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MAY 1962

tv horizons

ANNOUNCEMENT NEXT MONTH — Transistorized F/S and Wattmeter

The Professional Television Journal

IN THIS ISSUE

Knife Edge Refraction Provides Extra Cable TV Channel
ILLUSTRATED-CATV Reflections • MORE-Radical Approach to CATV in Canada • CATV Amplifier Techniques in G.B.

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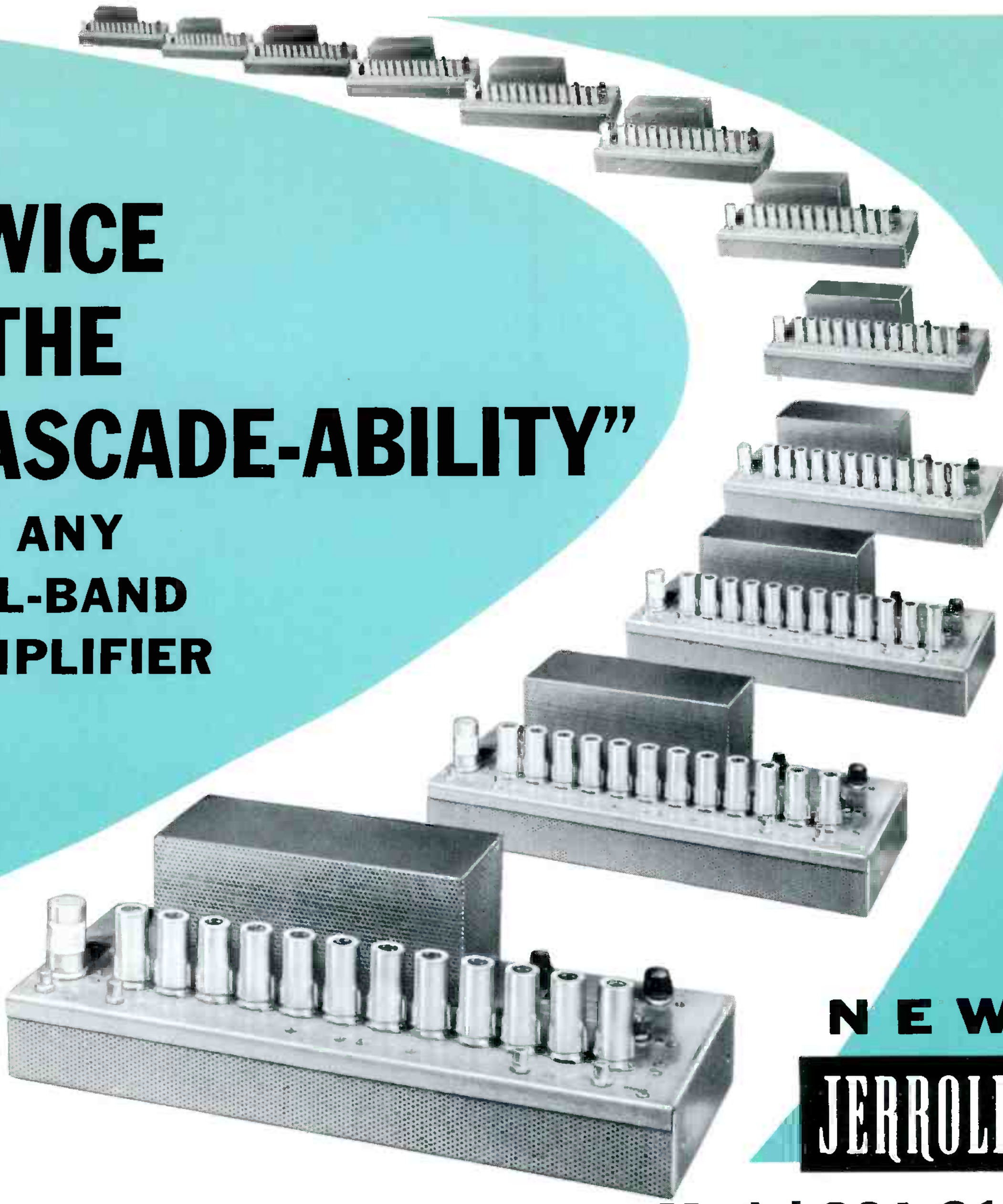
OF ANY ALL-BAND AMPLIFIER



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**0 dbj=1,000 microvolts across 75 ohms.*

FEATURES

- MAXIMUM "CASCADE-ABILITY"
- EXTRA-WIDE BANDWIDTH (6-220 mc)
- PLUG-IN EQUALIZERS COMPENSATE FOR CABLE LOSSES
- FREQUENCY RESPONSE FLAT WITHIN ±½ db WITH EQUALIZATION
- VOLTAGE-STABILIZED TRANSFORMER
- PLUG-IN AGC (Use with Jerrold Model AGC-213)
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Channel 1

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

ENTRON APPOINTS SCHAFER, BUILDING NEW PLANT

Entron, Inc., Bladensburg, Maryland pioneer CATV manufacturer has announced the appointment of Edward Schafer to the position of General Sales Manager. Schafer will be responsible for the direction of all marketing and sales functions at Entron, including the firm's national sales effort, customer relations, sales promotion and market research.

With the announcement came news that Entron's new plant, in an industrial tract near Bladensburg, is progressing towards an August 1 completion date. The new plant will double Entron's manufacturing capabilities and is one of many areas of growth at the Maryland firm.

Schafer, prior to joining Entron, was Marketing Manager at Intercontinental Electronics (INTEC), Westbury, New York, and Merchandise Manager at Blonder-Tongue Laboratories, Newark, New Jersey.

ANOTHER CATV MILESTONE

'Ten years ago' in CATV takes us back quite a ways. On March 19th television viewers in Hancock, Maryland celebrated their 10th year on wired television when Tri-State Cable TV, Inc. marked the start of its second decade of operation. Then known as Community Television, Inc., Tri-State began its Hancock operations with 43 subscribers. The ten year period has been marked with expansion piled upon expansion. The original system carried three channels, all from Washington, D.C. Today's system carries 9 channels to more than 1,200 homes in Hancock, Maryland, McConnellsburg, Pennsylvania and Berkeley Springs, West Virginia.

NCATA ANNUAL CONVENTION —A REALLY BIG SHOW!

May 2, 3 and 4 marked the Sixth Annual Convention and Trade Show for the CATV operators of Canada.

Held at the Chateau Frontenac, Quebec City, Quebec, the meeting's schedule indicated it would be excellent in every detail.

May 3rd's opening speaker was scheduled to be Mr. Sruky Switzer of Estevan, Saskatchewan. Mr. Switzer has become an 'office-hold word' in the CATV industry in recent months, as a result of his two part series appearing currently in Television Horizons. His topic, and there is none better qualified to speak, was "Looking Ahead in CATV." He planned to cover microwaves in Canada, parametric amplifiers, tunnel diodes, system additions and conversions and a host of other future points that promise to change the complexion of CATV in Canada (and the United States) soon.

Also slated for much discussion were talks by Ken Easton ("Underground Systems — the Challenge and the Problems"), Mr. Gilbert Allard ("Decibels and Dollars; the Economics of System Planning") and Mr. S. F. Ritchie, Vice President of Johnson and Higgins Ltd. ("Principles of the Laws of Negligence and Comments on the Subject of Third Party Liability Insurance").

TRANSLATOR LICENSE PERIOD EXTENDED

The FCC has revised Sections 4.15 and 1.328 (a) of its rules related to TV translator stations, extending the license period of such stations from one to three years, on a staggered basis depending on which 18 geographic areas the station is located in. The regulation changes also require that an application for licensing renewal be filed 90 days prior to expiration, instead of the present 60 days.

The Commission noted "this change is necessary for handling the growing number of TV translators. There are now about 1200 authorizations (800 VHF and 400 UHF) with 300 applications pending. The total is expected to increase to 1600 by the year's end."

Previously, all licenses expired on June 1 of each year.

To start the staggered system going, the following expiration dates have been adopted:

Virginia, North and South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Arkansas, Missouri, Kentucky, Tennessee, Indiana, Illinois, Michigan, Wisconsin, Puerto Rico and Virgin Islands . . . *to August 1, 1962.*

Oklahoma and Texas . . . *to October 1, 1962.*

Kansas and Nebraska . . . *to December 1, 1962.*

Iowa and South Dakota . . . *to Feb. 1, 1963.*

Minnesota and North Dakota . . . *to April 1, 1963.*

Wyoming . . . *to June 1, 1963.*

Montana . . . *to August 1, 1963.*

Idaho . . . *to October 1, 1963.*

Washington . . . *to December 1, 1963.*

Oregon . . . *to February 1, 1964.*

Alaska, Hawaii, Guam . . . *to April 1, 1964.*

Colorado . . . to *June 1, 1964.*

MAY 1962
VOLUME 3 • NUMBER 5

TELEVISION HORIZONS

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EDITORIAL

Convention time is fast approaching. In Canada, this month (May 2-4) the NCATA met at the Chateau Frontenac in Quebec City. Just around the corner is the annual (11th) NCTA convention, scheduled for June 17-22 at the Shoreham Hotel, Washington, D.C.

What is the purpose of such a meet? And, why should you be there?

Last year's NCTA meeting was dedicated as "A Milestone in Progress." This year's meeting will mark the first in a new (and second) CATV decade. The importance of the meeting can not be overestimated.

Within the industry the value of spending time exchanging ideas and procedures cannot be duplicated. A man in New Mexico uses a vacant channel for a "weathercasting service." A man in New York originates local community events television on his system. A man in Canada uses a B and K Television Analyzer to provide subscribers with a bulletin board service, including buy and sell items, on a vacant channel. These and dozens of other new and original ideas are yours for the taking, when you rub elbows with the backbone of the industry.

But what of the image we present to those outside, but still involved in, the industry? This year's meeting is in Washington, D.C., the center of our industry's many traveling companions. The broadcasters house here. So do our legislative representatives. The trade press centers here. It is fair to say that this year's meet will be covered, watched and bird-dogged by 'interested but outside parties' like no meet in history. We will be convenient to interview, handy to watch and available for scrutiny.

All of this necessitates a meeting that is representative of the very best foot we have to put forward. We are assured of a top notch program by the NCTA leaders. But the real test of program will be the industry turn out. Never before has a record turn out been so important.

R.B.C.

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CATV IS GOING WIDE BAND . . .
SKL IS LEADING THE WAY!

As more and more CATV owners make the *wide band* decision for the construction of new systems and the conversion of old ones, they turn to SKL for equipment and engineering with *experience.*

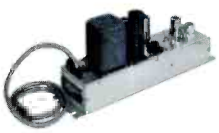
First in the wide band field, SKL pioneered the all-channel CATV system a decade ago. Since then, thousands of SKL wide band distributed amplifiers and their associated equipment — over many millions of actual operating hours — have demonstrated their high fidelity performance, their continuing reliability, their low maintenance cost year after year.

They have built SKL's solid reputation for top quality. They have proved that in *every* way, SKL is *first* in wide band systems.

Just a Few of SKL's Wide Band "Firsts":

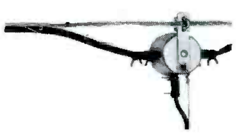
1950
First wide band distributed main line amplifier.

1951
First wide band directional coupler.

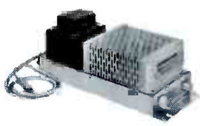


1952
First automatic level control unit for *wide band* systems.

1954
First Multivider line splitter for *wide band* use.



1956
First Chromatap line tap for *wide band* application.



1958
First wide band distributed feeder line amplifier.

1959
First "Thermatic" gain control for *wide band* systems.

1960
First "Thermatic" *wide band* line equalizer.

. . . And in **1961**, the *first* high gain, thermally controlled *wide band* distributed main line amplifier, which remains the standard of the industry.

For the most advanced wide band equipment — backed by the most experienced engineering — call the leader in the field. Call SKL *first!*

SKL SPENCER-KENNEDY
LABORATORIES, INC.
1320 SOLDIERS FIELD ROAD
BOSTON 35, MASS.

Reception of Channel Four at 230 miles distance . . . that would be considered pretty fair in any terrain.

But in the craggy peaks of the Canadian Rockies, most CATV operators would consider such a feat impossible.

Not C. E. Stephens, president of Central TV Systems Ltd. in Revelstoke, B. C. He's putting KXLY, Spokane, Wash., on his cable daily — by direct off-the-air pickup!

Just to make things a bit more complicated, the path from KXLY's 6000-foot Mount Spokane transmitter site to Central TV's receiving antenna passes directly over a 9,200-foot mountain. *Impossible?*

Actually, the 9,200-foot peak of Mount Barr is the secret of the

The Spokane-Revelstoke link has been operational only since last fall. "It is working out quite well," reports Stephens, "although we feel that we will still be able to make some improvement to the picture next summer after the snow is gone."

Stephens estimates picture quality on Channel Four as "good about 75 percent of the time, poor about 22 percent, and not viewable possibly 3 percent of the time." He feels he will have to observe the system's behavior for a year or more to estimate seasonal variation, but adds "indications are that the signal is quite a lot stronger in the summer months."

Basis for the system's operation is a mode of propagation discovered

But if you have a mountain, this is not necessarily enough. The mountain must be placed at just the right location with respect to both transmitting and receiving antennas. Measurements made over Pike's Peak showed as much as 20 db. difference in signal strength when the path grazed the peak instead of passing directly over!

"How can I arrange this?" you may ask. Obviously, neither the transmitter nor the mountain can be moved to suit your convenience.

This is where a bit of geometry and a good topographic map (standard aeronautical charts, available for about 25 cents at any airport, are excellent for the purpose) come into play.

Right, you can't move either the

KNIFE EDGE REFRACTION Adds EXTRA CATV CHANNEL

whole situation. "Obstacle gain" provided by "knife edge" refraction over the peak makes the difference between no signal at all, and a quite respectable almost-snow-free pickup at Revelstoke.

Stephens and his obstacle-gain system are no strangers to Horizons readers; in our very first issue (back when the magazine's name was "TV-FM DXing Horizons") we reported his success in obtaining Channel Two reception from Kewlona, B. C., over a 98-mile mountain path.

The Kewlona-Revelstoke path has now been in operation for four years; signal has been steady during this time.

less than 10 years ago. Stated simply, the TV signal "bends" over a mountain crest and returns to earth. In flat land, ground losses soak up all the signal and establish the range limit—but the "knife edge" refracted ray travels mainly in free space and so is stronger than would be expected for the range.

A more strictly accurate explanation is given in the October, 1955, issue of The Proceedings of the I.R.E. (page 1467)—but the precise explanation is not of importance here. The important thing is: "How can you use this?"

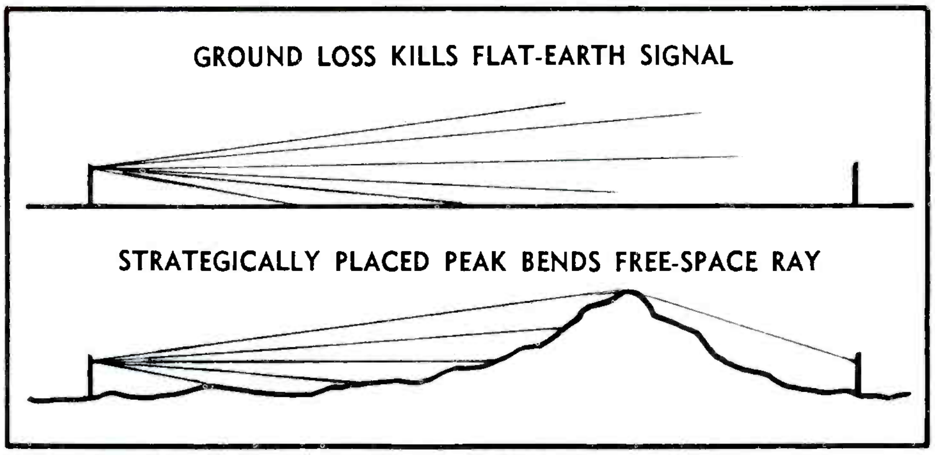
To start with, a mountain is necessary. If you're in flat country, forget it.

transmitter or the mountain. However, you can (and you must) move the receiving antenna to the proper point.

The procedure is simple but tedious. First, plot the transmitter site on your map. Next, draw a line from the transmitter site to your locality.

Now, study the line and vicinity to see if it passes anywhere near a mountain peak sufficiently higher than the transmitter site to have a chance of working. How much is "sufficient"? Try any of them and see—there's no rule to guide you!

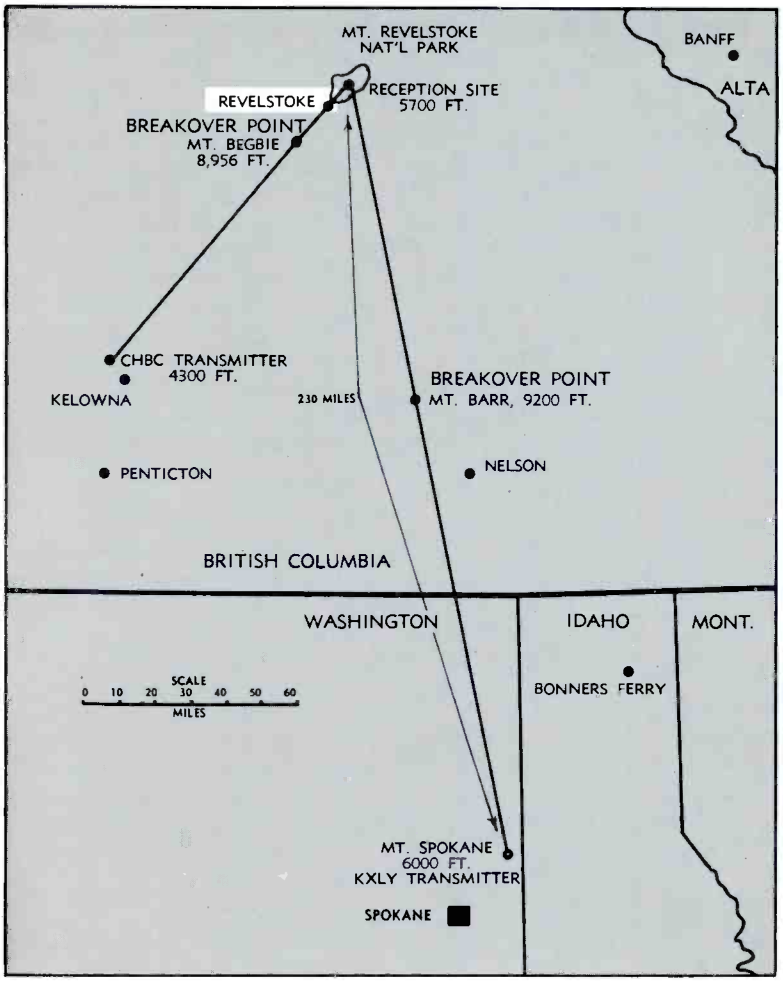
If you find such a peak, draw another line from the transmitter straight through the crest of the



peak and extend it to your area. Along this line somewhere, you should find your signal.

To find the exact spot — and knife-edge signals are funny, they're either there or they're not, and the area where they exist is usually small and well-defined — you have to go out on the ground and look.

Stephens uses a dipole and portable field-strength meter; with this combination, he located Channel Two signal which he estimates at 150 microvolts. It occupies an area only some 300 feet wide; outside this area, nothing.



Don't be surprised if your received-signal area turns out to be a bit inaccessible. Stephens' antenna site is 5,700 feet up on the side of Mount Revelstoke, some 800 feet from a trail (not kept clear during the winter) and 18 miles travel from town. His cable run is only 3 3/4 miles, but this is straight down the mountain.

And don't expect the same luck Stephens had. Formerly, he had been getting Channel Two on a receiving site at the 1,500-foot level. However, when he found Channel Four at the 5,700-foot mark he probed again for Two and found it only 150 feet away! Thus, one antenna site does it for him—but as we said, don't expect this kind of luck.

When your signal is coming in by knife-edge, be prepared for some surprises. You *may* have to use elaborate antenna systems — but again, you may not. For instance, Stephens has no signal at all 30 feet in the air; it's all right down on the deck. He uses four 10-element yagis stacked horizontally to receive Spokane, and a set of Quads on Channel Two.

He has found that a side hill gives the best signal; peaks are useless as the signal disappears entirely. His antennas are between 20 and 30 feet above ground; snow depth in winter at the antenna site is 18 feet.

Aside from the fact that it must be fairly maintenance-free, Stephens' trunk from antennas to town is conventional. He uses the Benco line of gear; his preamps are B4 transistorized boosters and he has T-amps every 1,230 feet along the line. The line itself is aluminum-shield foam cable, and carries 40 volts DC to feed the line amps. The preamps are fed from a 6-volt "hot-shot" battery at the site.

The line amplifiers *do* create one problem not common elsewhere, Stephens reports. Each is above ground (the cable itself is buried except for the last half mile) on either a pole or a tree—and before snow came this winter, the line was suffering bear troubles. Twice, bears wrenched the line at an amplifier point—the first time, the bear chewed the aluminum cable in two!

"This," groans Stephens, "may create a problem next summer."

Bears, though, have nothing to do with knife-edge reception. A few closing pointers may be helpful to you in your search for signal: For best results, the mountain should be halfway between transmitter and receiver. If it is closer to the receiver, signal is stronger but occupies a smaller area. If closer to the transmitter, signal is weaker but more widespread.

One of the major characteristics of a knife-edge signal—and one which makes it extremely useful

(*Continued — Page* 20)

Mis-match? Ghosting? Garbled Audio?

CATV REFLECTIONS

— PART TWO —

by Jacob Shekel
Spencer-Kennedy Laboratories, Inc.
1320 Soldiers Field Rd., Boston 35, Mass.

Introduction

Last month[1] we discussed the effects of reflections in CATV transmission lines, with special emphasis on the tolerances that will insure ghost-free pictures. In particular, we found that the length of cable between the point where the reflection originates and the point where it is observed has two opposite effects on the echo. On one hand, the reflection is delayed by going through the cable, and its effects become more objectionable as this delay increases; on the other hand, the reflected signal is attenuated by the cable before it reaches the observer. As usually happens when two trends work in opposite directions, there is a condition when they balance each other and result in a maximum—or minimum—combined effect.

Fig. 1 shows plots of the maximum return loss that can be tolerated in an RG-11/U coaxial line. The attenuation of the cable—and the resulting plots—depend on frequency, and the two curves apply to the two extreme frequencies of the VHF TV band. It appears that the distance where the two effects balance varies between 250 ft. (at channel 2) and 120 ft. (at channel 13). At this distance, the tolerances on reflection are most severe; this is the distance that causes a delay large enough to make the ghost objectionable, and yet does not attenuate it enough to make it invisible. The minimum of the curve is rather shallow, so that particular attention should be paid to reflections that originate at a distance of 50 to 600 ft. down the line.

It so happens that spacings between taps on a distribution line, or between a tap and an amplifier, tend to be in this critical region. This puts very severe specifications on the match of these components, as can be seen on Fig. 1. If the distribution line is RG-11/U coaxial cable, the return loss of the amplifiers and taps has to be better than 24 db at the low band, and at least 18 db in the high band.

Capacitive taps

A popular method of tapping the distribution line is shown in Fig. 2. The center conductor of the drop line is connected to that of the feeder line through a small capacitor. Tap-off loss (feeder to drop line) depends on the product Cf of the capacitor value C and the frequency f, and decreases when this product is increased. Values of C usually range between 1 and 10 pF.

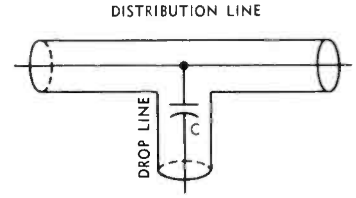


FIGURE 2
CAPACITIVE TAP ON DISTRIBUTION LINE

The discontinuity introduced by the tapping capacitor may be quite small, but the resulting reflection in most cases is larger than the critical value. The *Theoretical* return loss in the distribution line is 6 db higher than the *theoretical* tap loss to the drop line. This is shown in the following table, with the computed values for the Cf product (f in mc, C in pF):

Tap loss (db)	10	12	14	16	18
Feeder line return loss (db)	16	18	20	22	24
Cf product (mc x pF)	760	570	440	350	280

In practice, tap loss will be higher and return loss will be lower than the theoretical values, so that the difference between them shrinks to even less than 6 db. A capacitive tap, at a frequency where the actual tap loss is 10 db, will have a return loss not higher than 13 or 14 db.

Comparing this table and Fig. 1, we may conclude that a capacitive tap in an RG-11/U feeder *may* cause visible reflections if its tap loss is lower than 18 db in the low band, or lower than 12 db in the high band. Translated to capaci-

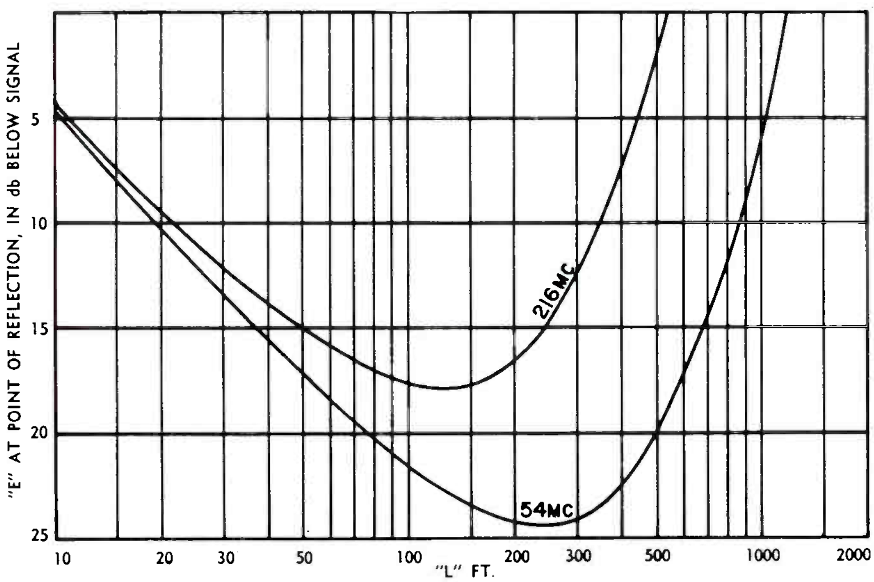


Figure 1. Minimum permissible return loss in RG 11/U coaxial cable as a function of the distance between point of observation and source of echo.

[1] J. Shekel, "Reflections in CATV transmission systems", TV Horizons.

tance values, this applies to capacitors of 4 pF or larger in wide-band (channels 2-13) systems, and 6 pF or larger in low band (channels 2-6) systems.

Reflections between taps

An actual observation of "ghosts" due to reflections from line taps is shown in Figs. 3 and 4. Two capacitive taps, with 8 pF capacitors, were mounted 250 ft. apart on a feeder of RG-11/U cable; a TV receiver was connected to the drop line from one tap, and the drop line from the other tap was terminated with a matching resistor (return loss better than 26 db). A signal was fed into one end of the distribution line, and its other end was terminated by a similar matching resistor with the same specified return loss. This simulated system is really better matched than a practical system, because seldom are there such good matches to be found at the end of drop lines; but even under these conditions there were perceptible ghosts on the screen, due to the reflections from the tap.

Fig. 3(a) is a schematic of the simulated system. The signal used was a standard test pattern of a TV station. The resulting picture is shown in Fig. 3 (b), and the reflection is visible as a "ghost" displaced to the right of the pattern. At this spacing between the taps, the reflection is only 5 db above the minimum perceptible value of Fig. 1. The second picture, Fig. 3(c), that does not have any perceptible ghost, was obtained when the capacitive taps were replaced by another type of tap, that will be explained in the next section.

Fig. 4 shows a more extreme case that occasionally may result, if a customer disconnects his set from the drop line, or if the connection is accidentally broken. The signal that reaches the end of the drop line is fully reflected from the open end, and is radiated back into the distribution line. If the capacitor in the tap and the length of the open drop line resonate at a frequency within some TV channel, an exceptionally strong reflection will occur. The result is shown in Fig. 4 (b).

Directional couplers

One way to eliminate the reflections would require careful engineering of the impedance match of the amplifiers and taps in the distribution trunk. Fig 1 shows that if the return loss is larger than 24 db, no reflections will be perceptible as ghosts. It is not easy to obtain

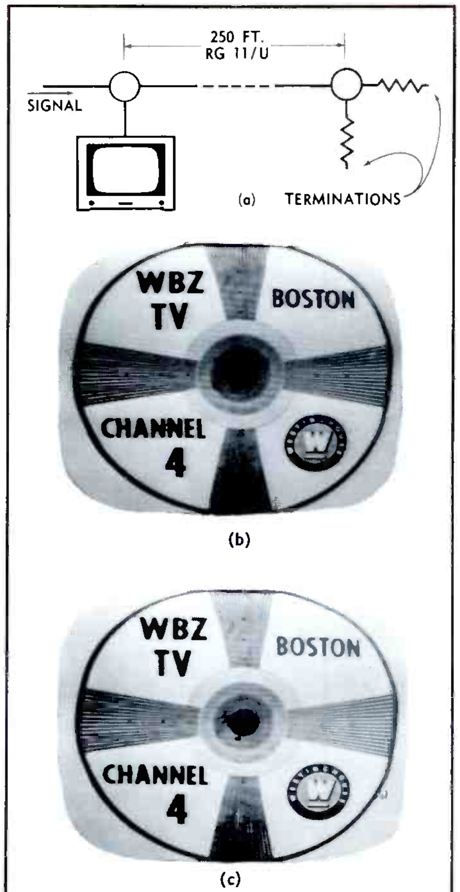


Figure 3

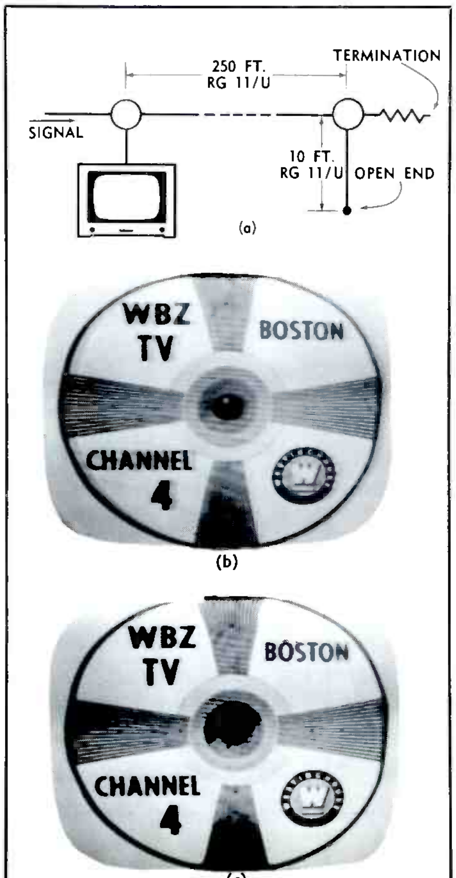


Figure 4

such a match across the entire band of channel 2-13, and it may strongly influence the cost of the components. In particular, the capacitive tap would no longer be a simple connection that can be installed by piercing the distribution line. Furthermore, even if such specially engineered components were used in a system, they would offer no protection against accidental sources of reflections, as that in Fig. 4.

Another way to combat this ghost problem is to minimize the *effect* of reflections. Since the reflected signals travel in a direction opposite to that of the desired signal, this can be done by a tap whose coupling depends on the direction in which the signal travels.

Such a tap is called a *directional coupler* and is shown schematically in Fig. 5, with typical values of coupling loss between pairs of terminals. The signal fed into the

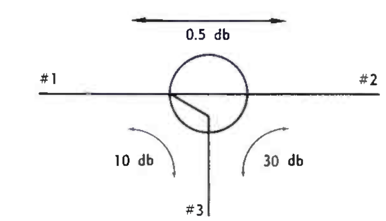


FIGURE 5
DIRECTIONAL COUPLER TAP: SCHEMATIC REPRESENTATION AND TYPICAL INSERTION LOSS VALUES BETWEEN PAIRS OF TERMINALS.

drop line at terminal #3 will be, in this example, 10 db below the signal that enters terminal #1, but 30 db below any signal that goes into terminal #2. If this tap is mounted in a distribution line, so that the desired signal passes through it in the direction from #1 to #2, it acts as a tap with a tap loss of 10 db; but any undesired reflection, that travels in the opposite direction, will have a tap loss of 30 db. The echo/signal ratio in the drop line is therefore 20 db lower than the ratio on the distribution line. (This value, the difference between the tap losses of signals that travel in opposite directions, is the *directivity* of the coupler).

Returning once more to Fig. 1, it is clear that an improvement of 20 db in the echo/signal ratio will completely eliminate any ghosts in the high band. Even in the low band, the critical return loss is reduced to 4 db (at most), and almost any component can be manufactured to well within this specification without difficulty. A directivity of 24 db or more will guarantee

ideal building block for any tv system—matv, cctv, etv, catv

The new MX series is typical of the creative engineering employed in all Blonder-Tongue Master TV system products. This factory-tuned filtered/mixer splitter requires no alignment in the field. With any system it provides filtering action, minimizes loss and permits balance of signal — on up to 8 channels. Ends the problems faced in mixing adjacent channels — whether they are equal, or they have to be equalized.

The MX is both efficient and economical to use. You don't pay for channels you don't need. You can buy a factory pre-tuned MX for precisely those channels for which it is needed.

The MX series consists of 4 separate types of units: (1) *Band-pass Filters, from MX-2, to MX-13,* (Including MX-FM) — can be used separately or with the MX series bases to form mixers or splitters. Pre-tuned to the desired channel. (2) *Mixing Base, MX-LB* — Mounts MX series filters. Accommodates up to four lo band (MX-2 thru MX-FM) filters. Also, up to three hi band filters can be mixed with lo band filters on an MX-LB. (3) *Mixing Base, MX-HB.* Mounts up to 4 hi band (MX-7 thru MX-13) filters. (4) *Hi–Lo Splitter/Mixer,* MX-M Mixes or splits hi band and lo band signals.

5 situations in which the MX is the ideal building block:

1. Combines signals from several antennas. Signals are equalized by: amplifying weak channels with single channel amplifiers (Blonder-Tongue CB); attenuating strong channels with a fixed attenuator (Blonder-Tongue FA).

2. Combines adjacent channels — Model MX-B serves as mixing base in both cases, because hi and lo-band channels are mixed in each case. Hybrid splitter (Blonder-Tongue TS-772 or MDC-2) used to combine outputs of the two bases to provide isolation between adjacent channels. Before mixing, channels are balanced by using single-channel amplifiers (CB) and fixed attenuators (FA).

3. Splits the signals from a broadband antenna as shown in #3. Also can split signals from a broadband amplifier.

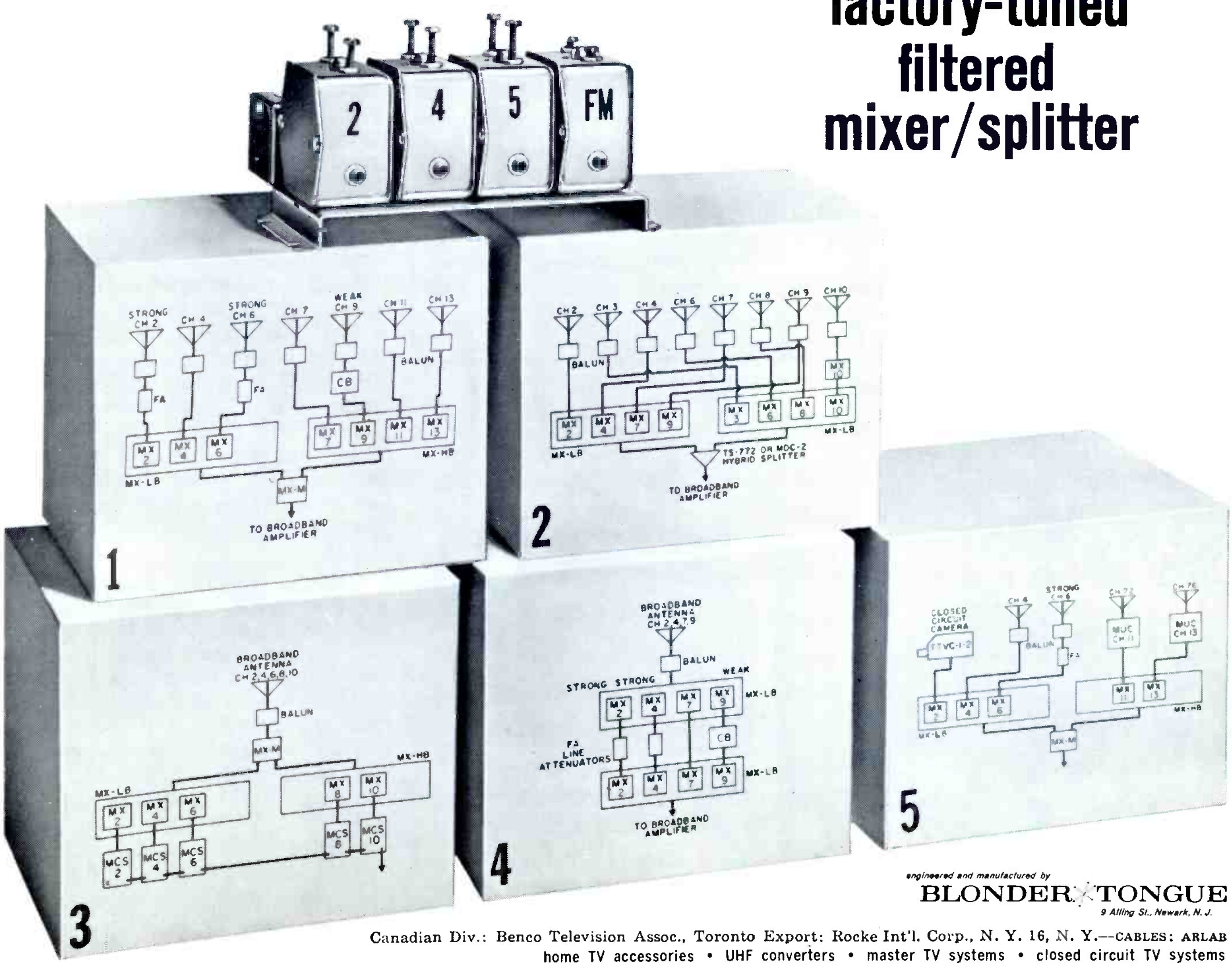
4. Balances signal strengths from a broadband antenna.

5. Mixes a CCTV camera into a Master TV system.

The MX is just one of a series of advance-engineered Blonder-Tongue products for superior Master TV system performance. Write today for details on the new FA series of fixed attenuators: MWT tuneable wave traps.

NEW BLONDER-TONGUE MX

factory-tuned filtered mixer/splitter



engineered and manufactured by
BLONDER-TONGUE
9 Alling St., Newark, N. J.

Canadian Div.: Benco Television Assoc., Toronto Export: Rocke Int'l. Corp., N. Y. 16, N. Y.—CABLES: ARLAB
home TV accessories • UHF converters • master TV systems • closed circuit TV systems

a ghost-free picture at any VHF-TV frequency, under all conditions.

Figs. 3 (c) and 4 (c) show the ghost-free picture obtained under the same conditions as 3 (b) and 4 (b), respectively, using directional coupler taps instead of non-directional capacitive taps. Both types of taps that were used in this experiment had the same coupling (10 db) to the desired signal, and the same specified return loss (16 db). The only difference is in the directivity, which is specified as 20 db minimum for the directional coupler, but is 0 db for the capacitive tap.

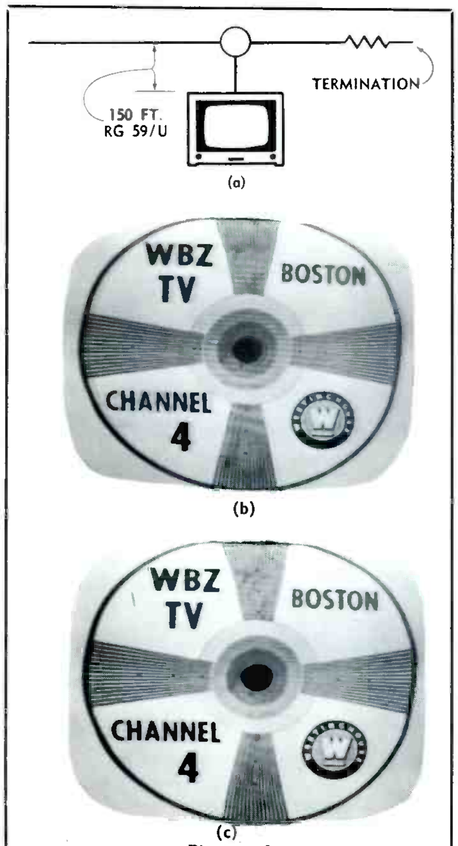
Reflections in the customer service drop line

Most customer service drop lines are much shorter than the critical length, so that any reflections that originate in them are not visible as ghosts. On the other hand, a regular commercial TV receiver does not present a good match to the line (even if a transformer is used) and the tap output of a capacitive tap is completely mismatched. The reflections are there, traveling up and down the drop line, and if this line gets to be moderately long, ghosts may appear on the screen.

Fig. 6 shows the picture obtained on a set connected to the tap through 150 ft. of RG-59/U coaxial cable. The higher loss of this cable results in a lower critical return loss—21 db for the low band—but receivers seldom meet this specification. The ghost in Fig. 6 (b) is produced by a double reflection: some of the signal is reflected from the receiver input terminals and travels up the drop line until it hits the tap; at that point it is totally reflected and returns to the receiver input.

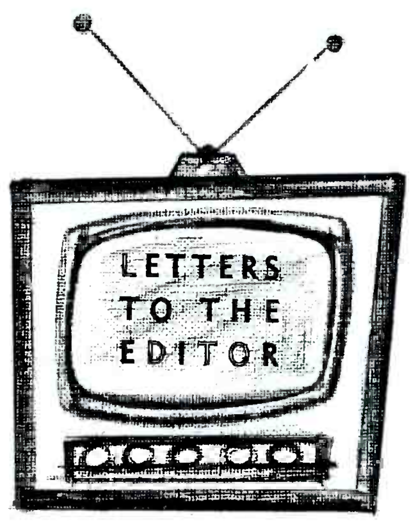
When the capacitive tap is replaced by a directional coupler type, the clean picture of Fig. 6 (c) is obtained. This is not a result of the directivity, but has to do with another property of the directional coupler: its drop line terminal is also matched to the impedance of the line, with a return loss of 16 db or more. Any reflection that does return from the receiver is absorbed in the tap, and only a very small portion of it is re-reflected towards the receiver input, compared to the full re-reflection from the capacitive tap.

It appears that directional coupler type taps have numerous advantages over regular non-directional taps. The next article in this series will be devoted to a more detailed study of this interesting CATV component.



(a) (b) (c)
Figure 6

Editor's Note: Although the original SKL photos clearly showed ghosting in photos 3b, 4b and 6b, it is feared much of this detail has been lost in the reproduction process. Take our word for it, they are there and most evident in the originals.



Editors are a strange lot. For their toil and long hours they are beset upon by all manner of men, many with smoking fire-driven typewriters. Frequently, however, the material contained within the postal missiles is worthy of sharing. For this reason alone Horizons Publications breaks a long standing precedent with this issue and makes available to the readers of Television Horizons some of the comments from within our industry.

Concerning Carter Mountain Case

"As a publisher, you are entitled to your opinion and by virtue of your position, you can give it widespread circulation.

"I refer specifically to your editorial in the February 1962 issue regarding the Riverton, Wyoming case. I would agree with you that this decision should apply to boosters as well as community antenna systems. Neither should be allowed to destroy the only available means of a community's self-expression. No responsible broadcaster condones the installation of booster stations in another broadcaster's backyard.

"By all rights, I should be the last one to defend KWRB-TV. This station, as you point out, picks up many of our programs off the air. Yet we are competitors for coverage in northern Wyoming. This disadvantage, however, is offset, at least in my mind, by the fact that this station is rendering a real service and a free service to all people in its coverage area and not to a select few whose homes are easily accessible by telephone poles and who can afford to pay for television reception.

The engineering report which you make regarding the facilities and reception of KWRB-TV is so biased that I cannot help but question your motives.

". . . Compared to the operation of the ordinary cable system, the technical problems which a station such as KWRB-TV faces are enormous. The profit potential is virtually negligible. But the service rendered is great, particularly in an area where other forms of entertainment are almost non-existent.

"Many of these same cable operators seem to forget that we are the people who built their systems. Now, they would not only bite the hand that fed them but they would eat us whole if they were given the opportunity. I know well the problems of the small town television operation and I have great respect for the people who operate KWRB-TV. I cannot see that a CATV system would be rendering a real service by knocking out the

(*Continued — Page* 20)

CATV DESIGN BOARD

Discussion: INTEC ABB-9

By ED CALDICOTT
Design Engineer

The INTEC-ABB-9 (manual gain control) and ABB-10 (automatic overload control) are fully transistorized low-band, broadband amplifiers for use in CATV systems. They provide performance comparable to that of conventional amplifiers, while requiring only one-tenth as much AC input power. In addition, they provide virtually unlimited operating life without the necessity of periodic maintenance checks, due to the fact that transistors have no inherent life limit.

Because power drain is so low, the ABB-9 and ABB-10 also include an emergency built-in battery supply. Should the AC input power fail, a relay automatically switches the amplifiers to battery operation until AC power is restored. The batteries will provide 24 hours of operation. Therefore, a localized power failure will not affect a CATV system using ABB-9 and ABB-10 trunk amplifiers.

Electrical Ratings:

Bandwidth: 53 - 100 mc.
Flatness: ± 0.25 db
Slope: 5 - 7 db
Gain: 35 db at Channel 6
Output: 0.2v/channel for one amplifier
0.07v/channel for 10 -20 cascaded
Manual Gain Control: 4 db
A.O.C. (ABB-10): 2 db output increase for 10 db input increase

Installation:

The ABB-9 and ABB-10 are enclosed in drawn aluminum cans. When mounted with the connectors and controls facing downward, they are weatherproof. Since they also have a built-in power line filter, they can be installed directly on a pole cross-arm or other support, without additional enclosure. A lightning arrestor and a good driven ground should be used.

Recommended output levels are from .07 volts to 0.2 volts on the highest channel, depending on the number of amplifiers cascaded. If less than 5 channels are carried, higher levels per channel may be used. Based on an operating gain of 32 db at Channel 6, input levels of 2,000 to 5,000 microvolts can be used (all signal levels are picture carrier, per channel, as read on a field-strength meter.)

It is recommended that the ABB-9 be operated with the manual gain control set to reduce the gain by 3 db or less from maximum. For A.O.C. operation (ABB-10), the output should first be measured at maximum gain in the manual position. Then switch to A.O.C. and reduce the output level by 3 db. Where the input levels are such as to require more than 3 db reduction to obtain the desired output levels, the input should be reduced with attenuator pads.

Alignment:

The alignment of a transistorized broadband amplifier will seem strange at first, compared to that of a tube-type. This is due to the coupling between input and output circuits of each transistor.

Alignment is done with a conventional set-up, using a wideband sweep generator, adjustable attenuator, crystal detector, 75 ohm load, and an oscilloscope. The gain control should be set up to the normal operating point, if known, or 2 db below maximum. When aligning the ABB-10, the gain control switch should be in the manual position.

Remove the amplifier from the case, and if possible, set it on a metal topped table or on a sheet of metal with a sheet of cardboard or heavy paper between the amplifier and the metal. This will stimulate the slight de-tuning effect of the case. The coil adjusting screws and transistors should be facing up. Use maximum scope gain and the lowest sweep signal input that will give an adequate scope pattern.

a) L1, L2, L5, and C1 (located under the chassis between L1 and the second transistor socket) as a group determine the overall bandwidth and slope.

b) *L1* principally determines the shape of the low end response (54-65 mc) and the overall slope.

c) C1 affects the high-end shape and top frequency.

d) *L2* and *L5* as a pair permit changing the sharpness of the high end, and the top frequency, by increasing one coil and decreasing the other.

e) *L3* is very broadly resonant, and should be set for maximum amplitude at 70 mc. If this coil is de-tuned from this point, the signal level point where overload occurs will be reduced.

f) *L4* is also broadly tuned, and should be set approximately to midband, but should be adjusted for best flatness of the overall response.

g) *C3*, located at the fourth transistor socket, varies the effective Q or sharpness of the tuning of L4, and is useful in obtaining the best overall flatness.

After obtaining the desired shape and bandwith, final slope adjustment is made with L1. Then all other adjustments should be retouched, if required. Be sure to tighten the coil lock-nuts before putting the amplifier back in the case.

The emergency power operation may be checked by disconnecting the AC cord from the outlet. Gain should not fall more than one db. A greater decrease indicates a weak battery. If the relay functions, but the output disappears, check the battery spring contacts and the relay contacts.

Trouble Shooting:

Since the total power input is low and all components are oper-

(*Continued — Page* 20)

CANADIAN CATV OPERATORS SAY . . .

"Vive la Difference!"

by

MR. I. SWITZER

Co-Ax TV Ltd.

Estevan, Saskatchewan

Canada

— PART TWO —

A previous article has described how Canadian CATV systems subsidize the operation of border UHF translators to provide broadcast service in the immediate area of the translator and to provide signals at a greater distance for distribution on the CATV system in Canada. Since the CATV system usually depends very heavily on the translator system the design of the whole UHF translator system, both transmitting and receiving ends, warrants careful attention. Successful operation of the UHF system is so important that professional consultation is warranted. The frequencies of UHF translators are close enough to the 960 Mc common carrierband that techniques from the 960 Mc band may be adapted for UHF translator engineering. Certain techniques used by tropospheric scatter communications systems may also be applied. Our systems have been designed by our own staff and checked by professional consultants.

UHF translators are licensed as broadcast stations and FCC regulations state quite clearly that relaying may be only a secondary function of the translator. This consideration has placed some restrictions on system design which are not faced by designers of pure point to point relay systems. In order to comply with the letter and spirit of FCC regulation we require that our translator transmitting antennas have a beam width of at least 20 degrees to the half power points. This is a compromise between broadcast spread, gain and cost. Such an antenna (20 degree beam width) has a gain of 18 db over isotropic. A system designed for point to point use at these frequencies would probably use an antenna having a beam width of only 8 degrees and a gain of 26 db.

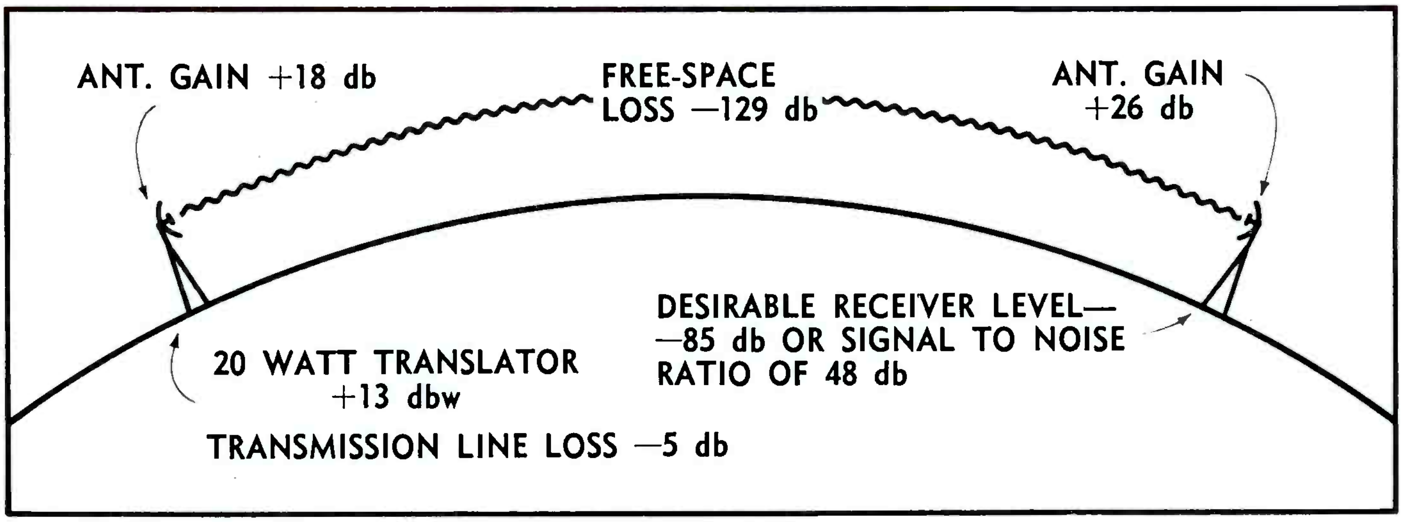
The next step in system design is choosing sites for transmitting and receiving antennas, and tower heights. Sites are chosen with regard to available primary signal for the translator, availability of power, and natural advantageous terrain features. Receiving antenna sites are similarly chosen. Tower heights are determined by accurate plotting of terrain profiles between translator and receiving sites. This aspect of the design is exactly analogous to point-to-point design and the reader is referred to standard manuals for 960 Mc design which are available from equipment manufacturers. We use 4/3 earth radius and provide for 0.6 first Fresnel zone clearance. We usually draw the terrain profile as though the earth were flat and then draw curved ray paths from translator to receiver. This permits us to study clearances for different cases of effective earth curvature.

Subsequent system design consists in determining minimum acceptable signal at the preamplifier or converter input and then working back through the system losses and gains to arrive at a translator ERP (effective radiated power). These quantities are tabulated and gains and losses distributed among system components in the most economical manner. This can best be illustrated by an example.

The system under consideration is to provide two TV channels over a distance of 48 miles with towers 300 feet high at each end.

Design work of this type usually uses the dbw as a unit of signal strength. This means decibels relative to 1 watt. A 10 watt translator is thus said to have an output of +10 dbw. A signal level of —100 dbw received by an antenna of 50 ohm impedance is equivalent (by application of Ohm's law) to 70 microvolts. The dbw is a convenient unit because system losses and gains may be conveniently expressed in db and added or subtracted to arrive at required parameters.

Design begins by consideration of the preamplifier at the receiving antenna. Because UHF transmission line losses are very high it is almost mandatory that this preamplifier be placed at the top of the receiving tower close to the antenna. Theoretical design begins with computation of preamplifier thermal noise. Thermal noise is the basic noise present in every amplifier and is a function of temperature and amplifier bandwidth. Special slide rules (like the one by Andrew Antenna Corporation) facilitate these calculations. Thermal noise at ordinary temperatures and with an amplifier of 8 Mc bandwidth is —135 dbw. To this figure we add the amplifier noise figure and the desired signal to noise ratio. Noise figure is dependent on amplifier design and for the time being we use the figure 10 db as representative of amplifiers commonly available (6299 ceramic tube in grounded grid configuration). A signal to noise ratio of 40 db is desirable. This means that the signal must be 40 db higher than the amplifier noise. Amplifier noise is now thermal noise plus amplifier noise figure. The desirable amplifier input is now —135 dbw+ 10 db + 40 db = —85 dbw. This is equivalent to



about 450 microvolts across 50 ohms or 1100 microvolts across 300 ohms. This is in agreement with practical experience with preamplifiers of this type. Desirable preamplifier signal is thus set at —85 dbw.

Since there is no restriction, other than economic, on the gain of the receiving antenna we may choose the best antenna that we can afford. This is usually a parabolic antenna with a diameter of ten feet. Such an antenna has a gain of 26 db. This is subtracted from the required preamplifier signal to give us a figure of —111 dbw as the required signal to the receiving antenna.

Our design slide rule gives the free space loss for a path of 48 miles at 850 Mc as 129 db assuming adequate clearances along the path. When added to required antenna input we get —111 dbw + 129 db = 18 dbw as the ERP required at the translator. This is equivalent to about 65 watts. We may use a 20 watt translator (output +13 dbw), a transmission line of 5 db loss and a transmitting antenna with 18 db gain. This would give an ERP of 13 dbw — 5 db + 18 db = 26 dbw. This is 8 db higher than our required minimum and would give us an 8 db margin for equipment depreciation and fading.

The calculations may now be summarized in reverse:	
Translator output 20 watts	+ 13 dbw
transmission line loss (300′ of ⅞″ line)	— 5 db
transmitting antenna gain	— 18 db
Effective Radiated Power (ERP)	+ 26 dbw (400 watts)
Free space loss	—129 db
receiving antenna gain	+ 26 db
Input to preamplifier	— 77 dbw
Equivalent noise input of preamplifier (thermal noise+noise figure)	—125 dbw
Signal to noise ratio	48 db

Decreases in ERP due to aging of translator and increased path losses due to atmospheric fading effects will appear as a decrease in the signal to noise ratio in the received signal. It is desirable to maintain this signal to noise ratio as high as possible. Consequently it is desirable to study all the parameters affecting system performance with a view to increasing this signal to noise ratio and thus providing more protection against fades and equipment depreciation.

System performance may be improved 7 db by using a 100 watt translator. This increases tranlator output from +13 bdw to +20 dbw. The 100 watt amplifier required costs about $5,000 per translator unit and increases power and maintenance costs.

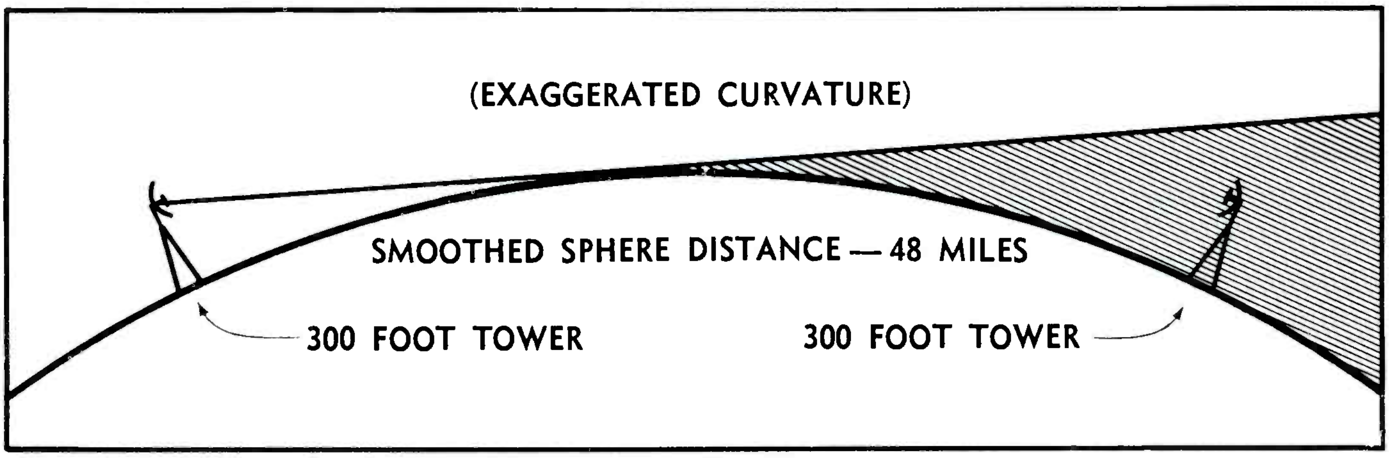
Transmission line with lower loss may be used. The ⅞″ line used in the example has a loss of about 1.5 db per 100′. Line of 1⅝″ size may be used having a loss of 0.85 db/100′. This would have a total loss of about 2.5 db for 300′ and would represent a system improvement of about 2 db. The cost increase over ⅞″ line would be about $600 per translator.

Transmitting antenna gain cannot be increased because of the broadcast nature of the translator. Free space propagation loss is an immutable law of nature and cannot be changed, except that the figure of 129 db may increase under certain atmospheric conditions or if terrain clearance is not adequate.

The receiving antenna specified (10′ parabola) is the largest that can be economically supported at 300′ height. A gain of increase of 6 db would require a 20′ parabola. Cost would be about $10,000 plus additional tower cost because of greatly increased loading.

The only remaining opportunity for performance improvement is in the preamplifier noise figure. In this regard the writer has investigated the application of parametric and tunnel diode preamplifiers. Parametric preamplifiers offer noise figures of 2.5 db (7.5 db improvement over conventional preamplifiers). Tunnel diode preamplifiers offer noise figures of 5 db (5 db improvement). The parametric preamplifier has been widely used in tropospheric scatter communications systems. Such amplifiers cost about $5,000 and contain an "active" element in the form of a klystron microwave pump oscillator and associated power supplies. Tunnel diode amplifiers contain only a solid state tunnel diode and associated bias supply (battery or solid state rectifiers). Tunnel diode preamplifiers are available with wider bandwidth than parametric preamplifiers.

Study of the design and areas of possible improvement indicate that the larger 1⅝″ size line is probably desirable. This line provides 2 db improvement at cost of $600 per channel. Addition of 100 watt amplifiers costs $5,000 per channel for 7 db improvement. This is rather costly and would be the "last resort" for improvement of system performance. "Exotic" preamplifier offer improvements of 5 to 7 db. These amplifiers offer the further advantage of permitting common receiving antenna and preamplifier for several channels and consequent economies. A parametric amplifier will usually accommodate 2 translator channels, while a tunnel diode amplifier could cover 3 or 4 translator channels simultaneously.



Both parametric and tunnel diode preamplifiers will be tested in translator systems to be constructed this summer. In one case it is hoped that the parametric preamplifier will permit use of a receiving antenna close to the CATV system saving a 10 mile cable run. The original tower had been sited some 10 miles from the CATV community because of consideration of terrain clearances. It is hoped that use of the parametric preamplifier will permit moving the receiving tower right up to the edge of community, thus saving the capital and maintenance costs of 10 miles of cable. UHF path in the latter case would be near grazing and the additional system performance required in this case would be supplied by the parametric preamplifier. In this particular case it will probably also be necessary to use 100 watt amplifiers for an additional 7 db improvement. The saving of 10 miles of cable runs justifies both expenditures if necessary.

(Continued—Page 20)

OUR MAN IN EUROPE

GORDON J. KING
Assoc. Brit. I.R.E.
Brixham, Devon, England

Of recent years UK relay operators have adopted a more scientific approach to the coaxial distribution of v.h.f. signals over large areas. This has resulted essentially from data collected from systems already in full operation and those under development and expansion.

As coaxial relay started life as little more than shared aerial sytems in blocks of flats and housing estates, there was very little information at hand in the early days revealing things like the cascading limits of repeater units, the values of intermodulation and noise that a viewer can be expected to tolerate and how system specification figures really tie-up with what the viewer sees.

Three major factors have thus been under consideration on this side of the Atlantic: (i) the deterioriation in signal-to-intermodulation ratio with increase in number of cascaded repeater units, (ii) the impairment of signal-to-noise ratio with increase in number of cascaded repeater units and (iii) the subjective viewing threshold of factors (i) and (ii). These have posed questions like "what intermodulation and noise specifications are required per repeater unit to avoid the signals at the remote end of x number of cascaded units falling below the subjective threshold" and "what is the economic design limit for repeaters to provide the required noise and intermodulation specifications at a total output made up of signals in a multiplicity of channels.

These things very much reflect into sytem design, of course, but before considering that, let us get a few definitions in relation to the foregoing.

Subjective Threshold

This factor associated with both noise and intermodulation is of great import since there is absolutely no point in talking about certain ratios of intermod and noise if they are without subjective association viewing-wise.

Tests have revealed that both noise and intermodulation on the British television system are just on the point of being invisible when the ratio in each case is about 40dB. At a ratio of about 46dB the picture is completely clear, while at a ratio of about 30dB the picture is poor. And at ratios below that the picture is distinctly unviewable (see Fig. 1).

We have thus called the 40dB ratio the "subjective threshold," and it is always our aim to keep both ratios above that value on all channels and at all points in the network. In some cases, of course, this is impossible from the noise aspect because the level of the signal at the master aerial may not permit this on all channels. Holding such a ratio from the intermodulation aspect at the remote point in a large system may also give problems, especially where nine or ten carriers are distributed via wideband repeaters. Network AGC systems (see past reports) assist considerably in this feat, and the noise performance (overall) is enhanced by the use of ultra-low-noise masthead amplifiers.

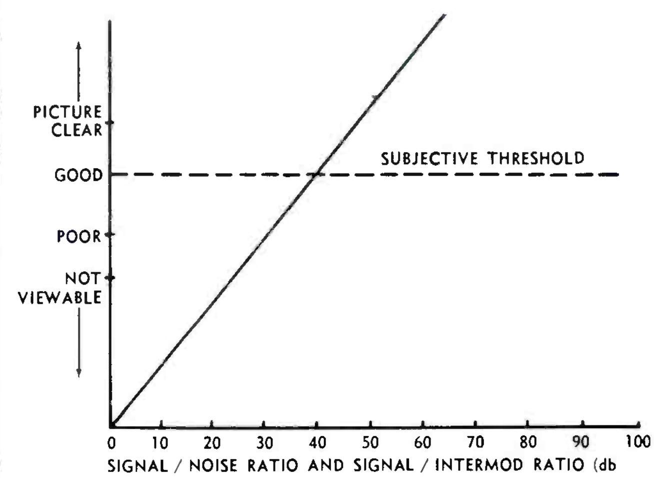


Figure 1 The subjective effect of noise and intermodulation. Also defining the threshold point.

Until very recently, most of our mastheads have featured valves, but the British Belling and Lee Company (Great Cambridge Road, Enfield, Middlesex) has recently launched a low-noise transistorised masthead. This is designed for clamping on a 1 in. dia. pole close to the aerial array and suitable weatherproof moulded plastic glands are provided for coaxial cable entry points. But a single transistor is employed, giving a channel gain of 14dB minimum and a noise figure of 2.5 to 3 on any channel in Bands I and III.

The masthead is designed to work in conjunction with a power-pack/filter unit either mains or battery operated, and the power-pack contains an integral filter for superimposing the direct voltage on to the signal carrying feeder. The impedance at both input and output is 75 ohms, and the power requirements are 8.5 volts at 1 mA.

Repeater Units And Equalisation

On any extended cable system we like to look upon the repeater amplifier and the preceding cable whose loss the repeater is equalising as a "repeater unit." We arrange this unit to have unity gain over the passband of the system (see Fig. 2). This is accomplished either by arranging the frequency-versus-gain slope of the repeater to match the frequency-versus-loss slope of the preceding cable or by the introduction of a suitably graded equaliser into the preceding cable network. For optimum equalisation, both methods are sometimes used simultaneously.

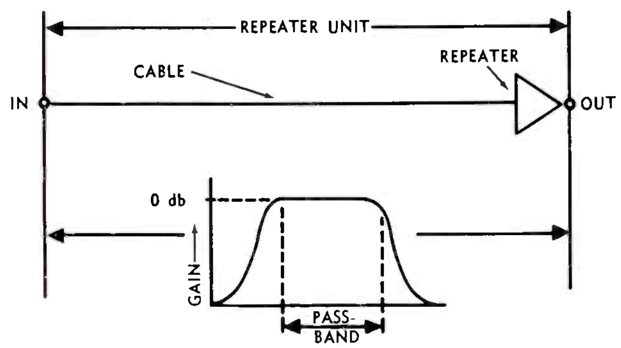


Figure 2 Definition of a "repeater unit".

There are two schools of thought on the merits and demerits of the two types of equalisation. One school deprecates equaliser units, since it says that an equaliser is nothing more than a frequency-selective attenuator (which is true, of course) and that it is wasteful to attenuate! This school also says that by tailoring the response of the repeater no loss is introduced, since by "turning down" the low-frequency response a greater high-frequency gain is possible. The school in favour of equaliser units says that there is far less complication in the design of a "flat" repeater, and that if a repeater response is sloped there is loss anyway. The battle is still raging, and in the meantime both ideas are in use and under development.

In their distributed type repeater, Belling and Lee Limited has incorporated a clever slope control. This works in conjunction with the first stage and is built around a bifilar-T filter system. This works extremely well in practice and gives a linear slope variation of the order of 6dB.

Cascadability

Thus, each "unit" is endowed with a specific noise figure and intermodulation figure, and so a single repeater unit based on the subjective threshold of Fig. 1 would have to provide noise and intermodulation ratios of not less than 40dB. This should not be troublesome, of course, and so far as noise is concerned most British repeaters have an equivalent noise value better than 5 uV. As a typical nominal input level (per vision carrier) is 5 mV, this produces a signal-to-noise ratio per unit of 60dB, which is well above the threshold.

Intermodulation ratios are in the region of 60dB at outputs in the region of 100 mV per vision carrier (e.g., repeater gain of 26dB), so on a simple single unit there is no trouble here either.

The trouble starts with cascading. Noise adds in a square law, which means that after ten units (with a signal-to-noise ratio of 60dB on **each** unit) the noise has deteriorated to 50 dB—still not troublesome. But we are down to the threshold point after about 100 units.

Intermodulation is more of a problem since it adds directly to each repeater unit. This means that as the number of cascaded units is doubled so the signal-to-intermodulation ratio drops by 6dB. In practice, however, there are two products of intermodulation, one which produces random beats and the other which (in the British television system) gives rise to "ghost" pictures on the required picture. It would appear that the latter follows the 6dB law, while the former follows a 3dB law (e.g., a 3dB drop in intermodulation each time the number of cascaded units is doubled).

Tests carried out over a system of repeater units have revealed that if each unit has an intermodulation ratio of 60dB, the intermodulation is down to the threshold point after about 10 units.

Clearly, then, intermodulation is our biggest bugbear, but by the use of a cable with an 0.068 in. inner conductor we are still able to carry trunk networks over three or four miles with ten repeaters, and it is possible to secure a "per unit" intermodulation specification better than 60dB in certain cases where there are fewer than 10 carriers distributed. To help in this respect, we usually distribute all sound signals at a level 6dB below vision signals, but we like to provide all subscribers with vision signals of OdB/mV at ±6 dB.

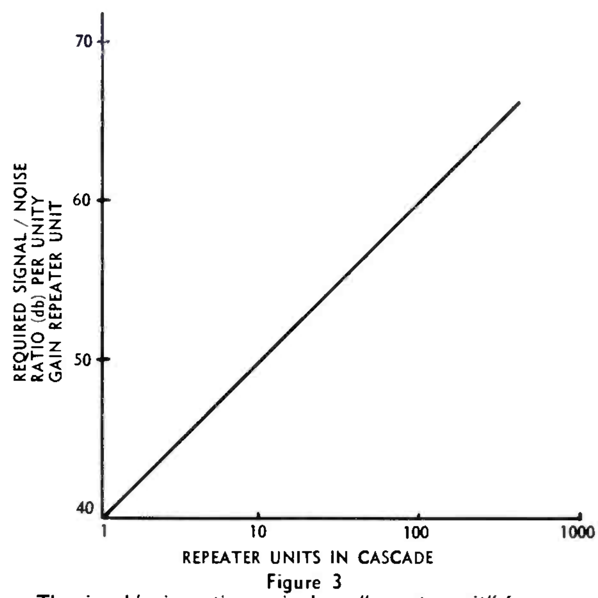


Figure 3
The signal/noise ratio required per "repeater unit" for providing "threshold" performance at the end of a system of a given number of cascaded repeater units.

Based on the foregoing, Figs. 3 and 4 are rather interesting as they show the noise and intermodulation specifications respectively required at each repeater unit to give threshold performance over a system of X number cascaded units. As we have already seen, a "per unit" signal-to-noise ratio of 60dB would result in the noise being at the 40dB threshold after 100 units, while for a similar intermodulation performance after the same number of units, each unit would require an intermodulation specification of about 70dB.

In practice it is, of course, highly undesirable to operate at the threshold point and margins of, at least, 6dB are given to both noise and intermodulation per unit.

There are various artifices of improving intermodulation performance over an extended system, and one is based on a progressive reduction of signal input level from the first to the final repeater unit in the system. But, of course, this is just the opposite to what is required to decrease noise. So although intermodulation is reduced, noise in increased. Nevertheless, it is sometimes possible to strike a reasonable compromise, having in mind that the noise is the least of the two evils.

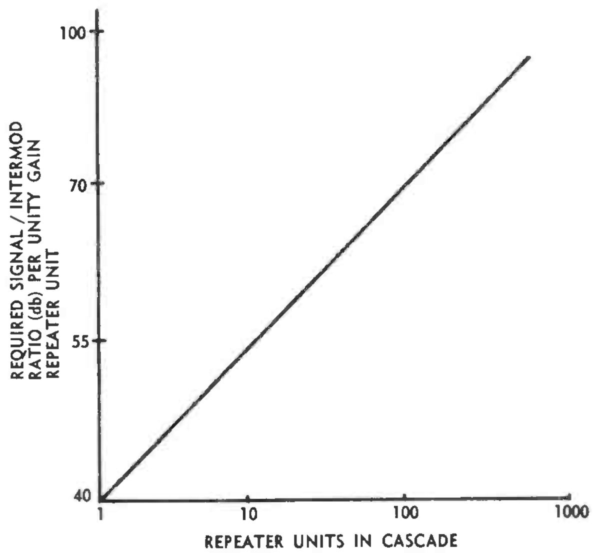


Figure 4
The signal/intermodulation requirements, as per Fig. 3.

As the intermodulation problem is so much related to repeater output power in total, thought is being given to the possibility of single channel units, integrated as a whole at each repeater system. This method would call for highly engineered filters, but it would probably be far better to add a small plug-in channel amplifier at each repeater system, as and when required for increasing the channel carrying capacity of a network, that hoping that there is going to be enough intermodulation margin available for extra carriers in a wideband repeater network. Small plug-in transistor channel units would be ideal. Larger power bridging units could, of course, be used to feed power over subscribers' spurs—these picking up their input signals from the output of trunk repeaters.

As a final bit of news from this part of the globe, a major franchise has recently been awarded to a radio/television dealer-controlled group of operators in the London area. Work is now in hand to install the system which will have a realizable subscriber potential in the 100,000 region.

MASTER TV ANTENNA SYSTEM GUIDE AVAILABLE

Blonder-Tongue has announced a new 30 page manual on the planning of master tv antenna systems. The booklet has been designed as a comprehensive and practical guide to all phases of the MATV installation. It outlines a variety of systems with examples, installation tips and a guide to equipment selection. The manual also includes a list of 12 "package systems" which B-T states will apply to 80% of all MATV installations.

The booklet may be obtained by writing to Blonder-Tongue at 9 Alling Street, Newark 2, N.J.

NEW CATV STEREO TUNER-CONVERTER

Telesystem Services Corporation, 130 South Easton Road, Glenside, Pa. is announcing a new "Tuner-Verter" FM headend unit. The Tuner-converter model HEFMT is an FM/stereo tuner and converter designed and engineered for use in CATV headend equipment. Problems of detection and remodulation of the audio and multiplex signal are eliminated by converting from rf to if and then back to rf operating frequency, without demodulating the signal.

The Tuner-Verter uses a 21 mc if, reducing beat and harmonic problems and features a separately peaked rf tuner and oscillator. No modification of existing equipment or auxiliary equipment is necessary for stereo and the complete unit fits a standard 19 inch rack.

NEW MEDIUM LEVEL SINGLE CHANNEL AMP

Benco Television Associates has a new medium signal level single channel television amplifier, model CAP-2. The amplifier is available for channels 2-13, and is recommended for medium level television signal distribution in CATV systems and ETV systems.

Gain of the unit is 65 db (with ACC disabled), and can be used in adjacent channel installations. A dual output provides linking of several units together.

NEW LOW COST TOWER

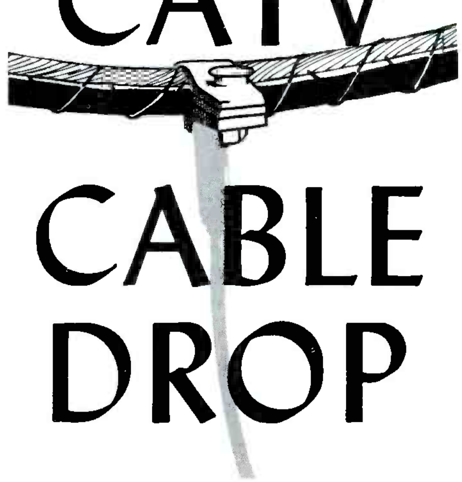
E-Z Way Towers, Inc., one of the largest and best known communication's tower manufacturers in the "under 100 feet category" has announced a new line of sturdy-economical towers that just may fit into your TV receiving applications.

Designed especially for quick-simple installation, the G-10 tower is available in 10 foot sections, weighing just 29 pounds each. For tv receiving services, the G-10 goes to 40 feet without guys or 60 feet with guys. Dealers price is $16.95 per 10 foot section. Write Clarence Jax, 5901 E. Broadway, Tampa, Florida for complete information.

OFF CHANNEL TELEVISION TRANSMITTER

A recent incident in Canada emphasized the unusual problems a CATV system can face, and the unexpected help that *can* come from the DOT (or FCC), when the chips are down.

CATV CABLE DROP



In a large metropolitan area, in Canada, CATV operators were puzzled by the gradual although persistent deterioration of reception on an American television station which operates adjacent channel to a local Canadian station. Reception became so bad at the head end of the Canadian CATV systems involved, that the U. S. channel was nearly useless much of the time.

Finally one of the Canadian CATV system operators effected made an accurate frequency measurement of the operating frequency of the Canadian station involved. Low and behold, the Canadian station had 'drifted' off frequency to such an extent that its sidebands were into the American signal. The Department of Transport was notified, and after customary measurements on their part, the Canadian offender was ordered back on frequency. Everything is cleared up now, and the Canadian transmitter remains on frequency!

CATV INDUSTRY FILM PLANNING UNDERWAY

13¼ minutes of information laden public relations material is already into production according to the NCTA. The industry's trade association adopted a *go-ahead* signal for the film at a recent Board meeting.

NCTA officials announced E. J. 'Manny' Spiro of Merit Productions, New York City is handling the project which many view as one of the most important steps taken by the industry this year.

(*Continued — Page* 20)

Model VIK 940 series

BROADBAND AMPLIFIER

ALL VHF TV CHANNELS AND FM

- FOR DISTRIBUTION
- FOR LINES IN SMALL SYSTEMS
- FOR LINE EXTENDERS

The VIKING BROADBAND AMPLIFIER is an amplifier designed for the future. It amplifies the entire low and high TV band and the entire FM band at 40 db.

It is designed with broadband tuning in each stage so that all tubes can be changed without bandpass change.

It uses passive output shaping for fine control of tilt without effect on operating characteristics.

It has an ultra low noise figure comparable to head end pre-amplifiers.

It does all this with only six tubes of two types, in either standard or 10,000 hour versions.

The features of the VIKING amplifier could only be achieved by the most advanced design techniques with the needs of the CATV industry in mind.

The all-band and FM coverage insures that no matter what TV or FM stations appear, this amplifier is equipped to handle them. The circuit design insures that the system operator need not "twiddle" coils or tuning cores with the exception of three tilt controls for line equalization. The proper bandpass is built-in. Since each interstage is tuned flat across the entire band, individual tube characteristics do not effect the tuning, and tubes may be replaced in the field with negligible effect on the bandpass.

Since only six tubes are used, four 6DJ8's (or 6922's), and two 12BY7A's (or 7733's), stocking tubes for the amplifier is simplified. These high-quality tubes, used in conservative operation, guarantee excellent stability and long life.

The input stage uses electronic impedance loading to achieve an excellent input V.S.W.R., and simultaneously, the correct impedance for optimum noise figure. All signals are handled at approximately the same level in the broadly tuned, non-peaked interstages, resulting in high, uniform output capability.

SPECIFICATIONS

BANDWIDTH: 54-108 mc / 174-216 mc at ± 0.75 db per band

GAIN: 40 db, min.

NOISE FIGURE: Lo band-4.5 db average
Hi band-7.5 db average

GAIN CONTROLS: Manual, to – 20 db, separate low and high band controls, bandpass remaining within ± 1 db.

TILT CONTROLS: Lo band-6 db / Hi band-5 db, flat within ± 1 db thru 27 db of cable at 88 mc and 40 db of cable at 216 mc

IMPEDANCE: 75 ohms, input and output

INPUT V.S.W.R.: 1.5:1 at full gain, maximum
1.7:1 at any setting of gain, maximum

TEST POINTS: –20 db., input and output

LEVELS FOR PASSABLE PICTURE:
(0 dbmv = 1 millivolt)

MINIMUM INPUT:
Lo band – 20 dbmv (100µv) per channel
Hi band – 16 dbmv (160µv) per channel

MAXIMUM INPUT: 40 dbmv (.1 v.) total per band for less than 1% cross-modulation

MAXIMUM OUTPUT: 64 dbmv (1.7 v.) total per band for less than 1% or 67 dbmv (2.5 v.) for less than 3% cross-modulation

TUBES: Standard Models-4-6DJ8, 2-12BY7A
Deluxe Models-4-6922, 2-7733

CONNECTORS: Type "F" or "UHF", trunkline; Type "C", test points

RECTIFIERS: Silicon

POWER: 117 V., 60 cps, 45 watts, 0.45 amps.

DIMENSIONS: 10" wide, 6⅝" deep, 5" high

SHIPPING WEIGHT: 9 pounds

Model No.	*Fittings*	*Tubes*
#VIK-940	F	Standard
#VIK-941	F	10,000 hour
#VIK-942	UHF	Standard
#VIK-943	UHF	10,000 hour

VIKING CABLE COMPANY
MANUFACTURERS OF COAXIAL AND C.A.T.V. EQUIPMENT
830 MONROE ST HOBOKEN, N. J OL 6-2020

CATV IN CANADA—*Continued from page 14*

The economics of the CATV system dictates extreme reliability of both translating and receiving equipment. This means careful, first class installation and maintenance of equipment. The public living within the normal "broadcast" range of such translators benefits from a professional standard of service usually uncommon in translator operation and the CATV system in Canada benefits from the availability of U.S. broadcast stations that form the economic basis of the CATV operation. UHF translators provide the only practical method of extending U.S. broadcast signals into Canada and at the distance involved, the CATV system provides the most economical method of home reception. The final solution makes everyone happy—U.S., public, CATV operator, and Canadian subscribers.

CATV DESIGN BOARD

(*Continued from page* 11)

ated conservatively, any failure which may be experienced is most likely due to transistor failure. First check for the presence of —10 volts and —22 volts at the two ends of the 430 ohm resistor (R23 in the ABB-9 and R24 in the ABB-10). If these readings are correct, try replacing one transistor at a time.

A defective transistor can usually be located by measuring the emitter to chassis voltage. Reading from the input stage first; these should be approximately —0.8V, —0.8V, —2.2V, and —4.2V. The fifth transistor of the A.O.C. (ABB-10) amplifier should read —1.0V.

Extensive tests by transistor manufacturers have indicated that most transistor failures occur in the first 100 hours of service. After this period virtually unlimited life can be expected.

KNIFE EDGE

(*Continued from page* 5)

for CATV use—is its amazing consistency. Signal fading is almost completely absent. This means, among other things, that no AGC is necessary on the pre-amps—and allows you to use maximum gain at all times.

We know of no other installation using this type of signal—but there ought to be. Right now, Stephens claims the world's record with his 230-mile Channel Four reception. *Any challengers?*

CABLE DROP

(*Continued from page* 18)

The film is slated to be made available to CATV systems around the country for showing to PTA groups, Scouts, State Legislatures, City Councils, fraternal and service organizations and wherever others will benefit by its knowledge.

PERLMUTTER TO PICTRONICS

Louis Perlmutter joined *Pictronics Corporation,* 236 East 46th Street, New York City on April 2 as the new Executive Sales Manager, and a member of the Board of Directors. Pictronics is a leading supplier-installer of closed circuit video applications in the New York area.

LETTERS

(*Continued from page* 10)

only free service available in west-central Wyoming. We may indeed (as you say) be 'one horse telecasters' but at least the horse is not stolen."

Joseph S. Sample
Garryowen Broadcasting
System KOOK-TV
Billings, Montana

Mr. Sample:

The question here should not, we feel, become one of whether KWRB **or** *the CATV system should be allowed to survive, but rather one of how the two can exist side by side, one supplementing the other.*

It has been our experience, in this case, that the broadcaster involved based his argument not so much on what he is doing for the community, but rather what he would not be doing if Carter Mountain Microwave should be allowed to bring CATV signals into town on microwave. IF, the broadcaster said, Carter Mountain is allowed to bring microwave signals into town for distribution, we will lose our local viewers.

In short, it would appear that the real basics in question were never questioned. We, simply, would like to see the case-to-point given the opportunity for settlement with all sides given an equal opportunity to be heard, with **all** *phases of the questions put up for observation and evaluation.*

Then, if Carter Mountain should lose, we would at least be confident it was because all portions of the case had been weighed equally, and in the best of American tradition, the decision reached was a fair and equitable one based upon all the facts, not just a portion of the truth.

Editor

Concerning G-Lines

". . . I saw Helena's line when they were building it. At the time they couldn't give me any information as they weren't sure themselves the line would work. So, after much trial and error, I figured out a system for myself. AMECO sent a representative here in 57 or 58 to survey my installation, and soon adopted G-Lines themselves. I now have four miles in operation, although I originally had six miles of line. Two and a half miles were lost in a forest fire which I replaced with coax buried underground. I have no ghosting on my line, and I run approximately two miles between amplifiers, high and low channels combined. I use Blonder Tongue MLA's on the antenna run. Snow has no effect (we have the highest antenna run west of the Rockies) although the launchers do fill up with snow and the line gets as big around as a man's arm. Losses do not seem to go up however. I have used copperclad wire and at one time had over two miles of aluminum wire (neopreme jacket) before the fire. The aluminum wire has more loss than the copper, but otherwise held up OK. I built everything myself, and the only cost was pipe, wire and time. Always happy to show it to visiting 'firemen'."

H. Jacobsen
Western TV
Deadwood, S.D.

TVH Sure Gets Around!

"Have just returned from an eight day trip into the eastern parts of the country. I came across copies of Television Horizons in numerous spots along the way, which was most interesting as we found one copy being read in the FCC office by the Microwave Application Engineers.

"Please be kind enough to send me twenty copies."

Paul B. McAdam
Western Microwave
Livingston, Montana