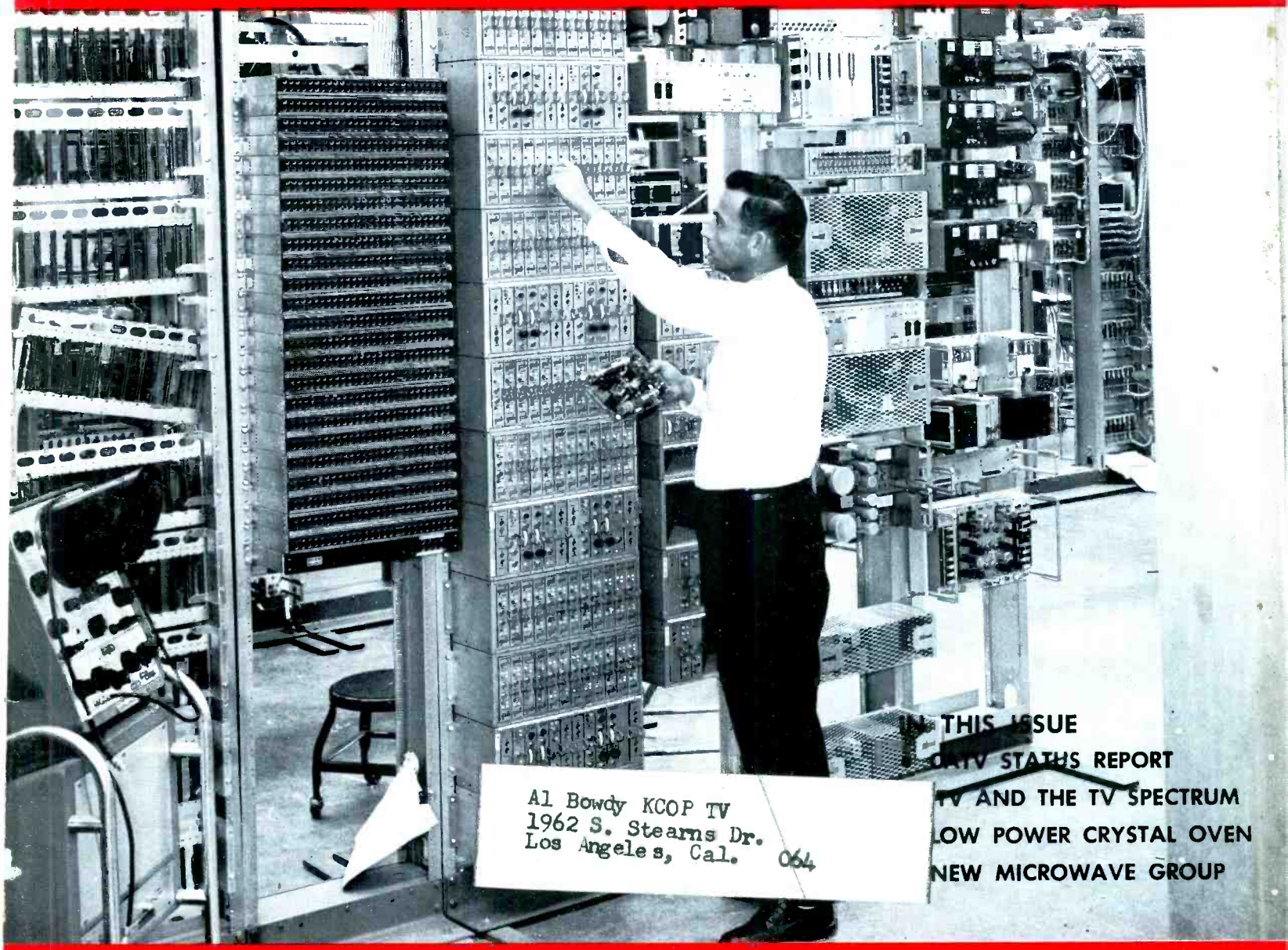
February 1964

TV & Communications



IN THIS ISSUE

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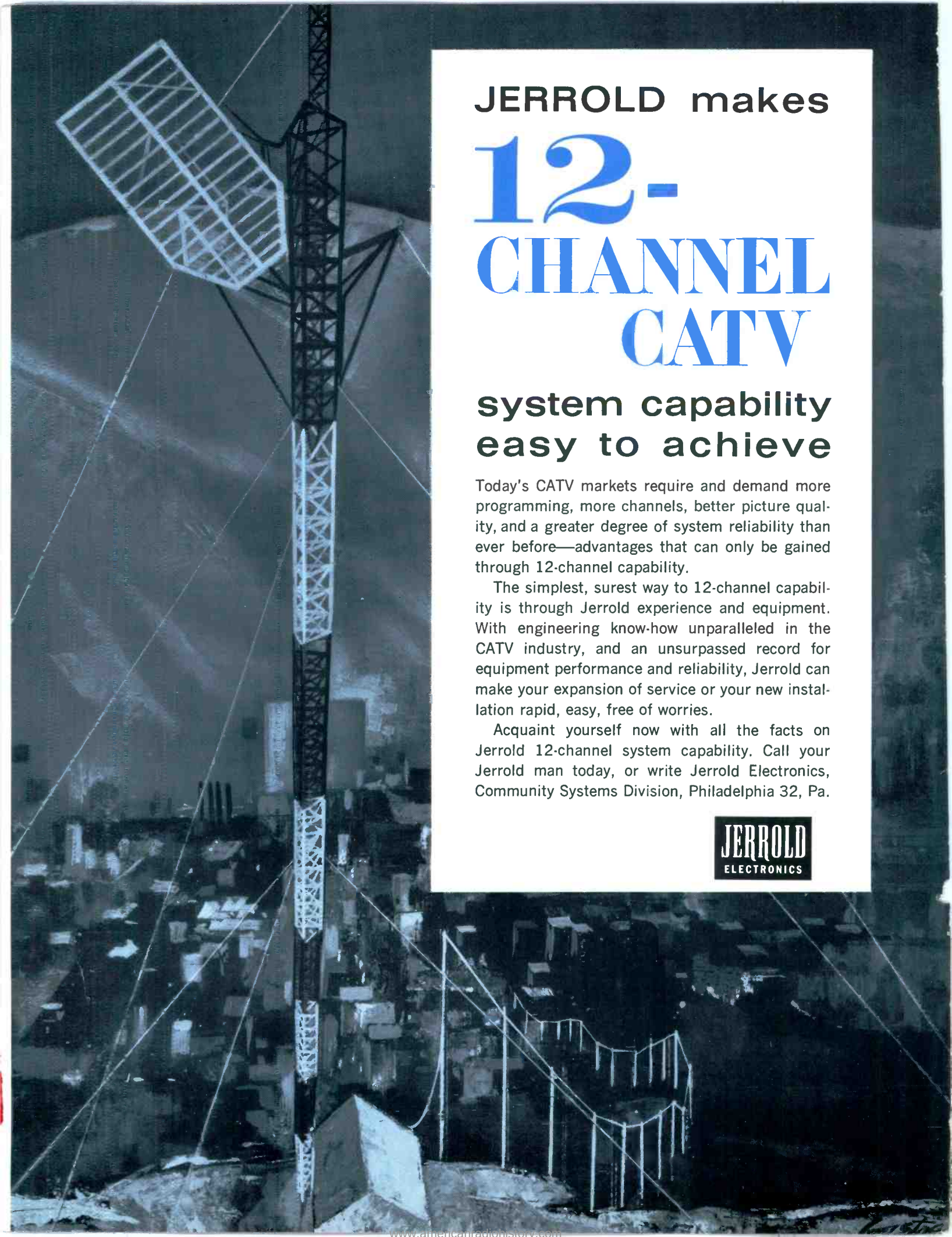

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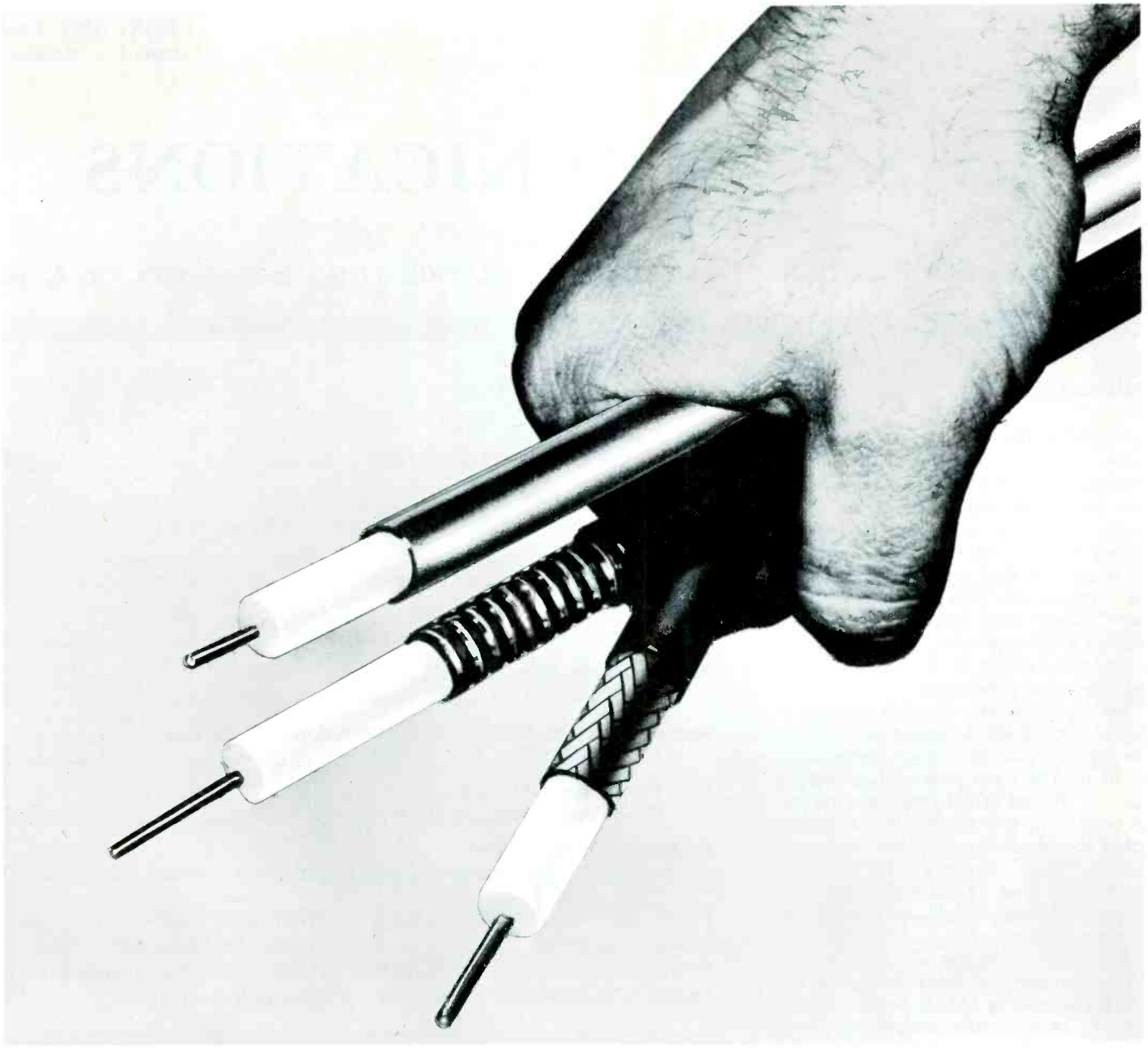

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FEBRUARY 1964
Volume 1 — Number 2

TV & COMMUNICATIONS

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Editorial

POLE PROBLEMS

While most CATV operators have been enjoying a happy working relationship with local telephone companies for many years, there are still some exceptions. During a recent visit to a cable system in Arkansas, we had occasion to examine the controversial "pole attachment agreement" which was prepared by Southwestern Bell Telephone Co. and presented to operators during the past two years in their five-state jurisdiction.

The significant objectionable features of the 12-page SWB document are stipulations that: *(1) double annual rental from $1.50 to $3.00 per pole; (2) give SWB right to change rental rate upon notice; (3) specifically prohibit Pay TV; (4) dictate cable specifications — without regard to industry's own standards; (5) increase surety bond from $5,000 to $20,000, and (6) prohibit locally originated Educational TV on system.*

The phone company told at least one CATV operator that unless he signed the new agreement by Jan. 1, they would ask him to *"remove your attachments from our poles."* However, we understand that cable owners are refusing to sign, holding out for an acceptable contract. If the telephone company presses the issue they will force the CATVs to present local governments with the unpleasant choice of allowing cable companies to erect their own poles or losing their constituents' best (or *only*) source of television.

Many cable owners already have franchises which permit separate poles for CATV. But Southwestern Bell will not create much goodwill by forcing cable companies to clutter the landscape with additional, unnecessary utility poles.

Southern Bell, in contrast, has just released *their* new pole rental agreement and cable interests have readily accepted it as mutually beneficial. We hope that *Southwestern Bell* will take the cue and modify their contract for the benefit of their customers, as well as the cable operators and the phone company itself.

SMS

IN THIS ISSUE:

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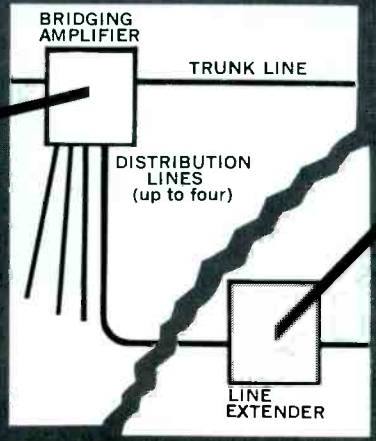

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News SPECTRUM

CROSBY, LIEBERMAN MERGE

Jack R. Crosby, NCTA Secretary, and Fred Lieberman, President of Telesystems Service Corporation, have announced a consolidation and expansion program being financed largely by Chase Manhattan Bank of New York City. Texas Capital Corporation is also reportedly involved in financial backing for the new company which will operate as Telesystems Corporation, with headquarters in Glenside, Pa., present location of TSC.

Telesystems will operate systems in 32 cities. Plans are to build additional CATVs and provide management services for others.

CATV UNDER ATTACK

An attempt to form a nationwide resistance group has been gaining momentum among television antenna manufacturers. In mid-January the organization, known as TAME (Television Accessory Manufacturers Institute), launched a campaign in Georgia. At a meeting held in Atlanta a committee was formed to "educate the public" with regard to the "evils" of CATV. Mr. Morton Leslie, Sales Manager for JFD, handed out promotion kits which carried the title, **"How to TAME CATV".** Leslie is the acting chairman of the anti-CATV group.

According to Jack Williams, executive secretary of the Georgia Association of Broadcasters, is not in accord with TAME—but he personally favors the goals of the new group.

The TAME strategy is apparently aimed at creating anti-CATV sentiment at consumer level as well as in Washington. Radio and television sopt announcements are being prepared for use in TAME's local campaigns, along with a TV film strip announced for distribution within a few months. Mr. Leslie warned that CATV proponents may request "equal time" on local stations. When this occurs, he advised, TAME forces should tone down their campaign in that particular locale.

Mr. Leslie, Samuel Schussel of Channel Master, John Winegard and Robert Fleming of Winegard Antennas, and Morris Finney of Finney Co. met with FCC commissioners Kenneth A. Cox and Robert E. Lee along with Commission staff members on January 20. The TAME representatives told the Commissioners that CATV delivers a "degraded" signal to the viewer and alleged that TV cables sometimes produce radiation in excess of FCC limits. The Commissioners' reaction was not learned, except that Commissioner Cox indicated that he had heard nothing negative about CATV prior to the meeting with the new anti-CATV group spokesmen.

The compatibility of CATV with pat TV is apparently a major source of concern on the part of the home antenna manufacturers and some broadcasters. Since TAME was formed last year by a group of manufacturers, it has been contesting franchise applications of CATV operators in several communities, reportedly with some success.

TWO-WAY RECOGNIZED IN FCC REPORT

The complexities of the land mobile radio field were the subject of much of the Federal Communications Commission's annual report to Congress for the 1963 fiscal year which ended last June 30. The report states the Commission's awareness of the fact that, "The use now being made of radio for two-way communication far exceeds its use for broadcast entertainment." (For more details see "Washington Report" on page 11, this issue.)

LOOK, MA. . .NO HEAD-END!

The entire town of Broken Bow, Okla., is being wired for television by Davco Electronics without benefit of receiving tower, microwave, or any kind of antennas! According to Davo President, Jim Davidson, the system is being fed by eleven miles of trunk line from the CATV operation at Idabel, Okla. Hickory No. 4930 cable and Entron LRA-40D amplifiers are used in the long trunk run.

ARIZONA OPERATORS MEET

The unusually large attendance at the January 10 and 11 Arizona Community Television Association meeting in Phoenix could be an indication of growing concern over problems facing the CATV field. The group has experienced increased activity and growth during the past year under the leadership of Mr. Arlo Woolery, Association President.

Mr. Bruce Merrill of Ameco opened the two day meeting with a report on National Community Television Association affairs, co-Television Association affairs, covering activities of 1963 and the outlook for cable television during 1964. One of the highlights of business activities was a talk by Dr. Ben Markland, director of radio of the Television Bureau at the University of Arizona, entitled "Educational Television and CATV". Frank Thompson of Rochester, Minn., a director of the NCTA was luncheon speaker. Key speaker at the Friday night banquet was Mr. Stary Gange of Visalia, California. More than 65 members attended the conference.

JERROLD AND MEREDITH BUILD CATV

Two new Florida CATV systems will be built under the joint-ownership of Jerrold Corporation and Meredith Broadcasting. The new operations, valued at more than one million dollars, will make available all-band service and FM to "over 18,000 homes" according to Mr. Milton J. Shapp, Presidnet of Jerrold. With the installation of the two new systems, Jerrold will have joint-ownership and management of seven systems.

CATV TO PURCHASE STATION?

Providing an interesting comparison to the frowing tendency of broadcasters to purchase CATV interests, the Fortnightly Corporation, owner of cable systems in Clarksburg and Fairmont, W. Va., is trying to purchase WBOY-TV, Clarksburg. The Broadcast Bureau of the FCC argues that a conflict of interest would result from the common ownership and opposes the sale. Submitting that CATVs and stations "are not in competition, as such" Fortnightly counsel E. Stratford Smith has suggested a one-year license to give the Commission an opportunity to scrutinize the CATV-owned station in operation before rendering final judgement.

MEXICAN MICROWAVE ANNOUNCED BY COLLINS

An extensive multi-channel microwave system spanning more than 900 miles of rugged terrain will be built in Mexico for Petroleos Mexicanos (PEMEX) by Collins Radio Co., Dallas, Texas. Communication and supervisory control for oil and gas pipelines will extend from Ciudad Pemex, near Guatamala, to Salamanca northwest of Mexico City. A microwave spur will connect the system with the city of Veracruz.

The $1,500,000 job will be completed within a year according to Mr. George Runge, Collins' Director of Public Relations. Twenty-five repeater stations and terminals will be located along the pipeline route to provide toll quality circuits which will permit installation of telemetry and supervisory control equipment for operation of the pipelines. The frequency diversity microwave system will use transistorized multiplex equipment, will be completely battery powered, and will be equipped with automatic fault alarm reporting devices and emergency power plants.

NCTA DAY AT THE FAIR

Administrators of the NCTA have made provisions for a special NCTA "Day" at the New York World's Fair on June 20, according to Mr. Don Anderson, Director of Information for NCTA. The 13th Annual Convention of the National Community Television Association will be held June 14-19 in neighboring Philadelphia. The added attraction of a day at the fair with other CATV operators and their families will undoubtedly boost attendance at the conference.

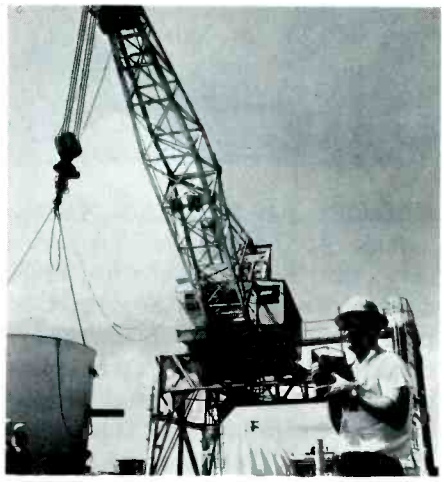
On June 22, Plastoid Corporation will stage an "open house" and host a luncheon for operators and their wives who have stayed over for the fair. Mr. Kerwin McMahon, Plastoid sales representative, advises that free transportation from the Times Square area to the company plant in Hamburg, N. J., will be provided. Guests will be treated to luncheon and a tour of laboratory and manufacturing facilities. Following an open forum discussion with company engineers, chartered buses will convey visitors back to New York City.

BBG TO REGULATE

Recommendations for legislation will follow a study of CATV by Canadian Board of Broadcast Governors. According to State Secretary Pickersgill and Transport Minister McIlraith, the regulations contemplated will be similar to those controlling broadcast stations.

Specifically, the BBG proposes to refuse licenses to cable systems planning to receive U. S. TV signals and to limit licenses to systems which are at least 75 per-cent Canadian owned.

Cable operators, through the NCATA, have asked Prime Minister Lester Pearson to withhold any changes until parliament has had opportunity to act on the matter.



General Dynamics Adds G-E Two-way

A new industrial communications system that includes 119 transistorized vehicular and portable two-way radios and six base stations has been placed in operation by General Dynamics' Fort Worth plant, according to William Johnston of the firm's industrial facilities division. The system includes 94 G-E transistorized Progress Line mobile units and 25 hand-carried G-E Voice Commanders. Four Desk-Mate base stations are used and two table-model stations.

In addition to in-plant communication, the mobile system includes vehicles operating in the Dallas area. The units replace old equipment which did not meet FCC narrow band requirements.

CALENDAR

PIEA-PESA Conference - April 7-9 in Galveston, Texas. Joint annual conference of the Petroleum Industry Electrical Association and the Petroleum Electrical Supply Association.

IEEE International Convention - March 23-26 in New York City, N. Y.

PSCC - March 31 - April 1 - Spring meeting of the Public Safety Communications Council, Arlington, Virginia.

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New Manager of Engineering for **Gabriel Electronics,** a division of **Maremont Corporation,** is **Harold E. Proctor.** The announcement came from **Robert F. Stewart,** President and General Manager of Gabriel Electronics.

Proctor is a graduate of M.I.T. where he received his B.S.E.E. and did graduate work in advanced calculus and circuit analysis and synthesis. He originated and directed capability studies in special microwave techniques as well as directing government sponsored programs involving multiple transmission lines and variable frequency beam steering techniques. He is a member of I.E.E.E.

On January 30, the tenth anniversary of the firm, **Superior Cable Corporation** reported the highest sales and earnings on record for any six months period in the history of the company.

For the six months ended December 31, 1963, net earnings were $568,102 (or 66¢ per share) as compared with earnings of $352,421 (41¢ per share) for the same period last year. In presenting sales figures, **Mr. J. L. Robb,** President, reported sales of $6,355,782 for the six months period just ended, as compared to sales of $4,718,800 for the same period in 1962. The Board of Directors recently authorized a dividend of $0.10 per share to be paid on March 2, 1964 to stockholders of record on February 14.

Mr. Robb also announced that the Board had approved plans to build a new wire and cable plant at Brownwood, Texas. The 60,000 square foot facility, Superior's fourth operating division, is scheduled for completion by mid-Summer.

Mr. Charles Wigutow of **Telesystems Corporation** is writing a syndicated column, entitled "The Cable TV View," for distribution to system operators. According to **Mr. Sam Street,** Advertising Manager, the column will be signed by the system manager in the community where the service is purchased.

Object of the newspaper column is to make local cable company management the main source of information on television matters. The copy is made up of views of timely and meaningful programs, comments on the place of television in political, social and educational matters, and sometimes straight publicity on the value of cable television.

Tele-Vue of Lampassas, Inc., a CATV system completed ten months ago, has been purchased by **Vumore Company** of Oklahoma City, in an expansion of Texas CATV holdings. **Daniels & Associates** of Denver handled the sale.

Harry Gilbert, Vice President and General Manager of **Blonder-Tongue Laboratories** has announced the appointment of **Walter A. Ullrich** as Eastern regional sales manager. He was formerly manager of the Sound Division at

George D. Barbey Co., Inc. where he specialized in master antenna and closed circuit systems. Prior to that, he was Eastern Pennsylvania regional sales manager for LCA Company.

Thomas L. Aye, Sales Manager for **Tape-Athon Corporation,** has announced the appointment of **Davco Electronics Corporation** of Batesville, Ark., as a stocking distributor of automatic music systems for CATV. **Jim Davidson,** President of Davco, indicates that a large stock of tape players are in stock in Batesville, ready for immediate delivery on lease, rental or purchase.

New Manager of System Development for the Community Operations Division of **Jerrold Electronics Corporation** is **Abram E. Patlove.**

Mr. Patlove's responsibilities will cover CATV franchise acquisitions through the development and management of the community antenna systems in which Jerrold is a co-investor.

LETTERS

Editor:

Having noted the disastrous fire which resulted in the demise of Horizons Publications Inc., publications, I had fully expected that no further magazines would be printed. I was more than happy to receive the first copy of "TV & Communications" and hope that I shall continue to receive future copies.

May I congratulate you on the changed format. The slanted approach seems to have been considerably toned down and I feel that the content of "TV & Communications" is much more informative and generalized in approach.

Thanking you for retaining my name on your mailing list, I am

Very truly yours,
Allen Cordon
Legal Assistant to
Commissioner Cox
Federal Communications
Commission

Editor:

Your new monthly magazine serving the community antenna television, closed-circuit television, educational television, microwave, and two-way radio communications industries would be of great interest to us.

Would you please let me know how to subscribe and the amount of an annual subscription?

Very truly yours,
Rose J. McAuley
New York Telephone Co.

There is a tear-out subscription coupon on page of this issue. Rates are: $5.00 for one year (12 issues), $9.00 for two years, and $13.50 three years.

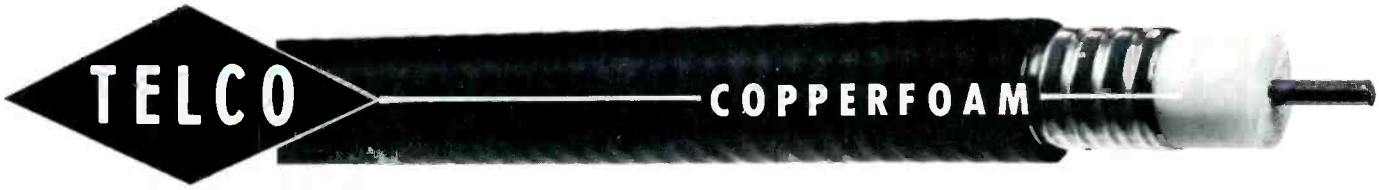
Editor:

We operate a broad-band CATV system supplying eleven television channels and 49 F. M. stations. Our TV channels are 2, 4, 5, 7, 9, 11 from New York City, Educational 13 from Newark, Wilkes-Barre 28 converted to channel 3, Scranton 16 converted to 8, and Scranton 22 converted to channel 10. We also convert channel 12, Binghamton, to channel 6. We use a broad-band amplifier for the F. M. Band 88 to 108 mc. All channels operate from individual antennas side mounted on a 147 ft. tower.

Mounted atop the tower are two communications antennas; one operating on 42.96 mc in the business band which we remotely control from three points in the operation of our business. The other (and this is the problem) is a fire radio service base station on 33.8 bmc furnished on a gratis basis to the Wayne County (Pa.) Firemens Association. This unit is remotely controlled from two points; our store during business hours, and the sheriff's office nights, Sundays and holidays. Everytime this unit is keyed we obliterate channels 4 and 10 on te cable system. Previously, we experienced this same difficulty with 42.96 mc affecting channels 2, 6 and 10. But installation of a Drake Lo-Pass Filter on 42.96 eliminated interference on channel 2. It still affects 6 and 10, as does 33.86 mc on channels 4 and 10.

Does anyone know how to clear up this problem? We will appreciate hearing from anyone who may wish to offer any suggestions on techniques or equipment to help alleviate this situation.

Respectfully,
Henry W. Kalinowski
Honesdale TV Service
Honesdale, Pa.



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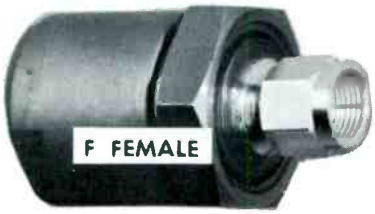
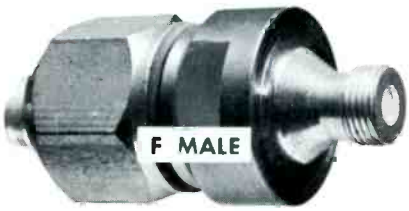
CAT. NO.	TYPE	DESCRIPTION	PRICE PER 1000 FEET 1M'-9M'	10M'-49M'	50M' & Over
203469	490	#12AWG Copper Center Conductor. Foamed polyethylene dielectric. Corrugated copper shield. Polyethylene jacket. O.D. .490".	$ 95.00	$ 90.00	$ 86.25
203569	490—14M	Same as Cat. No. 203469 except with integrated extra high strength, 7-wire, ¼" messenger.	162.00	155.25	148.50
203669	490—9M	Same as Cat. No. 203469 except with integrated .109" solid galvanized messenger.	138.00	132.25	129.35
203769	650	#9AWG Copper Center Conductor. Foamed Polyethylene dielectric. Corrugated copper shield. Polyethylene jacket. O.D. .650".	156.00	149.50	146.25
203869	650—14M	Same as Cat. No. 203769 except with integrated extra high strength, 7-wire, ¼" messenger.	228.00	218.50	213.75

STANDARD REEL LENGTH: Type 490 — 5000 ft. Type 650 — 4000 ft. 20% of order may be from 1000 feet up to standard length, but none less than 1000 ft. No Charge; Non-Returnable reels.

COPPERFOAM COAXIAL CABLE CONNECTORS





CAT. NO.	MFG. NO.	DESCRIPTION	PRICE EACH 1-99	100-over
150099	CF-490FM	F Male Connector for .490" Copperfoam Cable	$4.35	$4.15
150199	CF-490FF	F Female Connector for .490" Copperfoam Cable	4.50	4.30
150299	CF-490S	Splice Connector for .490" Copperfoam Cable	5.90	5.60
150399	CF-650FM	F Male Connector for .650" Copperfoam Cable	6.95	6.60
150499	CF-650FF	F Female Connector for .650" Copperfoam Cable	6.25	5.95
150599	CF-650S	Splice Connector for .650" Copperfoam Cable	6.55	6.25

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CAT. NOS. 203769; 203869 NOMINAL ATTENUATION PER 100 FT.			CAT. NOS. 203469; 203569; 203669 NOMINAL ATTENUATION PER 100 FT.		
0.50 db	@	50 mc	0.60 db	@	50 mc
0.65 db	@	Ch. 6	0.88 db	@	Ch. 6
0.69 db	@	100 mc	0.95 db	@	100 mc
0.80 db	@	150 mc	1.19 db	@	150 mc
0.96 db	@	200 mc	1.39 db	@	200 mc
1.05 db	@	Ch. 13	1.50 db	@	Ch. 13

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Washington Report

By Robert E. Tall

FCC Report Recognizes Two-Way—A healthy portion of the FCC's annual report to Congress for the 1963 fiscal year, ended last June 30, which was released by the agency at the end of January, was devoted to the land mobile radio field and problems associated with that area of the Commission's jurisdiction. The document recognized at one point, at least, that "The use now being made of radio for two-way communication far exceeds its use for broadcast communications."

"Nonbroadcast services—specificially land mobile—will receive considerable study," the Commission said, "in an effort to relieve part of their critical frequency needs. . . . .Vehicular radio communications, as a valuable tool of industry, demands increased effort to meet its growing frequency requirements."

The annual report notes that in the safety and special radio services field, "the nearly 4,000,000 fixed, portable and mobile transmitters attest to the mushrooming radio usage by more than 40 categories of stations. These transmitters are operated by more than 1,100,000 licensees for the protection of life and property and a wide variety of uses in connection with business, transportation, personal, research, and other activities."

On the common carrier radio field, the Commission pointed out that the domestic public land mobile radio service "continues to expand at a rate which indicates the widespread need and acceptance of this service by the general public. Metropolitan areas began using common carrier mobile radio in the early stages of its development, and present trends show new awareness and increasing demands for mobile communication in rural areas. . . The potential is great for miscellaneous common carriers interconnected with telephone companies in a nation whose population is becoming increasingly mobile."

Based on statistics on hand at the time the report was written, the FCC explained that in the common carrier field, "Land mobile radio telephone service is offered in about 450 areas (each usually comprising a city or town but sometimes covering adjacent cities or towns) by 34 of the 73 telephone carriers reporting to the Commission as "fully subject" carriers, with revenues for the year 1962 amounting to $7,500,000, an average of over $16,000 per area.

"This service," the report continued, "is also offered in 133 areas by 115 other carriers engaged in general landline telephone service and in 460 areas by 359 miscellaneous common carriers. Their 1962 revenues were $600,000 and $4,600,000, respectively, or $4500 and $10,000, respectively, average area. The low average revenues per area served of the 115 general telephone companies is apparently a result of many of them using the mobile service largely in their own maintenance vehicles and possibly not actively pursuing outside sales.

"In many cases, the miscellaneous common carriers and general telephone companies are in direct competition. The former also compete among themselves in many localities. More than half of the miscellaneous common carriers reported operating losses for 1962. Operating losses or profits are not available for enough of the general telephone company licensees to permit a similar statement regarding them."

The annual report referred at one point to an FCC proposal for legislation which is currently awaiting clearance by the Bureau of the Budget prior to its transmittal to Congress, which would give the FCC direct regulatory authority over the interchange of facilities arrangements between communication common carriers.

It described the proposal as a "new section of the Communications Act to give the Commission regulatory authority over the charges and other terms and conditions in arrangements between communications carriers for the interchange of their communications facilities or in arrangements between common carriers regarding the furnishing of facilities or services by one communications common carrier to another."

Another FCC proposal for legislation in the same boat—awaiting Budget Bureau clearance—was described as "a new section to give the Commission authority to prescribe regulations for the manufacture, sale, and interstate shipment of devices which interfere with radio reception."

The agency said the proposal is designed to "control interference" or "insure" electromagnetic compatibility of a particular device by requiring "that interference

problems be considered at the time that electrical devices are designed and before they are placed in production."

A third legislative proposal in the same category is "an amendment to section 303(q) of the Communications Act to give the Commission jurisdiction to require the painting and illumination of abandoned radio towers and to require dismantlement when they constitute a menace to air navigation."

Nonbroadcast View On UHF TV Docket—The California Public Safety Radio Association, in comments on outstanding FCC rule proposals which would revise the UHF television assignment plan to "foster" the "expanded" use of UHF TV assignments, submitted the nonbroadcast communication field's first expressions to the Commission on the proposals, as it declared that it "is difficult to understand" why the agency is trying to persuade reluctant broadcast interests to make use of the UHF spectrum space."

Emergency services," CPRA President Robert E. Brooking said, "have demonstrated a current need for additional spectrum," but have "been denied the opportunity" to make use of the "unused spectrum."

CPRA suggested that the Commission "review the total requirements for spectrum space for television broadcasting with the thought in mind that an all-UHF allocation of a maximum of 50 channels should provide for any future requirements both for commercial and educational television."

At the request of educational television interests, meanwhile, the FCC has granted a further extension—from Feb. 3 to April 3 —in the comment deadline on the proposals. The extension was asked by the National Association of Educational Broadcasters and the Midwest Program on Airborne Television Instruction, Inc.

ITT Reports Exten ve RC Plans — ITT Mobile Telephone, Inc., San Fernando, Calif., sub-

Continued on page 29

CATV STATUS REPORT

By Robert E. Tall
TV&C Washington Bureau

The FCC-NCTA meetings--the first held in six months--were attended by FCC Commissioners Robert T. Bartley, Kenneth A. Cox and Frederick W. Ford, with Chairman E. William Henry also putting in an appearance; FCC Deputy General Counsel Henry Geller; FCC Broadcast Facilities Division Chief Martin Levy; NCTA Chairman Fred Stevenson and Vice Chairman Archer Taylor; NCTA General Counsel Robert D. L'Heureux and Special Counsel E. Stratford Smith; NCTA committee chairman Al J. Malin; and committee members Martin Malarkey, Bruce Merrill and Gene Schneider.

Before complete accord is reached, the discussions may get into areas not yet touched, involving questions on joint ownership of CATV and TV station facilities, among other things. Broadcast station ownership of antenna systems has, of course, been picking up significantly in recent months.

The Television Board of the National Association of Broadcasters, meanwhile, came of a late January meeting in Sarasota, Fla., with a new definition of pay television which lumps CATV systems which originate programs, along with relayed programs, into the general category, which the Board opposes. The new definition is that pay TV includes "any wireless, wire or cable facility transmitting or distributing programs into the home on a fee basis which are not in the first instance broadcast for reception by all members of the public without charge."

The new NAB TV Board policy also opposes CATVs carrying background music services or other types of non-TV programs, a practice in which an estimated one-fourth of present antenna systems engage. NAB reported that the Board "also voted support of the FCC's proposed rules to control microwave fed community antenna television systems, and it authorized the committee to prepare legislation which would confer on the FCC jurisdiction to similarly regulate non-microwave CATV systems and to report on such proposed legislation at the June board meeting or before if deemed necessary."

Genuine progress appears to have been made at late January and early February meetings by representatives of the National Community Television Association and the Federal Communications Commission toward compromise draft legislative proposals which would formally give the FCC direct authority to regulate community antenna television, and, at the same time, free the CATV industry from some of the more objectionable burdens with which the Commission has been saddling the industry lately.

There were published reports during the FCC-NCTA sessions that the negotiators were gunning for arriving at an agreement which might sidestep legislation this session of Congress, but responsible association sources have labeled these rumors as "so much stuff." No matter how well the CATV industry may do in informal talks with FCC Commissioners or staff members, it will, of course, always be wary of a government agency which is prediminantly broadcast-minded having the power to harrass the antenna operators without some pretty firm guidelines from Congress, where CATV stands to get a more even shake under the present political set-up on the Hill.

The upcoming "compromise" draft legislation, it is understood, means just that--a true compromise. NCTA is giving on some points, and the FCC is giving on some points.

One of the big points under discussion, of course, is the "non-duplication" clauses of presently outstanding FCC rulemaking proposals, which the FCC has already rammed into being for CATV operators who need microwave relay facilities, licensed by the FCC in either the business or common carrier radio services.

The predicted outcome, at this stage of the game, is that there will continue to be prohibition against duplication of a TV station's programs where the station objects to the antenna system carrying the programs. This point has been pretty well settled. The negotiating point involves the length of time the CATV would be barred from carrying the programs after they are broadcast by a station in its area.

The Commission started out with a 30-day "before and after" provision, sliced this to 15 days before and after--currently applicable for radio relay-fed CATV systems and proposed in the outstanding rule proceedings; and appears on the verge of buying NCTA's insistence that the prohibition be applied only as a "simultaneous" non-duplication provision.

Other questions center around how many TV stations in an area a CATV system should be required to "protect," and how big a geographical area the antenna system should be required to protect.

HOW TO USE AN RF SWITCHER

By Lon Cantor
Blonder-Tongue Labs

The professional CATV operator will find a good RF Switcher to be an invaluable tool. He can use it for quick and accurate comparisons between input and output voltages of any circuit under test. A switcher can also be used to measure amplifier gain, VSWR or attenuation. An RF Switcher is actually an electronically actuated high speed switch that permits two signal tracings to be displayed simultaneously on an oscilloscope. Either tracing may be viewed separately, or both may be seen superimposed. Learn to use a switcher properly and it will save you time and money. This article will give you detailed instructions for some of the most common RF Switcher applications.

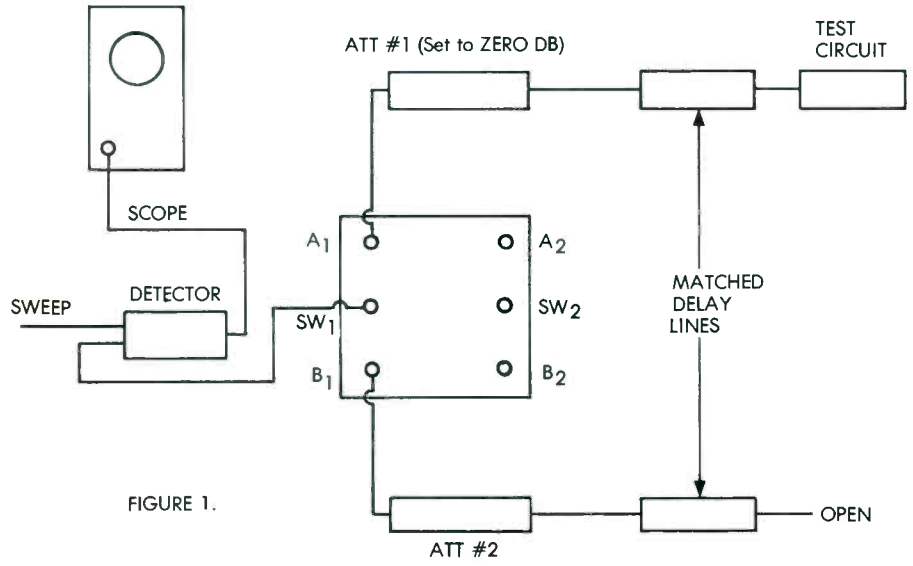

FIGURE 1.

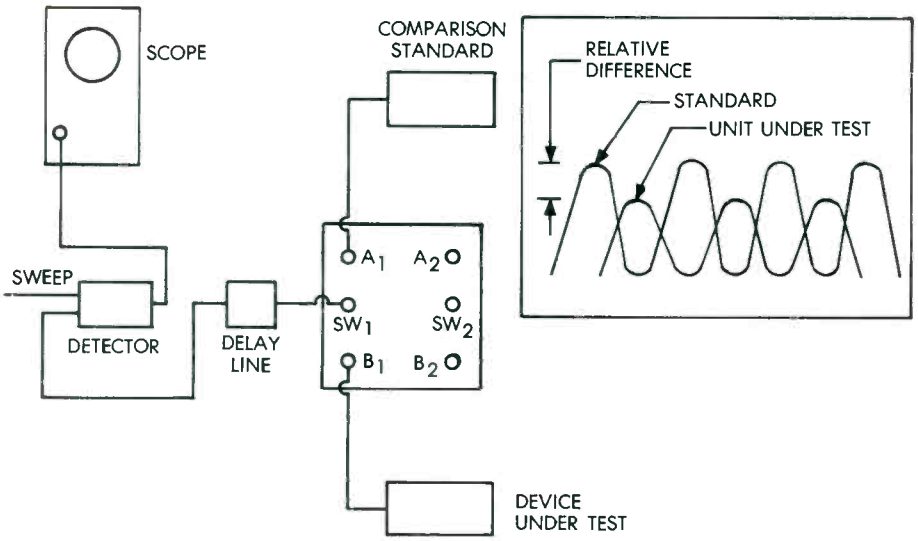

FIGURE 2.

Measuring VSWR

Equipment Needed:

(1) RF Switcher (B-T Model 4102 or equivalent)
(2) Matched delay lines (B-T Model 4107 or equivalent)
(2) Variable attenuators(B-T Model SA-7 or equivalent)
(1) 75 ohm detector (B-T model 4104 or equivalent)
(1) Oscilloscope, AC with good low frequency response or DC
(1) Sweep Source

Procedure

1. Set up as shown in Figure 1.
2. Set RF Switcher function switch to "Auto".
3. Adjust ATT #2 until the height of the reflected voltage equals the reflected voltage from the circuit under test.
4. The amount of attenuation inserted now indicates the relationship between the main voltage wave (incident wave), E1 and the reflected wave, Er. This figure is doubled (since the reflected wave makes two trips through the attenuator). See Table A or compute the value from the following formula: $VSWR = \frac{Ei+Er}{Ei-Er}$
5. Example: If 6db insertion is required in the attenuator, the return loss is 12db (2x insertion req'd).
   Er = 12db below E' (12db is a ratio of 4:1)
   Er = 1/4 E'

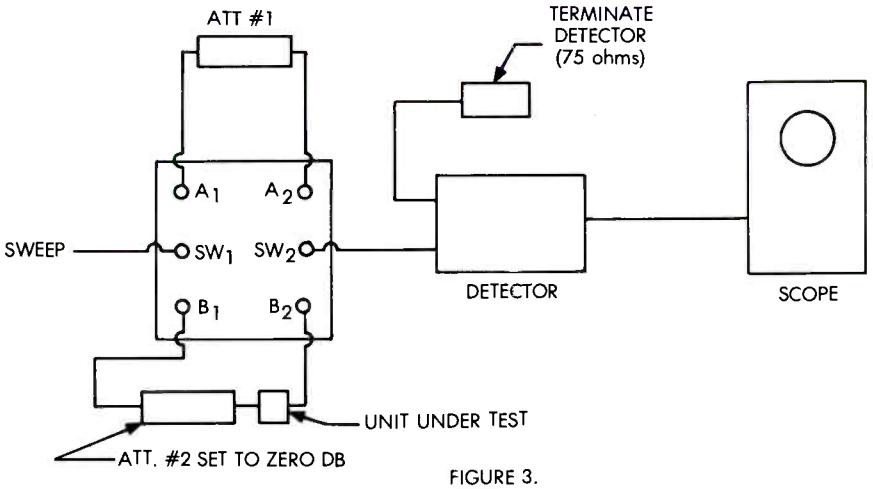

FIGURE 3.

$$E' + Er = 1 + .25$$
$$E' - Er \quad 1 - .25$$
$$1.25 = 1.67 \text{ (VSWR)}$$
$$.75$$

6. ATT #1 is provided to compensate for the residual insertion loss of ATT #2; the two units should therefore be of the same type.

Comparing VSWR Against A Standard

This method is particularly useful for production measurements where it is desired to compare a unit against an acceptable standard.

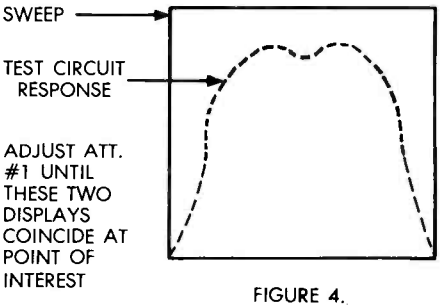

FIGURE 4.

Equipment List:
(1) RF Switcher
(1) Delay Line
(1) 75 ohm detector
(1) AC oscilloscope with good low frequency response, or a DC type.
(1) Sweep source
(1) Comparison standard, (A unit similar to the one being tested)

Procedure
1. Set up equipment as shown in Figure 2.
2. Set RF switcher function switch to "Auto".
3. A relative comparison between VSWR of the acceptable standard and VSWR of production unit can now be made.

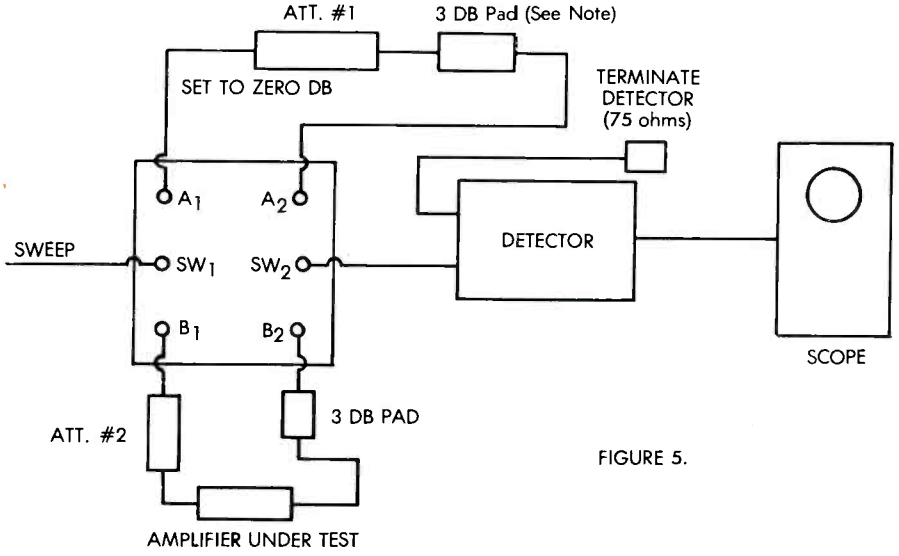

FIGURE 5.

Measuring Attenuation

Equipment List:
(1) RF Switcher
(1) 75 ohm detector
(2) Variable attenuators
(1) One 75 ohm termination (to terminate detector if necessary)
(1) Oscilloscope with good low frequency response, or preferably a DC type.
(1) Sweep source.

TABLE A – VSWR

ATTENUATOR READING	VSWR	REFLECTION COEFFICIENT	PERCENTAGE REFLECTION	RETURN LOSS	MATCH RATIO
1 db	8.8	.80	80%	2 db	1.25:1
2 db	4.3	.63	63%	4 db	1.6:1
3 db	3.1	.50	50%	6 db	2:1
4 db	2.3	.40	40%	8 db	2.5:1
5 db	1.9	.32	32%	10 db	3:1
6 db	1.7	.25	25%	12 db	4:1
7 db	1.5	.20	20%	14 db	5:1
8 db	1.4	.16	16%	16 db	6:1
9 db	1.3	.13	13%	18 db	8:1
10 db	1.22	.10	10%	20 db	10:1
11 db	1.17	.08	8%	22 db	13:1
12 db	1.14	.06	6%	24 db	16:1
13 db	1.11	.05	5%	26 db	20:1
14 db	1.08	.04	4%	28 db	25:1
15 db	1.07	.032	3.2%	30 db	32:1
16 db	1.05	.025	2.5%	32 db	40:1
17 db	1.04	.02	2.0%	34 db	50:1
18 db	1.032	.016	1.6%	36 db	63:1
19 db	1.027	.013	1.3%	38 db	80:1
20 db	1.020	.01	1.0%	40 db	100:1
23 db	1.010	.005	.5%	46 db	200:1
25 db	1.006	.003	.3%	50 db	300:1
27 db	1.003	.002	.2%	54 db	500:1
30 db	1.002	.001	.1%	60 db	1000:1

$$\text{Reflection Coefficien} = K = \frac{\text{VSWR}-1}{\text{VSWR}+1} = \frac{1}{\text{MATCH RATIO}}$$

$$\text{VSWR} = \frac{1+K}{1-K}$$

$$\text{Return Loss} = 20 \log \frac{1}{K}$$

Procedure
1. Set up equipment as shown in Figure 3.
2. Adjust ATT #1 until the detected displays coincide at point of interest. (See Fig. 4)
3. Characteristic attenuation is equal to inserted amount as indicated on ATT. #1

Measuring Gain

Equipment List:
(1) RF Switcher
(1) 75 ohm detector
(1) 75 ohm termination Model (to terminate detector if necessary)
(2) Variable attenuators
(2) 3 db pads (used only if amplifier oscillates during open contact period.)
(1) AC oscilloscope with good

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Here's what C. M. Kirkeeng, General Manager, Cable-Vision, Inc., said after completion of a 4200 subscriber network utilizing 65 miles of Corr-O-Foam: "Corr-O-Foam cable was very easy to handle on the ground and in the air; extremely adaptable in connecting amplifiers, Multitap boxes, line splices and Chromataps. Much of the construction was made through heavy tree laden areas, but the usual problems were minimal."

Corr-O-Foam, available with a full line of matching connectors, is setting new standards of economy, ease of installation and reliable performance. Our new catalog provides full details on why Corr-O-Foam is first choice for CATV. Write for your copy today.

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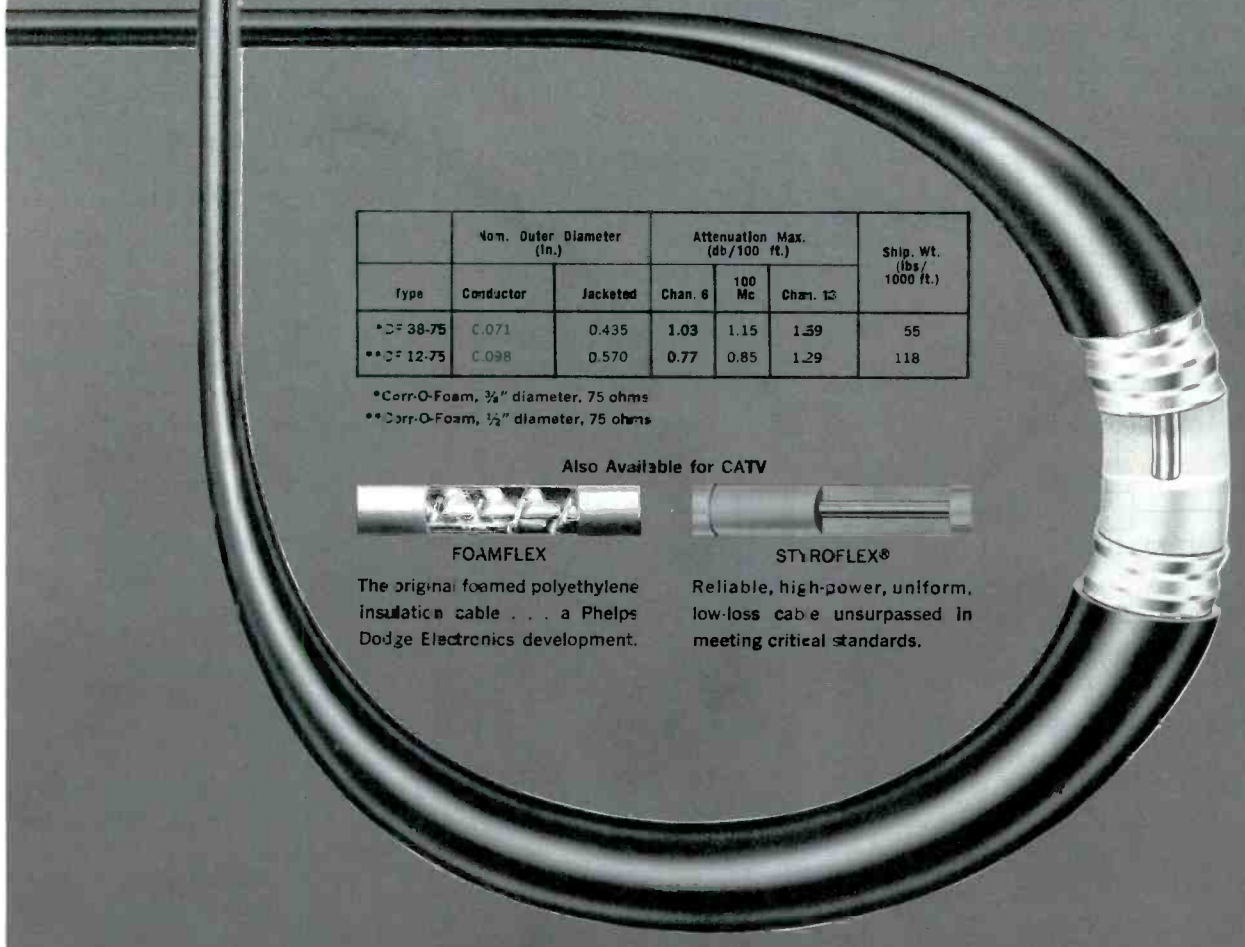

Type	Nom. Outer Diameter (In.)		Attenuation Max. (db/100 ft.)			Ship. Wt. (lbs/ 1000 ft.)
	Conductor	Jacketed	Chan. 6	100 Mc	Chan. 13	
*CF 38-75	0.071	0.435	1.03	1.15	1.39	55
**CF 12-75	0.098	0.570	0.77	0.85	1.29	118

*Corr-O-Foam, ⅜" diameter, 75 ohms
**Corr-O-Foam, ½" diameter, 75 ohms

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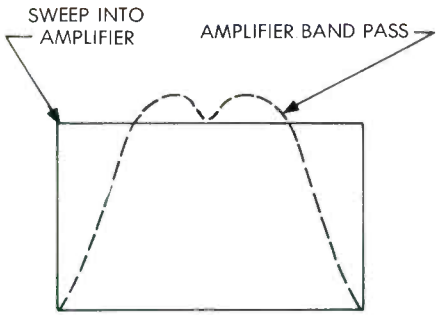


FIGURE 6

low frequency response or a DC type.

(1) Sweep source.

Procedure

1. Set up equipment as shown in Figure 5, using two similar attenuators. Set ATT #1 to zero db. (This is to compensate for any residual insertion loss in ATT #2.)
2. Adjust ATT #2 until the two displays coincide at point of interest. (See Figure 6.)
3. Gain of amplifier is equal to the insertion loss of ATT #2.

Note: When measuring some amplifiers it has been found that during the open contact period between A2 and B2, an unterminated output may cause oscillation. Two small-value pads should be used as shown, if this oscillation occurs.

Comparison Of Bandpass Response

Equipment List

(1) RF Switcher
(1) 75 ohm detector
(1) 75 ohm termination (To terminate unused output of detector.)
(2) 3db pads (used only if amplifiers oscillate during open contact period.)
(1) Amplifier with standard response characteristics.
(1) AC oscilloscope with good low frequency response or a DC type.
(1) Sweep source.

Procedure

1. Set up equipment as shown in Figure 7.
2. View each display separately to identify response characteristics of the amplifiers.
3. Set function switch to "Auto" for simulteneous comparison of outputs. (See Figure 8.)

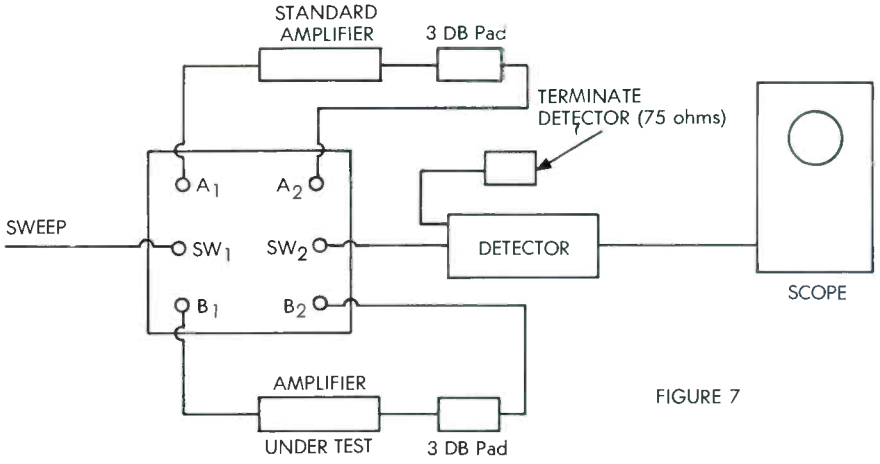
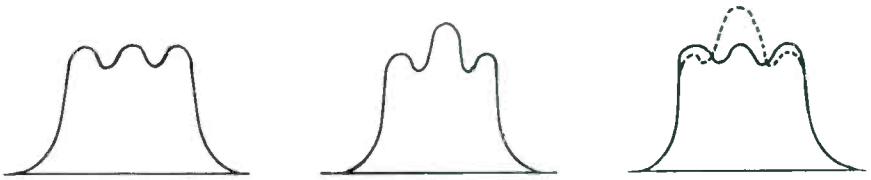


FIGURE 7



"A" POS. (AMPLIFIER STANDARD)

"B" POS. (AMPLIFIER UNDER TEST)

"AUTO" POS. (SIMULTANEOUS DISPLAY OF BOTH)

FIGURE 8

TV&C STAFF REPORT ON

A VISIT TO COLLINS

The manufacturing building of Collins Radio Company is its Dallas location. This is where microwave equipment is produced.

Located just outside the handsome and booming city of Dallas is a company that seems right at home in this fast-moving part of the big state of Texas. The brightly styled office and production buildings of the Collins Radio Company are situated amid pastoral expanses which include, quite naturally, some conspicuous antenna structures. A guided tour was arranged for us by George Runge, Collins' Public Relations Director, and we soon discovered that the inside of the Collins facilities are as impressive as we had expected.

After visiting several production areas, including the extensive microwave assembly stages, we talked with George about Collins' growth and the enviable status which the company enjoys in several sophisticated communications fields.

For example, line-of-sight microwave systems built by Collins Radio Company are in use throughout the world, bringing modern communication services

Part of the Collins Radio Company complex in Dallas taken from atop a large antenna. In background in city of Richardson. The two buildings and land are only one-fourth of the 240-acres the company owns in the Dallas area.

to people in countries such as Thailand, Republic of China, Turkey, Iran, Pakistan and Syria.

United States governmental agencies and numerous private enterprises use microwave and more and more educational and CATV systems are employing the company's equipment.

As early as 1951, Collins regarded microwave as a new field of expansion. By 1953 the firm was manufacturing the new product, an extension of its capabilities in the fields of amateur radio, broadcast equipment, aviation communication/navigation, and specialized military systems.

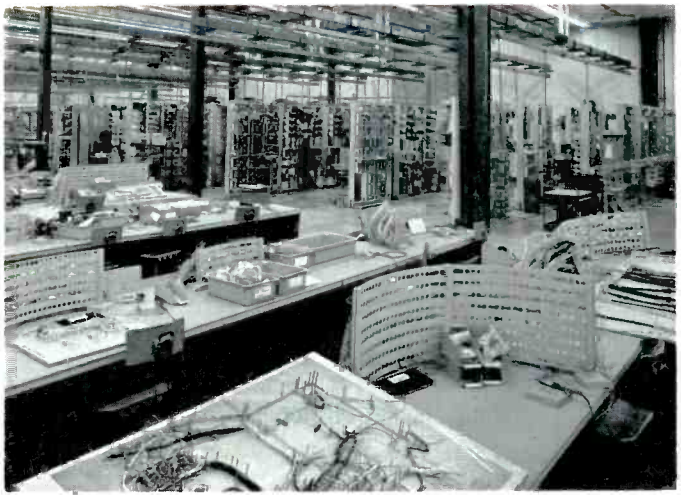
The company got its start in the early thirties when Arthur A. Collins built the first commercially available amateur radios. While amateur equipment today represents a very small volume of total business, the Company's ham gear is still acknowledged as the industry's finest.

Adm. Richard E. Byrd's second Antarctic expedition in 1933 used Collins designed radio gear to keep the 115-man party in contact with the rest of the world. The success of the "black boxes" catapulted the company to fame. From a company of just eight employes housed in a basement in Cedar Rapids, Iowa, it has advanced significantly to become a corporation of 16,000 employes with major offices in Dallas; Cedar Rapids; Newport Beach, Calif.; New York; Washington, D.C.; and Toronto, Canada.

Scope of operations soon broadened to include aviation communication equipment and broadcast. These are still major product areas.

During World War II the company's plants operated around the clock developing and producing radio equipment which was used by the United States and its Allies in all theatres of operation. Transmitters aboard the USS Missouri in Tokyo broadcast to all peoples the V-J Day surrender ceremonies.

Two emerging fields of activity are digital com-

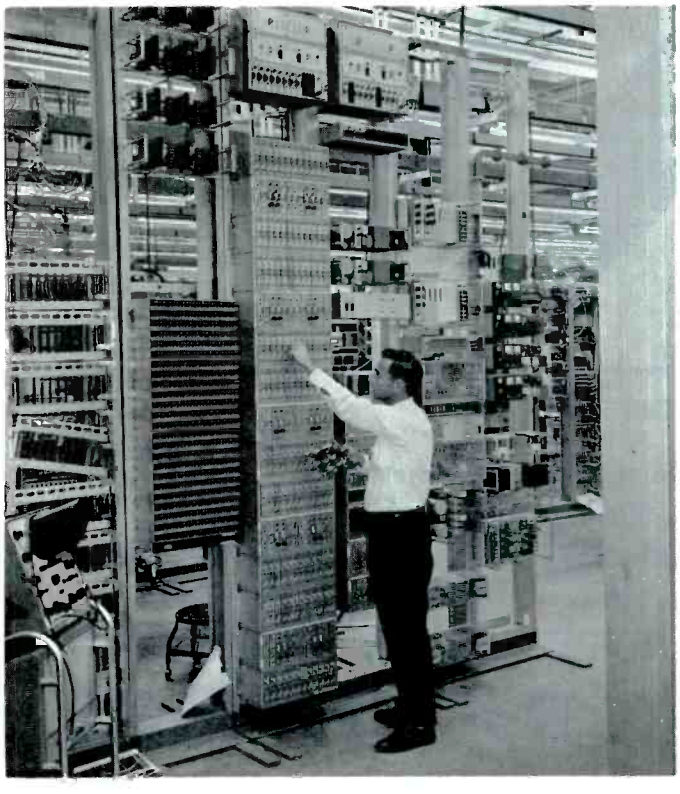


The microwave manufacturing area at the Dallas facility.

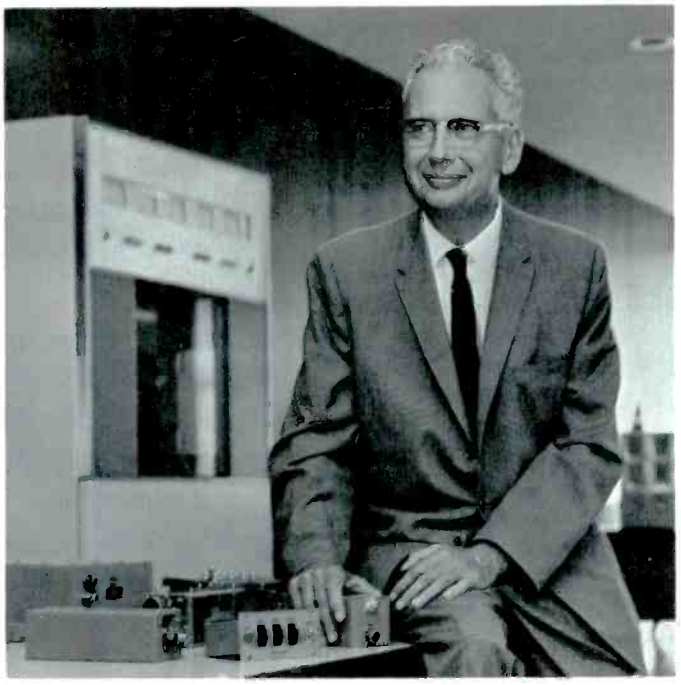
puters and space communication. The latter is perhaps the most glamorous endeavor today. Back in 1947 the company did research associated with the upper reaches of the atmosphere and beyond. In 1952 the first lunar communication relay between Cedar Rapids and Sterling, Va. was established. Since then the company's role in space communication has expanded rapidly.

All space flights made by American astronauts have used communication equipment developed by Collins. Before that the company developed the communication system for the X-15 rocket plane. Radios for upcoming Project Gemini and Project Apollo spacecraft also will bear the label of the 30-year-old communication company.

Mr. Collins himself best explains this young giant as "an energetic organization ..... strong in technical initiative."



A microwave system receiving final check-out in the factory in Dallas.



President Arthur A. Collins with radio equipment like that used in space flights by the Mercury astronauts.

The company has grown in orderly fashion, placing emphasis on development and manufacture of high quality equipment. An example of this is the 10-year growth of the microwave product line to a well-established position in the field of high-density, reliable, microwave (line-of-sight) relay communication. Some of the first commercially available microwave equipment was produced by Collins and now the firm is one of the largest independent producers of microwave.

This position has been maintainted by a continuous research and development program in all phases of microwave communication service, including the TV-STL band, the common-carrier band, and the operational-fixed band (educational television, rail, pipeline, etc.).

The thoroughness which accompanies Collins endeavors is founded on the company-wide philosophy: "Design and build equipment based on need, technical ingenuity, unique function and quality of craftsmanship, rather than solely on the grounds of price and sales effort." Collins produces 6kmc and 12 kmc equipment, with power from 50 mw to 5 watts. A well staffed field engineering force is available for consultation on CATV, ETV and various other microwave applications.

As we have opportunity, TV&C will present first-hand reports on leading manufacturers serving the audio-video communications industries. This brief look at the Collins Radio Co. is the first of many articles in which we will endeavor to acquaint you better with the designers and manufacturers of equipment used in your business.

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PP 15259PVC	**-Foam dielectric, single shielded, single jacketed.**
PP 423	**-Solid dielectric, single shielded, single jacketed.**
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SCHOOLS AND THE TV SPECTRUM

Cable and Microwave Distribution Viewed as Answer to Growth and Flexibility Needs

By Robert J. Nissen and Grace E. Knecht

The American commitment to universal education requires that instructional television be made available to the broad base of the nation's educational system. If television is to be of significance to American education, it will have to be used as a workhorse on a scale as yet foreseen by only a few leaders in education. This potentially massive use of ITV poses a serious problem.

There is simply not enough television broadcast spectrum space available to accommodate the future demands of commercial television, noncommercial community television, and instructional television. Something will have to give. And for reasons discussed in the following pages we believe that, sooner or later, ITV will no longer be able to use the broadcast spectrum as its prime means of distribution.

It's a safe bet that some will sense an element of heresy in this belief. For there are many in the field currently devoting much time and energy to acquiring additional television channel space for ITV broadcasting. Without question, there are benefits to be gained from an expansion of ITV on the broadcast spectrum. But, for the most part, these are short-term benefits. On a long-term basis, an expansion of ITV on the broadcast spectrum will inevitably create disadvantages—and indeed dangers—to the cause of instructional television. The purpose of this article is to delineate the conflict between a limited broadcast spectrum and an expanding ITV broadcast service.

Education and ITV

That the United States is in an educational crisis is attested to by most knowledgeable citizens. There is no need to play the education numbers game here—that detailed enumeration of estimated enrollment increases, present and projected teacher shortages, and numbers of classrooms needed. It takes but cursory reference to educational journal or popular magazine to convince one that the nation has an education problem requiring massive frontal attacks and a casting aside of horse-and-buggy concepts.

With some obvious over-simplification, it is plain that one problem is paramount: There are simply more students to be educated than can be properly taught by the present number of teachers or accommodated in the present physical facilities. And the situation is growing worse, not better. While salary upgrading would undoubtedly retain the services of many of those now leaving the educational field, there is no stockpile of competent teaching talent large enough to meet the demand. And it can't be developed overnight. To get out of the quicksand, instructional television is one of the essential tools that must be fully used.

How effective is television as an instructional tool? No other element of formal instruction has been so intensively researched in so short a time as instructional television.

The result of this massive research almost invariably shows that quality instruction can be extended by television to a larger number of students with no loss of instructional effectiveness. The cliche "no significant difference" stands out in most of the reports. Further, it has been repeatedly shown that the medium of television can provide additional dimensions to education that even the finest teacher cannot offer on his own.

It is not our intent here to prove the advantages of instructional television. If the reader is not already convinced of this, the rest of the article is moot and irrelevant. It is our belief that, at a minimum, instructional television can be of tremendous value in relieving both the quantitative and qualitative shortage of teachers.

Most ETV stations now on the air are shouldering the double broadcasting load of both an ITV service and a general public broadcast schedule. With the increased acceptance of instructional television, educators are demanding more and better programs. At the same time, it is becoming increasingly apparent that the present ETV broadcast service for the general public but touches the surface of the ground to be worked.

At many ETV stations, personnel, production facilities, and broadcast time are strained to fulfill the dual role of public broadcasting and ITV broadcasting. The fundamental problem is not solved by expanding the staff and facilities: The number of broadcast hours in the day, and the number of available channels remain limited. In an attempt to alleviate the problem, several ETV stations have acquired a second channel for instructional television. But, while this allows an immediate considerable expansion in television service, it is, at best, a stopgap measure. It is pure

fantasy to believe that one, two, or three broadcast channels can satisfy the future demands of a metropolitan school system.

The formidable task which lies ahead of expanding the quality and significance of noncommercial public broadcasting will, in itself, tax ETV personnel and resources to the utmost. The logical and full development of both ITV and ETV cannot be achieved if they are forced to compete with each other for personnel, production facilities, and an inadequate number of available broadcast hours.

Once ITV is accepted as an essential element of modern education, all the broadcast channels in the spectrum will be woefully inadequate to fulfill the demand. The FCC itself has stated: "The total number of channels allocated for television broadcasting is inadequate to provide channels for broadcasting, both educational and commercial, and still leave multiple channels for classrooms instruction and other special uses."

The Spectrum Space Problem

The electromagnetic spectrum is a limited natural resource. This incontrovertible fact is at the heart of the problem of the expansion of broadcast instructional television in the United States. Only a certain portion of the limited spectrum can be used for television broadcasting. And television broadcasting—being the spectrum space-hog that it is —severely limits the number of channels which can be accommodated.

How the television broadcast portion of the spectrum is used, however, is a metter which can be controlled by social and political actions. This is the problem of "allocations"—who gets what portion of the limited spectrum. The FCC is charged with the responsibility of riding herd on the spectrum. The Commission's actions are governed by the Communications Act which repeatedly emphasizes that the use of the spectrum shall be in the "public interest, convenience, and necessity." The FCC must constantly consider what effect a particular use of the spectrum will have on the entire public.

The specific questions involved here are: How can ITV be most effectively and efficiently distributed? And, in the face of increased competition for the use of the broadcast spectrum, is the "public interest, convenience, and necessity" properly served by allowing a large portion of the spectrum to be used for the internal communications purposes of a school system?

If instructional television were to be used no more extensively than at present, there would be no question that the broadcast spectrum could adequately serve ITV, and do so in the "public interest." However, a critical examination of the expansion of instructional television in our schools in the last few years indicates the inadequacies of the airways to accommodate the future demand.

The voluminous NAEB study on the nation's needs for educational television shows a total minimum need of 1197 broadcast channels (including those stations now in operation).

But, does the survey reflect a reasonably accurate estimate of the number of channel allocations needed for education? It might be argued that a person answering this kind of survey has a propensity to ask for more than might be needed, since there is little to lose by doing so. Although this may have been the case in certain instances, at least two factors lead one to believe that it did not greatly influence the over-all validity of the survey. First, instructional television is a relatively new tool which many conservative educators do not as yet consider a necessity. Since the results of research into the effectiveness of television have not drifted down to many in the educational field, it is understandable that this lack of knowledge could lead to an underestimate of future requirements for channel space. Second, most educators are accustomed to estimating future needs in terms of local political imperatives and the hard facts of an actual budget. This would cause the estimate to be made in terms of present practicality rather than future possibility.

Therefore, we believe, when the results of this survey are properly weighted, 1197 allocations is, if anything, a conservative requirement. In other words, when instructional television becomes a nationally accepted educational tool, far more than this number of channels would be needed.

Clearly, the prime purpose of the NAEB study was to make sure that the FCC and others interested in the spectrum did not underestimate the requirements of American education for spectrum space. With only some 80 ETV channels presently in use, out of more than 300 allocated for ETV, Congress and the FCC could very well draw the erroneous conclusion that educators are not interested in television. There are commercial television enterprises which are more than eager to convince them that this is so. The NAEB study shows clearly that educators are not only interested in, but vitally need, television for instructional purposes.

The study proves its point; we fear it also defeats its purpose. For, while it shows that a large number of channels will be required in the future for educational television, the report admits that ". . .this number of channels could not be acquired from the present table of allocations, nor even 'dropped-in' under the present rules."

The engineering section of the report represents an estimable effort to cram the needed channels into the present table of allocations. Even so, only 906 possible allocations for ETV were found. It was indicated that the rest might be accommodated with changes in the FCC assignment plan. The computer study undertaken by the NAEB is a further attempt to "stretch" the spectrum to accommodate additional channels.

Without question, research into spectrum efficiency of this type has great value. But there is considerable question whether it will provide the

answer in light of the vast predicted (and unpredicted) needs of television for our schools.

Further, the report gave little weight to the stiff competition for available unused channels which will inevitably come from commercial television applicants. We speak of the competition which will develop as the UHF band becomes more active.

Looking out across the broad plains of UHF, all this talk of a limited spectrum may appear meaningless. From the UHF channels 14 through 83, there are 70 virtually unused channels. Admittedly, the band holds an answer to the problems of broadcast television space. But the misconception that UHF can provide space for ITV, in addition to an expanding commercial and noncommercial television service, is based on an underestimate of the growing needs of American education for instructional television.

The FCC has given long and serious consideration to the needs of education for spectrum space. In word and in action, it has shown itself to be strongly pro-ETV. But the spectrum remains a limited natural resource. And, in the current proposal by the FCC for a new table of allocations, it has proposed that only 692 allocations be reserved for ETV—clearly far short of the estimated requirement for 1197 channels.

To base future ITV plans on the availability of broadcast spectrum space is flying in the face of hard physical fact. It is not feasible that the limited broadcast spectrum be used in the long-range future for the internal communication purposes of academic systems. We propose that closed-circuit methods are the only suitable means for providing the bulk of this service.

Closed-Circuit ITV

Exactly what does the use of closed-circuit methods of distribution mean to the educator? Primarily, it means that the use of television for instructional purposes will not be limited by lack of spectrum space. But in addition, it offers advantages quite apart from unlimited expansion.

To illustrate, consider a hypothetical large urban area that wishes to use instructional television in the elementary through secondary levels. The system could be set up along the following lines. The cooperating school districts would have a single central production center with facilities for film, tape, and live originations. The production center would be similar in many respects to that of a broadcast station, except that provision would be made to originate and distribute many simultaneous programs. A central control would connect, on schedule, any studio, film, or tape facility with any school or group of schools. If desired, provision could be made to allow direct talkback from the classroom to the studio. Because a closed-circuit system is private, it could also be used for administrative purposes outside the area of instruction.

It should be understood that when we speak of "closed-circuit," we are referring either to the use

of **cable distribution systems** and/or the use of the relatively uncrowded **microwave** portions of the spectrum. The microwave band systems would use either the standard point-to-point microwave transmission or the recently opened-up 2500-megacycle service (more properly referred to as "instructional television fixed service"). None of these systems uses any broadcast spectrum space. A single ITV distribution system might use all three types of closed-circuit methods.

A cable system offers some unique advantages. Since a cable does not allow the signal to be radiated, or "transmitted," the user of cables can make his own "allocation laws." Any technically useable frequencies—including those outside the standard television bands—can be utilized. This would allow at least fifteen programs to be sent simultaneously through a single cable. And since any number of cables can be used, **the number of channels available for simultaneous transmission is truly unlimited.** Further, because of the absence of radiation, there would be no Federal spectrum regulations (licenses, technical and program requirements, etc.) to contend with.

Broadcast ITV service is often frustrated by reception problems. In many localities not all of the schools desiring the service can adequately receive the signal. Reception area problems do not exist with a closed-circuit cable system; any school is guaranteed the service by the installation of the cable. Only equipment failure can interrupt the service.

The use of broadcast channels for ITV has one primary advantage over closed-circuit forms of ITV: the ability to cover large geographical areas without a distribution system. The use of airplanes or satellites simply expands this advantage. The main disadvantage of broadcast ITV is the limitation of airing one program—one lesson—per channel at a time. Consequently, a large number of additional channels would be required to fulfill the future plans of ITV, and inevitably, sooner or later expansion will be stopped by the stone wall of the limited spectrum. In short, broadcast ITV has distribution simplicity, coupled with spectrum inflexibility.

The decision to use cable, point-to-point microwave, or the 2500-megacycle systems for closed-circuit ITV distribution will be based primarily on economic considerations. In general, a cable system is the more expensive, but this is not necessarily so. The answer must be weighed in terms of local circumstances—connection distances, system complexity, equipment costs, etc.

Perhaps one of the most significant advantages of a closed-circuit ITV system is that the educator would be in full control of his own system. Most of the noncommercial stations now offering both an ITV service and community programing are reticent to publicly admit the rather broad discrepancies which exist between the two types of broadcasting. Nevertheless the differences do exist and seldom are the educator and the community broadcaster completely happy about the association.

With a closed-circuit ITV system, the educator would have the independent freedom to develop and use television specifically for the purpose of direct instruction. With the flexibility of multiple channels, the teacher could be provided with what he wants, when he wants it.

Excellent groundwork has already been laid in the use of closed-circuit ITV. There are now hundreds of small closed-circuit systems in American schools. But more significant for our comparisons are the larger systems which have proved their value, such as the pioneer system in Hagerstown, Maryland, and the more recently developed system in South Carolina.

It is impractical for in-school instructional television to rely, in the future, on the use of broadcast channels as its principal method of distribution. This is not to suggest that ITV programs presently being broadcast on EVT channels should be discontinued. The broadcast method of distribution is a major one at the present time, and there is considerable evidence that it will expand in the next few years.

We maintain that only if the FCC were capable of allocating, and willing to allocate, at least twenty instructional broadcast channels to a metropolitan area—with proportionately fewer in smaller communities—would the use of broadcast channels for this purpose be feasible. With the cold fact of a jammed spectrum, this kind of a decision by the FCC is clearly out of the question. Even if enough channels could be allocated, the inherent advantages of closed-circuit ITV would probably rule in its favor.

The separation of ITV from the broadcast spectrum certainly does not imply isolation of the noncommercial broadcasters from "educational" programing in the broad sense. On the contrary, ETV stations, as presently charged by the FCC rules and regulations, have a basic responsibility for serving intellectual aspects of the community at large. Broadcast television is admirably capable of reaching the general public with adult education and extension courses.

We realize that a proposal to separate ITV from ETV may not be received with enthusiasm by those ETV stations whose bread and butter comes from their ITV service, or by those stations which find a welcome side income from their instructional programing. But the break between instructional television and public noncommercial broadcasting will inevitably be forced by the extreme shortage of specrrum space. Educators and ETV broadcasters would do well to face up to the problem

Neither the cause of instructional television, nor the "interest, convenience, and necessity" of the public can best be served by the long-term planned use of a limited broadcast spectrum for the internal communications purposes of an academic system.

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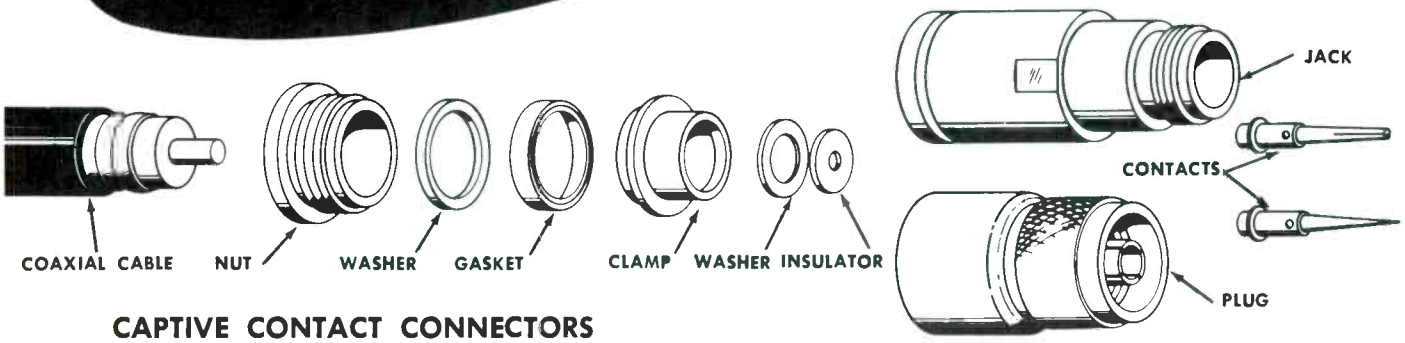

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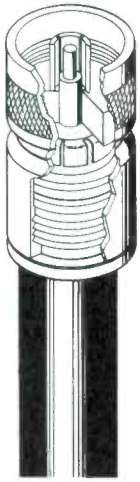

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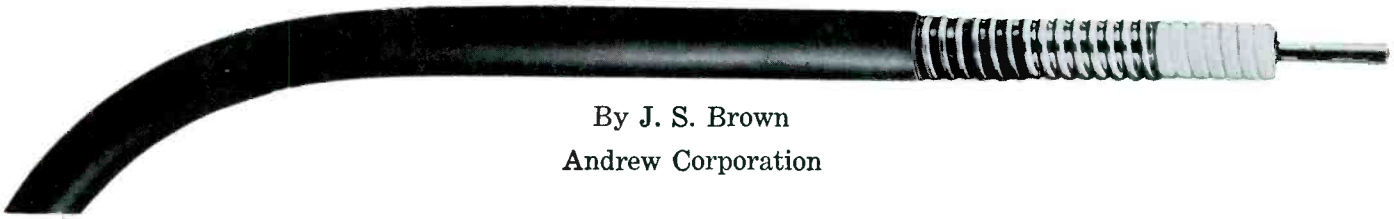


By J. S. Brown
Andrew Corporation

It is now over two years since foam Heliax was first introduced. Its acceptance has been excellent, especially in the two-way communications field. The purpose of this special report is to review the original designs to describe recent technical developments on this type of cable, and to report on a number of environmental tests and users' field reports.

The basic design of this cable is probably well known throughout the industry. It is an all-copper coaxial cable manufactured by a unique process, employing a configuration that takes advantage of the superior flexibility and ease of handling of air dielectric Heliax. The need for pressurizing, as required by air dielectric Heliax, is eliminated by using a foam polyethylene dielectric. The resulting cable is one that is superior in a number of performance aspects to solid dielectric cables and is still competitive price-wise.

The cable is manufactured essentially by a continuous process. The first step is the extrusion of the foam polyethylene dielectric over the inner conductor. After the foamed core is extruded, it must be baked in order to drive out moisture that is formed as a chemical by-product of the foaming process. Next, the outer conductor is applied over the core, welded, and corrugated. The machine that performs this operation is shown in Fig. 1.

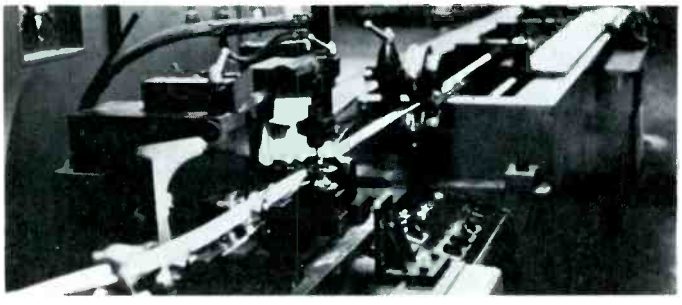


Fig. 1 Machine applying welded outer conductor over foamed cable core.

Quality Control at all steps is a very important aspect of the process. The copper strip used to make the outer conductor is especially critical since its weldability is seriously impaired if it does not meet exacting material specifications. Samples from each lot of copper received are welded and the welds examined under a microscope to insure satisfactory raw material. Control of dielectric loss in the foam dielectric is also essential. Regular sampling checks of the dielectric loss are performed. Dielectric samples are measured in a high Q cavity (Fig. 2) that was especially designed and built for this purpose.

Fig. 2 Laboratory setup for measuring loss in dielectric.

High voltage and DC continuity checks are made on every length of cable. VSWR and pulse tests are performed on a sampling basis. Fig. 3 shows some of the test equipment used for making the VSWR measurements. Fig. 4 shows typical VSWR measurement on a piece of half inch foam Heliax with connectors.

In the pulse measurement (Fig. 5) the pulse was first sent through a piece of RG8 and then through a comparable length of half inch foam Heliax. The superior electrical uniformity of the foam cable is quite evident from this curve.

The electrical performance of foam Heliax is illustrated by the accompanying curves. Fig. 6 shows the attenuation of 1/2 and 7/8 inch foam Heliax, compared to commonly used solid dielectric cables.

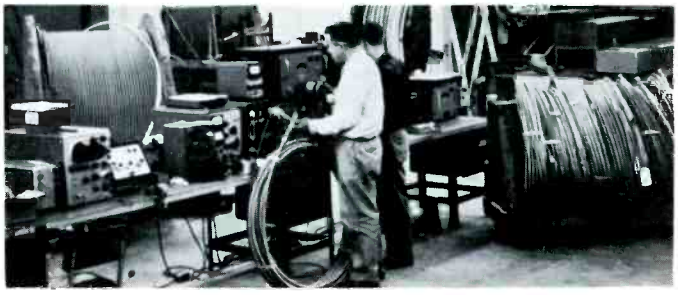


Fig. 3 Views of laboratory showing test equipment setups for various electrical tests.

In recent months a new larger size of foam Heliax has been introduced, nominal 1-5/8 inch. Fig. 7 shows the attenuation of this cable, compared to

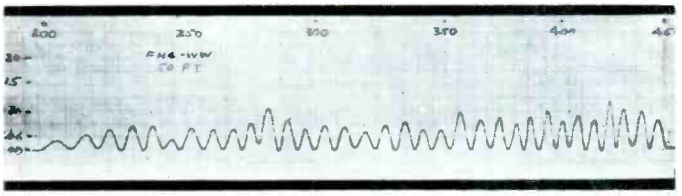


Fig. 4 VSWR measurements on length of ½" foam Heliax.

RG17 and 1-5/8 air dielectric Heliax. The increase in loss over 1-5/8 air cable is due to the larger amount of dielectric present. Fig. 8 shows, on a comparable basis, the loss of all three sizes of standard foam Heliax. The power ratings of these

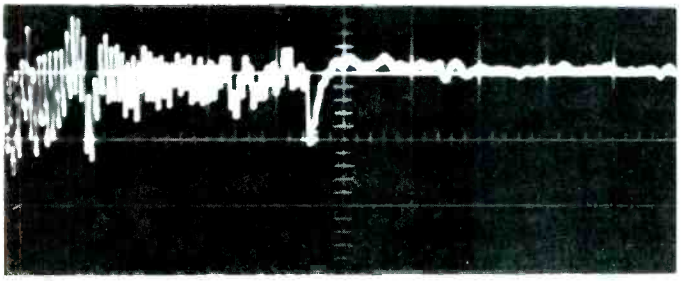


Fig. 5 Pulse measurement, RG8 on left, ½" foam Heliax on right.

three cables are shown in Fig. 9.

A relatively new performance requirement for coaxial cables is one that calls for stability of electrical length with respect to temperature change. This performance parameter is especially important in phased arrays, where many radiating elements in a complex antenna array must be fed in a certain phase relationship to each other. It so happens that the dielectric constant of polyethylene decreases slightly with an increase in temperature, which makes solid dielectric cables look electrically shorter as the temperature increases. Since the dielectric constant of foam heliax is lower than that of a solid cable, and since the copper conductors tend to become longer with increasing temperature and therefore make a change in the opposite direction, it would be expected that foam cables would exhibit more stable electrical length-temperature characteristics. Such is the case, and Fig. 10 shows a comparative plot of electrical length versus temperature for 7/8 foam heliax and RG 17 cable.

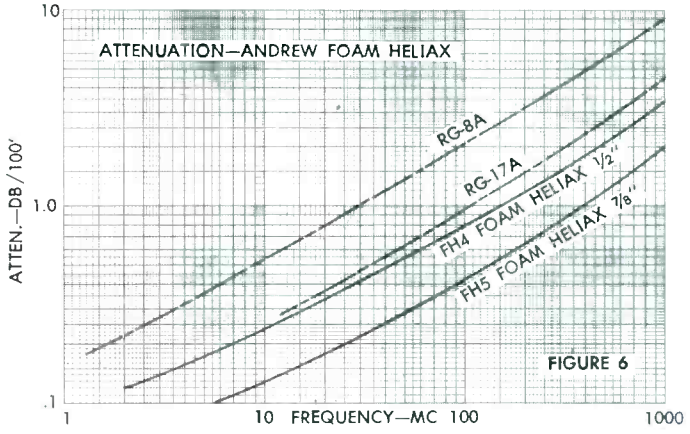


Fig. 6 Comparative attenuation curves for ½" and ⅞" foam Heliax.

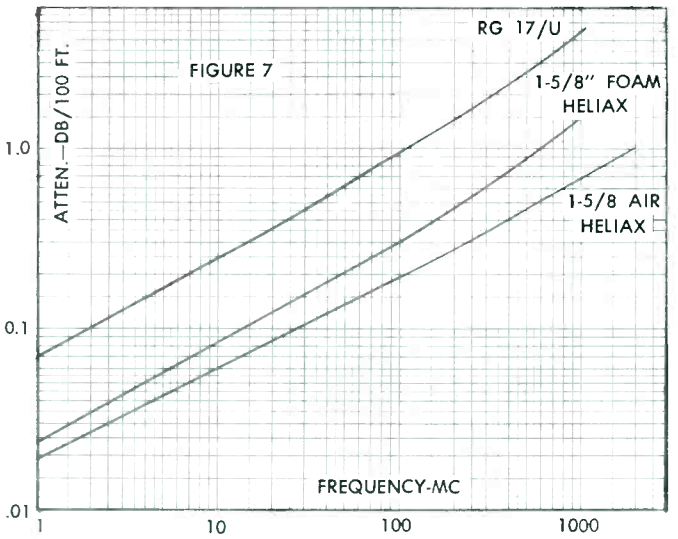


Fig. 7 Attenuation curves, 1⅝" foam and air dielectric Heliax.

Continued mechanical evaluation of foam heliax cables has been conducted ever since its introduction on the market. Bending tests are conducted regularly, to make certain that the flexibility inherent in the basic design is maintained. The

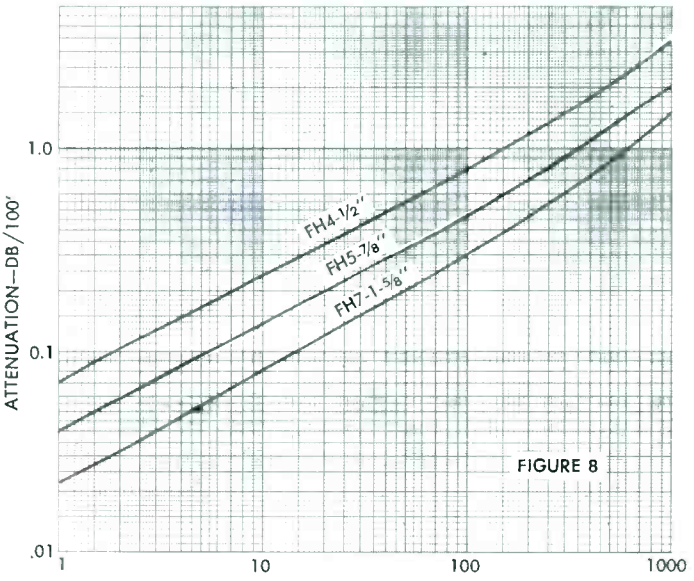


Fig. 8 Attenuation curves, ½", ⅞" and 1⅝" foam Heliax.

original design goal of 40 reverse bends when bent on a bending radius 10 times the cable diameter has been consistently maintained.

One of the features of this cable that takes full advantage of the properties of the foam dielectric is the solid sheath outer conductor. It is well known that braided cables using foam dielectric deteriorate over a long period of time, as moisture enters the foam through the jacket and braid and increases the attenuation. This is obviously no problem in a solid sheath cable except for the possibility of pin holes in the welded seam. Strenuous attempts to eliminate pin holes are made, of course, but it is very difficult to perform 100% inspection in this regard. In the case of air dielectric cables a pressure test will reveal leaks,

but such a test is not possible in foam cables. It was therefore decided to conduct a series of tests to see how far the cable would deteriorate performance-wise if some holes in the seam did occur.

Most pin holes that occur in a weld are very small, on the order of a few thousandths of an inch in diameter, but in order to conduct an unusually severe test series it was decided to drill a number of holes in the outer conductor for the various tests that were .070 inches in diameter. A cable with such a hole was submerged in the tank of water six or eight inches deep. Over a period of 1-1/2 years the attenuation of the sample increased from 2.18 to 2.27 db at 1000 MC, which is almost within measurement error.

Several other samples with the same size hole were left outdoors and in various types of humidity chambers for periods of well over a year with no perceptible change in attenuation. It must be concluded that occasional small holes in the welded seam do not cause any deterioration of electrical performance.

Connector design and performance is as important as the cable itself. A wide variety of connectors has been designed and evaluated, and performance, based on field reports, has been excellent. Here again, of utmost importance to the two-way user is the waterproofing of the connector

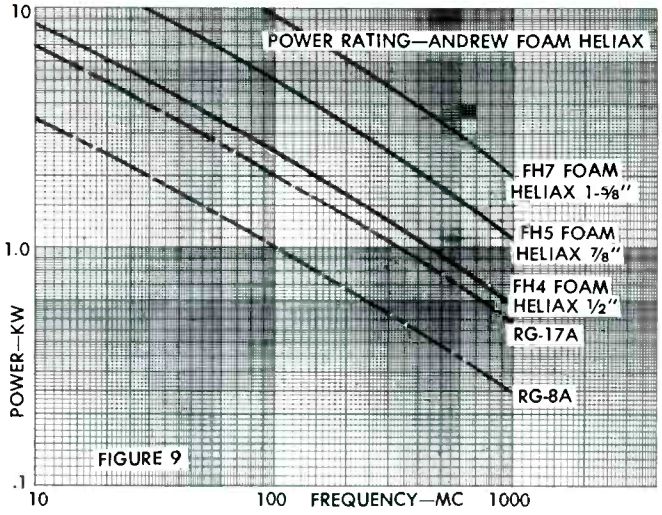


Fig. 9 Power ratings.

assembly. In order to simplify design, reduce cost, and improve ease of attachment no waterproofing seals are included in the connectors; rather the use of silicone grease and waterproof tape is counted on to provide water tight integrity. Extensive tests in the laboratory and reports from field users confirm that these two simple precautions are completely adequate to insure a waterproof fitting. Field installation of foam heliax is fast and easy. Its corrugated outer conductor virtually eliminates the kinking problem if reasonable care is exercised in handling. For tower installations, the cable is merely strapped to a convenient vertical tower member at suitable intervals. It can be easily snaked through raceways and cable troughs, and in many cases has been pulled through conduit. Attachment to the antenna is simple, since the flexibility of the cable will in most cases eliminate the need for solid dielectric jumper to connect between the antenna and transmission line.

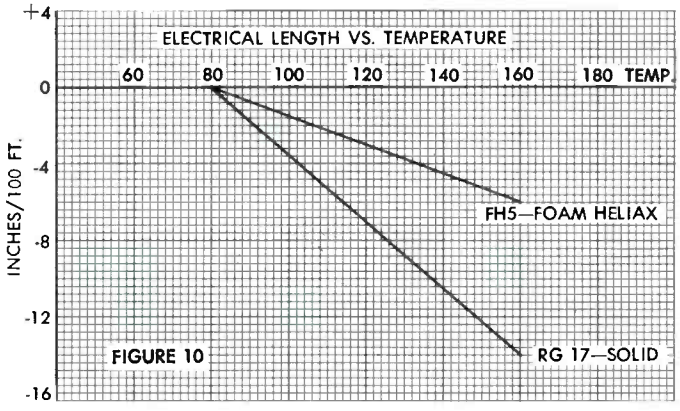


Fig. 10 Phase-temperature characteristics of RG-17/U and 7/8" foam Heliax.

In summary, it can be said that this cable type has not only been thoroughly investigated in the laboratory but subjected to a wide variety of field conditions, and its suitability and performance as a low loss, highly flexible permanent cable for two-way use has been established.

sidiary of the International Telephone & Telegram Corp. which was recently authorized by the FCC to get into the radio common carrier business at several locations, has announced that it expects to be operating RCC systems "in a minimum of 50 key cities throughout the country" within "five years.'' The report came in the company's formal announcement of its entry into the RCC field.

FCC authorizations for two-way RCC facilities are now held by the company for Los Angeles, San Diego, San Francisco and and San Bernardino, Calif.; Cleveland, O.; Omaha, Nebr.; and Fort Wayne, Ind. In addition, ITT Mobile Telephone is authorized for a one-way signaling common carrier radio station at Omaha.

Strassburg on RCCs— FCC Common Carrier Bureau Chief Bernard Strassburg, accepting an invitation to address the mid-September national convention of the National Mobile Radio System in Washington, D. C., has advised NMRS President Ralph Hicks that matters discussed at December meetings between FCC staff members and representatives of the association "will have my continuing concern and attention.

Mr. Strassburg said he "looks forward to being able to report "at the time of the NMRS convention "both material progress in the curtailment of application processing time and the establishment of improved processing procedures."

FCC Budget—President Johnson's budget request of $16,610,000 in new obligational authority for the FCC fiscal year 1965, beginning July 1, constitutes a slight boost over the expenditures estimate for fiscal year 1964, now in progress.

Local Government Waiver— The county of Yolo, Calif., has persuaded the FCC that its situation is "unique" enought to justify waiver of local government radio service rule provisions that on certain listed frequencies in the service, "the antenna height may not exceed 50 feet above ground level at the antenna location." The County got permission to modify the antenna of a standby station from 50 to 150 feet above ground level.

Yolo had pointed out that when the station—a standby facility for the county's mobile relay station on Bald Mountain, which goes into operation only when the Bald Mountain station is off the air for repair or other maintenance reasons—is required, its coverage is inadequate because of the 50-foot height limitation and the shielding effect of a 70-foot building on which the antenna is located.

The Bald Mountain station operates from an overall antenna height of 1877 feet above mean sea level—1837 feet of mountain, and 40 feet of antenna—while the standby transmitter, about 20 miles to the east, at Woodland, has a ground elevation of only 47 feet. So, even with the 150-foot antenna being proposed, the standby antenna would reach only 197 feet above sea level, and would cover an area about 30 miles less than is covered by the Bald Mountain station.

The Commission made it clear that the waiver was approved under two definite criteria: (1) the Woodland station is used only for "standby" purposes; and (2) the coverage of the standby station is less, even with the increased antenna height above ground, than the station it is spelling.

Washington RCC Hearing— Applications of two common carriers seeking to serve the Tacoma, Wash., area on the frequencies 152.06 and 158.52 megacycles, have been designated for hearing by the FCC, and a hearing date of March 18 has been established. Involved are C & G Electronics Co., who filed an application for a new RCC system at Tacoma in July, 1962, and Robert M. Kunz, doing business as Radiofone Service, who filed two months later for authority to switch his existing operation to the same two frequencies.

The Commission pointed out that both applications "are seeking to provide two-way communications service on the same

frequencies in the same general area, in and about Tacoma, and it appears that these applications are mutually exclusive by reason of potential harmful electrical interference. Therefore, a comparative hearing is required to determine whether a grant to either of the applicants would serve the public interest, convenience, and necessity."

Business Eligibility Waiver—The Tonadel Communications Corp., operating at the John F. Kennedy International Airport in New York, has been granted an FCC waiver of eligibility provisions of the business radio service rules in order to provide a radiocommunication service to Alitalia Air Lines in the area. The business rules make no provision for eligibility of persons engaged solely in providing a radio service for others, except in the special case of a subsidiary providing service to a parent corporation, and Tonadel is not a subsidiary of the Italian air line. The waiver was granted with the provision that the service to Alitalia be provided on a "non-profit, cost-sharing basis." The agency noted that similiar authority was granted several years ago to Solcom, Inc., to serve Air France.

Senate Commerce Funds—The Senate Commerce Committee has been given $360,000 in additional funds to carry out its investigations into various field, including communications, during the current year. Commerce Committee Chairman Warren G. Magnuson (D., Wash.) was expected to call for a review of present policies and a complete evaluation of the allocation of frequencies to assure the most effective use of the radio spectrum.

ARRL Intervenes on Filing Fees—The American Radio Relay League has noted its intention to intervene in the case before the Seventh US Circuit Court of Appeals in Chicago in connection with a requested review of the FCC's decision to put a projected "filing fee" program into operation.

Antennas for the 2500-2690 mc Instructional TV Service

By Albert K. Fowler, R.F. Systems, Inc.

Little seems to be known concerning the selection of antenna equipment for use in the 2500 mc to 2690 mc band for use in closed circuit T.V. systems. These systems will perform an important mission in the Instructional Fixed Station Field.

Cable loss will be a significant factor in this type of system and economy will dictate the use of some form of air dielectric coaxial cable. For example, Foamflex cable has a loss of approximately 6.5 db/100', Spirafil a loss of approximately 5 db/100' and RG-9/U solid dielectric cable a loss of approximately 15 db/100'.

The information prepared here has assumed a lower loss cable as is suggested in the systems calculations.

There is no question that many antenna systems required will have to be specifically designed for applications in this field particularly where there is an unusual location of schools and unusual terrain problems. However, the systems will, for the most part, be adaptable to a convenient configuration. Starting with this viewpoint a simple system is designed that does not require special antenna selection or special beam characteristics. The heart of the system is an omni-directional antenna (sending equal energy in all azimuth directions). To provide maximum elevation coverage for variations in elevation an antenna of nominal gain is picked. This assures good vertical beam coverage, reasonable average gain, and nominal size and configuration for installation on the public building. The nominal gain of transmit antenna is 6 db.

The transmit power of these systems of 10 watts of average power, the line loss if 5 db/100' and 20 feet of line is assumed at each end of the system. The maximum range assumed for the system in any direction is 10 miles. The permissable minimum signal strength at the receive end of the system is 500 microvolts at an impedance of 75 ohms. Accordingly the received power required is:

$$P = \frac{V^2}{Z} = \frac{(500 \times 10^{-6})^2}{75} = 3.33 \times 10^{-9} \text{ watts}$$

Pdb = −54.8 dbm

Summing up the losses and gains, we are in a position to determine the receive antenna gain requirements.

	dbm add +	dbm subtract −
Transmit Power PT = 10 watts	40	—
Transmit Cable loss (20 ft.)	0	1
Transmit Antenna Gain GT = 6 db	6	—
Space attenuation at 2500 mc for 10 miles	0	125
Receive Antenna Gain GR	GR	—
Receive Cable Loss (20 ft.)	0	—
	GR + 46	− 127

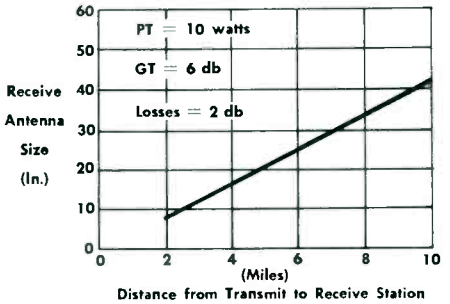
The sum of the gains and losses must equal the received power; so

GR + 46 - 127 = -54.8

GR = 81 - 54.8 = 26.2 db

The parabolic antenna size required for this gain is 42 inches.

It is readily seen that a curve of minimum antenna size versus range can be constructed and this has been done for the assumed conditions in the curve below:

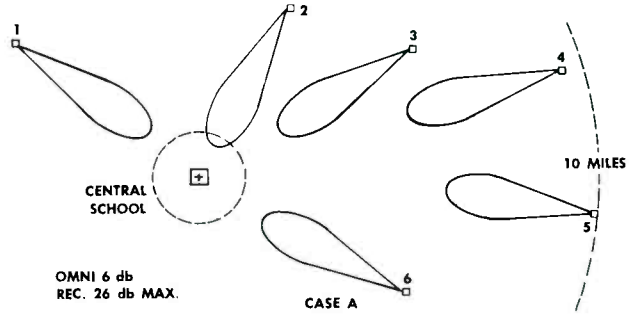


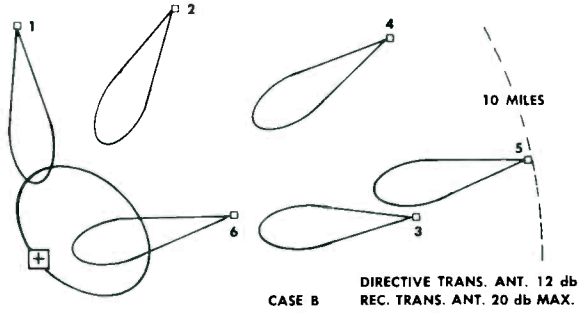
Since it would not be economical to provide all ranges of antenna sizes to logical selection would be to pick two sizes that represent a reasonable safety margin—for example: 4 feet and 2 feet.

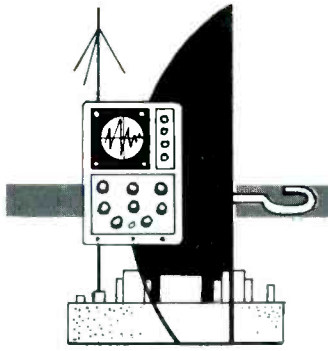
It is fairly obvious that any gain requirement by the same amount. For example, suppose the system was physically so located that it could use a directive antenna at the transmit site with a gain of 12 db. The gain requirement of the receive antenna would be 6 db less and for the case considered the 42 inch antenna would reduce to 20 inches.

It is highly unlikely that an antenna of more than 17 db gain at the transmit end would be desirable and it is concluded that receive antennas of from 20" to 48" would be most appropriate.

Special situations will no doubt require special solutions but the two cases laid out below will solve 99% of the requirements in the new 2500—2690 mc service.



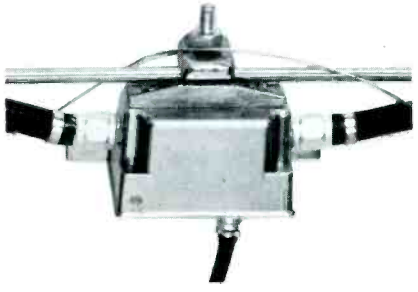




PRODUCT REVIEW

CATV & MICROWAVE

A new series of solid state amplifiers has been introduced by **C-COR Electronics.** Band pass is 100 kc to 150 mc. Output is 5.5 v p-p into 50 ohms at 10 mc. Impedance is 50 ohms in and out with noise and hum 35 uv rms equivalent input. Solid state circuitry throughout. Units are available with a gain of 20 db, 40 db, and 60 db nominal. Amplifiers are packaged as signal chassis only (3000 series). Delivery available from stock. Units are priced from $450 to $1700. For further information contact James R. Palmer at C-COR Electronics, Inc., P. O. Box 824, State College, Pa.



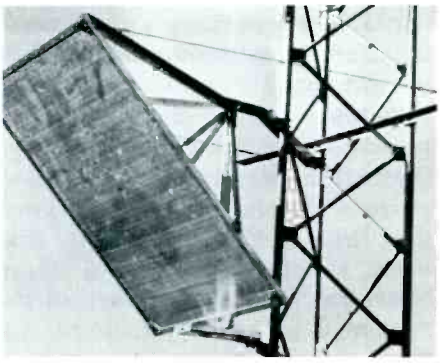
A new **Directional Line Tap, No. 935,** is available from **Viking Cable Company,** 830 Monroe St., Hoboken, N. J. The 935 is a distributed design tuned for an input VSWR of less than 1.15:1, according to manufacturer's specifications. Output and tap terminals are matched to better than 1.3:1 and isolation between them is over 30 db. A 17 db tap with 0.3 db insertion loss and a 10 db model with 0.7 db insertion loss are available with either F fittings or push-on fittings for Viking 308 coaxial cable. The unit is adapted for either messenger or pole mounting and designed to drive hybrid splitters to provide up to four outputs without additional loss. Units are available from stock at $5.00 each.

A complete **fault and service communication system** designed to increase system reliability in both microwave and wideband cable distribution systems has been announced by **Jerrold Electronics Corporation.** The new alarm and control system, Model JACS-31, and service channel unit, JSC-3400, used together provide an integrated compatible unit for highest reliability. The JACS-31 is designed primarily for instant reporting and pin-pointing equipment failures in a microwave system. The alarm and control signals are transmitted over an unused portion of the microwave baseband. The circuitry permits reporting from both local and remote locations, with alarm indication given in visual and audible form and without need for interrogating reporting systems.

Jerrold describes the JACS-31 as consisting of three basic packages: a time division multiplex encoder with tone transmitter and power supply for each station to be monitored; a time division multiplex decoder with a power supply for each maintenance control station; and a tone receiver for each channel to be monitored.

The voice communication facility, service channel unit JSC-3400, covers a frequency range from 300 to 15,000 cps. The unit has two basic functions; order-wire with remote signalling, and baseband tone insertion. The order-wire circuitry includes a front panel speaker which is also used as a microphone, and a switching unit for connecting a standard telephone headset. Selective ringing of remote stations is included. The JSC-3400 has low power drain and needs only 5 1/2" vertical rack space.

For systems handling television information where the lower portion of the baseband is used for video information, the Jerrold JCT/R carrier transmitter and receiver permit the insertion of the service channel or alarm signals above the video information. The equipment is FCC type accepted.



Rohn Manufacturing Co. of Peoria, Illinois, manufacturer of communications towers and accessories, has entered the microwave passive reflector field with a new type reflector made of Reynolds aluminum interlocking extrusions. Rohn offers the reflectors in three standard sizes—6 x 8 feet, 8 x 12 feet and 10 x 15 feet. The reflectors in these sizes weigh approximately 140, 280 and 438 pounds respectively. Special features include simplicity of design, ease of handling and, greatly reduced shipping costs. The extrusions can be shipped knocked-

down to the erection site and easily snapped together and assembled in the field. For additional details, contact Rohn Manufacturing Co., Box 2000, Peoria, Ill.

A complete music channel head-end unit, the **Davco Model MC-1100 Music Channel,** has been announced by Davco Electronics Corporation. The unit is rack mounted and ready to plug in to any community antenna system. No other equipment is needed. It is completely wired and includes Tape-Athon tape deck with 10" reel capacity, pre-amplifier and Entron FMT FM transmitter, all as a complete integrated unit. Overall dimensions are 21" x 32".

The music unit is available for any FM channel, frequencies of 89, 89.75, 90.5, 91.25, 92, 92.75, 93.5, 94.25 and 95 mc. Also available on FM frequencies up to 108 mc.

Price of the Davco unit, complete, is $849.50, fob Batesville, Ark.

COMMUNICATIONS

Communications Products Company has introduced a new line of **Duplexers** for the land mobile services. The new equipment, developed to provide greatly increased transmitter to receiver isolation, 70 to 100 db, in minimum physical space, consists of four standard items: Nos. 498-509 and 499-509 for the 148-174 mc range and Nos. 520-509 and 521-509 for the 406-470 mc service. The manufacturer reports that the units are extremely rugged and are designed to operate over a very wide temperature range. Inquiries should be directed to Communication Products Co., at Marlboro, N. J.

The **Secode Corporation** of San Francisco has announced the addition to their product line of a conversion kit designed to allow telephone companies now operating manual mobile telephone systems to convert their conventional mobile units for use in the new IMTS systems.

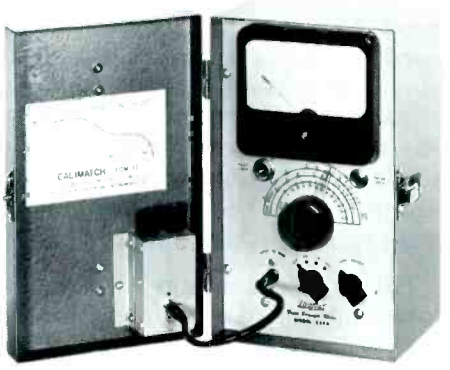
With the addition of the DMK-103 conversion kit, a standard manual duplex mobile telephone unit will be able to provide all of the features now required for an IMTS system. The kit consists of a standard IMTS supervisory and logic unit, a standard IMTS telephone instrument and control head and a solid-state idle marked channel selector, all of which simply plugs into the present manual mobile radio unit without external alteration of the set.

Secode's Telecommunications Division says that the new conversion kit will enable phone companies now operating manual equipment to go immediately into the IMTS program with a maximum salvage of their existing equipment.

A new hand-held **dynamic microphone,** developed for fixed and mobile communication applications and featuring a unique method of Background Noise Cancellation has been announced by **Altec Lansing Corporation,** a subsidiary of Ling-Temco-Vought, Inc.

Designated the Altec "Dyna-Mike", the new device is reportedly the product of extensive research at Altec's Anaheim, California facility. To elliminate the problem of ambient noise interferring with voice transmission, the "Dyna-Mike" was designed with a "suspended" diaphragm assembly and packaged in a case perforated to allow omnidirectional access of sound to the diaphragm.

Included with each model is a connecting cable, mounting bracket, and push-to-talk switch with an extra pair of contacts for operating relays, indicators, etc. that close when the audio circuit is completed. Specifications and a complete description of the new Altec "Dyna-Mike" are available on request from Altec Lansing Corp., 1515 S. Manchester Ave., Anaheim, Calif.



TEST EQUIPMENT

A VHF/UHF Field Strength Meter has been announced by **Hickok Electrical Instrument Company,** Cleveland, Ohio. Described as a rugged and completely portable instrument, the Model 235A, is designed for installation and maintenance of both VHF and UHF antennas and antenna distribution systems. It provides direct reading of absolute field strength on all television channels from 2 through 83.

LITERATURE

A free subscription to **BEC Review** is offered to persons engaged in the communications industry, including users and makers of communications equipment. The four-page bi-monthly publication contains application information about unique UHF and microwave communications systems and technical information about communications equipment. Requests for subscriptions should include ZIP colde numbers and should be addressed to **Budelman Electronics, Corporation,** a unit of General Signal Corporation, 375 Fairfield Avenue, Stamford, Connecticut 06902.

LOW POWER CRYSTAL OVEN

By G. A. Vogt, General Manager
Ovenaire, Incorporated

The trend in the design of mobile equipment over the past several years has been toward miniaturization, and reduction in power consumption. This is true particularly of the power consumed during the standby operation of the receiver. This trend has seen the removal of the majority of the vacuum tubes in mobile equipment and this removal of tubes left the crystal ovens in a position of exposure that required their removal also. Needless to say, conventional crystal ovens do consume a considerable amount of power and do not permit equipment to be left on day after day without recharging of the battery.

This major change in the size and the power consumption of equipment has not been easy, nor has it been obtained without a price. This price consists not only of a cost in dollars and cents for the technology involved, but it has also been a price involving the reduction of stability in certain areas. This reduced stability has been particularly evident in the higher and the lower ambient temperatures. The low power, needless to say, does not hold in the lower ambients where auxiliary heaters of one kind or another have been used by most manufacturers. The overall reduction in power has nevertheless been dramatic and has contributed to the acceptance of transistorized equipment.

The removal of the crystal oven has resulted in a great number of attempts to stabilize the crystals without temperature control. There have been attempts at circuit compensation that make correction for crystal frequency variations over the ambient temperature range. There have been mechanical devices applied to the quartz crystal itself which physically distort the blanks to make correction for frequency changes and, of course, there has been the method of tighter and tighter tolerances in the selection of crystal units to fit within modified ambient parameters.

Most of these techniques, if carried out methodically, do yield stabilities which are significant and if great care is taken, they do lend themselves to some form of production. The very greatest disadvantage in each of these methods is the matter of greatly increased cost and reduced availability. Where mobile equipment manufacturers were able to buy crystals for something in the order of $1.50 to $2.50, they now find themselves paying from $5.00 to $10.00 for crystals that are able to meet the existing stability requirement of + or - .0005% without the use of ovens.

The matter of the high price for these selected crystals is not the only disadvantage that is involved in their use. A secondary disadvantage is the fact that these crystals are very often awkward and difficult to obtain, particularly on short notice.

Ovenaire has been aware of these problems for several reasons. One being that Ovenaire has been a prime supplier of ovens to the mobile communication manufacturers for a number of years and removal of ovens from new transistorized equipment certainly had its impact at our level. In addition, Ovenaire has always attempted to keep up with the state of the art requirements of the mobile communications people and is always trying to meet and predict their needs. It was with this in mind that experimentation and development has led us to a point where an oven is now available which will, in our opinion, help to solve the problems mentioned.

We now have available for purchase a miniature proportionally controlled oven which operates on extremely low power and is quite inexpensive. The fact that the oven is proportionally controlled has the advantage that there will be no switching of contacts to produce noise in the circuit or to induce changes of capacity which could in turn cause a frequency jump in the oscillator. Since there are no moving parts or electrical contacts, the life expectancy of this oven should be greatly expanded.

Proportional control also means that the oven can be set to any required temperature by the equipment manufacturer if it is so desired. Adjustment of the oven temperature to the turning point of the crystal could yield stabilities as good as one part 10^7 or .00001%. This would be approximately fifty times as good as the existing specification requirements. This technique would be particularly applicable to single crystal ovens, but would be somewhat awkward with multiple crystal ovens because crystals would have to be selected for matching turning points. Field adjustments of temperature would not be too difficult in that a technician need only adjust this oven to the minimum frequency turning point of the crystal. The potentiometer required for making this adjustment may be located anywhere in the equipment and need not be within the oven enclosure.

A distinct advantage of the proportionally controlled oven is that there is no interruption of current. Power is drawn on a continuing basis as

Continued on page 36

MICROWAVE GROUP FORMS

While the ties are still strong and the fields of mutual interest still close to those of the National Community Television Association, the microwave common carrier owners of the nation have decided the time is ripe for their own association.

Bruce Merrill

Meeting in Chicago on Jan. 7, 1964, a large group of owners and operators of microwave common carrier companies formed the National Association of Microwave Common Carriers, Inc.

Bruce Merrill, president of the newly formed NAMCC, outlined the following three-fold program as objectives of the association:

(1) To render mutual aid and assistance in all matters pertaining exclusively to microwave common carrier operations.

(2) To gather and disseminate to NAMCC members knowledge and information of common interest to the microwave field.

(3) To encourage and promote a high standard of business conduct during the rapid years of growth predicted for the microwave industry.

In addition to Merrill, other officers named were: Vice President, Frank Spain of Microwave Service Company, Tupelo, Mississippi; Secretary-Treasurer, Cliff Collins of Columbia Basin Microwave, Ephrata, Washington.

Directors named were: Bob Clark of Mesa Microwave, Oklahoma City, Oklahoma; Jack Crosby of Southwest Texas Transmission Company, Del Rio, Texas; Frank Valentine of New England Microwave, Dallas, Texas; Bill Calsam of Eastern Microwave, Oneonta, New York; Warren Fribley of Pennsylvania Microwave Corporation, Corning, New York; and James Klungness of Upper Peninsula Microwave, Iron Mountain, Michigan.

The charter membership fee of this association is $100. Quarterly dues are $10 per receiver.

All microwave common carrier companies interested in joining the NAMCC can secure a formal application blank by filing out and mailing the form below.

APPLICATION FOR MEMBERSHIP

NATIONAL ASSOCIATION OF MICROWAVE COMMON CARRIERS

% Cliff W. Collins—P. O. Box 65—Ephrata, Washington

Company Name _____

Street Address _____

Post Office Address _____

Telephone Number _____

Type of Business Organization _____

Continued from page 34
contrasted to thermostat ovens where relatively high current is required for short periods of time. This makes for drafting of a more realistic equipment performance specification. Present specifications usually ignore some of the peak power requirements and are written around average power requirements.

The existing EIA specifications require the equipment to perform properly within the ambient range of -30° C to +60° C. It is fairly common for this upper limit to be exceeded. Present techniques make it difficult to conform to the specified tolerance if this temperature is exceeded. This is primarily due to the fact that crystal characteristics become somewhat radical at the higher temperatures. This new oven performs easily within the present EIA specification with the oven set to 70° C. The oven could just as well be operated at a higher temperature such as 80° C or 90° C, so that in spec performance could be obtained at ambients much higher than at present.

It was found that with a power consumption of approximately one watt, the oven will warm up from -30° C to +70° C in approximately five or six minutes. Power consumption at a steady state -30° C is approximately .6 watts for a two crystal oven. This reduces to about .33 watts at +25° C and about .05 watts at +60° C.

If rapid warmup is desired, 31/2 watts will bring the oven to 70° C in about 21/2 minutes while +25° C is reached in about one minute. This technique usually allows communication to begin in one minute if reasonable care is taken in the selection of crystal turning points. The power consumed during warm-up has no bearing on the current drain after the warm-up process is completed.

A voltage change of + or - 10% yielded oven temperature changes of less than one degree total and ambient changes of -30° C to +60° C produced oven temperature changes of less than two degrees centigrade. Worst condition situations for + or - 20% line voltage and - 30° C to +60° C ambient should produce temperature excursions of less than + or - 2° C. Changes of this kind should yield stabilities of better than + or - .0001% with crystals of reasonable quality, reasonably priced.

The design and performance data referred to herein is related to the use of crystals of the HC-18/U configuration. Larger crystal containers can be accommodated, but will require more power and will exhibit slower warm-up characteristics because of the crystal can size. Replacement ovens to accommodate these crystals for existing equipment will be available shortly. Ovens to operate on alternating current will be produced later.

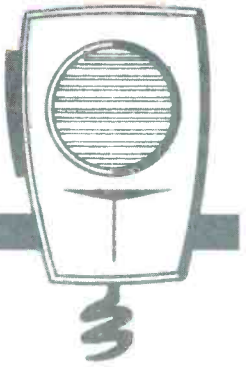
The performance specifications cited are typical of ovens in reasonably well insulated thermal packages. The basic oven heater clip and proportionally controlled circuit arrangement is very small and lends itself to a great variety of packaging techniques. A well insulated package to yield such performance would be a cube approximately 1 1/4 to 1 1/2 inches on a side. These dimensions can be altered and reduced at a moderate trade-off in power consumption. It would seem that even a poor thermal package with double the power consumption would still yield a very attractive performance level.

It would seem that this oven would lend itself to some new thinking in the design of mobile equipment in that it would be possible to wire the oven directly across the line and leave it connected all of the time so that warmup requirements could be disregarded completely. As an alternative, a switch could be provided so that the user may draw the power for the oven directly from the battery, or through the equipment control switch. For average ambient conditions, a two crystal oven will be drawing only about 30 milliamperes at 13 volts. For multiple crystal use, the oven could be modified to accommodate four crystals, or it would be possible to use several ovens, one for each pair of crystals, and then a selector switch could select the oven-crystal combination to be used so that all ovens do not have to operate simultaneously.

We have suggested herein, a solution to the technical problems and that leaves us still with the problem of price. It would seem that in comparable quantities the price for this new oven could be about the same as prices for conventional crystal ovens now being used in the mobile communications industry. This means that the manufacturer would gain a price improvement of approximately four to five dollars per pair of crystals. An over all price saving of five to ten dollars per two channel unit is practical, while at the same time, receiving the benefit of greatly improved stability through the use of temperature controlled crystals.

It is apparent that this oven could help solve the present frequency control problems associated with 450 megacycle equipment and might even open up the way to making the proposed split in that frequency range a feasible, practical and economical undertaking. Ovenaire is prepared to work with any manufacturers who have an interest in this approach to low-power, miniaturized crystal ovens.

Public Safety Communications



By Robert E. Brooking

A year ago comment was made in this column of efforts by the Land Mobile Communications Section of the Electronic Industries Association to gain additional operating space for the Land Mobile Radio users. Mr. Robert Galvin, President of Motorola, had stated at the 1961 National Conference of the Professional Group on Vehicular Communications of the Institute of Radio Engineers, that some important changes were necessary in the management of the radio spectrum. His three main points were: 1. There must be a single management agency for the radio spectrum in place of the present divided responsibility; 2. There must be a solution to the television allocations problem; 3. And soon!

At the 1962 National Conference of PGVC at Anaheim, California, it was the pleasure of your editor to participate in a panel discussion on the subject of The Crowded Frequency Spectrum. Others participating in the panel were: Richard P. Gifford, now General Manager of the General Electric Communications Products Department; Grandt E. Woodside, Office of the Chief Engineer, FCC; Victor Reis, Chairman of the National Association of Manufacturers Committee on Manufacturers' Radio Use and Robert Peth of Motorola, who chaired the session. Mr. Gifford, a member of the Joint Technical Advisory Committee, again pointed out that there remains only one solution to the problem; and that is a general reallocation. He pointed out that the channel widths now authorized are necessary to provide for the modulation requirements of the signal. Yet there were still opinions, particularly among the FCC staff people, that the Land Mobile Radio users had not done all that they could to resolve the problem. The use of the 450-470Mc band for fixed point to point work was mentioned. Your editor took a good look at this one and found that in the Los Angeles metropolitan area elimination of fixed use wouldn't add a single channel to either the Public Safety or Business Radio Services. Why tell users in Arizona, Nebraska, North Dakota or South Carolina, or even the desert areas of California, that they can't use this band for fixed work? There isn't any frequency shortage in these places; it's in the large metropolitan areas that the problems exist.

But, with the arrival of 1963, the Public Safety groups went to work in an effort to squeeze still more use out of the already overloaded Land Mobile portion of the spectrum. The comments had been filed in Docket 14503. A decision would make available a few more channels, but in the areas of serious problems, these wouldn't last long. Too, there were other problems. The Local Government Radio Service, which operates on split channels created between some of the primary Police and Fire channels, was in need of a method of providing for frequency advisement under Section 10.8. This was further complicated by the fact that other services such as Highway Maintenance and Forestry-Conservation could have an interest in these channels for systems covering several functions. For example, a State Department of Public Works might be responsible for Highway Maintenance, State Buildings and Grounds including Colleges and also Flood Control Measures. To cover all of these functions with one radio system, a Local Government channel would be required; or they might use a Highway Maintenance channel for their responsibilities in that field and still desire a Local Government channel for functions which could not be properly placed on a Highway Maintenance frequency.

To provide for a method of Local Government coordination, representatives of the American Association of State Highway Officials; Associated Public Safety Communication Officers; Eastern States Police Radio League; Forestry, Conservation Communications Association and the International Municipal Signal Association met on January 3, 1963, in the Offices of the FCC in Washington, D.C. A method, satisfactory to the Commission, was developed and as a result, Docket 14932 was adopted.

At the Spring 1963 meeting of PSCC held in Chicago, the final

plans and forms for Local Government coordination were prepared and adopted. Another step had been taken to provide for better and fuller use of the portion of the radio spectrum assigned to Public Safety.

About the same time rumors started appearing concerning a proposed organization of all Land Mobile users. On June 1, 1963, Robert M. Johnson, Manager, Government Sales and Service, General Electric Communications Products Department presented a paper at a meeting of the Alabama Civil Defense Association in Mobile, Alabama. In this paper Mr. Johnson explained, as briefly as possible, the reasons for our difficulties. First, the state of the art and the laws of physics place mobile radio in the 25-890Mc portion of the radio spectrum. Of this space 23% is used by Federal Government plus 12% which is shared between Federal and non-federal use. This leaves about 562Mc of space for all non-federal users. 492Mc of this, or 88%, is allocated to the Broadcast Services. Of the remaining 70Mc of space, less than 44Mc are allocated to the Land Mobile Radio Services.

Mr. Johnson stated: "It is into this very limited space that we, as an industry, have managed to pack 1,800,000 transmitters..... "Gentlemen, to put it as succinctly as I possibly can, the future of land mobile radio in this country is completely — I repeat, completely — dependent upon some sane solution to the allocation of radio frequency space for TV transmission.

"Now some of the regulators in Washington would lead us to believe that the problem has been solved. The solution is status quo —88% of the portion of the spectrum that we can use for land mobile communication continues to be allocated for all-channel television reception. In an unbelievably naive assumption that telecasting must increase manyfold in the United States and an almost calculated unconcern for frequency requirements for other forms of communications, the issues were debated in Washington for years. Yet, I challenge anybody to uncover one serious utterance during these proceedings that suggested that a booming industry of two-way radio communicators throughout this country was staggering under an unlivable condition of frequency congestion.

"FCC staff officials have to turn a deaf ear to state Civil Defense organizations on many requirements because they do not have the frequencies to supply them their communications requirements. Los Angeles has industrial communications users piled up to fifty deep on a single frequency. Communications engineers in Chicago throw up their hands in surrender when a requirement for additional transportation frequencies is made. I know of several important federal government systems that are held up because of frequency shortage.

"All of this is the case, even though this industry has split channels, split them again, employed tone squelch techniques to minimize co-channel interference, created frequency coordinating committees, explored new techniques of modulation, and, oh yes, run up a bill of tens of millions of dollars in the process.

"Back in 1958, this whole industry presented what was then an urgent requirement for additional spectrum to the FCC in Docket 11997 proceedings. We proved to the FCC that an additional 43Mc of space would be required to accommodate the orderly development of mobile radio in the United States. This whole affair was nothing more than a mental exercise since the wash-out of the proceeding is even now being prepared at the Commission. Needless to say, we have been given no relief.... We can certainly investigate computer techniques for frequency assignment but these improvements are relatively insignificant when compared to the spectrum requirements that confront us.

"To meet the immediate needs of two-way mobile communications even in light of these improvements set up a requirement for an additional 43 Mc of space or approximately twice the band width that we now enjoy. This is failing to consider the requirements of Federal Government users for both defense and non-defense needs, which any Government communicator will assure you are considerable and growing at a rapid rate.

"Obtaining this space is a herculean task that lies before us. The only apparent possibility lies in the TV allocations. It requires a selling job on the Congress and the FCC that is tantamount to reversing an already adopted national policy. It means convincing our Government that the public interest of the nation requires only 90% instead of 100% of 482Mc of non-shared clear-channel television space. It also means a convincing demonstration to 180 million Americans that the luxury of unlimited television must and should be compromised slightly to give this nation the vital communications links that are required to serve our defense, public safety, public administration, as well as our transportation and industrial growth."

Mr. Johnson concluded: "I propose that all land mobile radio users throw their efforts behind a single effort dedicated to the single purpose of obtaining the frequencies required to serve the communications needs of this country."

Your editor read and waited, but not for long. Two weeks later at a meeting in Washington, D.C. of the National Association of Manufacturers Committee on Manufacturers' Radio Use, things began to happen. Five Commissioners of the FCC including Chairman Henry were present at some of the sessions. As a result, plans were formulated for a visit by all seven Commissioners to the Los Angeles area for a first hand look at the number one problem area of the country, spectrum-wise and announcement was made that such a visit would take place.

In August the Associated Public-Safety Communication Officers

held its National Conference. The highlight of the conference was the Federal Agency Forum, moderated by **TV & Communications'** Associate Editor Bob Tall, and featuring Commissioner Robert E. Lee. To lead off, Commissioner Lee was asked to explain why, in spite of extensive testimony presented in Docket 11997, APCO had apparently failed to convince the Commission of our needs for spectrum space for Police Radio or even of its essential role to our internal security. Commissioner Lee replied that not only Police but all other users of Land Mobile Radio had not done well because they are not as active a political force as they might be and the Commission is sensitive to political pressures. To illustrate the point, Commissioner Lee mentioned education. Because of the present political climate, education does well in Washington and any time a request is made of the Commission for spectrum space for education, it is granted.

Mr. Johnson was present too, and again stated that we must go to Congress and even the public with the message that there is one big chunk of spectrum which must be taken from TV and assigned to the Land Mobile Services if we are to survive.

In September, the visit of the seven FCC Commissioners to Los Angeles took place. It was my privilege to participate in the activities. Almost all Land Mobile Radio Services were represented and all said the same thing— we must have more spectrum space. The Commissioners saw the situation first hand— but that story has been told already. They returned to Washington and finalized Docket 14503, which added a few more channels for the various users in the Land Mobile Services.

In October the representatives to the Public Safety Communications Council met in Chicago to discuss an agenda of 18 items. Many of them dealt with the question of meeting the increasing requirements of Public Safety for more radio spectrum space.

In November all of the Public Safety Radio groups filed in support of Docket 15161 which would give frequency advisory committees permission to limit transmitter power in their letters of recommendation. Some of the groups suggested that the Commission proposal did not go far enough and that effective radiated power (ERP) should be substituted since users could effectively increase their power and potential interference by installing high-gain antennas.

In December the Vehicular Communications Group of IEEE again met. Mr. Gifford again spoke, this time proposing that the economic "value of service" approach to spectrum allocation be studied. The answers still came out the same — TV cannot justify its present allocations while Land Mobile can still show need for double what it now has.

Mr. James E. Barr, FCC Safety and Special Services Bureau

Chief, stated that the Land Mobile users, "have had to content themselves with what is tantamount to table scraps," simply because their "importance" may not be "fully recognized."

"I get the impression of a host of individual user groups, frequency coordination groups and equipment manufacturers all concerned almost exclusively with their individual problems.....

Mr. Barr also indicated that the Commission had no intention of re-allocating any space in the 25-890Mc portion of the spectrum as a result of the Statutory Inquiry (Docket 11997).

And so, as 1963 ends, we find that the same problems still exist and no relief is in sight.

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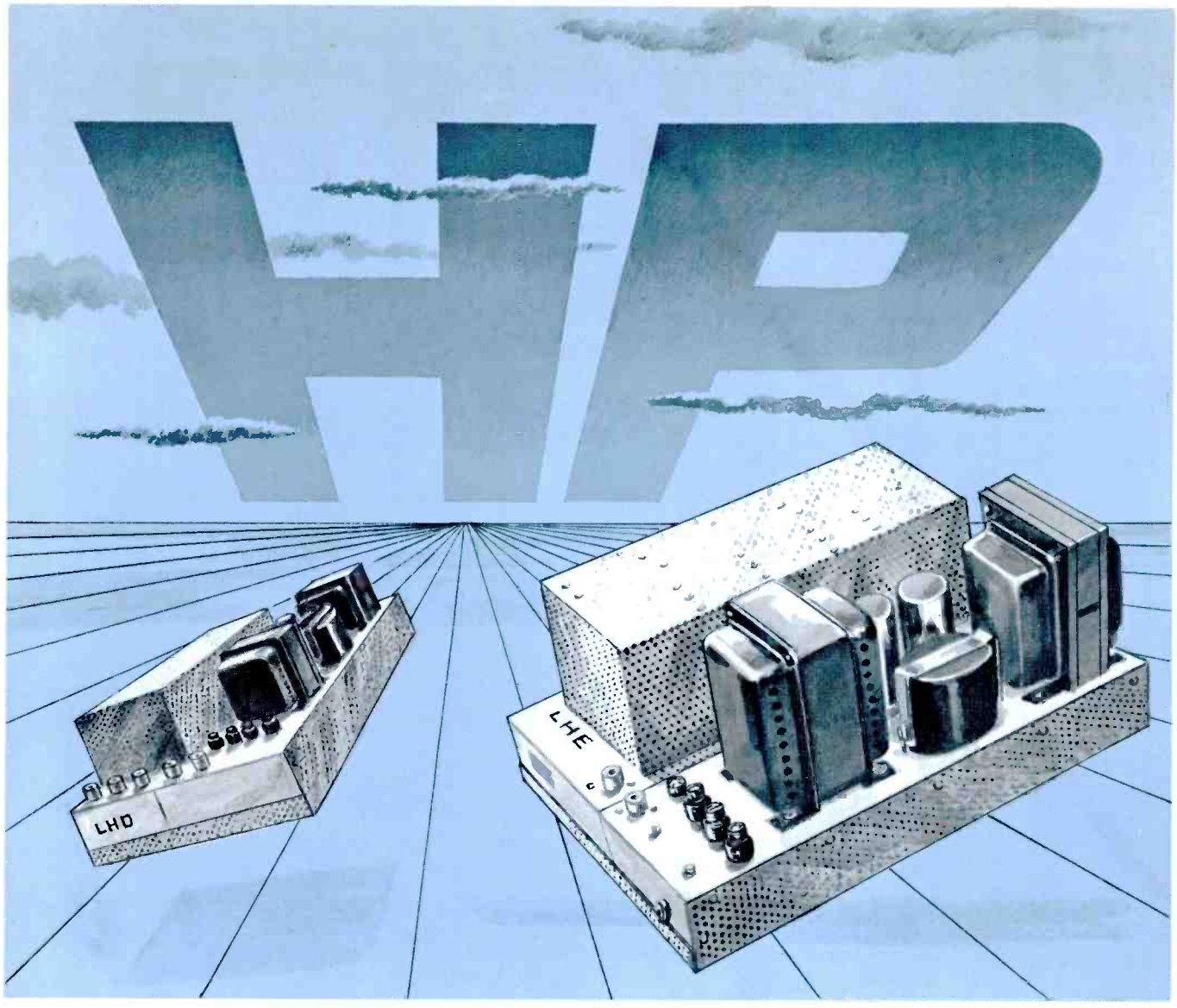

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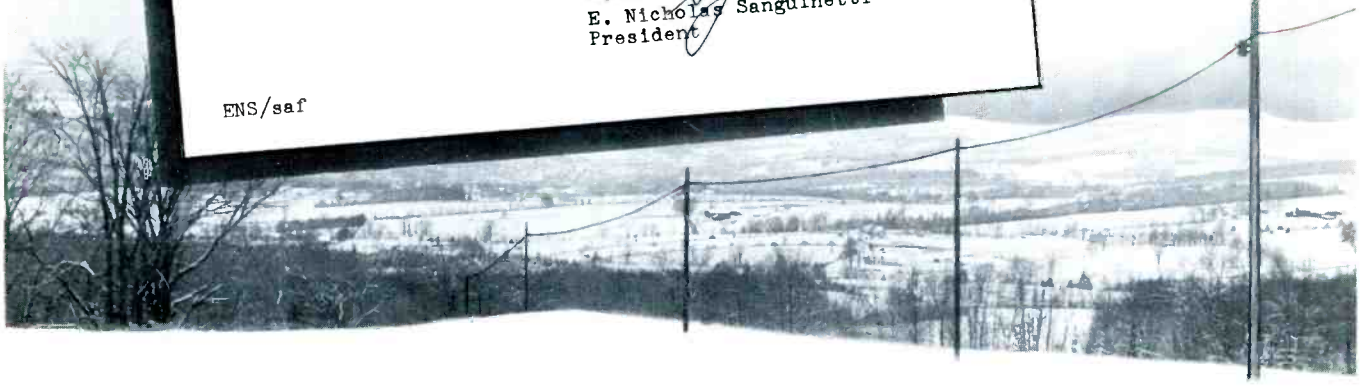

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