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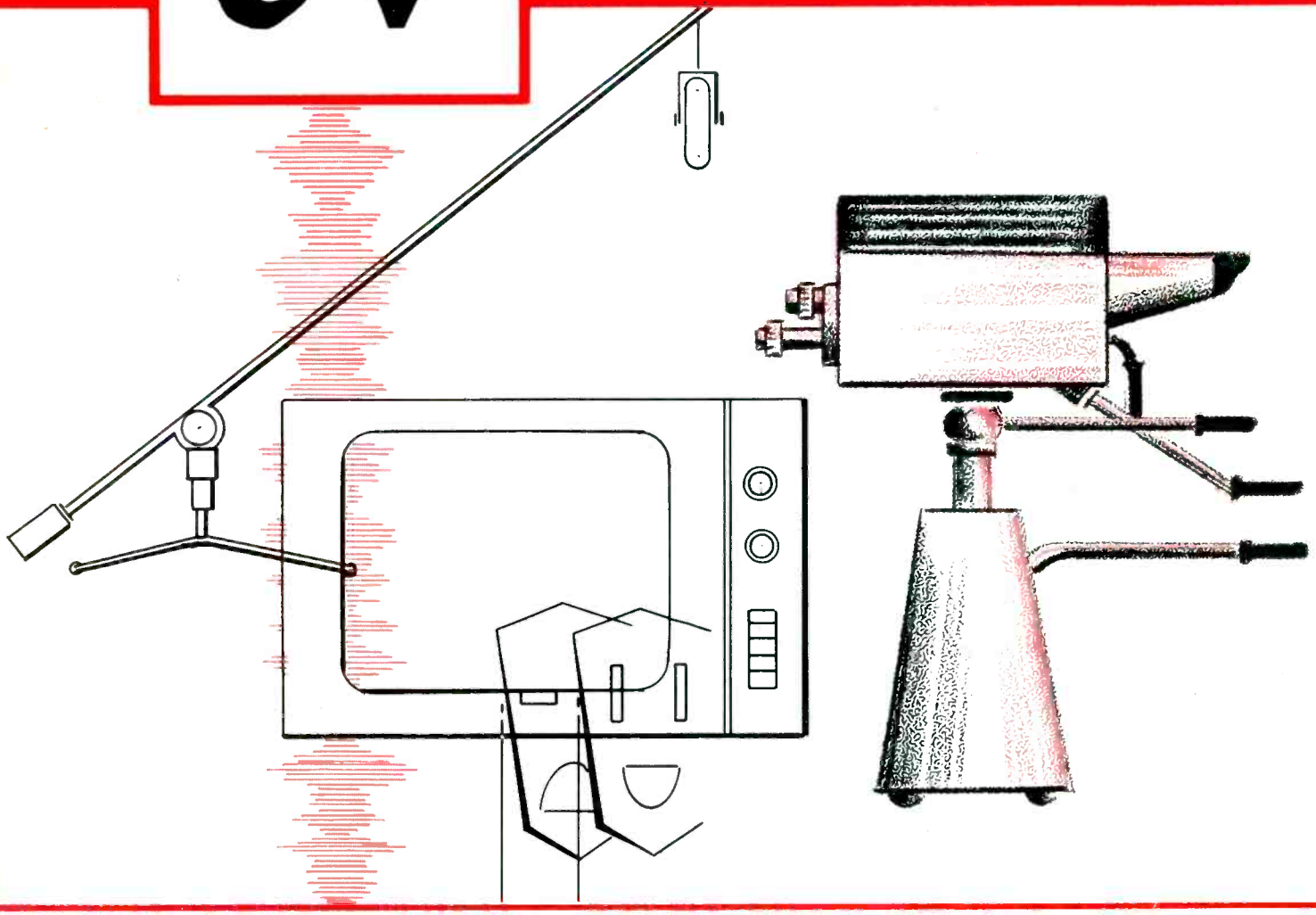

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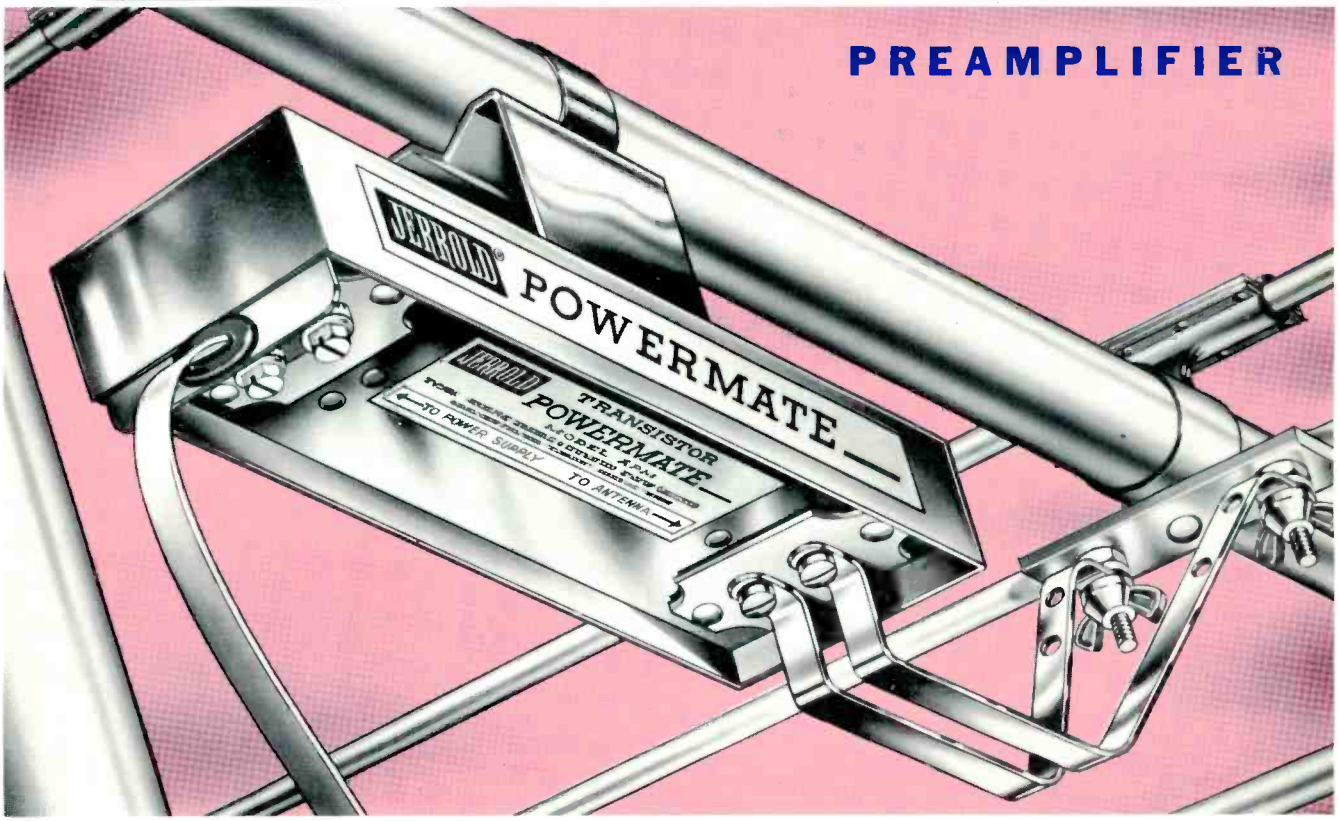


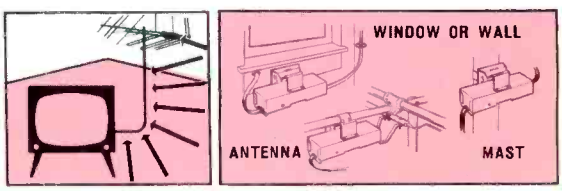
offers highest gain, lowest noise figure

Here's the preamplifier for every TV antenna in your area, whether new or up for years! The exclusive universal bracket of the new JERROLD Transistor POWERMATE permits mounting directly on the antenna boom (for greatest boost before downlead losses) or at *any* other point—along the mast, on the wall or windowsill, behind the set—anywhere your best judgment dictates.

And look at this gain: An average of 13.9db at Channel 13 and 18.25db at Channel 2—by far the highest in the business! This remarkable gain gives any antenna system the lowest *S*ystem *N*oise *F*igure obtainable—the key to better pictures.

See your distributor today, or write for special bulletin describing *S*ystem *N*oise *F*igure. Begin cashing in on your big market for the new JERROLD Transistor POWERMATE!

Model APM-101—$39.95 list complete with power supply

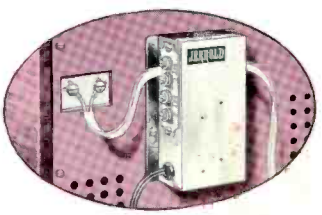


NO TUBES, NO BATTERIES, NO OSCILLATION, NO FEEDBACK

Mount it on the boom or anywhere along the downlead. Thoroughly neutralized against oscillation; output impedance balanced to prevent radiation back to antenna. Same 300-ohm lead that carries signal also carries 15 volts ac to POWERMATE. No tubes or batteries to replace.

REMOTE AC POWER SUPPLY OPERATES 1 OR 2 TV OR FM SETS

installs on or near receiver, draws less current than an electric clock. No polarity nuisance when attaching to lead, no danger of transistor damage.



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AMERICA'S LEADING MANUFACTURER OF TV-FM RECEPTION AIDS AND MASTER-ANTENNA-SYSTEM PRODUCTS

Channel 1

New Look for An Old Friend

This is the new look and format for the monthly news reporting publication of the MATV, CATV, fringe-TV ad infinitum industry — **Television Horizons.** Page size, layout and areas of news and feature coverage have received particular scrutiny and research as we redesigned **Television Horizons** into a more useful — forceful publication.

Partciular emphasis has been given to our coverage of the technical areas of CATV, MATV, fringe-TV. We found a crying need for more — solid servicing information, a dire need for more theory information on system layout, design and installation. Armed with this obvious lack of editorial coverage, TVH tackled a number of prominent manufacturers of CATV-MATV equipment asking their aid in preparing monthly **Service Notes** on particular pieces of equipment now in use in the field. Response from the manufacturers was very good, and the January issue will carry the first full load of **Service Notes,** a multiple page section devoted to minute trouble analysis, equipment alignment and repair instructions prepared for our readers by the very engineers who were responsible for the initial design of the CATV, MATV, fringe-TV equipment. **Service Notes** will tell you how to spot trouble areas in amplifier-distribution equipment, how to correct the trouble and how to proceed with step-by-step alignment procedures insuring peak operating performance for each piece of equipment in your system. **Service Notes** pages will be perforated to be removed from the text of **Television Horizons** and placed in a three-ring binder.

Our pre-change survey also indicated a great interest in system management information, including such fine pieces as appear in this issue on the subject of CATV system evaluation.

ETV in CATV systems, in school MATV installations and on a national level will receive almost monthly interest from our editorial staff.

Motel-hotel installations (MATV) are scheduled to be covered in "installation-servicing" detail. With the motel

CATV
MATV
Fringe TV
ETV
UHF-TV
Associated Industries' News

population growing at approximately twenty-five percent of the previous year's total each succeeding year, someone is making a large number of MATV installations in this region!

All forms of weak signal reception, including UHF and VHF, will continue to receive prime interest space, of course.

In short, the new-look for **Television Horizons** goes much deeper than merely consisting of a larger page size. The editorial approach to this dynamic young industry has been re-adjusted to reflect the growth patterns within our industry, and to keep you — the reader — constantly aware of the changes and advances around you.

We hope you like our efforts!

Special Directory Issue

Among the many things we discovered while researching the new look for TVH was the appalling lack of buyer's reference material in the MATV, CATV, fringe-TV field. So we set about to correct this problem. During the past sixty days we have been collecting data on every piece of CATV, MATV, fringe-TV, closed circuit-TV, and ETV equipment; on every service available in these fields; on every unit available in these fields. The December issue of **Television Horizons** will be our first "Annual Directory Issue." Within its pages (more than sixty-four in all) you will find a complete cross-referenced listing on each and every unit and service you as a buyer of units and services will need in the year ahead (1962). Equipment and services will be grouped in categories in such a way that you will be able to quickly compare characteristics, specifications and prices in any given category.

Some will call the "Directory Issue" a buyer's guide. Others will use it as a "Specifications Guide." But no matter how you use it, **you will use it!** Frequently. Throughout all of 1962.

The price for the Directory alone is $1.00. As part of the subscription to **Television Horizons,** it is considerably less. Use the handy order card between pages 2 and 3 to order extra copies for your office **today.** Only 10,000 copies will be printed, so place your order early.

Miratel Purchases MARS

Miratel Electronics, Minneapolis, Minnesota has announced the purchase of Mid America Relay Systems, Inc., Rapid City, South Dakota. MARS will operate as a wholly owned subsidiary of the nation's oldest — most experienced relay-television engineering firm, Miratel. MARS will continue to be based in South Dakota under the guidance of Keith Anderson, President.

MARS is currently marketing the MAC-17 VHF translator. Miratel will add a wealth of field servicing experience, a trained field service crew and engineering know-how to the MARS operations in the upper-midwest. Under the new operation, Miratel-MARS will be establishing a nationwide distributor-representative system to market the MARS VHF translators in areas outside the Dakotas, Montana, Wyoming, Colorado, Idaho and Oregon, where the majority of MARS activities have been concentrated to date.

Miratel, Inc. is also a prime manufacturer of closed circuit monitors, video equipment and Citizens Band Radio equipment.

NOVEMBER 1961
VOLUME 2 • NUMBER 11

TELEVISION HORIZONS

PUBLISHED MONTHLY BY HORIZONS PUBLICATIONS
POST OFFICE BOX 3207 • MODESTO, CALIFORNIA

EDITORIAL

There is strong evidence in the MATV-CATV fields the industry is not getting any younger. As a matter of observation, the industry is not only not getting younger, it is getting older.

If maturity comes with age, than this is good. If maturity is the only thing that comes with age, this is not so good.

Case to point: The MATV-CATV industry is heading for trouble . . . bad trouble . . . and it may be here a lot sooner than many of us believe. The trouble we are concerned with is manpower-trained, skilled manpower capable of installing the equipment of the industry, and keeping it running once it is installed. In a question,"who is training skilled help to meet the demands of an industry that is becoming more highly specialized by the day?" When the first generation of MATV-CATV installers-operators has made its mark and sets about retiring, where will we find talented-younger skilled persons to fill the shoes of the pioneers?

Perhaps industry progress will fill a portion of this gap as transistorized solid-state equipment eventually replaces tube type equipment. Such innovations may replace component substitution and replacement, but will transistored equipment reduce the need for equipment tuning, sweeping bandpass units and peaking front ends? Only time will tell.

In the mean time the industry is in sorry need of a clearing house for skilled-talented personnel. Today we still have no real answer to the problem "where do I find a skilled lineman," or "where do I find an engineer to oversee my microwave installation?"

If your firm is looking for help, or if you are an individual ready to sell your services to the industry, TV Horizons will print a five line display detailing your wants and/or needs free of charge. Box numbers in care of the magazine are available if you wish to keep your identity strictly confidential. Again, no charge. Write for full information, department J J at Post Office Box 3207, Modesto, California.

RBC

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ADVERTISING: Television Horizons accepts commercial display advertising from bona fide manufacturers of electronics equipment and apparatus dealing with the CATV, MATV, fringe-TV, ETV and rebroadcast TV industries. Advertising rate card and circulation data upon request.

CIRCULATION: Television Horizons is circulated through the mails and in person on the 5th of each month to an average of 7,500 readers in the CATV, MATV, TV servicing, fringe-TV, ETV and TV broadcast (and rebroadcast) industries. Circulation is both paid and controlled. Detailed circulation breakdown, by reader occupation, is available upon request.

SUBSCRIPTION: Subscription rates in the United States and Canada $5.00 per year. Subscription includes the Annual Directory edition, issued every December. Single magazine copies $.50 each. Single Directory Editions $1.00 each. Subscription remittances should be made by bank money order or check. Two year subscription rate U.S.A. and Canada—$8.00. Subscriptions outside the U.S.A., Canada $6.00 per year.

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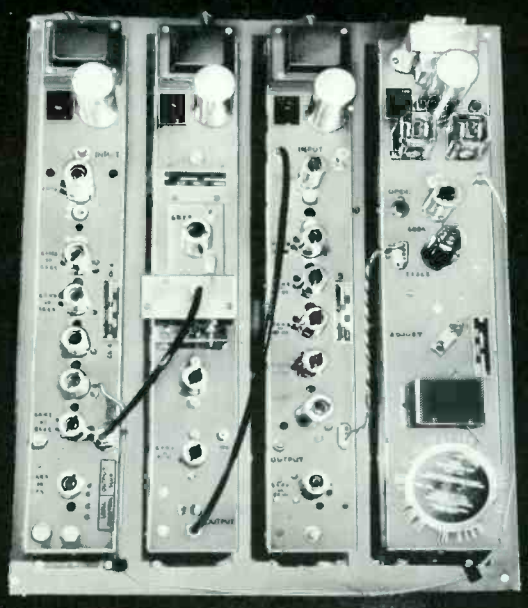
(Suggested User price)

...It is

FCC Type Accepted

Rugged and Reliable

Available for Prompt Delivery



The Benco T-6 offers these advantages:

1. Meets all FCC specifications.
2. Provides constant output even in weak signal areas—preamp AGC activated by signals as low as 50 microvolts.
3. Automatic shutoff and identification.
4. Remote shutoff for any location up to 5 miles from the translator. (with RC-1).
5. Covers from 8 to 30 miles or more.
6. Prompt delivery to those who must have a low cost unit immediately to meet their 'on-the-air' time-schedule.

TECHNICAL SPECIFICATIONS

Primary Power Source	117 v ± 10% 60 c/s
Power Consumption	120 W
Temperature Ambient	—30°C to + 50°C
Overall Noise Figure	
Low Band	4 db ± 1 db
High Band	6 db ± 1 db
Recommended Input	50—4000 microvolts
Max. Permissible Power	1 Watt (Peak Power)
Frequency Stability	.02%
Gain (maximum)	105 db
Band Width	6 Mc (3 db points)
Dimensions (metal base)	18"x22½"
Weight	27 lbs.

BENCO VHF AND UHF TRANSLATORS FOR EVERY TYPE OF INSTALLATION

MODEL T-1 VHF TRANSLATOR, FCC type-accepted. 1 watt output for U. S. use • ideal for future expansion • meets all FCC specifications • noise-proof automatic shutoff • regulated power supply for stable operation, even at the end of poor quality power lines • underrated output section for continuous service; weather-proof housing; quick easy coding of identification unit • built-in direct reading power meter.

MODEL T-14 VHF-TO-UHF TRANSLATOR. FCC type-accepted. 2.5 watts output. For U. S. use. Includes identification units with automatic "on/off," power indicator and voltage regulator. VHF input, channels 7-13.

MODEL T-13 VHF-TO-UHF. Same as T-14 except: VHF input, channels 2-6.

If you're planning a translator installation, contact Blonder-Tongue. Free layout service and field engineering assistance are available at nominal cost.

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home TV accessories • UHF converters • master TV systems • Industrial TV systems

Answering the Question

ASKED BY THE CATV SYSTEM OWNER

You may or may not be a present owner of a CATV (Community Antenna Television) system, but the chances are very good that if your interests include distribution television you may someday find yourself considering the purchase or installation of a "system." In recent years CATV investment has proven to be one of the fastest means of making the investment dollar grow known to the electronics industry. Present CATV systems owners include multi-hotel chain operators, TV broadcasters, capital investment groups, manufacturers of distribution equipment, and local businessmen investing in the future of their community.

With the industry now into its second decade, it is frequently suggested to the present owner that selling his system and re-investing in CATV is the only real way of keeping his investment growing. Selling for capital gain purposes immediately brings up the problem of determining what the existing system is worth. How much will it bring on the CATV marketplace? In the two pages to follow, an industry expert reveals his viewpoint on the highly controversial and timely question, "What Is My CATV System Worth?"

SPEAKING FOR DANIELS & ASSOCIATES
Bill Daniels
2430 E. 3rd Avenue
Denver 6, Colorado

Active trading has been taking place in the CATV field for the last three years.

Inasmuch as all of us sooner or later will be selling our properties, it was felt that this message should be passed on to all CATV operators, so they may do all that is possible to prepare their properties for sale. Whether it be in the next six months, the next two years, or the next ten years, the preparation necessary should put dollars in the pocket of each of you beginning now.

It should be remembered that the comments passed on to you here are the result of three years in dealing exclusively as a broker for the sale and purchase of CATV systems, during which time the Daniels' firm has handled more than $12,000,000.00 in CATV system sales.

There are no concrete formulas with which any owner of a CATV property can value his system. Each system has its own specific problems, which would throw any type of a formula completely out of kilter. I would not even think of attempting to tell the CATV operators present how to set a value on their system. There are too many variables.

It has been a little disturbing for me, during the last three years that we have been dealing exclusively in handling CATV properties, to see various formulas tossed around as though they were reliable. They are not. Some two and one-half years ago, a friend of mine in Pennsylvania put a value on his system of thirty times the monthly gross receipts and, for some strange reason, this formula caught on in the area, and was used by owners as determining the value of their property.

About six months later, someone came up with the mysterious figure of $150.00 per customer.

Shortly following that, another unknown party figured their system was worth five times the annual cash flow, after establishing a new depreciation schedule for a new buyer.

Recently, one prominent buyer has established a formula two and one-half times the annual gross income.

The reasons that no formula should apply are many, and the best way to demonstrate this is to give you some examples. I am well acquainted with a system that has a monthly service charge of $9.90. Certainly when buying a system on a per customer basis, this system is worth considerably more than a system obtaining a service charge of $3.75 per month, providing the operating expenses of the two systems are somewhat identical.

We recently completed an appraisal of a property that had a beautiful cash flow picture, was very stable in the community, enjoyed good public relations, got a pretty fair monthly service charge — everything looked great. However, after a personal inspection by our personnel, we discovered that an excess of $250,000.00 had to be spent on the property during next five years to replace worn out cable, add new service, and improve the picture. Once again, you must throw formulas out the door.

We are familiar with a third example wherein a large system gets a good monthly service charge of $7.50. In this particular case, the same system pays the Telephone Company approximately $10,000.00 per month for microwave service. With a large overhead item such as this, any formula that you would apply would not be realistic.

There is only one formula to my knowledge, if you want to call it a formula, that will hold up. Your system is worth what somebody will pay you for it, and it behooves each operator to be as good a trader as possible when negotiations are entered into, either with a broker or with a direct buyer of properties. The valuation of properties has much to do with the **demand** for systems. Presently, we are enjoying a bull market, much the same as the stock market activity for the last fifteen years. This means that there are actually more active buyers of properties than there are sellers. This should be obvious, because of the large number of direct mail pieces that you receive, contacts by interested purchasers, and occasionally competition by two or more prospective buyers attempting to buy your property.

What are the factors, then, that determine my system's value? I will list those, not necessarily in the order of importance, and consider each of the items as important as any other.

1. Of prime importance, of course, are the number of customers that are served.
2. What is the size of the community?
3. What is the competition, and what is the anticipated competition, in the area in which the property is located?
4. If microwave service is a part of the CATV system, this, in a sense, is built-in protection because of the long distance necessary to transport the television signals to the community, and obviously for protection against boosters or other services from distant stations.
5. What is the remaining growth in the CATV system? Additional potential is attractive to buyers looking at your property. While it will not always add value to the system, it certainly will help make a faster and cleaner sale. Any buyer feels that the remaining growth will be his real profit and, therefore, is not willing to pay you for

What is MY SYSTEM'S NET WORTH ?

the potential, but wants to develop the potential himself for a further capital gain to his account.

6. The investment in your plant is important, in that a new buyer must always set up a new schedule of depreciation, and the more hard dollars that you have invested in the property, the easier it will be for the new buyer to set up a new depreciation schedule, and we all know that the higher the value for depreciation purposes, the better off the new buyer will be.

7. The condition of the records of the prospective seller is most important. A prospective buyer must be able to get information, and the only way this can be done is by good solid bookkeeping practices. He wants to know what the history is on connection of subscribers on a month by month basis, how you control the inventory, whether or not you have had annual audits. All of these things he wants to see. In addition, any letters that you have, complimenting you on the service or complaining about the service, should be readily available for a new buyer to observe.

8. The condition of your city permit or franchise is most important. How restrictive is your franchise? Do you have permission to transfer the franchise to a new owner? What is the term of the franchise? Are the rates controlled?

These are questions often asked by new buyers, and the better condition that your permits are in, the easier it will make a sale.

9. The same applies to the condition of your pole line contracts. How restrictive are they, and may they be transferred without the permission of the company owning the poles?

10. What is the general condition of the plant? Buyers today are becoming more and more particular about how much cable has to be replaced, how many channels you are capable of carrying, etc. The capacity for putting on additional channels without a large capital outlay is important.

Since there is a definite trend today to convert most systems to all-band systems, you should keep in mind that by going ahead with your conversion to satisfy your present customers, you also raise the value of your property at the time of a sale.

11. The condition of your office and normal housekeeping practices are important. Any prospective buyer can take a good look at your office and determine if you are a neat and clean operator. After all, the real front of this business is the office where customers subscribe and you collect their money.

12. If you have any law suits pending against your company, or tax liens, this, by nature, scare a buyer off, so stay out of trouble, and pay your taxes.

13. Quite often the geographic location of your property is important to a prospective buyer. Some of you have CATV properties in locations with exceptionally nice living conditions. We are finding that these systems automatically have an additional bonus purchase price, because of the general living conditions.

14. If your system is near another system, there is quite often an advantage in a buyer buying two systems close together and the buyer then, by combining overhead, can afford to pay you and your neighbor CATV operator down the road more money for your two systems as a package. Do not discount this possibility. In the end it benefits both sellers by a larger purchase price for their property than if one is selling his property singularly.

15. The economy of the area in which you live would help you sell the property for a higher purchase price. Single industry towns are sometimes a little dangerous, and a diversified economy will help the sale.

16. The public relations that you enjoy with the city, your customers, the schools and others, are important. A good buyer can come into the community, and in very short order he can tell whether or not you are a welcome part of the town in which you live, and whether or not there are any serious forces working against you.

17. Lastly, the terms on which you will sell your property will help determine the purchase price. A buyer expects a discount for a cash purchase and, on the other hand, if you will agree to sell on a long term payout basis, with a fair interest rate on the unpaid balance, you can usually obtain a higher purchase price.

Last, but not least, consult with your accountant. We have seen many sellers think that their property was ready to sell, and be close to the final consummation of a deal, when they have been advised suddenly by their accountant of the reasons they should not sell, or other ways that they should have sold their property. At this stage, it often is too late to correct the error. We, therefore, always recommend that a prospective seller sit with his accountant prior to putting the property on the market, so that he can advise him of the other steps that he should take in preparing the property for sale.

I give you this information to try to get across one point to all of you. Ninety percent of the work in selling any CATV property is the assembling of information and getting the property ready to sell. The actual negotiation between you and a prospective buyer or a broker and his many prospective buyers is simple, compared to the preparatory period.

Since the subject of systems evaluation covers **much more** than the selling of a CATV property, I should touch on appraisal service. There are many owners who wish to determine the value of their property, but for a number of reasons other than a desire to sell. Most important is their desire to borrow money from lending institutions. Sometimes the stockholders are entitled to know the value of their property. The appraisal service is often required by courts in determining the value of the property for estate purposes. Here, an independent appraisal by a qualified appraisal firm is the answer.

To sum up, we believe we are as close to the industry as any single firm in the States. We see nothing but progress in the industry. We concede that we have our problems, but if this young, dynamic industry continues to move as we predict it will for the next ten years as it has in the past, none of us will be sorry that we took the step we did when we first began operating a CATV property.

Can Anyone Top This?

ANTENNAVISION, INC., Phoenix, Arizona based multiple CATV system operating company, recently completed installation of forty miles of underground Haberline Jacketed Foamflex aluminum sheathed cable. The amazing part of the installation was a 34,714 foot run (more than 6.5 miles) in a single 9 1/2 hour period! The cable went underground between El Centro and Calexio, California, in the desert valley east of Los Angles and southeast of Palm Springs.

Using a technique perfected by AMECO engineers, the special cable feed plow with a cable reel trailer following, progressed at a steady pace playing out cable into the ditch. The cable trailer has a capacity of six thousand (6,000) feet of aluminum cable or 4,000 feet of RG/11U feeder cable. A jeep equipped with a grader blade follows the rig filling in the ditch and smoothing out the dirt. At each splice in the cable a four foot riser is set in the ground with the cable running inside. This is connected at the top to an AMECO SP-1 splice box. An iron cap is firmly bolted to the top of the pipe making the installation weatherproof and at the same time discouraging vandalism.

The record-making installation is part of a huge complex installation currently being installed by ANTENNAVISION in the California desert. The systems will serve the valley towns of El Centro, Imperial, Brawley, Holtville and Calexio. Four Los Angeles TV channels and the ANTENNAVISION owned and operated Yuma, Arizona station (KIVA-TV) are distributed on the systems. The four Los Angeles channels are microwaved to El Centro and carried via the underground cable to systems in the surrounding communities. Forty miles of town-connecting cable is being used in all. When completed the systems will offer service to seventy-one thousand (71,000) residents in the California Imperial Valley.

The ANTENNAVISION systems are being built to ultimately accomodate AMECO's fully transistorized all-band TV distribution equipment which will appear soon on the market. The Company plans to eventually distribute all seven Los Angeles channels as well as the Yuma channel, and one educational channel to the Imperial Valley viewers.

AMECO is the manufacturing subsidiary of ANTENNAVISION, INC, with headquarters and marketing facilities in Phoenix, Arizona.

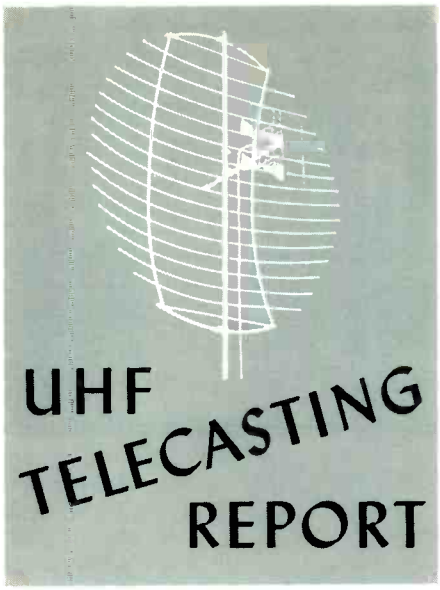
Antennavision construction crew making underground installation of Aluminum Sheathed Cable. The special cable plow precedes the cable trailer, directly behind the Caterpillar tractor, automatically filling the trench with cable. A grader follows to fill in the trench.

For nearly two years now Horizons Publications has been the lone editorial spokesman in the entire television industry for an "all UHF television economy," based upon complete usage of the Ultra High range for telecasting. With increased Commission interest on this very subject, the realization is at last coming to the surface that "perhaps for the overall good of the nation's economy an all-UHF television economy would be best." While other publications have vacillated from stand to stand, apparently hoping to catch "the winds of favor" of their readers, Television Horizons has plunged on in a reckless course of out-and out favoritism for an all-UHF economy.

It is our intention to remain on this course of editorial sailing with ever increasing steam and enthusiasm in the year ahead. Towards this end we invite engineering and topical papers from interested readers who have personal or business experience with either receiving or transmitting phases of Ultra High Frequency work. It is ouf custom to pay for such papers.

While we invite research and engineering papers from the industry, we will continue research and editorial preparation on our own to the extent that this page will be utilized as an outlet for recent engineering and business developments on the UHF scene.

R. B. Cooper, Jr.
Publisher
Horizons Publications



Deintermixture Won't Be Easy

If the past month's activities are any clue to the future, the path of the FCC's trip to deintermixture-ville may be strewn with more than the corpses of antiquated VHF television receivers.

Reviewing the situation, eight major markets are scheduled for deintermixture (i.e., removing the existing single "V's" in favor of all U). These eight major markets include Madison, Wisconsin; Rockford, Illinois; Hartford, Connecticut; Erie, Pennsylvania; Binghamton, N.Y.; Champaign, Illinois; Columbia, S.C., and Montgomery, Alabama. Four of these cities are state capitols.

Since the Commission's announcement of intent to remove the lone V stations from these areas, a general uproar of disbelief has gone up from state legislators. Congress members returned home to find the general public stirred up over the proposed move. The question of who stirred the public up has not been resolved. None the less committees are being formed in a number of these areas, labeling themselves "The Save VHF Television Society" ad infinitum.

The end result of all of this activity will undoubtedly be a long drawn-out series of Washington hearings before a House of Representatives Commerce Committee. One bill (HR 450) has already been introduced into the hopper by Representative Vernon W. Thomso (R-Wisconsin) who apparently is stirred up over the proposed loss of WISC-3 in Madison to the Ultra Highs. Thomson's bill seeks to delay deintermixture until such time as the present New York City UHF test is completed (1963).

Thomson says he feels the Commission's two million dollar UHF test in the nation's largest city is inconsistent with its recently proposed deintermixture program. He points out that the New York UHF test is for the expressed Commission purpose to prove or dis-prove the feasibility of the Ultra High range, and he adds, why should existing V's be asked to move until the Commission has analyzed the testing results and decided the fate of the ultra high range?

Representative Thomson's argument is gaining a number of followers on Congress, and has reportedly been printed and circulated in large numbers in several of the "future — all UHF" markets (eight in all).

In Illinois, both Houses of the Illinois legislature have resolved to ask the U.S. Congress to pass a law **forbidding the FCC** to delete any VHF channels in that state (WCIA-3, Champaign, WREX, Rockford are slated for UHF conversion).

Meanwhile city councils and township politicians are climbing on the "save VHF" bandwagon in and around Binghamton, New York; Hartford, Connecticut and Charleston, S.C. In Montgomery, Alabama the state legislature has unanimously passed a resolution pleading against deintermixture.

While the FCC may be getting its druthers now, the basic duty of the Commission remains unchanged. It has the power, and the sole authority, to establish allocations tables, and remove certain allocations from these tables. It acts in the overall public interest irrespective of local or state politics. It must do so because it deals in a commodity which traverses city, county and state boundaries. The Illinois legislature, by passing a resolution urging the Congress of the United States to take away the Commission's rights to change allocations in that (or any) state is in actuality urging that Congress take away the authority vested in the Commission to operate (i.e., formulate allocation tables, make assignments and tender grants).

And all of this "negative thinking" merely because one (or in this case, possibly eight) VHF broadcasters believe their licenses, granting them authority to operate on "FCC assigned carrier frequencies," are lifetime and unchangeable regardless of the progress and needs of the times.

As could be expected, not all deintermixture news is filled with **negative** thinking. For example Wilton E. Hall, licensee of channel 40, WAIM-TV, Anderson, South Carolina, has praised the FCC's proposal to delete channel 10 from Columbia, South Carolina. As a matter of further fact, Hall asked that channel 10 in Columbia be assigned to Anderson, in lieu of the present channel 40!

Communal Aerials in England

For some time your publisher has felt that CATV-MATV techniques in North America could be broadened by the knowledge of our European counterparts in the CATV-MATV industry. This has finally been borne out by the appointment of **Gordon J. King** of Brixham, Devon, England as our European CATV-MATV Correspondent. Mr. King is a well know authority on the subject of "Communal Aerials" and "Coaxial Relay" on the continent.

He has been responsible for the launching of numerous large systems in England, notably the system at Oxford with a subscriber potential of 30,000. We believe you will enjoy his papers which will begin appearing in **Television Horizons** in January under the heading **"Our Man in Europe."**

ETV

SOUTH CAROLINA EDUCATIONAL TELEVISION

Little heralded outside the education field, the South Carolina "educational television experiment" will someday be acclaimed as the forerunner in a field which is expected to "come into its own" in the decade ahead.

The South Carolina Experiment in Closed Circuit Television was begun in the fall of 1958 at the request of the General Assembly of the state. At the time the state found itself nearly at the bottom of the educational ladder. It had fewer accredited high schools and a lower literacy rate than nearly every state in the union. The emphasis was changing at a state and national level to more and better education, but South Carolina found itself with an education system that dated back to the early 1900's with no significant changes in nearly 40 years! If the state was to do something about the appaling lack of proper education, that "something" was going to have to be drastic and probably expensive.

One of the cruxes of the South Carolina problem was its pay scale. The pay scale was poor because the school system was poor. And the school system was poor-ineffective because the pay scale was low. Truly a "hen and egg" situation. None the less the brave legislators knew something had to be done, and pressure was on them throughout the state.

"Build better schools and hire better teachers" many suggested.

"That will take too long, and we can't afford to waste time" was the assembly's answer.

"Put the extra-talented teachers and instructors busy in front of a greater number of students" came the reply from the state's peoples.

"Now we are on the right track" returned the Assembly, "but how do we do it? Each teacher can only be in one school at a time!"

"Television" came the retort. "Put our state's best instructors on television, give them a statewide audience of our young people and let them all benefit from the knowledge of a few."

And so it was decided. Television would be utilized to bring classroom instruction to the schools in the state. A program of investigation was begun and the state's commercial television stations were asked to help in the study. It was soon apparent that over-the-air instruction would require an exhaustive, time consuming study period plotting the coverage of the planned transmitters, and assuring that no major areas of the state would go unreached by the service. Translators were engineered into the program of study as a means of filling in the dead spots, and then the entire program was dropped when costs began to mount and the expense of maintaining full time engineers and operations personnel at each of the stations and translators became all to apparent.

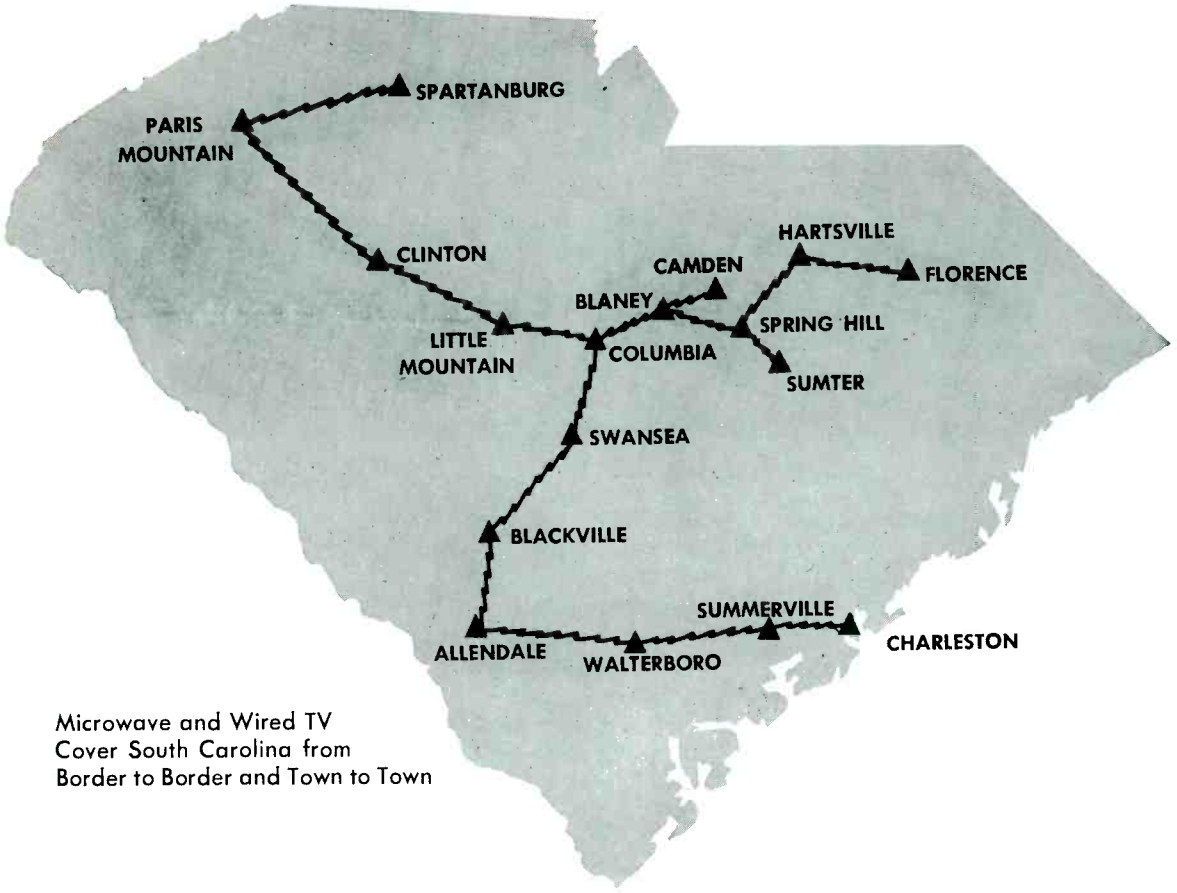
The people of the state were demanding action, and every conventional method of instituting television instruction seemed too costly, and much too time consuming to the state's legislators.

So from this background a proposal for a statewide closed circuit system evolved. The towns would be tied together via Bell Company microwave. The individual schools within the towns would be inter-connected via coaxial cable with conventional drops utilized throughout each school for the classrooms.

The actual beginning of television instruction began in September, 1958, in the Columbia, South Carolina school system. $80,000 was appropriated for the initial pilot study. Bids were submitted for the installation and maintenance of the closed circuit video equipment and Dage Television (a division of Thompson Products, Inc.) was low with a $23,409.53 estimate. A registered professional engineer, Mr. Robert Lambert, donated his services to the first year of the project. The equipment initially installed in the production studio (which was originally housed in an outmoded high school library and in the first classrooms, included two live studio cameras, one film camera with slide and motion picture projectors, a speech audio console, two channel video distribution systems, eight high quality, high resolution

SOUTH CAROLINA HAS WIRED THE STATE FOR ETV

FIND OUT WHY, AND HOW IT WORKS, HERE



Microwave and Wired TV
Cover South Carolina from
Border to Border and Town to Town

monitors for classroom use, and associated microphone and audio equipment. A Video Engineer from local WIS-TV, Mr. Earl Beeker, was placed in charge of maintenance of the equipment.

The first instruction consisted of 150 students taking Plane Geometry and another 150 taking French 1. Certified teachers were selected in each subject to work with the television instructors making up a teaching team. Television instruction was scheduled for the first thirty minutes of each classroom meeting, the remaining twenty minutes left open for classroom follow-up purposes.

Following the first session of television instruction, the state was convinced. IQ and course tests indicated no significant differences could be found between students who worked **directly** with the instructor and the students separated by miles of video distribution line.

In January of 1959 the state's committees began drafting plans for the second and succeeding years of the project. $100,000 was allocated to the project expansion during phase two, which consisted of expanding the subject matter to include French, Plane Geometry and Algebra. Forty-five receivers were purchased to bring more classrooms into the project, and facilities of the Bell System were utilized for the first time on a large scale spanning the programs to a number of new Senior and Junior high schools in the Columbia area.

This fall thirty-one schools in seventeen South Carolina cities are interconnected via microwave with the instructional center in Columbia. Programs are video taped two weeks in advance, and each program is placed on the network twice daily, during the school week. Commercial station WFBC, Greenville, video-tapes Continental Classroom from the NBC television network, which is in turn shipped to Columbia for an afternoon airing over the educational closed circuit network.

As the multitude of programs now provided by the system emanate in Columbia, they are microwaved over existing telephone company circuits. First priority in the year ahead is to interconnect the 413 secondary schools in the state. Estimated yearly cost to telecast thirty-six high school subjects over a three channel network is approximately $4,000,000 per year.

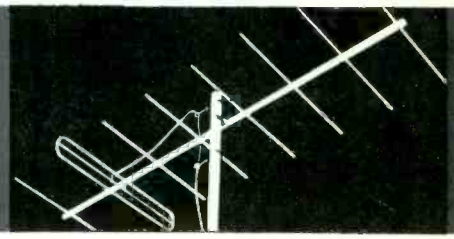
The Television Center has moved from its ex-library housing to what was once a supermarket. From the 6,500 square feet has come a dozen different offices, a stenographich department, a visual aids department, a photo lab, two 30' by 40' studios and engineering space. The two studios are served by one control room with visual access to both. The special equipment now in use includes an RCA TS-40 Video Switcher and a TG-25 special effects system. The studio equipment consists of three RCA image orthicon cameras. Other studio equipment includes an RCA vidicon film chain with dual drum slide projector, a single turn table, to ampex audio tape recorders and two RCA video tape recorders.

Approximately 7,200 student impressions per day are made via closed circuit instructional television in South Carolina. The early success of the still expanding program can best be measured by an editorial which appeared in the **Charlotte (N.C.) Observer** during March, 1961. "South Carolina, which in the past has been near the bottom in all phases of education, now has an educational television system that is ranked as one of the best two or three in the nation. North Carolina would do well to follow the example of its next door neighbor."

And the most amazing part of it all . . . the entire statewide system nucleus was set up in a matter of months through the facilities that were either already established (the Bell System microwave) or were capable of quick establishment (the installation of studio and recording equipment to feed the system). CATV and MATV businessmen would do well to follow the South Carolina example on a more local level. ETV is here to **stay,** but someone still has to **pave the way!**

RBC

PHASING AND/OR YAGI



Despite the fact that the yagi type antenna is nearly three decades old, new ways and means of making it perform are discovered almost daily. Last month's TELEVISION HORIZONS reported on a method of minimizing co-channel interference; a method worked out by engineers at TACO, one of the most skilled antenna engineering firms in the nation. Response to this information indicates "we can't say too much" about the parasitic type array, for the average TVH reader. Thus this month's yagi discussion supplied in part by engineers in the CATV System's Engineering Department at Jerrold Electronics, Philadelphia, Pennsylvania.

Bucking-Out Adjacent Channel Interference

Several years ago a broadcasting trade publication carried an item about a man in Florida who had "discovered" a unique method of separating two stations on a single channel. According to the non-technical publication's report, the man "used an attenuator on a cut-to-channel yagi antenna pointed at the non-desired station, and an amplifier on the cut-to-channel yagi pointed at the desired station. Through a simple phasing network, he cancelled out the undesirable signal."

The embarassed magazine reported back a week later that it had been in error . . . the system the man "devised" was in truth a means for separating a weak distant station from a strong adjacent channel station.

Whether the man in Florida developed such a system or not is unknown. It is a fact that such station separations can be done, and in fact are done daily in thousands of installations where the ratio of signal levels between the weak, although viewable and amplifiable distant station, and the strong local station are as much as 40 db.

Under severe conditions where a strong local channel is interfering with a desired fringe channel at the antenna site, traps and band pass filters may not succeed in eliminating the interference. This is due to the fact that local station pickup is so strong, even with the directive array, that the number of traps and/or band pass filters required ahead of the pre-amplifier would severely attenuate the desired weaker signal. Under these conditions a method of **bucking out** the undesired signal may prove useful.

As illustrated in figure one, the **buck-out** method requires a second antenna, a yagi, mounted near the desired channel array and orientated to pick up maximum **undesired** signal. The **buck-out** antenna is connected through a 72 ohm (assuming the system is in coax) attenuator, such as the Jerrold A-72, and a tap unit (refer to figure 1) into the antenna line, ahead of the pre-amplifier.

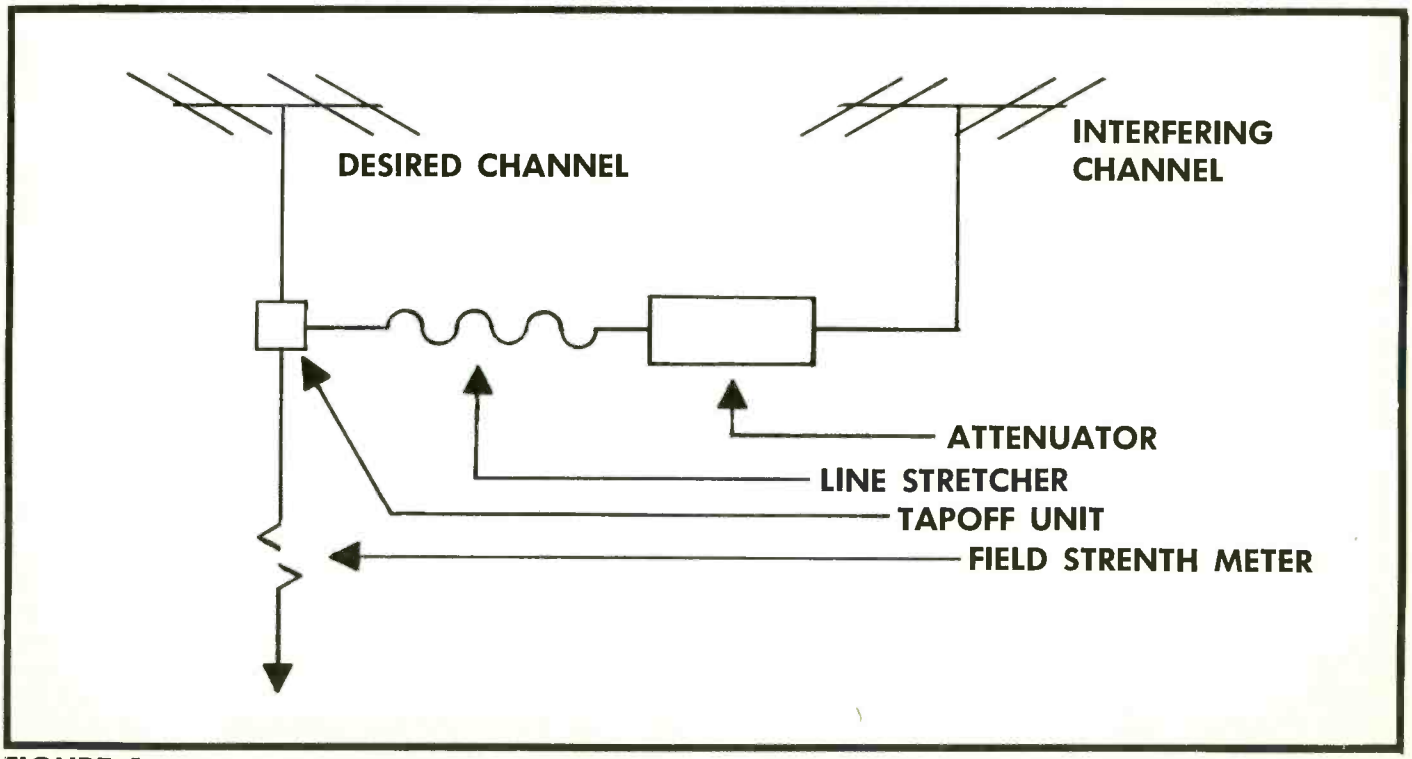


FIGURE 1

STACKING ANTENNAS

Adjustment of the **buck-out** signal requires a careful amplitude and phasing series of adjustments.

Amplitude

In the circuit shown in figure one, disconnect the preamplifier and connect a field strength meter to the antenna line. Measure the level of the undesired signal. Then disconnect the desired signal antenna from the tap unit and terminate the spigot. Connect the **buck-out** antenna to the tap unit through the attenuator. Adjust the attenuator to the previous level of undesired signal as shown on the field strength meter.

Phasing

With both antennas connected through the tap unit into the field strength meter, insert a "line stretcher" in the **buck-out** line and try to obtain a minimum undesired signal reading on the field strength meter. In the absence of a "line stretcher," the same results can be accomplished by the trial and error method; i.e., cutting the cable inch-by-inch until the right length (minimum undesired signal level) is established.

Conclusion

The **buck-out** method is applicable where the undesired adjacent carrier is very strong, some 30-40 db greater than the desired signal. The method should provide about 20 db attenuation of the undesired carrier, and with extreme care in adjustment, reduction of 30 db is possible.

Thus the **buck-out** method should be used to reduce strong interfering carriers to 10 db above 1,000 microvolts, or less, at the input of the preamplifiers. Further trapping with high-Q traps or band pass filters is then possible.

Passive Splitters for Stacking Yagis

To obtain a gain increase from antenna stacking it is required that signals from individual antennas arrive at the combining point (load) in phase. It is also required that the impedance of the combined array be matched to the load.

Under ideal conditions of a uniform field at the receiving site, 3 db gain is theoretically reasonable each time the number of driven elements is doubled. Experience with stacking large numbers of yagis (up to 16) has come from two methods:

(1) combining individual coax down-leads from each antenna by means of matching 0.25 wave 50 ohm stubs to arrive at a net impedance of 75 ohms;

(2) combining individual coax down-leads by means of antenna matching networks useful for the low band only.

Method 1 above has the shortcoming of requiring tuned stubs and splices, and does not lend itself readily to phase adjustments as is necessary in non-uniform signal fields.

Method 2 accomplishes a gain increase but has been shown to also decrease bandwidth to the point of poor picture definition.

Both methods become extremely cumbersome and more

(Turn over page — Text continued on page 14)

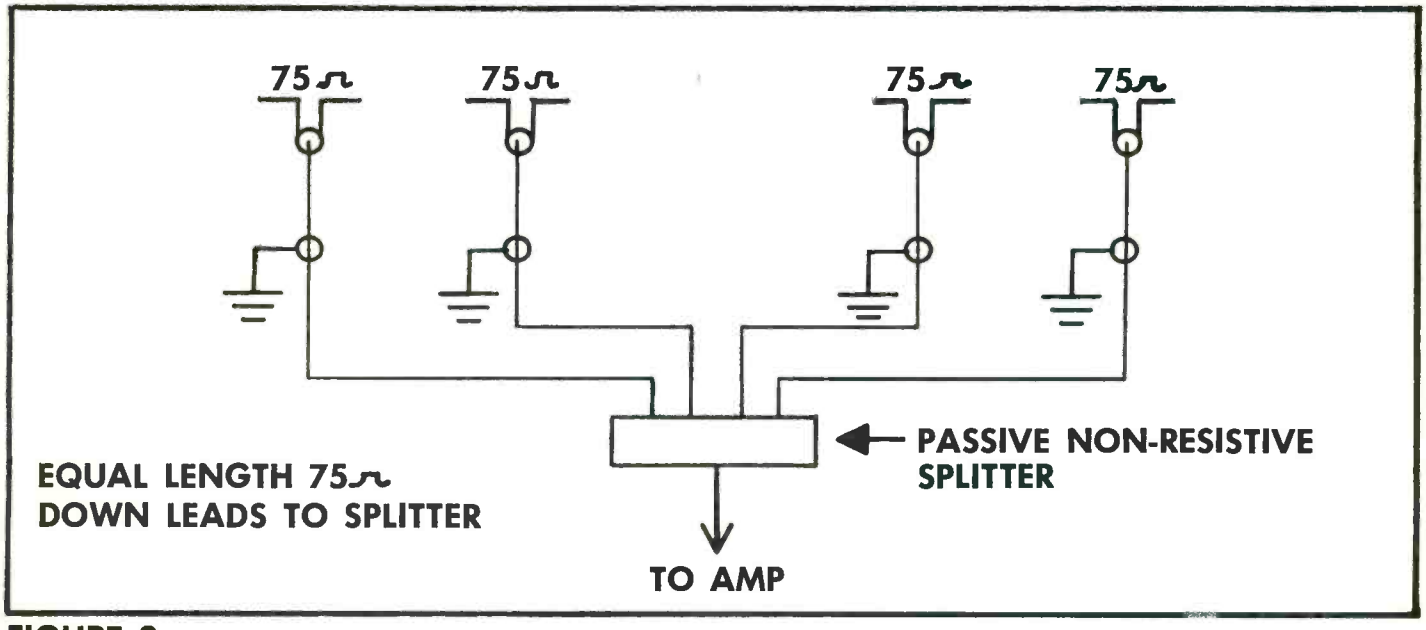
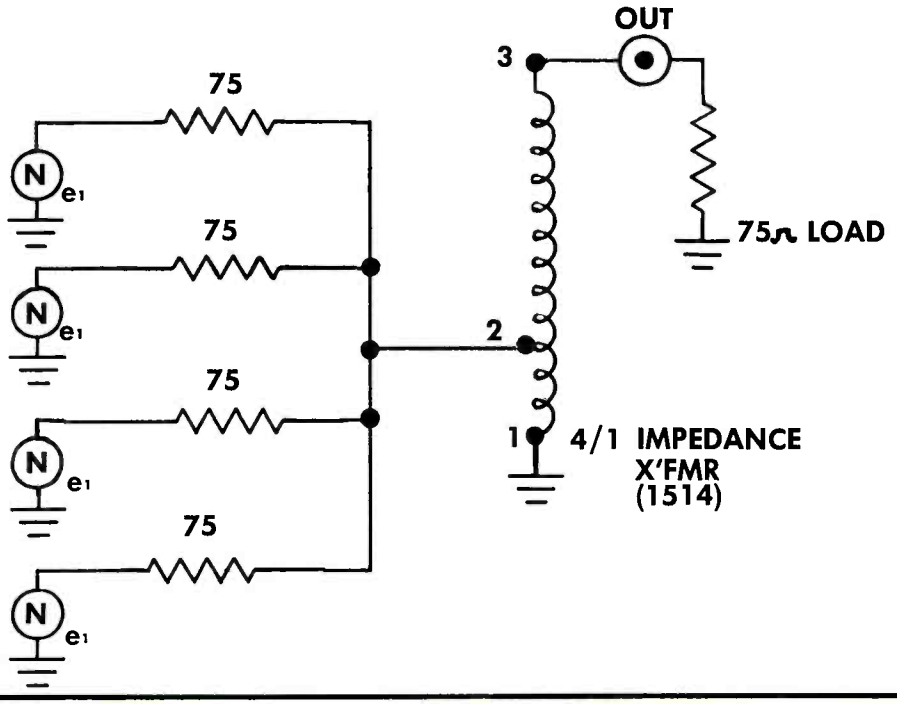


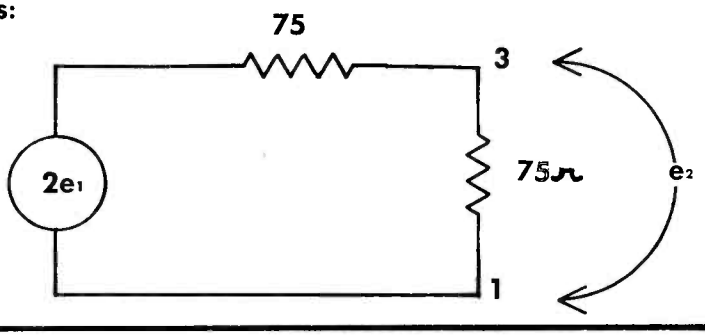
FIGURE 2

1 The array of Figure 2 may be represented schematically as shown below:

EQUIVALENT ANTENNA VOLTAGES AND IMPEDANCES

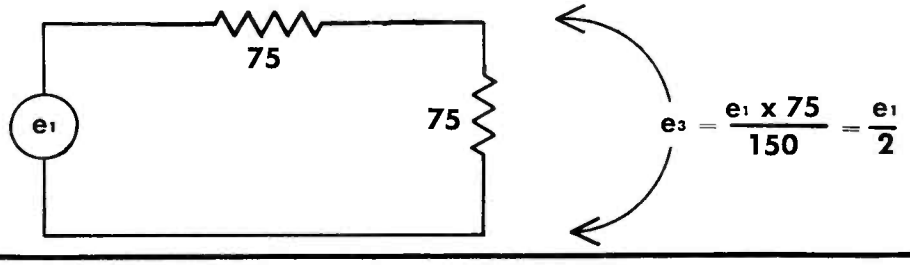


2 Using Thevenin's theorem the equivalent generator (antenna) voltage and impedance looking into terminals 1-3 appears as:



3 Therefore, in the four antenna array load voltage $e_2 = \frac{2e_1 \times 75}{150} = e_1$

4 In a similar manner, a single antenna would produce a voltage e_3 across the load.



5 Comparing (3) and (4)

$$\frac{e_2}{e_3} = \frac{e_1}{e_1/2} = 2/1 \quad \text{or}$$

a 6 db gain is achieved from the four stack array over a single antenna.

Likewise, in Figure 2, the directional coupler incorporates an impedance step-up transformer, 2/1 ratio, to match the two 72 ohm inputs to one 72 ohm output. An equivalent circuit can be drawn, as above, to demonstrate that 3 db gain is achieved when two generators are combined through this network.

(Continued on page 14)

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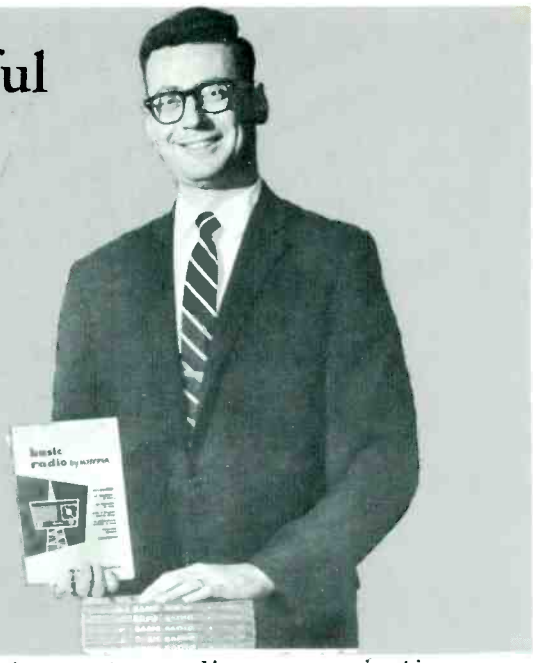

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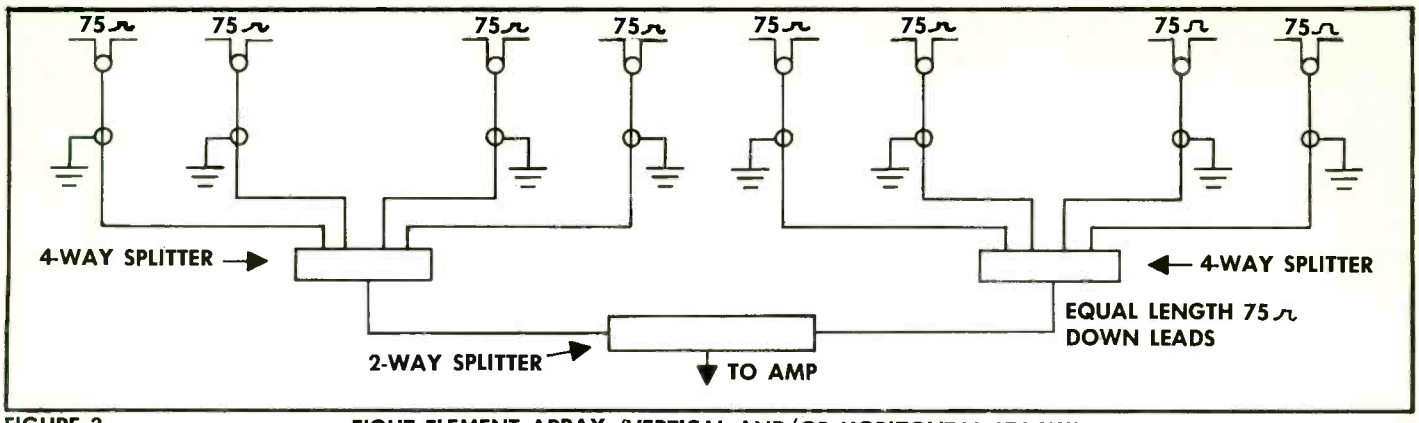


FIGURE 3 **EIGHT ELEMENT ARRAY (VERTICAL AND/OR HORIZONTAL STACKS)**

difficult to adjust with an increase in the number of yagi antennas (i.e., 4, 8, 16, etc.).

A relatively new and apparently superior method of antenna mixing uses passive non-resistive splitters (such as Jerrold Models 1562, 1514), as illustrated in figure two.

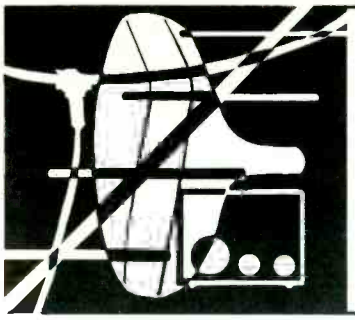
Figures two and three are self-explanatory as far as connections are concerned. In answer to the question, which is often asked, as to why a gain is realized rather than the characteristic loss of the splitter, it is necessary to consider each antenna as a generator and the splitter as simply a paralleling device which correctly transforms impedances for match. Thus four generators in parallel, each producing equal voltages in phase, provides four times the power available from a single generator (antenna). This represents a voltage gain of 6 db.

When stacking yagis, all spacings should be a optimum distance both vertically and horizontally, except in non-uniform fields where "layering" or reflection causes the field to be unequal at different measuring points within the proposed region of the array's capture area. It is suggested that readers refer to pages 4 through 8 in the October 1961 issue of TV HORIZONS for a discussion on optimum spacing within a field of equal signal levels.

Each antenna should either be equipped with a 75 ohm output, or be transferred to 75 ohms at the dipole through a four-to-one matching balun.

Equal lengths of 75 ohm coaxial low-loss cable should be run to the equipment shack and connected to splitters as illustrated in figures two and three.

A final adjustment of each individual down lead is recommended for optimum phasing. This can best be done by using one antenna of the array as a reference connected to a splitter and connecting each of the other antennas in turn through a "line stretcher" to the splitter. The "line stretcher" is then adjusted for a maximum reading on the field strength meter and the down-lead adjusted accordingly.



PRODUCT SHOW CASE

Two-Stage UHF Pre-Amp

CECO (Community Engineering Corp.), 234 East College Avenue, State College, Pennsylvania has announced a pair of new extremely low noise figure single channel UHF preamplifiers for channels 14 through 83. General Electric ceramic or planar (lighthouse) tube types 7077 and GL-6299 are used exclusively in the units, operating with two cavities in cascade. The noise figures are as follows: 6 (plus or minus 1 db.) for channels 14-40 using the 7077 tubes; 5 (plus or minus 1 db) for channels 14-40 using the GL-6299 tubes; 6.5 (plus or minus 1 db.) for channels 41-60 using the GL-6299 tubes and 8 (plus or minus 1 db.) for channels 61-83 using the GL-6299 tubes.

All models have grounded grid, high-Q resonant cavity plate circuits. Minimum unit gain is 20 db. and a frequency response of plus or minus 1 db. over the full six megacycle bandwidth is specified. Impedance is seventy-five ohms input and output and the input circuit is optimum matched for noise figure with the antenna load. The power supply source must be 117 volts. Connectors are all of the UHF type. One external balun with approximately five feet of coaxial cable is furnished to connect the input to 300 antenna terminals, if a 300 ohm system is used ahead of the pre-amp.

Enclosures include a weatherproof aluminum enclosure, and a rack-and-panel mounting enclosure.

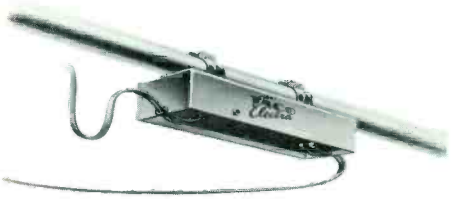
INTEC Data Sheets

INTEC (International Electronics Corporation) 300 Shames Drive, Westbury, Long Island, has available for distribution a new data sheet describing two INTEC fully transistorized Lowband and FM Broadband Amplifiers. INTEC models ABB-11 and ABB-12 transistorized Broadband Amplifiers offer a gain of 35 db. with a low internal noise figure. Other features include cable powering, low power consumption and weatherproof enclosures. Model ABB-11 has a manual control. Model ABB-12 includes automatic gain circuitry.

Full data sheets are available from the manufacturer.

Taco's New Products

TACO (Technical Appliance Corporation, Sherburne, New York) has announced a pair of new antenna products designed to meet the demands of the times. The firm has just released a line of 3.5 and 10 element FM gamma-matched seventy-two ohm yagis designed specifically for Multiplex Stero applications. The precision cut-to-frequency antennas are designed to provide flawless medium to long distance FM reception. Built-in coax fitting, quick rig construction and a full year written warranty are included with the design line. The antenna is dubbed "The FM Stereo Multiplexer."



TACO has also recently announced a new Electronic antenna, "The T-Bird Electra." The all-new transistorized amplifier-antenna features the 100 percent rust-proof T-Bird antenna and a precision matched transistorized antenna-mounting amplifier. The T-Bird Electra is available in three models for various levels of TV signal strength. A built-in signal splitting network allows the signal on the downlead to be split to two receivers, FM and/or TV.

Manufacturers of CATV, MATV, fringe TV, closed circuit TV and broadcast TV equipment are invited to submit produce news releases to this column. Address all mailings to "New Products, Dept. JJ, Television Horizons, P. O. Box 3207, Modesto, California." Check and make sure TVH is on your mailing list.

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News Is Where You Find It

CATV system owners-operators will be gladdened to learn of a new monthly section in **Television Horizons**, to appear first in force in the January issue. We call it **Service Notes**, and it will consist of a series of one page servicing reports prepared by the top servicing engineers at Jerrold,Blonder Tongue, INTEC, AMECO and others in the CATV field. **Service Notes** will feature, in each one page report, a brief description of a popular piece of CATV equipment, how it performs and how to make it perform. Each installment will consist of a list of possible trouble spots in th equipment, routine check-out procedures and routine alignment procedures. The purpose of **Service Notes** is to provide the CATV engineer and/or technician with a ready reference to field servicing data on a particular piece of equipment. Each **Service Notes** page will be perforated and prepared for a three ring binder. A special index to the service notes and binder will be offered sometime this spring. If you don't wish your office copy of **TV Horizons** "ripped apart" by technicians and engineers anxious to keep up-to-date their files for CATV equipment servicing, next month would be an excellent time to begin receiving a second copy of the industry's news and engineering publication.

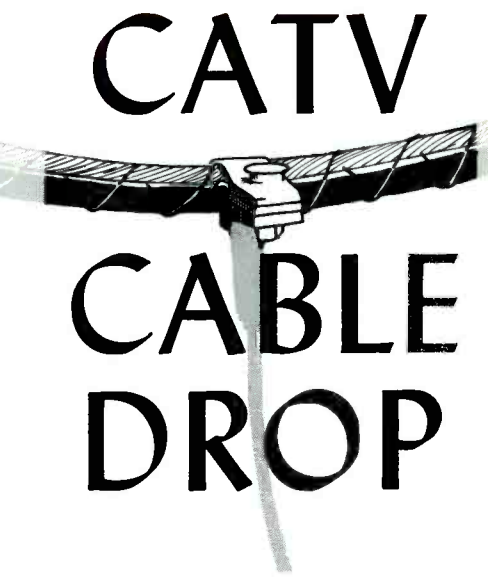
System Acquisitions

The TelePrompTer Corporation, one of the largest group owners of community antenna television systems, continued its expansion of CATV holdings during the past month with the purchase of the Pacific Telescription System of Santa Cruz, California.

The 3,200 subscriber system was purchased for approximately $690,000 in TPT stock.

Irving B. Kahn, President of the giant corporation, told **Television Horizons** his company now has an investment of approximately $5 million in 11 CATV systems serving 28,000 subscribers. His company continues to negotiate for the purchase of additional 1 CATV systems. The sale was handled through Hamilton-Landis, Media Brokers.

The Denison, Texas CATV systems, comprised of 2,000 plus subscribers, has been sold through Media Broker Daniels & Associates for an undisclosed amount. The Better Television Corporation was purchased by the Vumore Corporation.



Bill Daniels, President of Daniels & Associates, announced this was his firm's 45th CATV sale in the past three years.

Pay-TV Questions

For some time there has been some question as to whether Pay Television can ever work on a restricted-local scale. If past performance is to be a guide, the Bartlesville, Oklahoma experiment indicates the Pay-TV picture may be anything but rosey. None the less the Pay-TV advocates are going ahead with their installations and we can be certain that one year from today we will know a great deal more about human behavior in this new field than we do today. During the past month the Pay-TV world saw Norman S. Robertson, Director of the Famous Players Canadian Corporation (operator of the controversial wired Pay-TV franchise in Etobicoke, Ontario, Canada) resign because (he claimed) "we are loosing $11,000 per week in Etobicoke for Pay-TV." Robertson claimed that shareholders were not kept informed of the tremendous losses in the company. On the otherhand J. J. Fitzgibbons, a Famous Players Company spokesman, said that Robertson was only a Director, and he did not understand the intricate workings of the company. Fitzgibbons did admit that the company was still losing money, but pointed out that high initial costs were to be expected and the company did not expect to make the firm self-supporting at such an early stage in the experiment. He described the losses as "closer to $6,000 per week."

On another Pay-TV subject, the impending over-the-air experiments in Hartford, Connecticut have drawn the comment of a broadcast economist that the initial cost for installing transmitting and receiving equipment for over-the-air Pay-TV will run as high as $150 per viewing home. The same economist questioned whether the economics of Pay-TV today warrant anyone going into the field, except in a very large scale market where quantity returns might make up for the initial high installation and operating costs.

At the same time a brief was filed in the U. S. Court of Appeals by the Connecticut Committee Against Pay Television. The brief questioned the legality of the FCC authorizing Pay-TV over the public owned airwaves.

RKO-General replied it felt the FCC was in perfect right to grant such an experimental license and it had acted "in the public's interest."

Wired Pay-TV experiments continue to go ahead in the engineering and planning stages in Little Rock, Arkansas where Midwest Video Company has a franchise, and in undisclosed towns where Home Entertainment Company and TelePromTer are planning tests.

CATV Names — In The News

Walter Holz, President, General Radionics, Stamford, Connecticut has announced the appointment of Bob McGeehan as Vice-President in charge of operations, General Radionics. General Radionics was recently organized to own and operate CATV systems.

Bob McGeehan, formerly Vice President in charge of Sales at Entron, Inc., Bladensburg, Maryland, is a well known figure in the CATV industry. McGeehan was one of the founders at Entron, a pioneer CATV manufacturing firm.

General Radionics now operates the two year old Kingston, New York CATV system and is active in the construction of the Gadsen, Alabama system which will ultimately serve some 70,000 people.

Vernon Louis Hedges has become a Microwave Sales and Engineering Representative for the Microwave Systems of Alpha Corporation (Collins Radio Company). Hedges will represent Alpha Microwave in Ohio, Pennsylvania, Virginia, West Virginia and portions of New York State.

Kenneth E. Farr of Jerold Electronics, Philadelphia, has been appointed Chief Engineer at the ever expanding Industrial Products Division at the Jerrold Lab in Huntingdon Valley, Pa.

CATV-MATV Service Bench

This Month...
BLONDER TONGUE MLA-b

By Marv Mitchell
B-T Service Manager

The Blonder-Tongue model MLA-b broadband amplifier is the workhorse of the Blonder-Tongue Masterline. It has been used extensively in Master TV installations and to a lesser degree in CATV systems (with the model MAC automatic gain control). Since it provides at least 40 db. of gain on all VHF channels and 3.5 volts per band maximum output, the MLA-b can handle even the largest MATV systems.

Installation

At least 240 microvolts per channel (across 75 ohms) should be supplied to the input of the MLA-b. Ideally, all input channels should be balanced. Weak signals can be amplified by single channel preamps (such as Blonder-Tongue model CB). Strong channels can be attenuated by attenuators (such as Blonder-Tongue model FA). If input signals are not balanced, the separate hi band and lo band gain and tilt controls can be used to provide some degree of balance in the output. Maximum output of the MLA-b is 3.5 volts per band. At this level, cross modulation is less than three percent, which is not discernible on the TV screen. If amplifiers are to be cascaded, however, the cross modulation should not exceed one percent. The MLA-b, can deliver two volts per band with less than one percent cross modulation.

Figures 1 and 2 show typical MATV head-ends. In figure 3, the MLA-b is shown being used as a line extender. Up to 1700 feet of RG-11/U foam cable can be used between amplifiers (at channel 13). An MAC should be used every 3rd amplifier, to compensate for temperature changes, aging components, etc.

Adjustment

The gain controls should be adjusted for maximum output with no observable cross modulation. Cross modulation appears on the TV screen as "windshield wiper" effect, cross hatch or loss of sync. A good practical way to do this is to connect a TV set to the monitor output of the MLA-b through a variable attenuator to equal the total loss to the last TV set in the longest line, minus 20 db. (the monitor output is 20 db. down). Then, proceed as follows:

1. Turn the lo-band gain to minimum gain (maximum counter-clockwise).
2. Observe the picture on all high band channels. Choose the strongest channel. Turn the hi-band gain control clockwise until you see cross modulation in the picture.

   Then, back off slowly until the cross modulation disappears. (If no cross modulation appears, set the gain control fully clockwise — full gain).

   Finally, recheck all the hi-band channels. Reduce the gain if cross modulation appears on any channel.
3. Turn the lo-band control up and observe all low band channels. Choose the strongest channel. Turn the lo-band gain control clockwise until you see cross modulation in the picture. Then back off slowly until the cross modulation disappears. (If no cross modulation appears, set the

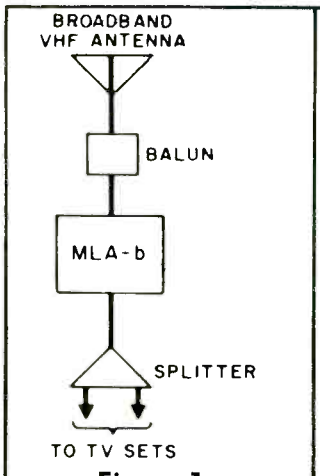


Figure 1

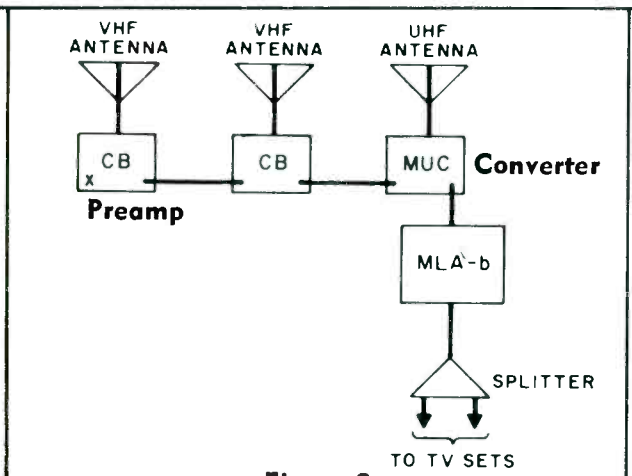


Figure 2

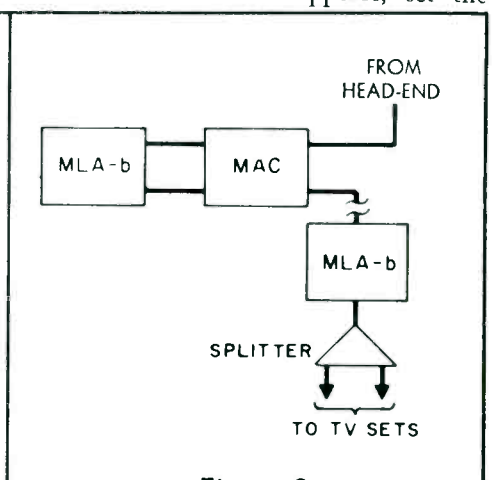


Figure 3

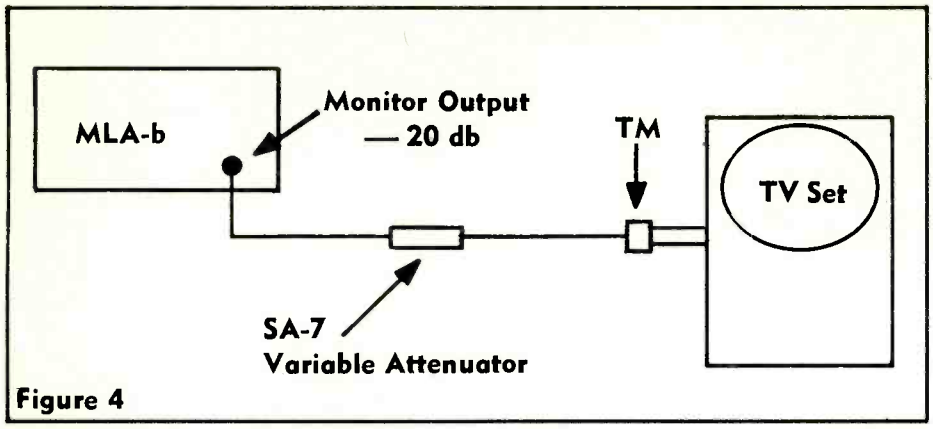


Figure 4

gain control fully clockwise — full gain.

Finally, recheck all the low band channels. Reduce the gain if cross modulation appears on any channel.

4. Recheck the high band channels. If any cross modulation is seen, reduce the lo-band gain control until it disappears.

If the input signals are so strong that cross-modulation appears even with gain controls turned to minimum use an attenuator (if all channels are too strong) or a Benco Unimix (if only some channels are too strong). The tilt controls are set at the factory for a flat output. For most installations, no adjustment of tilt controls is necessary.

Figure 5 shows how the tilt controls can be used to compensate for the unequal attenuation of cable, where long runs are used.

Alignment

To properly align an MLA-b you will need:

1. A VHF broadband sweep generator (54-216 mc.)
2. A Channel marker generator
3. An Oscilloscope
4. A variable attenuator, such as B-T model SA-7.
5. A detector, which you'll have to make, as shown in figure 6

Figure 7 shows how the equipment is set up.

To align the lo-band (see schematic, figure 9):

A. Set the iron core of L45 (tilt control) to approximately 1/4 inch from the free end of the coil form.
B. Turn the lo-band gain control to maximum clockwise.
C. Adjust L32 and L34 for the frequency of peak 4.
D. Adjust L33 for the frequency of peak 1.
E. Adjust L35 for the frequency of peak 5.
F. Adjust L37 for the frequency of peak 2.
G. Adjust L36 to equalize peaks 2 and 3.
H. Adjust L38 to set the proper height of peak 4.
I. Adjust L25 to set the proper height of peak 1. L25 affects the overall shape of the lo-band response curve.
J. Go back over all adjustments several times if necessary to produce desired response curve.

TO ALIGN THE HI-BAND:

A. Set the iron core of L44 (tilt control) to approximately 1/2 inch from the free end of the coil form.
B. Turn the hi-band gain control to maximum clockwise.
C. Adjust L9, L10, L17, and L19 for the frequency of peak 8.
D. Adjust L11 and L18 for the frequency of peak 5.
E. Adjust L13 for the frequency of peak 7.
F. Adjust L15 for the frequency of peak 6.
G. Adjust L16 to equalize peaks 6 and 7.
H. Adjust L20 to set height of peak 8.
I. Adjust L9, L10, L17 and L19 to balance the relative heights of peaks 5 and 8.
J. Adjust L23 to fine tune the overall hi-band response.
K. Go back over all adjustments several times if necessary to produce the desired response curve.

Of course, the object of alignment is to get as flat an output at 40 db. gain as possible. Units shipped from the factory are within 1½ db. (peak-to-valley) but three or four db. is usually passable for field alignment. Only it amplifiers are to be cascaded is this much variation in response likely to cause trouble.

For non-cascaded amplifier applications,realignment is seldom necessary, even when tubes are changed.

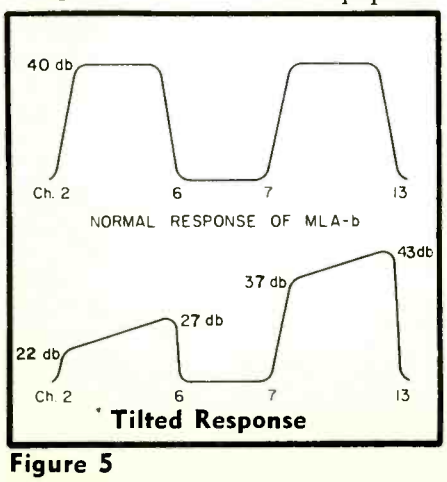


Figure 5

Trouble Shooting

Figure 9 shows a block diagram of theMLA-b which should be a trouble-shooting aid. Generally, trouble shooting is not difficult. Most troubles are caused by defective tubes. Another common source of trouble is the power supply, especially the rectifiers and the electrolytic. Interestingly enough, power supply trouble can effect either the high band or the low band, as well as both.

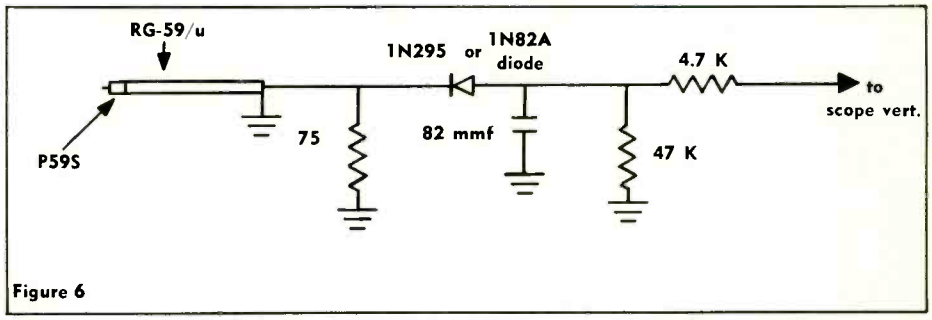


Figure 6

There are only five basic troubles to which the MLA-b is susceptible.

1. **Weak or no picture on all channels.** Check the fuse and measure B-T voltage. If B-T is below 115 volts, try replacing the rectifiers and the filter capacitor. Check J1 and J2. Check for open C1 or shorted C3.
2. **Weak or no picture on low band channels. High band channels OK.** Check V5, V6 and V7. Check pin voltages, especially plate voltages. Use test set up as shown for alignment but move scope from output of V5 to output of V6, to output of V7, in order to isolate trouble to a single stage. Try adjusting the alignment coils slightly. If adjustment has no effect, stage is probably defective.
3. **Weak or no picture on high band**

channels. Low band channels OK.
Check V1, V2, V3 and V4. Check pin voltages, especially plate voltages. Use test set up as shown for alignment V1 to V2, to V3 to V4, to isolate trouble to a single stage. Try adjusting the alignment coils slightly. If adjustment has no effect, stage is probably defective.

4. **Hum bars in picture.**
Check ripple voltage at output of B-T filter (should be less than 0.5 volts). Check electrolytic. Check all grid resistors for poor contacts or cold solder joints.

5. **Dark wavy lines in picture.**
This indicates oscillation. Check all tubes by substitution. Check all coupling capacitors. Be sure physical arrangement of components has not been disturbed. Check all grid resistors. Use alignment setup and probe tuning coils with finger until oscillation stops. Response curve will then indicate oscillating stage (high peak at oscillating frequency).

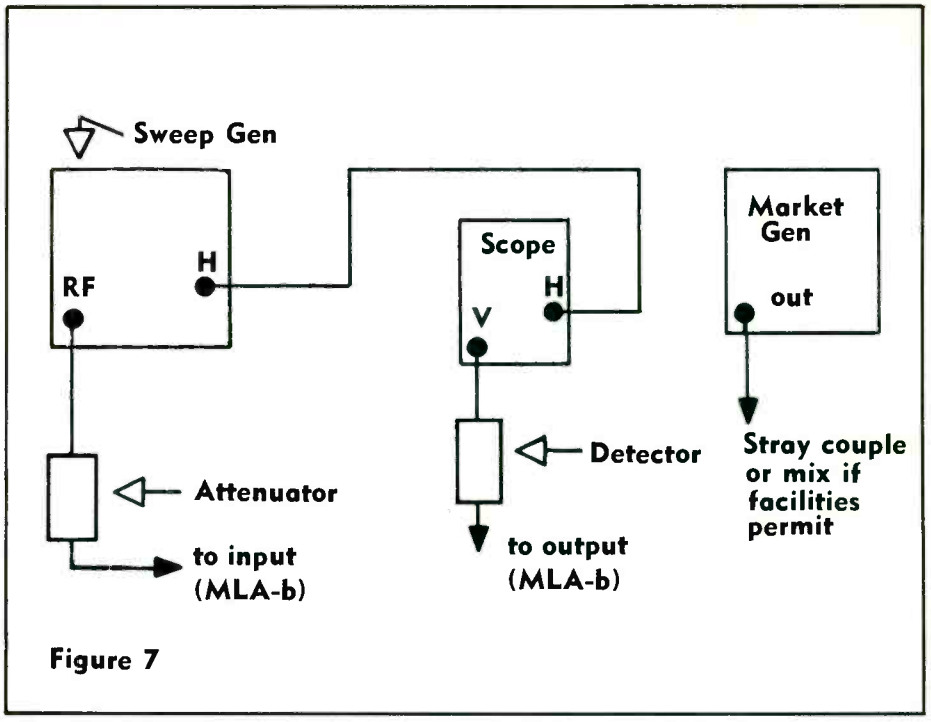


Figure 7

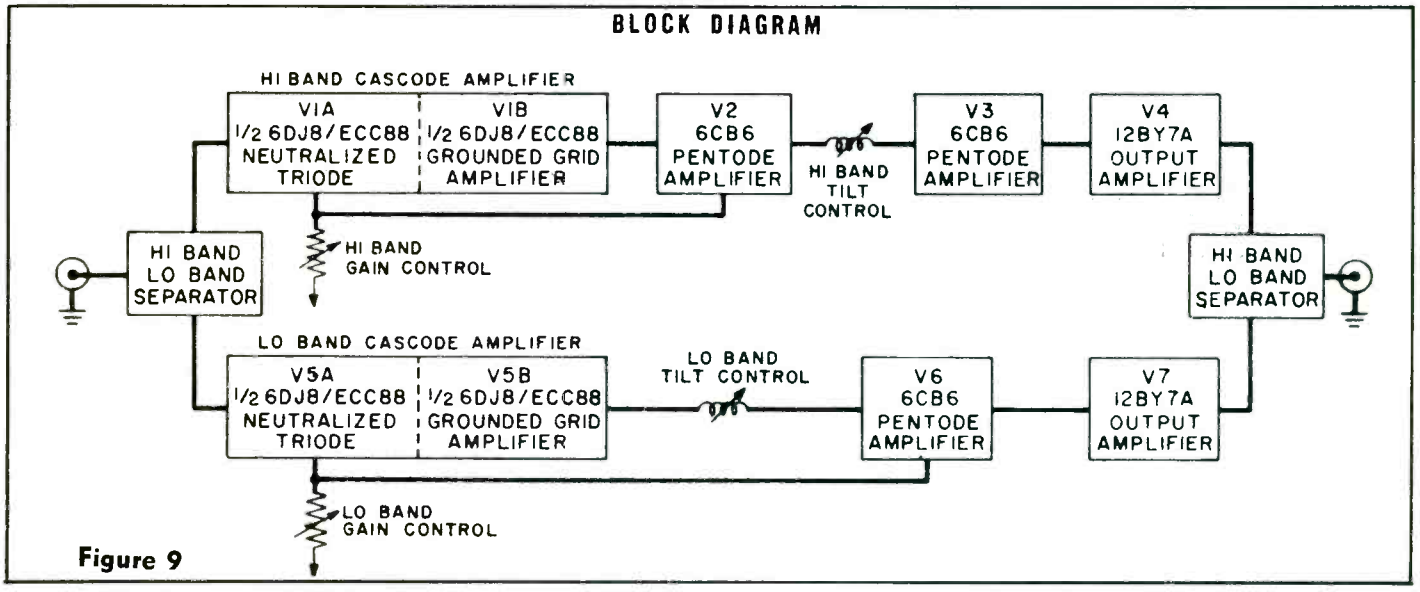


Figure 9

NEWS BRIEFS

Meet Lon Cantor

Lon Cantor is well known in the CATV-MATV industry as a technical writer for Blonder Tongue Labs. Lon has agreed to conduct a new monthly column covering all phases of MATV-CATV installation and service, under the guise of **The Field Engineer** (see page 16). This clever, witty piece of dialogue is sure to become one of your favorite sections in the new **Television Horizons.**

GE's New Monitor Bulletins

General Electric has issued a series of four-page bulletins on its new 14, 17 and 21 inch monitors for closed circuit TV installations and broadcast stations' monitor use.

The fully illustrated publications outline specific capabilities of the new cabinent and rack-mounted models for military, industrial, commercial, educational and institutional broadcast needs.

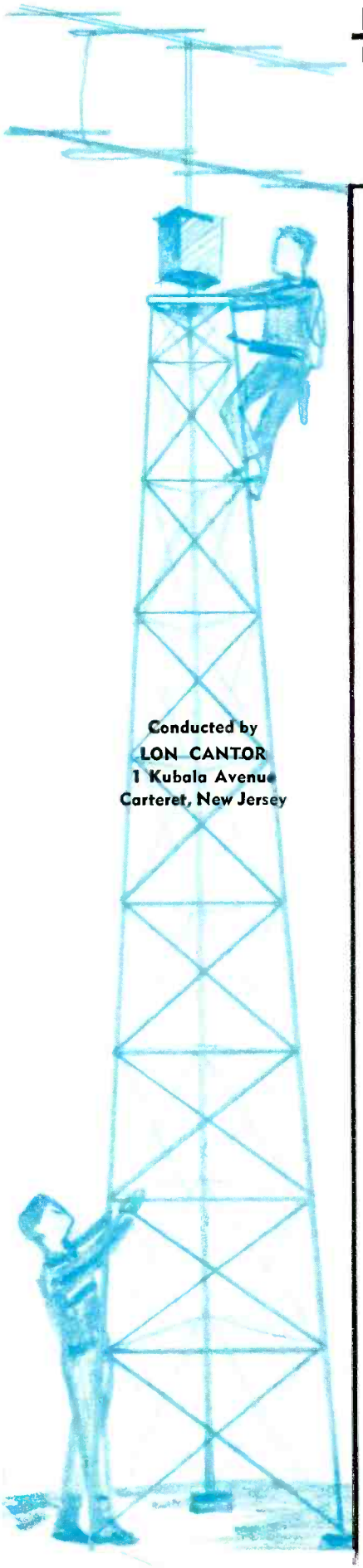
The new bulletins . . . ECB 215 for broadcast, ECL 91 for military and ECL 92 for industrial . . . are available free from General Electric by writing to Frank H. Callaham, Jr., Communication Products Department, P. O. [illegible]197, Lynchburg, Virginia.

TV Automation Equipment

Visual Electronics, 356 West 40th Street, New York 18, New York has completed installation of a Visual 6000 series television program automation system at WDSU-TV, channel 6 in New Orleans.

The purpose of the equipment is to provide smooth programming especially during the very active station break period and at the same time reduce the technical operator's work load. The equipment does this by automatically switching video and audio signals on the air in accordance with the station's pre-machine programmed schedule. It also turns on projectors, rolls the film and switches multiplex mirrors as required.

MATV CATV FIELD ENGINEERING



Conducted by
LON CANTOR
1 Kubala Avenue
Carteret, New Jersey

A LESSON IN MATV BASICS

Bright and early, Monday morning, Hank and Bob pulled up in front of the large, new apartment house.

Getting out of the panel truck and slamming the door emphatically, Hank said, "Now remember, let me do all the talking."

"But I never say anything, I just ask questions," protested Bob.

"Yeah, I know," growled Hank. "But we're supposed to be experts, remember? We're not supposed to ask dumb questions. Save your questions for when we're alone."

They walked into the bright foyer and were greated by Bert Stollard, the unhappy looking installer. After a round of greetings, Stollard began his story.

"I can't understand it," he said. "I've checked everything, but I still get snowy pictures. Maybe it's in the splitters, I don't know."

"Let's take a look at the Head-End," suggested Hank.

They rose swiftly in the modern new elevator to the 20th floor. A few steps away from the door to the roof was the amplifier housing.

Hank looked the Head-End over briefly. It consisted of four cut to channel Yagi antennas on the roof, feeding through baluns into four single channel amplifiers. The amplifiers were combined into a single output cable and then split into twenty down leads (see Figure 1.)

The antennas were installed solidly, not too close to each other. All the connections locked firm. Only short lengths of 300 ohm twinlead were used in front of the baluns and the installer had used RG-59/U foam cable after the amplifier strips.

Hank grunted his approval "I can't see anything wrong up here," he said.

"What kind of signals are you pulling in?"

"Good signals an all channels," replied Stollard. "Even without an amplifier I can get a good picture from any of those antennas."

"Oh, you didn't use a field strength meter?" asked Hank.

"No, I never do," replied Bert. "I do not even have one. But if the signal is good at the Head-End, it should be good throughout the system, right?"

Hank countered the question with a question of his own.

"Do you get snowy pictures throughout the system?"

"No," replied Stollard. "That's why I suspect the splitters. Every channel is okay but 13. On channel 13 I get a good picture on the top floors but by the time I get to the bottom it looks like a snowstorm. And sometimes it's worse than others, which I can't understand because these strips are supposed to have a pretty good AGC. I tried jumping the splitters and I got a good picture all the way down too the basement on a single line."

"What is your distribution system loss?" asked Hank.

"Well, I guess its pretty high. I never actually bothered to compute it — but I've used these same strips on big buildings before and never had a bit of trouble."

"Okay," said Hank, "I've got a pretty fair idea of what may be wrong. Let Bob and me look the rest of the system over. We'll let you know what has to be done."

Bert Stollard looked relieved as he said, "Okay. I'll see you men later. I'm working on another job."

"What do you think it is, Hank?" asked Bob eagerly, once they were alone. "Where did Stollard go wrong?"

"Fella," said Hank pedantically, "This job is going to be an education to you. We're going back to the all-too often neglected fundamentals. To design a Master TV system, you have to be systematic. If you go one step at a time, you're going to get a good system — provided you do every step right."

"All right," said Bob brightly, "Where do we start — at the Head-End?"

"Nope, we start at the distribution system," grinned Hank. "We can't figure out what kind of a Head-End we'll need until we know how much distribution loss there is.

"Look, let's pretend we were laying this job out from scratch. We know there are twenty floors and twenty apartments to a floor. So, how many down leads would we need?"

"Twenty," replied Bob.

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  - Fringe TV — technical (Service Bench, Yagi Phasing)
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  - Re-Broadcast TV — (FCC in Review, Yagi Phasing)

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"Right," said Hank, "one for each floor." Now we have to figure out a way to get twenty down leads using two way and four way splitters. Then we put twenty tapoffs on each line and we've got a tapoff in each of the 400 apartments in this glorified Cliff house. We'll draw the Distribution System like this." (See Figure 2).

"What are those X's at the bottom of each down lead?" asked Bob.

"I'm glad you asked. Those are 75 ohm terminating resistors. That's an important point for you to remember — every down lead has to be terminated."

"What for?" asked Bob.

"Because, if we don't treminate a line, it will have standing waves and reflections."

"Gee, that sounds bad," said Bob, trying to act as though he knew what Hank meant. "That can really foul up the system, huh?"

Hank decided to elucidate. "It can cause ghosts and smears on the TV sets," he said. "Look, Bob, here's what happens if the line isn't terminated. The signal goes down to the end of the line and then bounces up like a pogo stick. Of course if the line were long enough the signal would be attenuated to the point where it wouldn't do any harm. But in a system like this, the TV set would see the reflected signal an instant after it sees the original signal. That's what causes a ghost. If the signal bounces up and down more than once, you get multiple ghosts, or smears."

"You've convinced me," said Bob. "I'll remember to make sure all my down leads are terminated."

"Fine," smiled Hank. "Now our next step is to calculate the total distribution loss of this system.

"Let's start with the splitters. A two way splitter loses about 3.5 db. and a four way splitter loses about 6.5 db."

"I see," said Bob. "Let me figure this out. We have six four way splitters and one two way splitter. Six times 6.5 db. is 39 db. plus one times 3.5 db. equals—42.5 db.," he finished triumphantly.

"Nothing wrong with your math," said Hank, "but you couldn't be more wrong. I'll have to explain just what a splitter does.

"A two way splitter is like a Y hose. It breaks the signal up into two equal parts. The signal goes into the splitter and half of it comes out each of the output terminals."

"Say, that doesn't sound like there's any loss at all," said Bob. "You get out just as much as you put in except that it's in two separate branches."

"That's right," said Hank. "The term loss is misleading. Actually, what we mean is that since each output gets only half of the signal power, the signal in either output is 3 db. less than the input signal.

"We follow either of these output lines as far as it goes. What we actually want to find out is, how weak will the signal be — in comparison to the input signal — at the last TV set on the line.

"We don't have to figure out every line; only the line with the most attenuation in it. In this case, the line that goes down to the basement.

"We lose 6.5 db. in the four way splitter, 3.5 db. in the two way splitter and 6.5 db. in the other four way splitter. Total splitter loss, then is 15.6 db."

" Wait a minute," Bob interjected. "Didn't you just tell me half the signal power went into each branch of a two way splitter and that's only 3 db? Where do you get this 3.5 db?"

"Well," replied Hank, "Very little of the signal is actually absorbed by a good splitter. But just to be safe, we call it half a db. We add that to the 3 db. and use the figure 3.5 db. for a two way splitter. It really wouldn't do any harm to forget about the half a db., unless you had quite a few splitters in series.

"Once we know the splitter loss, we have to determine the cable loss. Here, again we use only the amount of cable in the longest line. Between that basement set and the head end we'll use — let's see — about 250 feet of cable. Stollard used RG-59/U foam.

"Cable loss depends on the frequency of the signal. The higher the frequency, the more the cable attenuates the signal. So we always figure cable loss at the frequency of the highest channel in the system."

"In this case, channel 13," chimed in Bob. "Right. Then what is the loss in 250 feet of RG-59/U foam cable at channel 13?" asked Hank.

"How should I know?" demurred Bob.

"Get yourself one of these slide rules*," said Hank, whipping one out of his breast pocket. Or get a chart (see Figure 3) that gives you the information. Anyhow, according to my slide rule, the loss of RG-59/U foam at channel 13 is 4.2 db. per hundred feet."

"I see," said Bob. "Then 250 feet of cable would attenuate the signal by 2 1/2 times 4.2 db. — or 10.5 db."

"Very good, said Hank, "Now we have to figure the tapoff loss."

"There are two kinds of losses associated with tapoffs — the thru line loss and the isolation loss."

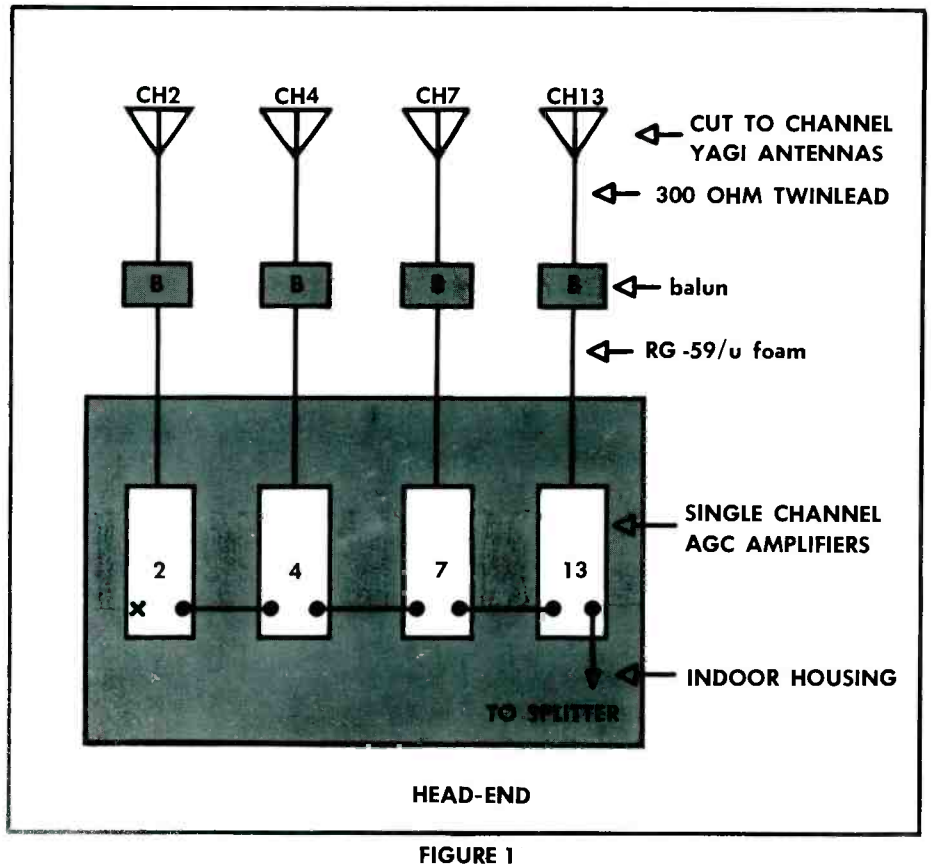


FIGURE 1

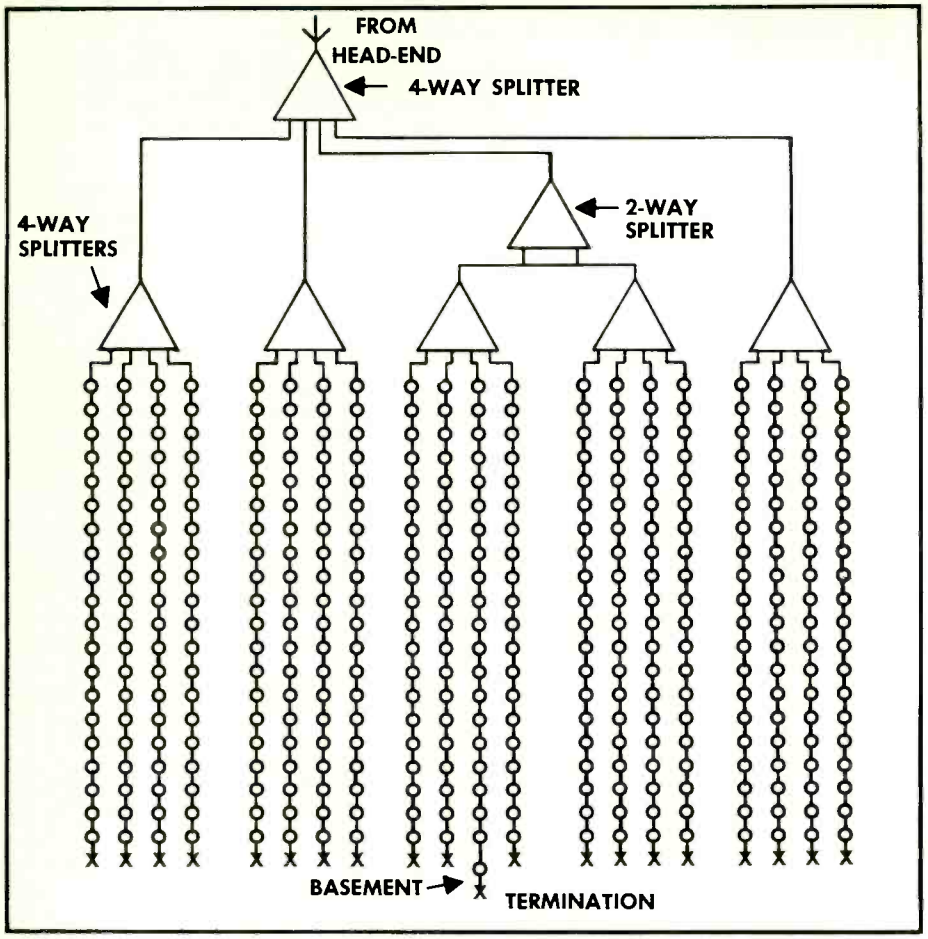


Figure 2 DISTRIBUTION SYSTEM

"I don't follow you," said Bob in bewilderment.

"All right, look at it this way," Hank patiently drew another diagram (see Figure 4). "We can represent a tapoff by two resistors. To get to the set, the signal has to go thru both of these resistors. Resistor R1 is small. It represents the thru line loss of the tapoff. Resistor R2 is the guy that isolates the set from the down lead, or thru line. In order to get to the basement TV set, the signal has to go through the R1 of all of the tapoffs in that branch line. But it only has to go through R2 once, in the basement tapoff itself. This gives us a general rule: You multiply the thru line loss of the tapoff by the number of tapoffs. But you count the isolation loss only once.

"Let's try it in this system. There are twenty-one tapoffs in the basement line. The manufacturer says the tapoff has a thru line loss of 0.7 db. and an isolation of 17 db.

"If we multiply 0.7 db. times twenty-one tapoffs what do we get?"

Bob was quick with the answer, "14.7 db.," he replied.

"Let's call it 15 db." said Hank. Now, we're ready to add up all our losses." He wrote:

4 way splitter	6.5 db.
2 way splitter	3.5 db.
4 way splitter	6.5 db.
cable	10.5 db.
Tapoff thru line loss	15. db.
Tapoff isolation	17. db.
Total distribution system loss	59. db.

"Wait a minute," said Bob, "I don't get it. How can 59 db. be the total distribution system loss? We've only figured out one branch. We haven't added in the other branches."

"Come on, Bob," cajoled Hank, "This isn't as complicated as all that. I think what's throwing you is this word loss. We don't actually lose 59 db. of signal on the way to the basement TV set. Most of that signal is sent to the other nineteen lines. What we mean is that the signal at the basement TV sets is 59 db. less than the signal at the Head-End. If we figured out how much loss there was between the Head-End and any other TV receiver in the system, we'd get less than 59 db. Another way to think about it is that every set in the system will get a stronger signal than this basement TV set. So if we can get strong enough singal here, we'll have a good picture on every set in the apartment house."

"That sounds logical," Bob nodded, "What's the next step?"

"The next step is to design a Head-End that can supply signals strong enough to provide a good picture on a TV set even after 59 db. of attenuation."

"How strong a signal do you need for a good picture?" asked Bob.

"Well, its hard to say. Depends a lot on the sensitivity of the TV set. You might get a good picture with less than 200 microvolts. But we always allow a tolerance in figuring master TV systems. The industry standard is that the system must provide at least 1000 microvolts per channel across seventy-five ohms to every TV set.

"Therefore, if we received 1000 microvolts on channel 13, our Head-End amplifier would have to give us at least 59 db. gain. That would overcome the 59 db. loss of the Distribution System and we'd have 1000 microvolts at that basement TV set."

"Then that's the answer," said Bob excitedly. "All we have to do is use enough amplifiers to give us 59 db. gain on all channels."

"Not so fast, friend," grinned Hank "You're overlooking a very important thing — the strength of the input signal. Suppose we received 2000 microvolts on channel 13? Or only 500 microvolts? We could need more or less than 59 db. gain. Let's break out the Field Strength Meter and see what we get."

They connected the Field Strength Meter to each of the antennas and recorded the following results:

Channel 2 — 25,000 uv
Channel 4 — 15,000 uv
Channel 7 — 13,000 uv
Channel 13 — 3,200 uv

"Now we know what we're working with," said Hank. "But look, our Distribution System loss is figured in db. and our amplifier gain is given in db., so let's express the input signal in db."

"How do we do that?" asked Bob.

"Well, you know pretty well what a decibel is, don't you Bob?" asked Hank rhetorically, "It's a ratio. Expressing a quantity in db. doesn't tell you anything unless you have some standard. I told you before that we need 1000 microvolts per channel at the TV set. That 1000 microvolts is our standard. In fact, 1000 microvolts is sometimes referred to as the 'Standard Minimum Signal.'

"When we say that a certain signal is received at 20 db., we actually mean that it's 20 db. greater than 1000 microvolts. Remember, by itself db. means only how many times. Only if

CABLE CHARACTERISTICS

Cable	Interference Rejection	Signal Loss/100 Feet				Effect of Weather
		Ch 2	Ch 6	Ch 7	Ch 13	
RG-11/U	Excellent	1.4 db	1.7 db	2.2 db	3.2 db	Signal loss unaffected by heat or rain
RG-11/U Foam	Excellent	1.1 db	1.4 db	1.6 db	2.3 db	
RG-59/U	Excellent	2.7 db	3.5 db	4.1 db	5.8 db	Signal loss unaffected by heat or rain
RG-59/U Foam	Excellent	2.1 db	2.7 db	3.1 db	4.2 db	
300 ohm Twinlead Ribbon	Fair	.75 db	1.1 db	1.2 db	1.8 db	Signal loss increases 6x when wet

FIGURE 3

you know what you're comparing does it have any absolute value."

"I get it," said Bob. "We compare the input signals we read on the Field Strength Meter with the Standard Minimum Signal, right?"

"Your're sharp today, Bob," approved Hank, "Let's try that system out with channel 13. We measured 3200 microvolts. Divide 3200 by 1000 microvolts (3200/1000=3.2) and we find that the received signal is 3.2 times the Standard Minimum signal. Then we look up 3.2 times voltage on a db. chart — or on my slide rule*— and find out how many db. it equals."

Hank made a quick pass with the slide rule and held it up to Bob's eyes. "See — 3.2 times voltage is about 10 db."

"Say, if your input signal is 10 db. more than we need, why doesn't the system work?" asked Bob.

"You're jumping to conclusions again, Ace," said Hank caustically. "I didn't say the input was 10 db. more than we need. I said it was 10 db. more than 1000 microvolts. We add that 10 db. to the gain of the amplifier — 35 db. — and what do we get?"

"Forty-five db.," replied Bob slowly. "Oh, now its coming to me. The Distribution System loss was 59 db. We're still 14 db. short."

"Good work, Sherlock," smiled Hank. "The sets in the top floors were ok, but by the time the signal was attenuated by the cable and the thru losses of all the tapoffs, it was pretty weak. Also, the 3200 microvolts isn't strong enough to activate the amplifier's AGC. So if the signal fades, it gets worse."

"What about the other channels?" asked Bob.

"We know they're ok because Stollard said so," said Hank. "Besides, they are all a lot stronger than 13 and none are attenuated as much. All the other signals are strong enough to drive the amplifier into AGC. And once the Automatic Gain Control takes over, the amplifier puts out 1 volt."

Bob decided to figure that one out.

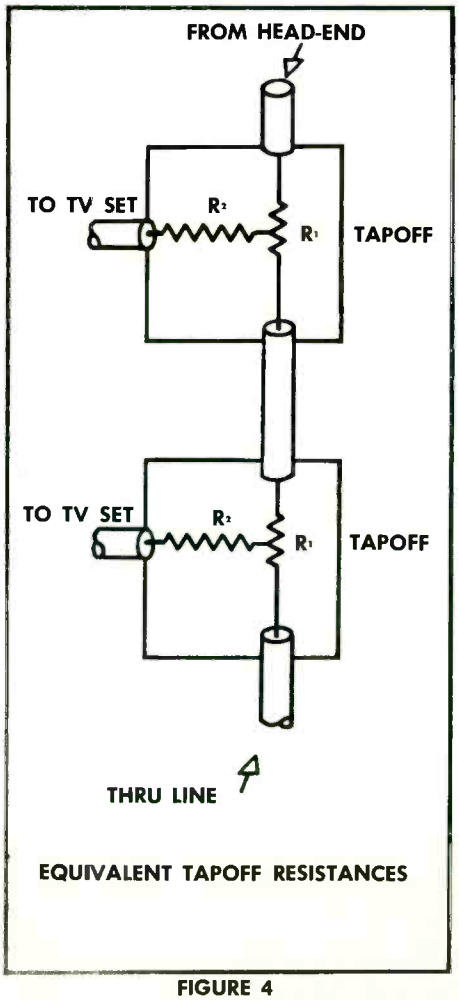


FIGURE 4

"Let's see," he said. "A volt is a million microvolts. Divide that by the Standard Minimum Signal (1,000,000/1,000=1,000) and we get 1000 times." He borrowed Hank's slide rule and said, "So the amplifiers put out a signal 60 db. stronger than 1000 microvolts," he concluded.

"Good," said Hank. "Now that we know what's wrong with this system, how are we going to fix it?"

"I guess we need another amplifier," hazarded Bob.

"Exactly," said Hank. "If we were only a couple of db. off, we might try to reduce the Distribution System loss. But in this case our best bet is to use a single channel pre-amp."

A week later Hank and Bob returned to see how the system was operating.

Bert Stollard had taken their advice, using a single channel pre-amp (18 db. gain) for channel 13. The pictures were fine throughout the building.

"Well Bert," said Hank, accepting Stollard's thanks, "that was a real good installation. You just didn't take enough time with laying it out."

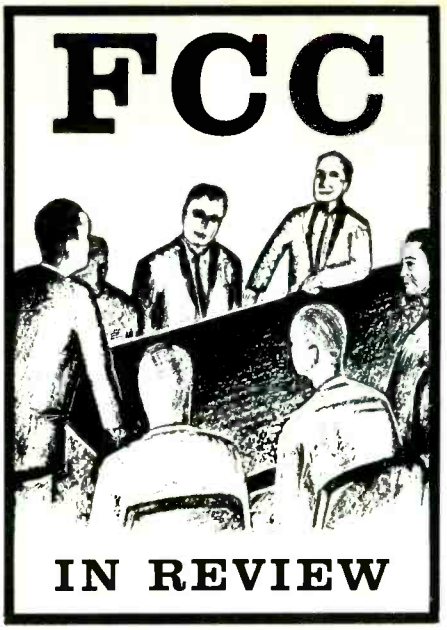
"Guess you're right," said Stollard. "How about going over this design method with me again?"

"Let Bob here explain it to you," suggested Hank.

"Is he an expert too?" asked Stollard.

Hank laughed, "They say an expert is anybody fifty miles from home with a brief case. No, I'm just breaking Bob in. But he's learning fast. Don't you worry, in a few months he'll be so good he'll be swinging from an antenna by his tail!" L.C.

***Readers may obtain a free Master TV Slide Rule like Hank's by writing to Lon Cantor, 1 Kubala Avenue, Carteret, New Jersey.**



October 31 Translator Deadline Extended

On July 27, 1960, the Commission adopted a Report and Order in Docket No. 12116 (FCC 60-697) amending its rules to provide for the licensing of VHF television translators. At the time the rules were adopted, there was estimated to be between one and two thousand such devices operating on VHF channels without authority of the Commission. Pursuant to legislation adopted by Congress, the Commission provided for issuance of temporary operating authorizations to these unlicensed operations upon appropriate application therefor, with the understanding that such facilities would be brought into conformity with the newly adopted rules by October 31, 1961.

The aforementioned provision was contained in Section 4.790 of the new rules and required, among other things, that all operators of the unauthorized stations must apply for the temporary operating authority by October 31, 1960, and that such modifications in the equipment as might be necessary to bring it into conformity with the new rules would not be made until a valid construction permit had been issued by the Commission. It was expected that the required application for construction permit would be filed in time to permit Commission action to issue the permit and the completion of construction by October 31, 1961.

Unavoidable delays have been encountered in securing needed equipment by permittees and in processing the hundreds of applications submitted to the Commission. The present temporary operating authority for these stations will expire October 31, 1961. It now appears doubtful that the Commission will be able to complete the processing of pending applications prior to October 31, 1961, or that those who receive such grants will be able to complete construction before severe winter conditions set in which render many of the sites almost inaccessible. The Commission does not wish the people to be deprived of service in those areas where a sincere effort has been made to comply with the rules.

Therefore, **we are amending Section 4.790 of our rules to extend the expiration date to April 30, 1962,** on all outstanding authorizations which have been issued by the Commission pursuant to the provisions of Section 4.790 of our rules, for temporary operation of VHF television repeaters and for which o construction permit has been issued to make such changes as may be necessary to bring the facility into conformity with our rules, or for which a properly executed application for a construction permit to make such changes is on file with the Commission on or before October 31, 1961.

Two Finals OK'ed — V Translators

1. On May 17, 1961, the Commission adopted a Notice of Proposed Rule Making (FCC 61-672) to amend Section 4.735 (a) of its rules to permit the use of more than one final radio frequency amplifier in VHF television translators where each of the additional amplifiers are to be used to serve a different and separate community or area. Interested parties were invited to comment on the proposal on or before June 19, 1961, and were given an additional 11 days to file replies to such comments.

2. Comments were filed by a number of individuals or groups engaged in the operation of VHF translators or the construction, installation, or maintenance of such equipment, merely endorsing the proposal without substantive comment otherwise. Mid-State Radio Supply of Wenatchee, Washington, suggested that the limits of permissible interaction between the separate transmitting antennas of stations employing more thon one final radio frequency amplifier, be more clearly defined. Lyle O. Keys, Consulting Engineer, of Salt Lake City, Utah, showed a comparison of service from a single one-watt translator with that which could be obtained with more than one final rodio frequency amplifier at the same location. The Washington Post Company of Washington, D.C., pointed out the advantages of the proposed system in a selected situation. The Washington State TV Reflector Association supported the proposal but requested that separate station identification not be required of the separate amplifiers. Pateros Brewster TV Association joined in this request. Electronics, Missiles & Communications, Inc., of Mount Vernon, New York, Manufacturers of VHF translator equipment, recommended that the rules clearly prohibit the use of a single amplifier with power output greater than one watt, where the power would be divided between more than one transmitting antenna so that no single antenna would be driven by more than one watt. They point out that such power division would be difficult to maintain in the event of damage to the radiating system.

APPENDIX

Section 4.735 (a) is amended to read as follows:

§ 4.735 Power limitation.

(a) The power output of the final radio frequency amplifier of a VHF translator shall not exceed one watt peak visual power. This power may be fed into a single transmitting antenna or may be divided between two or more transmitting antennas or antenna arrays in any manner found useful or desirable by the licensee. In individual cases, the Commission may authorize the use of more than one one-watt final radio frequency amplifier at a single VHF translator station under the following conditions:

(1) Each amplifier shall be used to serve a different community or area. More than one final radio frequency amplifier will not be authorized to provide service to all or a part of the same community or area.

(2) Each final radio frequency amplifier shall feed a separate transmitting antenna ar antenna array. The transmitting antennas or antenna arrays shall be so designed and installed that the outputs of the separate radio frequency amplifiers will not combine to reinforce the signals radiated by the separate antennas or otherwise achieve the effect of radiated power in any direction in excess of that which could be obtained with a single antenna of the same design fed by a one-watt radio frequency amplifier.

(3) VHF translators employing multiple final radio frequency amplifiers will be licensed as a single station. The separate final radio frequency amplifiers will not be licensed to different licensees.

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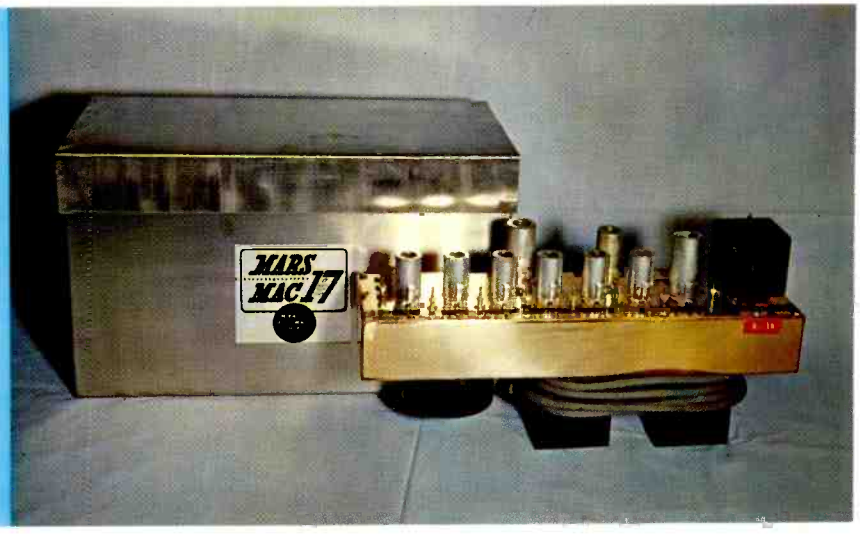

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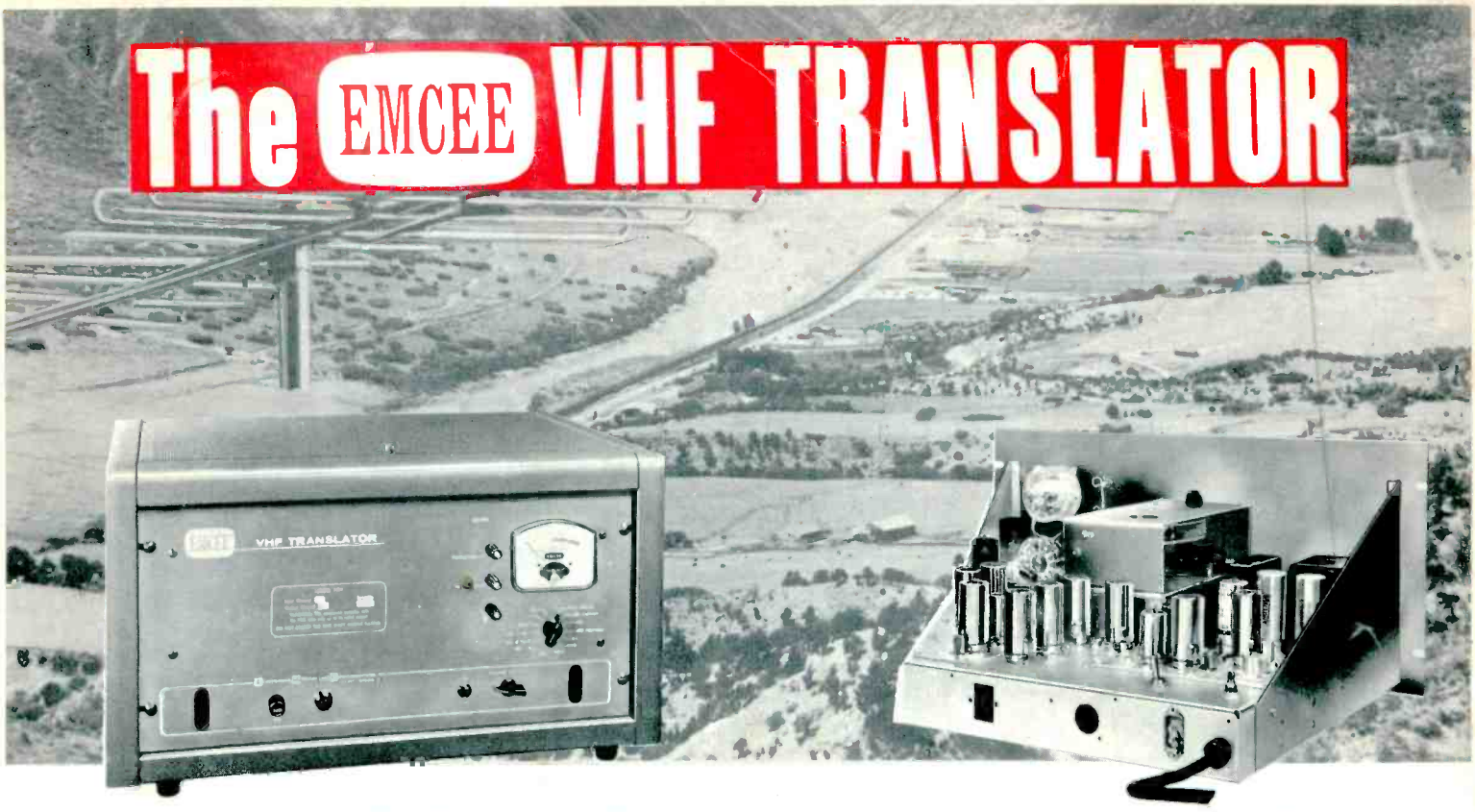

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