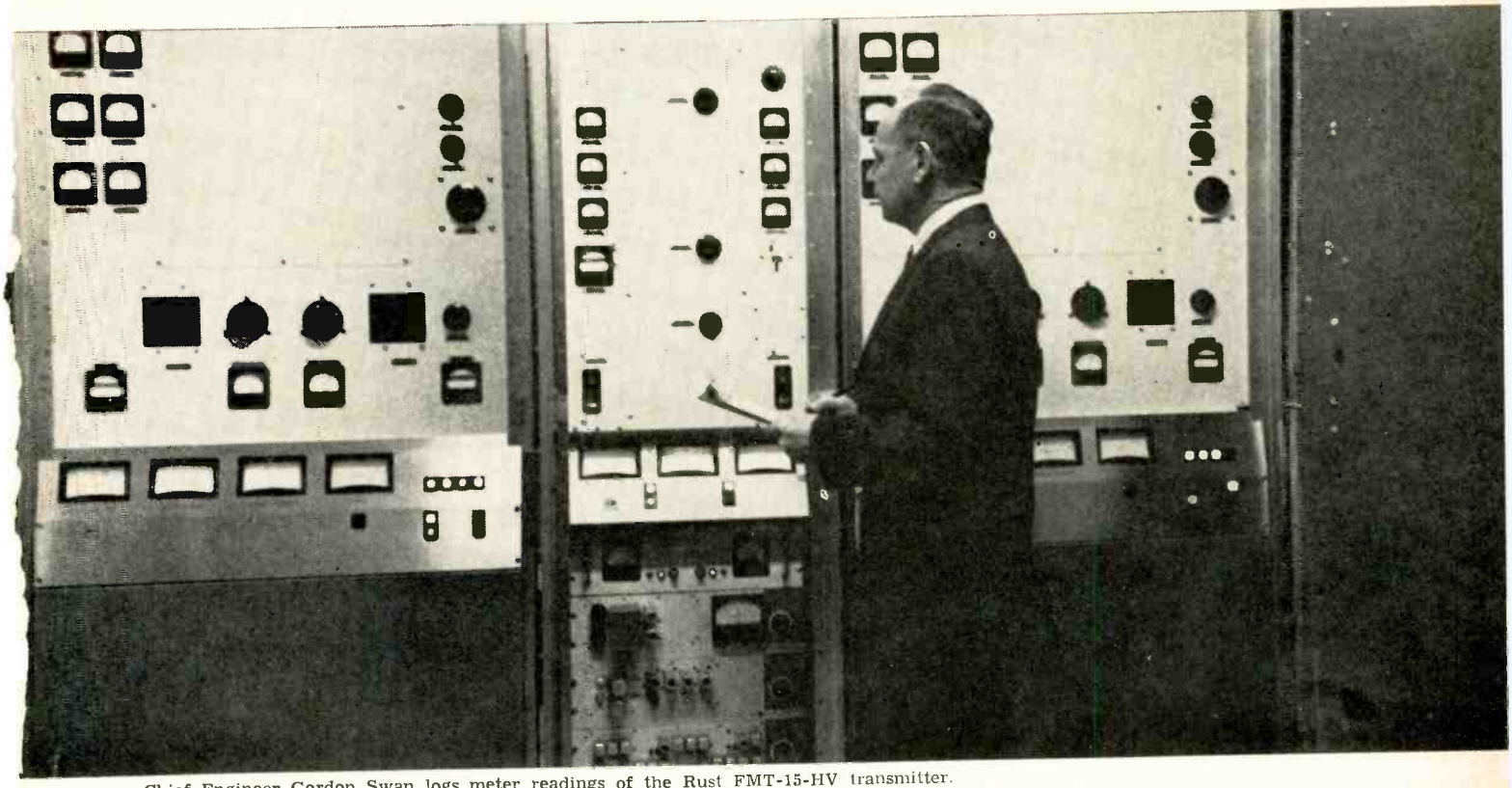
Only three of us would be operating the station 17 hours a day at the outset; therefore, it was imperative that we automate. Even though one of us *had* to be there, we could be doing double duty—recording music, making announce tapes, keeping the books, phoning prospects, or typing letters—while the station ran itself. For economy plus consistency, all the music was recorded from discs onto tapes for use in our self-designed automation system.

Music was selected for its general appeal following the guidelines previously outlined, then split into fast and slow tunes. All slow music was recorded on one set of tapes, while fast music, including novelty tunes, marches, up-beat dance band tunes, and small combo music was recorded on another set of tapes. We began with a meager library of about 60 hours of slow music and half that much fast music, adding as we went and eventually building a fine set of tapes.

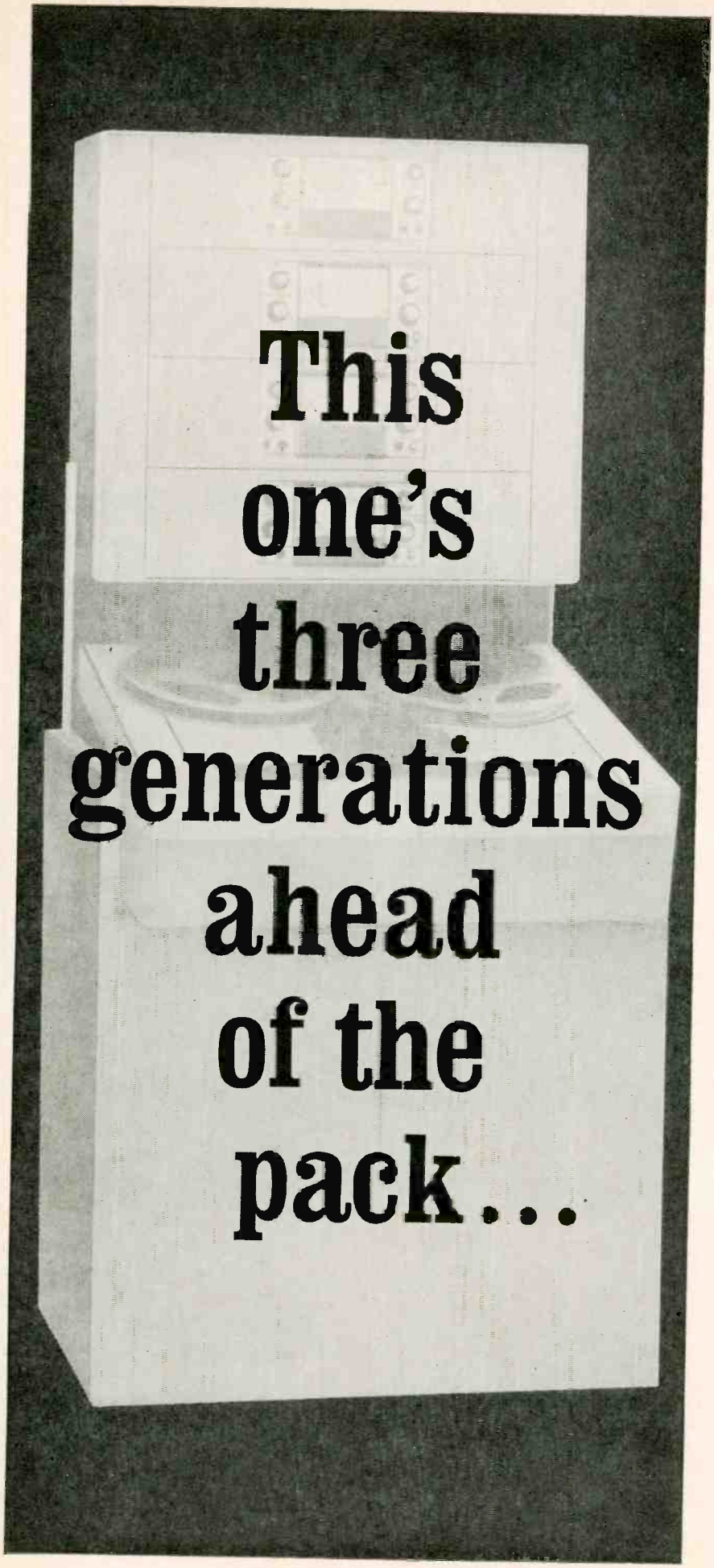
In the morning from 7 to 9 we programmed one fast and one slow tune (wakeup-type music). From 9 to 12 a ratio of three slow to one fast were used; at lunch, dinner time and late evening we stayed with slow music. At most other times three slow and one fast are used. This tempo balance has changed somewhat from time to time, but regardless of our desires or listener demand, we've been able to control the general overall tempo and "feel" of our programming at different times using the same system and taking advantage of *all* our music. We can use old or new tapes and still carefully control the music, selecting the ratio needed at any particular hour. It's a system that's worked out well for us.

We do deviate from our general format by using Broadway Show or sound-track albums on a Wed-

Continued on page 26



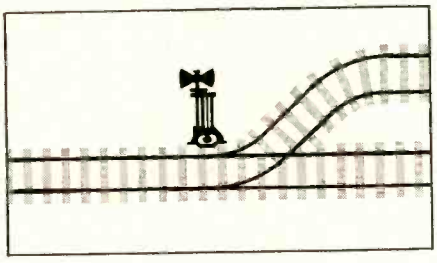
Chief Engineer Gordon Swan logs meter readings of the Rust FMT-15-HV transmitter. Twin 15-kw final amplifiers feed separate transmission lines.



Because the new 3M Professional Tape Recorder, through its "Dynatrack" mastering system, has increased signal-to-noise ratio 15 db. So its third generation dub is the equal of anyone else's master! What's more, it makes a 10 or more decibel difference in measurable noise on your finest LP pressings, whether Bach or one of the noisier moderns. . . . And because, for a while the supply will be somewhat limited, we've tried to keep it secret, but perhaps you've heard rumors about this extraordinary innovation in recording-playback instruments. Those who *have* heard it rub their ears and say we've succeeded listenably well. When you *do* have a demo you needn't plug in the oscilloscope — this difference you *hear!*

It is true that 3M's new Recorder is quieter than both the Rolls Royce and the Ford — not to mention any and all tape recorders on the market today. And it *is* true that it incorporates two radically new electronic and mechanical principles. If you were expecting a Big Blast — sorry! May we suggest you read on quietly, critically, yet we hope with mounting excitement about the new 3M Professional Tape Recorder? . . .

15db more dynamic range is yours with the new 3M Professional Tape Recorder. Or to give you the whole bit: this recorder's unique two-track technique extends the weighted dynamic range of audio tape systems to at least 80 db below third harmonic distortion. *This is another way of saying our third generation dub equals anybody else's master.*

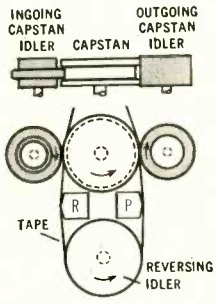


Always a clear track. You're always on a virtually distortion-free track (less than 1% harmonic distortion) with this new 3M Recorder. A single signal is recorded simultaneously on two separate tracks. One track is recorded at normal NAB level, the other at a higher level. When these tracks are played back they will approach distortion at different times due to the difference in recording levels.

The high or "H" track, recorded at normal (NAB standard) level, handles the higher level signals. The low or "L" track has a pre-emphasized higher level signal – high frequencies as much as 15 db more, to better record lower sound levels.

On very soft sounds usually lost when recording at NAB levels, the low or "L" track puts out a clean, undistorted signal. However, when the low or "L" track approaches distortion, an automatic circuit anticipates and switches to the high or "H" track – noiselessly and in milliseconds. The reserve volume capability of the "H" track thereby provides an extension of the dynamic range.

Flutter tamed by 3M "Isoloop". The "Isoloop" system on the new 3M Recorder has the lowest flutter of any recorder ever built in the audio field! It's a closed loop system, in itself unusual. And what *is* really unique is control of the "Isoloop" by a differential capstan that generates and keeps tape tension constant within the loop (using techniques first developed by 3M for telemetering instrumentation recorders). This tight, closed loop around the tape heads isolates tape passing over them from the rest of the tape transport. The tape path in the loop is very short. Unsupported tape is reduced to 3½ inches. Less tape free to shimmy and shake over the heads! Result of this nonsense tape support: a flutter rate that would discourage a butterfly – considerably less than that produced by ordinary professional recorders. Complete elimination of compliance arms, filters, etc.



Complete NAB compatibility. Yes, your present pre-recorded tapes *will* play with new brilliance on the 3M Recorder. You can also record standard tapes, to be played on ordinary (NAB-standard) machines. Conversion from the expanded range of the new 3M Professional Tape Recorder to conventional NAB recording is fast. Just change 2 plug-in circuit boards in the front panel.

Does it have everything? Every big and little thing we could think of to make this *the* Recorder that advances the "state of the recording art". Recording amplitude linearization for further reduction of harmonic distortion. Phase correction for dub after dub of crisp, clean sound. Silicon solid-state circuitry. Modular electronics. Epoxy glass circuit boards. Overdub sync is available. Photoelectric tape position sensing. Interlock safety tape control – go directly from "fast forward" or "rewind" into "play". Automatic tape lifters for rewind. Impossible to snap, break, spill or stretch tapes. Precision tape splice locating, marking. Construction: only finest American parts.

Availabilities: the complete Console, pictured at the left. Truly portable units complete in two shock-mounted carrying cases. You may purchase the track-switching electronics, or the "Isoloop" tape transport separately.

Any questions? For the full story on the 3M Professional Recorder, please fill out the coupon below. A descriptive brochure will follow.

(NAB Compatibility, too!)

3M Company, Revere-Mincom Division
Attention: Norman G. Lyall, Sales Manager
2501 Hudson Road, St. Paul, Minn. 55119

Tell me more about the 3M Professional Tape Recorder. Especially interested in this use: _____

My name _____

Company _____

Title _____

Address _____

City _____

State _____ Zip _____

Revere-Mincom 3M COMPANY

3M COMPANY

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nesday night program. Saturday Dance Date runs on Saturday from 8 until midnight, featuring names of the big-band era in half-hour segments. The morning program features weather every 10 minutes and time-temperature every 3 minutes. Three editorials, clipped from different newspapers, are broadcast at 12:30, 6:30, and 11:30 PM. Weather reports are programmed every hour. Total number of announcements are held to six per hour, with no double spotting.

On-Air Image

Many stations install elaborate equipment to insure the finest sound, purchase the finest music libraries, and program outstanding music—then hire green high-school kids to announce. A station's total image is carried by its announcers. Anyone can play records, but the announcers carry the station message into the home. They must be professional. We couldn't afford to hire fine staff announcers, so we did the next best thing. We brought in the finest available local men on talent fee to tape many station breaks and promotional announcements. They had to be pleasingly presented, with reasonably slow pace and professional phrasing. We think it's paid off.

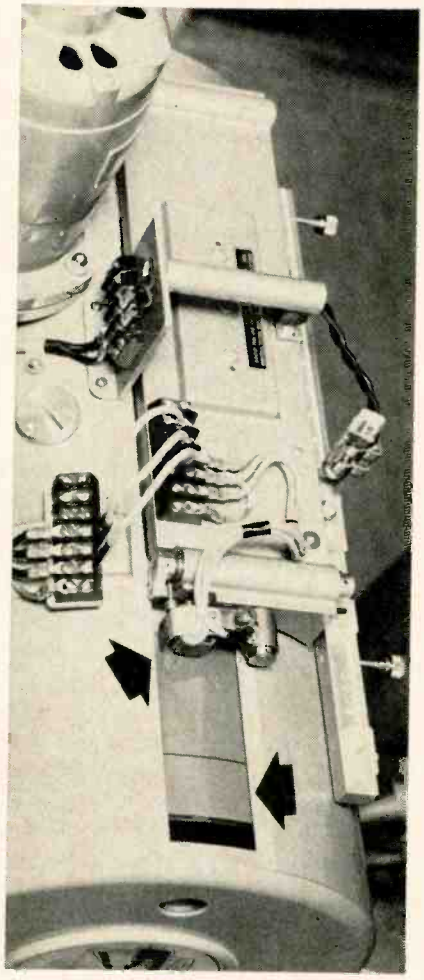
One other consideration: music was recorded on tape with 10 seconds silence between tunes to give the station a slow, easy-going pace. This pointed up the difference between us and the frantic AM programming. No jumping cues or snappy play-offs, but relaxed, adult presentation of both music and announcements. We had no objection to selling our sponsor's products, but strived to do it in an adult fashion.

Finally, we decided to omit news because it is so well covered on many other stations in Atlanta. We couldn't do better than one of the big AM stations with the finest news staff in the state. Of course, this decision also saved us some money.

WKLS Engineering

In the beginning money was a vital factor (as is usually the case). We reasoned that power wasn't of top importance because we were offering a somewhat exclusive service, and listeners would come to us. This was true at the time. Antenna height was important in order to reach as many potential listeners as possible, so we placed our equipment on a hill near Atlanta. It was more economical, anyway, to buy a hilltop lot in a rural area than to build that much steel downtown. We used a 1-kw transmitter and an 8-bay antenna mounted on a 270-foot tower, resulting in an ERP of 6.35 kw and a radiation center of 510′.

For economy, the WKLS studio was located in the transmitter building, a frame structure housing a cement block studio to assure good sound-proofing. The studio window looked directly out on the automation system so the man on duty could be recording or making announce tapes and still see the equipment in operation.



Top view of time-temperature machine. Time drum is shown uncovered, with the head (left arrow) just completing a time announcement cycle. Small part of drum (right arrow) has 12-hour tracks; larger part has 60 one-minute tracks. Total time announcement reads: (small drum) "Six (large drum) thirty-two."

The automation system utilizes Ampex 450's, with a silence-sensing circuit. An intersperser switches to a different key function after every period of silence, selecting the tape deck as switched by that key. A 10-minute timing cam inserts an announcement every 10 minutes at the end of the music. The announcement comes from another Ampex 450, followed by a 25-cycle tone which restores the music cycle. With the advent of multiplex stereo, we simply changed the heads on the 450's, added a stereo simplifier, and continued much as before.

When WKLS began stereo operation in May 1962, it seemed advisable to raise power. We applied for 32,000 watts, but were given only 19,000 as a result of the FM freeze that was then in effect. Increasing competition and the advent of vertical polarization eventually indicated the need to make the final move to maximum power in both planes, which was accomplished in November 1965. A Rust FMT-15-HV transmitter with twin 15-kw power amplifiers feeds two independent transmission lines, one to each antenna bank (a Jampro 8-bay vertically polarized antenna was installed on the tower beneath the existing antenna). If one or the other transmitter amplifier fails, we can still operate with reasonable receptivity until repairs can be made. Studios were moved to downtown Atlanta, and most existing equipment updated or replaced. A twin Moseley STL carries the programming 12 air-line miles to the transmitter site.

Recent equipment additions include an ATC-55 automatic cartridge machine from which all announcements now come, plus an Audichron time-temperature machine that automatically reads out the correct time (to the minute) and accurate temperature upon a signal from the announce cartridge. The time and temperature announcements have been invaluable from a sales standpoint, and have added a vital service that most automated stations do not offer. The time-temperature service is a highlight of our morning program from 6 to 9 AM.

Station Promotion

Listeners have to find out about a radio station, of course; it's vital to have a group of loyal listeners. But, if the programming is good enough, and the signal adequate, listeners will find you naturally through word of mouth.

Advertisers are a different story. If limited money is to be spent for promotion, it's only log-

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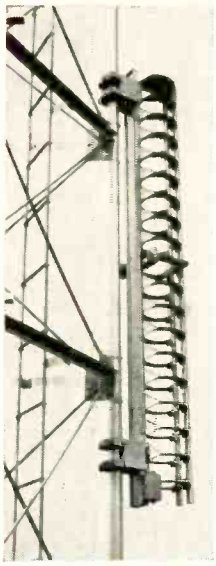

VHF-TV
Transmitting Antennas

VHF-TV TRANSMITTING ANTENNAS
Mast or tower-corner mounted
DIRECTIONAL OR OMNIDIRECTIONAL
for Channels 5 to 13

Omnidirectional VHF-TV antennas with power gains up to 20. Directional VHF-TV antennas with power gains up to 36.

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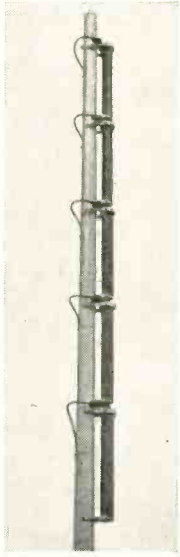
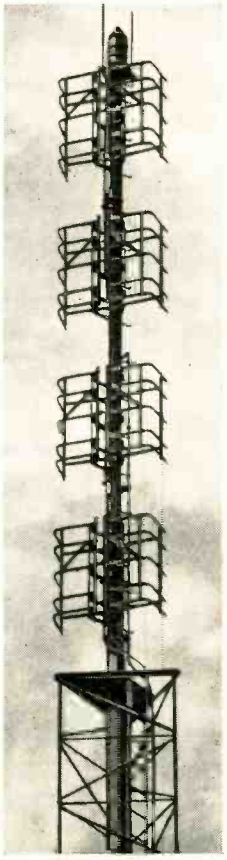
Omnidirectional UHF-TV antennas with power gains up to 50. Directional UHF-TV antennas with power gains up to 80.

FM TRANSMITTING ANTENNAS
Mast or tower-corner mounted
DIRECTIONAL OR OMNIDIRECTIONAL

For single or multi-station transmission.



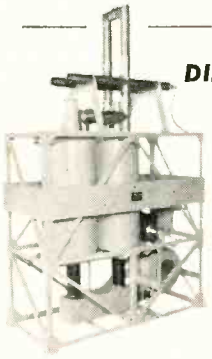
UHF-TV
Transmitting Antennas



FM Transmitting
Antennas

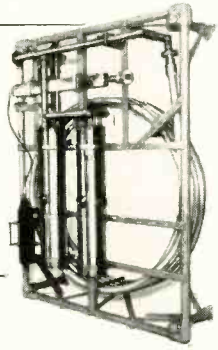
SPECIAL PURPOSE ANTENNAS

The Empire State Building Master FM Antenna; two rows of dipoles around the 102nd floor observation level, the diplexers within the tower, and the transmission line, designed, built, and installed in 1965, permit up to 17 FM stations to broadcast simultaneously from the same antenna.



DIPLEXING FILTERS

Temperature compensated. Aural-to-visual and visual-to-aural rejection over 30 db. For use with transmitters up to 50 kw.



VESTIGIAL SIDEBAND FILTERS

Low insertion loss. Lower sideband of the color subcarrier frequency is attenuated 30 db. or more.

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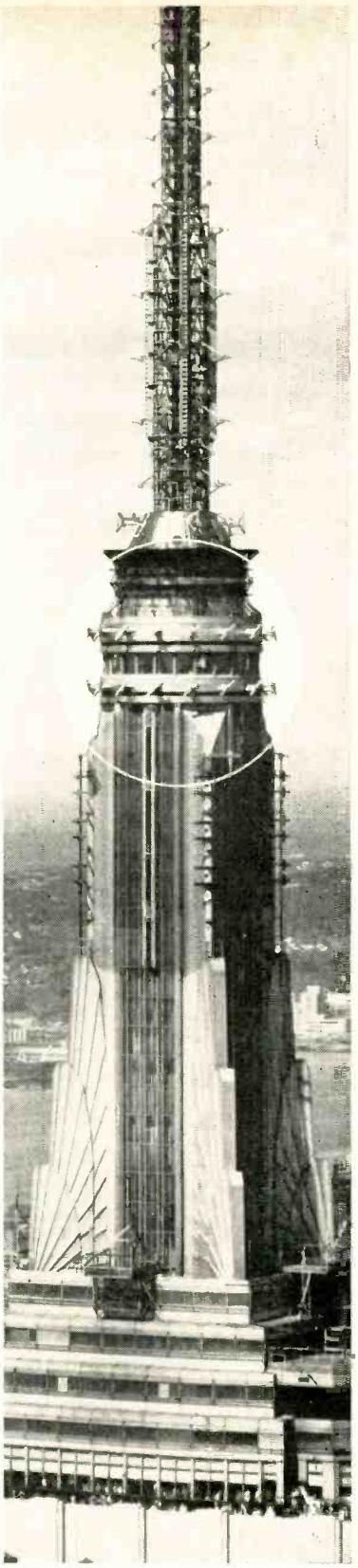
For 6⅛" or 3⅛", coaxial transmission lines.
SWR over a specified 100 mc band under 1.03, high peak power models under 1.06 over a specified 50 mc band. CW power rating equal to the mating transmission line.



Special Purpose Antennas

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Circle 19 on Reader Service Card

Operator-secretary Barbara Goltz keeps automated system tapes up-to-date in addition to her secretarial duties.

ical that it be spent telling the prospective advertisers about the station, and telling them in a clever and memorable way. We don't claim to be star promotion men, but here are some of the things we did—a few of them terribly corny in retrospect.

Tiny postal cards were sent out before going on the air, with the caption, "FM IS GROWING IN ATLANTA. SOON ON THE AIR —WKLS, 96.1 mc." With each mailing the size of the card was increased until the final card, timed to be received right before opening day, told of the on-air date.

Mailings offering a cash prize for knowing the call letters of the new FM station were sent out to agencies and prospective sponsors, with a blank for the answer. Returned correct answers received new pennies. Not much, but a cash prize nonetheless.

A slide presentation explaining stereo FM along with a stereo tape will attract the interest of service clubs and get the story across. It's surprising how many people have questions about FM, and how many go out and buy FM sets when they see the slide presentation. We use a live taped combo, with slides to match showing the instruments and their positions, to demonstrate what stereo is, then briefly plug WKLS as the pioneer FM-stereo station in Atlanta. It's effective and impressive.

We often rubber-stamp the outside of direct-mail envelopes with a curiosity-tickling phrase such as: *Message from Alexander G. Bell* inside, to announce sponsorship by the telephone company, or *202,000 FM Homes Now in Atlanta,* to pique interest in more details. In one instance, we sent a sheet introducing a program sponsored by an airline in one of their ticket envelopes. Comment was liberal.

An antique automobile with a sign on the side, *"Good Old Music —WKLS,"* was another of the early promotions that proved effective. We drove it all over town on sales calls, and parked it near the expressway during morning and evening rush hours.

In all methods, we've followed two basic rules: Don't say too much, for most persons get a great deal of mail and must read quickly. Send out pieces regularly, so people won't forget you. Large city or small, big promotion effort or small, some promotion is vital to establish a station as an important, permanent business, to keep people from forgetting you.

Sales, Sales, Sales

When you boil it all down, *sales* is what you're in business for. Everything you do points to more sales, or it should. Programming is important, so you have a good product to peddle, but if you don't make any sales, all the fine programming in the world won't make the station a financial success. Some of the points we're about to mention are elementary, but it's surprising how many stations bumble along for years without focusing attention on the all important sales function. We certainly made some grave errors until we discovered a few of the unique approaches to selling FM as opposed to selling just radio. Here are the most vital:

1. We sell FM as a separate entity. Just as TV and AM are separate, we feel that FM is separate, requiring a separate budget and separate approach to advertising copy.

2. Sell only those prospects who have a product or service for your FM audience, whatever audience you may be shooting for. (In our case, we can't sell black leather jackets or lollypops, and we don't try.)

3. Sell something specific. Woe to the FM salesman who goes into the prospect's office and says, "You wanna' buy some FM time, Mister?" Tell him what he wants to buy. Size him up before you go in, and have a package ready, even if it's one spot a day for two days. Be specific. Tell him when

WKLS Market Coverage

The number of FM homes in Atlanta grew as WKLS grew, as shown in this comparison:

	Year	WKLS Power	FM Set Penetration	FM Homes In Metropolitan Atlanta
WKLS Opened	1960	6.35 kw	19.2%	53,000
Stereo Introduced	1962	19 kw	25.5%	130,000
Power Increase	1963	19 kw	38.6%	150,000
Power Increase	1965	100-kw V 100-kw H	42.9%	202,000

The new WKLS 50-μv contour encompasses 59 counties in Georgia, 5 in Alabama, and one each in North Carolina and Tennessee, covering over 2 million persons. Reports from listeners bear out the effectiveness of the new vertical antenna and twin 100,000-watt transmission. Reception on small table-model receivers is greatly improved—automobile reception is good many miles beyond the metropolitan area.

Don Kennedy, General Manager of WKLS, doubles as announcer and part-time salesman.

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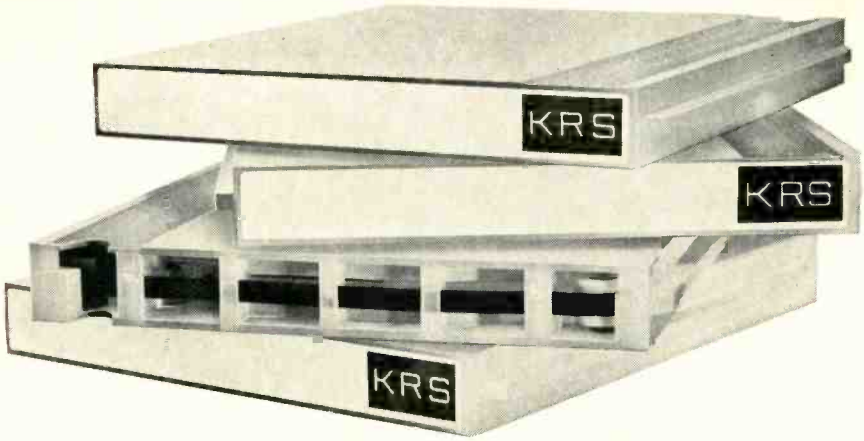

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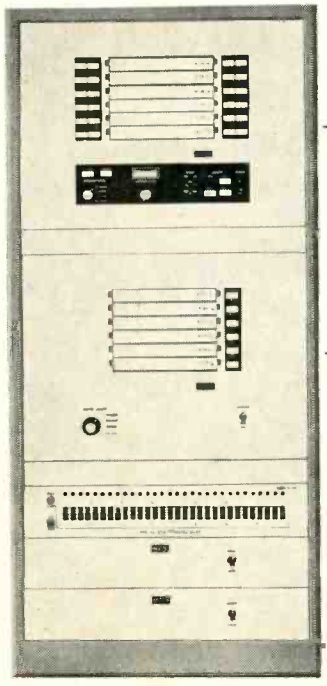

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RANDOM ACCESS PROGRAMMERS — Model SRAP-15-30 provides random access to 15 program sources and up to 30 sequences per unit.

CARTRIDGE GROUP SEQUENCERS — Model SGP-2 provides additional access to cartridge program sources.

AUXILIARY CUE TONE SENSORS — Model SQA45 detects cue tones to provide control of associated equipment.

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his programs will run and why. Sell him a predetermined number of shows that'll do his job and he'll respect you for it. Even if he doesn't buy your specific offering, it's surprising how often he becomes a prospect for something else. You have more confidence and he has more respect for you when you *sell something specific.*

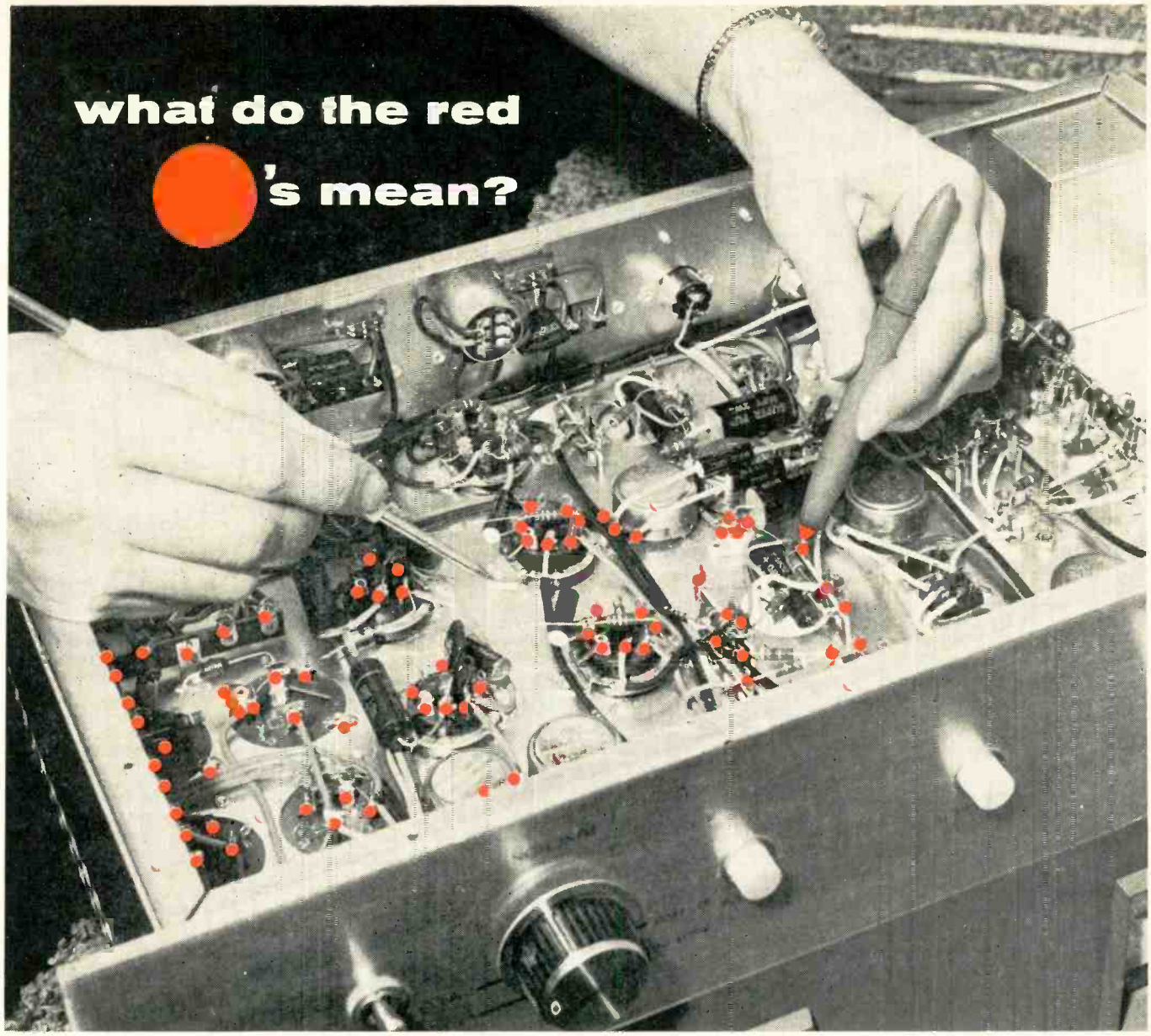
4. Have the right tools for the sale. Prospects are going to ask questions and they have a perfect right to know the answers as accurately as you can give them. Be prepared with attractive charts that show your listeners' age and income group . . . often they buy cars . . . how much they spend on groceries . . . how much their homes cost . . . how many live in apartments . . . how many phones they have. You can easily get this information by sending a questionnaire to your listeners. Tell them on the air you'd like to know who and where they are, then send them a sheet of questions. Compile the answers neatly and use them liberally. These same letters can show *where* your listeners are, by city or county. It's impressive for a prospective advertiser to see a list of percentages showing who you reach and where they live.

Follow-ups and clear records are also necessary for efficient salesmanship. We always send a memo to thank a prospect for his time—whether we make the sale or not! If he's a live one, it certainly doesn't hurt to send him a proposal in writing, or a letter outlining what you discussed with him. Let him know you're there, and don't forget to add him to the regular promotion mailing list.

Finally, there are lots of folks out there to sell, and all you've got to do is see them. It's as simple as that. List the prospects who would be right for your FM station, see them systematically, and sell them.

Conclusion

FM means many things to many broadcasters who have experienced success with varied formats. Whatever the format or approach FM stations use to specialize their programming for specific audiences, it's our contention that the future of FM is assured. Past experience proves it and, for the future, reinforces the value of FM to both listener and advertiser alike. •



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Design & Operation Of Directional AM Antennas

By John H. Battison

Part 4 — Two-tower arrays can be designed to produce innumerable symmetrical patterns, but there are some cases where 3- and 4-tower systems are required.

THE TWO-TOWER antenna system is the basic directional array. It can produce a large number of basic patterns. In fact, the results are so standardized that a set of patterns can be drawn using the parameters shown in Fig. 1 .

However, the 2-tower array cannot produce non-symmetrical patterns, nor can it always adequately suppress radiation over a wide angle. If a narrow, but concentrated, lobe is needed, a multiple-tower array must be used.

Mr. Battison is a consulting engineer based at Annapolis, Md.

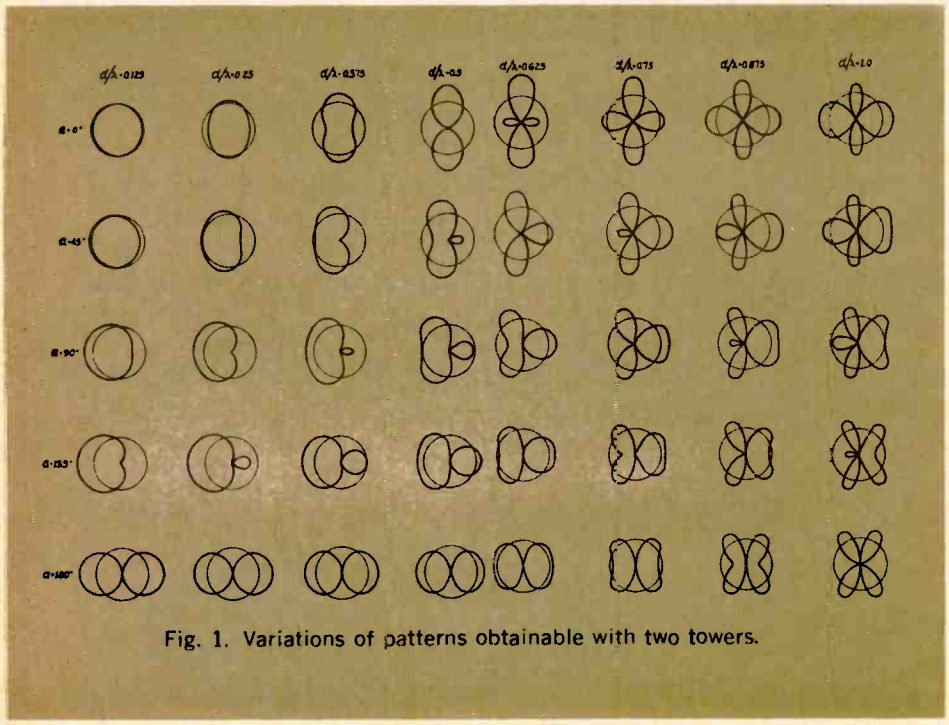

Fig. 1. Variations of patterns obtainable with two towers.

The 3-Tower Array

The in-line 3-tower configuration is the simplest multi-tower array to handle. Fig. 2 shows the basic vector relationship, which is very similar to that used for 2-tower arrays.

The formula for the pattern produced by three in-line equally-spaced towers is:

$$F_{px} = 1\angle 0° + BL(\phi_2 + 5 \cos \theta) + CL(\phi_3 + 2\,S \cos \theta)$$

where θ is the angle between the line of towers and the line joining point P to the tower (azimuth),

S is the distance between the towers in degrees.

ϕ is the electrical phasing between tower currents.

B and C represent tower current ratios referenced to tower T_1.

S Cos θ is the space phasing difference between the fields of the three antennas.

If unequal tower spacing is employed, 2S in the right-hand expression becomes $[\phi + (S_1 + S_2) \text{ Cos } \theta]$. In other words the physical tower spacing is mathematically added, and the total is used as the physical spacing term.

If symmetrical electrical phasing and current ratios are used, and if the 3-tower array is completely symmetrical about the center tower, the solution will be much simpler because the formula simplifies itself.

Consider the array defined by these specifications:

T_2	T_1	T_3
$2\angle\phi_2$	$1\angle 0°$	$2\angle\phi_3$

Parameters:

$S_1 = S_2$

G (tower height) $= G_2 = G_3$

Current Ratios:

T_1 center tower $= 1$

T_2 & T_3 (outer towers) $= 2$

Electrical Phase Angles:

$\theta_2 = \theta_3$

The two vectors produced by T_2 and T_3 are plotted as shown in Fig. 3. The actual angles or their magnitudes (length) are unimportant at this point; therefore, the

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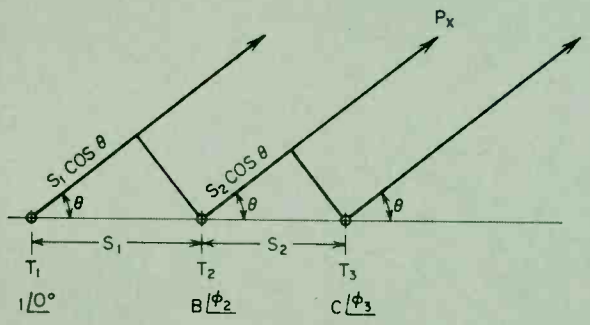


Fig. 2. Vector relationship of simple 3-tower array.

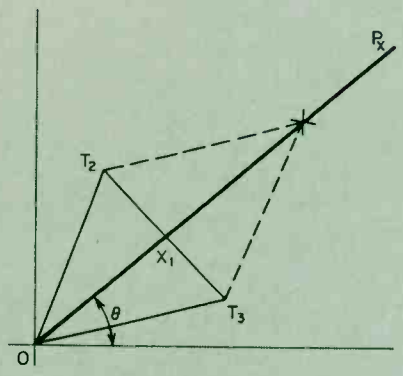


Fig. 3. Vectorial representation of 3-tower symmetrical array.

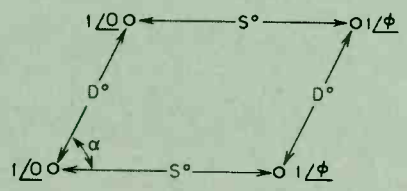
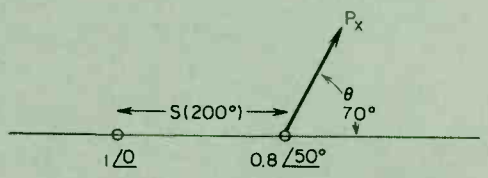
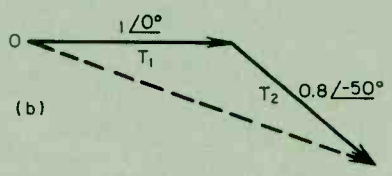


Fig. 5. Typical parallelogram or rhomboid tower configuration.

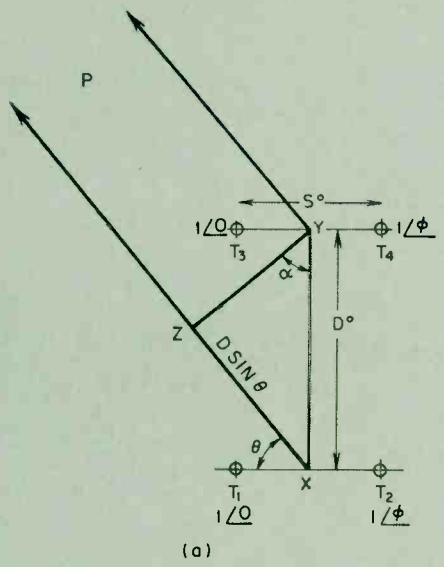


(a) $F_{P_X} = 1\angle 0° + 0.8\angle(-50 + 200 \cos 70°)$



(b)

Fig. 7. Typical vectorial representation of a 2-tower array.



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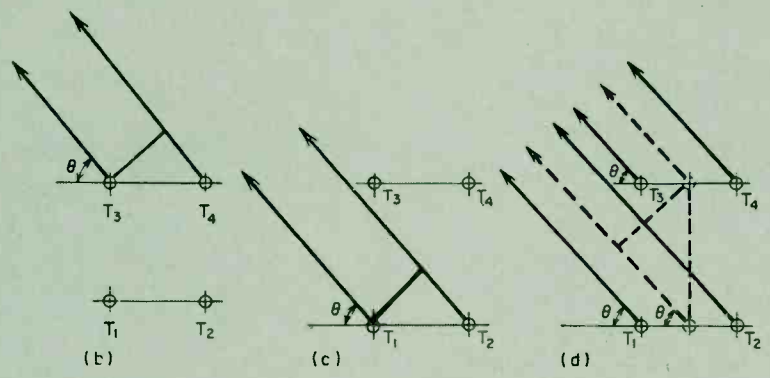


Fig. 4. (a) 4-tower array with symmetrical pairs; (b and c) vectorial treatment of each pair of antennas, T_1 and T_2, T_3 and T_4; (d) vectorial combination of the 2-tower pairs.

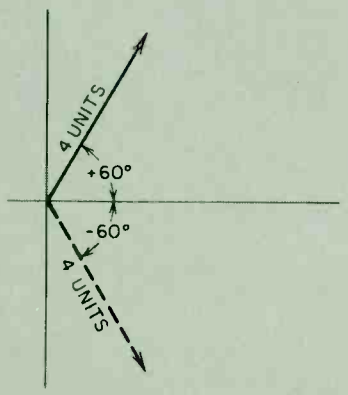


Fig. 6. Plotting vectors.

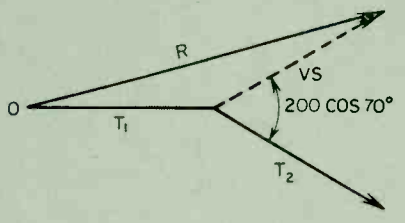


Fig. 8. The effect of space phasing on the vectorial relationship.

vectors may be placed in the first quadrangle and the current phase angle (OP_x) drawn at any value. The vector for T_2 (OT_2) is drawn above OP_x and T_3 (OT_3) is drawn below. Each vector has the same direction and magnitude in reference to OP_x, except that one is more (plus), and one is less (minus).

By completing the parallelogram, we find the length (or strength) of the pattern component produced by the two end (or outer) towers. (The parallelogram is completed by drawing a line from T_2 to X parallel to OT_3, and and another line from T_3 to X parallel to OT_2. The point where they intersect is X. Joining O and X gives the resultant. The distance OX_1 is the same as X_1 — X.)

Because the array is symmetrical and their resultant (OX) indicates the direction of the combined effect. To compute the length of OX, we use the distance OX_1, 2 cos (S cos θ), in the equation:

$$OX=2\ [2\cos(S\cos\theta)]=4\cos(S\cos\theta)$$

To find the total field in the direction θ, we merely add the radiation from T_1 and include the phase angle θ of the end tower radiation to obtain:

$$F_{px} = 1\angle 0^\circ + 4\cos(S\cos\phi)\ L\phi$$

Actual values in mv/m can be calculated after the pattern is plotted on polar graph paper.

It is interesting to note that if the current ratio had been 0.5 instead of 2, the expression would have been

$$F_{px} = 1\angle 0^\circ + .5\cos(S\cos\theta)\ L\phi$$

Four-Tower Arrays

So far in this series we have considered the fields from two antennas, three antennas, and symmetrical pairs (i.e., three towers with the outer two symmetrically arranged in phase, power, and spacing). For computational purposes, it is convenient to consider multi-element arrays in pairs. For example, the 4-tower array (Fig. 4a), can be considered as two groups of two towers. The radiation from each pair of towers (Fig. 4b and 4c) is computed as though coming from a single separate pair. Then these two tower radiation figures are considered as emanating from single towers and combined once more (Fig. 4d). The result is the effective vector pattern from the four towers. The angle X at the apex of the right triangle is the same as angle θ, the azimuth angle; therefore, XZ can be written as D sine θ which means that the length of the line XZ is D times the sine of the angle θ. Line XY represents the phase spacing of the two pairs of towers. Thus, the equation can be written:

$$F_{px} = 1\angle 0^\circ + 1L\ (\phi + S\cos\theta) + [1\angle 0^\circ + 1L\ (\phi + X\cos\theta)]\ LD\sin\theta$$

Unsymmetrical DA Patterns

In cases where a symmetrical radiation pattern will not provide protection in required directions, a pattern that is non-symmetrical or assymetric, is needed. This can be done with an array that produces unequal radiation on each side of a center line. A parallelogram tower configuration (see Fig. 5) will accomplish the purpose. The pattern produced by a parallelogram array can be calculated by:

Field at distant Point $X = 1\angle 0^\circ + 1L\ (\phi + S\cos\theta) + [1\angle 0^\circ + 1L\ (\phi + S\cos\theta)]\ LD\cos(\infty - \theta)$

This formula can be simplified using previously described methods.

The parallelogram or rhomboid antenna array can also be used to produce symmetrical radiation. This subject, as well as other related aspects, will be considered in later installments. ●

Fundamentals of Vector Relationship

A vector has both magnitude and direction. For example, a vector described as 4 $\underline{/60^\circ}$ is 4 units long at an angle of 60°. This can be plotted as shown in Fig. 5. If the vector had been 4 $\underline{/-60^\circ}$ it would be shown as the dotted line.

Applying the principle to vectors produced by a two-tower array, the process is the same but extended and repeated. Consider the array shown in Fig. 7A. The field at point X produced by the currents in the two towers is expressed as:

$$1\ \underline{/0^\circ} + BL\ (\phi + S\cos\theta)$$

The vector for tower 1 (Fig. 7) is drawn one unit long at 0° from the origin "0". Continuing in the **same** direction, the vector for tower T_2 is drawn at an angle of −50° (**down** from the origin line) and 0.8 units long. The units can be any suitable scale, inches, centimeters, etc. Joining the origin to the last arrow produces a vector (broken line) indicating the magnitude and direction of the field produced by the two towers at azimuth 70°. (This will be true only when S cos θ is zero, at 90° or 270°.) In addition to the current phase relationship, space phasing at the desired azimuth θ must be added; space phasing is 200 cos 70° and the vectors are shown in Fig. 8.

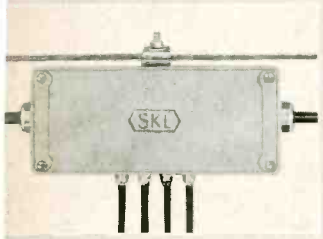
$$\text{Cos } 70^\circ = 0.342;\ 200\ (0.342) = 68^\circ$$

Therefore, the effect of tower T_2 is modified by the space phasing and it is necessary to rotate vector T_2 68° in a positive (counterclockwise) direction, measured from T_2 **(not from the origin line).**

The length of the vector (.8 units) remains the same because the space phasing did not affect the current in the towers. So T_2 is kept at 0.8 units while it is rotated up to 68° as shown by the dotted vector line VS.

The direction and magnitude of the field produced by the combination of tower currents, electrical phasing, and space phasing, are shown by the angle between R and the origin (horizontal) line. The length of R is measured in the same units as T_1 and T_2. The same process can be followed for any value of θ.

This approach can also be used any number of towers. In the case of a four-tower array, the two pairs are computed and the resulting vectors added in a third computation. (Vector arrows must follow each other because the vectors are being added). To generate the final vector, the spacing between the pairs of towers (mid-point of each pair) is applied as D cos θ, (Fig. 4) the dimension D° (XY).



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Planning CATV Cash Requirements

By Robert B. Cooper, Jr.

An adequate cash flow is the life blood of any business. Here's how to estimate new or existing system financial requirements.

BEFORE building or buying a CATV system, the wise investor will make a realistic appraisal of the system's economic potential. Quite simply, this means estimating how much money the system is likely to generate in a given period of time, how much money will be required for operation during that same period and, at the same time, amortize the investment.

Cash Generation

Most CATV systems receive income from two sources—initial installation charges, and monthly subscriber fees. A ballpark figure for the *cost* of an installation (i.e. time and material for one drop) is $17.50, based on a national average. If you were average, and your installation charge were exactly $17.50, the outlay would offset the income for each installation. However, chances are that your installation charge will not be $17.50; perhaps it will be $10.00 (as the popular trend seems to be) or, perhaps it will be $25.00. If your installation charge is less than the actual out-of-pocket cost (as would be the case with a $10.00 charge), then each drop represents a cash deficit or *loss*.

From a tax standpoint, it is usually better to consider each drop as an *expense* in a situation such as this, rather than as a capital improvement. As a capital improvement, the drop would be depreciated as a part of the plant.

On the other hand, if your installation fee exceeds the cost of the connection, it can be considered as a profit item. Some in the industry *still* expense the drop and take the difference between the drop cost and the customer fee as regular income. Others prefer to consider each new drop as a new capital improvement to the plant and begin depreciation on the drop in the year it was installed. In a large system, where the bookkeeping machinery is available, this approach is probably not a bad idea; it allows a small continuing depreciation schedule even after the usual 5-year depreciation period is up on the bulk of the plant installation.

The matter of calculating cash requirements for any substantial period of time is an extremely involved projection. The tables shown with this article are intended to provide nothing more than a guide to the newcomer to CATV.

Mr. Cooper is VP of operations, Valley Vision, Inc., Modesto, Calif., and Pres., R. B. Cooper Associates, CATV consultants.

Table II—Operating Expenses

Average cost per subscriber, per year, in systems of varying size for management, technical help, and other overhead factors. Not included is repayment of any system construction loans, pole attachment charges, or taxes.

System Size	Cost Per Subscriber Per Year
Under 700	$24.00 to $36.00
700-1,500	$21.00 to $28.00
1,500 to 3,000	$18.00 to $23.00
3,000 to 5,000	$15.00 to $20.00
5,000 to 10,000	$13.00 to $18.00

Monthly overhead for a 700-subscriber system will average, per subscriber:

Manager-Engineer	$.85 to $1.00
Office	.58 to .72
Technician	.65 to .72
Trucks, etc.	.14 to .28
Promotion	.24 to .24
Overhead	.49 to .60
Total	$2.95 $3.56

Cash Required to Purchase a System

CATV systems, as business enterprises, are no different from any other: on one hand you have expenses, and on the other you have income. The trick is to make the scales tip towards the income side of the ledger after all operating expenses have been paid out of gross income. That seems elementary enough.

At the present time, there exists a rapid 5-year depreciation schedule, approved by the IRS, which allows the operator to accelerate his depreciation, thereby showing a large per year operating expense for the first 5 years of operation. Of course, the money taken out of gross income as depreciation is never paid out as operating expense. In many cases this money goes toward repayment of the loan used to finance the system.

For example, let's consider the purchase of a 1660-subscriber system at $300 per subscriber, an investment of $498,000. During the first year, the new operator would take in 1660 times $60 ($5 per month) or $99,600 in regular subscription income, and signs up 230 new subscribers, at $20 per installation, for an additional $4,600. The 230 new subscribers each average 6 months of service during the first year for an additional $6,900 income (230 x $30). Total income for the first year is therefore $111,100 on an initial investment of just under a half million dollars.

Now, on the expense side of the ledger, let's assume the system spent an average of $17.50 installing each of the 230 new drops (for a total of $4,025) and paid out $37,800 for management services (including all direct overhead costs except amortization of the original investment money). Total out-of-pocket expenditure would be $41,825.

If the system took in $111,100 and spent $41,825 the first year, the cash balance, before amortization of the initial investment, would be $69,275.

Table I—Cash Flow Study for An Existing System

Number of Subscribers: 1660 — **Population in Franchise Area:** 11,000
Miles of Plant: 26 — **Total No. Pot. Subscribers:** 3050
Channels on System: 12 — **Installation:** $20—Monthly: $5
Price Paid for System: $498,000 (1660 x $300)
Annual Depreciation—New Owner: $79,680 (20% of 80% of cost)

YEAR ONE	INCOME	EXPENSES	CASH FLOW	INCOME BEFORE TAXES
1660 subs x $60 ea.	99,600			
230 new subs x $20 install.	4,600			
230 new subs x $30 (6 mos.)	6,900			
Total	**$111,100**			
230 Install. Exp. ($17.50)		4,025		
1890 Manage. Exp. $20 ea.		37,800		
Depreciation		79,680		
Total		**$121,505**	**$69,275**	**(10,405)**
YEAR TWO				
1890 subs x $60 ea.	113,400			
100 new subs x $20 install.	2,000			
100 new subs x $30 (6 mos.)	3,000			
Total	**$118,400**			
100 Install. Exp. ($17.50)		1,750		
1990 Manage. Exp. $20 ea.		39,800		
Depreciation		79,680		
Total		**$121,230**	**$76,850**	**(2,830)**
YEAR THREE				
1990 subs x $60 ea.	119,400			
100 new subs x $20 install.	2,000			
100 new subs x $30 (6 mos).	3,000			
Total	**$124,400**			
100 Install. Exp. $17.50		1,750		
2090 Manag. Exp. $20 ea.		41,800		
Depreciation		79,680		
Total		**$123,230**	**$80,850**	**$1,170**
YEAR FOUR				
2090 subs x $60 ea.	125,400			
100 new subs x $20 install.	2,000			
100 new subs x $30 (6 mos.)	3,000			
Total	**$130,400**			
2190 Manage. Exp. $20 ea.		43,800		
100 Install. Exp. x $17.50		1,750		
Depreciation		79,680		
Total		**$125,230**	**$84,850**	**$5,170**
YEAR FIVE				
2190 subs x $60 ea.	131,400			
100 new subs x $20 install.	2,000			
100 new subs x $30 (6 mos.)	3,000			
Total	**$136,400**			
2290 Manage. Exp. $20 ea.		45,800		
100 Install. Exp. ($17.50)		1,750		
Depreciation		79,680		
Total		**$127,230**	**$83,850**	**$9,170**
YEAR SIX				
2290 Subs x $60 ea.	$137,400			
2290 Manage. Exp. $20 ea.		45,800	$91,600	$91,600
Five Year Cash Flow/Profit Totals*			**$400,675**	**$2,275**

*Not including sixth

Obviously, taxes would take a pretty big hunk of that $69,275 were it not for the depreciation allowance. On a 5-year depreciation schedule, using one-fifth of 80% of the original $498,000 investment per year, the operator would be able to show a *depreciation allowance* of $79,680 for the first year. This is $10,405 *more* than the cash balance, so for tax purposes this operator would have a *tax loss* for the year of $10,405, even though the bank account showed a cash *balance* of $69,275.

Obviously, too, if the system were financed through regular channels, repayment on the purchase loan would probably take a great deal (if not all) of the balance. Therefore, the actual money retained by the system would be small, if anything at all.

Operating Expense Estimates

In a new CATV system, there are initial construction expenses and continuing maintenance and operational expenses. Whether you construct your own CATV plant, or have it built for you under a turnkey arrangement, you can determine with fair accuracy just what the system is going to cost you. This is your initial expense, and it is this figure which you will take to the bank or other funding source to seek capital.

But what about the other year-to-year operating factors? What will it cost to manage the system . . . to maintain the system . . . to advertise and promote the system? How do you arrive at actual cost figures in these expense areas? You can be certain the bank is going to want to see such a projection, and you can be just as certain that your own group of investors or your company is going to want to know what to expect one, two, four and five years down the road. Your CPA, to whom you will carry these and other figures for compilation into a professional 5-year projection, will also want to know these expenses items, to the penny.

Let's talk about an "entire ball of wax" figure first of all, because this is the gauge used most frequently. Table II shows total cost per-subscriber per-year figure for systems of varying size. This covers the cost of a system manager (or manager-engineer as in the case with the systems of under 700 subscribers), an office, utilities for the office and the plant,

Win

The Rome Unifoam™ CATV Cable

No-Contest Contest!

Figure out the amount of your own cash prize and declare yourself the winner. (No time limit, no limit on dollars. And no present users of Rome Unifoam CATV Cable, please, since you've already received your prize.)

Here's how:

Fill in the blanks below, making the calculations indicated.

1. Write in your present trunkline amplifier spacing_____db
2. Write in cost of one trunkline amplifier . . . . . $_____
3. Write in Channel 13 cable attenuation of your present ¾" cable . . . . . _____db/1000′
4. Multiply Item 2 by Item 3 and divide the result by Item 1. This gives the amplifier cost per 1000′ of your present ¾" trunkline cable. Write it here . . . . . $_____
5. Channel 13 attenuation of Rome Unifoam ¾" cable . . . . . 8.6 db/1000′
6. Multiply Item 2 by Item 5 and divide the result by Item 1. This gives the amplifier cost per 1000′ of Rome Unifoam ¾" cable. Write it here . . . . . $_____
7. Write in the number of feet of trunkline to be installed _____. Now, ÷ this figure by 1,000. Put answer here_____
8. Subtract Item 6 from Item 4 and write answer here $_____
9. Multiply Item 7 by Item 8 and write it here.

It's your prize! $_____

Now collect: just order Rome Unifoam CATV cable and save the amount of money you've just calculated.

Example:

Trunkline amplifier @ $350: 22 db gain
Typical ¾" cable Channel 13 attenuation: 11 db/1000′
Required: 1 amplifier every 2000′
Amplifier cost: $350/2 = $175/1000′

Rome Unifoam Cable Channel 13 attenuation: 8.6 db/1000′
Required: 1 amplifier every 2,550′
Amplifier cost: $350/2.55 = $137/1000′

Savings (prize): $175 – $137 = $38/1000′ of trunkline

Want more information? For a fact-filled folder on Rome Unifoam CATV Cable, write to Rome Cable Division of Alcoa, Rome, N.Y.

Rome Cable
DIVISION OF ALCOA

Circle 24 on Reader Service Card

technical help, trucks and truck equipment, and replacement parts for the plant itself. This also includes a modest advertising budget of $3 per subscriber per year (5% of gross income per subscriber in a system with $5 per month rates).

A monthly categorical expense breakdown may look like this:

Manager—In a system of under 700 subscribers, he is often a manager-engineer, or at least has the ability to direct the engineering and maintenance operation. A man of this caliber is usually paid from $600 to $700 per month, which averages $.85 to $1.00 per subscriber per month. In larger systems, the cost of the manager is spread over the larger number of subscribers. If the manager also directs or is responsible for sales activities, his salary may be smaller, but he receives an override based upon total number of new subscribers signed each month.

Office — The office, the office girl, and the utilities required to

TABLE III—CASH FLOW STUDY

Following is based on two $300,000 loans at 7% simple interest; total loan $600,000. First $300,000 loan first year, second $300,000 loan second year. Interest only payments first year after loan is made. Term of loan—6 years. No allowance made for population growth, motel, hotel connections. Depreciation term—5 years on each of two loans.

Estimated Miles: 190
Estimated Construction Cost: $730,000
Estimated Total Sets (1965): 14,000
Installation Fee: $10.00
Monthly Service Fee: $5.00

FIRST YEAR	GROSS INCOME	EXPENSES	CASH FLOW	INCOME BEFORE TAXES
25% of Receivers (3500)				
Installation Income— 3500 x $10	$ 35,000			
Monthly Subscriptions— 3500 x $30	105,000			
Total	**$140,000**			
Installation Costs—3500 x 17.50		61,250		
Management Costs—3500 x 15.00		52,500		
Depreciation—20% of $292,000		58,400		
Total First Year		**172,150**	**84,650**	**(32,150)**
Interest Payment		21,000		
Net Cash Gain		5,250		
SECOND YEAR				
37.5% of Receivers (5250)				
Installation Income— 1750 x $10	17,500			
Monthly Subscriptions— 3500 x $60	210,000			
Monthly Subscriptions— 1750 x $30	52,500			
Total Second Year	**280,000**			
Installation Costs—1750 x $17.50		30,625		
Management Costs—5250 x $14		73,500		
Depreciation—20% of $584,000		116,800		
Total Second Year		**220,925**	**292,675**	**59,075**
Interest—First Loan		21,000		
Interest—2nd Loan		21,000		
Principal—First Loan		60,000		
		102,000		
2nd Year Cash Gain		73,875		
Total Cash Gain		**79,125**		

THIRD YEAR	GROSS INCOME
50% of Receivers (7,000)	
Installation Income— 1750 x $10	17,500
Monthly Subscriptions— 5250 x $60	315,000
Monthly Subscriptions— 1750 x $30	52,500
Total Third Year	**385,000**
Installation Costs—1750 x 17.50	
Management Costs—7000 x $13	
Depreciation—20% of $584,000	
Total Third Year	
Interest—First Loan	
Interest—2nd Loan	
Principal—Both Loans	
3rd Year Cash Gain	
Total Cash Gain	
FOURTH YEAR	
57.5% of Receivers (8050)	
Installation Income— 1050 x $10	10,500
Monthly Subscriptions— 7000 x $60	420,000
Monthly Subscriptions— 1050 x $30	31,500
Total Four Year	**462,000**
Installation Costs—1050 x $17.50	
Management Costs—8050 x $13	
Depreciation—20% of $584,000	
Total Fourth Year	
Interest—First Loan	
Interest—Second Loan	
Principal—Both Loans	
4th Year Cash Gain	
Total Cash Gain	

SYNOPSIS: Based upon the type of loan described here, this system will generate a cash surplus (before applicable taxes) of $1,280,200 after making principal and interest payments as noted here, in seven years of operation.
Cash flow is considerably greater than cash gain, because it includes monies retained for depreciation, and can be used to repay principal and interest on loans.

run the office and the plant will average $400 to $500 per month in a small system of 700 or so subscribers. This is a per-subscriber expense of $.58 to $.72 per month.

Technician—A full time technician, running new drops, pulling out disconnects, and performing routine maintenance operations in a small system is paid from $450 to $500 per month, depending on his skills. Cost to the system per month, $.65 to $.72 per subscriber.

Truck, Equipment, Maintenance — Assuming initial truck expense was part of the original plant investment, a system of this size and scope will spend from $100 to $200 per month on running expenses. Total cost to system, $.14 to $.28 per subscriber per month.

Promotion — Some systems spend virtually nothing, others spend as much as 10% of their gross income on advertising and

Continued on page 91

FOR A NEW SYSTEM

	EXPENSES	CASH FLOW	INCOME BEFORE TAXES
FIFTH YEAR			
65% of Receivers (9100) Installation Income— 1050 x $10	10,500		
Monthly Subscriptions— 8050 x $60	483,000		
Monthly Subscriptions— 1050 x $30	31,500		
Total Fifth Year	**525,000**		
Installation Costs—1050 x $17.50		18,375	
Management Costs—9100 x $13		118,300	
Depreciation—20% of 584,000		116,800	
Total Fifth Year		**253,475**	**505,125**	**271,525**
Interest—First Loan		8,400	
Interest—Second Loan		12,600	
Principal—Both Loans		120,000	
		141,000	
5th Year Cash Gain		247,325	
Total Cash Gain		**621,600**	
SIXTH YEAR			
65% of Receivers (9100) Installation Income— 0 x $10			
Monthly Subscriptions— 9100 x $60	546,000		
Total Sixth Year	**546,000**		
Installation Costs—0 x $17.50			
Management Costs—9100 x $13		118,300	
Depreciation—20% of $292,000		58,400	
Total Sixth Year		**176,700**	**486,100**	**369,300**
Interest—First Loan		4,200	
Interest—Second Loan		8,400	
Principal—Both Loans		120,000	
		132,600	
6th Year Cash Gain		295,100	
Total Cash Gain		**916,700**	
SEVENTH YEAR			
65% of Receivers (9100) Monthly Subscriptions— 9100 x $60	546,000		
Total Seventh Year	**546,000**		
Management Costs—9100 x $13		118,300	
Depreciation		None	
Total Seventh Year		**118,300**	**427,700**	**427,700**
Interest—Second Loan		4,200	
Principal—Second Loan		60,000	
		64,200	
7th Year Cash Gain		363,500	
Total Cash Gain		1,280,200	

30,625			
91,000			
116,800			
238,425	**380,175**	**146,575**	
16,800			
21,000			
120,000			
157,800			
105,575			
184,700			
18,375			
104,650			
116,800			
239,825	**455,775**	**222,175**	
12,600			
16,800			
120,000			
149,400			
189,575			
374,275			

How to make a lot of

money

without doing any work at all:

LET KAISER-COX PUT YOU IN THE CATV BUSINESS!

Kaiser-Cox Turnkey service provides the entire package — from feasibility studies to financing . . . from space-age engineering to marketing assistance. Neither you, your investors or your personnel are involved in the construction or detail work . . . after the initial plans, goals and budget have been approved! And when we hand you the key after our job is done . . . you're in business!

Furthermore, we will not compete with you! Kaiser-Cox produces the very finest CATV equipment. We are *not* in the franchise business!

It won't cost you a penny to get all the facts in our big, new, full-color illustrative brochure! Write, phone collect, or visit . . .

KAISER-COX CATV

KAISER-COX CORPORATION / *P. O. Box 9728, Phoenix, Ariz. 85020, Phone (602) 944-4111*

DEPEND ON KAISER-COX FOR CATV LEADERSHIP TODAY AND TOMORROW

These 4 identical type tubes are about to change the size, weight and color fidelity in television cameras

G. E.'s new PE-250 gives a color fidelity unmatched

Four lead oxide Plumbicons*, in the new PE-250, give you the highest color fidelity in television today.

You also get a separate luminance channel for optimum black and white performance. And exceptionally high signal-to-noise ratio for a more quiet picture.

A precision type optical bench for all channels, and specially designed relay optics for the color channels to provide maximum stability. A removable 10 to 1 continuous zoom lens is *built into* the camera. And you can even get range extenders if you need them.

The all solid-state and plug-in modular construction are integral parts of the new design.

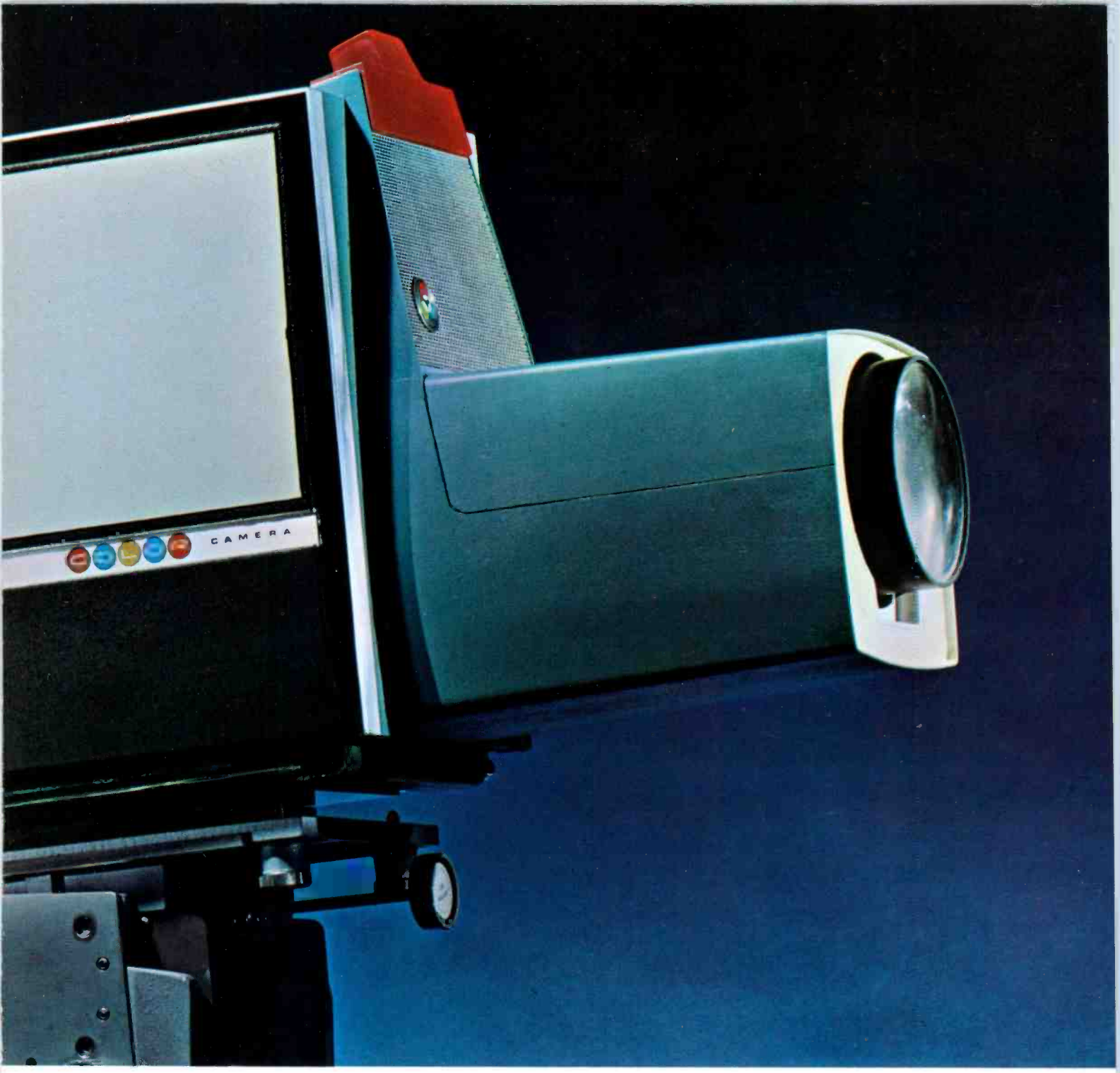
And the camera is light and mobile —weighing less than 150 lbs., *fully* equipped.

Look at the diagram—the light path to the Plumbicons is simple but precise. This is a key factor in the camera's amazing performance.

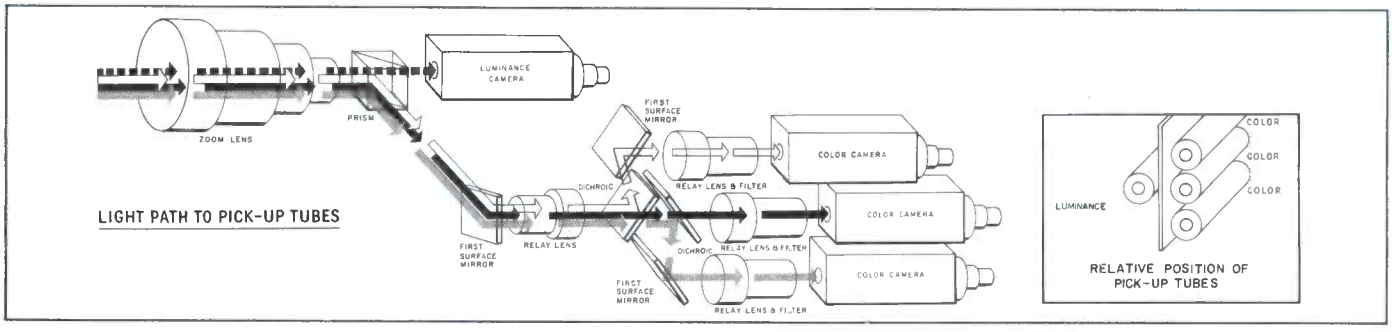
These important new features make General Electric's new PE-250 the best live color camera in television.

But you don't need a zoom lens to see that. Just write General Electric, Visual Communications Products, 7-315 Electronics Park, Syracuse, New York.

*Registered Trademark of North American Philips Company, Inc.



in television–and weighs less than 150 lbs.



G. E. also introduces a new 2nd generation 4-V color film system.

The best color film camera on the market is now better than ever.

General Electric has redesigned television's most widely accepted color film camera, the famous PE-24—replacing it with the new PE-240.

Four similar pick-up tubes give you the highest color fidelity in TV.

And a new separate mesh luminance channel gives optimum registration and resolution performance. The automatic exposure and automatic contrast control (black level and exposure) are important new features in the PE-240 design.

All 4 cameras include precision optical bench and precision adjustments.

And the plug-in modular subassemblies give you easy accessibility—*without* disabling the system.

Built-in calibration signals and differential monitoring are also provided.

Write to General Electric, Visual Communications Products, 7-315, Electronics Park, Syracuse, New York.

GENERAL ELECTRIC

GE-29

HERE ARE 8 GREAT WAYS KAISER-COX CATV EQUIPMENT MAKES MONEY FOR YOU

Pictured above is the full line of solid-state, all-band amplifiers (8 in all) offered in the great new Kaiser-Cox Phoenician Series. Its modular circuit design permits you to plug-in whatever is needed . . . from trunkline amplifier to 2 and 4-output bridging amplifiers to combinations of both, with or without automatic gain control and tilt. Also, standardized fittings are used throughout the series. This interchangeability saves you money on parts inventory, *today* . . . saves you money as you convert for expansion, *tomorrow!*

The Phoenician Series

Other money-saving Kaiser-Cox innovations:

- Space-age dependability. Less trouble-shooting time . . . fewer lost pay-hours.
- Superior design. Test point access ports, universal hinges, knob controls . . . all add up to ease of field-testing and maintenance . . . more money saved in manhours.
- Kaiser-Cox products are warranted to perform to published specifications . . . no money lost in rejects at your end.

SAVE GREEN STAMPS? TRY SOME OF OURS:

For all the rewarding facts, write, wire or phone collect:

KAISER-COX CATV

KAISER-COX PRODUCES CATV EQUIPMENT
IT IS NOT IN THE FRANCHISE BUSINESS

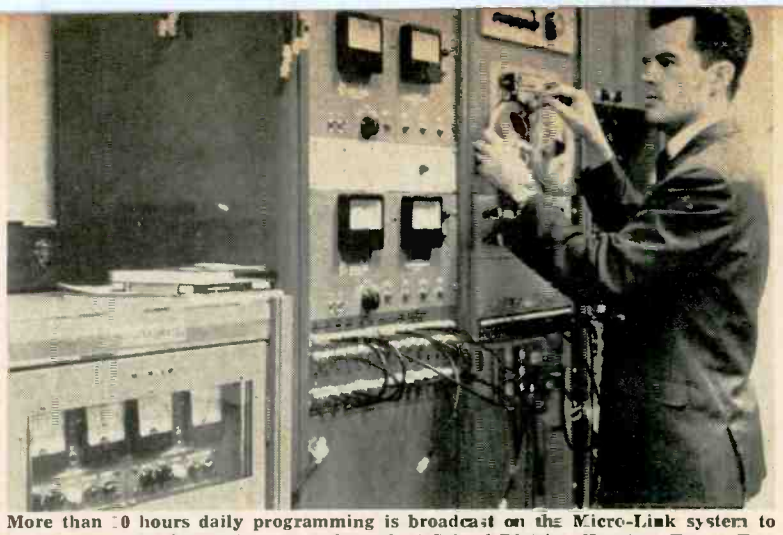
KAISER-COX CORPORATION */ P. O. Box 9728, Phoenix, Ariz. 85020, Phone (602) 944-4411*

DEPEND ON KAISER-COX FOR CATV LEADERSHIP TODAY AND TOMORROW

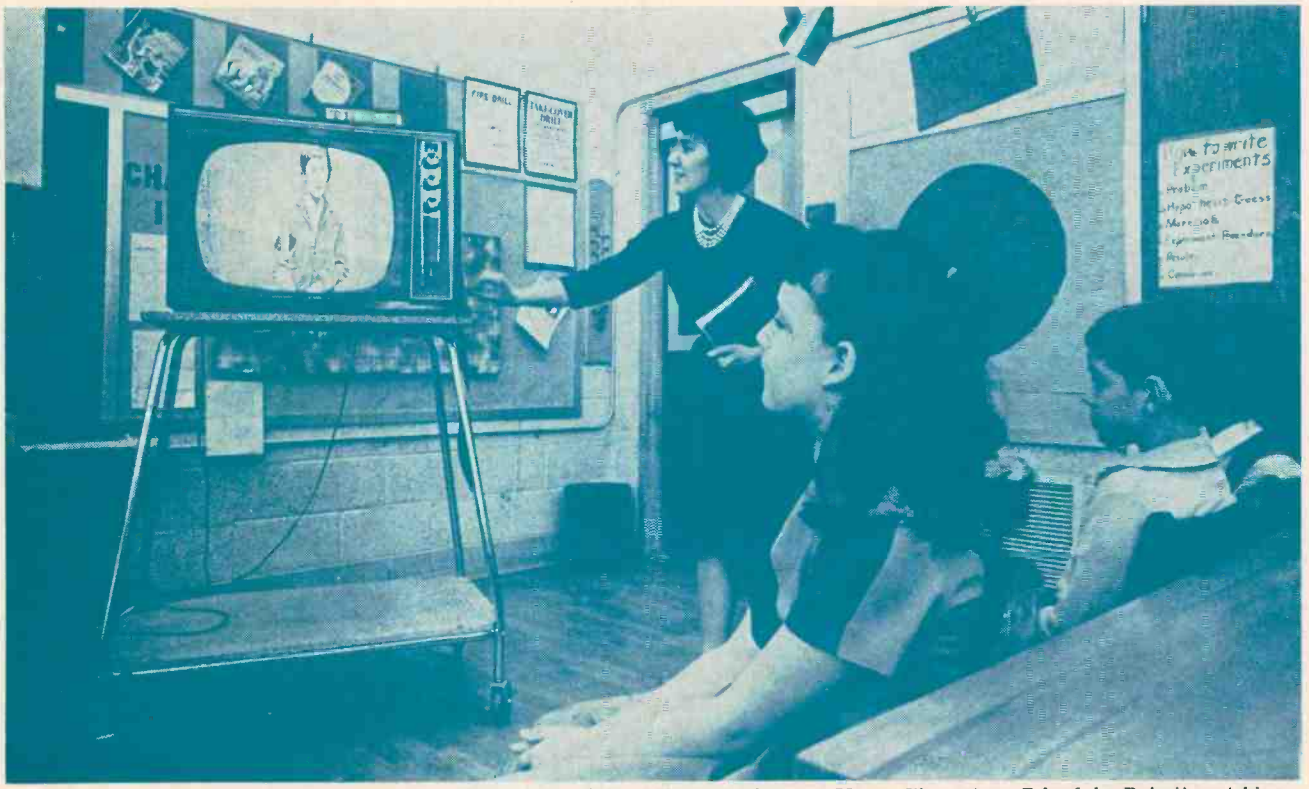
Circle 25 on Reader Service Card

Planning a 2500-mc ETV System

By Charlie Buffington,
BM/E Associate Editor



More than 10 hours daily programming is broadcast on the Micro-Link system to 22 schools in the Spring Branch Independent School District, Houston, Texas. Two 2500-mc signals are converted to standard VHF Channels 7 and 9; Channel 9 is devoted to film presentation; Channel 7 is used for instructional programming from video tape, film, or live camera. Most telecasts on Channel 7 are presented on video tape because of the repeat showings necessary to meet the many time schedules through the district.



Third-grade class at Stevens Thomson Mason Elementary School in Detroit watching a televised lecture. Studio facilities of Detroit's Channel 56 ETV station are used to program two 2500-mc channels with 7 hours of televised courses each day. 15,000 students in 60 schools benefit from instructional material on the two 2500-mc channels as well as the programming on Channel 56. This EMCEE system will be expanded to serve an additional 270 schools so that all 330 schools in the Detroit District will be equipped to receive programming from the 2500-mc channels.

2.5-kmc microwave channels are filling an important niche in ETV program distribution. Here's what it's all about.

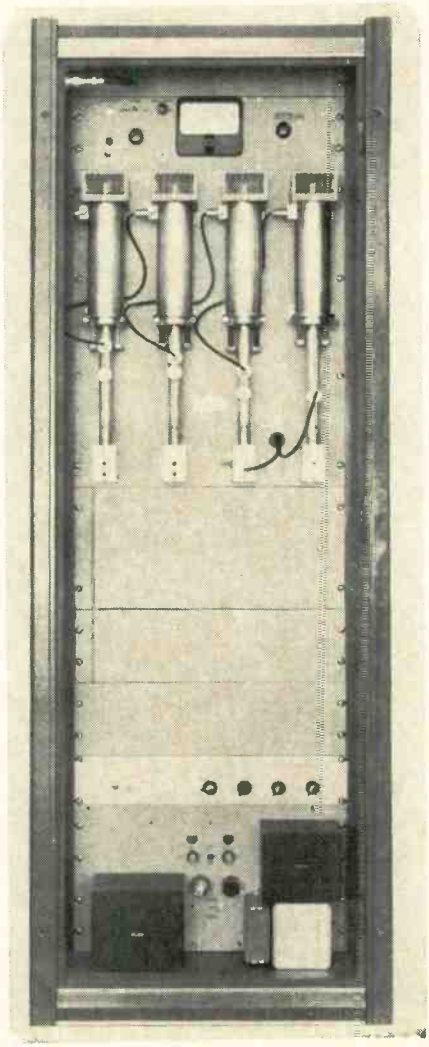
THE VALUE of television as a supplementary aid to classroom instruction has begun to attract greater attention, thanks to a comparatively new method of transmission. This new system offers TV facilities to school systems previously denied them due to the usually high costs encountered in establishing an educational station on a conventional VHF or UHF channel. All academic levels from kindergarten to university can utilize this relatively low cost medium.

What Is 2500-mc ETV?

In 1963, the FCC allocated 31 6-mc channels in the 2500-2686 mc band for the transmission of educational TV programs from a central location to specific reception sites. Many buildings in a school district or college campus may be linked together without

Programming for the Miami Catholic School system, installed by RCA, originates from studio facilities equipped with TP-66 film projector, monochrome film camera and slide projector, and TR-3 tape player. One of the four assigned channels is used to beam programming to 23,000 pupils in 38 elementary and high schools (the other three are expected to be in operation within two years). In the immediate future, live cameras will be installed, and the system will be expanded to include an additional 17,000 students in neighboring counties.

The Litton 250-mc transmitter, Model ETT-10A, is capable of 25-watt operation, providing reliable coverage within a 15-mile radius. The Adler Division installed the first experimental 2500-mc system in the Plainedge, L. I., N. Y., school District in 1962, with FCC permission, to demonstrate its educational value, low cost (compared to conventional ETV), and simplicity of operation. Favorably impressed with the results of the Plainedge system, the Commission, in July 1963, set aside 31 channels in the 2500-mc portion of the communications spectrum for ETV use.



the cost and technical problems associated with a TV broadcast system. The features of closed-circuit TV or cable-connected TV) and broadcast TV are combined; signals from a central location are picked up by special receiving equipment, then converted from the 2500-mc channel to a standard VHF channel (7-13) and distributed by cable to each classroom. Up to 5 individual programs may be transmitted simultaneously to each building within an extended area.

Reception sites need not be confined within a specific district or campus; any properly equipped site within a reasonable distance can receive the transmissions; they cannot be directly received on standard TV sets, however.

Program Material

Visual and aural instructional material designed to enhance the academic curriculum is transmitted on a carefully balanced schedule to coincide with classroom courses. It may also be used for teacher training and for administrative traffic such as reports, assignments, and personnel conferences. In addition, special training material may be broadcast to selected outside locations —hospitals, nursing homes, training centers, clinics, rehabilitation

Financial Aid for System Construction

National Defense Education Act: Provides support for many critical subject areas, ranging from English and History to the Sciences. Among eligible equipment is the receiving portion: converter, antenna, coax cable, distribution system, and receivers. Aid requests are processed through and coordinated with State Education Agencies.

Elementary and Secondary Education Act of 1965: Designed for school districts serving larger concentrations of low-income families. Classroom equipment may be purchased with money from this agency; however, the project must be tailored to a basic plan to meet the needs of educationally deprived children. Aid requests are processed through and coordinated with State Education Agencies.

Vocational Education Act: Contact: Division of Vocational and Technical Education, Office of Education, Washington, D. C.

Library Services and Construction Act: Contact: State Library Agency.

Research and Development Grants: Available to public and parochial schools, institutions of higher education, public agencies, and private non-profit organizations. Contacts: Division of Vocational and Technical Education, U. S. Office of Education; Manpower Administration, Dept. of Labor; Office of Economic Opportunity; Office of Juvenile Delinquency and Youth Development, Welfare Administration; Office of the Surgeon General, Dept. of the Army.

U. S. Government Organization Manual: Describes functions and areas of interest of every department and agency. Copies from: Office of Federal Register, General Service Administration, Washington, D.C.

Foundation Directory: Lists private foundations with funds for educational projects. Available from Russell Sage Foundation, New York. Also refer to the Library of Congress Listing on non-profit institutions.

Developing a System

Contact equipment manufacturers, describe objectives, give information regarding location of transmitting and receiving sites, existing facilities, including available maps. Final survey and firm bid preparation involves examination of topographical maps, visits to sites to ascertain location of obstacles and study of natural terrain, and establishment of antenna heights and location of repeater stations (if necessary). May require as little as a week, but could extend to several weeks.

Preparation of Form FAA-117 for Federal Aviation Agency. Must include location of any new structures which may be an aviation hazard. Any mast which extends 20' or more above the highest point of an existing building must be reported (FAA replies usually within 30 days if it has any objection). Systems not requiring high antennas or using existing towers need not file FAA form.

File FCC Form 330-P for construction permit; includes information on financial and legal commitments of applicant, intended program material, technical information on equipment and transmitter and receiver sites. Exhibits must show maps and elevation drawings of transmitting site. Equipment manufacturers will cooperate in preparing application. Legal representation is not necessary, but it usually expedites application handling.

Obtaining construction permit requires at least 30 days, during which time the Commission will hear comments from interested parties or objections regarding possible interference with existing systems. Actual time before grant is issued may be anywhere from one to three months. Applicant may start equipment installation as soon as CP is granted; he must begin within 60 days of grant and complete construction within 6 months from date of CP issuance. Completion date may be extended for good reason. Installation time usually requires from three to six months, depending on system complexity.

centers, commercial and industrial establishments, etc.—to promote new developments and techniques.

Program material may be produced within the school district and transmitted live, or recorded on video tape and presented later. Rebroadcasts from educational and commercial stations, and film and video tape material from outside sources may be integrated into any desired program schedule which fits the overall aims of the school system. In addition, enrichment material dealing with a wide range of subjects can be used to supplement the regular schedule.

Coverage

Since the 2500-mc band lies in the microwave portion of the frequency spectrum, signals tend to travel in a line-of-sight path; therefore, geography and architectural development must be considered in a system layout. If the transmission can be directed in a narrow beam to receiving sites, which is generally the case in smaller systems, reliable reception is possible up to 25 miles or more, provided there are no line-of-sight obstructions. In larger districts, where there are many schools and receiving sites in all directions from the transmitting site, an omnidirectional radiation pattern is required. As the transmission beam angle is widened, power and radiation distance are diminished sharply. Beyond 4 or 5 miles, the size (and cost) of receiving antennas must be increased to obtain usable signals. Some systems with wide scattered buildings may require booster stations to reach the more distant receiving sites. Where rough terrain or architectural obstructions interfere with line-of-sight reception, booster stations may also be required.

Equipment Requirements

Three basic elements make up a complete system: program originating gear, transmitting equipment, and the receiving system. Program origination equipment is similar to that used in any TV studio: live cameras, video and audio switchers, monitors, audio equipment, power supplies, lighting equipment, test instruments, and installation materials (interconnecting cables, etc.). For film

Our TDA26 High Gain Video Amplifier is designed for use in any application where up to 28 DB gain is required.

It's completely transistorized and is generally used at the output of camera branching pads. Three outputs are provided for distribution service. The amplifier circuit is designed to take one input signal of as little as 50 millivolts peak to peak and deliver three isolated output signals of 1 volt or more. A sync mixing feature is included which permits addition of sync from a standard 4 volt source to a non-composite signal within the amplifier.

We specifically designed our TDA26 High Gain Video Amplifier for use in any application where up to 28 DB gain is required.

It rack mounts in only 1¾ inches of vertical panel space and will operate reliably for many years without need for replacement of any parts. The unit is completely shielded to prevent radio-frequency interference and all signal connectors are the standard 83 type. The power supply is self-contained and employs full-wave rectification, degenerative feedback and stabilization by the use of a Zener diode.

If you've got any application where up to 28 DB gain is required, then you need our TDA26 High Gain Video Amplifier. No fooling!

$400.00 EACH F.O.B. NASHVILLE

We invite your inquiry, write or phone collect today.

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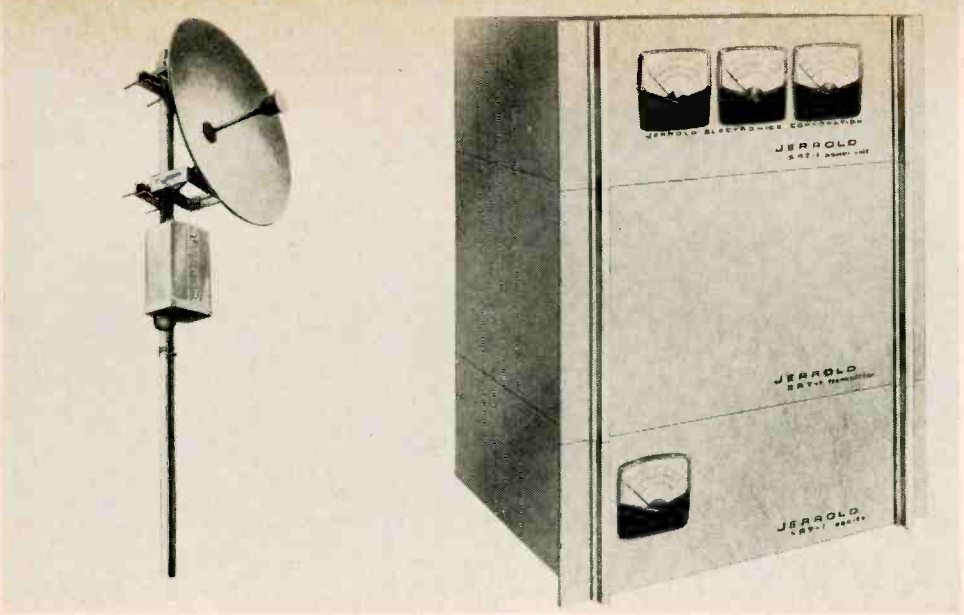
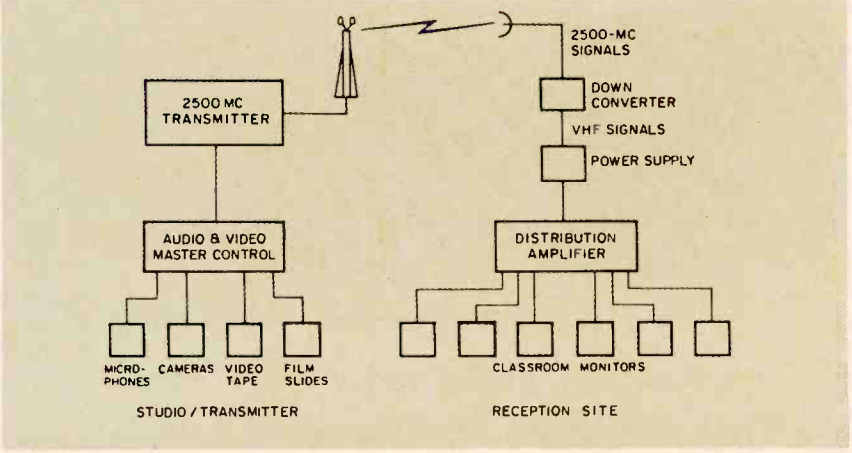


The heart of an ETV system is the radio link between the studio and each individual school building. The Jerrold SRT-1 transmitter is designed for multiple channel output mixing, and the exciter-modulator and control unit (one required for each channel) can be mounted any distance from the transmitter. The mast-mounted receiver will pick up any 4 or 5 alternately-spaced VHF channels.

System Cost

Transmitting: Single channel (depending on towers) — $15,000 to $30,000. Additional channels, each—$10,000 up.
Receiving site: Converter, antenna, and installation—$1,000 to $1,200.
Distribution system: Depending on single or double cable; $50 to $90 per classroom. Receivers and stands average $150 per classroom.
Service: Usually 5% to 10% of initial cost.
Survey costs: Most manufacturers will make at least preliminary survey free, but when a rather extended system is contemplated, a more complete survey is desirable. Costs will average $50 per receiving site.
Studio: Minimal one-man operation relying on film and video tape program sources would include vidicon camera for film and slides, 16mm projector, slide projector, multiplexer, helical scan video tape recorder, video monitor, waveform monitor, audio mixer, console apparatus, switchers, remote control, and sync generator—total, about $29,500.
Local program production: Two vidicon cameras, lighting and associated control and monitoring equipment—$15,000 and up.
Video tape facilities: for playback only—$12,000 to $22,000; record and playback—$25,000 to $34,000.



A typical 2500-mc ETV system beams program material originating from live studio, video tape or film machine to each building equipped with a receiver. 2500-mc signals are converted to VHF channels and distributed by cable to each classroom outlet.

and slide operation, a multiplexer with film cameras and 16mm film and slide projectors are needed. If live programs are to be taped for later presentation, or if video tapes from outside sources are to be used, a video tape recorder or at least a video tape playback machine will have to be included.

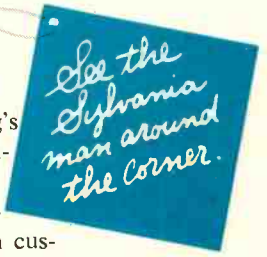
Transmitting equipment includes a specially designed 10-watt transmitter (more than 10 watts may be authorized upon proof of need). Transmission lines or waveguides connect the transmitter to special antennas designed for directional or omnidirectional use. Up to 5 channels may be authorized for each station, thereby permitting simultaneous transmission of as many separate programs. Some equipments use a separate transmitter for each channel, while others incorporate a multiple channel transmitter. If a signal is to be retransmitted by a booster station, it may be converted from one 2500-mc channel to another.

Receiving equipment includes, generally, a 2- or 4-foot parabolic reflector-type antenna — standard TV receiving antennas will not work. Some omnidirectional systems require a larger antenna if the reception site is 5 or 6 miles from the transmitter; receiving sites beyond 8 miles probably will require a special consideration (higher gain or special antenna installation or booster station). A broad band "down" converter at each building translates or converts the 2500-mc signal to a usable VHF channel (7-13). A single converter will handle up to 5 signals if they are on alternate channel frequencies. A wired distribution system carries the VHF signals to a standard TV set connected to an outlet in each room. The cable distribution system can also be used to carry off-the-air signals and other closed-circuit programs.

Initial Costs

A number of variables enter into the cost of a system—the number of channels used, the number and location of reception sites, the degree of sophistication in studio equipment, and the terrain of the area. Before any reasonably accurate estimate of total cost can be obtained, a complete system survey must be made to determine requirements, site conditions, number of booster sta-

Gold Brand tubes live so long they hurt our business.



They can last 10,000 hours. They survive 10-g's vibration or 500-g's impact shock. And withstand extreme temperatures, high altitudes.

Every Gold Brand tube in Sylvania's complete line is this dependable. So even though customers don't reorder them frequently, they always reorder.

We use our new gold-plating process to make grids for these tubes. It forms a strong bond and eliminates flaking and peeling. Eliminates shorts from these causes.

Rhenium-tungsten heater wire increases ductility and mechanical strength, thus improving heater life.

A heavy insulating coating guards against heater-to-cathode leakage. Bends are coated individually to prevent hot spots and shorts.

Cathodes are formed from powdered metals. This way we can control properties and minimize contaminants.

In fact, we sometimes wonder if we've done too much to our Gold Brand tubes. Sylvania Electronic Tube Division, Electronic Components Group, Seneca Falls, N. Y. 13148.

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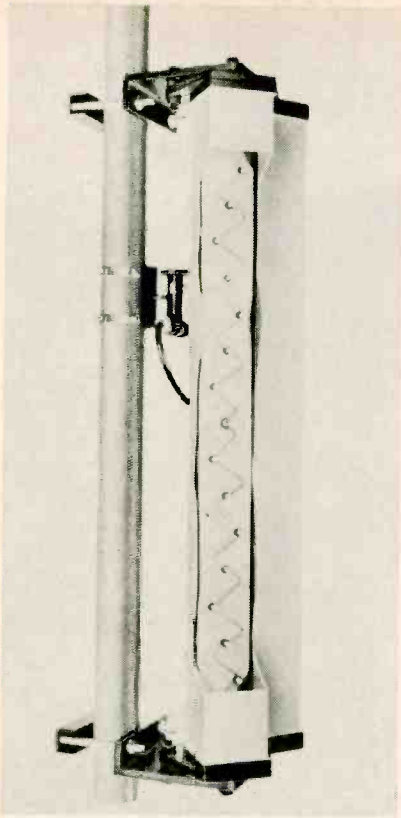
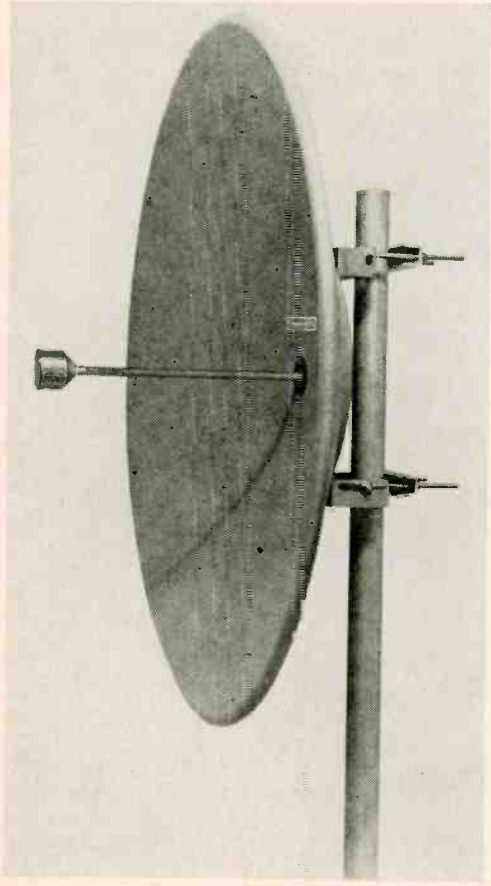


Example of newly developed zig-zag transmitting antenna developed for tailoring 2.5-kmc coverage pattern (Courtesy TACO).

Parabolic receiving antenna for reception of 2.5-kmc ETV signals.



tions (if any) tower heights, etc. Any obstructions—trees, buildings, hills and mountains, and even bridges—cause huge signal losses. When a line-of-sight path can not be attained from the vantage point of a rooftop, a tower may have to be erected to provide suitable elevation for the antenna.

In many cases, the equipment supplier will make at least a preliminary study without cost, but it is usually better to have a more extensive survey made. A good rule of thumb for estimating survey costs is $50 per building. This survey will, in most cases, include line sketches, photographs, path profiles for each reception site, and additional information necessary to complete FCC Form 330-P. The survey will, of course, include a consideration of studio, transmission, and receiving equipment.

Studio equipment costs can range from $15,000 for a simple installation up to $250,000 for a complex operation which would include live cameras, video tape recorders, projectors, etc. If initial funds are limited, this more elaborate equipment can be added later, after the other parts of the system are complete and in operation.

A single channel transmitter costs between $15,000 and $30,000 installed, depending on tower, antenna, and transmission line requirements. Additional channels cost $10,000 and up (some equipment designs require a separate transmitter for each channel).

At each receiving location, an antenna, converter, and power supply must be installed; the installation procedure is much like that of a conventional master TV antenna. Costs range from $1,000 to $1,500 per building. Distribution system costs, depending on the use of single or double cable (for both 2500-mc and off-air signals), will range from $50 to $90 per outlet. Classroom receivers and stands will cost around $150 each.

Personnel

The transmitter may be operated by a third-class radiotelephone license holder; to qualify for the license, an individual must have a knowledge of FCC regulations and pass the required FCC examination. Maintenance and equipment repair must be done by a first- or second-class license holder. Most systems, with the exception of quite large ones, are better off with a service contract

Channel Number	Band Limit-mc
A-1	2500-2506
A-2	2512-2518
A-3	2524-2530
A-4	2536-2542
B-1	2506-2512
B-2	2518-2524
B-3	2530-2536
B-4	2542-2548
C-1	2548-2554
C-2	2560-2566
C-3	2572-2578
C-4	2584-2590
D-1	2554-2560
D-2	2565-2572
D-3	2578-2584
D-4	2590-2596
E-1	2596-2602
E-2	2608-2614
E-3	2620-2626
E-4	2632-2638
F-1	2602-2608
F-2	2614-2620
F-3	2626-2632
F-4	2638-2644
G-1	2644-2650
G-2	2656-2662
G-3	2668-2674
G-4	2680-2686
H-1	2650-2656
H-2	2662-2668
H-3	2674-2680

Suppliers of 2500-mc ETV Equipment

Electronics, Missiles, & Communications, Inc. (EMCEE), 160 E. Third Street, Mt. Vernon, N. Y. 10550

Jerrold Electronics Corp., 401 Walnut St. Philadelphia, Pa. 19106

Litton Education Technology Div., 580 Winters Ave., Paramus, N. J. 07652

Micro-Link Corp., Div. of Varian Associates, Inc., 1375 Akron St. Copiague, N. Y. 11726

Radio Corp. of America, Broadcast & Communications Products Div., Front & Cooper Streets Camden, N. J. 08102

Mr. Irving B. Kahn, president and chairman of TelePrompTer Corp., owner operator of 20 CATV franchises.

A man works hard to get a CATV franchise

He needs a cable that will help make it profitable

TIMES
CATV CABLE & CONNECTORS

Timatch® perfect match connectors

Coaxial Cable: Available in seamless lengths up to ½ mile

After the battle for the franchise is won, the battle for customers and profits begins.

Times can help you win that battle on both fronts with its seamless sheath CATV cable in continuous lengths up to ½ mile, and its matching connectors that install instantly. Both are designed for long-term high efficiency use.

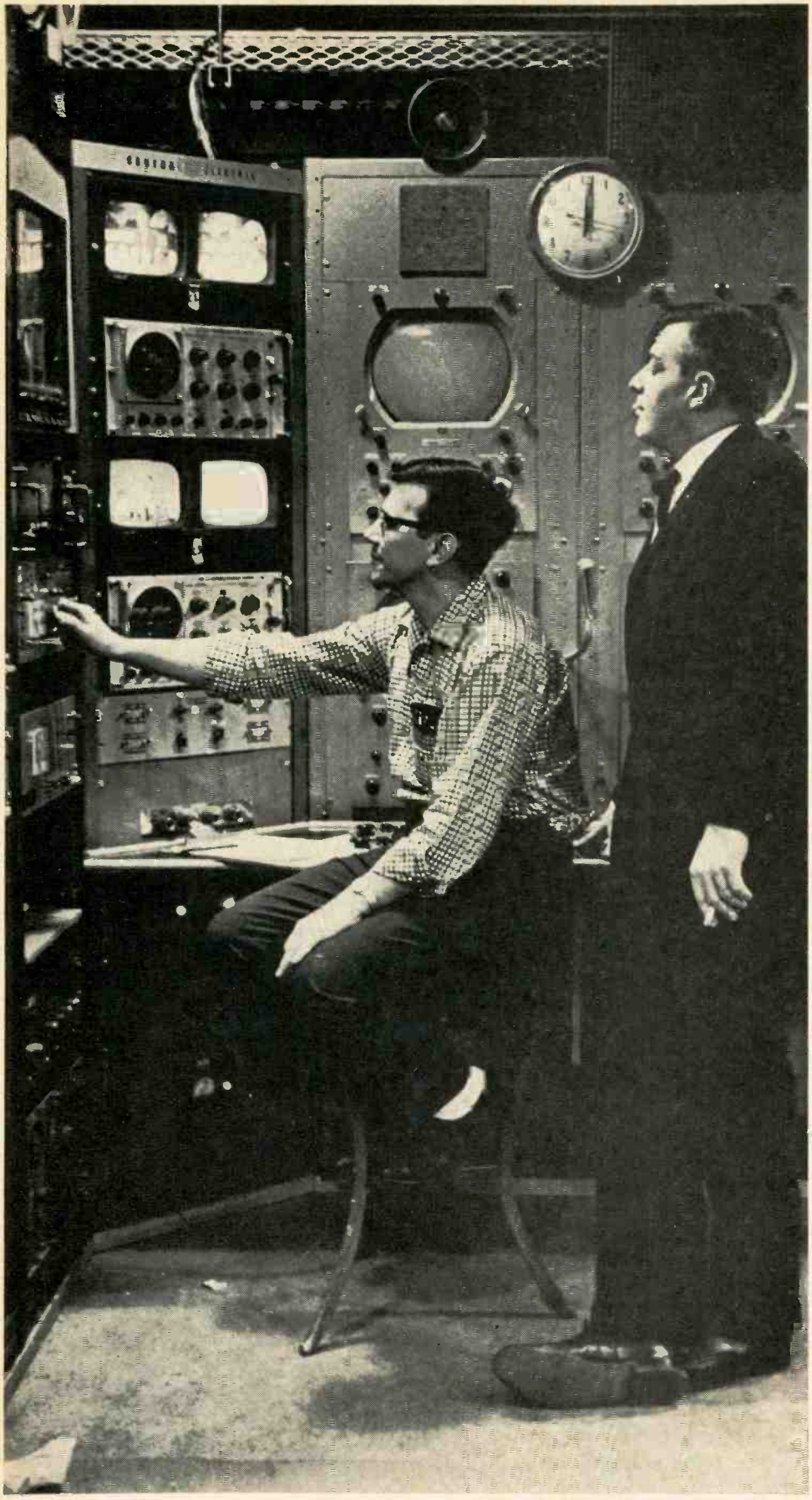
Why ½ mile lengths? Because that's the average distance between amplifiers, and ½ mile lengths mean fewer splices. The fewer the splices, the fewer the trouble points, the less maintenance needed. And the less labor cost and more profit over the longer life of the system.

Times builds in other advantages to keep performance quality high and customers happy. Times cable is water and vapor-proof, so it won't let the signal stop short of target. You can also count on guaranteed 30db minimum return loss and guaranteed maximum attenuation.

All in all, you get improved electrical performance from Times cable and matching Timatch connector. Long after so-called economy cable has been replaced (and re-installing always costs more than the original installation), Times cable will still be a top performer — even while you're upgrading your system.

You've put your best into getting the franchise. Now Times helps you put your best into the system. Why settle for anything less?

TIMES WIRE AND CABLE / A Div. of The International Silver Co. / Wallingford, Conn. / Transmission System Design & Engineering / Standard & Special Purpose Coaxial Cable / Multiconductor Cable / Complete Cable Assemblies



Master control room at WTVS Detroit is nucleus of ETV for public schools. Clem Grzywacz (left), assistant engineer, adjusts picture quality as John F. X. Browne, C.E., department of educational broadcasting, checks monitor banks. Broadcast service from two new 2500-mc channels augments WTVS programming, and a fourth broadcast source is received from MPATI. (Photo courtesy EMCEE.)

with the equipment manufacturer.

The responsibility for production scheduling, personnel training, medium promotion, and program implementation is usually placed in the hands of a coordinator. Teachers who will become the "network personalities" must adapt themselves to on-camera techniques, which are a bit different from conventional classroom methods. Instead of directing his attention to an entire class, he must concentrate on one student, represented by the camera. The teacher must become familiar with camera position, which takes a little practice.

The production staff may be comprised of teachers who have been trained for studio work, such as production director, coordinator of visual material, technical administrator, and cameraman (students may be used for the latter).

Curriculum planning is best determined by a committee composed of knowledgeable people from within the district or faculty. The members must study the needs of the overall school system and ascertain the concept and scope of the material to be used. The committee would also integrate the TV curriculum with classroom instruction, prepare tests, devise and distribute printed material for the introduction of TV lessons, etc.

Financial Resources

There are a number of areas in which both federal and state assistance is available. Federal aid legislation has some provisions which apply directly to equipment acquisition and others that contribute to the overall effort of which the equipment is only a part. In preparing federal aid applications, legal and engineering counsel is generally advisable, and often vital.

The potential of educational TV is far from being fully utilized; as a matter of fact, the surface has hardly been scratched. ETV offers school systems the means for employing specialized training facilities and personnel more profitably. By using a multi-channel system, up to five simultaneous programs can be transmitted to each school or building in the district. Then, too, programs aimed at community improvement can be accelerated by offering adult and professional-industrial training courses. Thus, 2500-mc ETV may be the greatest boom yet to the dissemination of educational and cultural data. ●

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The Economics Of UHF-TV

By William L. Walker

This material, of vital interest to anyone considering UHF-TV, is based on a presentation by the author at the 1965 NAB Fall Conferences.

THERE ARE not quite 600 commercial TV stations operating in this country. The large majority are VHF. Any change in the number or financial and competitive status of the present UHF minority group is certainly going to affect every other member of the lodge. So, before we single out the smaller coterie, let us put the microscope on all presently-operating stations. Since they operate in a capitalistic society based on the profit motive, how are they doing?

Profit Comparison—UHF vs VHF

Table I shows revenues, expenses, and profit margin for the *typical* TV station in 1964, on a nationwide basis. Revenues just over $1,200,000, expenses slightly over $1,000,000. Profit before taxes of $229,000 for a profit margin of 18.1%. This is *all* stations. Now how about UHF stations in 1964? Table II shows the typical financial picture of *UHF* stations for 1964. Revenues are not quite $625,00; expenses are about $565,000; profit before taxes is $58,000 for a profit margin of 9.4%. These figures show that UHF stations are now managing to generate sufficient revenues in their markets to support a profitable operation.

What does the future hold for television? Well, this industry should be in for a great deal of growth in the next 5 years. As it becomes apparent that available channels offer an opportunity for profitable operation, investors will construct stations in a search of these profits. Many of these investors may well be present owners of VHF stations, forced by FCC requirements to move into UHF in order to secure additional outlets.

How many stations will be built and on the air by 1970? Based on interest in applying for additional stations, the effect of the all-channel set law, the projected growth of the economy and the population, we come up with the estimate in Table III. This is our considered opinion as to what will take place, barring catastrophes such as war or depression, or a log jam in the processing line at the Commission.

We expect very few additional VHF stations to go on the air during this period. The unassigned "V" channels are largely in the western portion of the country. Goldfield, Nevada, with a reported population of 300 in a county of 600, is undoubtedly a lovely place to live, but it is not a very good place to build the Channel 5 station allocated to that community. Most of the new stations will have to operate in the UHF spectrum.

This anticipated growth in number of operating UHF stations will come close to matching the record of another element of the broadcast industry—FM. The growth cycle of commercial FM is familiar to many; initial spurt, decline, period of levelling off, and finally renewed growth surpassing the initial peak. A similar pattern is developing in UHF.

FM made its recovery and growth record without the aid of one important stimulant available to the prospective UHF station operator—the all-channel set law. As a result, every TV set in this country will ultimately have UHF capability. As of late 1964, we estimate that 24% of all receivers were either converted, or were all-channel sets. Based on manufacturers' life expectancy figures, we anticipate that this percentage will increase as shown in Table IV. From a practical standpoint, one will be able to consider all sets as having all-channel capability in a little more than 5 years. The all-channel set law has provided an added inducement to the entrepreneur considering the construction of a UHF station.

Mr. Walker is Director of Broadcast Management, National Association of Broadcasters, Washington, D.C.

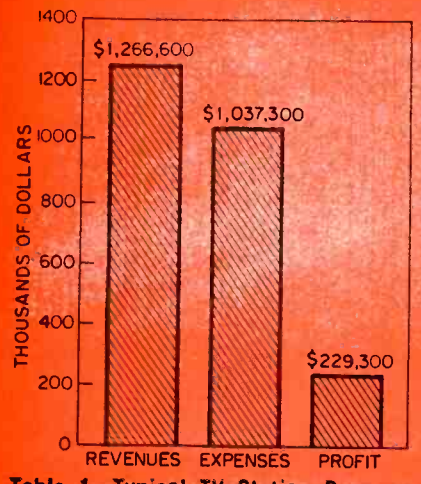

Table 1—Typical TV Station Revenue and Expense—1964

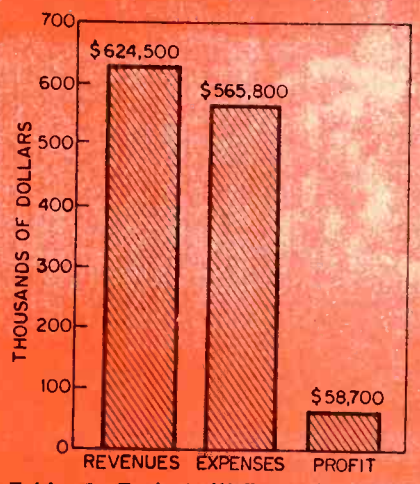

Table 2—Typical UHF Station Revenue and Expense—1964

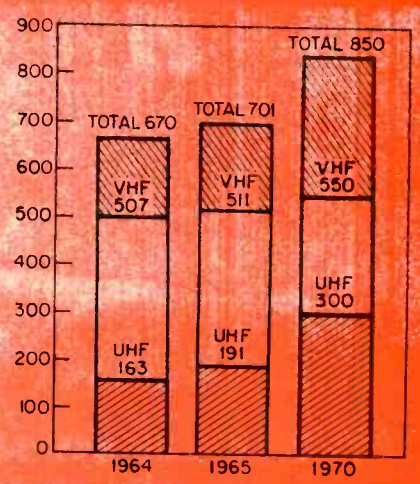

Table 3—Estimated Number of Commercial TV Stations by 1970

IN 1776 JOHN ADAMS OBSERVED:

"All great changes are irksome to the human mind"

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In 1966, Entron Inc. of Washington squarely faces the CATV industry with its new In-A-Line Series of all-solid-state equipment: converter systems, trunkline amplifiers, bridging amplifiers, extender amplifiers, preamplifiers and more. It's Entron's strongest way of casting a vote of confidence for the bright future of CATV. The In-A-Line Series stands for long, long service, lightweight construction and infrequent maintenance. It takes a step beyond meeting today's CATV needs. The In-A-Line Series makes you ready now for the increased subscriber demand in this burgeoning industry that has made solid state a necessity. (This fact alone makes the In-A-Line Series a good investment.)

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18.6% of all sets in the U.S. have been manufactured since the effective date of the law and *are* all-channel sets. Therefore, the present UHF broadcaster can count on a built-in nucleus of some 18% of the sets in the market, provided set sales have been proportionate in his coverage area. Only the UHF broadcaster who worked to bring about UHF in his locality a decade or more ago can really appreciate the value of this ready-to-go audience potential.

Market Size

Now, let's consider the intriguing FCC proposal for low-power, small-market UHF stations. Basically, the proposal is that these be licensed on Channels 70-83, to operate with 10-kw ERP, with maximum antenna height of 300′ in towns of 25,000 or less. This has stirred up a great deal of interest, ranging from the firm proposing to furnish a packaged station for one-man operation to the local businessman who sees a chance to get "a little television station of his own." Let's explore the possibilities of such an operation. Where could it be located?

We have already dismissed Goldfield, Nevada, as being too small. How small is small, and where is the cutoff point? Some markets which many would consider as too small to support a TV station are currently doing just that. Let's consider, for example, Glendive, Montana, in Dawson County. This county of 13,000, with $16 million in retail sales, is served by three broadcasting stations—a Channel-5 station which went on the air in 1957, a full-time 250-watt radio station with an air date of 1948, and a kilowatt daytimer which was built in 1962. One TV and 2 radio stations in a town of 7,000. Of course, this is a one-station market as far as TV is concerned. Smallness, relatively speaking, is no guarantee that the TV station will be the only game in town.

Let's look at Yuma, Ariz. Here we find a city population of 30,000 and county population of 55,000. City retail sales are $66 million and county sales are $92 million. Yuma has four times as many people as the Montana County and nearly six times the volume of retail business. But who is cutting up the advertising pie in Yuma? Three TV stations (one Mexican and two American), three radio stations in Yuma itself, and four more coming in from across the border. There is also one daily and one weekly newspaper. Too, Yuma has a CATV system.

The point of singling out Yuma and Glendive is to show that TV stations are operating in markets many would consider incapable of supporting such an outlet. Of course, these stations are VHF. Will the proposed small-market UHF work out? With each day that passes, the problem of set conversion becomes, at least theoretically, less and less overpowering. The UHF station going on the air two years from now should find 50% of the sets in the market capable of receiving a UHF signal. As time passes, the question will become, "Can this market support a *television* station, rather than can it support a UHF station?"

We have examined several small markets around the country, checking such items as adjacent TV signals, population, sales, and CATV, to see if potential locations for these low-power UHF stations are available and feasible. The more we looked, the more we came to realize that there was going to be no pat answer on the location of these stations. One positive conclusion is that there is no package of standard gear which can be taken off the shelf, dropped into a given location, and automatically made into a money-making station. That old cry, "My market is different," is certainly true here. First is the matter of terrain and coverage. An engineer who is an acknowledged leader in the industry made the statement that, if he were considering building one of these stations on Channel 70 or above, he would hire a helicopter to hover over the spot where his antenna would be located. What he could see, he could cover. The intervention of a tree or other hindrance to vision would separate the viewer from the station's picture. While he might be making his case overly strong, the fact remains that these are not Class IV radio stations from a technical standpoint.

Second is the matter of present competition, both for audience and advertiser. In Table V we have a hypothetical set of market statistics, a city of 14,000 in a county of 30,000. This city population is greater than the county population in the Glendive market. Look at the retail sales: $66 million in the county, with $55 million of this concentrated in the city. This is something like four times the retail volume available in the Montana market. This market is eligible under the Commission proposals for one of the low-power stations. However, here it is possible for a resident, with a rotating, outside antenna, to pick up as many as 10 VHF signals. The picture may be snowy, but it is still a picture. VHF reception is good enough so that the local CATV system is experiencing success best described as, "come si, come sa." The market also has two AM stations, one of which is a daytimer, plus an independent FM, so there is plenty of competition for the local audience.

How are these three radio stations doing? Now we have to see who else is in the market from

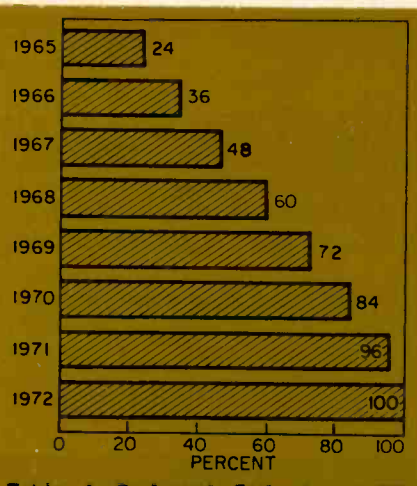
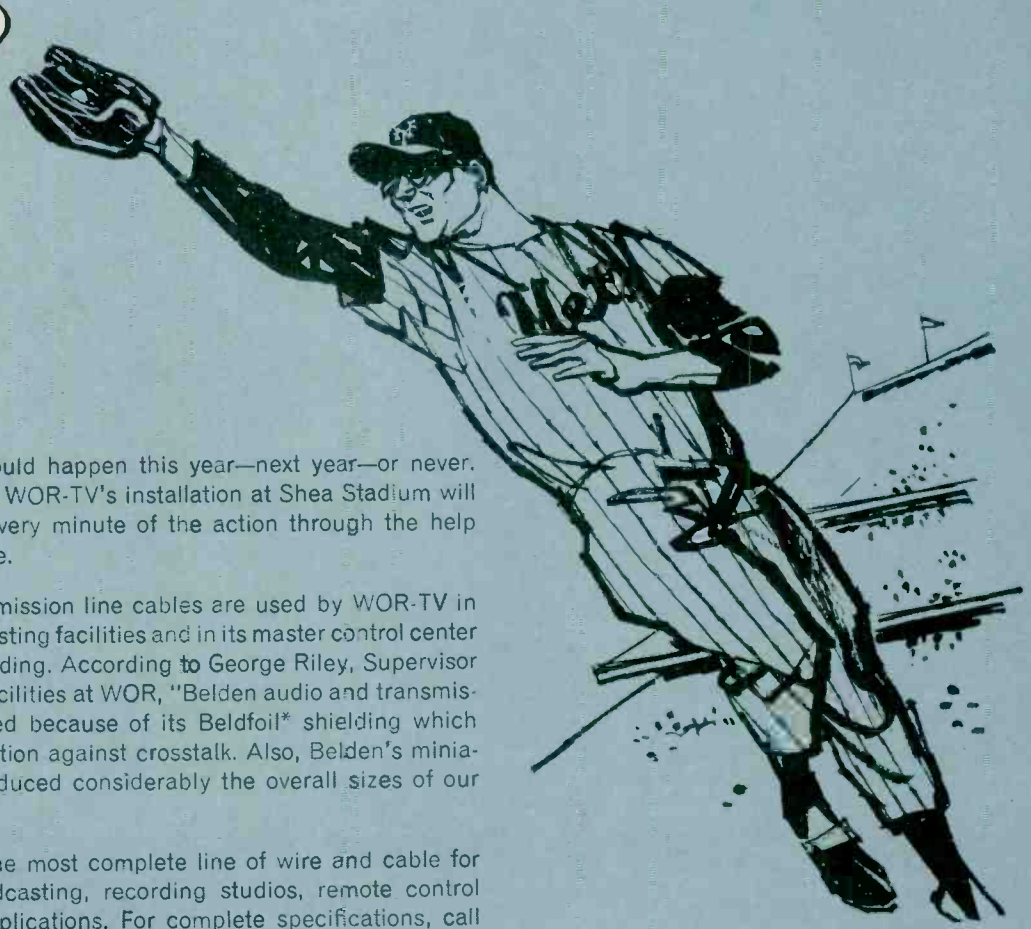


Table 4—Projected Estimate of TV Sets With UHF Capability

When the "Mets" capture the pennant... Belden will be there

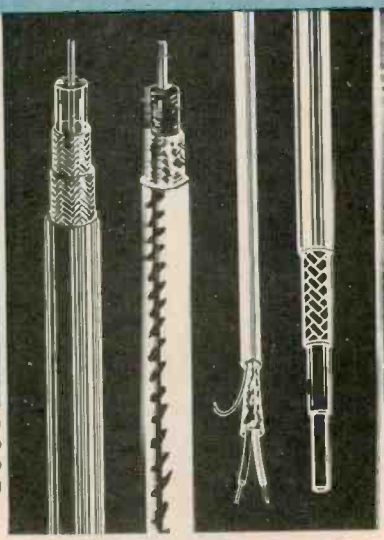


Such a phenomenon could happen this year—next year—or never. But if and when it does, WOR-TV's installation at Shea Stadium will record and broadcast every minute of the action through the help of Belden wire and cable.

Belden audio and transmission line cables are used by WOR-TV in both its stadium broadcasting facilities and in its master control center in the Empire State Building. According to George Riley, Supervisor of TV Operations and Facilities at WOR, "Belden audio and transmission line cable was used because of its Beldfoil* shielding which provides superior insulation against crosstalk. Also, Belden's miniaturized audio cables reduced considerably the overall sizes of our panels and consoles."

Belden manufactures the most complete line of wire and cable for all TV and radio broadcasting, recording studios, remote control circuits, and similar applications. For complete specifications, call your Belden electronics distributor.

The control center of WOR-AM-FM is wired with Belden 8451 and 8700 miniature broadcast and audio cables. Explaining the complexity of the installation to George Kyros is Orville J. Sather, Director of Engineering for WOR-AM-FM.



In the control room, six monitor screens help the engineers transmit the play-by-play action. Looking over part of this installation are George Kyros, Belder Territory Salesman, and Earl Neely, Maintenance Supervisor of WOR-TV. The monitors are wired with Belden 3451, 8241, and 8281.

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a competitive standpoint. Right in the middle of the town is a well-established daily newspaper. Here is the pie. Are the three broadcasters and the newspaper leaving a piece for the prospective TV station operator? The total of $1,100,000 seems to be just about the maximum to be squeezed from this market. The newspaper is 100 years old. The full-time AM dates back to the thirties. If these two competitors haven't yet convinced a retailer that he should advertise, I don't think there will be much chance for the neophyte TV station to do so. What it boils down to is this: the local TV station would have to fight for viewers, but more important, its advertising revenues would probably have to come through diversion from existing media.

Let's take a look at another market (Table VI). This one is different, and in a lot of ways. Here we have a town of 8,000 with a county population of 17,500. Retail sales of $25 million. And, who, pray tell, is cutting up this pie? This is a nice little enclave. There is just enough TV around the area to give fringe viewing sufficient to keep a CATV out. The existing TV stations make no sales effort in the market. The newspaper coverage is largely what would be described as "state editions" of metropolitan dailies, again with no sales effort for advertising revenue. In this pocket is exactly one radio station. The owner-operator is making a comfortable living. His gross last year was about $85,000.

Let's compare this with Ben Sanders, almost legendary Spencer, Ia. market. Spencer has a population of 9,000 and retail sales of $29 million, which makes it roughly comparable with this market. Ben says they expect to reach $300,000 in revenues at KICD this year. If Ben can do that amount of business, I somehow feel that there must be additional business available in this market. Maybe a local TV station could drum up a couple of hundred thousand dollars in revenues.

Operating Expenses

If a station could generate $200,000 income, then the operator faces the hurdle of whether or not he could operate on this amount of money, and how he would do so. To the man who is about to spend $800,000 on color conversion, or who just signed a contract for a half-million dollars worth of color film, the thought of a TV station with revenues of $200,000 a year may be blood-curdling. So let's look at some really small-market stations. Table VII shows three actual stations, operating at a profit, with expenses of just about $200,000 dollars a year. So if there is that amount of revenue available in the market we looked at, it might be possible to drop in a station and operate at a profit.

Of course, expenses would depend on the type of operation. Our example stations each have a network affiliation, albeit at minimum rates or even bonus arrangements. Nevertheless, this allows them to program with relatively little film expense. The hypothetical station we are considering would have these problems with its programming: Could it get a network affiliation, and if it did, would it be able to gain audience acceptance? To put it bluntly, if the average listener can watch the XYZ program, although with a somewhat fuzzy picture from a relatively distant VHF station, is he going to put up a bowtie to see the same program on this low-power community UHF? If the operator is not successful in securing a network affiliation, what is he going to do about programming? As an independent, what film is going to be available, and what is it going to cost him?

One definite answer is that this station is not going to be able to afford any really fresh film. Product is available, but it is composed of features and syndicated segments which have been well-exposed on the larger market stations. What will it cost? Well, there would seem to be almost a basic minimum of something on the order of $15 per half hour. Some feature film cost would be less, depending on the reruns, but with less audience appeal. If the station can come in with a figure for film cost in this neighborhood, it can then predict with fair accuracy its programming expense, based on the number of hours per day it would expect to operate, along with the amount of live programming, news, and other non-film service it contemplates.

Staffing a Local "U"

With the number of hours of broadcasting to be done each day, as with so many other things in this small market area, much depends on the

Table 5—Statistics for Sample Market Number One

		Media Revenues	
City Population:	14,000	Daily Paper:	$750,000
County Population:	30,000	Full-time AM Station:	200,000
City Retail Sales:	$55,000,000	Daytime AM Station:	125,000
County Retail Sales:	$66,000,000	FM Station:	25,000
			$1,100,000

Table 6—Statistics for Sample Market Number Two

		Media Revenues	
City Population:	8,000		
County Population:	17,500	Local Paper:	None
County Retail Sales:	$25,000,000	AM Station:	$85,000

Table 7—Small Market TV Revenue, Expenses & Profits

	Station A	Station B	Station C
Revenues	$235,000	$260,000	$205,000
Expenses	205,000	205,000	200,000
Profit	30,000	55,000	5,000

Table 8—Typical Staff for Small-Market "U"

- Manager
- Sales Manager
- 2 Salesmen
- Program/Production Manager
- Director
- 2 Cameramen/Film Technicians
- 3 Engineers/Announcers
- Newsman
- Secretary/Bookkeeper

Who ever thought Miss Brown would be running the station?

Certainly not Miss Brown. The closest she ever came to broadcasting was a man-on-the-street interview.

But today she's a traffic manager at an ATC-automated radio station. And the little IBM cards she punches out do indeed run the station.

The new ATC punch card programmer works in conjunction with other ATC equipment to give a broadcaster truly efficient automation.

There's also a magnetic tape control system, and a time/sequence control system. They work wonders, too, even though Miss Brown isn't in there punching.

When you consider the benefits of station automation, cost doesn't mean much. But broadcasters live with budgets, so you want to know what it's going to cost.

Can you sell $65.00 worth of extra spots a week? AM and/or FM? That's all it takes to automate your station. In many cases, even less.

You can buy the system outright. Or finance it. Or lease it.

Then you can take your creative announcers away from purely mechanical control room work. Give them more time to prepare better programs. Better commercials. Better newscasts. To make more sales.

ATC automation lets you do that. For a few hours a day or around the clock.

And the truly gratifying thing about ATC systems is that you buy only what you need to serve your purpose—and your budget. If you want to expand later, you just add on.

One more important point: ATC came into being because a group of broadcasters saw a need. From the beginning we've looked at automation through a broadcaster's eyes.

Why not find out today how automated broadcasting will work for you? Who knows, you may have a Miss Brown in *your* station some day.

AUTOMATIC TAPE CONTROL INC.

1107 E. Croxton Street
Bloomington, Illinois
309-829-7006

Circle 30 on Reader Service Card

market itself. Probably most of these outlets will operate, at least at first, with a late afternoon sign-on, such as 5 PM, and operate until 10 or 11 at night, leaving the daytime audience, if any, for future development.

The hours of operation would also have an immediate effect on the size of the station staff. How many people will it take to man one of these proposed outlets? The minimum would seem to come out at about 13 (see Table VIII). Obviously, this would be a non-union station, with everyone "doubling in brass." Someone would have to handle traffic as a sideline, for example. While some may come up with a different makeup of job assignments, it seems to take 12 to 14 people to operate a TV station as envisioned today.

Potential Operators

Given the programming we have mentioned, the hours of operation limited to evening only, and this minimum staff, the station should be able to operate within the $200,000 dollar figure we have for the expense budget. In the market we looked at earlier, with but one radio station, and possible additional business, such a station could operate at a profit, provided the programming attracted sufficient audience and advertiser acceptance. To do so, the station would have to sell out at some $10 per spot for the limited hours of operation. In some markets it would be impossible. In any market it would be difficult. But, it can be done, in some situations. The prospective community UHF operator would do well to look carefully before leaping into this pool.

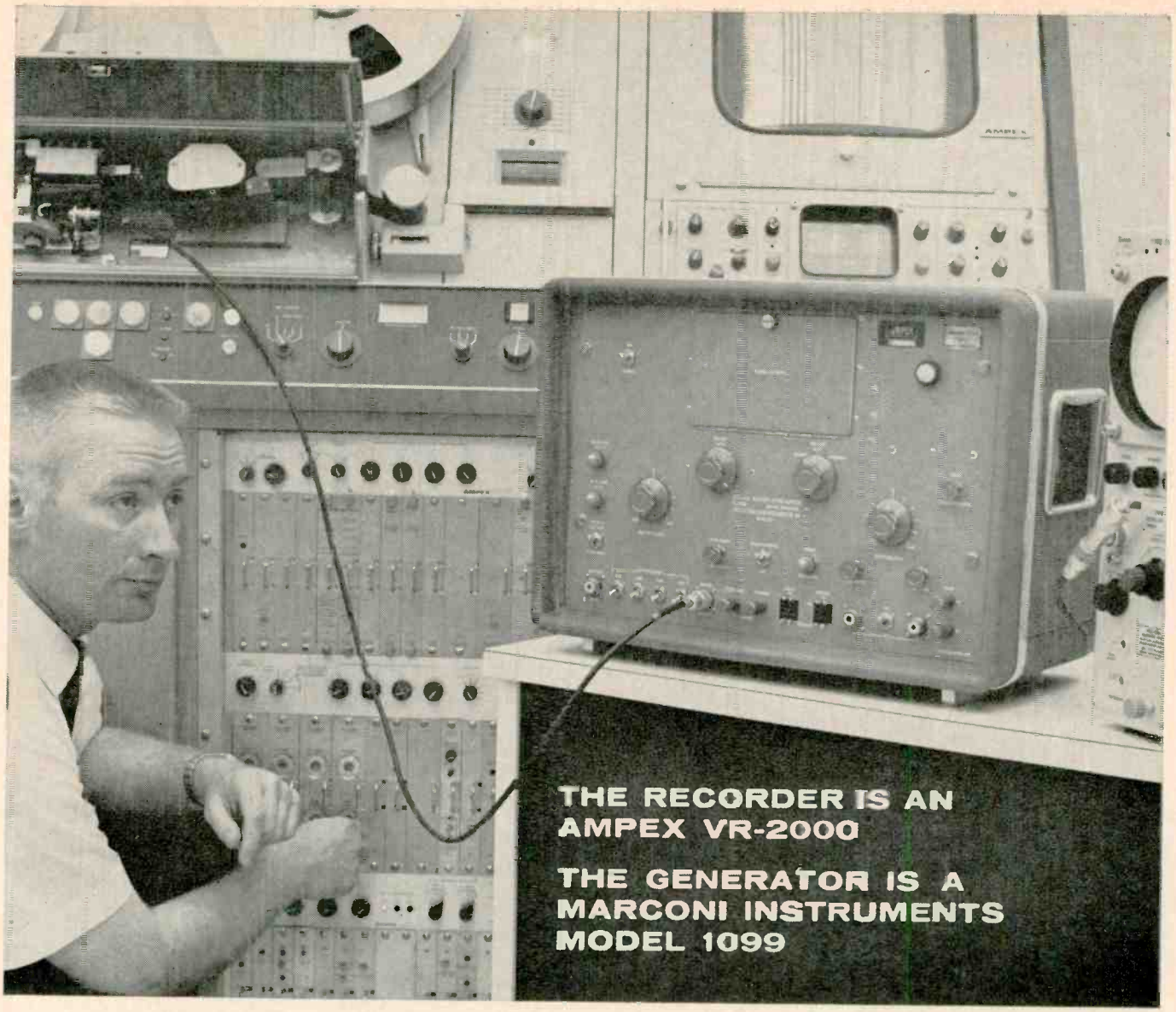
Who are these prospective operators? Apart from the well-heeled industrialists moving into the major markets, and the local businessman, who will build these smaller stations? There are numerous possibilities. One is the radio broadcaster already in this market. He didn't get into TV in the early days because of the money involved, and the lack of a channel assignment. He is an established businessman in the community, and most important, he knows the market.

Another possibility not to be overlooked is the CATV operator. If the system is doing any local origination, it might be a gambit for the system to construct one of these UHF stations for the express purpose of continuing the programming. He would carry the signal on his wire, and be able to continue as before.

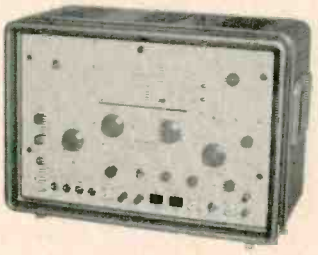
But generally these stations will be built by persons and firms who see an opportunity to earn a decent return on their investment. And, this leads us to the question of investment.

Equipment Costs

We put together what we considered to be a minimum equipment list. It is based on a 2-kw transmitter, 6-gain antenna, and a 300-foot tower. The studio equipment includes two camera chains, two film projectors, and the necessary mics and other technical and test equipment. We took this list to two suppliers and asked them to go over it. Based on our conversations with these firms, we figure that the minimum cost, for all new equipment, would be some $225,000. This does not include a building, real estate, or



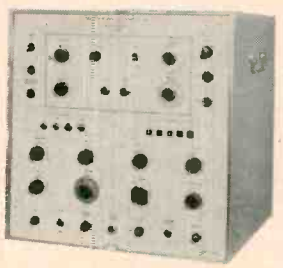
Ampex uses the 1099 to align Color Video Heads and Amplifiers for Maximum Linearity



Model 1099 sweeps from 0.1mc to 20mc with 1mc and 5 mc markers. Sweep is flat to 0.1dB with a maximum output of 3 volts p-p. The Sweep Generator uses special detector probes (supplied) to provide differential level, input/output, for exactly linearising networks and amplifiers and can discriminate to 0.02dB.

FOR YOUR TRANSMITTER –

Television Sideband Analyzer Model 2360 with UHF Adapter TM6936



- tests channels 3 thru 83
- measures dynamic response of transmitter
- allows insertion of sync and blanking on internally generated sweep signal
- for steady state response use as sync mixer with external oscillator for trap setting etc.

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MEASURING RESPONSE OF TV TRANSMITTERS

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INSTRUMENTS
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(201) 567-0607

Circle 32 on Reader Service Card

Table 9—
Cost of Acquiring $225,000 Equipment Package

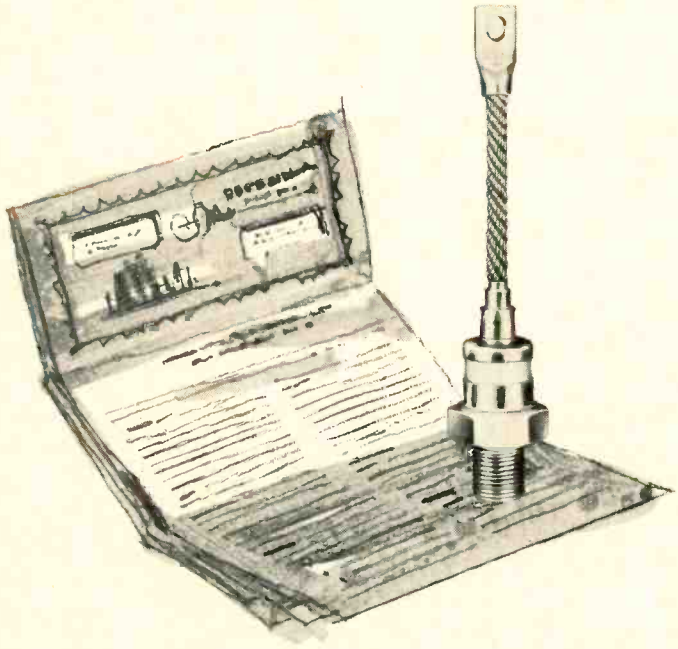
1. Outright Cash Purchase:		**$225,000**
2. Deferred Payment Plan Offered By Manufacturer (¼ Down 6% Interest on Balance 4-Year Payout):		
Down Payment:	$56,250	
Balance Due:	$168,750	
4-Years Interest:	20,675	
Total Cost:		**$245,675**
3. Bank Loan (1/3 Down 5% "Add-On" 4-Year Payout):		
Down Payment:	$45,000	
Balance Due:	$180,000	
4-Years Interest:	36,000	
Total Cost:		**$261,000**
4. Commercial Leasing Firm (No Down Payment, $5,215.50 Per Month for 48 Months):		
Total Cost (48 x $5,512.50):		**$264,600**

VTR equipment. The figure could be lowered by purchasing second-hand equipment or getting by with less gear.

This brings us to the question of whether it is better to lease equipment or purchase it outright, whether with the firm's capital, or borrowed money. With the surge in TV equipment acquisitions for color and second-generation equipment in many stations, many broadcasters are curious as to just how one comes out when leasing instead of purchasing (Table IX). If the broadcaster paid cash for this equipment, he would pay out $225,000. If he purchased it on a deferred payment plan through the manufacturer, with one-fourth down and 6% simple interest computed on the balance (sum of the digits), he would pay a total of $245,675. If he floated a bank loan—and he might be able to get better terms than shown here—with 20% down, a 5% "add on" and a 4-year payout, he would pay a total of $261,000. If he went to a *typical* equipment leasing firm, he would pay nothing down. His only expense would be the monthly rental of $5,512.50. However, at the end of 4 years, he would have paid out $264,600 *and the equipment would still be the property of the leasing firm.*

Conclusion

All of this discussion has been based on the present state of the industry. If we have sounded as if we feel either bullish or bearish, we hope that we have leaned toward the bullish. We don't want to sound like the person who told Wilbur and Orville that their contraption would never fly. Just as sure as we make a flat statement that these small markets will not support a TV station, especially a UHF station, some pioneer will come along with new ideas and originality, capitalize on the coming miniaturization of receiving sets or home video tape recorders, and make a raving success of one of these operations. Then, the gold rush will be on! •



like taking out insurance!

trouble-free dependability and efficiency!

Syntron Avalanche Silicon Rectifiers provide protection against voltage transients. The Avalanche Silicon Controlled Rectifier gives you the same protection plus! They have the dependability and efficiency to help you meet the highest standards of reliability.

There is a Syntron Avalanche Silicon or Avalanche Silicon Controlled Rectifier for your every requirement.

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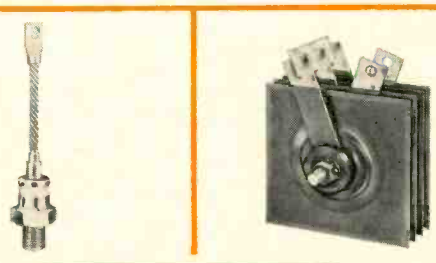


SYNTRON

SYNTRON COMPANY

2240 LEXINGTON AVENUE • HOMER CITY, PA.

66R17

Circle 34 on Reader Service Card

BROADCAST EQUIPMENT

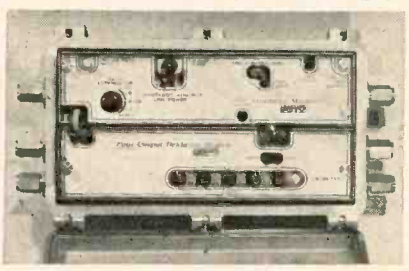
Stereo Production / Remote Studio

Sparta Electronic Corp., Sacramento, Cal., is marketing equipment designed for stereo production and remote studio operation. The AS-500 portable unit includes the Model AS-100B console, Model TEP-2S stereo equalized preamps for each TC-12 turntable, and separate monaural monitor and cue amplifier. The solid-state console has four stereo inputs: microphone, —50 dbm, 150/250 or 50-ohm balanced; turntable and auxiliary, —20 to +8dbm, 600-ohm balanced. Console output is +4 dbm into a 600-ohm balanced line. Frequency response is ±1 db 30-15,000 cps. The 3-speed turntables offer instant acceleration (1/16 revolution at 33-1/3 rpm, according to the manufacturer), centered controls, and fast, easy cueing. Price for Model AS-500 is $1350. Turntables (included in the above price) are priced separately at $179.50 with hysteresis synchronous motors. Same unit is available in monaural design, Model A-500.

Circle 54 on Reader Service Card

New CATV Amplifier Series

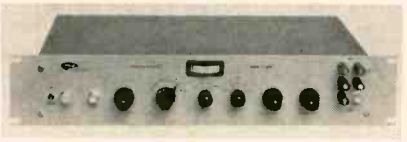
The Phoenician series, announced by Kaiser-Cox, Phoenix, Ariz., features die-cast aluminum housings designed to accommodate popular sizes and types of cable. The series is said to offer easier installation, field testing, service, and convertability, with the added advantage of low parts inventory. The amplifiers are of plug-in modular construction and allow interchangeability from a trunkline amplifier to a 2- or 4-output bridging amplifier, or combinations of trunkline and bridging amplifiers with or without AGC and automatic tilt. Built-in knob-type controls eliminate the need for screwdrivers, plug-in pads, or accessories. Three sealed access ports permit internal probe measurement without exposing internal parts. Universal hinges at both top and bottom of the cover allow it to be swung open in either direction. Prices range from $350 to $640.



Circle 73 on Reader Service Card

TV Sideband Analyzer

Designed for use in tuning closed-circuit and broadcast TV transmitters on Channels 2 through 13, the TS-100A sideband analyzer, manufactured by Dynair Electronics, San Diego, Cal., is compatible with most commercial scopes with vertical and horizontal input deflection responses of 10 through 1000 cps. The solid-state unit is housed in a standard 19" rack-mounted chassis. A front panel test point is provided for comparing the vertical amplifier of wideband scopes against a detected video sweep.



Circle 81 on Reader Service Card

Tape Playback Preamp

Two solid-state tape playback preamplifiers have been introduced by Viking of Minneapolis. The units include tape speed equalization from 1⅞ to 15 ips. Power supply consists of solid-state rectifiers and capacitance-multiplier in a full-wave circuit. Silicon planar transistors and metal film collector resistors in the output stages limit residual noise; distortion is said to be less than 0.2% at 1v output. Model PB10,

v.i.t. displays with TEKTRONIX video-waveform monitor

with capability for sine-squared testing

Type RM529

frequency responses—Four response characteristics necessary to monitor Video Test Signals are provided:

1. FLAT to 5 MHz ±1%, to 8 MHz ±3%. *This flat response position to 8 MHz assures waveform fidelity and makes the video-waveform monitor ideally suited for sine-squared testing.*
2. HIGH PASS 3.58 MHz center frequency, 30% down at ±400 kHz.
3. LOW PASS -18 dB at 500 kHz.
4. IEEE 1958 STD 23-S-1. Color subcarrier -20 dB.

YRBG or RBG display capability—For monitoring output of color processing amplifiers.

line selector—Provides stable displays of the Vertical Interval Test signals. Adequate brightness is provided even at the fastest sweep speed. Can display any line desired. Brightening pulse automatically intensifies the displayed line as viewed on the associated picture monitor. No modification to the picture monitor is required.

field selection—Positive acting circuit allows selection of field one or two for display. Noise will not cause random field changing.

dc restorer—A feedback-type restorer acts during the backporch time. Not affected by presence of color burst. Does not distort the burst. Front-panel switch can disable the restorer—when other than video waveforms are viewed.

Cabinet Model also available. Same features as RM Model and designed for side-by-side mounting with a picture monitor in standard racks. Takes only 8¾" of rack space. Field case offered as an optional accessory for Type 529.

Type RM529 Video-Waveform Monitor	$1100
Type 529 Video-Waveform Monitor	1050

U.S. Sales Prices, f.o.b. Beaverton, Oregon

VISIT THE TEKTRONIX BOOTH 202 AT NAB

Available throughout the world

Tektronix, Inc.

Circle 36 on Reader Service Card

with response of 30 to 18,000 cps (±2 db) at 7½ ips, and output impedance below 13,000 ohms, priced at $34.50. Model PB10-22

includes 600-ohm output transformer; taps for 6-, 150-, and 1500-ohm outputs are standard. Price is $44.

Circle 78 on Reader Service Card

Studio Turntable

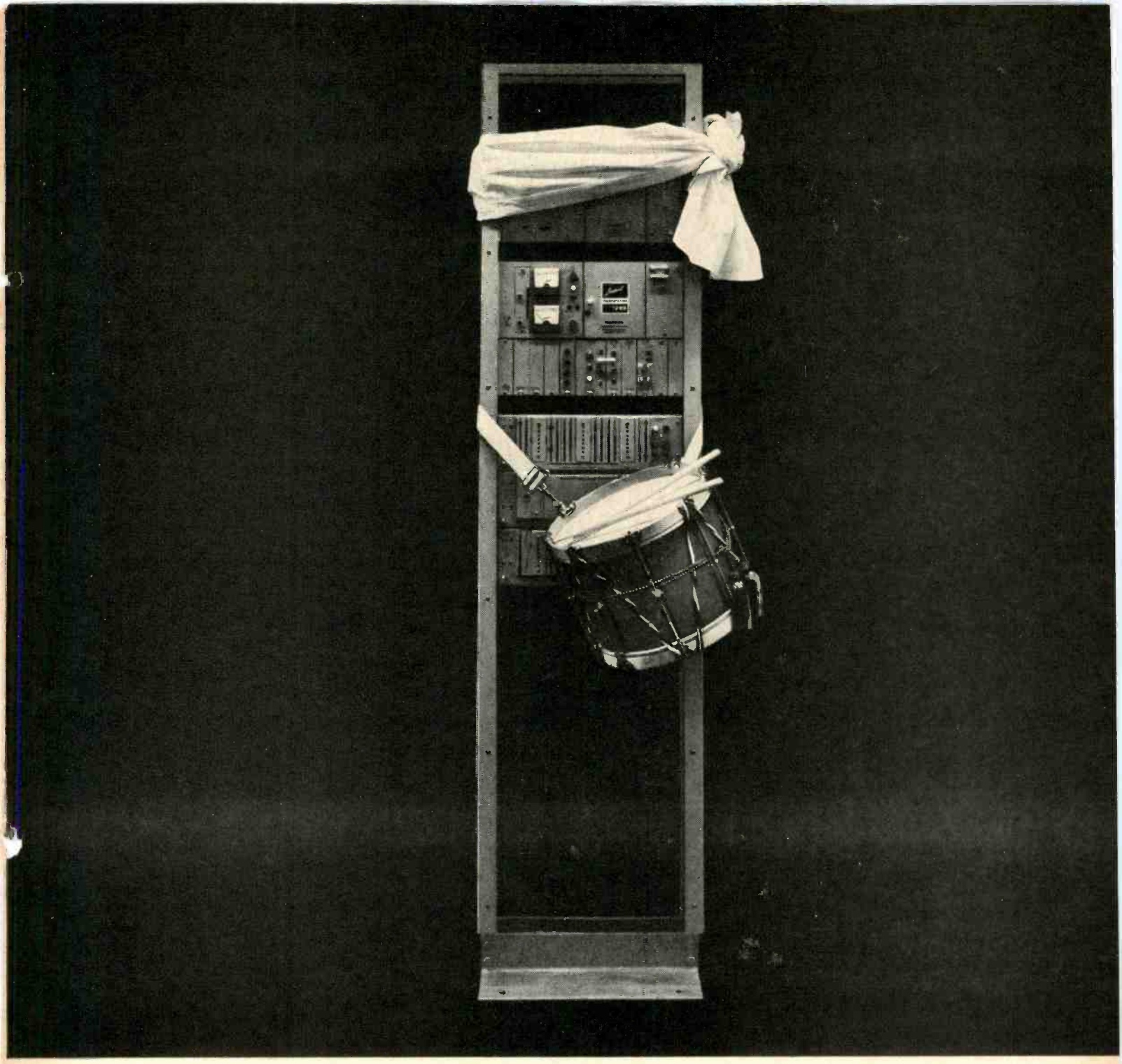
A 3-speed stereo/mono turntable system, the EMT 930st, is available in the U.S. from Gotham Audio Corp., N.Y.C. An equalizer/amplifier furnishes line level output with a wow and flutter figure of 0.03% RMS and rumble figure better than NAB standard.

The turntable is equipped with remote start/stop control and is said to reach operating speed in 0.4 sec., with output cutoff for wowless starts and cueing to the beat or syllable. Incorporates synchronous motor, arm lowering device, groove illumination light, and interchangeable mono and standard groove cartridges. Price, less console, is $1295.

Circle 58 on Reader Service Card

TV Waveform Scope

Hewlett-Packard, Palo Alto, Cal., has announced a TV Waveform scope designed for accurate vertical interval test signal measurement. The Model 191A is said to have 1% vertical accuracy for most measurements and 1% stability for all operations. A new cathode-ray tube permits full screen display of low-duty-cycle signals; T/2, T, and 2T sine-squared test pulses are presented with brightness ordinarily asso-



The spirit of 76 (tv)

We'd like to urge you to buy our 76TV microwave relay system next time you are in the market for monochrome or color video transmission equipment. Not for the obvious reasons, though, like its outstanding performance, low price, and easy maintenance.

No, we think you ought to buy our 76TV because of its demonstrated heroism and valor. And long-suffering patience in the face of overwhelming odds.

How do you think it feels when, year after year, hundreds of tons of explosives are fired off inside you?.When, in a typical week – besides three glorious concerts and five exciting football games – about 30 murders, 24 auto accidents, twelve divorces and four or five extortion schemes are perpetrated through your unflinching innards? When headaches, backaches, congested nasal passages all get their appropriate fast relief through you?

To do this day-in and day-out takes solid-state guts. Such devotion ought to be rewarded. Buy a 76TV microwave relay system from Lenkurt Electric Co., Inc., San Carlos, California, now! That's the spirit.

LENKURT ELECTRIC

SUBSIDIARY OF
GENERAL TELEPHONE & ELECTRONICS GT&E

Circle 38 on Reader Service Card

ciated with continuous signals. The solid-state unit features positive selectivity for field 1 or 2, and an automatic discrete selection of lines 16 through 21 for VIT measurements. The vertical amplifier is said to be flat within 0.05 db from 100 cps to 1 mc, monotonically decreasing to —0.10 ±0.05 db at 4.5 mc, —3 db at 10.5 mc, and more than —20 db at 20 mc. Includes 5 accurately defined positions for waveform measurement, and the low-pass position has a sharp notch at 500 kc. Price is $1295.

Circle 76 on Reader Service Card

CATV Wire Grips

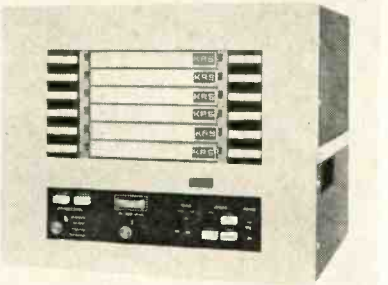
The Pruzan Co., Seattle, Wash., has available two TV "S" wire grips for dead-ending CATV house drops on pole, tap, and house connections. The grips (one

of stainless steel, the other aluminum) are single-size one-piece construction designed to distribute the grip over 4″ of cable. Tests, said to be equivalent to years of use, showed no tightening of the grip and no damage to the cable.

Circle 77 on Reader Service Card

Cart Tape Machines

KRS Instrument Div. of Datapulse Inc., Pasadena, Cal., is offering a series of tape machines featuring reversible, continuous-loop cartridges, 6 tape decks, automatic cueing and sequencing, and remote control. The SB6AP



offers playback with front panel and remote controls, SB6AP-1 offers playback with remote controls, SB6AR1 (pictured) is a 6-deck playback with one combination reversible erase/record/playback deck (SB6AR6 has all decks reversible). Monaural units use one track for audio and one for cue tone, which may be used for projector control, etc; stereo units

Those R&D eggheads have fouled us up again.

They called our bluff, met our design objective, raised us two operational modes and hit the jackpot–The PCA-1

(Program Controlled Amplifier)

A modest $990.00*

*(U.S. Funds, F O B Toronto. Duty and Brokerage Fees Included)

All we asked the lab to develop was a simple forward acting solid state limiter, with 30:1 ratio, fast attack, low distortion, "Set and Forget" operation. Then they surprised us with multifunctional circuitry—a bonus of two additional operating modes *essentially for the same price.*

The automatic leveller has a 40 db range—and that's about twice as good as the competition — plus an audio external controller. Given some modicum of sophistication, you can even juggle a constant or three, and the PCA-1 functions imperturbably as a limiter *and* an automatic leveller. Simultaneously.

And if this little introduction isn't intriguing enough, *you should see the specs.* Those PhD's of ours really came up with a lallapalooza. For details write to:

Northern Electric
COMPANY LIMITED
DEPT. 9950, BELLEVILLE, ONTARIO, CANADA

. . . tantalizing, isn't it?

1065-2

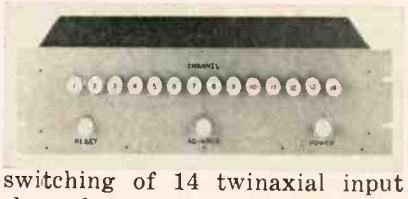
Circle 41 on Reader Service Card

use one track for cue tones and two tracks for audio. Cartridge sequencing may be manual or automatically controlled from a panel switch on one cycle, continuous recycle, or preset sequence. Tape speeds are 3¾ or 7½ ips; frequency response is 30-18,000 cps ±2db at 7½ ips; signal-to-noise ratio claimed is at least 50 db from 3% THD point. Record input is 600 ohms, mixed and individual outputs are 600 ohm, 0 dbm. Price is $1985 for SB6AP-1.

Circle 68 on Reader Service Card

Video Scanning Switch

A scanning switch developed by Trompeter Electronics, Chatsworth, Cal., provides sequential

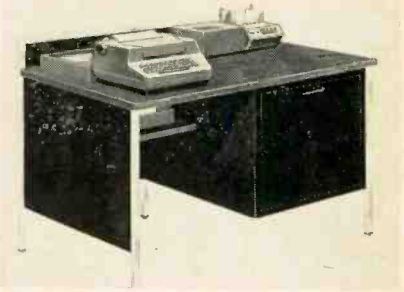


switching of 14 twinaxial input channels to a single twinaxial output. Switching is controlled by either front panel push button or remote contact closure. A reset or homing function is also provided with both front panel and remote control capability. The channel in use is shown at the front panel by lighted indicators. Available in custom configurations, the switch can also provide for coaxial and triaxial circuits. Isolation and cross-talk options are 45, 75, and 110 db; frequency ranges are DC to 20 mc for twinaxial and DC to 60 mc for coaxial and triaxial configurations. Special configurations are available for higher frequencies. Switching speed is 250 ms per step.

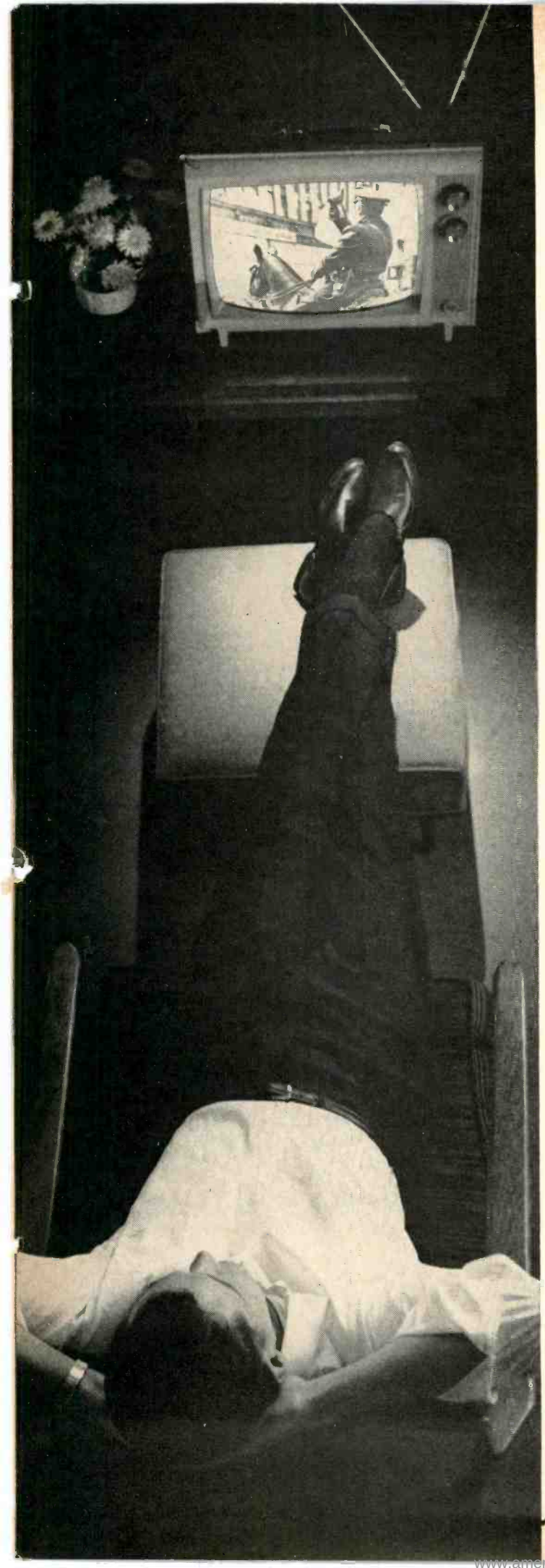
Circle 63 on Reader Service Card

Punch Card Programming

A punched card system of automation control which provides for later installation of automatic



billing and other data processing units is available from Automatic Tape Control, Bloomington, Ill.



When the viewers are home enjoying the show ...you will be too!

(Thanks to Raytheon's Dual Link II)

With Raytheon's new Dual Link II, getting home on time is as automatic as your STL protection. The Dual Link II, a *solid-state* hot-standby television microwave equipment, provides completely automated transmitter switching and duplicated receiver STL protection. Since equipment can be serviced during normal programming hours, after-hours maintenance and revenue losses from STL outages are gone forever. The equipment can handle up to four audio channels for AM, FM, stereo, or TV, and will transmit NTSC color with 1.0+ watt output. If your station is considering improving color performance and the replacement of overworked tube-type equipment, check the Dual Link II, first. It's warranted for 5 full years and "guaranteed" to get you home on time, everytime. Mail this coupon for complete information.

RAYTHEON

See us at
NAB Booth #106

Sales Manager
Raytheon Co., CADPO
1415 Providence Tpk.
Norwood, Mass. 02062

Please send me the full story on Dual Link II.

Name_____

Title_____ Station_____

Address_____

City & State_____ Zip Code_____

Circle No. 44

Up to 500 IBM-type cards, each representing a program element, may be placed in the reader which then programs the system. As the system operates, the program log is automatically typed with all necessary information for FCC-approved logging. The punched cards may then be used in existing accounting systems.

Circle 90 on Reader Service Card

5-KW FM Amplifier

A 5-kw FM power amplifier designed for use with any 250w driver is available from Teletronix, Pasadena, Cal. The Model FMA-5 has provisions for remote control, RF output impedance is 50/51.5 ohms, and maximum SWR to load is 1.75:1. Only one tube is used, a 4CX5000A. Price is $7,810.

Circle 56 on Reader Service Card

Ektachrome Film Processors

Two color film processors, designed for increased speed and quality, are available from Filmline Corp., Milford, Conn. The units offer extended developing time to accommodate ASA indexes of 250 at 50 fpm; changeover from standard to extended time takes 30 sec. at 30 fpm, Model FE-30 processes color emulsions Model FE50 at 50 fpm. Other features include a transistorized temperature control, 8 recirculation pumps, oil-less rotary pumps, feed-in and take-up time delay elevators, dial thermometers, and impingement dry-box.

Circle 94 on Reader Service Card

New Video Tape

Memorex Corp., Santa Clara, Calif., has developed a broadcast video tape said to have low dropout characteristics and feature freedom from head clogging and reduce head wear. The Type 77V is magnetically and electrically compatible with video tape currently in use. Extra length is included in each reel to allow recording of color bar and calibration signals.

Circle 96 on Reader Service Card

CATV Pilot Carrier Generator

A pilot carrier generator designed to supply a constant level for automatic gain control of CATV amplifiers is available from Ameco, Inc., Phoenix, Ariz. The transistorized PCG for all-band systems is shipped ready for use without internal adjustment, according to the manufacturer. Only operating controls are an on-off switch and an output level control with a 25 db range. The rack-mounted unit has sufficient shielding to prevent interference with other head-end equipment.

Circle 60 on Reader Service Card

CATV 'Weatherama"

Viking Industries, Hoboken, N.J., is manufacturing the 'Weatherama," designed to provide CATV system subscribers with time and weather information. A TV camera focuses on 10 gauges which report date, time, rainfall, relative humidity, an automatic multiple slide projector, wind velocity and direction, barometric pressure, temperature, and a weather forecast card slot. The camera focuses on each gauge for 4.8 sec. and re-focuses on the next in 1.2 sec. for a total of 6 sec.; the time clock gauge is televised every 60 sec.

Circle 65 on Reader Service Card

NAMES IN THE NEWS

Continued from page 10

James D. Bowen has been named manager of Raytheon's Sorenson operation, moving up from marketing manager. **Joseph W. Butler** was elected president of the Dage-Bell Corp. subsidiary, succeeding **Patrick J. Clancy** who will join the Raytheon corporate staff. **Samuel R. Harrell** joins Raytheon as assistant district sales manager of CADPO Div.

J. D. Bowen

S. R. Harrell

Anthony Severdia has been appointed sales manager of broadcast and TV products for the Conrac Div. of Giannini Controls Corp.

A. Severdia

John S. Auld

John S. Auld has been appointed general manager, North American Philips Studio Equipment Div.

John W. English has been named product sales manager of Superior Cable Corp. Mr. English will develop sales and distribution plans.

J. W. English

Dr. Maltzman

Dr. Edward Maltzman has been appointed manager, Electronic Systems for Education, Commercial Electronics Div. of Sylvania, according to **T. A. Combellick**, div. marketing manager.

Bill Haynes and **Etsell Emde** have been appointed regional sales managers for the Charles Machine Works. Mr. Haynes will work east of the Mississippi, Mr. Emde in the west.

Dr. Edward F. Brice was appointed assistant to the Assistant Secretary for Education, Dept. of HEW. Working under **Francis Keppel**, Dr. Brice will work on the coordination of educational programs.

Irwin B. Freedman has been appointed sales manager, Professional Cine Products, Agfa-Gevaert, Inc.

Mr. Robert E. Hull has been named vp of operations, Radio Engineering Labs. Mr. Hull had been vp of engineering. **Michael V. Burridge** was named commercial manager, moving up from sales manager—defense marketing.

Donald Wyckoff has been appointed director of Multiple Systems Owners and telephone sales for Kaiser-Cox Corp.

D. Wyckoff

C. H. Wagner

Charles H. Wagner was named sales engineer for Memorex Corp., covering Virginia and W. Virginia, and parts of Maryland and the District of Columbia.

LITERATURE of INTEREST

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

CATV Information channel, Viking Weatherama, described in flyer, offers 10-station indexing, live and slide operation. **102**

Audio/video systems, described in 6-page brochure from Ampex, includes CCTV, low-cost VTRs, TV cameras, recorders, audio and video tape. **103**

Tape preamp, high and low Z with variable equalization at all playback speeds, described in data sheet from Viking of Minneapolis **104**

Scope, push-button programmable design for TV and pulse waveform measurement, described in Hewlett-Packard brochure. **105**

IGM News, published bi-monthly by International Good Music, reports on taped music and automated system operations. **106**

Magnetic film described in brochure from Reeves Soundcraft includes illustrations, characteristics, prices on 35 and 16mm full-coated and Magnastripe films. **107**

Chart recorders described in brochure from Offner Div. of Beckman Instruments features S series pen-tip feedback system. **108**

Tape recorders, Magnecord 1021 monaural and 1022 stereo, described in 6-page folder listing features and specifications. **109**

Zoom lens, Angenieux Model 10X40C 10:1, described in folder from Television Zoomar Co. Includes specifications, prices. **110**

Power line chart recorder, described in catalog from Amprobe, records voltage and current and can also be used as indicating instrument **111**

Coax connectors listed in 240-page catalog from Amphenol. Contains dimensions, characteristics, connector-to-cable assembly information on 1400 types. **112**

Digital measuring system described in data sheets from Hickok uses plug-in units for AC-DC volts, ohms, capacity, frequency, current, multimeter, etc. **113**

Control knobs folder from Raytheon Components Div. includes drawings and dimensions for 8 colors. **114**

RF Interference, an 18-page report dealing with operation of engine-generators available from Onan, discusses causes and cures. **115**

Background music for FM described in illustrated brochure from Magnetronics. Discusses franchise of motivational library. **116**

2500-mc ETV antennas described in brochure from TACO. Includes specifications on transmitting and receiving types. **117**

2500-mc ETV transmitters and receivers described in catalog sheets from Jerrold. Includes specifications and operational data. **118**

2500-mc ETV systems described in brochure, "A new Concept in TV for Education," from Litton Educational Technology Div. Discusses uses of ETV, how to apply for and operate a system. **119**

2500-mc ETV planning guide from Micro-Link outlines steps requred to plan and install a system, major system elements. **120**

Emergency power generators described in brochure from Allis-Chalmers featuring brushless types. **121**

Emergency power generators described in folder on No-Fail system from Fermont Div. of General Dynamics. **122**

Emergency power generators described in diesel engine brochure, "Family of Generator Engines," from Detroit Diesel. **123**

Emergency power generators described in brochure from Consolidated Diesel Electric Co. Discusses Uninterrupted Power Supply features. **124**

Emergency power generators described in brochure from Cummins Diesel, listing generator and engine features and specifications, automatic starting and transfer controls. **125**

CATV Cash

Continued from page 41

promotion. Assuming a median of 5% of gross income, the system under consideration will spend $.24 per subscriber per month on advertising, or $175 per month.

Overhead—In a system of this size, operational overhead eats up from $.49 to $.60 of every gross dollar taken in. In a larger system, where the number of subscribers increases sufficiently to spread the overhead base over a larger area, $.38 per gross dollar per subscriber per month is considered a respectable figure.

After these cost factors come, of course, the repayment of the initial loan, taxes, and finally, the net profit.

Projection for New Systems

In a new system, we have a new income source to consider—initial installation fees. When an existing system is purchased, the number of new subscribers seldom will be an important factor in the estimation of cash flow; they simply will not, in small numbers, generate that much gross income, or net income after installation expenses.

In a new system this is obviously not so, as Table III indicates. This is a large system of 190 miles, and a subscriber potential at the end of five years of 9,100 sets.

In this case, the installation fee is lower than the actual cost of making the installation, and this is reflected in the *Installation Income* ($35,000) versus the *Installation Costs* ($61,250) in the first operating year.

The term *Cash Gain* appears here, on a cumulative basis after each year of operation, to indicate actual money left over after all operating costs and loan payments have been deducted. At the end of five years, the cash gain is $621,600.

Conclusion

Any CATV investor owes it to himself to have at least a speaking relationship with each requirement projections. There are many rules of thumb within the industry to indicate this, that, or the other thing. But nothing will substitute for black-and-white computation of the actual factors involved in your own situation, because no two situations are exactly alike. ●

BM/E

ADVERTISERS INDEX

ROUNDTABLE

Continued from page 94

audience (age, sex, income, occupations) and their response to your programming? The more we can learn about your station, its programming (talk, pop music, album music, contemporary music, etc.) and its acceptance in the market, the better we can evaluate its contribution to our program. Without this knowledge, selection reverts to a statistical comparison where stations are selected on the basis of their total reach and cost efficiency. This is bad because numbers alone are not the answer to sound and effective media buying.

Before making any sales calls, you should know who you are calling on and their title and responsibility as it affects the advertising. You should attempt to learn as much as possible about the advertiser's business, their advertising objectives, distribution/sales in your market, etc.

Once your homework is complete, your sales call should be well planned and designed to provide information about your station; AM or FM, power, frequency, coverage; show how your station fits into a given advertising program, how it supplements and complements other media. Make one key point relating to the importance and influence of your station in your market—a point that would be highly memorable, that will create a lasting impression in the mind of the advertiser regarding the media value and importance of your station. You should do this in a manner that bespeaks your enthusiasm for your station and confidence in its ability to do the job.

Every station has its own ideas of how to set up a rate card. These differ in basic rates, discount structures and application—time classifications, type of announcement offered, etc. A basic structure would make our job a lot easier and make radio a lot easier to buy. If there is anything that annoys an advertiser, it's the feeling that someone else (oftentimes a local competitor) is getting a better rate. Abolish the national/local rate cards. Let's have a single rate structure for all.

Today, most advertisers are committed to a strategy of combinations of media. They know that no one medium and no one station in a market can do an effective job. Recognize this. Sell your medium hard and you'll get your fair share of the advertiser's dollar, *if* you have the station that fits his advertising and marketing objectives.

Advertisers occasionally need information on competitive activity and expenditures. If you could keep a record of this activity, by product and advertiser, it would be a real service to the advertiser. This information serves as a guide in planning advertising schedules, and often helps determine the market and stations an advertiser will use.

When we are in a buying period, time is of the essence. Therefore, anything you can do to get your availabilities to us promptly and in a way that we can quickly analyze will be appreciated. As it is now, every station and station representative has their own way of submitting avails. Some are complete and usable; some lack basic information we need; some lack organization, which takes a lot of time to analyze.

The broadcast industry has long lacked a satisfactory "proof of performance." We don't know what can be done about this without incurring great expense, but the industry should be investigating the situation. In the meantime, let's make sure affidavits of performance are accurate and agree with the station logs.

No sales job is an easy one today, but you have a lot of important media values working for you. Radio is a very effective medium; all you have to do is point out the advantages of radio in general, and your station in particular, and demonstrate what this can mean to an advertiser's campaign. ●

MANAGEMENT
ROUNDTABLE

Selling Regional and National Accounts

HOW DO ADVERTISERS choose the stations they use? What do advertisers want to know about your station and market? How should data be presented to a prospective client? Here are some pointers from individuals who deal with radio advertising every day.

Norman R. Proudy
Vice-President, Radio
Advertising Time Sales, Inc.
New York, N.Y.

How do you attract national "spot" dollars to your market and, in particular, to your station? Unfortunately, this question is not easily answered. If your market is one of the top 25 or even top 50, and yours is the top-rated station according to one of the acceptable audience surveys, the job is easier. However, even then you're not "home free." Through your program appeal you must have the greatest portion of the particular audience which the advertiser is trying to reach—men, housewives, teens or children. This is further broken down into age groups and various ethnic groups. Then there is the cost of reaching the audience. Does your station offer the necessary audience at the most efficient cost-per-thousand?

Assuming your station fulfills these requirements, does it have adequate, or better than average, representation in the major buying centers? This is the area where a company such as ours has a real obligation to their station clients. We must have the manpower and ability to "spread the gospel" about the stations we represent to all potential customers. Aditionally, as a representative, we must maintain close rapport with our stations. We must keep them advised at all times of the accounts being worked on and do everything in our power to help improve their image. The representative must intimately know the markets and stations he represents, as well as their competition.

Edward R. Gerken,
Manager, WGN Eastern
Advertising Office,
New York, N. Y.

Basic to the success of any broadcast operation is the ability of its sales team to make buying "easy" for an advertiser; the ability to let a client know exactly what to expect in return for his investment; the ability to make a prospect see why a particular service is potentially more valuable than any other station or any other medium at his disposal.

As is true in the marketing of any commodity, selling radio advertising is not a simple task. Nor is there any one universally agreed upon formula for healthy broadcaster-client relations. This is as it should be. It would be folly to suggest that what works in Chicago will necessarily work in Kansas City or Cleveland. Each market, or station within a market, has a personality that is characteristically its own. Each offers its advertisers slightly different benefits. It is the responsibility of every salesman to tap the personality of the station he represents and to make it part and parcel of everything he does in its behalf. WGN uses the following sales pattern to market its Mid-American service.

Be discerning: Go after the client who will benefit most from your service. Pick and sell to clients whose product or service appeals to your audience. If yours is a youth-directed format, don't try selling a realtor—offer your time to a soft drink manufacturer.

Be prepared: Once a contact has been established, make a thorough investigation of the prospect's needs and develop a proposal that will meet them.

Follow through: We have only begun to go to work for a client when the contract is signed. With emphasis on personalized merchandising service, we are happy to have an advertiser on our schedule and we let him know it!

Be specific: Don't take up a buyer's time with a list of glittering generalities. Come armed with any available (but relevant) statistical information which back your contentions. Use reports of independent research organizations which cover your market, and don't be afraid to initiate studies of your own under proper and ethical conditions.

Be fair: Be honest with yourself and with clients. WGN adheres to a one-rate policy. Your situation might warrant rate variations. If so, use the system which fits the circumstance. In any case, live by your rate card. Let your advertisers get to know and trust you as ethical businessmen. Word gets around fast on a good thing—on a bad one too!

George S. Burrows,
Media Director,
N. W. Ayer & Son, Inc.
Philadelphia, Pa.

During the past 10 years, radio has gone through a profound transition. It is an age in which radio as an advertising medium must be approached and interpreted differently than other media. Its main forte is its ability to reach the individual on a *personal* basis. Radio can talk convincingly to many individuals in many different places. Through its ability to deliver efficient frequency, it can continue to tap consumer consciousness, and in so doing, contribute successfully to an advertising campaign.

In the analysis of media, we are helped and guided by a wealth of data and information. Some of this is statistical—the numbers of our business that can be easily measured (coverage, cost, audience). This we secure direct from stations, standard reference books, and some from special research studies. However, it's not enough to know how many people you reach and the kind of people you reach. We've got to know how these people feel toward certain media and how they react to advertising exposed to them in one medium versus another. As a result, we place greater emphasis on the qualitative factors surrounding a medium. For if our advertising is to be successful, we've got to go beyond the numbers and delve into the human thoughts and behavior to be sure we not only reach the right people, but reach them in an atmosphere, a mood, and at a time when they are most receptive to our message.

In analyzing local radio stations, we consider these factors: past record of ownership; present station owner; program format; percentage of network and local programming; special audience programs for women, etc.; the kind of news reporting; the kinds of sporting events; public service type programs; station personalities and their background and acceptance in market, etc.

What can you tell us about your

Continued on page 93

COLOR NOW COLOR WITHOUT A COLOR CAMERA OR ENCODER

INTRODUCING THE RIKER COLORIZER

The RIKER COLORIZER allows even the smallest station to swing to color. Now for the first time, broadcasters can produce color station breaks, color commercials and network color inserts using existing monochrome cameras.

A RIKER COLORIZER consists of two all-transistor modules. A 6 position switch selects the following modes of operation:

. . . Any 3 pre-selected colors
. . . Manual selection of color
. . . Automatic cycling through the color spectrum at a selectable rate
. . . Color added to a monochrome camera output

This unique production tool is designed for economy, speed and simplicity of operation. For example: black and white film may be developed normally to generate color. Color inserts may be varied without changing luminance.

So many color effects are possible. Here are a few:

. . . Fade to any color
. . . Insert any color
. . . Color monochrome slides (even the U.S. flag in color)
. . . Color ID's and titles

FOR THE COLOR STATION—another color video source.
FOR THE MONOCHROME FACILITY—color station breaks, color commercials and color inserts—all possible with the RIKER COLORIZER.

Partial Listing of Additional Color Equipment from Riker:

- Encoded Color Bar Generator
- Color Bar Generator
- Color Sync Generator
- Subcarrier Regenerator
- Bar & Dot Generator
- Color Video Switching Systems
- Additive/Non Additive Mixer
- Black Burst Generator
- Burst Flag Generator
- Color Special Effects Generator
- Test Signal Generators
- Color Processing Amplifier
- 3.58 MC Phase Shifter
- Plus Many Others

Call or write today for complete details.

RIKER INDUSTRIES, INC. ...thinking always of tomorrow

Norden Lane, Huntington Station, New York Phone 516 HA 1-3444 Atlanta Los Angeles, Detroit, Washington, D.C.

Circle 2 on Reader Service Card

This was the E-V Model 635.
It started a tradition
of excellence in
dynamic microphones.

This is the new
E-V Model 635A.
It's better
in every way!

Model 635A Dynamic Microphone $82.00 List. (Normal trade discounts apply.)

How can a microphone as good as the E-V Model 635 be made obsolete? By making it better! It wasn't easy. After all, professional sound engineers have depended on the 635 since 1947.

During this time, the 635 earned a reputation for toughness and dependability that was unrivalled by other omnidirectional dynamics. And internal changes through the years have kept the 635 well in the forefront of microphone design.

But now the time has come for an all new 635: the Electro-Voice Model 635A. It's slimmer, for easier hand-held use. Lighter, too. With a slip-in mount (or accessory snap-on Model 311 mount) for maximum versatility on desk or floor stands. The new, stronger steel case reduces hum pickup, and offers a matte, satin chromium finish perfect for films or TV.

The new 635A is totally new inside, too—and all for the best. A new four-stage filter keeps "pops" and wind noise out of the sound track, while guarding against dirt and moisture in the microphone, completely eliminating any need for external wind protection. Of course you still get high output (—55db) and smooth, crisp response. And you can still depend on the exclusive E-V Acoustalloy® diaphragm that is guaranteed against failure for life* (it's that tough)!

We expect to see plenty of the "old" 635's in daily use for years. But more and more, the new 635A will take over as the new standard. It's easy to find out why: just ask your E-V Professional Microphone distributor for a free demonstration in your studio. Or write us today for complete data. We'll be proud to tell you how much better the new Model 635A really is!

*The E-V Professional Microphone Guarantee: All E-V professional microphones are guaranteed UNCONDITIONALLY against malfunction for two years from date of purchase. Within this period, Electro-Voice will repair or replace, at no charge, any microphone exhibiting any malfunction, regardless of cause, including accidental abuse. In addition, all E-V microphones are GUARANTEED FOR LIFE against defects in the original workmanship and materials.

ELECTRO-VOICE, INC., Dept. 461EM
614 Cecil Street, Buchanan, Michigan 49107

Electro-Voice®
SETTING NEW STANDARDS IN SOUND

Circle No. 3 on Reader Service Card