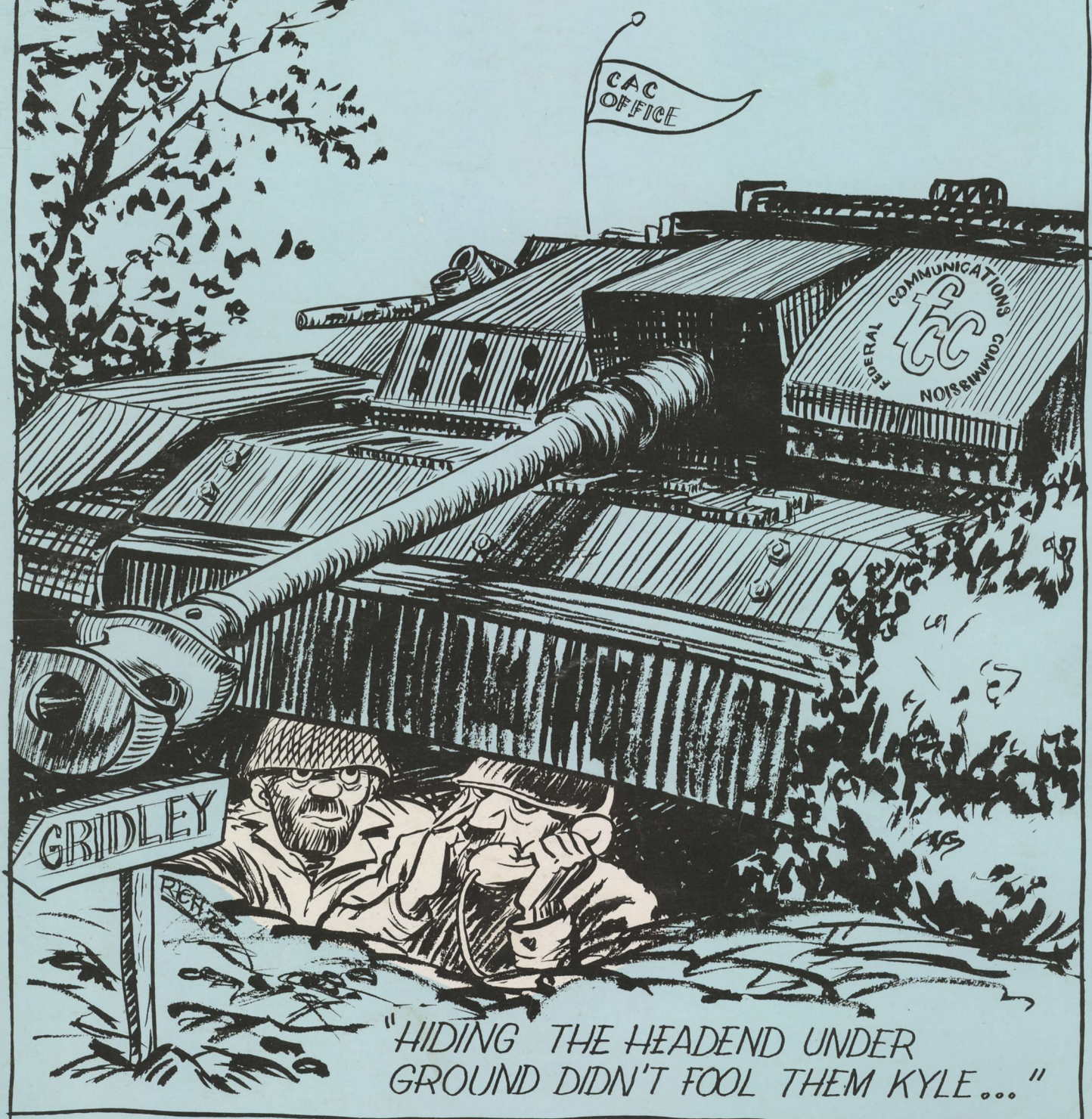
CATJ

MAY
1976



OAK

subscription Pay-TV products

...provide a choice for premium cablevision... secure scrambling...unscrambling with perfect picture quality...complete headend control...and minimal headend equipment investment...and keylock option.

Increase subscriber revenue WITHOUT rebuild, WITHOUT sacrificing current channel capacity, and WITHOUT excessive equipment cost, WITHOUT necessity of dedicated channels.

Choose a single channel converter, single channel decoder, or a converter-decoder combination providing up to 31 channel capacity. Oak has designed a pay TV product for every size cable system!

Oak units are housed in attractively designed, compact cabinets with a leatherette-type finish.

A single detented rotary selector on each unit controls both "normal" and "premium" channel selection, with automatic unscrambling of the "premium" channels.

Products are manufactured and serviced in Oak's North American facilities to assure U.S. and Canadian customers prompt, efficient, and economical service.

For complete information, call or write the CATV Division sales department.

OAK Industries Inc.

COMMUNICATIONS GROUP / CATV DIVISION

CRYSTAL LAKE, ILLINOIS 60014

TELEPHONE: 815•459•5000 • TWX: 910•634•3353

MULTI-CODE — multi-channel converter-decoder

Decodes channels specified by the system operator for secure scrambling and incorporates an OAK Jewel Case AFC or Trimline AFC varactor converter to provide basic converter functions. Economical scrambler and modulator are provided for headend control of video scrambling.

ECONO-CODE — single channel decoder

Designed for 12-channel or other non-converter cable systems. Provides economical method of increasing subscriber service and revenue. Headend scrambler and modulator are provided for headend control of video scrambling.

SCC — single channel converter

Adds a channel for pay-TV by converting one mid-band channel to Channel 3 or 4. Unnecessary converter or headend equipment cost is eliminated — merely add a modulator to existing equipment. Knob on front of unit allows for convenient fine tuning of "Premium" channel.

You won't have to face this

There are certain TV programs people in your community just don't want their children to see or hear. So Blonder-Tongue has developed a unique Home TV Terminal for pay cable that scrambles *both* picture and sound.

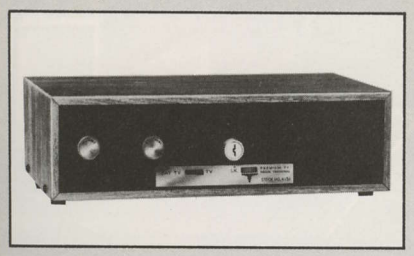
Other decoders on the market today, scramble *only* video. With audio in the clear, adult programming sound can come through loud and clear, even if the children can't see what's going on. This can cause problems. Further, non-subscribers can listen in and enjoy important sports events, even if they can't see them. It's also easier for subscribers to cheat when "video only" is scrambled.

And Blonder-Tongue assures complete parental control. A special key lock built-into the terminal provides the parent with complete control over programming. When the parent leaves the house, he or she simply locks the set and there is no way for the babysitter or child to see or hear the pay-TV channel.

There's more to recommend this new decoder. A "barker" channel is available for operators who originate their own programming. On the other hand, the operator can use the "barker" channel for music.

The Blonder-Tongue Home TV Terminal. It's totally secure. It protects the family's privacy. For details write: Blonder-Tongue Laboratories, Inc., One Jake Brown Road, Old Bridge, N. J. 08857.

New Blonder-Tongue Total Security Pay Cable Terminal



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TV RECEIVING EARTH STATION

- Antenna meets all FCC requirements for both receive and transmit
- Gain 51dB at 3.95 GHz. G/T of 26 when using GaAs FET pre-amp with 3dB NF at 20° elevation. Video S/N 52dB minimum with 34dBw EIRP
- Double reflector feed system for superior cross polarization discrimination. (Much better than prime focus!)
- Antenna erectable without crane
- Guaranteed system performance

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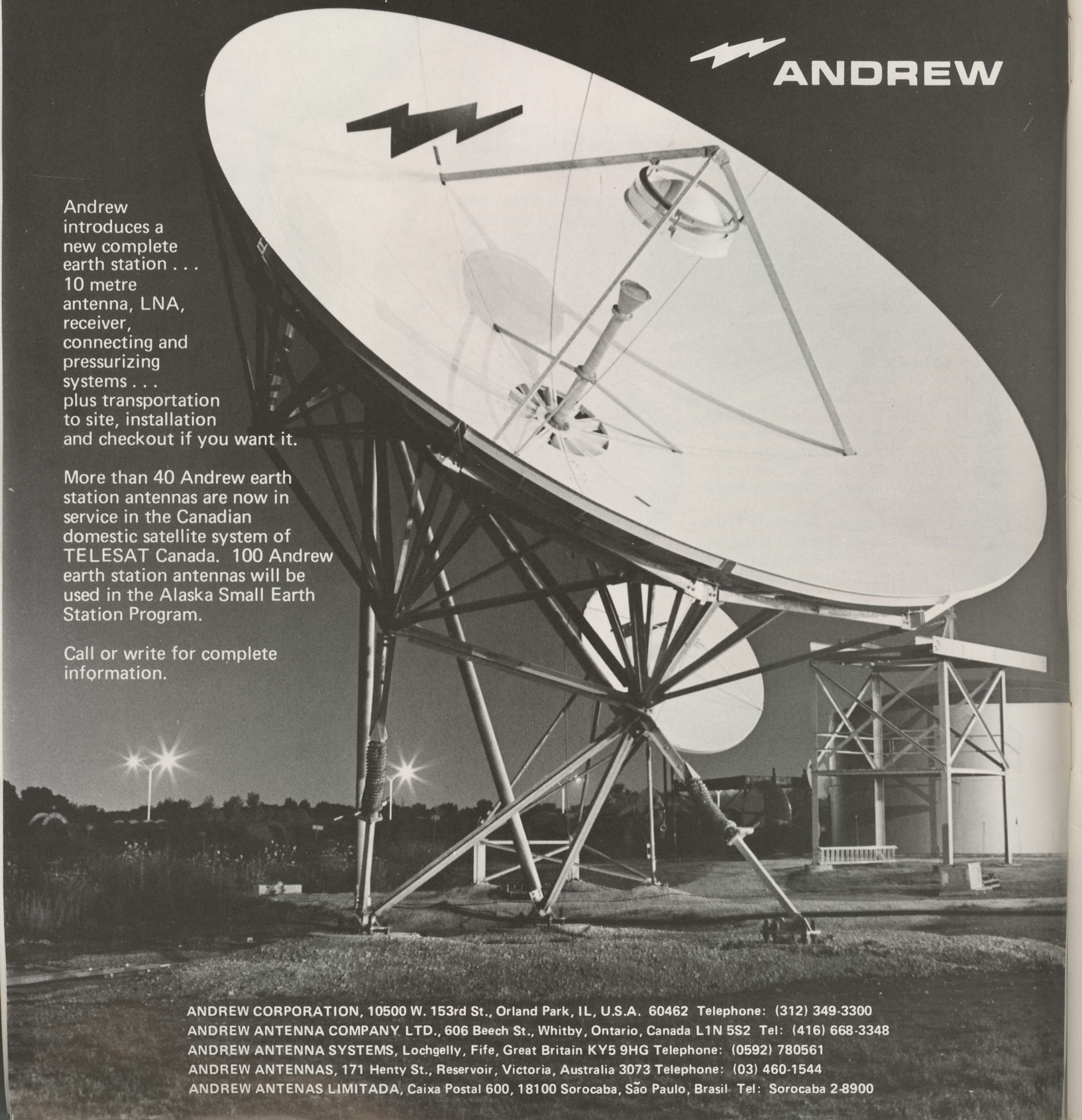

Andrew introduces a new complete earth station . . . 10 metre antenna, LNA, receiver, connecting and pressurizing systems . . . plus transportation to site, installation and checkout if you want it.

More than 40 Andrew earth station antennas are now in service in the Canadian domestic satellite system of TELESAT Canada. 100 Andrew earth station antennas will be used in the Alaska Small Earth Station Program.

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ANDREW ANTENAS LIMITADA, Caixa Postal 600, 18100 Sorocaba, São Paulo, Brasil Tel: Sorocaba 2-8900

CATJ

MAY 1976

VOLUME 3 - NUMBER 5

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OUR COVER

The FCC Review Board in April ruled that the Gridley, Kansas CATV system (test case) is to cease operations on May 26. Of course the system will not, an appeal to the full Commission, then to the federal court system is still ahead. CATJ's Production Director Richard Montgomery, borrowing freely from World War II cartoonist extraordinare Bill Mauldin **re-created** this well known Mauldin cartoon for our third American Bi-Centennial cover. Other Mauldin look-alikes are found elsewhere in this issue. Montgomery notes "Once you start re-creating the Mauldin 'Willie and Joe' style, it is almost impossible to stop!"

CATA-torial

KYLE D. MOORE, President of CATA, Inc.

CATA CONVENTION: A $2,500.00 "Seminar"

In the March 29th issue of **CATV Weekly**, publisher Stan Searle found reason to question the effectiveness of the annual industry "trade show", which he characterized as "**a $500,000.00 social**". At the bottom-line, Searle asked the question, "I wonder what would happen in (NCTA) cut the registration fee in half and just held a convention?"

Well, we are all about to find out. This summer, August 9th-11th to be specific, CATA will hold its first "convention". Only it will not be a convention, it will be a "seminar". And, lest we be accused of playing semantics, allow me to explain.

To attend the NCTA annual affair this past year cost the individual registrant from $135.00 to $200.00, a price paid, if not willingly, frequently merely to duck into a meeting or two, attend a luncheon and perhaps a banquet, and to roam the manufacturers' displays at will. That is a lot of bucks to be **an observer**. For that kind of money, a person **should** be able **to participate.**

That is the key word. **Participate**. Do something more than sit and listen. Do something more than occupy a chair in an auditorium. Go home with something more than a fuzzy head and tired feet (and a thin wallet).

The recent Dallas conclave was the 25th for the NCTA. It was "bigger" and it was "busier" than the preceding 24. It had more glitter, more tinsel and more "name-speakers". Mike Wallace, it is rumored, cost the convention hosts $2,500.00 for his 60 minutes of patter. If you were one of the approximately 1,500 people who listened to him speak, we hope you got your $1.66 worth of entertainment!

Participate.

That is the key word of the first (but we are not **yet** going to say **annual**, because it may **not** be) CATA Cable Operators Seminar (CCOS) to be held August 9-11 at Sequoyah State Park, near Wagoner, (Northeastern) Oklahoma.

Participate.

The seminar **concept** borrows rather freely from a number of the more successful gatherings held in past years by **non**-cable groups. First and foremost, attendees will have full opportunity to **participate**. In those sessions which are technical, participation will mean actual hands on the equipment participation...a learning by doing, by making mistakes, and by correcting those mistakes kind of approach.

Example: We plan to hold a 2-½ day session on spectrum analyzers. The first day will be devoted to being taught, by a knowledgeable teacher, how a spectrum analyzer works, and working with analyzers so that each participant in this "class schedule" actually **experiences** the operation of an analyzer unit. Then, for the **finale** of **this** 2-½ day session, the participants will sit down in a quiet room with a bag of parts **and build**, following the July 1975 CATJ article written by Jerry Laufer of Gill Cable, **their own elementary spectrum analyzer**. The "seminar" will provide, at cost, each participant in this session with a full set of parts, circuit boards and instructions for building his own economical analyzer. Each participant in this session **will leave the Seminar** with a **working** analyzer to take back to his system and put into everyday use. **Now that is participating!**

Example: We plan to hold a 1-½ day session on the topic of readying **your** system for March, 1977 franchise compliance. Each participant in this "class series" will, with instruction from CATA General Counsel Rick Brown and associate Steve Effros, "walk-through" a **complete** set of FCC filing forms for the dreaded March 31, 1977 compliance. The session will include specific guidance and instruction on (1) re-organizing your own system's franchise and operation to comply, and, (2) actual completion on an individual basis of the relevant forms (such as CAC applications). When you leave, you should **know** how **you** must comply.

Now **that** is participating!

But enough of the examples. For the **full** story, see the feature article on page 32 here this month.

Now, what about costs? If NCTA charges $135.00 to $200.00 to let you be **an observer**, what will CATA charge you **to participate?** Very little. Probably not over $25.00 per person, **if** your system is a CATA member system. And if you are **not** a CATA member system...well, if a CATA member system **brings you as a guest**, there will be **no** charge! (If you come alone, without being a CATA member-system guest, there will be a charge.) Again, see page 32 here for full details.

And what about the manufacturers and suppliers to the industry? In Dallas they paid **$7.00 per square foot** for exhibit space **plus** the annual NCTA membership fee assessed to all Associates. The CATA Board of Directors has appointed a two man Associate's Committee to develop a plan whereby Associate member firms of CATA may (at their option) be involved in the seminar program, with equipment displays, **if they wish**. There will be **no charge** made by CATA to any Associate Member firm participating. We belive the Associates are "taxed" too severly now, and we have no desire to contribute to their economic problems. Rather, we opt to try to develop a program that will give them financial benefits for their participation — **financial benefits to them**, as suppliers, and **not to CATA** as the sponsor of this seminar ("convention").

This issue of CATJ contains a questionnaire card to help would-be attendees help us select the **best possible program** for the three day session. The program will, in the final form, be determined by industry response to this questionnaire and a similar one appearing in the current issue of the

CATA Newsletter.

There is one problem with this first seminar ("convention"); and that is space. This strange out-of-the-way spot has been chosen on purpose. The state-run lodge is on an attractive lake and it is off by itself out of the hustle and bustle of the everyday world. It represents an opportunity for cable people to "retreat" into the solitude of a "private-cable-environment" for three days. Large multi-thousand room facilities are **not** built in such locations; for they would soon attract others like them and the "retreat atmosphere" would soon evaporate. The Lodge offers every advantage of modern day life, **without** most of the distrations. And it will accommodate (with nearby support facilities) no more than 350-400 people.

Consequently, the total registration shall be limited to the capacity of the facility. Contrary to current show trends **we don't happen to believe** that "big is beautiful". Nor do we think "big is conducive to creating a worthwhile learning atmosphere".

CATA will therefore, **we fear,** turn away many who would **like** to attend. We certainly will turn away (by virtue of being filled up to capactiy) virtually anyone who waits around a week or two to make up his mind as to whether he can or should attend. For that we have no excuses to offer, save the truth; to insure that everyone be granted the opportunity to be a participant and not a mere observer, the size of the seminar has to be limited.

We look forward to seeing you there.

WELL . . . IT IS EITHER A SUPPLIER OR AN OPERATOR.

"Dependability makes the difference."

Magnavox
CATV Systems And Equipment

In three Ohio cities, Continental Cablevision has what is essentially a "showcase" of Magnavox Distribution Systems in different plant configurations.

Continental, one of the nation's 14 largest MSO's with almost 150,000 subscribers, is proving Magnavox dependability in just about every major category of system.

Springfield's 240-mile plant is really twice that length because of its dual cable system. Fairborn is 100 miles of dual cable. And Findlay is a single cable rebuild with two-way over part of its updated 135 miles.

In this unusual application spectrum, Magnavox dependability has become a major factor in successful operation. Chuck Younger, Vice President-Operations, and Lyle Kneeskern, Director of Engineering for Continental Cablevision of Ohio, tell why...

Younger: "When we bought Magnavox, we knew it was competitive in price. Since then, we've found in actual usage that Magnavox dependability is a major factor in long-term profitability. Our maintenance costs have been minimal. The Magnavox distribution equipment has operated in temperatures from -10 to 105 degrees Fahrenheit. Along with the dependability, technical performance has been very impressive. Since Magnavox is totally modular, we can easily expand our partial two-way systems simply by changing out amplifier modules. The dependability we get with Magnavox is a definite plus on our bottom line."

Kneeskern: "Performance capability was a major factor in our buying Magnavox. Especially the advanced use of hybrid integrated circuits. Those IC's have done the job—in Springfield, for example, our Proof of Performance far exceeded specifications. We expected excellent performance, but dependability can't be specified so closely. We have it, just the same. In fact, we haven't had to rebalance in Springfield or Fairborn since turn on. Magnavox dependability means real savings in time and manpower. It also means the best service for our subscribers and efficient, profitable operation for us."

Large plant or small. Turnkey installation. System design and bill of materials. Rebuild. Magnavox dependability can make the difference for you. We'll prove it. Call us at our toll-free number...800-448-9121 (East of Mississippi) or 800-448-5171 (West). Or write...

Magnavox
catv division
Manlius, N.Y. 13104 Dept. J

Please send information on:

- ☐ Turnkey plant distribution systems
- ☐ System design—bill of material
- ☐ Magnavox MX-404 Amplifiers
- ☐ Magnavox Passive Devices
- ☐ Please have Sales Engineer call.

Name _____

Title _____

Company _____

Street _____

City _____ State _____ Zip _____

BUILT-IN TEST POINTS "A MAJOR INNOVATION"

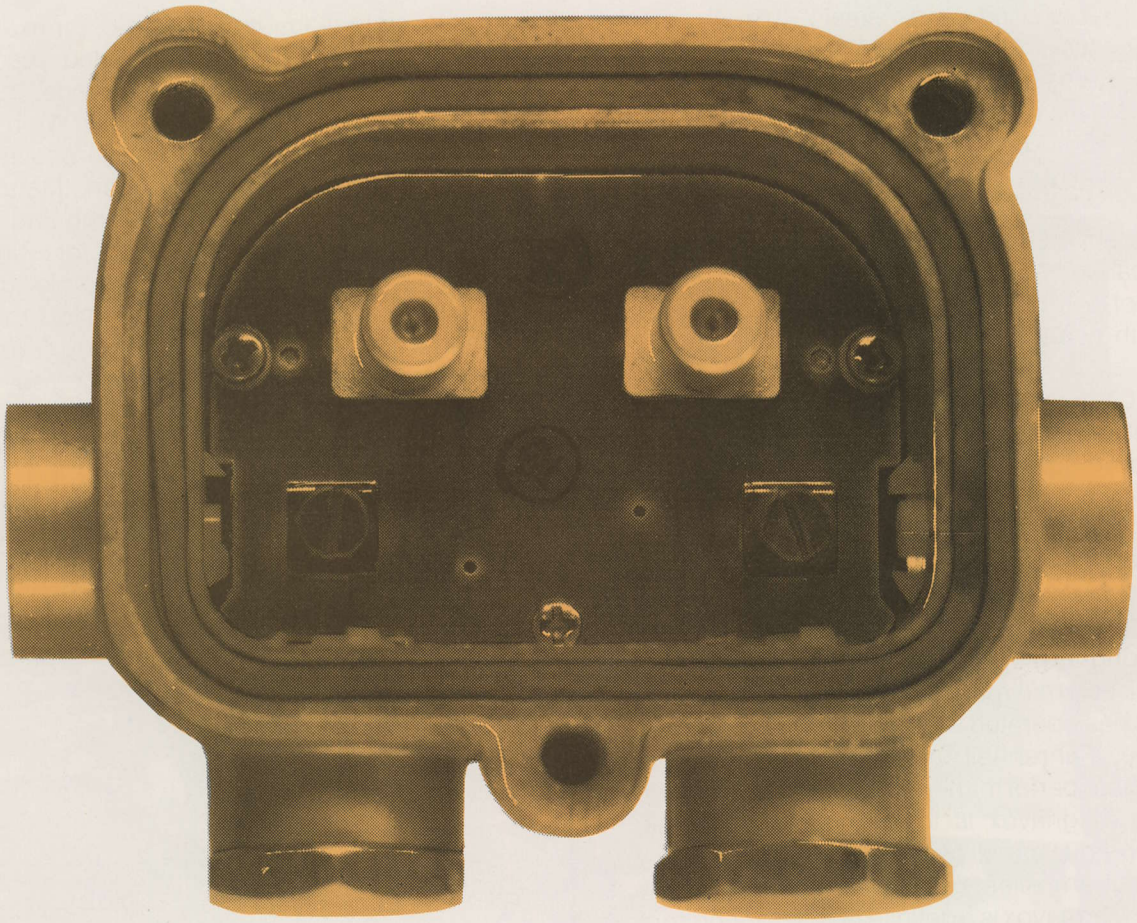
That's right, and its only available from RMS

ADVANTAGES:

1. Power and signal feed-thru is not interrupted causing a disruption of subscriber service down the line. Interruption takes place only at the tap being used for a signal test.
2. When testing RF signal levels with a field strength meter or fault finder the feeder line coaxial cables are not removed from the "UNITAP" housing. Labor costs are drastically reduced.
3. Built-in test points, a major "UNITAP" feature provides superior 75 ohm match between the terminal posts ("test points") and the test equipment being used. Inferior "probe" test techniques are eliminated.
4. AC power feed-thru is not interrupted minimizing the risk of blowing out a fuse.
4. Test points accept standard F-59 type push-on connectors, adapters, of any kind are not needed.
5. Silver plated test points assure positive contact surface area, with no possibility of future corrosion.

RMS CATV DIVISION
ELECTRONICS, INC.

Remember at RMS we deliver more than promises.



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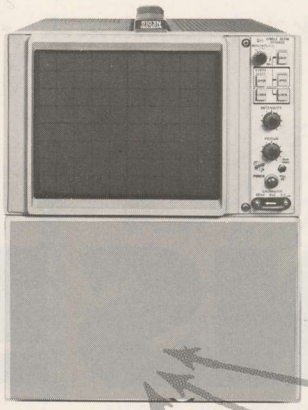
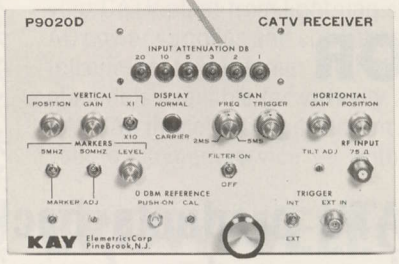


KAY's modular CATV test set.

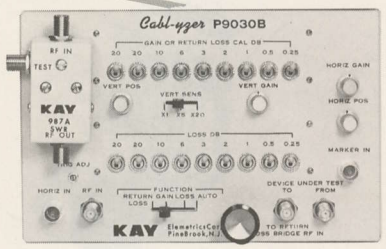
- PLUG-IN FLEXIBILITY
- HIGH ACCURACY
- LOW COST
- COMPATIBLE WITH 5100 & 5400 SERIES TEKTRONIX SCOPES

Kay's 9000 series CATV test modules are used with the 5100 or 5400 series Tektronix scopes. There are low cost plug-ins for: summation sweep testing, spectrum analysis, loss and return loss measurements and bench alignment.

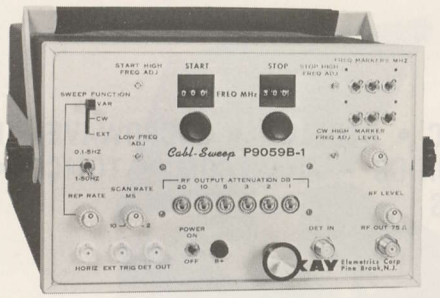


The P9020A/VHF Summation Sweep Receiver — features 40 db post amp. — 42 db attenuator, markers, detector and tilt control. Also built-in +15 db mv reference signal.

The P9040 Spectrum Analyzer features phase locked 1 KHz resolution in 1 — 300 MHz frequency range with 72 db dynamic range from +20 dbmv 75 ohm.



The 9030 measures gain/loss and return loss of active and passive device. Includes attentuators, electronic switch bridge and detector.



New KAY HALF-RACK Sweep Generator Series

Model	Frequency Range	Sweep Width	RF Output	Flatness	Distortion	Price (plus markers)
9059	.5-300 MHz	0-300 MHz	1V RMS	±.25 db	>30 db down	845.
9060	.5-500 MHz	.5-500 MHz	1V RMS	±.3 db	>35 db down	1150.
9062	1-1000 MHz	.5-1000 MHz	.5V RMS	±.25 db	>30 db down	1350.
9063	1-1500 MHz	.5-1000 MHz .2-700 MHz	.5V RMS	±.3 db	>30 db down	1590.

KAY Attenuators

- High Accuracy
- Low VSWR
- Minimal Insertion Loss
- 75 Ohm

Miniature
DC-2 GHz
Rotary
70 db

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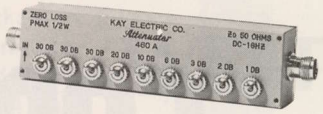
DC-1 GHz
In-Line Toggle
132 db



DC – 1GHz
Dual Rotary
80db

Noise Figure Meters • Gain-Loss, Return Loss Bridges
LIN/LOG Amplifiers • RF Detectors
1 GHz Electronic Switch • Test Equipment

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Maple Avenue, Pine Brook, New Jersey 07058/Phone (201) 227-2000

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THE MARGIN OF CATV
(Sometimes It's Not Much!)

A Thin Margin

With the possible exception of systems which deliver to their subscribers signals originating at a (very) distant point and brought to the system via microwave, the *average* CATV system channel is only marginally better in appearance (and performance) than the home cable viewer could (and perhaps does) receive with his own rooftop antenna.

CATJ is preparing to look at that margin, to discuss how we achieve it and maintain it at the subscriber's receiver, and where cost conscious shortcuts by system planners often prove to be poor management decisions as a system matures. This discussion, a series of related and interrelated topics, deals for the most part with the CATV headend facility from whence all good (or bad) pictures come. This series of discussions will continue each month through the summer of 1976 until the headend, as a "piece of the cable action", has been treated as thoroughly and as adequately as we are capable of detailing in print.

When we have finished, in our October 1976 issue, this series will be available as a "Headend Planning Guide" for existing and new systems alike. This series will look into every aspect of headend planning from signal locating to signal cleansing. We will look at new CATV opportunities (i.e. areas where CATV service does *not* exist, but should), and we will look at the newest headend toy, the satellite receiving terminal. But first and foremost throughout the series, we will look and re-look at something we call the *thin margin* of CATV superiority, the ability of the CATV system, when planned properly and operating properly, to provide *visually better pictures* and audibly better sound to the subscribing homes. When all is said and done, we happen to believe that this is *still* what CATV is all about.

The Acceptable Service Level

The average home viewer demands *no less than* three networks of service. If he is located in Canada, he demands no less than full Canadian network service, and some selection of U.S. programming. To enjoy that type of service, the average home viewer will spend as much as $250.00 to $300.00 for a "sophisticated" outdoor antenna receiving array, load it down with an all-channel pre-amplifier, and couple the resulting microvolts to the best receiver he can purchase locally. All told, he may have from $800.00 to $1200.00 tied up in receiving one or more channels of service.

Or, if he happens to be fortunate enough to live in or nearby to a major metropolitan area with multiple over the air services available, he may spend $69.95 at the local drug store for a small screen black and white AC/DC portable receiver with a built-in whip antenna. The UHF loop, if he notices it in the carton when he unpacks the receiver, usually gets consigned to the same receptacle as the cardboard container.

The fringe-located viewer is, by happenstance, a connoisseur. He is the reason the CATV industry first got off the ground, and for the majority of all cable systems in operation today, *he is the reason* the industry has endured for twenty eight years.

His *standard-of-comparison* is poor quality television reception — reception loaded with man-made or atmospheric interference — reception marred by co-channel or adjacent channel interference — reception marred by changes in weather and deterioration in his receiving equipment. He has *low* standards to begin with because he *knows* that inspite of *his own best efforts*, his results are at best poor. He is the guy who rushes down to sign up for cable the day you open your office doors.

Virtually any reception you provide him, from your 300-500 foot tower or your nearby to town hilltop headend, is going to be better than he has grown accustomed to with his home antenna. More microvolts simply look better than fewer microvolts. You are, whether you realize it or not, in the microvolt business. An oldtimer in CATV once remarked "CATV is really the business of bringing *microvolts to the masses*".

To this *typical* cable subscriber, if you can deliver to him better looking pictures and cleaner sound on three basic channels (i.e. one each ABC, CBS, NBC) than he has been able to do on his own, you probably have him "hooked-up for life". And if in the process you *also* deliver to him *additional* channels beyond those basic three, *so much the*

better. Just as long as if in the process you don't tinker with the "basic three."

Now what does it take to do a better job than the home viewer is able to do on his own?

If our mythical subscriber lives in a valley or behind some natural formation such as a hill, his reception is "marred" by mother nature. Distance may *not* be his problem; location is his problem. Pennsylvania, West Virginia, Kentucky and many other states with high CATV penetration are living examples of the inflexibility of natural terrain to the passage of VHF (and UHF) broadcast signals. The distance from transmitter to receiver may be small, often a matter of a few tens of miles, but if the terrain is not cooperative, the signals never find their way to the intended receiving location. CATV is more than a curiosity in such areas; it is an absolute necessity.

But suppose the problem is not all *terrain* related. Suppose there are excessive distances involved as well? Normal television broadcast facilities, given reasonably flat terrain, have little difficulty providing our connoisseur with *reasonably* good service out to 60-70 miles in most areas of the United States. But. . . *and this is a large but*. . . as the distance increases beyond the magical grade A coverage contour, the *responsiblity* for creating good quality service shifts. It shifts *from* the 1000/2000 foot tower and maximum transmitting power *of the broadcaster* to the 40-100 foot tower and 20-30 dB gain preamplifier *of the receiving system owner*. And not everyone is willing, or financially able, *to pay the price* of good or decent quality fringe region reception. The *margin* between an acceptable home picture and a degraded home picture is often *very* small. So small, that *just a little bit more* receiving system gain or transmitting tower height/power will result in a marked improvement in the quality of the home received picture. In hundreds of CATV installations throughout the United States and Canada, this is the *CATV margin*; a margin which is often *no more than 10 dB.*

There is in the off-air-receiving business (of which CATV is one part), a rather narrow signal level region *within which* received signal quality goes from not acceptable to acceptable. All things being equal, it is often that magical 10 dB step previously noted. And all things being equal, it is often not *that* hard to find *that* 10 dB. Someone once noted "Vancouver (British Columbia) is 10 dB out of decent service levels from Seattle; but that 10 dB built the world's largest CATV system and turned a handful of enterprising Canadian engineers and businessmen into multi-millionaires." That is the kind of stuff CATV dreams are made of.

10 dB boundaries abound in CATV. San Diego is roughly 10 dB *out of* decent service levels from Los Angeles. Toronto is roughly 10 dB *out of* decent service levels from Buffalo. Had low band VHF stations been established or permitted initially 1,000,000 watts of ERP (and high band stations permitted 3,160,000 watts ERP), the chances are good there would be *no need for* CATV in *any* of these cities today! Ten dB more receiver signal is the same as an ERP increase of 10 at the transmitter.

On the receiver end of the equation, if we reference to the subscriber's non-cable (home) antenna at 60 feet and call it "0 dB", it would be necessary to *raise* that *same* antenna from 60 to around 180 feet to gain 10 dB *additional* off-air signal at the antenna terminals. Again, the CATV industry is fortunate that thanks to a number of laws of physics and economics, 180-190 foot steel support structures (i.e. towers or masts) are much more difficult to design (and pay for) than the garden variety of 40-50 foot rolled-steel-tube "zip-up" mast!

Of course not every CATV situation is a "10 dB problem". A few are less (than 10 dB); and a large number are much more than 10 dB. The purpose of this initial thrust into the "CATV Margin" is to acquaint you with what various margins look like, how they occur, and what can be done in the CATV headend planning, design and construction to make every dB of margin count. What we are talking about, in the end, *is subscriber saturation* or *cable penetration*. We are talking about the tangible differences which a non-subscriber can *see*, on his own receiver. We are talking about increasing penetration from 50% to 60%, or from 40% to 70%. The CATV engineering margin, whatever the number is, translates into another kind of dB's very quickly — *dollar bills*. And when all is said and done, that is why we are in the trenches and on the poles in the first place.

Not All Created Equal

No two "CATV situations" are *alike*. Individual variations in local terrain, local interference conditions, local station mix and a host of other variables (to be discussed individually) all create the uniqueness of *your* CATV situation.

Let us return to the original premise — that a CATV system *to be viable*, needs to operate in an environment where it provides a "margin of improvement" for *basic* services. If you have an area, any area of virtually any size of 50 homes or up, where one *or more* of the *basic* three networks of full time service is missing, *you have a CATV situtation*. And by missing, we may be dealing with totally missing, or marginally missing.

A concentration of homes, trailers, or humanity (50 housing units up) may be situated so that local terrain blocks the desired three basic services. Or it may be isolated by sheer distance from one or more of the basic services. Or, the services may be present, but only with concurrent reception of non-desired interference which makes the reception of the desired services poor or degraded.

There is a popular *belief* that if you are located in flat or reasonably flat terrain areas, such as is common in the great mid-section of this country or

along the Gulf Coast area, that VHF (and to some extent UHF) signals are *everywhere* more or less *equal* in signal level. That is, if you are 70 miles from Kansas City with your CATV situation, the signal levels from Kansas City will be more or less (i.e. within a few dB) the same regardless of which side or edge of town you locate your headend on.

This is a fallacy that has grown up through the years, and before this series in CATJ concludes, we will demonstrate why it is not so, and how you can calculate or measure *"signal fingers"* on your own *prior to* establishing a headend location.

Virtually any headend location must be some type of compromise — a compromise between available signals, available (and reasonably priced) real estate for the headend facility, and the access to the community for the trunk line(s) from the headend site. If your signals come towards your headend from several *different* directions (i.e. from different TV broadcasting markets), there is seldom if ever *one ideal location* for *all* of the received signals. The exception to this statement is the prominent elevated hill or mountain top site nearby to the to-be-cabled community, where natural elevation at the site makes it the obvious choice for off-air antennas.

The Low Band Problems

Television broadcasting in reality occupies three different (and *each* individually distinctive) frequency ranges. As any CATV type knows, we have low-band VHF signals (channels 2—6; 54—88 MHz), we have high-band VHF signals (channels 7—13; 174—216 MHz) and we have UHF band signals (channels 14—83; 470—890 MHz). To complicate the selection of a headend site, signals propagated (i.e. carried through the atmosphere) in *each* of these three frequency regions take on differing " propagation characteristics".

Low-band VHF signals tend to be the *most uniform* in distribution through the lower atmosphere; that is, channels 2—6 tend to cover the terrain better and leave fewer dead spots (and their alternate high spots) than either high-band or UHF. This simply means that in areas where the terrain is relatively flat, one does not *typically* expect to find *large* signal variations between locations a few hundred feet (or even a few hundred yards) along the ground. This "spread effect" is most evident at the low-end of the low-band (i.e. channels 2—3), and it becomes less apparent as we reach channel 6. Practical experience has shown that the first *normal* occurence of *signal-fingering* (1) appears near 100 MHz, although in some terrain it may be found down as low as VHF channel 4.

(1) **SIGNAL FINGERING** — When the even-spread of a coverage contour is disrupted into ''rays'' or ''paths'' of alternating high and low signal levels, these ''bands of signal'' are called ''fingers''. Fingers are not restricted to hilly or mountainous terrain, and are often found even over flat terrain. Fingers or bands generally can be followed, with suitable care and patience, from within the Grade A contour of a station, directly into and beyond the B region.

Therefore, site selection *for low band channels* should be the *least* important denominator when you are doing initial survey work for *signal level variations*. However, there is a counter-balance to signal level, and that is interference levels.

Troublesome interference to CATV signal pick-up is largely in three categories:

(1) Co-channel (and/or adjacent channel) interference from other TV broadcast stations;

(2) Broadband noise interference originating at electrical or motor driven machinery;

(3) Harmonic or spurious emissions originating in *other* broadcast(ing) devices, such as CB transmitters, which do *not* operate directly *within* the TV channel frequency range, but which, because of their proximity to sensitive CATV receiving equipment, often interfere with off-air TV reception.

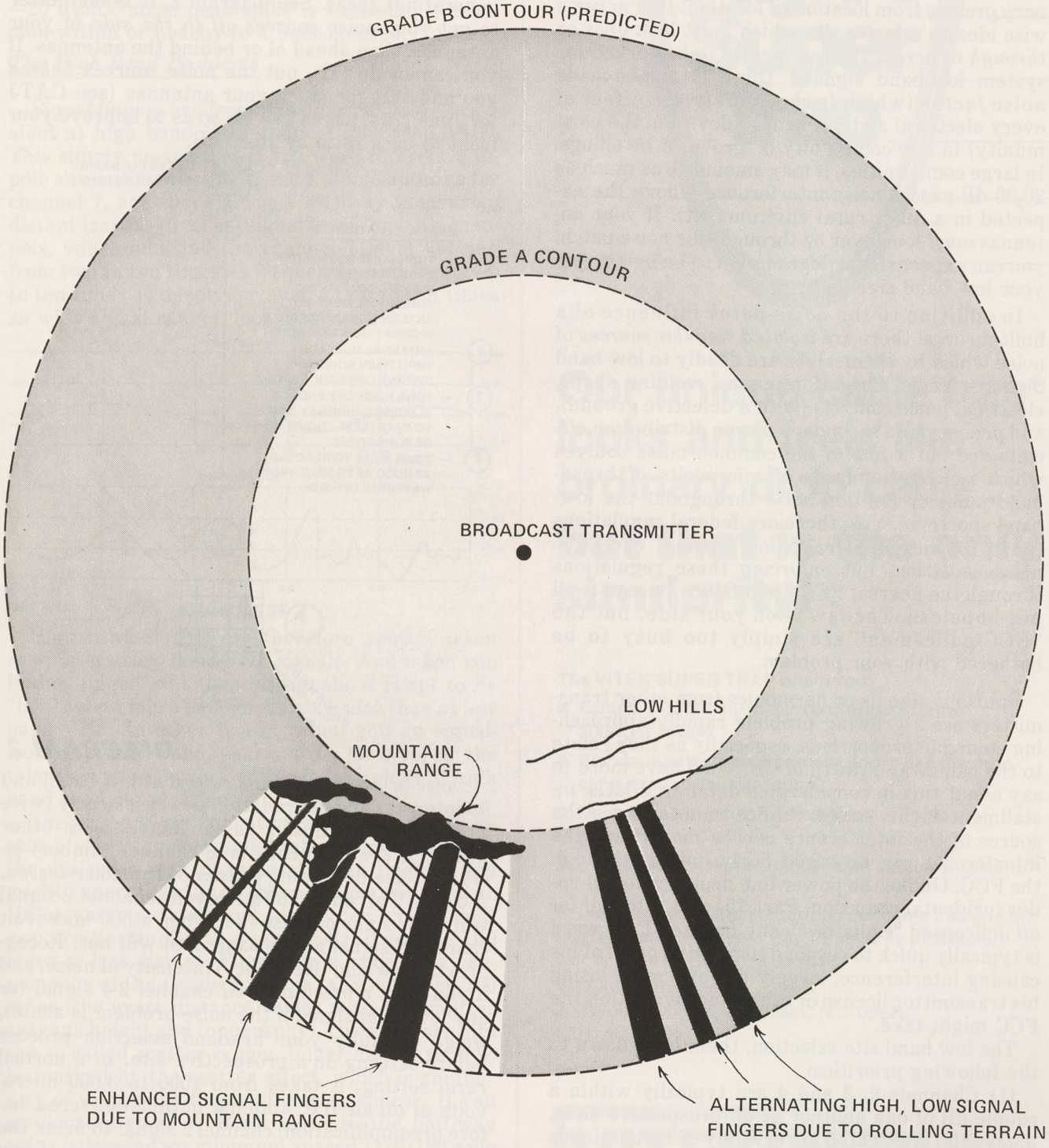

DIAGRAM 1

In most prospective (flat terrain) locations, low band co-channel or adjacent channel interference levels will be about the same; that is, there is seldom one site where such interference problems are markedly better (or worse) than other sites considered.

Broadband noise interference, from electrical power lines, sub-stations, gasoline operated pumping equipment, highway traffic and the like does *vary greatly* from location to location. It is *never* a wise idea to select a site which must look *over* or *through* or *across* the community to be served for system low-band signals. There is a man-made noise *factor* (which is the *cumulative* effect of every electrical and mechanical device in the community) in *any* community or group of dwellings. In large communities, it may amount to as much as 20-30 dB *excess* noise interference (above the expected in a quiet rural environment). If your antennas *must* look over or through this noise-patch, you can expect signal degradation to be evident on your low band signals.

In addition to the *noise-patch* influence of a built-up area, there are *isolated singular sources* of noise which by themselves are deadly to low band distant signals. Irrigation pumps, welding shops, electrical fence controls (with a defective ground), and primary and secondary power distribution circuits are but a *few* of the common noise sources which radiate hundreds of microvolts of broadband pulse or ignition noise throughout the low-band spectrum. Yes, there *are* federal regulations (Part 15, incidental radiation) *against* excessive noise radiation; but *enforcing* these regulations through the nearest FCC Field Office Bureau is all but hopeless. The law *is* on your side, but the "FCC-policemen" are simply too busy to be bothered with your problem.

Spurious signals or harmonics from other transmitters are a growing problem rapidly approaching epidemic proportions, especially as they relate to the run-away growth of CB. We'll have more to say about this in considerable detail in a later installment of this series. Suffice to note that *if* the source of the interference *can be pinpointed*, the interference can be cured fairly quickly through the FCC. Unlike the power line people who fall under incidental radiation, Part 15, as a catch-all for *all* unlicensed "radiators", any *licensed* FCC ward is typically quick to respond to positive proof of his causing interference, largely out of *fear* of losing his transmitter license or other punitive action the FCC might take.

The low band site selection, then, boils down to the following priorities:

(1) Channels 2, 3 and 4 are typically within a couple dB of one another at all prospective sites, *unless* you are located in very hilly or mountainous terrain where signal spread is uneven. Channels 5 and 6 (and FM) *begin to finger* and by the time you get into the FM band, you *may* find as *much as* 10 dB differences between nearby sites. We'll explore locating fingers and proving their reliability in a subsequent session.

(2) Low band sites should be *largely* chosen based upon the background noise criteria. That is, choose a site at which your weakest level low band signals are located in such a direction that the antenna arrays will be 90 degrees off of pointing over, towards or through any built-up (high noise generating) areas. See diagram 2. It is far better to get your noise sources *off to the side* of your antennas, than ahead of or behind the antennas. If you cannot do this, put the noise sources *behind* you and stagger stack your antennas (see CATJ for June 1974, pages 7 to 16) so as to improve your front to back ratio by 15-20 dB.

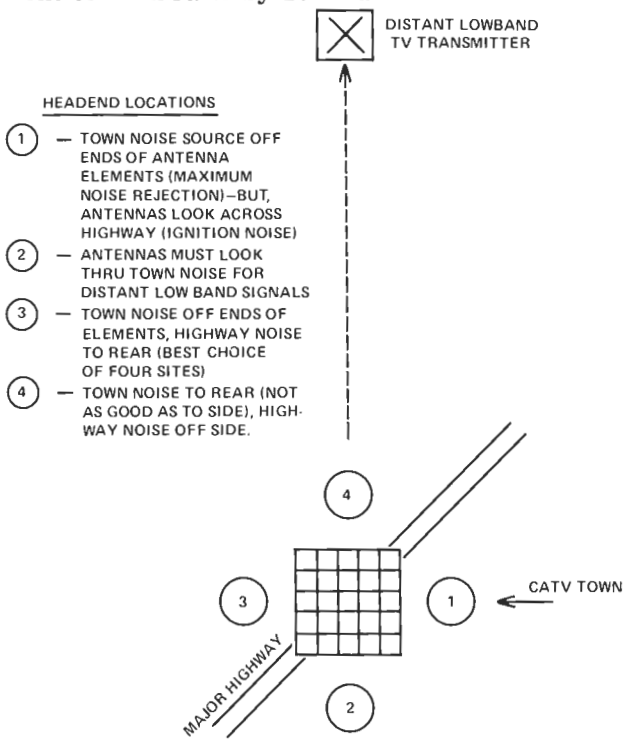

DIAGRAM 2

Noise is the *number one culprit* at low band, and its intensity and degradation power is nearly twice as potent at channel 2 as at channel 6. In other words, as the frequency (and channel number) *increases*, the degrading effects of the noise *lessen*. A 0 dBmV off air (1,000 microvolt) channel 2 signal will show signs of noise in it when a 500 microvolt channel 6 signal at the same site will not. Recognize the low-end (frequency) intensity of noise, and if you have a *much desired* channel 2-4 signal (or any low band signal if the noise problem is acute), weigh carefully your headend selection process before settling on a prospective site. In a normal *rural* setting, it takes from 1500 to 3,000 microvolts of off-air (i.e. antenna output delivered before preamplification) channel 2 signal to mask the effects of just moderate man-made noise. If you are looking through, across or over your community for a low band channel, as much as 5,000

microvolts of off-air signal may be required to eliminate the noise degradation from the picture. *Remember*. . . noise degradation is directly related to the *ratio* between the noise pulses present and the signal level present. To completely mask noise pulses requires a 35-40 dB signal to noise pulse ratio. If noise pulse measures —20 dBmV on occasional peak spikes of noise, the off air signal to mask these noise spikes must be on the order of +15 to +20 dBmV *before* preamplication. And a —20 dBmV noise peak spike *is* exceedingly common within or nearby to a built-up area.

The High Band Problems

Signal fingers are from 2 to 10 times *more* prevalent at high band VHF than at low band VHF. This simply means that if you were to erect a dipole antenna for channel 2 and a dipole antenna for channel 7, and drive along a highway *measuring* distant (say 60-70 miles) signal levels on both channels, you would find the channel 7 level varying from two to ten times as frequently, and from two to ten times as deeply (or over a two to ten times as wide signal range), (see diagram 3).

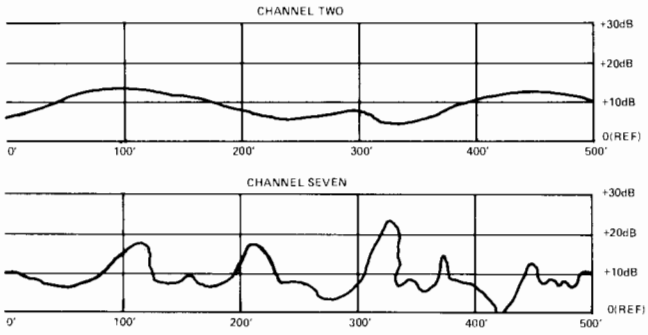

DIAGRAM 3

High band signals *are* therefore spotty, *when compared* to low band VHF signals. And *when* you find a "finger" of *enhanced* signals, it is apt to be "hot" over a much smaller finger-*width* than at low band VHF. In other words, when you go signal-looking at high band, your *margin for error* or the tolerance you can work within is far tighter at high band than at low band.

The *primary* problem at high band, once you locate a signal, is co-channel interference. Because the desired signal often breaks into fingers, you might expect that the co-channel signal would also. Unfortunately, this is not altogether true, unless you are dealing with a non-desired source 100 miles or less distant. Fingering is basically a phenomenon of the Grade B region, and out to 80-100 miles (the exact distance varies with transmitter antenna height and topography). Once you are into the so-called *scatter region*, finger effects tend to be masked by the scatter effect, which is another way of saying the finger effects disappear. If you are located close or fairly close to the half-way point *between* two minimum spaced (170/190 mile separation) same-channel stations, you might find that by playing the finger effect carefully you can

locate your headend in an area where the signal finger *from the desired signal* is *up* in level, and by sheerest odds, the finger effect *from the non-desired signal* is *down*. Within the Grade B to 100 mile (maximum) range, or out to the point where scatter level signals predominate, signal levels within hot and cold "fingers" follow pretty true regardless of weather effects. That is, if you are in a "hot finger" for the desired and (coincidentally) a "cold finger" for the non-desired (through luck or on purpose), when weather conditions create abnormally *high* tropo signals levels, the cold finger for the non-desired signal *will* come up, but, it will come up *less than* if you were otherwise located.

Noise at high band is seldom much of a problem; but if you happen to have it badly enough that your high band signals are degraded, your low band channels are probably (at the same time) all but useless. If your site has no low band signals, you can usually forget about noise if your site has (1) 250 microvolts or more *minimum* high band level antenna signal(s), and, (2) you are not looking at, over or through a "noise-patch" (i.e. built-up area). Most high band noise is from a single source, which can be easily traced. The *average* source (malfunctioning electric fence, malfunctioning fluorescent light starter, etc.) does not generate much energy field above 120-150 MHz (high band starts at 174) and *when* you have one that has high band radiation characteristics, common noise tracking techniques (see CATJ for May 1974, pages 8 to 18) should be followed. Unlike low-band VHF where there are layers upon layers of noise(s), and where *when* you find and cure *one* source you instantly find seventeen more (or so it seems) beneath the one you fixed, high band has seldom much of a noise-*layer* problem.

Harmonic radiation problems are, conversely, frequently more troublesome at high band for all *but* CB transmitter sources. One particular problem is FM broadcast band transmitters, which may be perfectly legal (i.e. meet FCC spec) but which radiate a potent (as far as you are concerned) "second" (harmonic) *within* a high band channel. Any FM broadcast transmitter operating in the FM band (88-108 MHz) can show up at *twice* its frequency (176 to 216 MHz). A tenth of a watt or so radiated from a 100,000 watt Class C FM broadcaster on the second harmonic will drive local TV reception out the window in a big hurry. Many systems have found, after careful analysis, that the FM broadcaster *does* meet spec, but that the spec is *not good enough*. The problem *can be* cured, but only *at* the FM broadcast transmitter. Presented with the proper documented engineering evidence, the FCC has been known to require the FM broadcaster to *further suppress* his second harmonic (i.e. beyond the *normal* FCC spec).

Channel 7 presents a special problem in some areas because two-way allocations are made right up to 174 (173.99) MHz. This means there is *no guard band* between channel 7 and the two-way services. For years those close-to-channel 7 frequencies were reserved for news gathering organizations, primarily newspapers. However, in the two-way frequency crunch the FCC is experiencing, the frequencies *immediately below* channel 7 are coming into more widespread usage. The interference range of a 100 watt two-way base station in this service, operating just below channel 7, will extend to 30 miles or more. The picture on your system on channel 7 goes "negative" when the two-way unit keys in typical overload (i.e. similar to adjacent channel interference) format.

The UHF Problems

The UHF range is blessed with no noise. Well, almost no noise. About the only noise you have to fight is *your own* internal equipment noise, created by an inefficient "front end" on your passive converter or by a too high noise figure on your UHF pre-amplifier. Apparently *only* lightning crashes from thunder storms extend *into* the UHF region; man made noise is almost unheard of in this range.

Co-channel interference at UHF has been growing slowly but steadily as more and more UHF stations slowly accumulate in our ultra-high range. There is still the general UHF mystique that started more than twenty years ago when home UHF receiving systems were at best in the cat-whisker and long-wire antenna era; that being, *UHF signals are hard to receive and that they don't go very far.* As equipment designs have become better and antennas have become more effective, we have learned that UHF ranges are every bit as good as VHF, at least for CATV level installations; and often better. The CATV industry is still five or more years behind UHF state of the art however.

Most CATV operators experience UHF co-channel so *seldom* that they are totally unprepared for it mentally when it happens. We talked with a UHF converter manufacturer recently who told us about a system down in Alabama that had ordered a channel 31 to some VHF channel converter. His desired channel 31 signal was about 80 miles from his headend. One morning last fall he awoke to find black bars running through his channel 31-on-VHF signal. When the lines did not go away, he diagnosed the problem as a bad power supply in the converter (creating hum mod), took the converter out of service and shipped it back to the factory for repair. But before the converter showed up, he telephoned to tell the factory to send it back without opening the box. When he located a spare to "stand by" while his regular converter was off for repair, he discovered it too had "black horizontal bars" in the picture. A little investigation revealed the black bars were coming from another channel 31 up in

Illinois — some 450 miles away! *And they lasted two days.*

As we have gained more and more experience with UHF, it has become clear that *when* "UHF goes over the horizon" during *abnormal weather* conditions, it goes a *long* ways and often with very-big signal levels.

This sort of thing does *not* happen very often, at least not often enough for most operators *to plan for it* in engineering their headend antenna layouts. But there are locations where co-channel at UHF is emerging as a serious problem. An opertor in south-central Louisiana has been trying to produce a useful signal from channel 26 in New Orleans (an indie) for several years — a 100 mile path. His channel 26 signal, with a *pair* of 8 foot parabolic dish antennas and a low noise UHF preamp, is stout enough to be usable perhaps 90 percent of the time. *But*, the twin 8 foot dishes are lacking in adequate front to side rejection, and he has *almost continous* co-channel from Houston's channel 26. Along the Gulf coast, UHF signals travel further on a reliable basis than over other sections of the country, and the 140 mile Houston signal is often stronger off-the-back of his twin 8 foot dishes than New Orleans is off of the front.

For *normal home receiver installations*, the mileage separations established for UHF may be adequate. But for CATV towers with considerable height, large aperture antennas and low noise preamplifiers, the FCC established separations are often *not* adequate. We are discovering this more and more every month as new UHF stations take to the airwaves. And the typical CATV UHF 4-8 foot parabolic antenna is *not* designed for maximum front to back or front to side rejection; rather, it is designed for maximum forward gain and/or best match. If your installation is or will be located where potential UHF co or adjacent channel interference *may be* a problem, it will pay you to put some attention to antenna design data in a subsequent portion of this series.

Signal fingering at UHF is almost legendary. Early home antenna installers often found they could move the antenna a few feet (or inches) on the customer's roof and go from noise to a full "quieting" signal. Things haven't changed much in twenty years.

The effect of fingering *increases with* frequency. That is, it is much *more* pronounced at UHF than at VHF. And the finger paths are often as not frequency conscious. That is, even if say channels 7 and 31 are located *on the same transmitting tower* at approximately the same height above ground, the fingers where channel 7 is *up* in level will seldom be the same fingers where channel 31 is *up* in level. And the peak to valley signal differences at UHF tend to be much greater than at VHF. It is not uncommon to find 20-30 dB level variations *within a few feet of space* at UHF, along a horizontal line (i.e. parallel to the earth), at right angles to the path to the station. So you *might be* lucky and situate your tower *right on* a strong UHF path finger, or you could miss it by a couple of feet one way or the other. Very few operators, however, take the time to look for up-level fingers, probably because it takes time and effort. It has always *seemed* "easier" to go *straight up* to look for signal.

For many years people assumed that as you went higher and higher above ground, the signal levels gradually got stronger. Then some people in the San Francisco area (in the mid 50's) discovered that with the peculiar combinations of fog and temperature inversions that build inland from the San Francisco Bay, there were some days when their 60 foot tall home antennas produced good signals, and other days when a lower antenna, 15 feet off the ground, produced the best picture (while at the same time the taller antenna levels had dropped way off). Word of this "discovery" spread throughout the mountainous western regions of the country, and in the ensuing years it was not uncommon to drive down a winding valley road and spot *one home's* antenna 90 feet above ground in a pine tree, *while* the next door neighbor had *his* antenna positioned two feet off the ground in some unlikely spot in the side yard. *The signal was where you found it.*

From this era has come the *fable* that signals tend to layerize, *or stratify vertically above ground.* During the 60's some exhaustive measurements of this phenomenon were conducted in different areas of the United States. The conclusion was that with the *exception of* mountainous areas where knife edge refraction (2) took place, any stratification found was at best a *temporary condition* subject to the whims of the ever shifting winds and weather patterns. True, *there were days* or hours (or minutes) when a 60 foot antenna produced the best signal levels; followed invariably by another set of conditions which produced the best pictures at the 400 foot level above ground.

From this period of television's development came a pair of *still valid* assumptions:

(1) Stratification, largely the result of an unstable (*or*, exceedingly stable) atmosphere, was a fleeting thing — here today and gone tomorrow. You could, in a short measurement time, prove most *anything* you wished, but if you long-term *averaged* the results, the net result was always that the taller you were, the better signal you had, except in mountainous terrain.

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(2) **KNIFE EDGE** — Knife edge refraction is a phenomenon when a tall, sharply defined (i.e. abrupt rise) hill or moutain peak protrudes into the direct path from transmitter to receiver. If the hill or peak can be "seen" from both ends of the path (i.e. transmitter and receiver), there is less signal-path-loss from transmitter to receiver than would normally be computed under "smooth earth" circumstances. This leads to the alternate phrase "obstacle gain", which refers to the fact that a well placed hill or mountain peak seems to "provide signal gain". A detailed discussion of this phenomenon will appear in a subsequent portion of this series.

(2) If you wanted to take *advantage of* this ever *shifting* stratification of signals, the best approach was to go to an *excessive vertical stack* of antennas, running them down the tower for 4 (minimum) to 8 or even 16 bays, using wide spacings vertically of at least one wavelength (*or boom length* if the boom was longer than one wave long) and preferably on the order of two-three wavelengths vertical stack distance.

And the point of all of this with UHF? If you want to cut down (you can *never* eliminate) long haul UHF *signal fading*, design your headend around an *exaggerated* (tall) vertical stacking of several antennas, spaced up and down over a 100 foot or more of tower.

Signal To Noise Margin

There is an especially well defined signal to noise *window* in the 20 dB signal to noise to 35 dB signal to noise region where pictures *snap out of* the noise crud and people line up to pay money for their service. They are shown here in photographic display from an off-air signal. In our test set up, we have taken a *clean* off-air signal and mixed it ahead of the receiver with a wideband "white" noise source from a Sadelco 260-B Spectrum Analyst. This white noise source is *not* the *exact equivalent* of random receiver noise that accumulates on say a 20 dB signal to noise *off-air* signal, primarily because in a *true* 20 dB off-air ratio, there is a *mixture of* receiver front end noise (which is close to white noise) *and* atmospheric and man-made noise (which is more akin to something called black noise). Thus in our four photos here, while the ratios are correct (verified with simultaneous display on a Texscan VSM-5), the noise may be understated because it is all laboratory generated, or white noise.

Now, let us say your CATV selected community home antennas typically have the worst case pictures shown here, a 20 dB signal to noise ratio. What will it take for you to take *that signal* and turn it into the 35 dB signal to noise ratio in the fourth photo of the set?

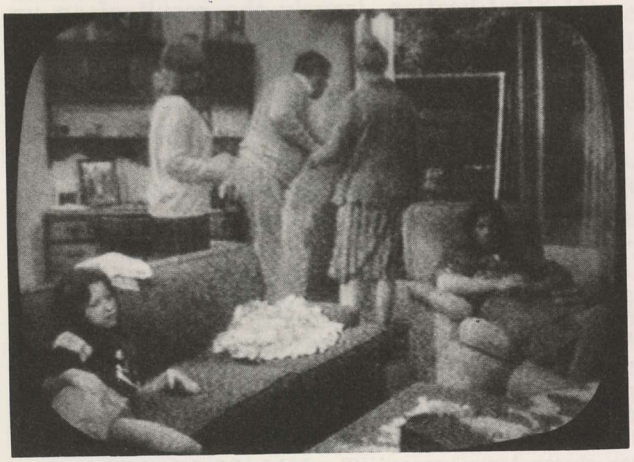
First of all, everything you might do to build your "CATV margin" will be *referenced to* the starting point, which is the customer's *present picture* on his present antenna. In effect, your headend design needs to pick up *15 dB* which the home viewer has been unable to find on his own.

(1) *Antenna gain* — Home-type antennas typically average 5-7 dB forward gain over a single channel dipole *on low band*; 7-10 dB forward gain over the same tuned dipole *on high band.*

(A) To get 5 + 15 dB of antenna gain at low band is 20 dB of forward gain. That would take an eight bay array of 12 dB gain CATV antennas (see

20 dB SIGNAL TO NOISE

25 dB SIGNAL TO NOISE



30 dB SIGNAL TO NOISE

35 dB SIGNAL TO NOISE — (now you can sell it!)

table 1).

(B) To get 7 + 15 dB of antenna gain at high band is 22 dB of forward gain. That would take 16 bays of a 12 dB gain CATV antenna.

(2) *Pre-Amp Noise Figure* — The *typical* home receiver has 5-7 dB front end noise figure. If you install a 2.0 dB noise figure CATV pre-amp, seemingly you would pick up something *approximating* the *difference* between the two noise figures as net signal to noise improvement. More about that shortly.

TABLE ONE — ANTENNA STACKING GAIN

Identical antennas (i.e. same make, model) can be stacked to provide more gain that a single antenna alone (see CATJ, June, 1974). If you know from the manufacturer's data sheet the gain of a single stack of the chosen antenna, additional gain due to stacking can be found here (**theoretical** stacking gain is 3.0 dB for each time the size of the array is doubled; however, **in practice**, stacking gain is typically **not over** 2.5 dB each time the array doubles in size):

Number Stacks	Add additional Gain
1	0 dB
2	2.5 dB
4	5.0 dB
8	7.5 dB
16	10.0 dB
32	12.5 dB

(3) *Height Gain* — Height gain is only a key factor when there is no immediate terrain shielding around the potential subscriber's receiver site. That is, if the terrain is flat, or reasonably flat such as in the mid-west and southern U.S., you can *compute* height-gain fairly accurately. If on the other hand there is local shielding, just getting clear (i.e. above or over the top of) the nearby ridge or hill may make a sudden and dramatic (i.e. 20-30 dB) difference.

For relatively smooth terrain in the immediate area of the receiver, height gain varies as a function of the distance to the transmitter. For example, if we assume the height gain reference to be 0 dB at 30 feet height, then for an increase to 50 feet the height-gain is 3 dB for a fifty mile path but only 2 dB for a 100 mile path. Or if we again assume the height gain reference is 0 dB at 30 feet, when we raise the antenna to 80 feet the height gain for a 50 mile path is 6 dB but only 4 dB for a 100 mile path. Height-gain *decreases with distance*, and once the total path length increases *beyond* approximately 100 miles, the dB's bought with increased height are at best very expensive dB's. See table 2.

Naturally, to find our 15 dB CATV margin we are going to employ *a combination* of antenna gain, height gain and improved front end (i.e. pre-amp) noise figure. A word here about the pre-amplifier noise figure. Recall that at low band VHF (channels 2-6) there is a natural atmospheric noise level even in rural areas which is impossible to cut beneath. Even in remote locations where power lines, electric fences and gasoline-engine fired

TABLE TWO — HEIGHT GAIN

Height gain over **relatively flat terrain only** increases rapidly for shorter-distance paths, but increases more gradually for longer paths. By starting with a measured signal level at a starting-height, additional signal level due to increasing antenna array height can be approximated from the following table:

Start With 30' Height	Height Gain — 50 mile Signal	Height Gain — 100 mile Signal
Raised to 60'	4.0 dB	3.0 dB
Raised to 120'	8.0 dB	6.0 dB
Raised to 240'	11.0 dB	8.0 dB
Raised to 480'	14.0 dB	10.0 dB

pumps are unknown, there is a natural atmospheric noise present in the lower channels which establishes a limit or floor *below which* all weak signals *are buried* by (or covered by) noise.

This noise is the accumulated effects of atmospheric variations (storms, and even dry desert air contribute minute amounts of "noise" to the spectrum in this frequency range) and even if all man-made noise is eliminated, this atmospheric noise remains. The *exact* amount of noise present in this range varies from location to location, but it is safe to assume that at most CATV headend sites this noise-floor is in the region of —48 to —52 dBmV over the 6 MHz bandwidth of a low band channel (such as channel 2). Which is another way of saying that a TV signal that is exactly —48 dBmV would be exactly *equal to* the atmospheric noise at such a representative site. Therefore, to achieve a 35 dB signal-to-noise *ratio* from an off-air signal at such a receiving site would require no less than —48 dBmV *plus* 35 dB of signal, or —13 dBmV in off-air signal level. In actual practice it may take —6 to —8 dBmV to achieve a 35 dB signal-to-noise ratio, if there are any (even weak) noise sources from *man made* equipment in the area.

So what good is a 2.0 dB noise figure pre-amplifier in such an installation? Probably, truthfully, not much better (if any at all) than a 5-6 dB noise figure pre-amplifier. That is to say that you simply never get the real 2.0 dB noise figure benefit of the ultra-low noise pre-amp in such a *low band* (this is low band, *not high band!*) situation. Therefore, if you are looking for ways to accumulate that 15 dB of *CATV margin* in your actual situation, and one or more of your channels are low band, you are best advised not to "plug in" any real life improvement factor for your better grade CATV pre-amplifier. Because the chances are pretty good that you will *not realize the improved noise figure spec* for your marginal low band signal.

Which means that for low band, we must count on antenna gain and antenna height gain to pick up our desired 15 dB margin. Antenna gain is self limiting, unless you have some way to hang the antennas except on a steel tower. There are just so many low band logs or yagis you can hang on a 30-40 inch face tower. Most systems are limited to

a maximum of four antennas for a single channel, a point at which the tower supplier begins to warn of potential disaster. If you need 15 dB of margin, and going from the home viewer's 5 dB gain antenna to a four bay CATV array with perhaps 17.0 dB of forward gain still leaves us 3 dB shy; the balance must come in height gain. If the home viewer is at 60 feet, we can pick up the 3 dB we need by going up just double that height, for a 70 mile signal. Or we could reduce the antenna array size to a *two-bay array* and hang it *240 feet* in the air.

For a high band signal and that 15 dB CATV margin, *we can return to the pre-amplifier* as an important part of the equation. Assuming a 2.0 dB noise figure pre-amp, versus a 6 dB noise figure TV receiver front end, we can safely assume a 4.0 dB improvement just by adding our better quality pre-amp at the antenna. That leaves us 11 dB to go.

(1) *Antenna gain* — assume the home antenna has 10 dB (peak channel) on our high band channel; by employing four of our 12 dB forward gain CATV antennas, we can realize around 17.0 dB gain, an improvement of 7.0 dB. That leaves us with 4.0 dB of margin to find.

(2) *Height gain* — again, if the home antenna is 60 feet above ground, by doubling that height we can add approximately 3 dB to our margin. To find the full 4.0 dB of height gain, we will need to multiply the home viewer's effective height by 3, or up to approximately 180 feet above ground.

Keep in mind that our CATV antenna height is effective height *over the viewer's height*. If the terrain is rolling and your headend site happens to be a hundred feet (or more) higher than the general height in the area to be served, this extra (hand picked) headend site elevation becomes *part of* the *total* height computed in the height gain portion of the equation.

Many system planners take the *worst* local case in town and start out their 15 dB (or whatever the number is) *margin search* from *that* point. Let's assume you are after a 15 dB CATV margin, and you use as your base calculation point the *lowest* elevation point in town. That may guarantee a high penetration from the homes in *that portion* of town, but what about the homes that are higher than the lowest point? Would it not be smarter to take *not* the *worst* in-town case but the *best* in town case to start your calculations? In that way, your penetration will be substantial throughout *all* of the community, because *your worst-case CATV margin* becomes 15 dB (which experience shows is a saleable product) while your *best case* may be 20 or even 25 dB. In other words, why self-limit your own system growth and penetration by being short sighted and only designing for the poor unfortunates who live in the worst part of town for TV reception?

The Noise Margin

There are perhaps several hundred CATV systems in operation today that would not exist if it were not for local man-made noise sources. We recently inspected a CATV system in a town of 9,800 homes where the CATV system, now nearly twenty years old, has over 9,000 subscribers. The off-air signal levels, as measured on a 60 foot antenna (typical fringe area antenna) *averaged 400-500 microvolts*; plenty good to make this seemingly a *not* very good choice for CATV. Yet the CATV system has better than 90% penetration.

The secret? If you check in between channels with a signal level device and a roof-top antenna, the town has an "ambient noise level" on low band of from —25 to —20 dBmV. Thus the typical off-air signals run 15 to 20 dB "*out of the noise*" on low band, and less than 30 dB out of the noise on high band (this is one of the few towns where we have found high band noise to be a universal, town-wide problem). The town owns and operates *its own* electrical distribution facility, and while the town is apparently not aware of it, the town's very poorly maintained electrical power company is the culprit.

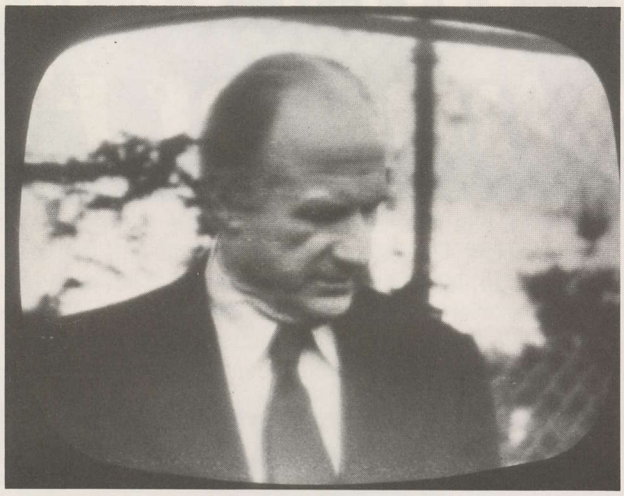
The CATV company went *out of town*, and put the town's noise into an "antenna null" and has prospered ever since. The CATV company averages only 5 to 8 dB better *real life signal levels* at *their* headend than the average town's people, but they average as much as 20 dB *less noise*. Thus the CATV pictures are sharp and for the most part noise free, while the rooftop signals are badly chopped up. And the only NBC service plus the closest ABC service is on low band.

Now if this same town were located where all of the off-air signals were on high band and/or UHF, the town would have been a poor to fair CATV town. Distance alone would not have done the trick; it took the noise degradation to turn the town into a hot CATV "margin" situation. As we shall see in June, there are many *sections* of non-cabled communities where the *same noise degradation exists* and where cable *could be* the profitable answer for the enterprising operator.

In the four photos set here, a low band signal of 0 dBmV (1,000 microvolts) is fed to a monitor. A local noise source (an electrical motor) is coupled to the input to the receiver, and by varying the coupling the noise level generated by the motor source is brought up from 35 dB *down* (i.e. a *ratio* of the desired signal to the motor noise of 35 dB) to a 20 dB ratio. The *CATV margin*, like the margin for signal level, is clear and very evident. And all it takes is careful antenna system engineering!

The Adjacent Channel Margin

The *average* television receiver does not exist, when it comes to adjacent channel selectivity. Yes, you *could* hang some numbers out and plot the



MOTOR NOISE/LOW BAND — Noise peaks **average** 35 dB below visual carrier level; note start of noise-banding along extreme bottom of screen.

MOTOR NOISE/LOW BAND — Noise peaks **average** 25 dB below visual carrier level.

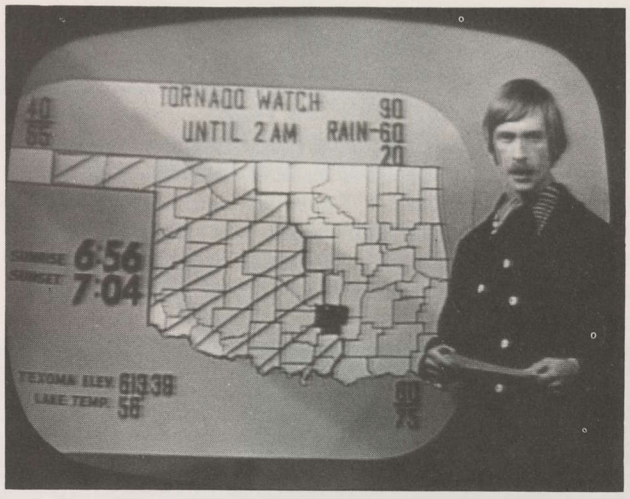
MOTOR NOISE/LOW BAND — Noise peaks **average** 20 dB below visual carrier level.

MOTOR NOISE/LOW BAND — Noise peaks **average** 15 dB below visual carrier level.

average "curve" of dozens of typical receivers on the market, to determine *the point at which* a stronger more-local signal on (say) channel 9 will wipe-out reception of a more distant signal on (say) channel 10. But into that nice paper plot, under laboratory conditions, you would be forced to plug in all of the variables which the actual receiving installation may create for the home viewer.

We have learned through several decades of CATV system engineering that *if we maintain nearly equal levels* between signals on adjacent channels most if not all recievers can separate the two (or three) adjacent channel signals. But the home viewer, lacking the sophisticated receiving equipment for signal balancing, the filtering equipment to trap out strong adjacent carriers and the host of other headend tricks we commonly employ is stuck with typically two controls — his antenna rotor (assuming his has one), and, his receiver fine tuning control. Sometimes this works, sometimes it does not. When reception conditions are bad and the distant weaker station is down in the mud in level, no amount of fiddling with the rotor and the fine tuning will eliminate the adjacent channel slop-over from the stronger more-local station.

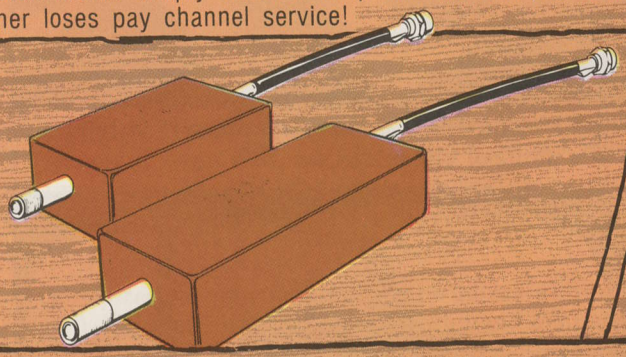
A subsequent portion of this series will go into the intricacies of adjacent channel filtering and signal cleansing. For now, see the five photos set here.



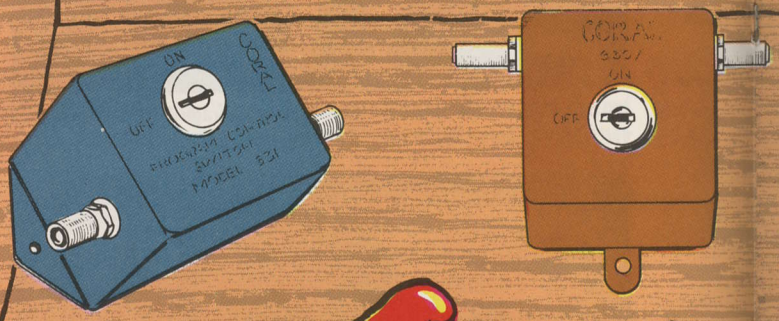
10 ADJACENT TO 9 — With both carriers equal

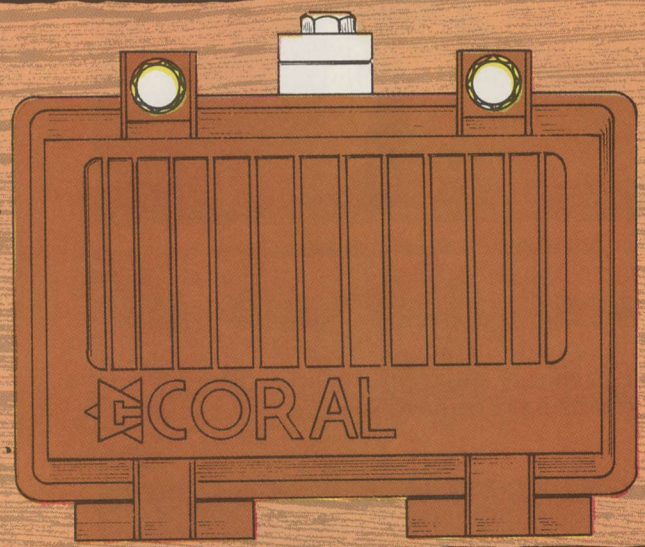
CORAL has been complete line of PAY-

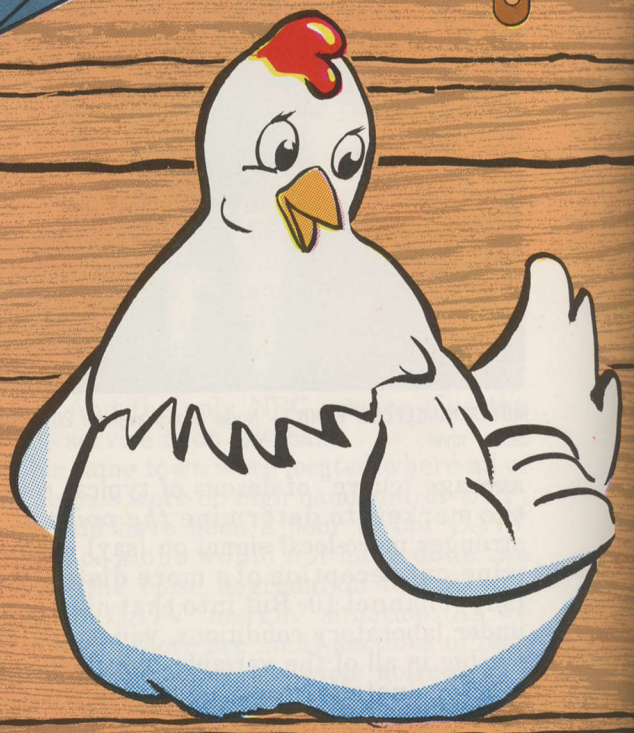
SERIES 600 VIDEO CARRIER TRAPS — Over 500,000 in use today! Channels 2, 5, 7 and mid-band standard off-the-shelf. Diecast housing, 100% waterproof. No splices required (cables preassembled). Easy installation, RFI shielded housing, double-shielded 59U leads. Trap attenuation 46 dB minimum with 500 kHz notch-width. Simply install in drop line and non-pay-cable customer loses pay channel service!



SERIES 630 KEY LOCK TRAPS — The ultimate parental control! Channels 2, 5, 7 and mid-band. Removing key (supplied) activates trap; inserting key allows pay-channel to pass to set. Traps video carrier minimum 46 dB (with 500 kHz notch-width). Also available model 635 for channels 2, 5; traps video **and** audio.2 inches square, 1.5 inches deep, with mounting ears.







SERIES 610/611 TRUNK/DISTRIBUTION TRAPS — Flexible system design! Diecast aluminum strand or pedestal mounting housing is RFI shielded, weatherproof, accepts connectors to ¾'' size. Circuit traps any channel 2-5, 7 and mid-band (specify when ordering); 46 dB minimum trap notch depth, 500 kHz wide. Power passing to 12 amps (60 volts AC). Cut house-drop trap costs by shutting off pay-channel to whole segments of town or whole blocks and buildings!

DON'T WASTE VALUABLE TIME SCRATCHING AROUND LOOKING FOR PAY-CABLE SECURITY. CORAL has the answers you are looking for . . . contact your nearest CORAL man for the full story today!

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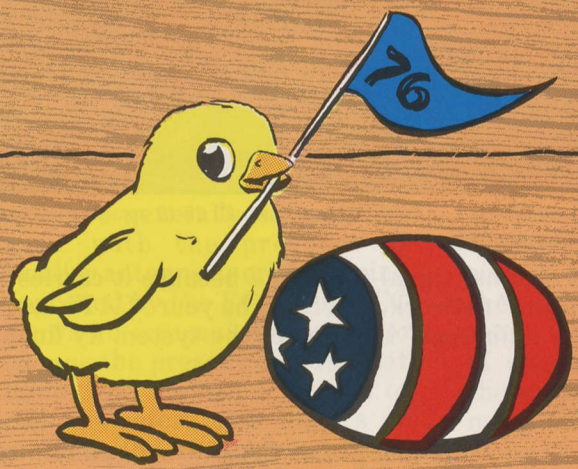

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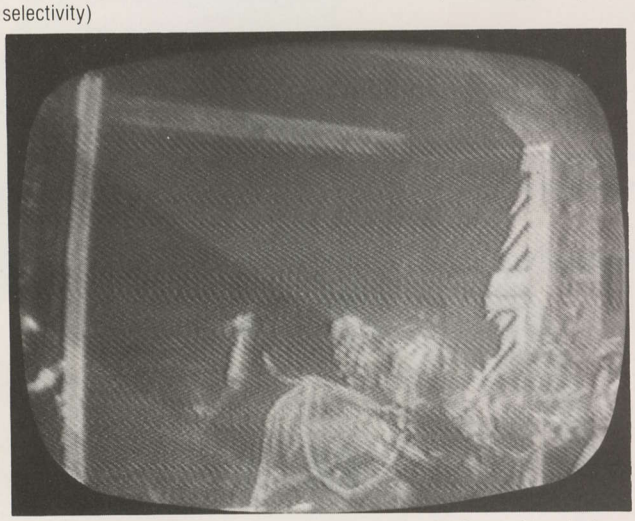
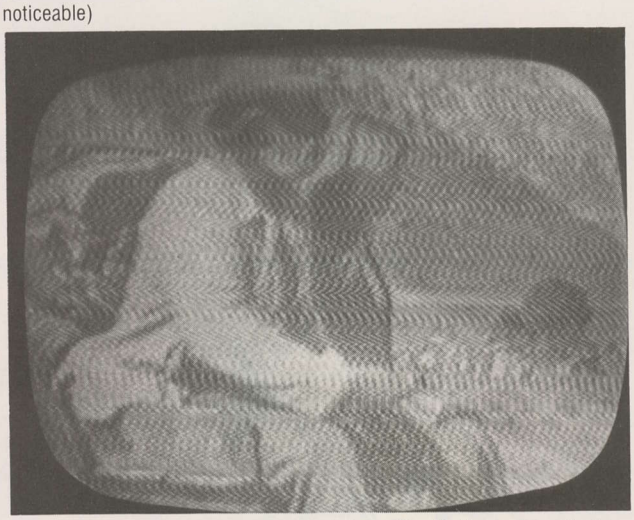
10 ADJACENT TO 9 — With 10 visual down 5 dB (still adequate reciever selectivity)

10 ADJACENT TO 9 — With 10 visual down 10 dB (9 aural herringbone noticeable)



10 ADJACENT TO 9 — With 10 visual down 15 dB (9 aural herringbone degrading)



10 ADJACENT TO 9 — With 10 visual down 20 dB (9 aural herringbone quite objectionable)

By maintaining a channel 9 signal at 0 dBmV to the receiver, we have adjusted the fine tuning for the best picture definition (i.e. tuner response) *on channel 10* when both signals (9 and 10) are 0 dBmV to the receiver. Now, by decreasing the level of the channel 10 signal and leaving the fine tuning completely alone, we see what happens when the channel 10 level drops down in 5 dB steps from *both equal at 0 dBmV* to channel 10 being degraded by —20 dBmV (relative to channel 9).

If in your particular situation the weaker adjacent channel signal *is desired* because it carries a "missing" network, this could be your *"CATV margin of difference"* that makes the system fly financially.

In June

...the "thin margin of CATV" will continue with a look at field survey techniques for finding and verifying "signal fingers", noise pockets and regions where CATV service is or would be desirable.

IN THE JUNE CATJ

*** UHF CONVERTER BASICS —** The theory behind the design of a modern day UHF to VHF converter, including complete step by step (illustrated) instructions for serving the popular UX-3 converter.
*** CARS BAND BATTLES —** A new broadcaster power play threatens the future of CARS band. What it means to you as an operator.
*** A TRANSLATOR IN YOUR FUTURE?** Some call it low-cost microwave.

SATELLITE TERMINAL ANTENNA SIZE ARGUMENTS HEAT UP
Phase III Report

Down to Earth

The natives are restless. After they have been to 'Paris', how are you going to hold them down on the farm?

10 meter dishes, as CATJ has pointed out in our recent October 1975 and February 1976 issues, are the only dishes which the FCC is presently authorizing for CATV earth terminal service. Yet, as CATJ has noted, 10 meter dishes cost a bunch of money. And there is a growing mound of evidence accumulating that many CATV satellite receiving sites do not require the kind of signal to noise ratios which 10 meter dishes deliver. It *may* be the classic old story of 'over-engineering', or at least, that is the way the *evidence* is beginning to point.

Those who have a running start on the 10 meter dish business are generally not enthusiastic with the prospect of smaller antenna apertures being approved by the FCC. The FCC shows *no internal inclination to change* the present criteria that limits CATV earth terminals to dish diameters of 9 meters or more (9 and 10 get used interchangeable in the industry, the FCC says that an antenna must have certain envelope patterns, and then defines those patterns. If you take the envelope patterns the FCC describes as minimal and design a parabolic to meet *that* pattern, you usually end up with a 9-10 meter dish aperture). The 9 (10) meter aperture limitation has an interesting heritage, which we will discuss shortly. Those who now market 9 (10) (11) meter dishes know that as long as the dish aperture is kept fairly sizeable, every Tom, Dick and Harry is *not* going to start cranking out *low cost* competitive dishes in their backyard. At some point *around* 3-5 meters, dish construction gets complicated enough and the tolerances get tight enough that the tinker-toy-set builders fade away and only the "pros" are left in the game. Call it the "endurance test" of the antenna industry.

So, as long as we are dealing with 9 meter-up dish apertures, we are dealing with a small (although growing) number of suppliers. If the FCC were to suddenly magically remove the antenna aperture size limits, competition would triple or quadruple overnight. Perhaps even faster than that.

Up to the *present* time, no CATV system wanting to install an earth terminal has been willing to *test* the FCC's hard-line on 9 meter and up size. Most observers fall into two camps; those who believe the Commission is perfectly correct with their 9 meter-up limitation, and those who believe the problem of envelope pattern shaping is the caveat any intelligent terminal buyer should be aware of, and if the buyer happens to *not care* about *possible* future potential interference from other satellites, so be it. *That is his worry.*

The purists like to point out that the FCC has long opted for an eventual satellite *stacking* arrangement whereby when the satellite belt *is* fully occupied, there will be one bird every 4 degrees of longitude. And that if you are pointing at 104 degrees west, that there will (eventually) be other satellites at 100 degrees west and 108 degrees west, using the same downlink frequencies at the same time.

This means, these purists say, that the FCC rules that prescribe antenna receiving envelopes (patterns) are merely for the *protection* of the earth terminal operator. That is, if you follow the FCC guidelines, installing *only* dish antennas with apertures of 9 meters or greater, you can rest assured that while pointing at 104 degrees west, your receiving terminal will not receive objectional interference from other birds at 100 west and 108 west.

In case you haven't figured it out yet, the antenna beamwidth is largely determined by antenna aperture. Bigger antennas typically have narrower (less broad or wide) receiving beamwidths, and a 9 meter (up) dish has a sufficiently narrow beamwidth that when it is pointed at 104 degrees west, signals originating from 100 and 108 degrees west will fall far enough down on the side lobe of the dish receiving pattern that these signals should not interfere with your desired signal.

That is how the theory goes. There is one more bit of logic behind the 9 meter and up requirement, and that is terrestial interference. The downlink frequencies employed (3.7—4.2 GHz presently) are "shared" here on earth by a number of point-to-point microwave users. And it is possible that sooner or later (we understand it has already happened) an earth terminal will desire to be located smack dab in the middle of such a terrestial link, using the same frequency band as the satellite downlink. Antenna envelope pattern to the rescue.

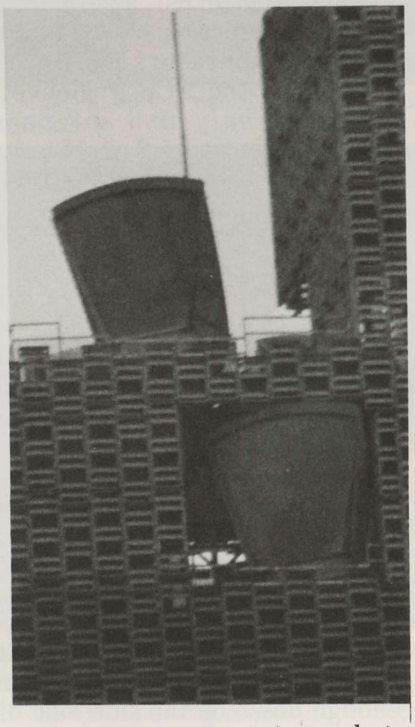
We covered most of this in our February CATJ report

(pages 10-25).

So where are we *today*, some 60 days later?

As we noted, *the natives are getting restless.*

Case to point. The CATV system in Gaithersburg, Maryland (Gaithersburg CATV, Inc.), owned by John Panagos, filed early in February an application to construct a CATV earth terminal utilizing a *10 foot horn antenna.* A what antenna?



A horn antenna (see photograph here). Look closely, that is the same antenna you see hanging on the side of Bell (and other) microwave point-to-point towers all across the countryside. And note that ten foot is not ten meters. The Panagos application *is* unique, in reason and in execution, to date. Panagos has elected to play it low key, *all alone.* He *personally* trotted the application down to nearby 1919 M Street, and he *personally* visits the FCC every week or two to see how his application is moving ahead. *In early April, it is not.* So far the FCC has *neither* accepted *nor* rejected it. They are simply *sitting* on it. They would like it to go away, or simply cob-web over from old age. Panagos is not the kind to let that happen. Every time he goes down and "visits" he forces them to pull it out of the basket and shuffle it around on the desk in front of him. If Panagos wins this battle (the first battle is simply getting the Commission to *formally accept the application,* so far they have *formally done nothing*), and he wins it alone as he is now playing the game, the industry should erect a statue to him. It will be the classic tale of David and Goliath.

PRODELIN 15 FOOTER — One of several existing 15 foot (give or take a foot) earth terminal antennas is the Prodelin Masar model.

The horn antenna is an interesting animal. There are apparently two suppliers of this antenna in the United States; one of which builds his antenna out of a fiberglass material. The ten foot model prices out around $10,000.00 but it has sufficiently low gain that to make upper 40's signal to noise ratios you need to tie into it with one of the exotic parametric amplifiers (a $20,000.00 amplifier LNA).

Another application is being prepared; this one by an MDS type operator who will specify a 14 foot horn antenna. This slightly larger horn will be able to deliver low 50's signal to noise ratios with the same $20,000.00 parametric LNA. In both cases, the total cost of the receiving system comes down substantially from the $65,000 to $100,000. prices now being quoted and paid by most getting into the industry. The 10 foot version pricing works out to around $40,000.00 for the total package.

But...the horn antenna has the same basic "FCC doesn't like it" problem as any parabolic antenna *smaller than* 9 meters. The FCC's limits on parabolic antennas is largely one contrived by the resulting envelope pattern, and the pattern specified by the Commission by in large builds around something engineers call "*32—25 log theta*" (that reads thirty-two minus 25, log theta).

New Delhi — 1970

In New Delhi, India in 1970, a high level group of international communication planners (the Henry Kissinger's of their respective national communication policy departments) met to adopt *international* standards for satellites. These people realized that at some future point in time, the so-called equatorial satellite-belt would be filled to capacity by birds. And desiring to get maximum communications channel capacity out of the eventual house-full of birds, these people agreed that some standards for satellite-to-satellite *spacings* must be adopted. The FCC decision to allow satellites to stack (on the same frequency) every 4 degrees of longitude around the equator has *largely come* from that high level conference.

Now the 4 degree stacking increments was not one of those "out of the hat numbers". It had good scientific background, at the time. Part of the session was devoted to analyzing the *actual measured receiving envelope patterns* of three (then operating) earth terminals. The dishes analyzed were *then* typical, such as the 85 foot Goonhilly Downs terminal in England. The other two terminals had 100 foot plus dishes.

The February (1976) issue of CATJ carried a lengthy report entitled "Earth Terminals — Phase II" (pages 10-25). **The report covered an operating installation owned by Tulsa Cable Television, Tulsa, Oklahoma and discussed at some length the current debate over antenna dish size versus system performance, utilizing smaller-than 9 meter dish antennas. That report drew the following letter from Robert C. Tenten, Director of Engineering, for HBO** (Home Box Office), **New York, New York** (10020).

Mr. R.B. Cooper, Jr.
Editor-in-Chief
CATJ
4209 Northwest 23rd Street
Suite 106
Oklahoma City, OK 73107

Dear Mr. Cooper:

I would like to make some comments on the article concerning satellite earth terminals, which appeared in the February, 1976 issue of CATJ. There appears to be some discrepancy with regard to the observations made at Andrew Corporation at Orland Park. For example, the 55dB S/N ratio would give a 17.3dB C/N ratio assuming the 37.7dB FM improvement ratio, which is a function of the HBO transmission parameters. If a receiver with an 8.5dB noise signal is connected directly to the antenna, the G/T of the station would be reduced by about 8.2dB, and the C/N ratio and S/N ratio should be reduced by the same amount; that is the C/N should be 9.2dB and the S/N should be 46.8dB. Since the measured S/N ratio was 36dB, it **appears** that the system was operating **below receiver threshold.**

If the **LNA used on the 10 meter dish** is used **with a 4.5 meter dish** as suggested, the G/T of the station would drop by something more than the difference in antenna gains (due to the higher **noise temperature** of the small dish).Even assuming a 7dB drop in S/N ratio to 48dB due to reduced antenna gain, the C/N ratio would drop to 11.3dB, very close to **receiver threshold**. When degradations in transmission from satellite to earth station occur, the system will operate **below** receiver threshold with a **serious decrease** in S/N ratio.

It should also be noted that these Orland Park measurements were made in an area that has a rather **high** EIRP from the satellite. In other areas of **lower** EIRP, stations must be designed to take this into account.

The measured S/N ratio is not a function of a tape machine since it is done in a line of the vertical interval and is generated by a Tektronix 149A generator, which comes **after** any tape machine. Also since the S/N ratio **from the Studio to the satellite transponder** is budgeted **at 59dB**, the overall S/N ratio should then be calculated as the power combination of this 59dB combined with the earth station S/N ratio. The difference should be less than 1dB, depending on the S/N ratio at the earth station.

Reducing the receiver IF bandwidth will not result in increase S/N ratio but **will** give increase in C/N ratio. Reducing the IF bandwidth to 18MHz as suggested would be rather extreme and would cause distortion in the audio, which is carried on a 6.8MHz subcarrier. It does appear that the IF bandwidth **can be reduced** to a point where about 2dB in C/N ratio can be gained. There is **no** resolution loss using **this** technique; however, some nonlinear distortions do occur which are a function of the APL (Average Picture Level) of the video but are **not** generally **noticed** on program material.

The use of a 1.6dB NF amplifier with a 4.5 meter antenna versus a 2.7dB amplifier with a 10 meter antenna will **not** yield 52/53dB S/N ratio but **more like** a 50dB S/N ratio **at a C/N of 12dB**, again very **little** margin is provided. The result is also dependent on the EIRP of the satellite at a given location.

Use of **small** earth stations (if and when FCC approval is granted) can be very helpful, especially to smaller CATV systems or in areas where construction of a 10 meter antenna would prove to be very difficult. Use of the small earth station should be considered very carefully. If LNA redundancy is considered, the cost of the station at this time can approach that of the 10 meter dish with a less costly LNA.

One of the main points which should be noted is that the video S/N ratio is **not** arbitrarily set at some **high** number but rather is the result of designing a station to have a C/N ratio that will provide some **margin of receiver threshold**; the FM improvement factor **then gives** a very high S/N ratio.

The HBO Studio facility in New York has always been aware of the video quality and has always originated on broadcast quality quad machines. Money has been spent at our Studio facilities primarily to obtain more operating space and to purchase more tape machines to meet the needs of our expanding programming requirements. The one area where money has been spent for the purposes of improving signal quality has been the purchase of an RCA TK28 film chain in an attempt to improve the quality of film transfers over that which we have been able to obtain from outside sources.

Sincerely,

Robert C. Tenten
Director of Engineering
Home Box Office
New York, N.Y. 10020

Uh-huh! These *are* very *big* antennas, with *very big* apertures. And *very narrow* envelope beamwidths. From this "new Delhi adoption" and CCIR report, the FCC structured its own thirty-two minus 25 log theta criteria. The New Delhi group erred, as far as the average man in the street is concerned, because it assumed that the *then typical* 85-100 foot (plus) diameter dishes would be the type of antenna systems that the satellite receiving terminals of the future would utilize as well. There is *nothing* "typical" about an 85-100 foot dish.

But, *they* assumed these *would be* "typical" receiving terminal antennas, and the FCC bought it. And the FCC bought the 4 degree longitude increment spacings that go along with 85 foot and larger dishes. It is a scientific wonder that when the CCIR program was boiled down to FCC standard that we got in with 9 meter dishes at all!

There is more to it *of course.* Such as the fact that the pattern as adopted by the FCC allows the thirty-two minus twenty five log theta individual side lobes to be *"averaged out"*, resulting in theory, in side lobes that are *"as poor as"* twenty-six minus twenty five log theta. But as you might guess, antenna design engineers can (and do) have a "ball" with their computers "playing with" the *FCC* guidelines and *their* antenna designs. There is plenty of room for "free interpretation" and probably at least one or two chances to "fudge a little".

But no amount of playing or fudging will get the permissible antenna size down *below* 9

meters. A meter, for those having trouble with the conversion, is roughly 39.37 inches. A 9 meter dish is 27.86 feet in aperture. Thus the "popular" 10 meter dishes are about 33 feet in aperture.

So anyone who thinks in terms of getting into CATV earth terminals with something smaller than a 9 meter aperture is facing:

(1) *Asking the FCC*, formally, *to act upon a petition to change the existing 9 meter criteria*, or

(2) *Asking for one specific waiver of the rules for a specific situation*, or,

(3) *Simply not asking the FCC for anything.*

To date, at least as this is prepared for publication early in April, everyone who has gotten into CATV earth terminals has been in such a hurry that they did not want to delay entrance of their service while awaiting "special" FCC action. Surely, many *have* considered either asking the Commission to change the criteria, or, asking for a waiver. But anyone who deals with the FCC knows that *any* application *that deviates* from the 9 meter (up) criteria is *asking for* a long-long wait. John Panagos in Gaithersburg is still waiting for the Commission to formally *accept* his application for a *ten foot horn*. Others who filed at about the same time with *10 meter* aperture applications *already have their CP's* in hand and they are under construction. Choosing to fight the system requires plenty of patience, plenty of time, and either a good attorney or good legal instincts of your own.

However, the first under 9 meter application may be at the Commission as this is read (1). An application for a CP, specifying something smaller than 9 meters in aperture, for an honest to gosh CATV system is one thing. An application to put in an *experimental* under 9 meter system is quite another. One system, put into operation during April, following the "experimental" approach is at the Santa Clara, California offices of *Prodelin, Inc.* Prodelin, an old line well established manufacturer of microwave antennas (including a 15 footer) wants into the CATV earth terminal business. As things now stand, they are geared up to produce dish antennas *up to* 15 feet (4.57 meter aperture) in size. And while Prodelin could surely get into the 9 meter and up antenna business if they *really* wanted to, they, like CATJ (see February — pages 10-25) wonder *why* the world *really needs* the 9 meter and up criteria currently pushed by the FCC.

Prodelin says that *if* they can get sufficient interest in their 15 foot version, and *if* the early interested parties are ready, willing and able to request that the Commission *change* the rules or *waive* the rules, *they believe the 9 meter up criteria can be beat.* If it can, as CATJ suggested back in February, there are healthy monetary rewards at the end of the trek for the lucky operators.

Prodelin, still in the throes of installing and tweeking their own 15 foot installation for Santa Clara as this is written, sees pricing for a complete terminal with a 15 foot dish, like this:

(1) 15 foot dish — with "J-Hook" (prime focus) feed, and mounting pedestal and all tie-down gear — $12,000 to $16,000.00;

(2) 1.3 to 1.4 dB thermoelectric cooled GaAs FET LNA (preamplifier) — $3,000.00;

(3) Receiver, with video and audio output, $8,000.00.

To save you adding it all up, that comes to $23,000/$27,000.00, plus things like installation (if you can't do it yourself), feedline, and whatever redundancy you might need. CATJ expects to have *a report* on the check-out of the Prodelin Santa Clara installation, including photos of the installation and measured signal to noise level ratios, *in the June issue.*

Understand *this is a test* installation, and that it will take a serious challenge (and serious challenger) of the 9 meter up criteria (plus a *favorable* FCC decision) *before* such an installation can be installed and put into *legal* service in CATV.

Apparently some of the 9 meter and up manufacturers *are showing* some concern that potential CATV buyers *might be* slowing down some buying decisions to *wait* for a decision on the smaller-than-9-meter criteria. At the recent Dallas trade show, virtually all of the earth terminal exhibitors were being questioned hard by CATV operators about "why should I buy a ten (or eleven) meter dish today...if I wait for a few months, I may be able to get by with a 4.5 meter antenna". The Dallas show created fantastic interest in earth terminals and their hardware, where, in 1974 there was a single exhibitor with earth terminal capability, this year there were four operating terminals (all competitive) on the convention grounds. And had the show been a couple of weeks later, there would have been at least two more live satellite terminal exhibits.

Back a little earlier in this report, we noted there are currently three things an operator *might do* about the 9 meter up criteria, ask that the rules be changed, asked that a singular waiver be granted, or, *don't ask the FCC for anything.* Just do it.

One year ago, it *would have been* unheard of to *suggest* in print that *perhaps* (just perhaps) the FCC may have serious problems defending its "get a CP/license" first requirement for earth terminal receiving stations. But that was before the Gridley CATV test case, which questions just that question, except not for satellite reception, for plain CATV broadcast reception. Even a casual visitor to the

(1) **The first to-the-FCC application for a 4.5 meter dish was filed in mid-April by Cable TV of Minot, Inc., Minot, North Dakota, owned by group owner Community Tele-Communications, Inc.**

Dallas trade show had to run into several discussions that poised the question "just where does the FCC get off requiring receiving terminal licenses in the first place?" And, "If they can sustain their right to require a CP and license, how can they sustain their insistence that we use a dish antenna of *only* a prescribed size"?

One operator was heard quizzing an FCC Cable Bureau official (who admitted he had very little knowledge about common carrier problems and satellites) with the question "How can you require that we use a dish of a certain size? How does *that* requirement read any different than the Cable Bureau telling us that we *must use* only quadstack logs for Grade B and beyond signals?"

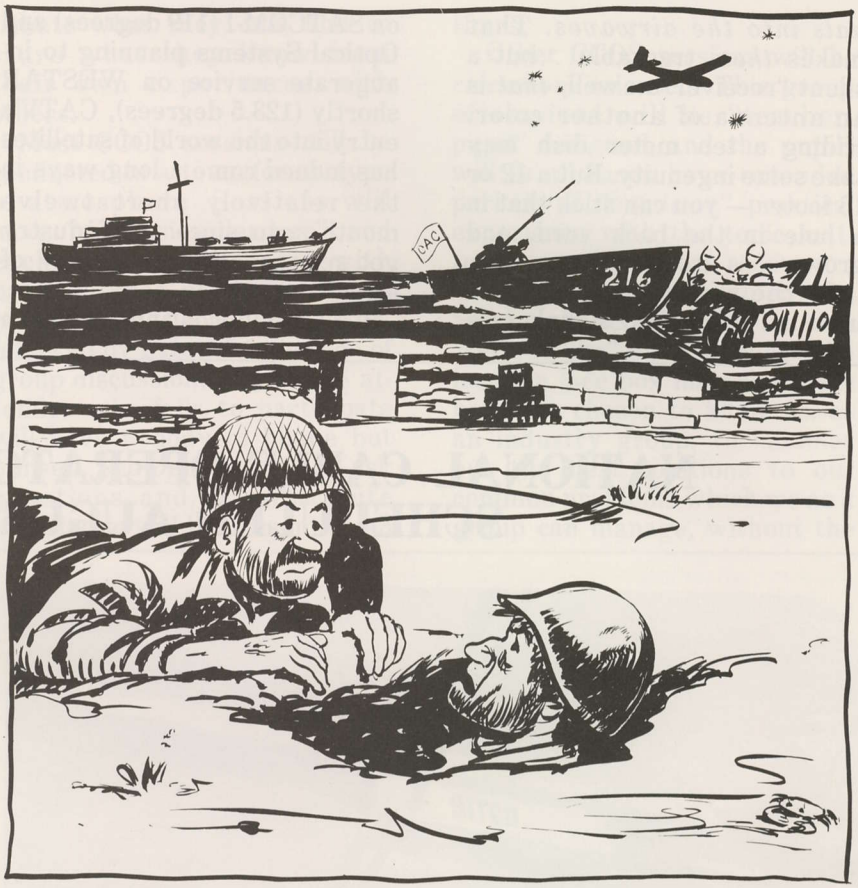
The question is a good one, as are the serious studies now underway to examine the heritage (with case law that may or may not back it up) of the FCC's assumption of earth terminal licensing requirements. CATJ sees it coming, perhaps before the summer is over, *somebody, somewhere, is going to challenge the Commission on both parts of the question:*

(1) Where does the authority to license receiving stations come from, and,

(2) *If* that sustains, how can the dish/aperture requirement be defended?

It may be the "Gridley in the sky" of not only CATV, but also of a whole new satellite to ground broadcasting industry we see emerging. There were, in attendance in Dallas, a *wide range* of interested observers from *non*-CATV fields. People who represent everything from large motel chains to well-heeled private individuals. They all wanted to *see* the pictures from the bird, and for whatever devious (or not so devious) plans they had in mind, to find out just which direction pricing of earth terminals was headed.

CATJ has met with several groups and a few individuals doing some *serious* work on *designing* new terminals. At least one such group *has an operating terminal with a 12 foot* (3.66 meter) *dish*. In this particular installation, they have a repeat-measurement signal-to-noise of 41 dB spilling out of the video spigot. CATJ sees no less than one, and probably a couple of these efforts resulting in system brewed (i.e. home brewed) terminals delivering signals to subscribers, again, *before the current year is over*. And if a system or small group can pool efforts to get a 41 dB (or better as the case may be) signal-to-noise ratio from the bird, for dollar figures so low (obviously the labor to build it is not included, for it is a labor of love) that they would be ridiculous to publish at this time, what will stop an equally talented individual or group from setting up in their "own backyards" to do the same thing, except not for CATV? *We see that coming also.*



"OUR ORDERS ARE TO FIND THE * @ † &* TERMINAL, NO MATTER WHERE IT'S HIDDEN !"

And apparently HBO is equally cognizant of the unrestricted availability of their signal from the sky. We heard some light hearted talk about HBO going to a scrambled video system to protect themselves from bootleggers. But like any ECM system (electronic counter measure — in this case *counter to* a program-signal theft attempt), if one man can design a scrambler, another can design a de-scrambler. And if through all of this the *FCC's will* to require earth terminal *licenses* prevails, having a rule on the books to stop unlicensed terminal operation is one thing, *enforcing it is quite another*. The FCC has shown in recent history (and currently) that they could *not* shut down a few hundred *unlicensed* TV boosters (translators), nor can they seemingly cope with the current rage: hundreds of thousands (if not millions) of *unlicensed* CB'ers. And both of these groups *radiate sig-*

nals into the airwaves. That makes *them* trackable...but a silent "receiver"...well, *that* is an antenna of another color. Hiding a ten meter dish may take some ingenuity. But a 12 or 15 footer — you can stick that in a hole in the back yard, and grow roses around it!

So the winds of change are upon us. With HBO signals now on SATCOM-I (119 degrees) and Optical Systems planning to inaugerate service on WESTAR shortly (123.5 degrees), CATV's entry into the world of satellites has indeed come a long ways in the relatively short twelve month span since the industry got *serious about* bird-relay of signals.

CATJ will continue to keep the industry advised of developments in this important new emerging field in TV reception services. We can promise you some *very exciting* developments ahead, and along about August or so, an entire issue devoted to satellite terminals, an issue that we assure you will be kept under lock and key by most readers!

NATIONAL CABLE OPERATORS SEMINAR SCHEDULED AUGUST 9-11

CATA's "Better" Idea

As announced elsewhere in this issue of CATJ (see CATAtorial, pages 4-5), the Community Antenna Television association will hold a national "seminar" for cable operating personnel August 9-11 at Sequoyah State Park near Wagoner, Oklahoma.

This is a critical year for CATV. The industry is facing increased state regulation, increasing (ever-increasing!) federal regulation, and, a growing municipal problem as systems go before their local authorities to seek FCC-demanded franchise modifications.

The requirements, by the FCC, of what you must do on or before March 31, 1977, are not universally understood. Do you have to get your franchise modified? Does your system have to have *total technical* compliance? If yes, *what is* total technical compliance?

Where will the money come from to upgrade technical performance? Where will the legal

CCOS PROPOSED PROGRAM SUBJECT MATTER

Technical

(1) **Signal propagation** — Half day session, classroom technique, teaching how VHF-UHF signals are affected by terrain and propagation abnormalities.
(2) **Antenna Designs/Test Range** —Outdoor full day session with operating antenna test range. Covering antenna stacking, phasing for co-channel, Yagi and Log antenna design, construction techniques. **Bring an antenna you wish measured for gain and match!**
(3) **Head End Practices** —One day session covering pre-amplifiers, their repair, trapping and filtering, when to use, signal combining.
(4) **Head End Equipment Maintenance** —One day session covering repair and alignment of headend equipment; **bring your pre-amp, processor for alignment check.**
(5) **Low Cost Plant Construction Techniques** — Half day session reviewing various techniques to construct low-density systems for rural areas.
(6) **Plant Amplifier Repair/Upgrading Techniques** — One day session covering basic amplifier troubleshooting techniques and upgrading of present amplifiers with new components for improved performance. **Limited registration.**
(7) **FCC Proof Testing** — Two day session, covering FCC compliance testing. **Limited registration.**

Operational

(8) **Going For Rate Increases** — One day session split between city views of CATV rate increase requests and practical experience of system operators.
(9) **Signal Leakage and CB Interference** — One-half day session covering system vulnerability to ingress of local transmitter sources.
(10) **The Bank Loan** — One-half day session on preparing an application for a bank loan to finance system re-building or new system construction.
(11) **Small System Satellite Terminals** — One day session exploring the problems associated with bringing the pay-cable via satellite programming down to a cost region which small(er) systems can afford.
(12) **Preparing For March 1977** — One day session covering cable system-municipal relationships to gain local franchise/permit compliance for 1977. Includes step by step approach to preparing 1977 CAC applications.

Special

(13) **The Spectrum Analyzer** — Two day session covering basics of spectrum analyzer operation and step by step construction techniques of "Elementary Analyzer" (Note: **Limited registration,** each registrant will construct and de-bug a working elementary analyzer.)

assistance come from to help you obtain a modified franchise from your local municipality? What are some of the techniques you can utilize to upgrade your system's technical compliance, without going broke in the process? What about long-rural extensions, where you *know* you are faced with extensive technical upgrading to make technical compliance? Would you be better off *shutting off* these sections of your plant (and thereby deny these rural people cable service), than spending several thousand dollars per mile to serve say ten homes?

The questions, go on, and on and on. *The answers do not come back nearly as fast.*

What about satellites? Will satellite terminal service and pay-cable *ever* be feasible for any but the largest systems or the larger multiple operators?

The CATA Cable Operators Seminar (CCOS) will attempt to provide answers to many of these questions. It is a three day meeting, jam-packed with learning and participating sessions. It will bring before and to CATV system operators acknowledged leaders from a wide variety of fields, many of whom have never previously had the opportunity to work with CATV system people before.

CCOS will be an intensive session, people who come should be prepared to "go back to school" and learn. They should be prepared to concentrate their mental powers and to bring with them their own specific problems. They should be prepared to take volumes of notes and be prepared to discuss openly and frankly the length and breath of of their *specific* system problems.

The CCOS sessions will not be lectures or talks, as much as they will be "discussions". Each session is intended to create an atmosphere of "give and take", where all session participants will be called upon to get *involved in* the discussion, contribute what they can, and to share what they know from their own experiences with others.

Most CCOS sessions will be conducted in a town-forum type of atmosphere. Sessions will have "discussion leaders" and each session will begin with basic outlines of the problems created by the topic matter, followed by extensive periods of group discussion. Any CCOS attendee who fails to participate will have nobody to blame but himself, the *opportunity* to ask questions and/or contribute knowledge will be present at all times.

Other CCOS sessions will be *classroom* oriented. This group of sessions will be "teacher-pupil" designed, and the pupils will in all cases have extended periods of "hands-on" practical experience with the topic matter.

The CATA Cable Operators Seminar is being conducted in a "retreat-like" environment. The location (see box material here) has been chosen to allow us, as an industry group, to hammer out the best solutions to our common problems which we as a group can manage, without the

CCOS LOCATION	— Western Hills Lodge, Sequoyah State Park (8 miles east of Wagoner, Oklahoma on State Highway 51; approximately 44 "air" miles east/southeast of Tulsa, Oklahoma airport)
CCOS DATES	— August 9-10-11, 1976, first sessions begin 9AM Monday, August 9, last session ends 3PM Wednesday, August 11th.
ATTENDANCE	— By pre-registration only, limited facilities, $25.00 per person for CATA-member-systems, $40.00 per person for non CATA-member systems. No charge for system operators/owners invited as guests of CATA-member-systems. See text.
PROGRAM	— Hands-on technical and system-owner/management operational problems and solutions.

distractions of a busy commercial environment. The location is quiet, rural-like, relaxing and very attractive. It should create the best possible "*frame of mind*" for three days of intensive learning.

The CATA Cable Operators Seminar is being run on a very democratic set of principles. Registrants will participate, *in advance*, in determining the precise sessions and topics to be included in CCOS. The general topics now under consideration are listed here in table form (see box). Between pages 40 and 41 of this issue of CATJ is a pre-registration card application which includes a complete list of all topic-subjects now being *considered*. Those pre-registering will indicate the sessions which they would like to attend (and by omission those which they would probably not attend). *From the tally of these returns*, a hard and fast program will be put together around June 15th. We *think* we know which topics will draw the largest interest, but our *final* choices and program selection will depend largely on the preferences indicated by the pre-registrants.

Limited Capacity

Virtually all of the Western Hills Lodge at the Sequoyah State Park complex, near Wagoner, Oklahoma is reserved for CCOS August 9-11. This is a Monday—Tuesday—Wednesday period. Western Hills Lodge is a remarkable, quiet, and relatively small facility located on Fort Gibson Reservoir in Oklahoma's "Green Country". The facility consists of a main lodge (with accommodations for approximately 325 people), and a small number of individually constructed "cottages". Cottages typically have one and two bedrooms, air conditioning, and a very small number also have kitchens. All told, approximately 400 people can be "slept" at the facility. In addition to the state lodge grounds, there is within 15-30 minutes driving time through rural countryside three motel-like facilities with room for perhaps another 100 persons.

All told, approximately 500 people can be accommodated in these facilities. Plus, the state park grounds surrounding the lodge proper has camper and camping facilities which for all practical purposes are "unlimited" in size.

The lodge proper has meeting rooms which vary in size from one that will comfortably hold 50 persons classroom style to the largest that sits 390 persons theater style. CCOS will operate with two or three simultaneous sessions during each respective meeting period, which means that attendees will have a *choice* of sessions and topics at all times. However, all instructor/pupil type sessions will have *limited* enrollment. Not only must these sessions be slotted to the smaller meeting rooms, but, in order to insure that everyone attending these sessions accomplishes his "learning goal", the various instructors involved have set limits on the number of persons attending their sessions, a number determined by "insuring personal attention to each participant" criteria.

Therefore, when you "mix up" the total number of beds available, and the total number of seats available in the meeting sessions, you reach a logical extension of just how many people can be accommodated at CCOS. *That number is between 400 and 500*, the exact mix to be determined by how many people (1) bring families, (2) camp out on the grounds, (3) wish to attend the various sessions.

CATA will accept pre-registrations for CCOS *only until* the limits of the lodging facilities and the limits of the session facilities are filled. Certain session facilities will, we fear, fill up *very* fast. On your pre-registration card between pages 40 and 41 here this month, we ask you to indicate by numerical preference those session-

WESTERN HILLS LODGE RATES

Note: Do **not** correspond or call Western Hills Lodge for reservations. You will receive complete reservation data with your initial pre-registration acknowledgement.

Sleeping Accommodations		Lodge	Cottage	Cottage w/kitchen
Single (*)		15.00	18.00	20.00
Double		24.00	18.00	20.00
	P.S.	27.00		
Double bed, single bed	L.S.	24.00	20.00 (3)	22.00
Two double beds	L.S.	27.00	24.00	26.00

* Cottage rates are subject to change.

There is a 3.00 charge for each additional adult.

Other/Category	Price/Charges Range
Lunches	$2.85 — $4.50
Dinners	$3.50 — $9.00
Bicycles	$1.00 per hour
Stage Coach Rides	$ .50
Saddle Horses	$3.00 per hour
Train Rides	$ .25
Hayrides	$1.00 per person
Golf Green Fees	$3.00 per person
Electric Carts	$4.00 for 9 holes, $7.00 for 18 holes
Fishing Boat (w/out motor)	$2.50 for 12 hours

many more.

This would seem to be an opportunity for the *whole* family to enjoy a mini-vacation, at an attractive, wholesome facility, for some of the lowest rates around. And while the "old man" took in the CCOS sessions, there will be no lack of activities for families. Depending upon the number of women and children who turn out, CCOS *might* get involved in planning some special events for the balance of the family as well.

Costs

We have developed a rather unusual charge-structure for attendees.

If you are a CATA-member system, the charge for the full three days (or any part thereof) will be $25.00. If you do not wish to attend the banquet on Tuesday evening (the one and *only* CCOS-meal event), you knock $10.00 off the registration fee. If you are *not* a CATA-member system, but you can talk a CATA-member system *to bring you as a guest* (this applies to system owner/operators *only*), you get in free. Or for $10.00 if you want to partake of our banquet. If you are *not* a CATA member system, and do not wish to come *as a guest* of a CATA member system, the charge is $40.00 for the three days. *Only one guest per member system* and then *only* if the member system operator/owner himself comes to CCOS.

What about CATA Associate Members, the suppliers to our industry?

CATA's Board appointed a two-man committee representing the suppliers: Jim Emerson and Vince Borelli. Emerson works with ComSonics and others such as Eagle Comtronics while Borelli is with TOMCO. These two gentlemen are presently drawing up a proposal to the CATA Board outlining how the suppliers should participate in this program. We have set aside a large area at the lodge for the suppliers and they will *not be charged* for the space. Based upon the recommendations of Emerson and Borelli, the display area hours and the "rules" will be adopted and published for the suppliers. We have a space limit here also and even without a formal announcement, the available space has been filling up rapidly. Suppliers will be able to send up to two people without charge for attendance, other than the banquet fee if they wish to attend the banquet. One concept we are toying with is centering the supplier display area open-hours for the *evening periods* when informal discussions can take place after the day's learning sessions.

Extra Costs

At least one, and perhaps two of the instructor/pupil sessions will have additional fees attached. At the moment, the session defintely scheduled to cost

"extra" is the spectrum analyzer session. In this session participants will *individually construct* working "*elementary analyzers*" following the CATJ article written by Gill Cable's Jerry Laufer in July of last year. The cost, in this case, will be announced when finalized, but it will be for the raw parts and the raw Jerrold converter which the people attending this class will utilize to construct the elementary analyzer.

Other sessions, such as the 1977 Legal Compliance Session, will have *optional* work packets available, packets of work materials which will be followed in the instruction portion of these sessions to allow each participant to work out his own franchise modifications for 1977 FCC compliance. The cost will be around $5.00 in this case.

Summary

The dates are August 9-11. If you will arrive by airplane, the Tulsa airport is the closest full facility port. Again, small planes can be accommodated at the Western Hills Lodge strip.

Groups in far states are encouraged to collectively pool transportation, such as car or camper pools. If you need help in getting together with others from your area who might be attending, let us know and we'll try to put you together.

The lodging space and the meeting-facility space is limited, and therefore applicants will be treated on a *first come-first served basis*. The first step *is to register* using the pre-registration card between pages 40 and 41 here this month.

NEW ENGINEERING ISN'T DEAD
(It's just slowed way down)
REPORT ON DALLAS TRADE SHOW

Limited Excitement

The 25th annual industry trade show in Dallas April 4-7 provided few big surprises, as one observer noted with accuracy, "during the past two years the major R and D efforts in this industry have been curtailed or cancelled. There has simply not been sufficient supplier capital available to fund on-going innovative research. Now it is catching up with us."

Still, several significant firsts *did* appear. There was the first showing of a new digital readout field strength meter. There was a very clever if not downright ingenious low-cost approach to pay cable "scrambling". There was the first showing of the first "under $3000.00" time base corrector box. And there were lots of claims and counterclaims (and prototype equipment) directed at the active or so-called "intelligent tap" concept.

There were booths that were too small (*example:* the T.E.S.T. booth where the "ingenious scrambler system" was demonstrated) and there were booths too large (there were many examples of this so why embarrass anyone by reliving it for them!). There were many orders placed on the floor for some new product concepts (*example*: the ComSonics Sniffer Radiation Detector proved a hot item) and there were moments of typical frustration (*example:* the April issue CATJ report of the new Richey Development Company Mini-Dyne to be shown in the TOMCO booth, after the first few hours, it quit working. But TOMCO's Tom Olson made lemonade out of the problem by demonstrating how when a processor fails his new SR-2000 remote control headend standby processor can switch around the bad unit!)

Other than the new, innovative products to be described here in some detail, there were some excitement trends. A trend is when two or more manufacturers decide an item or concept will sell and competitive juices begin to flow.

Intelligent/ smart/ addressable taps were a trend. After they were first shown in Anaheim at the Western show in November (DBC had a working display there), people naturally *expected* bigger, better things in Dallas. They were bigger, *but in our estimation*, not necessarily better. DBC again showed how they plan to deliver their version of the product...but the actual delivery from DBC (as well as the others) seems still uncertain. There were many glittering generalities (i.e. "fall 76", or "first quarter 77")

BUSY T.E.S.T. BOOTH

quoted and there were many holes in the product line-ups themselves. Pro-Com displayed their "Pass III" version, but it lacked any outdoor (strand or pedestal mounting) taps. What seems to be missing in the intelligent/addressable/smart tap area right now is customer directives. Everyone seems to agree that this *is* a "neat concept", but very few people seem to agree *how* and *when* and *why* you will use the devices. Some suppliers believe that the device will be the salvation of pay-cable (which at the *moment* seems to need *no* saving) that when (and if) the device gets widespread usage, the cable system of the future will be selling pay cable programs not pay cable channels. Even the motion picture people felt inclined to *boost* the addressable tap subject at the show, when one Hollywood representative commented that *as soon as* use of the unit is *widespread, he foresaw* a whole new film and program production industry springing up to provide *special event programming* which would be sold on a "per program basis". It is the classic chicken and egg situation. Only at the moment the chicken is very expensive.

If there is a *reluctance level* amongst system operators or designers to get *serious* about immediately redesigning for intelligent taps in their systems, it is the reluctance of spending so much money per subscriber. Where nobody seems to be ready, *today*, to deliver any *quantity* numbers of the units, the prices per tap device seem pegged in the $60-$100.00 range. If a device can serve four homes for that kind of investment, there is some concern how you are going to get that money back.

Another trend is the runaway wild fire called satellite distribution of pay cable programming. There is every indication that as many as 100 terminals will be in *actual operation* before the current year is out. This meets or exceeds even the most optomistic forecasts of just one year ago when CATV first got serious about satellites and terminals.

There were four 9-10-11 meter dishes on display, and a 4.5 meter dish installed by Collins. The Collins dish was delivering pictures, just like the big ones. Collins said they were *not* on hand to *push* the 4.5 meter dish concept, but "merely" to "demonstrate" that such a dish size does work, *and*, that they have a dandy LNA (preamp) for sale *should* anyone care to buy one. Several indicated they were impressed with the Collins pictures, and *few* claimed they could tell the *difference* between the pictures from the Collins 4.5 meter dish and the bigger antennas on hand. For a more complete update on the current status of the CATV earth terminal saga, see page 27 here.

The T.E.S.T. Box

Prior to the Dallas show, probably very few had ever heard of TEST, Inc. For the record, the alphabet "zoo" stands for "Tanner Electronic Systemps Technology" (Inc.). The company is located at 16130 Stagg Street, Van Nuys, California (91406).

Tucked away in a minimal size booth in a far corner of the display floor, the people from TEST spent the better part of their three days in Dallas crawling over one another and the hordes of potential system customers who descended on the booth like a herd of hungry rodents. TEST it seemed, had built a *better* mouse trap for "scrambling" a pay cable channel so that non-paying subscribers could not enjoy the picture or sound from the raucous flicks.

The TEST system is simplicity itself. Perhaps that is one reason why the average cable operator liked what he saw, *he understood the premise* and he understood why it did work. And the TEST system is cheap. Not inexpensive, but cheap.

To explain.

TEST, like the people at DBC who block pay cable channels with their intelligent tap by inserting an interfering carrier *within* the TV channel passband, know that if you stick a carrier someplace into the TV passband between the video carrier and the color subcarrier, you get what looks like a severe case of co-channel (see photo here, taken from the display monitor in the TEST booth). *See diagram one.* Now in the DBC approach for intelligent taps, the interfering carrier is generated *in the intelligent tap* and is carried into the home on the pay channel. The device that creates the interfering carrier in the DBC tap is a miniature transmitter.

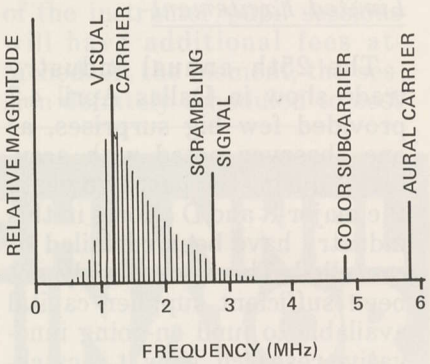


DIAGRAM 1

TEST takes *their* "interfering carrier transmitter" *back* to the headend, and they position it on a frequency that is 2.257 MHz *above* the visual carrier frequency (diagram 1). This carrier is sent throughout the plant, right along with the normal component parts of the TV chanenl (i.e. visual carrier, color subcarrier, aural carrier). If the carrier were to go along unmodulated, it would create a film or graying-blanking effect *over the video* on the channel (it is located too *far* away from the visual carrier at 2.257 MHz above the visual carrier to create *normal* co-channel beat bars). This filming or blanking effect *might*

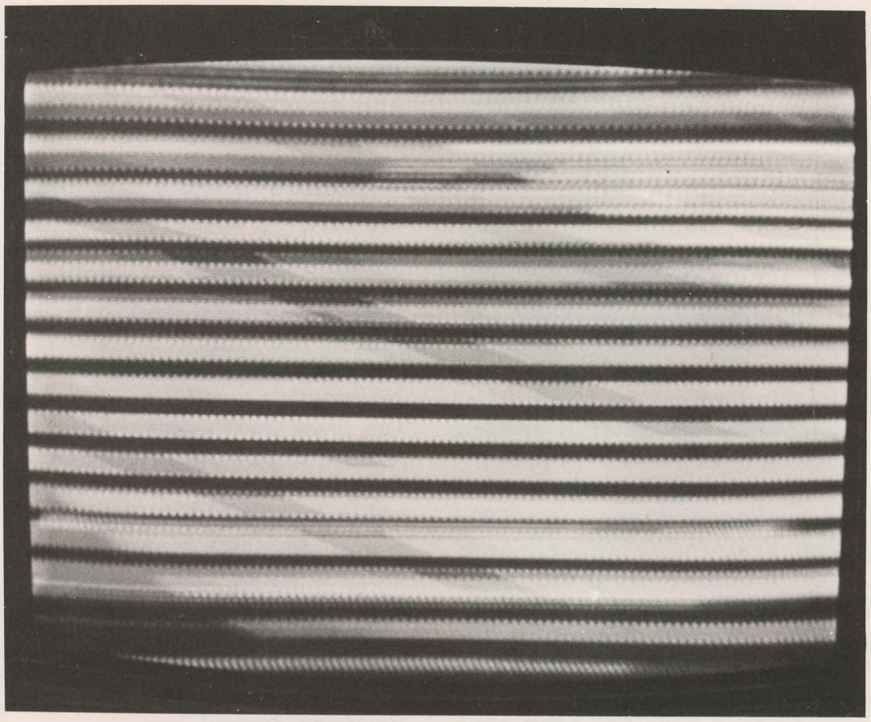
be disruptive to the viewing of the pay-cable picture, but it would hardly make it *impossible* for someone to watch the picture, and it certainly would not mess up the sound.

So TEST *modulates the interfering carrier* with a selection of carefully chosen modulation frequencies. These "modulating" frequencies are 15 Hz (that is hertz, not kilohertz) and 1 kHz. The low frequency modulating wave, 15 Hz, is designed primarily to cause the TV receiver AGC system and vertical sync pulses to come *unglued.* In other words, by modulating the interfering carrier with the 15 Hz (AM) information, the scrambling of the pay cable picture takes place *not* in the transmission but in the *reception* of the signal. The video detector *in the TV receiver* gets all messed up when it sees those funny 15 Hz modulation products and this causes the picture to tear and roll.

The 1 kHz modulation signal creats two *additional* effects on the pay cable channel, it generates a "whine" (audio note) that passes through the receiver limiter circuit, and is detected and amplified for speaker "display". This audio "whine" very effectively covers up the audio material on the channel so it cannot be heard. At the same time the 1 kHz modulation *also* creates alternating white and black bars on the TV screen, bars which, when added to the film effect of the interfering carrier itself, result in something that sort of looks like the co-channel effect.

So the cable subscriber, not part of the pay-cable scheme, tunes to the pay cable channel and receives a loud audio whine from the speaker, and a picture that has bad jitters, a heavy set of black and white bars running through it, and a film or graying over the video. It just doesn't seem like anything the person is willing to watch (or listen to).

And again, understand that unlike complex scrambling systems where the video information and sync information is taken apart and sent out along the cable in random, unrelated parts to be put back together by the special descrambler at the home, *this scrambling system* sends out a perfectly watchable picture and decent sound, *until* it runs into a receiver where the presence of the interfering carrier *and* its modulation forms creates a scrambling *inside of* the television receiver itself.



JAMMING ALA T.E.S.T. – 1 kHz modulation of interfering carrier plus 15 hZ modulation creates picture nobody could watch.

Obviously, with the TEST system, you don't need traps on *non*-pay-cable homes. All you need is *some way* to descramble the receiver created mess at the homes, *for the paying customers* who *want* pay cable.

Before we get into the descrambling portion, it should be noted that the headend "scrambler" is a rack mounting unobtrusive package that costs around $800.00. The "scrambler" not only creates the undesired in-channel carrier (with modulation), but it also works in conjunction with the normal on-channel signal processor (modulator) to provide "*selective pre-emphasis*" of the video information that is contained *within* the portion of the passband immediately surrounding the frequency of the scrambling carrier.

The reason behind this special pre-emphasis is as follows:

As you shall see, when the signal is "descrambled", a trapping technique is utilized. If the video information located around the channel-portion where the interfering carrier is centered (i.e. +2.257 MHz of the visual carrier frequency) were *not* specially (pre)emphasized, there would be a "loss" of that video information on the subscriber's picture tube. This would show up as smear and loss of signal definition. So the scrambler pre-emphasizes the segment of the passband *around* the interfering carrier, so that when we "descramble" the resulting picture is quite close to the original non-scrambled picture.

Now at the receiver, without a "descrambler", the viewer receives the messed-up video and aural-whine shown and mentioned previously. To unscramble the mess, TEST provides a $5.00 "descrambler" which the system installs at the home in the drop line. The descrambler is a very nifty highly selective

(and TEST says highly stable) signal *trap*. It centers its trap-notch on the interfering carrier frequency, and literally *traps out* the interfering carrier. Don't laugh...*it does work*... at least it did in Dallas.

The trap/descramber is indeed an interesting advance in trap state-of-the-art. Hopefully, TEST *will* offer the traps for *general* CATV system headend use also. The trap is contructed following so-called thick-film techniques, where trap inductances are "deposited" onto both ceramic *and* glass substances. This makes for exceedingly uniform trap-inductances, and some precision Hi-Q devices. The whole circuit is housed inside of a die-cast housing, with an in and an out "F" fitting on opposite ends. The unit shown in the photo here has been cut-away to allow show people to inspect it closely, but the customer unit is totally sealed.

Now, in installing the trap/descrambler at the home, a special screw (one with a customized screw-head) inserts through the body of the trap and into a secure wall joint or floor panel. This locks the trap into a physical location from which a person cannot remove it with any *commonly available* screwdriver. Now, should someone try to get cute and attempt to pry the trap/descrambler loose from the wall or floorboard with a crowbar, any pressure exerted on the special mounting screw causes the screw to disintegrate. When it busts into a jillion pieces, it releases a spring that trips a "hammer" that *destroys* the glass subtrate inside of the trap/descrambler, rendering it useless. And that's the end of the trap.

You probably think we are making this up. *We are not.* And the price for the trap/descrambler is $5.00 ("in any quantity" says TEST).

Like we said, the TEST system is ingenious, and whether it catches on or not, it certainly did brighten up the show. We even heard some pay-TV-scrambler people planning how they could market a counter-measure device!

The Digital SLM

We have been expecting someone to turn loose with a digital SLM/FSM for quite some time. There *have been* several outfits working on it, but with the industry cutting way back on R and D money in the last two years or longer, we knew that most of the full-line manufacturers were not breaking any records getting it done.

Harry Sadel of SADELCO proved to be the first to make the grade, and it is perhaps fitting that Harry is first with this innovation since he has been the most prolific innovator in SLM design in our industry for perhaps twenty years or more.

The Digitalevel-100 was shown at Dallas to a constant crowd of interested operators.

Low-Cost Time Base Corrector

If you are into local VTR programming, whether you use one of the popular video juke-boxes or record and playback machines for local origination, you are probably well aware that picture skewing and other bad nonsense from the recorded video information oftentimes gives your locally produced or locally shown tapes anything but a network appearance.

For many years you could spend $5,000. or $10,000. or $20,000. for a time base corrector and probably solve your cruddy-looking-picture problem. Then a couple of years ago you could spend "as little as" $4,000. (well, a few bucks less actually) and solve the problem. Now the price of correction has come down again, this time to (just) under $3,000.

Systa-Matics, Inc. (510 North Sheridan, Tulsa, Oklahoma 74115) displayed a unit completed just hours before the show (the solder was still warm) called the RAIM 1000. It features fast picture lock-up (it requires 1/4th second to lock up on a distorted picture and correct it), and about a dozen other features that probably deserve your attention if you are plagued with time base (VTR) problems. We watched the unit work at the show (it does work, although we think they could have found a more interesting tape for their demo) and listened to them explain how they had worked until midnight Saturday night to complete the unit in time for the Sunday AM show opening. But most of all, we were amazed that a unit com-

"DESCRAMBLER" ALA T.E.S.T. — Special Dallas show unit had cut-away for view inside of glass and ceramic substrate of trap unit.

PRE REGISTRATION

for

CATA's CABLE OPERATORS SEMINAR
August 9-10-11, 1976
Sequoyah State Park / Western Hills Lodge
Wagoner, Oklahoma

- **Read the complete text of the outline of CCOS on pages 32 to 37 here this month before completing pre-registration card.**
- **Complete the two-sided card.**
- **Enclose the appropriate check and mail to CATA SEMINAR** (make check payable to CATA SEMINAR), **4209 NW 23rd, Suite 106, Oklahoma City, Ok. 73107.**

***NOTE:** Registration is limited to the capacity of the housing facility and meeting space available. **Registrations will be returned after that capacity is reached.**

PRE-REGISTRATION — CCOS — AUG. 9/11, 1976

☐ **I represent a CATA-MEMBER system**; $25.00 enclosed for pre-registration to CCOS-76.

☐ I will bring as a guest _____ of _____, _____; a system operator not a member of CATA. Please enroll him on the pre-registration list.

☐ **We are NOT a CATA-member system**; $40.00 enclosed for pre-registration to CCOS-76.

Note: Registration is on an **individual basis**; use separate application for each registrant.

NAME _____

Company Affiliation _____

Address _____

Town/City _____ State _____ Zip _____

— — — — — — — — FOLD HERE — — — — — — — —

Telephone _____

I represent following systems: _____

_____ with a total of _____ subscribers

INSTRUCTIONS FOR COMPLETING PROGRAM OPINION STUDY:

Read through the **complete** list of program-topics being considered. Then, using numbers 1-7, select the first, second, third (etc.) **most interesting** topics to **you. Limit** selection **to seven** please.

- ☐ Signal Propagation
- ☐ Antenna Designs/Test Range
- ☐ Head End Practices
- ☐ Head End Equipment Maintenance
- ☐ Low Cost Plant Construction Techniques
- ☐ Plant Amplifier Upgrading Techniques/Repairs
- ☐ FCC Proof Testing
- ☐ Going For Rate Increases
- ☐ Signal Leakage and CB Interference
- ☐ The Bank Loan
- ☐ Small System Satellite Terminals
- ☐ Preparing For March 1977 FCC Applications
- ☐ The Spectrum Analyzer

NOTE: Read complete description of topics on page 32 here this month.

pleted Saturday night had full four-color brochures printed and ready to hand out to the waiting crowds on Sunday.

Other New Concepts/Products

Sylvania showed a new mid-band to UHF "block" converter, designed to fit into pay-cable situations where the pay channel is mid-band transported, and rather than giving the subscriber a multiple channel set top converter, you would give him a VHF to UHF converter for watching the pay channel(s) on UHF. Sylvania was showing the unit, but was undecided as to whether or not they would produce it, awaiting some feedback from potential users.

One small booth that had a very handy gadget was the Multi-Purpose Ladder Sales Company (1200 Westlake North, Suite 701, Seattle, Wn. 98109). This is a very unique design heavy duty (but lightweight aluminum) ladder that unwinds like a carpenter's folding pocket rule. It will unfold to make a straight-up ladder, a straight-up ladder with a platform at the top, a trestle (i.e. step) ladder, a scaffold or probably a pretzel. It is worth 13 cents postage and a few minutes of your time to drop them a note asking for their pamphlet on the A-12-5W and A-16-5W ladders. Anyone who has to climb around, or work at elevated heights will appreciate this new tool.

Blonder-Tongue has an interesting application for their CATV Civil Emergency Alert System. Using their model AMT 4921 modulators (provides an unmodulated visual RF carrier and a modulated aural RF carrier for any TV channel), BT is talking about how (relatively) easy *it would be* to design a cross-mod measuring system. The CEAS packages have not gone over all that well in the industry, even though 50% federal matching funds are available for their purchase and operation. Ray St. Louis suggests that if a system looked at the CEAS package as a *combination* emergency alerting system *plus* a method of accurately measuring cross-mod, the financial bite to install the CEAS system would be considerably lessened (i.e. you get a cross-mod measuring system for the price of the CEAS package).

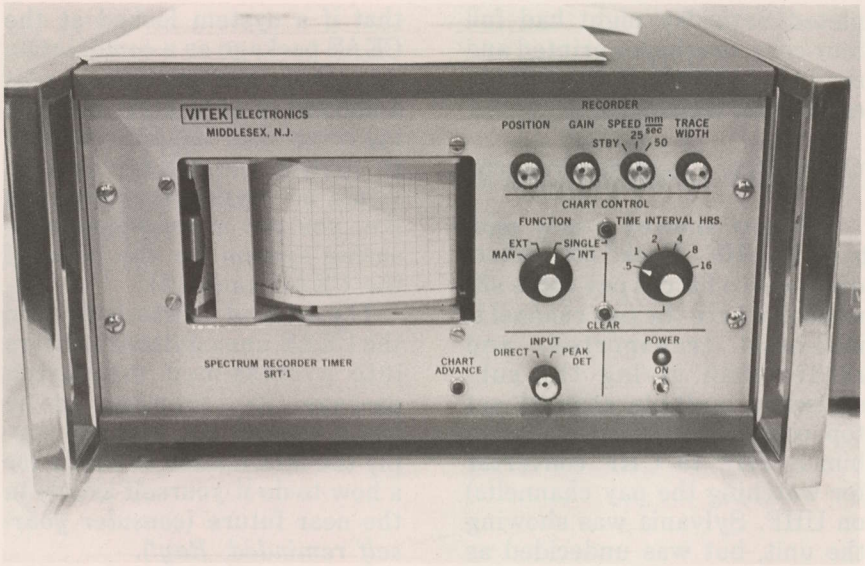
The trick of course is to turn the CEAS unmodulated carriers into a cross-mod measuring package. Ray promises us he has it worked out, and will supply the information to CATJ for a how-to-do-it-yourself article in the near future (*consider yourself reminded, Ray!*).

Broadband Engineering, Inc. (535 East Indiantown Road, Jupiter, Fl. 33458) has been supplying replacement parts for CATV equipment for quite some time. Now they have gone into the packaged-parts approach, providing complete "*parts-kits*" for field updating of older style amplifiers. The concept is that by taking a parts-kit for a SLE-1 (for example) and making the changes in your shop, you gain amplifier *performance improvement*. This is possible because the current generation of parts is considerably better than the original parts used in many units (time improves most things, parts specs included). For example, you can gain a 3-4 dB noise figure improvement, a 6-10 dB cross-mod improvement (for 12 channels) and a 3-5 dB output capability improvement (typically) with a Broadband "Mod-Kit". Additionally, in some units (such as SA-1 through SA-6) you pick up bandwidth improvements, and of course, better reliability of the amplifier with newer, better-rated critical parts. The Mod-Kits are priced from $11.55 to $35.00, depending on the amplifier involved. Because this is something you can do in your shop, one at a time, it makes excellent sense to look into this approach from Broadband.

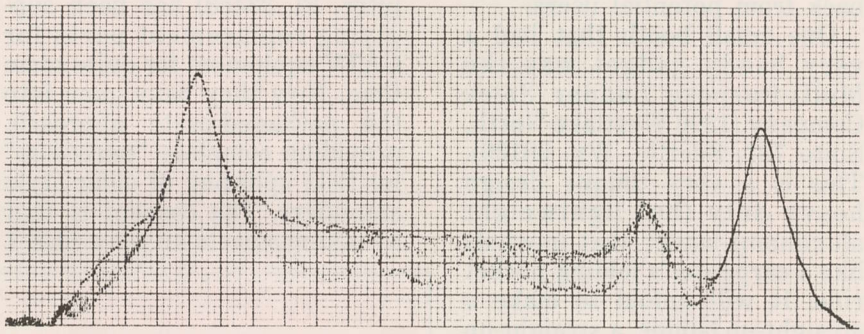
VITEK Electronics, Inc. (200

Wood Avenue, Middlesex, N.J. 08846) had something old and something new to show, both of which many (if not most) of the industry were not previously acquainted with. In the "new-new" department, VITEK had a coaxial bandpass filter that looks for the world like their now-famous coaxial-look-alike pay cable trap. The BPF follows the same technique, but utilizes 1/2 wave rather than 1/4 wave lines inside of the jacket. The filter passband response is certainly not like you would expect to find with a $200.00 interdigital unit, but then the price is very low ($6.00 each). We can see applications in pay-*only* drops, plus, we can see many applications around the headend and on the tower. For example, if you stuck one of these in between the antenna output spigot and the downline, you would eliminate *other* high energy level signals from the downline (and preamp). If you used these coaxial-look-alike BPF's in your headend combining, you could probably clean up some beat problems. It is a neat idea, and it is inexpensive.

VITEK also displayed a host of VITEK test gear (most people seem to forget, if they ever knew, that before VITEK stumbled into the pay-cable-trap business, they had a fairly broad CATV test equipment line), which we will mention here in listing form just in case you don't know they have such equipment. There is a solid state wideband noise generator (similar in concept to the Sadelco unit), the NC-2 that sells for $375.00, there is a video comb generator that produces a "comb" of "pickets" every 15.7 kHz from 15.7 kHz up to 5.0 MHz (model CGV-1), there is a VHF-UHF noise generator that covers 40 to 900 MHz with a wideband noise output of —15 dBmV (model NVU-1, $275.00). In the strange-but-true categories, there is the "Downtimer", a device that responds to a loss in television signal level. Any input signal connected to the unit, between 5 and 900 MHz, that falls below —3 dBmV, starts a timer internal in the battery operated unit. The timer measures how long the signal was below the threshold level with an Indachron elapsed-time-indicator. That might be handy at a headend or at the end of a drop. There is also an SPDT switch/driver that is designed for IF and RF switching applications. The unit sells for $75.00.



VITEK SPECTRUM RECORDER — Provides hard copy record of analyzer displays without camera; and can be programmed to record without anyone in attendance.



VITEK HARD S/A COPY — Single channel display from VITEK spectrum analyzer recorder.

Back in the *new*-new category, VITEK displayed a spectrum chart recorder which should be appealing to people who have spectrum analyzers and who would like to capture and hold displays. Rather than messing around with a camera, and then trying to make sense out of the often-blurred polaroid shot, the VITEK SRT-1 recorder-timer records on a paper chart (using inkless writing) the same display that the SA unit has on the tube. The SRT-1 is connected to the video output spigot on the SA and to the analyzer's sweep output for automatic recording. The chart will start recording only at the start of an analyzer sweep, and then by pushing a front panel button (trigger) or applying an external 5 volt pulse. An internal timer will automatically start the SRT-1 every .5, 1, 2, 4, 8 or 16 hours. The SRT-1 has a peak detector, and if the SA has been set to display at a sweeping rate of (for example) 10 seconds per cM, and the SRT-1 writing speed is set at 50 mm per second, the recorder written display will actually magnify the analyzer display by 50. The SRT-1 can also be utilized with a sweep and scope to record swept response displays. It is a very neat kind of box, and the price of $1050.00 shouldn't drive any real enthusiast away.

TECHNICAL TOPICS

TESTING TRAINING SESSION

Jerrold/Texscan are scheduling a full five day CATV system testing training session for June 14-18 in Indianapolis at the Sherator Inn, I-465 and Route 67.

The seminar will be conducted by Raleigh Stelle and Len Ecker (of Texscan and Jerrold respectively). **Attendance will be limited to 60 students.** The sessions will begin at 9 AM on the 14th and 8 AM on the balance of the days. You **must** sign up in advance, and when the registration is to the sixty mark, new registrations will be turned back. The limitation is due to the fact that every attendee will go through equipment handling and use sessions, and without some limits on the attendance, there would not be adequate teacher/student personal time to insure that every person attending the sessions gets maximum value for the session.

You can sign up or get additional data from Raleigh Stelle, Texscan Corporation, 2446 North Shadeland Avenue, Indianapolis, Indiana 46219 (317-357-8781).

TRANSLATOR FREQ TRUTH

"I note with some concern the recent correspondence from CATJ readers concerning the FCC required frequency tolerance for UHF translators. The letters seem to suggest that 99 watt and lower power UHF translators are required to maintain a tolerance that translates to +/— 178 kHz for channel 83, but that translators of 100 watts and over are required to maintain a tighter tolerance (equivalent of 17.8 kHz at channel 83).

Not so. The rules require translators of 100 watts **or less** (not 99 watts or less) to maintain the equivalent of +/— 178 kHz at channel 83. Thus only those translators that are **over** 100 watts are required to maintain the tighter tolerance. As a matter of practicality, there are only a handful of authorized translators with over 100 watts translator transmitter power. The number is so small as to be inconsequential. Therefore, CATV systems making measurements on off-air-UHF translators can reasonably assume the translator's tolerance is in the 125-178 kHz range (plus or minus), because that is what all 10, 20 and 100 watt translators must maintain.

It might be of interest to note that translator operators have the same problem with output-frequency integrity as cable systems are apparently now facing, when two or more translators get linked and especially if the end unit is a VHF output unit. For example, suppose the off-air signal (channel 13) gets translated to 83. The 83 signal goes some distance, is picked up and then re-translated on 65. Now the 65 signal is taken off-the-air at some distance and converted down to channel 2 for re-broadcasting via a VHF translator on channel 2. The channel 2 translator stability requirement is approximately 11 kHz. Obviously, with two (125-178 kHz) tolerances ahead of it, there is a very slim chance the channel 65 to 2 conversion will hit the channel two '11 kHz window'. This usually means that the translator operator sets up and measures **where he is** on channel 2; and **then** he orders a **new** channel 2 translator crystal to **correct** for the measured deviation he finds.

There also seems to be the suggestion in CATJ that UHF translators **drift** around in their tolerance-passband. I am sure this can and does happen, but as a rule, my measurements indicate the bulk of the off-frequency error is due to (1) initial set-up error, and, (2) long term crystal aging. Over short periods of hours, days and even weeks, I doubt that a UHF translator operating in a typical 0 degree (F) to 100 degree (F) environment will change actual transmitting frequency by more than a couple of kHz".

Dr. B.W. St. Clair
Television Technology Corp.
Arvada, Co. 80003

MORE — FREQ MEASUREMENTS

With reference to Dick Kirn's letter (**April Technical Topics**) relative to measuring frequency conversion equipment oscillators for FCC frequency measurement compliance. I have used this same method and calculated 'worst-case' situations relative to broadcast station carrier frequency tolerances. As Kirn states, it does get a bit hairy when there are multiple conversions involved, but the technique certainly makes sense and it should be more than acceptable to a logical-thinking and knowledgeable FCC inspector.

Our in-house counter lacked frequency response, not accuracy, cutting off at 175 MHz as so many units do. The unit also suffered from decreasing sensitivity with frequency, another common problem with the less expensive counters. I made use of a 'Pagel' probe-type preamplifier and where needed the Mid State RD-1 amplifier prior to prescaling and counting. We installed a 'gimmick' probe into the oscillator circuit on our frequency conversion units and brought the probe out to a standard F fitting where the probe is convenient and available for measurements in the future. I did find that extremely light coupling of the probe-gimmick is required with some oscillators to prevent the oscillator from being loaded by the proximity of the inductive probe, and thereby shifting frequency.

I believe it is the responsibility of the technician to obtain FCC acceptable proof of performance at a minimum of cost to the system. This is especially true in a measurement such as this where the equipment required for the measurement is not part of any daily routine-use equipment. Wherever possible, a good tech keeps his system's investment in needless test gear down to a minimum.

George F. Province
Fort Cablevision
Fort Scott, Kansas 66701

FRANCHISE RAIDING

Your CATA-torial appearing in the April issue hits squarely at a very serious problem facing our industry today. Franchising-raiding is not the only problem facing older operators in grandfathered situations however . . . there is an equally difficult and complex situation developing in straight-forward franchise renewals and rate-adjustment determinations.

Many systems are requesting rate hikes, and while the majority are apparently getting these rate hikes with only modest opposition, others are running into a whole new type of "community-ethic" response. Recently I have seen several situations develop where a relatively calm request for a rate hike has unleashed a hornet's nest of local anti-cable-system protest, a reaction which by in large the cable operator was ill-prepared for nor does he know how to react to.

Because of the unique nature of our free-enterprise, admittedly profit motivated, business, we are neither fish nor fowl. In a time of inflation, increasing utility costs and doubling basic food costs every few years, **any** increase for basic television service seems to bring out the worst type of suspicions in the minds of many community leaders. All it apparently takes is **one** dis-gruntled city council person to start the ball rolling. A case to point is occuring now not far from Oklahoma City, a cable system has asked for a rate hike (the present rate is under $5.00 for 12 channels). One city person decided he wanted to see that rate hike justified on a utility-approach "rate of return" basis, and from that request or demand, the city is now overrrun with city engaged consultants, experts of all types and descriptions, and the city is entertaining the suggestion that it take over the cable system and run it as a municipal utility (the same city now owns and operates the local electrical distribution company). The poor cable system manager never knew what hit him!

The cable system was, prior to the present mess, reasonably well run, provided typical service, and while there was room for improvement in perhaps two key areas, neither of these problem areas should have fanned the present flames. (**One** was a reluctantness of the system management to **promptly** make relatively short line extensions of perhaps 1000-2000 feet intc new housing developments, the **second** was a company policy not to respond to service calls or outtage complaints after 9 PM, and before then only when five or more homes were affected.)

A fire like this one is very difficult to stop once it starts. I don't think anyone is immune, and that includes locally owned and locally operated systems. The general public has been exposed to enough printed material about the "gold-mines of cable" that there is a growing suspicion of just how our business operates, what we put into it, and in return, receive from it. As they say, **a little bit of knowledge** is oftentimes a very dangerous thing, and at best, the average antagonist when he starts a fire like this burning has very little real knowledge.

To my fellow cable operators, then, I offer the following recommendations, based upon personal experience and the realities of the municipal environment:

Now, let's face it, we all know of systems (and operators) who have **not** performed to even minimum expectations for their communities. Some were well-intentioned but made poor decisions . . . others were just plain less than lilly-white.

But, those instances are rare. However, if

you, as an operator, fall into either group... look to your own stew when it boils over.

a. **Be prepared to defend your franchise**, rates, policies, etc., with full effort in court. It may be the only place you can receive a fair and objective hearing if this "trend", as it has been observed, continues.

b. **Examine your operation carefully**. Is there any room for real criticism? Could you defend your operational policies, technical determinations, overall performance before a judge and win?

c. Pay particular attention to your service-call-response, (speed and consistancy) picture-quality, and reasonable, visible, evidence of return of surplus capital **to the system**.

d. Educate your councilmen and city-employee/administrator. It's imperative. **Start now**, not when you need the rate increase or franchise renewal. Each time there is an election that brings a new face (or a new employee in city-management, etc.) make certain they understand CATV and your system's ambition and limitations in **full.**

e. Plant an early seed that you can**not** be compared to a power or telephone utility in rate-base determinations.

(We're working hard to develop data and comparable criteria for justification of this inequity. It's going to be critically necessary since the "utility-approach" is the only well-defined and generally-accepted approach that is familiar to councilmen, city-managers, utility-directors, etc. etc.)

Heaven help us if we fail to "win" that issue.

We must soon, as an industry, develop and expose a rational CATV-approach consistent with our **real-world** or face severe problems as this treatment grows in popularity and acceptance.)

f. Accept as fact that municipal people (elected and employed) are in communication with like-counterparts in other cities; cities, most likely, quite different than your situation. Whatever happens there...will be attempted here. A California ghost in advalorem-taxes, for instance, is **really** going to haunt us as it may set a precedent or guideline.

g. **Subscribe to at least one** of the municipal "trade-press" magazines. Find out what "they" read at your city hall, or county tax office.

Be aware...your "governing folks" accept this as their gospel.

Get them a gift-subscription to one or more of our CATV-trade journals. Drop in for a chat just after you get your copy and answer questions readily.

h. **Assume** that your town **will** probably be targeted by a "raider". (Could be that good-old-boy from the next county...?)

Conduct your affairs accordingly.

i. If you are employed in management and are frustrated when your council, neighbors, and friends put you on the griddle and you can't authorize "changes" that you sincerely believe are fair and needed..."go to the wall" with your recommendations to top-managment or the "home-office".

Our observation has been that "nice-guys" who don't make honest-waves in this kind of situation...drown and get transferred (at best) when it gets too deep to tread water any longer.

j. If you are uncertain of your city's reaction to the rate-increase, renewal etc.... **find out now!** If you can't do that personally, for political reasons, and you are on the "outside"...get on the "inside" or go to someone who is.

k. If you really can't afford to do something that needs "doin" in your system...admit it, openly and early. "Poor and honest", is, believe it or not, still admired by some.

l. Remember, your city hires a "consultant" most often as a "buffer" between them and the citizens. They can then stand "behind" the report and admit that it is a "complex issue" for which they employed "professional" service.

m. If the "consultant" fails to quote comparables, or never worked at anything closer to cable than a telephone-rate-hearing, or who's engineering in CATV is just two-months removed from aero-space....PRAY. It's about the only hope you've got for an intelligent analysis.

n. If an "outside" analyst is being considered, offer to split the cost. (A darn shame actually 'cause that's what your franchise fee was supposed to pay for anyway all these years)....

But, if the "evaluation" is paid, even in part, with public funds, then it should be **public** knowledge. If it is totally your dollars, however, then it's **your** confidential report.

Remember that.

o. If there is an "outside" report...demand to receive it **no later** than any city person. **You**, again via franchise fees, **paid for it!**

p. Be prepared (even when you engaged your **own** appraiser) to find that a totally objective review will contain some things that "hurt" (**nobody's perfect**).

Better your "friend" tells you than your mayor.

Finally, if all this sounds a bit "advocacy" for the system-operator versus the municipal regulators...perhaps it is. But...if it were possible to "advocate" fair and equitable regulation, judgement, and treatment **all** the time, it would be far better than what has been observed, this past year, **most** of the time.

Gary A. Dent
Duncanville, Texas 75116

Gary —

You offer good advice. To many, it may be a bitter pill to swallow. But as you note, this new local-level problem has all of the earmarks of becoming an out-of-control prairie fire in a very short time. The FCC March 1977 certificate deadline provided the spark, but as you suggest, many operators have provided the fuel. **We think your best advice is that operators take a close look at their own shop, and where they honestly find problems, either fix them immediately and admit they exist, or plan to fix them as quickly as financially able. Franchise raiding, and municipal unrest have the same seeds, at some point, the operator has failed.**

CANADIAN JAMMING

Some technical aspects of the "U.S. plan" to jam their own network TV signals broadcast into Canada (in particular, from the Buffalo, New York, stations) have come to light. They are worth relating here because of the general confusion that exists as to the "operating system" that **might** be employed by Buffalo channels 2, 4 and 7 should jamming be put into operation.

The present U.S. plan is to place on-channel transmitters north of Niagara Falls on the shore of Lake Ontario. The transmitters would be frequency offset from channels 2, 4, and 7, thereby creating on-channel co-channel. The transmitters would utilize directional beam antennas to concentrate (if not limit) radiation into Canada.

Because mere frequency offset same-channel co-channel could be broken by the sharp Canadians with not much effort, the system would also noise-modulate the transmitters. That is, a noise generator, not unlike the Sadelco 260-A/B noise source, would be utilized to modulate the jamming transmitter over the 4.5 MHz bandwidth from the visual carrier frequency up to the aural carrier frequency. Careful bandpass filtering would limit the noise product to the 4.5 MHz channel width in question.

In this way, the jamming signal would be broadbanded, as it were, and simple co-channel phasing techniques that might eliminate the offset carrier itself would **not** eliminate the wideband (**in channel**) noise modulation product.

The "target" of the U.S. broadcasters remains largely the CATV systems in the Toronto area, where a limited amount of commercial substitution has been employed under directive from the Canadian authorities.

CANADIAN WEATHER STATIONS

"The federal Department of Communications has agreed to make available to the Atmospheric Environment Service (AES) the frequencies of 162.55 and 162.40 MHz on a national (Canadian) basis for the operation of a dedicated VHF Weather Broadcast Service. This decision is based on the understanding that plans will be coordinated with the U.S. National Weather Service which operates a similar service on the same frequencies. We have already been assured by the NWS that we will have their full cooperation and support.

Initially, it is our intention to make prototye installations in 1976-77 to serve the Vancouver/Victoria metropolitan area in British Columbia and Montreal in the Province of Quebec. In the following five years it is planned to make installations designed to serve metropolitan communities across Canada having a population of 100,000 or more, at the rate of approximately 3 per year. The installations beyond the first two noted here are still in the planning stages and have not yet received executive approval.

At the present time the use of the 'tone alerting' warning system is **not** being planned but incorporation of this feature may be considered at a later stage in the program."

L. T. Campbell
Director General
Field Services Directorate
Atmospheric Environment Service
Downsview, Ontario
Canada

AML 3 dB IMPROVEMENT

Theta-Com has recently announced a new, improved AML receiver which should be of interest to both existing AML users and those systems who have previously found AML coverage too short to satisfy their needs.

Basically, the system now has a 3 dB better sensitivity figure going for it because of a redesign of the AML receiver front-end. Here is what has been done and what it means:

(1) The microwave mixer (i.e. frequency

downconverter) has been redesigned from its previous silicon shottky barrier diode to the more recently developed gallium arsenide shottky barrier diode. This is a more sensitive mixer diode that results, with other changes, in a 3 dB sensitivity improvement for the new AML receiver.

(2) To compliment the microwave mixer circuit change out, the new AML receiver also has re-designed VHF (i.f.) stages. The previous hybrid amplifier has been replaced with descrete low noise (microwave type) transistors.

The new AML receiver package replaces the previously available package for all new AML gear shipped. The changeout is also available for existing users of AML equipment, the net result being a 3 dB improvement in your present signal to noise ratio **with** the changeout.

The front-end for the improved receiver front end mounts, as did the previous model, at the antenna (receiving dish). It is powered via 30 or 60 volts AC as is the fashion with CATV plant amplifier equipment. For installations where the receiver mounts indoors, the powering is 115 VAC.

Now as to what you can expect with the improved front end, a few example should illustrate:

(A) If you had previously been limited to a 20 mile path for AML transmission, for unfaded signal levels, the new 3 dB improvement in the AML receiver will give you 28 miles of path (i.e. **40% more path**);

(B) Or, you could cut either the receiving antenna dish size or the transmitting antenna dish size to **1/2 of its former value**, and with the new AML front end, **still have** the same signal to noise ratio you now have with your old front end;

(C) Or, for fixed path lengths and fixed antenna sizes, you can now **double** the number of power splits (i.e. transmission paths) without degrading any of the existing signal to noise ratios (assuming all receivers affected had the new front end). As a further example, in San Diego a single AML transmitter site now feeds 10 receiving sites. By using the new front end at all sites, the number of receiving sites could be **expanded** to 20.

Now here is what the new package will not do; it will **not** work as an add-on or replacement for any **other** type of equipment. That is, it is an AML only retrofit, capable of being added to any existing AML equipment (as well as going into all new AML equipment). So if you have somebody else's equipment, you are out of luck.

No Lashing Wire Clamps

A quick note to tell you and your staff that we here at Valley TV feel you are doing a great job with CATJ. Except ever since I have seen your magazine's front cover, I've wondered how your lashing wire stays on! So my only complaint with CATJ is your ''logo'' needs lashing wire clamps; or (I can't resist) CATJ needs to be clamped down on! (Bad pun!).

Raymond M. O'Donnell
Assist. Chief Engineer
Valley TV Cable Co.
Sayre, Pa.

Not only does the CATJ logo not have lashing wire clamps on the feeder line depicted on the front cover, but the DT shown apparently magically attaches to the strand. Plus, there are no output spigots on it to serve anybody! When the logo was first conceived more than two years ago, we had it originally drawn with all of the true-to-life components including the lashing wire clamps and the more carefully depicted DT. But it ''looked'' too busy, that is, cluttered and the extra detail seemed to detract from the ''clean look'' we were trying to achieve. So call it editorial liberty, or ''cable magic,'' but that is the way it evolved and until a major change comes along, that is the way it will stay!

WHEN YOU REACH 1,000

Most systems are aware that when you reach 1,000 paying subscribers, you are then liable for various forms of non-duplication program protection for stations within whose 35 or 55 mile contour you operate.

If you have **fewer than** 1,000 subscribers and are within the 35 mile contour-zone of a major market city, or within 55 miles of a contour-zone for a minor market city (i.e. those ranked market 101 up), you have **no** non-duplication liability. Similarly, if you are **outside of** the 35 or 55 mile zones, you also have no non-duplication liability, **regardless of your subscriber base size**.

Now, what happens when you reach 1,000 subscribers?

Section 76.95 (b) provides that within sixty days of reaching 1000 subscribers, the cable system shall notify in writing the Federal Communications Commission (Cable Television Bureau, 1919 M Street NW, Washington, D.C. 20554) and send a copy of that notice-to-the-FCC to each television station and translator station carried by the system.

On notice, the TV stations can then logically be expected to come back to you with a written request asking for non-duplication protection.

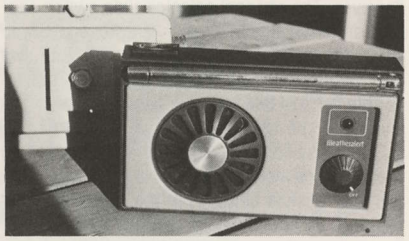
What is a ''**system**'' with 1,000 or more (or fewer) subscribers?

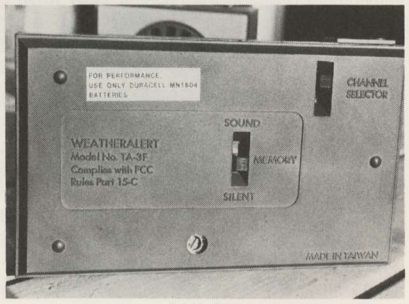
(1) The system may consist of any number of political sub-entities, (i.e. more than 1 or only 1) all of which must be served by the same headend(s). In other words, if there is RF continuity from the beginning of the system to the end of the longest trunk and feeder cascade, it all adds together to form a ''single system''. This also includes CARS fed systems where several communities are linked together via CARS band from a single headend site. In other words, there does not have to be cable-continuity between the headend(s) and the towns, as long as there is RF continuity.

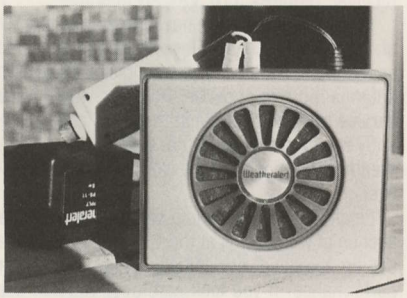
Now what happens if you have say four communities, all of which take (say) six signals off the air locally and then through a common microwave receiving site, receive **another three channels** via CARS band? We are not sure, and apparently neither is the Commission. But we throw it out here for discussion, certain that by doing this the matter will be clarified by a reader at the Commission!

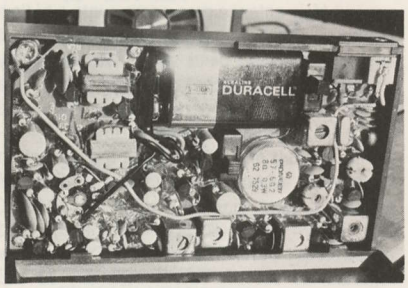
MORE—NOAA Receivers

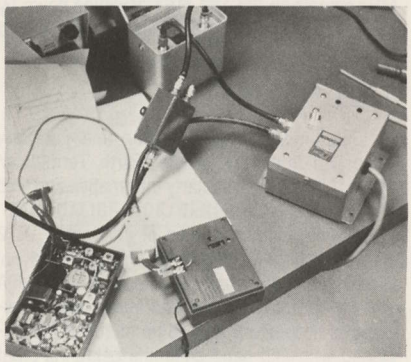
The January CATJ carried a report on the 162.4/162.55 MHz NOAA ''Weather Radio'' stations and broadcasts around the country. The report singled out a couple of commercially available receivers from WeatherAlert (639 South Dearborn St., Chicago, Ill. 60605). Space in the report prevented us from showing more of the receivers, and because so many systems have shown an interest in this program, we thought we would ''footnote'' that report.











In the first photo we see the TA3F receiver, which has standby DC powering, an LED severe weather warning light (above knob to right) and warning buzzer. We photographed the unit in front of a CERRO directional tap, as a means of showing how small the receiver (or alternately, how large the tap) is (!).

In the next photo we see the back of the TA3F

receiver. The channel selector slide switch (upper right) selects between 162.40 or 162.55 MHz channels. The cable customer could, we feel, handle this switch with ease if your system is able to carry two separate NOAA stations. The middle of the case "Sound", "Memory" and "Silent" switch is associated with the severe weather tone alerting system. In the sound position the receiver operates in the normal receiver fashion. In the memory position the receiver remembers (through the flashing LED) when a severe weather alert has been received. In the "silent" position the receiver stays squelched (i.e. silent) until a severe weather alert (with 1050 cycles per second tone) is broadcast. The tone, in this position, "unlocks" the squelch and audio pours-forth.

In photo 3 we have the lower cost TA4 receiver, which retails for under $30.00. This unit is "all speaker" from the front. The rear controls and connections include a channel selector switch and a set of 300-ohm-type balanced antenna terminals for an external antenna. This receiver requires 110 VAC to operate.

In the fourth photo we have the guts or interior of the TA3F receiver. Inspite of the crowded appearance, the circuitry is simple to trace from antenna input to speaker. However, there is **no service manual** available at this time, and apparently even a schematic is not generally available. WeatherAlert does service work in Chicago however.

Finally in the fifth photo we have a shot of a section of workbench at the CATJ Lab where we set up the receivers initially to evaluate their performance. If you look carefully, you can see our 162 MHz antenna drop coming into a hi/low separator. The low band side is terminated (trust us) while the high band side drives a slightly retuned CATV pre-amplifier (a Q-BIT unit). The output of the pre-amp (supply) is connected through a matching transformer to the TA4 receiver. There **is** one problem with the receiver in some areas when there are strong local FM broadcast band signals present. On 162.40 MHz the FM signals come boiling through; and we cured this problem by sticking in the hi/low separator as shown. This knocks any 88-108 MHz signals on the 162 MHz downline down by 30 dB or so, and that cleans out the FM overload of the receiver.

A — 2 = 12 (MHz)

"Just finished reading your fine February issue and found the article 'Earth Terminals/Phase II Report' particularly informative and well presented.

However, your definition of channel A — 2 (i.e. A — 2 MHz, pages 13 and 22) does not agree with the standard definition of A — 2, i.e. A — 12 MHz. My company, Oak Industries, manufactures converters and some of these are designed with mid-band channels below 'A', but again at 6 MHz intervals. They are called A — 1 (i.e. A minus one 6 MHz channel), A — 2 (i.e. A minus two 6 MHz channels or 12 MHz), so that the standard TV channel spacing is maintained. As an example, we designate A — 1 as 114 — 120 MHz, A — 2 as 108 — 114 MHz and A — 3 as 102 — 108 MHz."

Alexis Azelickis
Morton Grove, Il. 60053

Alex—

Our definition is not of our own creation, although we admit **creating now and again! Several trap suppliers use the A — 1, A — 2 etc. designators to represent MHz below the nominal channel A frequency, and we 'picked it up' from them. And several systems also use this designator system, especially the systems that buy traps from the afore-noted trap suppliers!**

Frankly, A — 1 suggests to us **A minus 1 MHz, not A minus a channel (although we admit to seeing the logic in your system). As to which is 'correct',** we ask the industry. **How do you vote?**

FCC TESTS WITH AN S/A

A new booklet entitled "CATV Testing With the Jerrold/Texscan Model VSM-5 Spectrum Analyzer" is now available, free for the asking, from Texscan Corporation, 2446 N. Shadeland Avenue, Indianapolis, In. 46219.

The booklet is a **good** lesson in basic kinds of spectrum analyzer uses and techniques, covering the following measurements:

1) Signal levels
2) Noise and signal-to-noise ratios
3) Beats
4) Co-channel
5) Radiation (and tower antenna orientation)
6) Crossmodulation
7) Hum and low frequency transients

The VSM-5 is one of the first "do-almost-everything" CATV boxes that has capabilities of performing virtually all system testing requirements. Anyone with a yen to learn more about spectrum analyzers, and their capabilites for CATV testing and routine maintenance is encouraged to drop Texscan a line at the above address for a free copy of this booklet.

Are You A Builder?

CATJ is looking for a few good bench people who like to build construction projects in their "spare time". What we have in mind is as follows:

We have a number of video (i.e. not RF) related projects which we have gathered, pieced-together, or otherwise developed schematics for. Some of the video projects are related to simple switching and control functions, others are more complicated master sync generator circuits and the like. We would like to find a few readers who will take parts **supplied by CATJ,** along with a schematic, and build the working project. There will be some opportunity for circuit refinements as you go along in some projects; others will we feel function just fine as diagramed.

We'll supply the parts, and the basic schematic. What we ask of anyone participating is that they take the parts bag and the schematic and develop the following:

(1) A working unit (i.e. de-bugged)
(2) An "as-built" schematic
(3) A short description of any special construction or alignment problems.

We'll take the finished unit, and your as-built schematic and develop a CATJ "Video Project" **construction article** for readers. Then we'll **return the unit you built to you;** you keep it for your efforts and time.

Readers helping us develop circuit concepts into CATJ "Video Project" construction features will, in addition to being able to keep the unit you built, be listed in the article as the circuit developer.

If you are interested in this free-time spare-bench-time project as a part of the "CATJ Video Projects Team", drop Editor Bob Cooper a line at CATJ, 4209 NW 23rd, Suite 106, Oklahoma City, Oklahoma 73107. Outline your interests and request a copy of the "Video Projects" equipment developmental list to see what projects we have in mind. The choice projects may go fast, so sit down today and drop us a line!

CATV BRIDGE

The March issue of CATJ contains a description of a CATV VSWR bridge designed by Mr. Hansel Mead of Q-BIT Corporation. I wish to construct this unit, but I have a few questions which I hope you may be able to answer:

(1) What is the 150 ohm resistor (R3) for? (This connects between the two load ports of the bridge)

(2) What are resistors R4 and R5 for (they are 10K each)

(3) What is the purpose of coils L1 through L6?

A.J. Martin
The Martin Company
Brainerd, Mn. 56401

CATJ went to the designer of the unit, Hansel Mead, for the response which follows.

Mr. Martin —

The VSWR bridge described in the March CATJ is one which we utilize in our laboratory for extensive checkout of our Q-BIT equipment. The bridge design has been around in the 50 ohm world for years, but I had not seen it described in CATV 75 ohm literature previously. The construction was so simple that I asked CATJ to publish it so that others could utilize it to check out their equipment match.

(1) **The 150 ohm resistor (R3) causes the VSWR bridge itself to be back-matched** (i.e. source matched). **This is quite important when you're turning up filters. Source and load match can affect filter shape factor** (see page 40, March CATJ).

(2) **The 10K ohm (R4 and R5) resistors show a very high RF resistance in shunt with the standard and the unknown** (load), **yet allow a way to get out DC voltage developed across CR1 to a high impedance** (i.e. greater than 100K ohm) **input terminal on an oscilloscope.**

(3) **The diode (CR1) and resistors have parasitic capacity which affects the back-match and response of the bridge at UHF frequencies. The small amount of inductance wound using the leads compensates or tunes out this capacity.**

It is also important to keep the leads of C1, C2, and CR1 as short as possible, and remember to utilize a heat sink (i.e. pair of needle nose pliers) **on the diode leads when soldering. Good luck on your construction project!**

CATJ FCC WALL CHART

The CATJ FCC subjective testing approach wall chart, announced in the February and March issue of CATJ, is now on its way to the printer. CATJ expects to ship this new wall chart around the 5th of June; so if you have ordered your copy, please rest assured it is in the process and should be along shortly.

cata ASSOCIATE MEMBER ROSTER

In recognition of the untiring support given to the nation's CATV operators, and their never-ending quest for advancement of the CATV art, the COMMUNITY ANTENNA TELEVISION ASSOCIATION recognizes with gratitude the efforts of the following equipment and service suppliers to the cable television industry, who have been accorded ASSOCIATE MEMBER STATUS in CATA, INC.

Anixter-Pruzan, Inc., 1963 First Ave. S., Seattle, WA. 98134 (**D1**)
Avantek, Inc., 3175 Bowers Avenue, Santa Clara, CA. 95051 (**M8**)
Belden Corp., Electronic Division, Box 1327, Richmond, IN. 47374 (**M3**)
BROADBAND ENGINEERING, INC., 850 Old Dixie Highway Lake Park, FL. 33403 (**D9, replacement parts**)
Burnup & Sims, Box 2431, W. Palm Beach, FL. 33401 (**S2, S7, S8**)
CABLE NEWS, 2828 N. 36th Street, Phoenix, AZ. 85008 (**S6**)
Cerro Communication Products, Halls Mill Road, Freehold, NJ. 07729 (**M3, M5, M7**)
COMM/SCOPE COMPANY, P.O. Box 2406, Hickory, NC. 28601 (**M3**)
ComSonics, Inc., P. O. Box 1106, Harrisonburg, Va. 22801 (**M8, M9, S8, S9**)
CORAL, INC., 400 Ninth Street, Hoboken, N.J. 07030 (**M1, M4, M5, M6, M7, D3**)
DELTA BENCO CASCADE INC., 40 Comet Ave., Buffalo, N.Y. 14216 (**M4, M7, M8, D3, S8**)
Jerry Conn & Associates, 550 Cleveland Ave., Chambersburg, PA. 17201 (**D3, D5, D6, D7**)
C-COR ELECTRONICS, Inc., 60 Decibel Rd., State College, PA. 16801 (**M1, M4, M5, S1, S2, and S8**)
DAVCO, Inc., P.O. Box 861, Batesville, AR. 72501 (**D1, S1, S2, S8**)
DEVINES Trailers & Accessories, Grantville, PA. 17028 (**M9, cable trailers**)
ENTRON, Inc., 70-31 84th Street, Glendale, NY. 11227 (**M4, M5, D4, D5, S8**)
GAMCO INDUSTRIES, INC., 317 Cox St., Roselle, NJ. 07203 (**M5**)
JERROLD Electronics Corp., 200 Witmer Road, Horsham, PA. 19044 (**M1, M2, M4, M5, M6, M7, D3, D8, S1, S2, S3, S8**)
Kay Elemetrics Corp., 12 Maple Avenue, Pine Brook, NJ. 07058 (**M8**)
Magnavox CATV Division, 133 West Seneca St., Manlius, N.Y. 13104 (**M1**)
Microwave Filter Co., 6743 Kinne St., Box 103, E. Syracuse, NY. 13057 (**M5, bandpass filters**)
MID STATE Communications, Inc., P.O. Box 203, Beech Grove, IN. 46107 (**M8**)
Pro-Com Electronics, P.O. Box 427, Poughkeepsie, NY. 12601 (**M5**)
Q-Bit Corporation, P. O. Box 2208, Melbourne, Florida 32901 (**M4**)
QE Manufacturing Co., Box 227, New Berlin, PA., 17855 (**M9, tools & equipment**)
RMS CATV Division, 50 Antin Place, Bronx, NY. 10462 (**M5, M7**)
Sadelco, Inc., 299 Park Avenue, Weehawken, N.J. 07087 (**M8**)
SITCO Antennas, P.O. Box 20456, Portland, Oregon 97220 (**D2, D3, D4, D5, D6, D7, D9, M2, M4, M5, M6, M9**)
Systems Wire and Cable, Inc., P.O. Box 21007, Phoenix, Az. 85036 (**M3**)
TEXSCAN Corp., 2446 N. Shadeland Ave., Indianapolis, IN. 46219 (**M8, bandpass filters**)
Theta-Com, P.O. Box 9728, Phoenix, AZ. 85068 (**M1, M4, M5, M7, M8, S1, S2, S3, S8, AML Microwave**)
TIMES WIRE & CABLE CO., 358 Hall Avenue, Wallingford, CT. 06492 (**M3**)
Titsch Publishing, Inc., P. O. Box 4305, Denver, CO 80204 (**S6**)
Tocom, Inc., P.O. Box 47066, Dallas, Texas 75247 (**M1, M4, M5, Converters**)
TONER Cable Equipment, Inc., 418 Caredean Drive, Horsham, PA. 19044 (**D2, D3, D4, D5, D6, D7**)
Van Ladder, Inc., P.O. Box 709, Spencer, Iowa 51301 (**M9, automated ladder equipment**)
WAVETEK Indiana, 66 N. First Ave., Beech Grove, IN. 46107 (**M8**)
Western Communication Service, Box 347, San Angelo, Texas 76901 (**M2, Towers**)

NOTE: Associates listed in bold face are Charter Members.

Distributors:

D1—Full CATV equipment line
D2—CATV antennas
D3—CATV cable
D4—CATV amplifiers
D5—CATV passives
D6—CATV hardware
D7—CATV connectors
D8—CATV test equipment

Manufacturers:

M1—Full CATV equipment line
M2—CATV antennas
M3—CATV cable
M4—CATV amplifiers
M5—CATV passives
M6—CATV hardware
M7—CATV connectors
M8—CATV test equipment

Service Firms:

S1—CATV contracting
S2—CATV construction
S3—CATV financing
S4—CATV software
S5—CATV billing services
S6—CATV publishing
S7—CATV drop installation
S8—CATV engineering

MAKE IT SIMPLE FSM

In an effort to develop an installer's tool that is virtually goof-proof, **Jerrold** has developed a new test instrument that makes installer check out of drops quick and easy.

The new LEVELITE indicator is basically a high band only TV signal level meter that utilizes a pair of LED's to indicate red (battery power OK) and green (TV signal level OK). The green light shines when the drop signal levels are approximately +6 dBmV or greater level, on high band. The brightness becomes maximum with a +10 dBmV high band signal present.

Also included is a "local-distant" switch. In the distant position, the green LED will glow with a —6 dBmV signal present and the maximum brightness will occur with a —2 dBmV level signal.

The unit has a standard 75 ohm fitting, and it should prove useful not only to installers, but also to a host of CATV technicians including antenna trouble shooters who will find its small size a boon to pocket carriage up the 500 foot stick.

SLM CALIBRATOR/GENERATOR

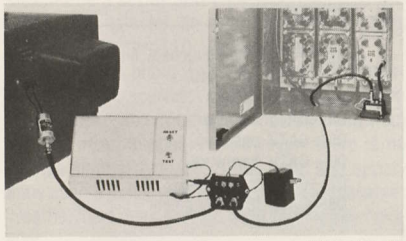
Model MC-50 signal level meter calibrator and general purpose high accuracy signal generator has been announced by **Mid State Communications** (P. O. Box 203, Beech Grove, In. 46107). The unit, which is part of the CATA Test Equipment package, and which was previewed in an equipment review in the June 1975 CATJ (page 9) covers 4 to 300 MHz with an output level accuracy of +/— 0.25 dB. The output level may be set from —30 dBmV to +50 dBmV in 1 dB steps.

The output level control circuitry is monitored by a front panel meter and an auxiliary output through a rear panel jack provides +40 dBmV to drive a frequency counter. The meter features simulated amplitude modulation approximating the horizontal sync of a TV carrier. Price of the

unit is $695.00 with built-in attenuators, and delivery is 1-2 weeks.

ANTI-THEFT SYSTEM

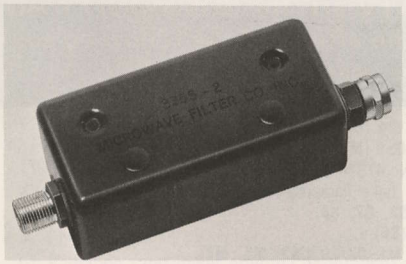
Toner Cable Equipment Company (418 Caradean Drive, Horsham, Pa. 19044) has a new anti-theft system called the "Squeeler". The unit combines the best of state-of-the-art burglar alarm technology with cable technology to produce a system that creates an ear-splitting 80 dB audio alarm should someone force their way into a CATV equipment enclosure in an apartment building, or other location.



The system is designed so that once the "Squeeler" sounds off, the horn is not shut down until a reset button is pushed at a separate (remote) location (typically in a secure office area). The unit sounds off whether the case is opened by force or with a master key.

PAY CABLE AUDIO TRAP

A new sound trap for pay cable services has been introduced by **Microwave Filter Company** (6743 Kinne Street, East Syracuse, N.Y. 13057). Model 3355(S) has at least 40 dB sound carrier notch on channels 2, 3, 4 and 6, and is priced at $8.50 each in 100 lot quantities.

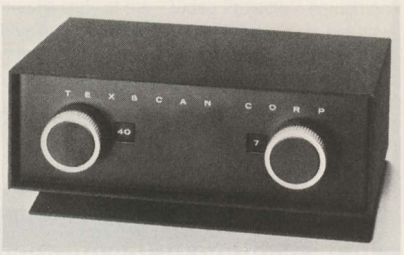


BENCH MOUNT ATTENUATOR

A new packaged test lab bench attenuator has been announced by **Jerrold/Texscan** (200 Witmer Road, Horsham, Pa. 19044). The model 577 has 0-80 dB attenuation in 1 dB steps with an accuracy of +/— 0.1 dB at 30 MHz, +/— 0.3 dB at 500 MHz.

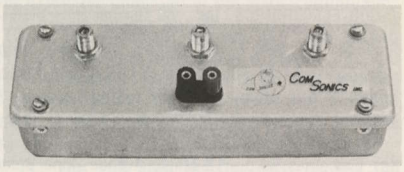
Insertion loss is less than 0.3 dB at 30 MHz and less than 0.8 dB at 500 MHz. The return loss at 500 MHz is 20 dB or better.

Jerrold/Texscan has also announced a new 75 ohm RF bridge, the model RFB-1/75 which covers 1 to 300 MHz. The new bridge features 60 dB balance, 15 dB insertion (i.e. RF to DC conversion) loss, 1 dB open to short ratio and a 35 dB minimum test-port match. Precision 75 ohm terminators are available as accessories.



HIGH ISOLATION SWITCH

ComSonics, Inc. (P. O. Box 1106, Harrisonburg, Va. 22801) has announced a new (Model RF-2) high isolation coaxial switch intended for useage in video, IF, and RF switching applications. The switch has an insertion loss of less than 0.5 dB, a minimum return loss of 23 dB, and isolation of a minimum of 60 dB at 220 MHz (80 dB at IF ranges).



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Western Communication Service designed and installed its first CATV log antenna more than 15 years ago. This log array is still up, still providing faithful service. In the interim we have provided thousands of CATV antennas, logs and Yagi-Uda arrays, to hundreds of systems. A Western-Log is special. It is better built, lighter-weight, and often lower priced than it's Johnny-Come-Lately ''imitators''. And like we said, we have a special way of handling the little feller. Whether you need one log or a dozen, you get the same top-notch service, and when you need help installing your antennas, Western has the people to do it for you!

Another Texas-Tuff small system tower, installed for Arapaho, Oklahoma's new system by Western Communication Service. A ''little-feller'' 200 foot tower, with logs-by-Western...of course!

Talk to Western. Call or write Richard Killingsworth, at

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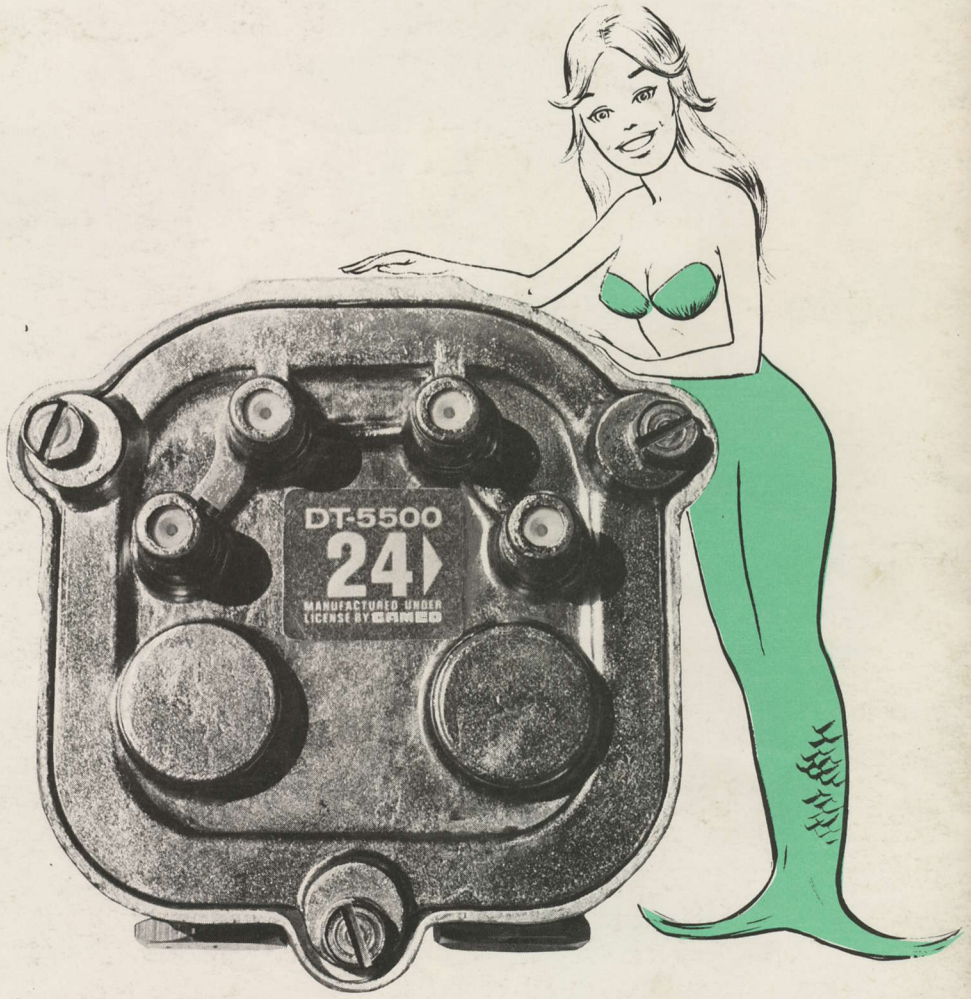

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