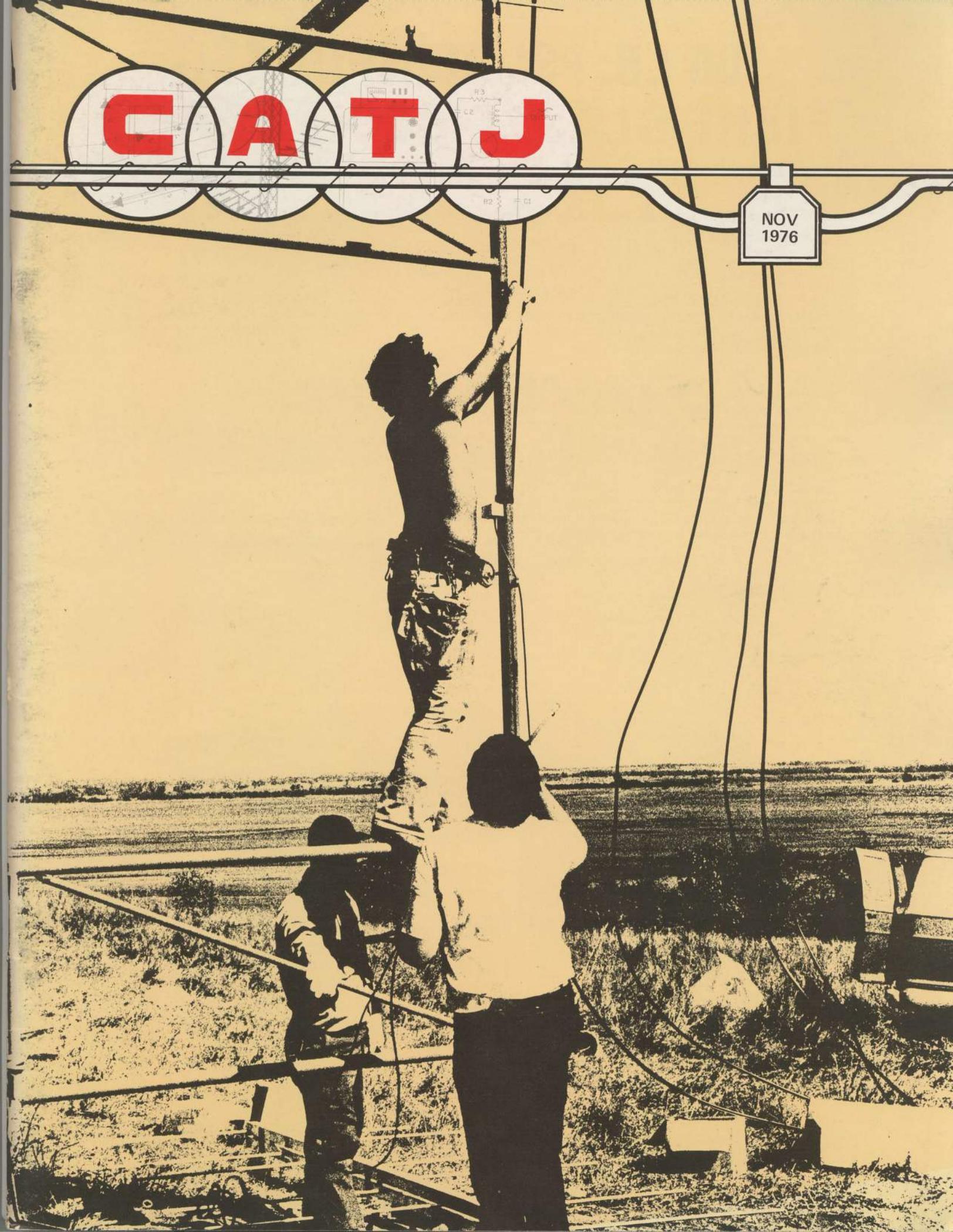


CATJ

NOV
1976



100 LB. PSI REINFORCED FIBRE GLASS CIRCUIT BOARD

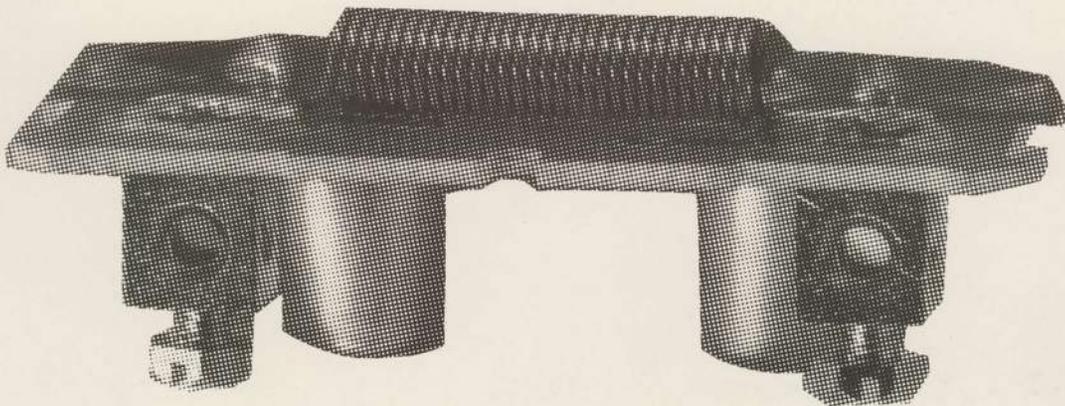
That's right, and it's only available in the RMS UNITAP

ADVANTAGES:

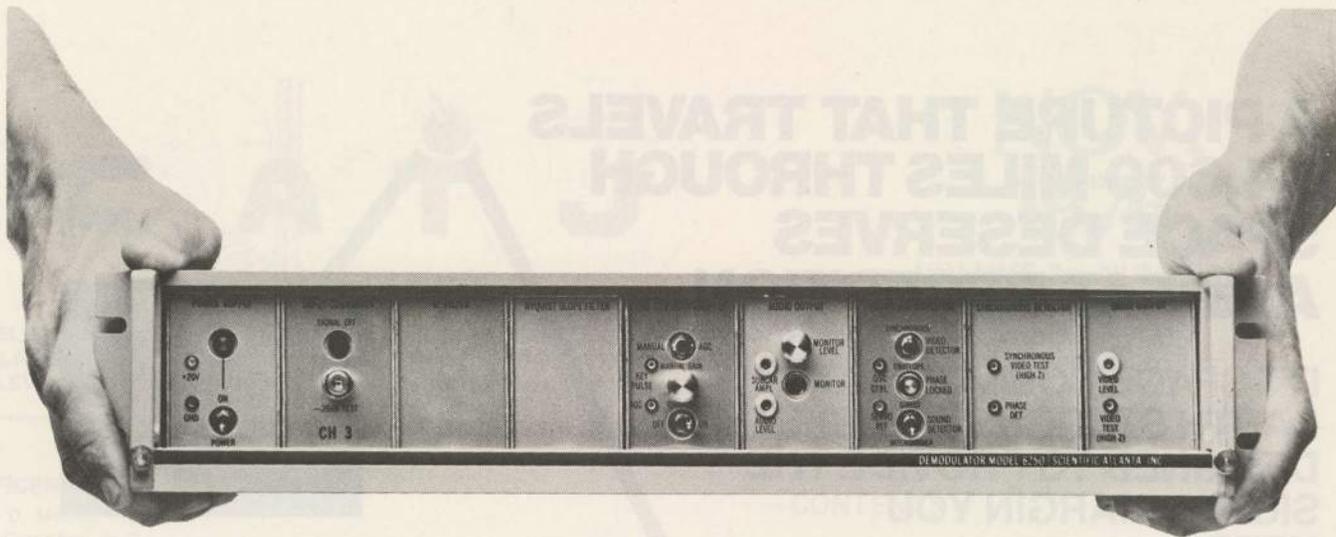
1. One eighth of an inch thick reinforced fibre glass circuit board can withstand in excess of 100 lb. PSI thermal contraction pull on the seized center conductor posts.
2. Competitive units use composition pressed paper and plastic circuit board that offers approximately 40 lb. PSI. In cold temperature areas this type circuit board can crack due to thermal contraction stress on the seized center conductor posts.
3. The "UNITAP" seized center conductor posts are mounted to the reinforced fibre glass plate which provides insulation between the A.C. power feed-thru and the tap housing. Some competitive tap units are incorrectly designed with the seized center conductor posts mounted directly as an integral part of the metal housing. This can sometimes create an undesirable electrical ground.
4. The seized center conductor post screws are nickel plated to prevent corrosion.

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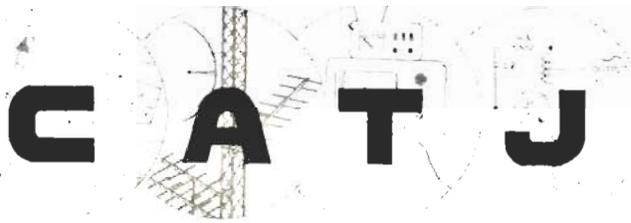


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NOV. 1976

VOLUME 3 - NUMBER 11

PUBLISHED MONTHLY, AS ITS OFFICIAL JOURNAL, BY THE COMMUNITY ANTENNA TELEVISION ASSOCIATION, INC. OKLAHOMA CITY, OKLAHOMA AS A SERVICE TO ITS MEMBERS AND OTHERS PROVIDING CATV/MATV SERVICE TO THE TELEVISION VIEWING PUBLIC LOCATED THROUGHOUT THE WORLD.

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OUR COVER

Preparing a quad-log array. A new seven community AML receiving site involved 6 channels of quad-logs plus 3 channels of dual logs for U.S. Tower Company recently. Serving 7 communities from a single headend, over a 60 mile long by 20 mile wide region involves many new engineering problems; as future CATJ reports will detail.

CATA "TORIAL

KYLE D. MOORE, President of CATA, Inc.

STATE ASSOCIATIONS AND NATIONAL POLARIZATION

Recently while appearing as part of the program for the Kentucky CATV Association (October 11th), an operator from the floor asked of me "Shouldn't we get more Kentucky operators in our State Association involved in CATA, and then place the Kentucky Association in CATA?"

The question has come up before. And the answer is yes, and no.

"Yes" you should be out beating the bushes for independent operators (and all operators) to join CATA. Our recent experience with the combination fine/forfeiture and pole bill is but the tip of an iceberg. The coming one or two years will potentially make or break this industry's non-metropolitan area system operators. We are facing a complete re-write of the Communications Act of 1934', a re-write which will include a complete "Title" or section for cable television. There will be massive hearings, blue-ribbon committees, panels and the frequent appearance of members of the House Communications Sub-Committee (and their staff) at CATV meetings from coast-to-coast. This will be "the story" and "the problem" in the next 12 to 24 months. And it may drag out much longer than that, copyright, afterall was said and done, required nearly 15 years from inception of the re-write of the 1909 act to passage of new law. Whatever the CATV industry has become during the past five years, with the FCC doing their own law making and rule enforcing, has been but a way station on the path to what we will ultimately become. Every facet of our operation is going to be shaped and re-shaped by the wording, language and intent of the cable television "title" of the re-written Communications Act. Every operator, regardless of his size or mode of operation, needs to be a part of this process. There will be no "independent views" on this one, either an operator speaks through and in concert with established trade associations, or his voice will be covered up by the more consistent and higher levels of organized voices. So "yes", every operator needs to belong to a national trade association.

And "no". No, the Kentucky CATV Association should not become a sworn supporter of CATA. Not as a state trade

association. Nor should Kentucky (or any other state) become closely aligned with NCTA either. And here is why.

As complex and confusing as our problems in Washington are, they are but a portion of the total problems operators are experiencing with legislation and bureaucracy gone amuck. Some seventeen states introduced PUC type legislation for cable in their 1976 legislatures. Six states already have "translator tax districts", wherein counties or other areas can raise tax money to support non-profit multiple channel translators. Some state broadcast organizations are aggressively pursuing restrictive legislation for CATV in their states. Some state power utilities are working intrastate to attempt to raise pole attachment rates clear out of sight. And on and on and on.

When these battles come up, and they do so frequently, the whole body of state operators in the state needs to get into a common posture to fight these encroachments on cable operation. The only way this is possible is for individual operators to leave their "national politics" at home. Having a state association leadership dominated by one faction or another is dangerous because that drives away full membership and full support from all of a state's operators. In matters affecting every operator in a state, there needs to be unity of purpose and a sharing of work to accomplish the objectives and goals.

There has been renewed talk of late suggesting CATA and NCTA really need to compare notes more often and to try to arrive at common purposes or goals. Some continually suggest that the cable industry needs to "grow up" and "stop acting like children". What these people are saying is "bury your differences and come out together, the foe is not within, it is from without". I buy that... up to a point.

"Washington does not like to hear from a divided industry" is another frequent message. Hogwash... Washington runs on division, and the compromises that occur as a result of diverse opinions and points of view. That is what Washington is all about. If everyone agreed on everything, privately, before hand, Washington's legislative process would turn from a mediating forum into an accreditation tool, giving sanction to only those "compromises" worked out privately



"HALF AN EGG AIN'T NO YOKE!!"

in advance. I don't believe that is what the framers of our Constitution had in mind when they set out 200 years ago to create a government system.

Washington does run on power. Little power, medium power and big power. Congressman Lionel Van Deerlin, addressing a hearing before his Communications Subcommittee on September 22nd, said in his opening remarks "I wish to congratulate CATA for having friends in high places who are in a position to influence the legislative process". He was referring, of course, to CATA's attempt at defeating HR 15372, the fine/forfeiture and pole bill, through the good offices of House Speaker Carl Albert. That kind of action, plain and simple, is the type of "power" that Washington responds to.

The same type of power functions with the cable industry. When a group wants something done, it musters all of the strength and talent at its disposal and has the job at hand. This often creates power struggles within the industry, because **there are divergent views** on many problems facing us. So how should an industry, with divergent views, reconcile its intra-differences?

Logically, when there are differences of opinion, the two or more sides holding to different views **should begin** their efforts to resolve those differences **by meeting to discuss their differences.** When two separate industries, such as broadcast and cable, have divergent views, we are all but forced to go before a third body (such as the FCC or Congress) for resolution of our differences. But when **two cable associations** have different views, the FCC and/or Congress is hardly the place to take our differences. This has happened repeatedly and this has led to the present turmoil in the industry.

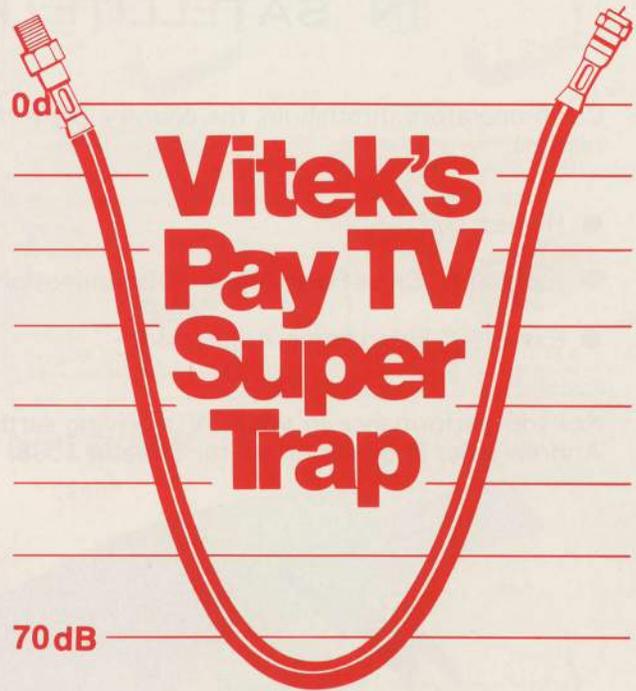
But ... alas, to date, there has been virtually no such efforts by the two national trade associations. For whatever reason, CATA and NCTA do not talk, except by the cumbersome message delivery technique of utilizing an intermediary. This is a dumb, childish approach. It is a technique that serves us badly, and one destined to escalate if some mature attempt is not made soon to bring the two competitive trade associations to a regular, almost routine exchange of concepts and arguments. **We should be making our differences known in private,** where there is a chance for resolution, **not in public,** where once-stated positions are often frozen into permanent positions for fear of adverse public (i.e. industry) reaction.

How do you do this? How do you get CATA and NCTA to adopt a more statesman like approach to their intra-industry positions? How is the first step taken to bridge the present gulf that seems to be widening weekly?

Both trade associations should feel the weight of their own member public opinion. If CATA's Board and NCTA's Board heard repeatedly from its own membership **that the membership wanted to see** a forging of a bridge between the two associations, in short order either the two group's leaders would oblige the constituents' requests, or the respective associations would have new leaders.

The first step boils down to you — the cable system operator. Do you favor a continuation of the present situation, or do you feel the industry would better be served by having the two trade associations regularly and routinely exchanging their advance positions and arguments before they become public? **You should let your respective trade association know how you feel about this.**

For my part, as the President of CATA, I favor such a policy. I have even suggested that at least the visible leaders of both associations (myself and Bob Schmidt for NCTA) make a **joint public appearance** before **all** of the industry at the forthcoming Western Cable Television Show in Anaheim in December. I favor an open debate between CATA and NCTA, one at which members of the industry, with whatever biases they may have, will have the open opportunity to question the two associations about their respective positions on all matters affecting this industry. Hopefully, something will come of this suggestion, and from this first public debate or confrontation could come regular, more private sessions between the two national trade associations of our industry.



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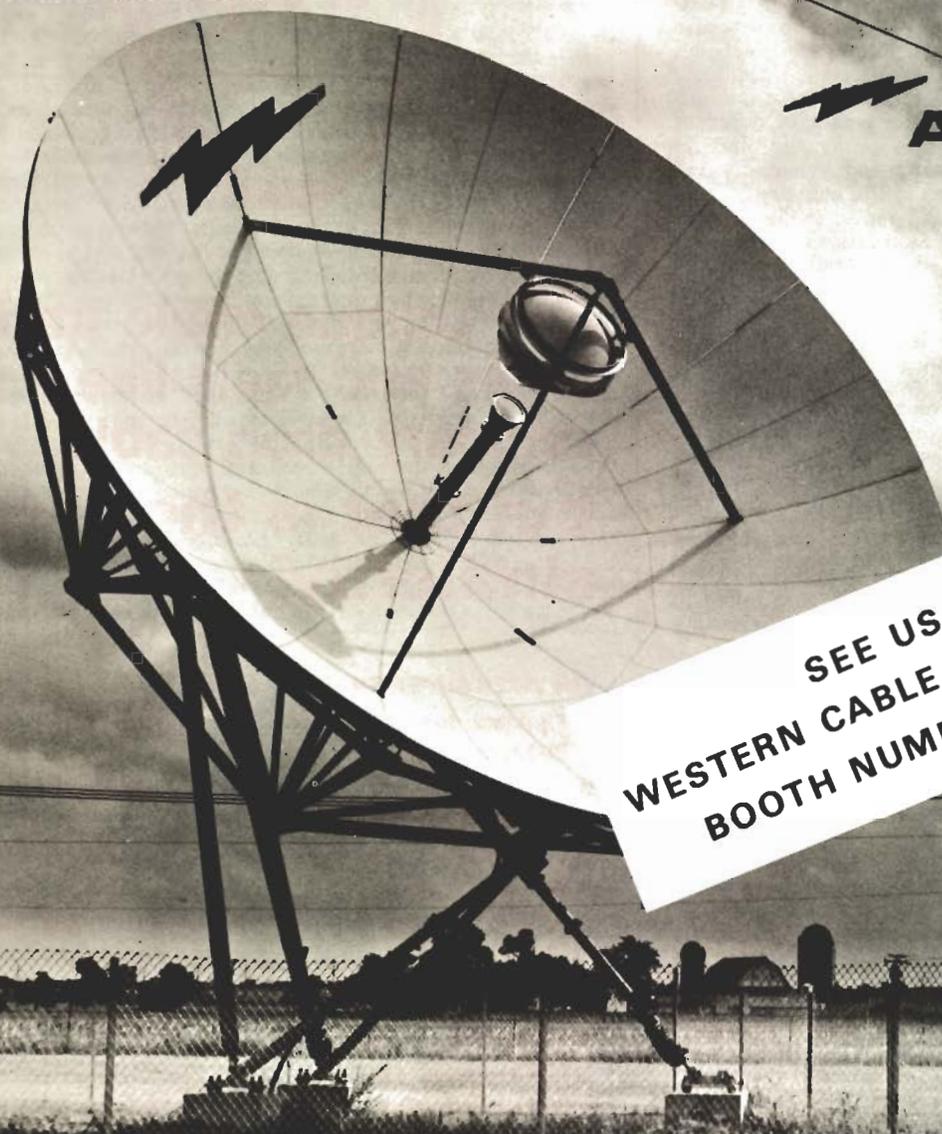
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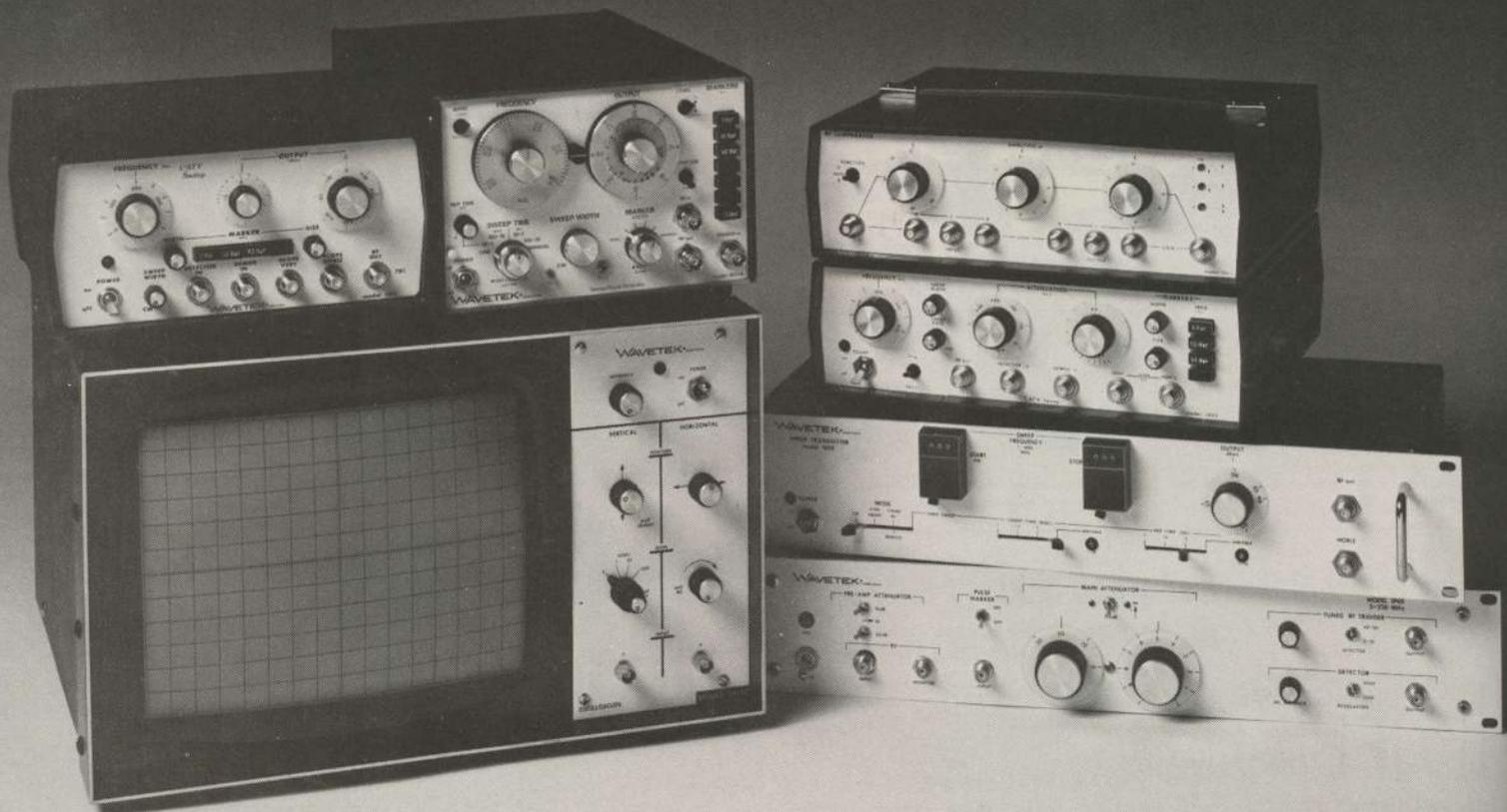
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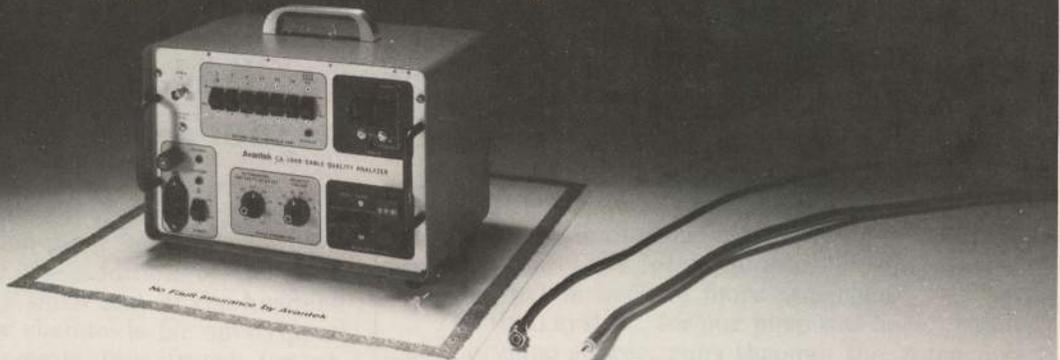
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Such systems worked, and continue to work (often surprisingly well) largely because the garbage type signals created by improperly adjusted amplifiers and processors more often than not fall into portions of the VHF spectrum not in use for television signal transmission. The FCC, for example, in laying out TV allocations in their present form in 1946, assigned our so-called lowband channels and our so-called high band channels in such frequency groupings that harmonic signals of low band fall not on high band, but "harmlessly" into what we now call mid-band. Thus the FCC avoided, for CATV, and for receiver manufacturers alike, many of the problems which could have plagued us in our early years. Our 1955 or our 1965 amplifiers, for example, were not clean (i.e. devoid of spuriously generated 'garbage' type signals). They were merely generating their 'garbage' largely in the 108 to 176 MHz region, a segment of the spectrum not assigned to TV signal

transmission. The garbage was there . . . we simply did not recognize its presence because we were not using that portion of the spectrum in our "secure" CATV transmission systems.

As Finlay and Cappon pointed out in the April 1976 *CATJ* ("Beating The Beats", pages 36-49), when single ended amplifiers are cascaded under the most carefully controlled operating conditions to a depth of 57 amplifiers (51 trunks, a bridger, and five line extenders), there are compounded second order intermod products within the CATV plant which virtually preclude the use of the 108-174 MHz region for CATV television program carriage.

The products analyzed by Finlay and Cappon indicated that in their test system analysis, no fewer than 55 intermod products (or undesired spurious signals) existed within the 108-174 MHz region at levels sufficient to create interference to any TV signals carried within that passband (or mid-band as it is generally referenced in CATV circles). None of the standard mid-band channels (A through I) escape the second order signal problem although some (i.e. A, B, G) had fewer in-channel distortion products present than others (i.e. D,I) in the Finley—Cappon situation.

The 'bottom-line' on the Finlay-Cappon study was that second order distortion products (i.e. undesired spurious signals generated when the 12 standard VHF channels are run through single-

ended solid state amplifiers) must be eliminated before mid-band signal carriage can be attempted.

And our point for re-referencing that material here? To illustrate the type of critical analysis which a cable system operator can subject his plant to if he is interested in knowing just exactly what is really going on within his "secure" transmission system. A cable system operator faced with the addition of a 13th channel (simply because he needs the additional channel space, or because he wishes to place program material on a portion of the spectrum not generally tuneable by the normal 12 channel VHF tuner), but operating a single-ended distribution plant faces a large new-capital-investment for the addition of the 13th channel. The relatively small cost of the headend equipment for the new channel is far outstripped by a very real large-scale investment for rebuilding of the CATV plant proper, simply to handle the "13th channel". A cost-conscious operator should carefully weigh every other possible alternative to replacing his single-ended amplifiers with a newer, "double ended" or "push-pull" amplifier system.

The point of all of this is that a cable system engineering department, equipped with the proper equipment and the proper manpower, can create *engineering alternatives for management objectives*, and the engineering alternatives most often will result in much larger savings to the system owners than the increased costs associated with the more capably equipped engineering department. A good engineering department, properly equipped, and properly operated, does not cost a system money, *it makes a system money*. It makes a system money by producing on-going system performance that is more closely related to maximum equipment operating capabilities than is possible to achieve with a field strength meter and talented fingers. And it makes a system money by providing engineering alternatives, or a variety of choices for system engineering and design, when a change or expansion is anticipated.

The CATV industry is now discovering the advantages of spectrum analyzers nearly 8 years after the first CATV spectrum analyzers were offered to the industry. The analyzer is slowly becoming a basic tool of the industry, and its exotic image has largely disappeared during the past year to eighteen months. As the analyzers become more widely utilized, it is no surprise that their basic uses are growing also. This is creating a new recognition that the visual-receiver (which is what the spectrum analyzer really is all about) may itself be but a portion of an ultimate system test machine, and not the end test machine. A growing system engineering use of the analyzer in conjunction with broad band noise sources (see CATJ for October, page 29) is leading to a whole new series of techniques for combining noise and spectrum display for measurement of everything from heterodyne processing equipment to even second and third order distortion products in CATV plant

amplifiers. CATJ anticipates providing a host of reports in this area in the coming year, all pointing the way to the analyzer becoming a basic building block not unlike the field strength meter which the industry has used as a crutch for more than 25 years. Only this new "crutch" promises to offer versatility and accuracy of engineering and maintenance measurements which the fabled FSM/SLM never approached.

The Analyzer Tool

As the analyzer becomes a more and more valuable tool, the limitations of the CATV distribution system and of the *total television program distribution system* become more apparent.

The total system, for our purposes here, begins at the video source, runs through the video processing equipment, on into and through a modulator and RF transmitter. Then it runs through a passive antenna line to the transmitting antenna, and into the 'ether' for carriage to the off-air reception point. At that point the signal sees in sequence a receiving antenna, a receiving pre-amplifier, a passive downline, some combination of pre-processing equipment and then the CATV signal processor. Now the 'program material' begins the final leg of its journey, through alternating segments of passive (i.e. loss) and active (i.e. gain) CATV plant to be eventually delivered to the input terminals on the subscriber's receiver. In the last portion of the final leg, the signal sees various intra-receiver stages of active (gain) and passive (loss) signal processing, before final presentation to the viewer's eyes on the screen of the receiver.

This is a complex and dangerous journey, and any single segment of that journey can and will affect the visual presentation seen by the ultimate viewer. But through the total journey, the engineering limits are established by the weakest link in the chain and in no case can the final picture be any better than the originated video signal first created by the video signal source.

For our purposes here, we will concentrate on a single measurement function, and the part played in this particular measurement by the spectrum analyzer.

An "off-air" received signal is required, by a combination of FCC or DOT requirements and customer "bottom-line-acceptance" to have certain minimum engineering parameters. For example, the FCC requires that Grade B contour or better off-air signals carried by CATV systems shall have minimum signal to noise ratios of 36 dB (at RF).

The signal to noise ratio measurement *should be* a fairly simple measurement, for it is in reality nothing more complicated than the ratio between the visual (RF) carrier and the total receive-system noise at the same or at a near adjacent frequency. Techniques for measuring this type of ratio abound, including techniques that utilize the tried and true field strength meter. But are such "standard techniques" adequate? Are they produc-

ing real-world numbers or are they producing educated guesses at best? And, what are the limitations to providing system subscribers with really high-quality signals that have markedly superior signal to noise ratios?

The spectrum analyzer provides a handy tool for visually displaying, on a calibrated screen, the presence of one or more carriers in a system. Seemingly, if a carrier can be displayed, and its amplitude accurately measured with the analyzer, the noise surrounding the carrier-occupied portion of the spectrum can also be measured and by simple arithmetic the ratio between the two established.

In a CATV system, (signal) carrier to noise ratios of 60 dB would be considered very good indeed. Assuming a 4 MHz wide video-products bandwidth with a "noise-floor" of -59 dBmV (KTB or thermal noise) at 75 ohms, let us look at a typical system requirement to create at the system headend a 60 dB signal to noise ratio:

A) Pre-amplifier/processor package noise figure = 10 dB

B) -59 dBmV + 10 dB (processor noise figure + 60 dB (carrier to noise objective) = +11 dBmV input signal requirement.

Therefore in our example system, if we have an input carrier level to the processor of +11 dBmV and we do *not* have a carrier to noise ratio at the output of the processor of 60 dB, we must have some problem within our processor system, or elsewhere. Either the noise figure of our processor system is not really 10 dB, the "noise temperature" of the receiving antenna system is excessively high (i.e. greater than the -59 dBmV noise floor *plus* the 10 dB processor noise figure... or more than -49 dBmV), the receiving antenna system is being exposed to an abnormally high external noise level (i.e. again, more than -49 dBmV), or, perhaps the pictures *being transmitted* are not equivalent to the 60 dB carrier to noise (i.e. video signal to video noise) "standard" we have set for ourselves.

The latter is in fact a quite likely situation. Most practical video-signal-sources (i.e. cameras, film chains, tape recorders, etc) have video signal to noise ratios of less than 60 dB; and further compromises in the transmitted signal to noise ratio occur in the TV transmitter's studio-transmitter link and indeed even within the TV transmitter itself. The discussion of such transmitter-based "noise distortion products" is a world unto itself and is beyond this *CATJ* report, but the reader should keep in mind that when 60 dB signal to noise ratios are approached at any point in the "system" there are real limitations present which push the present state of the art to its very limits.

Returning to the analyzer, peak visual carrier power is quite easy to measure with a quality analyzer. In the caveat area, we need to be sure we are utilizing a wide enough IF and video bandwidth to pass the true carrier peaks. However, measurement of noise with an analyzer on a *fully modulated* TV carrier is something else again.

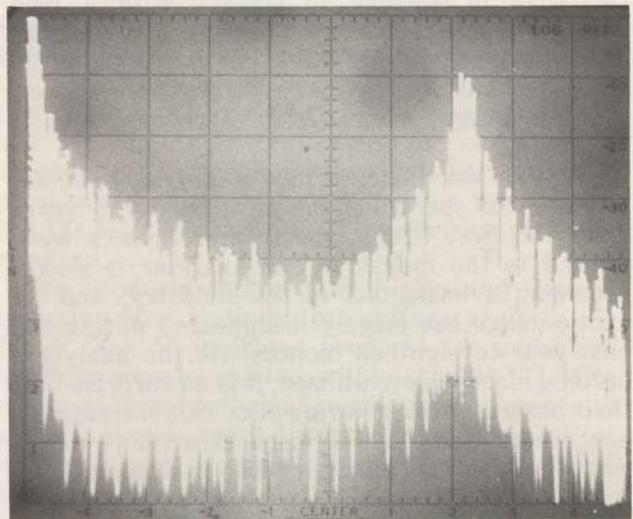
Ideally, we would request that the transmitter or program link be modulated with 0% modulation. That is, we would request that the transmitter produce carrier only (i.e. no video modulation product sidebands), modulated only by internal transmitter noise and video system noise. Our spectrum analyzer would then show the carrier and sideband noise *provided* this transmitted noise is above the level of the noise present in our receiving system environment. In either case, we would be able to measure a level of received noise which could then be compared (i.e. a ratio established) to the received carrier level.

Because the opportunity to make measurements under such "no program modulation" conditions are seldom if ever presented, we must therefore consider the problems associated with making signal to noise measurements under normal program modulation conditions or during conventional test transmissions.

The Prospects

At this point it would be informative to examine the spectrum of television video signals to determine whether there is indeed any prospect for measurement of noise level within a program/test signal modulated channel. To do this analysis, first we must look at the spectrum of video signals because the broadcast (RF) transmitted signal will have similar spectrum characteristics to the pure video signal, having added only the carrier component (with the video as modulating sidebands).

In our test set-up, color bars from a Tektronix 140 video test signal generator provided our video signal for analysis. The spectrum analyzer observations will be conducted on a Hewlett Packard 141T/8553B/8552B/8443A analyzer with tracking generator.



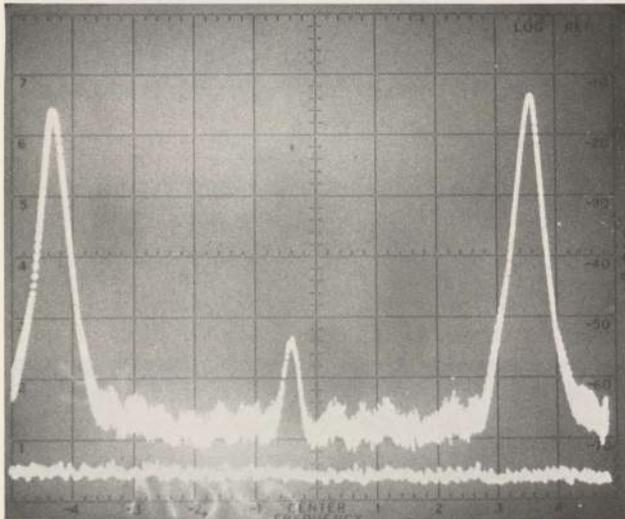
OBSERVATION ONE — Photo one

Observation One:

This photo indicates the general (video) energy distribution of the Tektronix 140 video color bar signal. Note the level of the first H component (i.e.

horizontal sync pulse) has been adjusted on the analyzer to place it at the top reference line (far left). (A resistive minimum loss pad is used throughout all of the observations to match the 75 ohm test signal[s] to the 50 ohm spectrum analyzer. Power loss of the pad is 5.7 dB.)

Knowing the specular nature of the video spectrum, one is really asking at this point "Is there a 'quiet' place in this spectrum where a noise observation might be made?". To start looking for such a 'quiet spot', the analyzer gain is set so that the first H component (at 15.734 kHz) is at -10 dBm (the top reference line). And we begin our search in an area where there should not be too much chrominance information, or around 1 MHz.



OBSERVATION TWO — Photo two

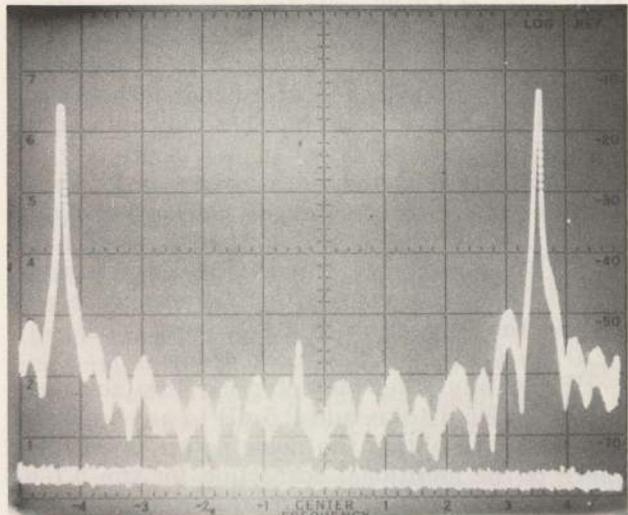
Observation Two:

We see there are two prominent H sidebands around 1 MHz. The gain of the analyzer has been raised to bring the spectrum region between the H sidebands off the analyzer floor, and the reference level is now -30 dBm. The bandwidth has been reduced to 300 Hz and a 10 Hz video filter is used on the analyzer to try to smooth the area between the H sidebands. The analyzer (noise) floor is evident along the bottom of the photo. Note the chrominance sideband is visible about 40 dB down from the H sidebands in this portion of the video spectrum.

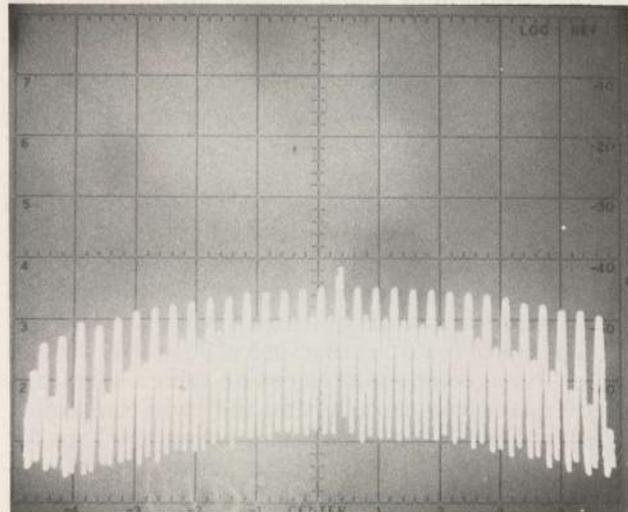
Now the \$64.00 question... is that area between the H and chrominance sidebands noise? Or, is it associated with the video? To find out we will have to look more closely.

Observation Three:

The dispersion is the same as observation two, but the analyzer bandwidth is now 100 Hz (the 10 Hz video filter is still being used). Humm. This is not noise after all, it is video information. We'll have to look even more closely.



OBSERVATION THREE — Photo three



OBSERVATION FOUR — Photo four

Observation Four:

"Zooming in" on the area of the chrominance component and using a 10 Hz bandwidth and the 10 Hz video filter, we can see a fine structure of 60 Hz and 30 Hz components which are obviously related to the field and frame rates (i.e. the V or vertical sync pulses) in the video. Our "quiet place" or "hole" is so far alluding us. Let's then look about half way between a chrominance component and a luminance (H) component, moving up approximately 3.75 kHz (actual frequency is now 0.99902 MHz).

Observation Five:

Alas, all we find are the 30/60 Hz spectrum components. We cannot see a noise component in these spectral lines because all we see is the resolution limit of the 10 Hz IF filter (actual frequency is 1.00288 MHz).

At this point it might be well to pin down what the noise would be if we could see between the video spectrum components. The handiest way to do this is to think in terms of video voltages. The video has a 1 volt peak-to-peak level, an equivalent

RMS value of 0.3536 volts for a sine-wave voltage. If we were looking for "noise" 50 dB down, we would be looking for a voltage of 1.118 millivolts, at 75 ohms and with a 4 MHz bandwidth. At this point, let's change to dBm. 1.118 millivolts across 75 ohms is the equivalent of -47.8 dBm.

Calculating the bandwidth correction for the 10 Hz filter in use on the Hewlett Packard analyzer, we start with the assumption that the 3 dB bandwidth (BW) of the unit is indeed 10 Hz. According to HP, the *noise bandwidth* is approximately 12 Hz. So the correction to 4 MHz would be:

$$10 \log 4,000,000/12 = 55.2 \text{ dB}$$

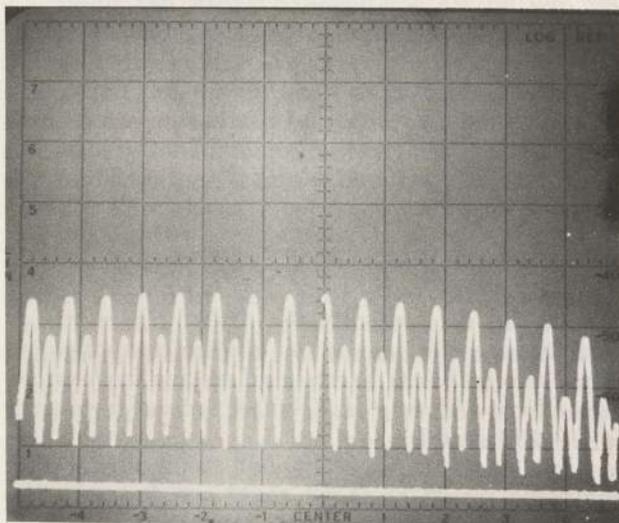
HP also says their detector/log amp noise correction is 2.5 dB (i.e. add 2.5 dB to any indicated noise level to obtain the noise power level). And there is the additional correction for the 5.7 dB minimum loss pad (i.e. 50 to 75 ohms).

So, a -47.8 dBm noise level in the video signal we are examining would appear on the spectrum analyzer as:

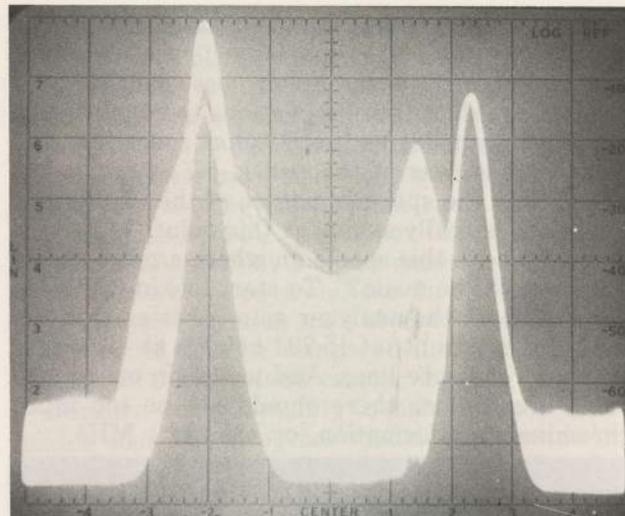
$$-47.8 \text{ dBm} - 5.7 \text{ dB} - 2.5 \text{ dB} - 55.2 \text{ dB} = -111.2 \text{ dBm}$$

This -111 dBm level is the very bottom line on photo 5. The analyzer noise floor is at about -107 dBm.

It appears that there is no hole in the video spectrum anyplace between 0 MHz and 4 MHz that would allow the spectrum analyzer observation of signal to noise (at RF) equivalents of a video signal to noise of even 50 dB (flat in a 4 MHz bandwidth). It appears that a fine structure of 30 and 60 Hz and other video components exist at such a level (i.e. 50 dB down from carrier) and they will completely mask any noise that is present, except perhaps for signal to noise / carrier to noise ratios *substantially worse than 50 dB*. Keep in mind that in photos one through five we are looking at a video signal, just as we would with an off-air signal when looking at the modulation present as a form of "mask" covering the carrier region. Let's take this a step further now and look at two actual off-air signals, one of true "local" quality (i.e. in town) and one of a just-beyond-B contour signal.



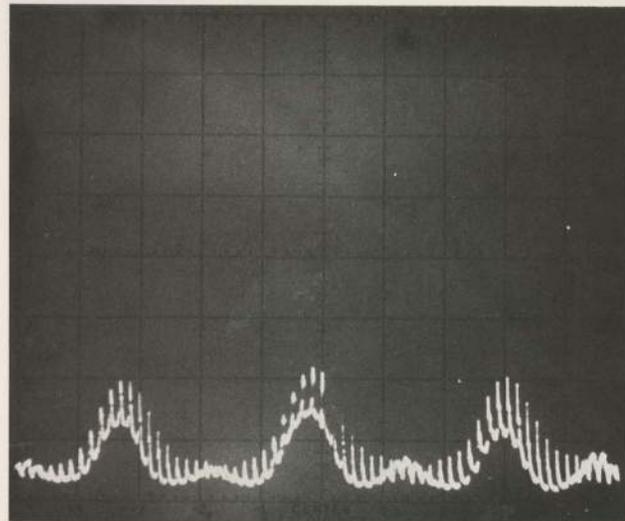
OBSERVATION FIVE — Photo five



OBSERVATION SIX — Photo six

Observation Six:

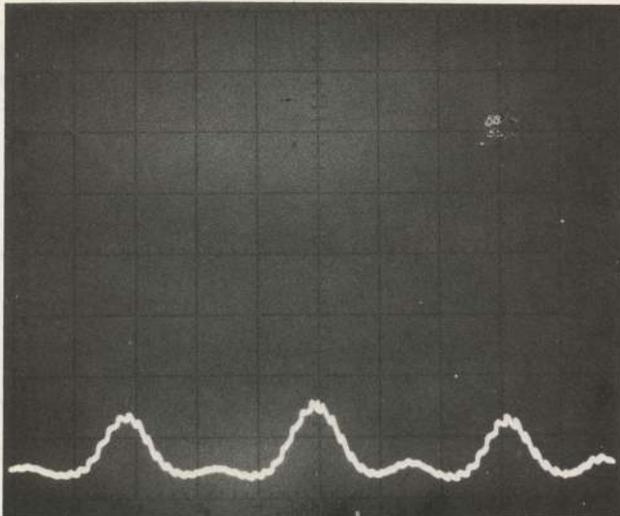
This is a local channel five signal, received on a medium gain broad band antenna. Peak visual power is -23.5 dBm (after the minimum loss pad). This is the equivalent of +31 dBmV across 75 ohms. Keep in mind, however, that a spectrum analyzer must by design trade-off have a poor noise figure (the trade off is the wide frequency range covered). In this case, the noise figure is approximately 20 dB.



OBSERVATION SEVEN — Photo seven

Observation Seven:

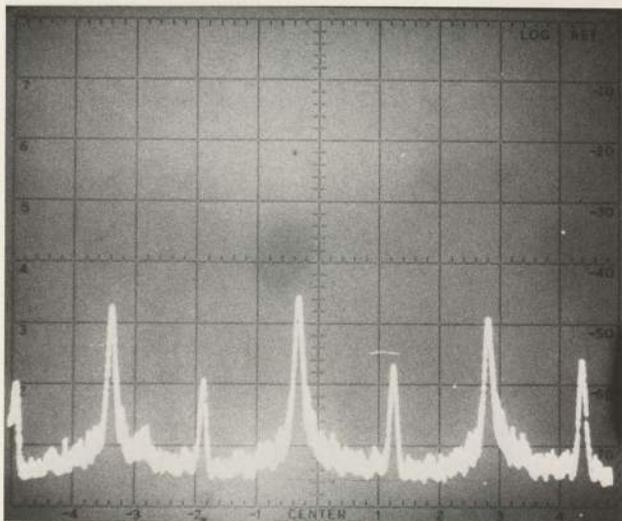
By moving up above the channel 5 visual carrier frequency some 2 MHz, we can begin our search for "a hole" to peer through for "system noise". This is 5 kHz per division (horizontal scale), and with 3 kHz bandwidth we see the luminance H (horizontal) sidebands and some chrominance components interleaved. Note the presence of some video (program) components, simply because the 100 Hz video filter has not completely eliminated them.



OBSERVATION EIGHT — Photo eight

Observation Eight:

By adding the 10 Hz video filter, we remove any sign of the program video components. The "low spots" in the display are not, however, noise level. Rather they are the "running together" of the skirts of the IF filter responses.



OBSERVATION NINE — Photo nine

Observation Nine:

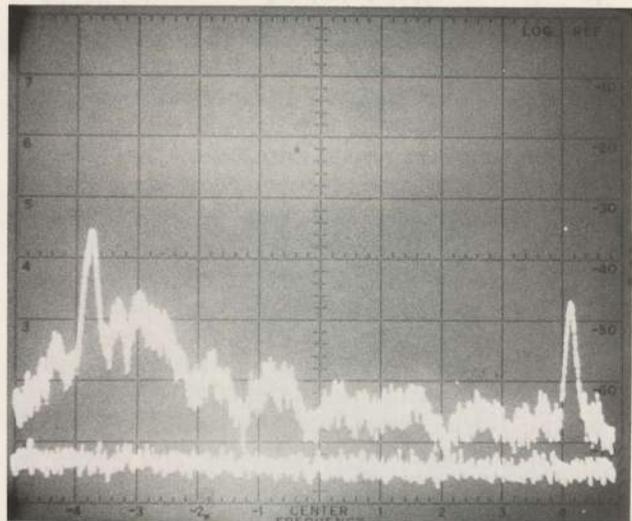
This display increases resolution by changing the IF bandwidth to 300 Hz and raising the gain by 20 dB. We might at this point be tempted to call the "low spots" noise, but we suspect this is not so when we recall our previous experience with our study of the pure-video spectrum (observations [photos] 1-5).

Observation Ten:

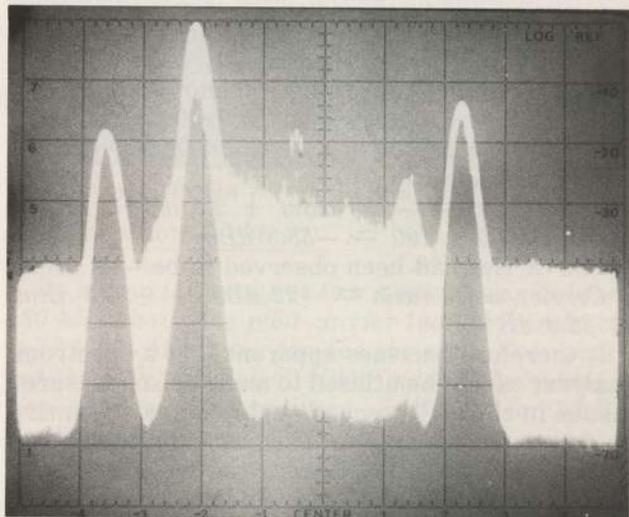
Just to be certain that our low spots are not noise, let's move upwards to 79.25207 MHz (we have been looking around 79.24990 MHz) to place us between chrominance and luminance sidebands to look at this "low spot" more closely. It is now obvious that this is not noise, but rather it has

spectrum components from program video. The gain has been raised an additional 10 dB here (we are looking down -53.5 dBm) and the noise floor on the analyzer is now visible along the base of the screen display.

Well, there appears to be no "holes" present in an off-air, modulated carrier, that has program or normal test video present. At least not for a strong, off-air, local quality signal. But what about finding noise for a less potent off-air signal, one that has considerable antenna noise contributions (from man made sources and from CATV processing equipment such as pre-amplifiers)? We have chosen to look at a 90 mile low band signal. The signal is routed through a 27 dBg (dB gain) single channel pre-amplifier, a filter and then through a state of the art broadband amplifier such as you might find in CATV distribution service. A 10 dB pad has been placed between the pre-amplifier and the distribution amplifier to insure there is no overloading of the distribution amplifier.



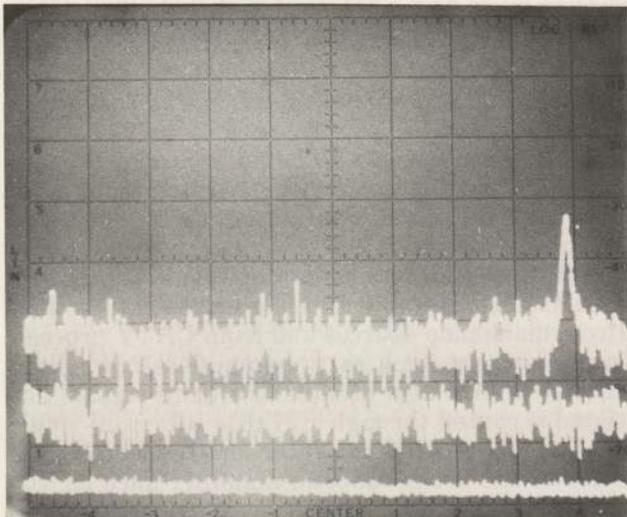
OBSERVATION TEN — Photo ten



OBSERVATION ELEVEN — Photo eleven

Observation Eleven:

This is the spectrum analyzer display of the channel 4 "distant" signal.



OBSERVATION TWELVE — Photo twelve

Observation Twelve:

For openers, this is a triple exposure. The top trace shows the signal and a prominent luminance H (horizontal) component is visible near the right hand edge of the display. The bandwidth is 100 Hz and the video filter is 10 Hz. The second trace shows the system noise, created by terminating the pre-amplifier (i.e. antenna lead is no longer connected to pre-amp although the pre-amp noise contribution is still present). The third (lowest) trace shows the spectrum analyzer noise floor.

Let's try measuring the apparent noise signal level in the top trace. (It would be nice if the analyzer had say 1 to 2 Hz of video filtering, just to be safe with the removal of the 30/60 Hz program material. If you cross-compare with observation 10's display, you can determine that the noise contribution for identical analyzer settings [identical save for analyzer gain] is markedly greater with observation 12 than for observation 10). The eyeball-average of the top trace is -54 dB reference the top reference line, or -103 dBm. According to HP we must add a 2.5 dB correction for detector and log characteristics, and then add the bandwidth correction for 4.0 MHz. This observation (12) was made through a 100 Hz filter, the same as observation 10.

$$\text{Noise level} = -103 \text{ dBm} + 2.5 \text{ dB} + 10 \log \frac{4,000,000}{1.2} \times 100 = -55.3 \text{ dBm}$$

The carrier had been observed to be -22 dBm.

$$\text{Carrier/noise ratio} = -22 \text{ dBm} - -55.3 \text{ dBm} = 33.3 \text{ dB}$$

It therefore becomes apparent that a spectrum analyzer cannot be utilized to make noise measurements 'in-channel' on good quality signals, primarily due to the presence of program spectrum components which are not being resolved by the analyzer's bandwidth and video filter characteristics. Being familiar with the 'signature' of good quality video is very helpful in making this determination.

However, the technique can be utilized on lower quality signals (perhaps down to the region of 40 dB carrier to noise) if the analyzer operator can determine that the noise he is observing is actually

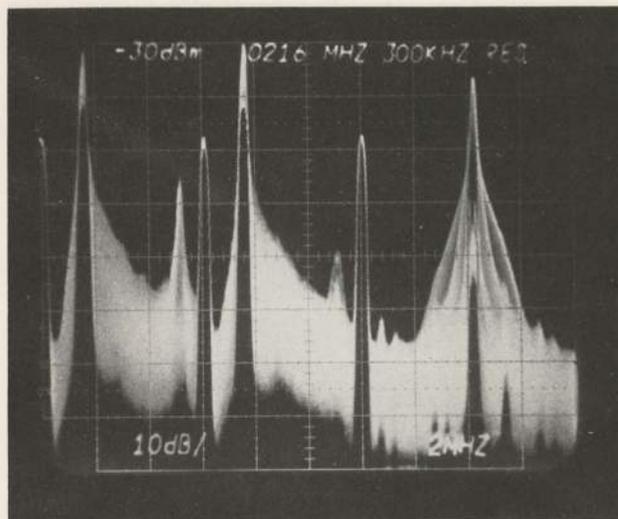
noise and not program spectra. The same technique would also be useful when there is excessive noise in the actual transmitted signal, to help assert and prove that the broadcaster is contributing noise to the equation.

A Possible Solution

The culprit in the fore going discussion is the video program spectra. Finding a "hole" sufficiently wide to allow the analyzer to "peak through" at the true system noise is virtually impossible as long as the TV carrier is modulated with program material or normal TV test video sources.

These problems are substantially overcome if the channel is modulated with a simple square wave or pulse function. Such modulation sources create video waveforms that include "gaps" or "holes", in which the noise measurements can be made.

To demonstrate this situation, a 73 MHz and a companion 220 MHz pilot carrier on an operating system were modulated with nominal 30 kHz square waves. A tektronix 7L13 spectrum analyzer was pressed into service to make the measurements.



OBSERVATION THIRTEEN — Photo thirteen

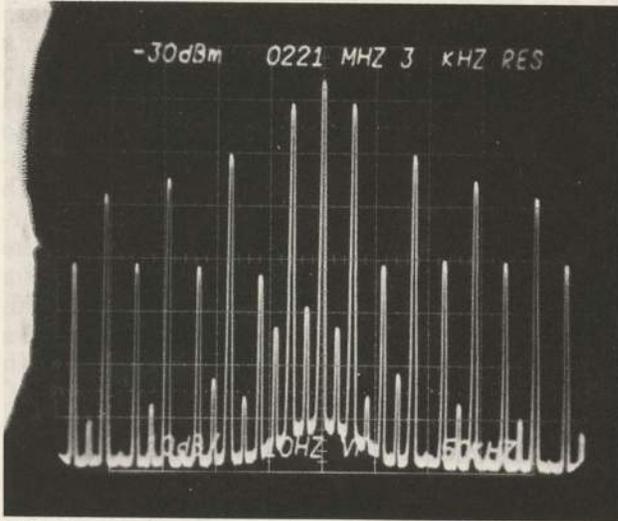
Observation Thirteen:

This shows the modulated 220 MHz pilot carrier (far right side carrier with obvious modulation sidebands), while to the left we have the channels 13 and (far left) 12 normal TV program carriers. The gain of the system has been adjusted to place the channel 13 carrier at the -30 dB reference mark.

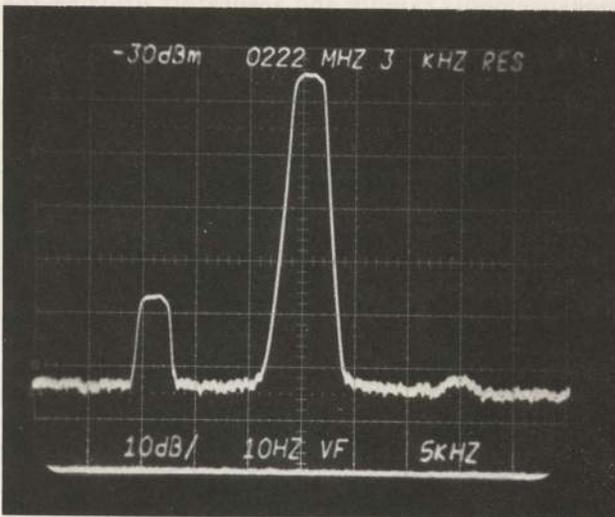
Observation Fourteen:

This is a detailed presentation of the modulated pilot carrier. The gain has been adjusted to place the carrier peak at the top reference line. There is a slight noise-level rise immediately around the pilot carrier itself (notice upward humping at base, center). The predominance of odd harmonics of the

modulating frequency can be seen; an indication of the square wave modulation source. Some spectrum lines attributed to the one-half of the (30 kHz) square waves can also be seen.



OBSERVATION FOURTEEN — Photo fourteen



OBSERVATION FIFTEEN — Photo fifteen

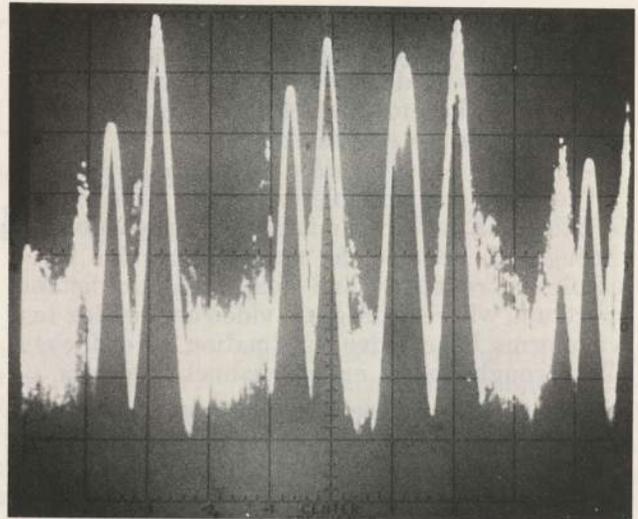
Observation Fifteen:

The (pre-amplifier) gain has been increased by 20 dB and the tuning has been shifted to the line 150 kHz above the carrier proper. The noise floor created by the pre-amplifier is also seen (bottom trace). The noise level can be read to be approximately 64 dB below the reference carrier level.

The same observation was now repeated, utilizing the Hewlett-Packard 141T/8553B/8552B/8443A analyzer with tracking generator.

Observation Sixteen:

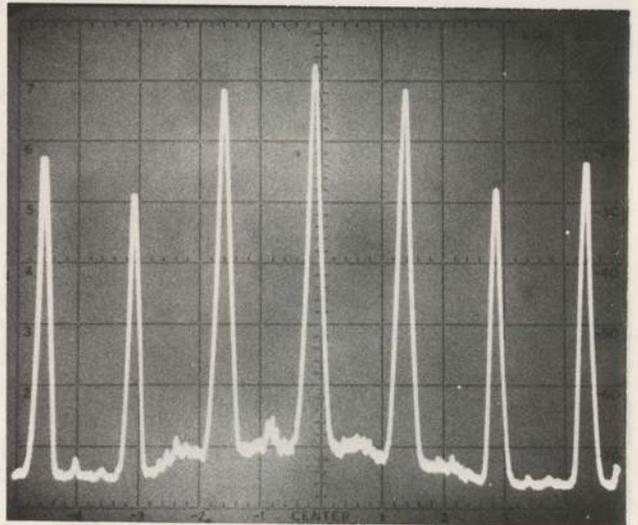
This is the channel 4/5 spectra with the 73 MHz pilot carrier. The center-of-display response is the channel 4 aural carrier at (nominally) 71.75 MHz. The 73 (72.99982) MHz pilot carrier is the first response to the right of center. The analyzer is adjusted to 2.0 MHz per (horizontal) division and a 300 kHz bandwidth. The top reference line level is -15 dBm.



OBSERVATION SIXTEEN — Photo sixteen

Observation Seventeen:

The pilot carrier signal is now centered on the display. Horizontal scale is 20 kHz per division, the bandwidth is 1 kHz with the 10 Hz video filter operating. Note again the slight "noise-rise" of the display at the base of the pilot carrier response. Noise "sidebands" are a characteristic of any transmitter / signal source.



OBSERVATION SEVENTEEN — Photo seventeen

Observation Eighteen:

By tuning the analyzer to a modulation sideband 180 kHz above the pilot carrier (actual frequency is 73.17074 MHz), we can see the noise floor present through the "holes" either side of the modulation sideband. The analyzer is adjusted for 1 kHz per horizontal division, 100 Hz bandwidth with the 10 Hz video filter operational. The indicated noise level is -109 dBm.

By plugging in the known characteristics of the HP analyzer, and the 2.5 dB correction factor for the detector/log, and the 1.2 x 100 Hz noise bandwidth, we have the following correction for a 4.0 MHz TV bandwidth:

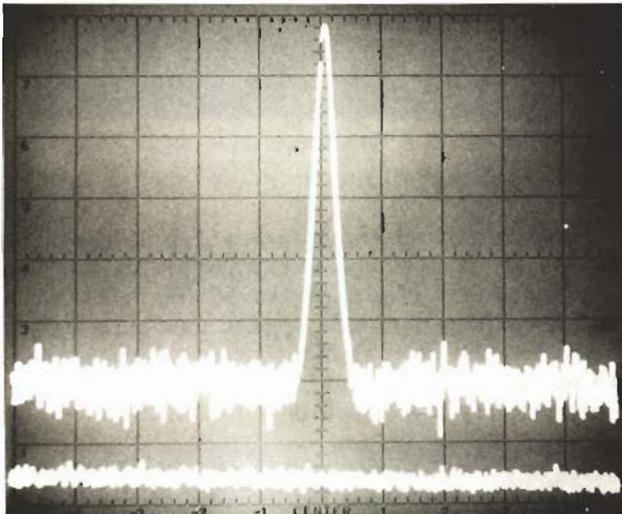
$$-109 \text{ dBm} + 2.5 \text{ dB} + 10 \log 4,000,000 / 1.2 \times$$

$$100 = -61.3 \text{ dBm}$$

The visual carrier levels in this measurement region were -15 dBm (see observation sixteen — channel 5). Therefore the carrier to noise ratio at this point can be estimated to be:

$$-15 \text{ dBm} - -61.3 \text{ dBm} = 46.3 \text{ dB.}$$

Therefore it is possible to see the noise characteristic(s) of the "transmitter" in observations 13 through 18, because the modulating video has a simple (i.e. repetitive and 'hole-laden') predictable spectrum, whereas program video or complex test waveforms have video information spread virtually throughout the entire channel spectrum.



OBSERVATION EIGHTEEN — Photo eighteen

The Analyzer 'Tool'

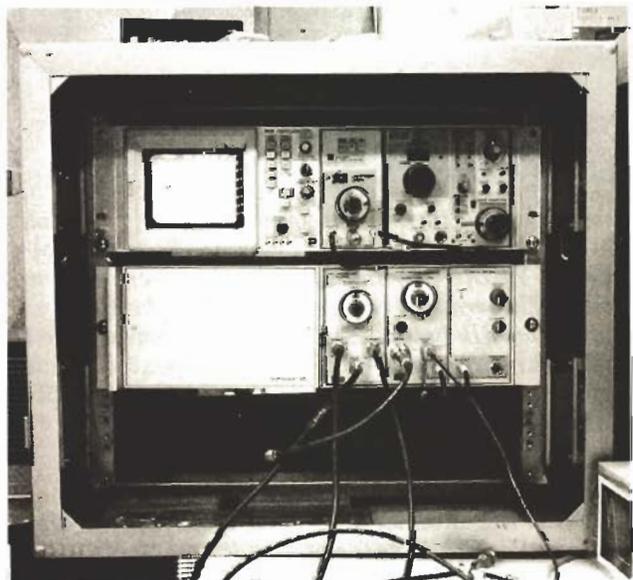
The analyzer machine and its implementation in CATV measurements is still a sufficiently new creation that it is safe to say that in the years ahead, as the unique measurement requirements of CATV grow, so too will the analyzer's ability to perform these measurements. This series of tests has indicated (1) that signal to noise (carrier to noise) tests with program or normal test modulated carriers is virtually impossible, even with the most sophisticated spectrum analyzers currently available to CATV. And, (2), unless the "transmitter" or source is modulated with a special-for-CATV (i.e. square wave or simple modulation format) video signal, true signal to noise measurements in-channel cannot be made with current technology.

However, with an understanding of the limitations of the measurements and their procedures, it is entirely possible that through the mutual cooperation of the engineers operating the broadcast facility, CATV people will be able to conduct such measurements rapidly and accurately utilizing the techniques outlined here.

Finally, it is worth mentioning that the highly sophisticated Hewlett Packard and Tektronix spectrum analyzers utilized in these tests are not necessarily laboratory-only machines. While the price-tag of such equipment might suggest that the equipment be operated only in sterile lab environments and then only lock, key and guard (the HP system utilized here has a price tag of approximately \$25,000.), there are examples of CATV system use of just this type of equipment under any and all field operating environments.



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GETTING READY FOR MARCH '77

Part Two Looks At Additional Requirements For Your New CAC

The October issue of *CATJ* carried part-one of this multiple part series, reporting on the dialogue between CATA Associate General Counsel Steve Effros (of *Brown and Effros*, Washington, D.C.) and cable operators attending his CCOS-76 "Preparing For March 1977" seminar course. In the first installment, Effros and the attendees covered the following topics:

- 1) What is a CAC?
- 2) What franchise format is acceptable at the Commission?
- 3) The four types of CATV systems
- 4) Renewal provisions in the local franchise
- 5) Getting CAC extensions when your franchise runs out
- 6) Public hearing provisions
- 7) The question of FCC authority
- 8) Signal carriage compliance vs. franchise compliance.

How Public A Meeting?

Floor question: "Does this meeting where they grant me a franchise, or renew my franchise, or modify my franchise have to be an advertised meeting? How about just a regular meeting?"

"The Commission has accepted that any regular meeting, open to the public, of a city council, county board, or what-

ever is presumptively an adequate public meeting. But, there must be some public notification that the cable television franchise is going to be discussed, and that notification must be made in advance of the actual meeting. What is not acceptable is a regular agenda meeting of the council (etc.) at which someone suddenly 'pops up' with a 'motion' that your cable application be acted upon when the cable activity did not appear on the scheduled advance agenda. This is not acceptable because there has been no notice of the intent to deal with cable television on the agenda, and as a consequence the public which might be interested in participating had no notice to be on hand. Most city councils, indeed most states require of the city councils, that they publish or post in advance of their meetings the agenda of the meeting. You should make it a point to see that this agenda notice is given, and if the city is in the habit of publishing the agenda, then you should see that cable TV appears in that published announcement. And, you should see that a copy of either the posted announcement and/or the published announcement gets into *your files* so you have a record should anyone ever question how this aspect of the proceeding was handled."

The Commission has been

very reluctant to turn down an applicant on the public notice grounds *if the local standard procedure has been followed*. The Commission recognizes that in some communities, a single-copy typewritten sheet appearing on a bulletin board at city hall or on a post in front of the general store is the 'local method' of handling agenda announcements. In five years of reviewing such activities, the only case where the Commission has reversed a local franchise citing as *part* of their reason for reversal the lack of adequate due process was the now famous Johnstown, Pennsylvania case involving TelePrompTer Corporation. And in that case the cable operator took the Commission decision to the U.S. Court of Appeals, and the court reversed the Commission.

Floor question: "Suppose the franchise itself states that the award has been made after a full and open public hearing... would that not be adequate?"

"In 99% of the cases it is adequate. That would be 100% of the cases were it not for those occasional situations where somebody locally, often a franchise bidder that lost, tries to get the FCC to act as a 'court of last resort' in the franchising process. You will notice in the Seminar Workbook that this is the *exact procedure* we are

PREPARING FOR MARCH 1977

Our October issue of *CATJ* carried part-one of the four-part series dealing with the practical problems all grandfathered systems face with the March 31, 1977 Certificate of Compliance deadline. The exact format by which the FCC will handle 1977 compliance applications remains unknown at this time. However, it is probably safe to assume that the more the individual operator knows about FCC thinking, and their operating methods, the better prepared the operator will be to meet whatever requirements as may finally come forth.

This *CATJ* series is being prepared by utilizing taped transcripts of the CCOS-76 seminar session entitled "Preparing For March 1977". Most of the material presented here is verbatim to the dialogue at CCOS-76, with minor editing where required to maintain coherency in the transition from "live" to the "delayed" format. Attendees at the CCOS-76 seminar session also had a "Filing Certificates of Compliance Applications With the FCC" **workbook**. CATA is currently holding a national series of "Mini-CCOS" meetings throughout the United States (see announcement here and between pages 8-9 of this issue of *CATJ*), where full day sessions are being conducted (again, with the special course workbooks). **All operators are urged to attend the "Mini-CCOS" seminar when it is closest to your system.**

recommending. If you are re-writing the whole franchise for whatever reason, or constructing a new one for a new system, it should begin right after the 'whereas clauses' as follows:

"Whereas, the City of _____ after a full public proceeding affording due process, has considered the legal, character, financial, technical and other qualifications of the applicant and the adequacy and feasibility of its construction arrangements...."

"...is therefore granting to _____ Cable Service a cable television franchise with the following requirements:"

Putting that language right at the beginning of the franchise eases the hearts of the Cable Bureau lawyers, and that is one of the things we are trying to do here. If we understand what it is the CAC attorneys do, and we know what their procedures are, why not 'spoonfeed it to them' like they have been taught to handle applications? This is the easiest way to stay out of a letter writing and telephone

calling hangup with them, and that same advice goes for the certificate application as well. It is so much easier if you just spell everything out for them, because if you don't, and one of them is not reading too well that day or has not consumed his third or fourth cup of coffee for the morning, and he misses a provision from his check list, then you start getting letters and telephone calls asking you where this or that is in the franchise. This takes your time, it takes your attorney's time (if you use one) and all of this is not necessary if you write a clean application from the start. This isn't meant as a criticism of the Bureau or the people working there. Remember they have to work with thousands of these things—and the easier you make it for them—in terms of having everything written out in plain English, the better it is for everybody.

State Created Curve Balls

Floor question: "I would like

to point out that the states can throw you a big curve ball as well. We revised our franchise in Minnesota and went in for a 15 year CAC. But the FCC came back and said no we couldn't have a 15 year CAC because the State the State of Minnesota had a five year limit on their level at the Minnesota Cable Commission. So we got one for five years, and then Minnesota revised their term to ten years, and now we have to go back in after the first five to get our second FCC CAC."

"In 1975 alone there were 123 state bills on cable television in this country. One of the biggest and most important things we must do at CATA and at the state association level is to recognize that in the next year we must get organized to fight expanding state regulatory activities. In my view the potential danger from mis-directed state regulatory agencies in the next few years is going to make copyright and fines look pale by comparison."

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Floor question: "Wouldn't it be agreeable that perhaps our best defense is a good offense? Shouldn't we be preparing our own state bills to introduce by saying 'Look guys—here is something we can live with!' And by cultivating the state legislative leaders perhaps head this into a direction more realistic than the present 6 or 7 PUC states have?"

"It depends to some extent upon the state. It worked on a minor scale in Arizona, for example, where cable operators got a 'sweetheart bill' and the chances are in Arizona with this law on the books, the state will not re-visit the cable TV matter for many, many years now. But you have to weigh the chance that when such an industry supported and sponsored piece of legislation comes along that you may draw a handful of college professors or "so-called" public interest people who have great theories about cable television but absolutely no real world experience. They can turn your sponsored piece of legislation against you and in the end you may get only part of what you want, none of what you want, or fight to a stalemate with everyone involved including having the legislature turn sour on cable TV.

For the record, significant bills proposing cable television PUC type regulation in 1975 came up in California, Colorado, Georgia, Maine, Mississippi, New Hampshire, Oregon, Pennsylvania, Texas, South Carolina, Washington, West Virginia and Wyoming. Additionally, Illinois had a similar bill but rather than PUC regulation it would have had a department of the Commerce Commission regulate cable. Maine had a pair of PUC bills for cable plus another bill to establish an independent agency to regulate cable! Texas actually adopted a PUC bill in 1975, but at the last minute cable got dropped out of the bill. And these things have a way of coming up year after year after year.

It appears as if we may be

headed for a very strange bind.

Let's assume that the industry wins the Gridley Case for the moment. Or assume that TelePrompTer's victory in the Johnstown, Pennsylvania case is enlarged upon. Or assume for the moment that come spring of 1977 some city with a decent sized and well funded legal staff says to the FCC "We are not going to do it your way"; and they take it to court and win.

In any one of these instances, if the Commission loses on the jurisdictional question, the end result will be that some or all of the federal rules we are here trying to live with will no longer count for anything. *The rules will be illegal, and without force.*

What then? Well, after a short period of loud cheering, we had all better start worrying. Because if Congress is not, at that point, in the actual process of re-writing the Communications Act of 1934 and setting out the rules for everybody...not only what you can do at various jurisdictional levels but more important what you cannot do...spelling out what the FCC can do and cannot do, what the states can do and not do, what the local authorities can do and not do, then an awful lot of states can be expected to suddenly say "Hey...here is a vacuum."

If the FCC is knocked out of the box, and there is nobody else around doing the regulating, you know as well as I do that the states are just as bad as the federal government about believing that a city or town can't do anything by itself. So there will be a sudden rush of state bills.

And this is precisely what the telephone companies have been waiting for. It would appear that sooner or later, because of jurisdictional disputes, because of courts stepping in to tell the FCC it has overstepped its bounds, because of the development of low cost fiber optic plants, or for a dozen other reasons...it would appear our next big battle ground is going to be with the telephone companies. The telephone com-

panies would love to see cable regulated by the state PUC's, and not by the FCC.

First we were as an industry at the FCC where the Commission, dominated by the broadcasters, allowed the broadcasters to take us apart signal by signal and franchise by franchise. In the next step we could end up under the various state PUC's where the telephone companies would take us apart pole by pole.

So we have a lot of work to do. And something to worry about long term. But the topic here is more directly concerned with the next three to six months and getting in shape by March of 1977. So let's look at the six points which the Commission's franchise standards require us to obey if we want that CAC.

Getting In Shape

There are several things you can and should be doing to pave the way for smooth handling of your franchise modification or renewal. Again, remember that you do not need to necessarily open up your entire franchise to make modifications to it for the FCC (see page 35, October CATJ). This is a strategy question and I cannot emphasize strongly enough that your own strategy has several key elements.

Number one— If you are not now providing good service, and you are not in a position to totally clean up your service in a very short period of time, look for another business to get into. There are Hugo, Oklahomas all over this country. If the city is not satisfied with your service, they are going to find some way to locate someone else to give them that service. And I agree with them. If you can't give your subscribers good service, you shouldn't be in the cable business.

Number Two— You must know and keep talking with your city attorney. Remember that your city attorney knows a whole lot less about cable law than you do. Now

most of you are not lawyers, but when it comes to cable television and the city attorney, you as an operator are a brilliant source of knowledge. You at least know what the FCC is. . . a lot of them do not. It is extremely important that you sit down with the city attorney *some time before* you come in and hand him a big pamphlet with the terse announcement 'Alright here it is. . . adopt it'. You need to be on a good, sound basis with the city attorney and he needs to begin to have some understanding of your problems at the federal (and state) level so he will be better equipped to appreciate the position you are in.

The Magic Provisions

In some systems, in fact in most systems which are already operating, some of the six provisions do not apply. For example, the construction time schedule which sets forth how long you have from the city to complete construction of the system obviously cannot apply to a system that is already constructed. One way to handle this would be to attach to your application to the Commission a statement which says, in effect, "*My community is completely constructed and therefore my city did not have to review my construction time schedule as specified in 76.31 (a) (2) of the rules. . .*". Now, if you don't say this clearly and concisely in your CAC application, some attorney at the Cable Bureau is going to sit down to read your franchise and on his check-off list he is going to find that your franchise did not specify a construction schedule. Then he is going to send a letter to you asking that you go back and get the city to revise your franchise, and the hassles will start.

Number One — The all important public notice is the first order of business (76.31 [a] [1]). Many states now have state code provisions that require the city council or county board or whomever to

operate under a sunshine law or provision, with full advance agenda announcement of every meeting. Review the previous material here (see page 19 this month) and just make sure the city or county follows the local procedure exactly and precisely. Don't needlessly open up your franchise modification to challenges by the Commission or some disgruntled would-be franchise-raider. If you follow the local standards, the FCC won't bother you about this one.

Now most of you have a constructed system, so to review the construction schedule in a modified franchise may sound kind of silly, but it won't hurt you to put it in. Agreed, it is meaningless. And it could be, as discussed earlier, *in the whereas clauses*. It could simply say that the city has reviewed the construction of the system and is satisfied that the system is now complete. However, for those systems starting new with a fresh franchise, you will probably find most cities are very particular about the construction schedules. Typically, they will say that you are to construct "X" amount in the first six months, another "X" amount in 12 months and so on. And this is what the Commission is really looking for, hard language that ties you to a construction schedule obligation. Now the Commission does not require *specific* numbers in the construction schedule. The 1972 rules *used an example of 20% per year*, and many people reading this example believed *this was the Commission's standard*. Not so. This was an example, not a rule.

Floor Question: "*I bought a small system in a rural county area that has 115 subscribers. There are no other systems in the county, and the county is thinly populated. I had planned to ask for a county wide franchise with a line extension clause attached. There are a couple of small areas of about the same size where separate headends could provide service. But*

most areas of the county will not support cable now, many will not in twenty years and some will never have sufficient density."

"The Commission will not, in all likelihood, accept a county wide franchise and you shouldn't want it either. Did the county grant the franchise you now have?"

Floor response: "*There is no franchise, they have no ordinance for a franchise.*"

"The best way to do this is to ask the county for discrete franchises for each of the areas you wish to serve. The Commission has ruled that a county-wide franchise is somewhat meaningless. And for precisely the reasons you have given. Some areas of the county, based upon population, will be built before others will be built. And some areas would never be built. The reference or lead case in this area is Baltimore County, Maryland, which presented the Commission with a different problem than yours, but it is instructive none the less. In Baltimore County you have a number of Grade B signal markets represented. In all of the county you have the local Baltimore signals. In most of the county, except for the far northeastern edge, you have Grade B signals from the Washington stations. And in some portion of the county you have some or all of the Grade B contours from the Harrisburg-York-Lancaster market. Finally, in the western half of the county you have the Grade B contour of the Hagerstown station.

Now the theory the would-be operator worked under was that he would obtain a *county-wide* franchise and then go to the Commission and say 'Well, *these are locally viewed signals. . .* at least someplace inside of my franchise area'. It was a good try, but the Commission responded with 'There is no way we are going to authorize carriage of signals from four markets *throughout all of Baltimore County*'. The county is quite large, north by south, and because of where it is, this

particular off-air condition exists relative to Grade B contours.

So the Commission returned the application to the franchisee, and said to the County break up the franchise areas into natural population centers . . . which are more close approximating normal franchising areas. Then we will deal with the signal carriage problems on a franchise by franchise basis'.

So this is the way most people are dealing with the county problem, and this is the recommended procedure to follow. If you can recognize say five population centers in the county, even if they have no formal name or map designation, then ask the county to give you five separate pieces of paper; one franchise for each area. Then you can treat each one separately, as the Commission will insist, and create your own franchise standards and line extension policies for each one.

The Commission has become a little bit more lenient on this particular point than many

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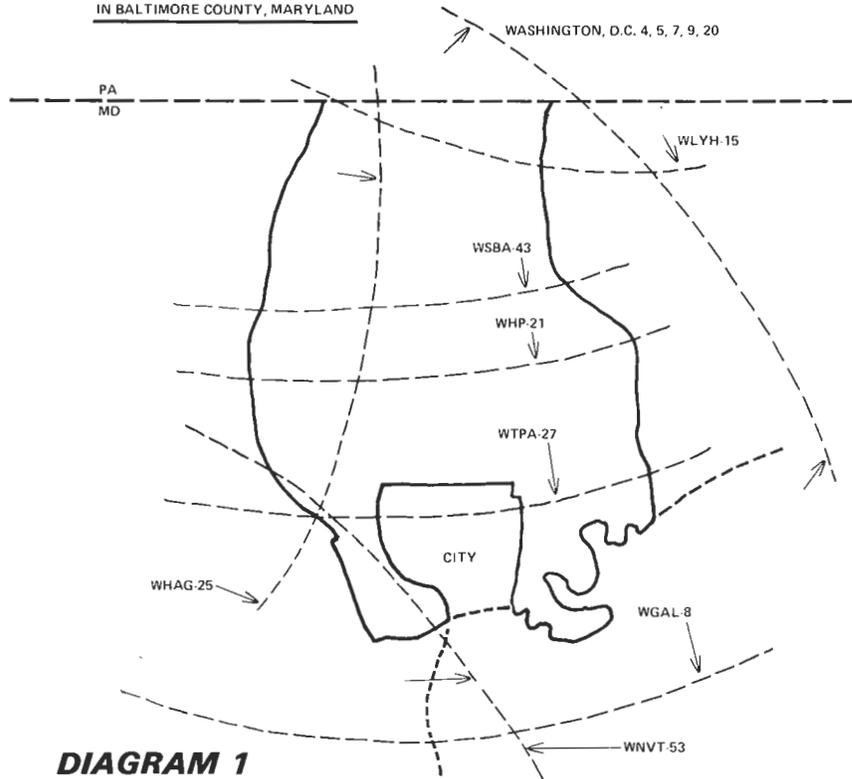
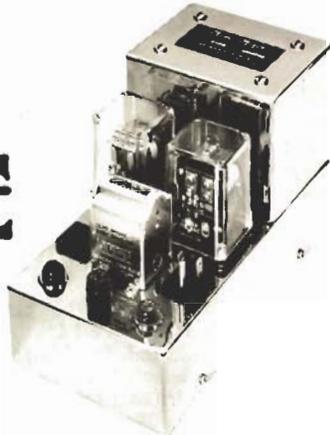


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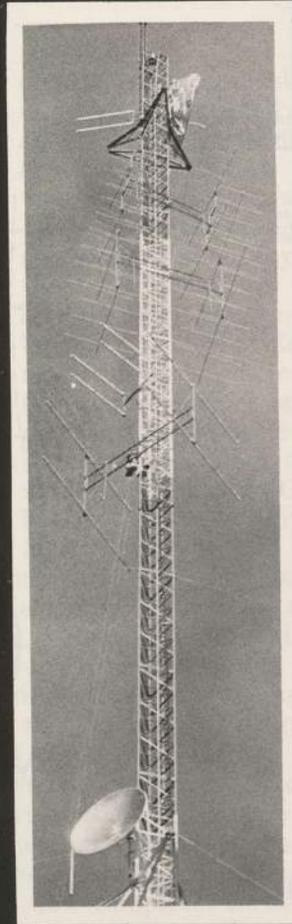
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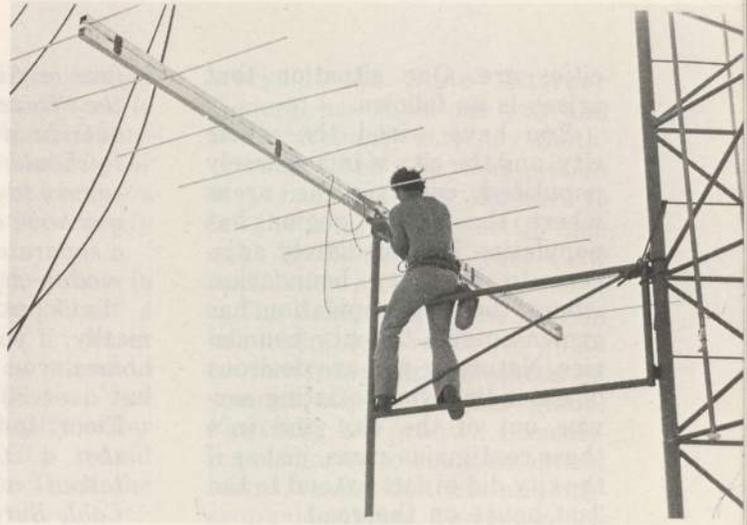
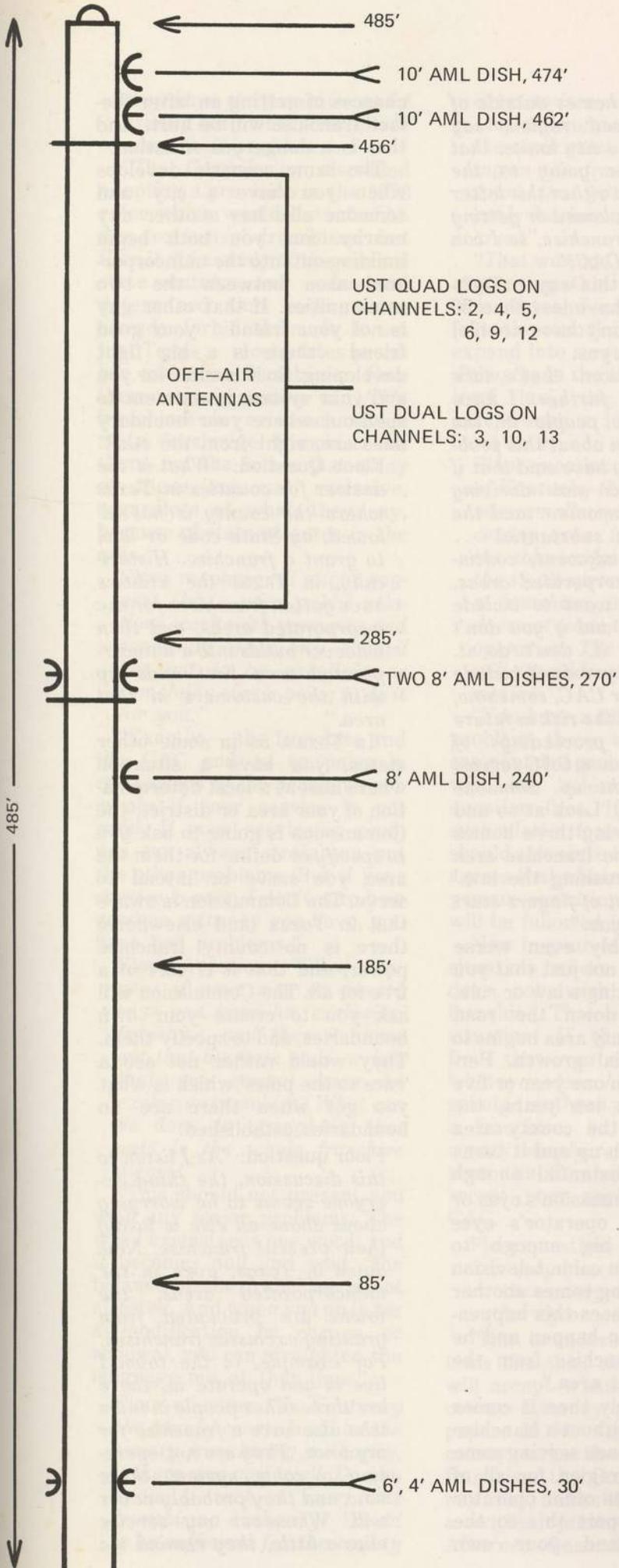
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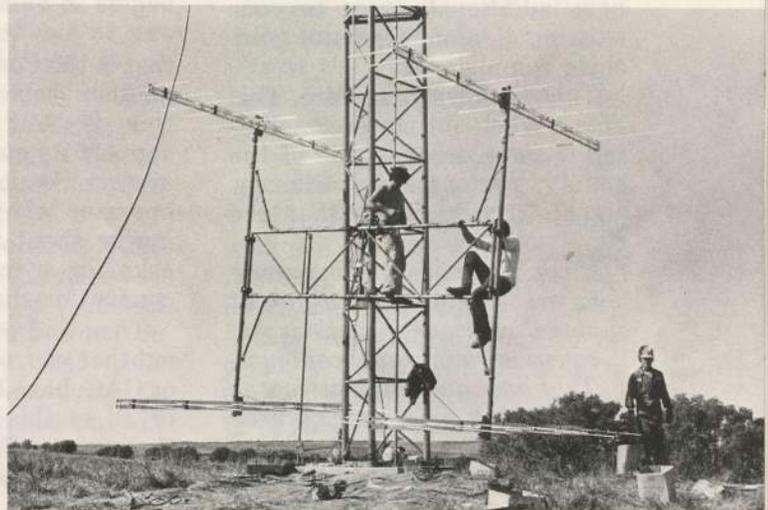
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cities are. One situation that arises is as follows:

You have wired the whole city, and the city is in a sparsely populated county. The areas where the county region has population is immediately adjacent to the city boundaries, where the city population has grown outside the city boundaries. Naturally you are desirous of extending your existing service out of the city and into these contiguous areas, just as if the city did in fact extend to the 'last house on the road.'

The Commission recognizes this situation and has said that instead of your going to the county and getting a full blown franchise from the county for the areas involved, you can go to the county and obtain a letter from the county that says 'We approve XXX cable company extending their service lines out of (name of town) into the (defined areas) because we (the county) have looked at the areas involved and the county has determined that there is no possibility of another cable operator coming in and bidding for a county franchise just to serve the area around (name of town/city), and therefore extension of the (name of town/city) system is the only feasible way that these residents of the county could expect to ever have cable television service'.

If you can get a letter similar to this from the county, the Commission will not force you to go through a separate franchise process, but will attach these new (additional) areas to your existing CAC in terms of franchise compliance.

There is a warning here. This gets a whole lot more complicated if some or even one of the county regions has different signal carriage rights than the city itself.

Floor Response: *"In our county area, we do have different signal carriage situations because of different contours. That was our original reason for asking for a county wide franchise."*

Floor Question: *"You mean to tell me that if I am serving*

four or five homes outside of the franchised region, say outside of the city limits, that I should be going to the county to get either this letter you have explained or getting a separate franchise, so I can modify my CAC?"

"Let's put it this way... Technically, if you have less than 50 homes, you don't have to file; but over 50... yes.

Floor Question: *"Let's take that a step further. I have talked with people in the Cable Bureau about this problem and they have said that if a system is not deriving substantial income... and the key word is substantial... from these adjacent, contiguous, unincorporated areas, then if you want to include them do so, and if you don't want to do it, don't do it. But... when you don't include them on your CAC, somehow, then you run the risk in future Commission proceedings of having these non-CAC service areas brought up. Someone may well say 'Look at so and so, he is serving three homes outside of the franchise area and he is breaking the law.' And then alot of fingers start pointing at you."*

"It is possibly even worse than that. It is not just that you might be breaking a law or rule, but suppose down the road a ways the county area begins to have substantial growth. Perhaps later on, in one year or five years or even ten years, the population in the county area begins to bunch up and it turns out to be substantial enough that in the Commission's eyes or another cable operator's eyes this is now big enough to support its own cable television system. So along comes another operator who sees this happening or about to happen and he asks for a franchise from the county for that area."

Then and only then it comes out that you, without a franchise or CAC, have been serving some or all of this region for all of these years. The other operator is going to report this to the Commission, and your own

chances of getting an 'after-the-fact' franchise will be hurt. And that is a dangerous situation.

The same scenario develops when you have a city and someone else has another city nearby, and you both begin building out into the unincorporated area between the two communities. If that other guy is not your friend... your good friend... there is a big fight developing. So it is safer for you and your system investment to spell out where your boundary lines are, right from the start.

Floor Question: *"What is the answer for counties in Texas where the county is not allowed, by State code or law, to grant a franchise. Historically, in Texas the utilities have gotten franchises for the incorporated areas, and then whoever builds into a unincorporated area first ends up with the customers in that area."*

"In Texas, as in some other states, you have a situation where absent a local determination of your area or district, the Commission is going to ask you to specify or define for them the area you serve or intend to serve. The Commission is aware that in Texas (and elsewhere) there is no county franchise power, and that it is sort of a free for all. The Commission will ask you to create your own boundaries, and to specify them. They would rather not see a 'race to the poles' which is what you get when there are no boundaries established.

Floor question: *"As I listen to this discussion, the thing everyone seems to be worrying about above all else is losing their present franchise. Now down in Texas, even in the unincorporated areas, the towns are prevented from granting exclusive franchises. For example, in the town I live in and operate in, there are three other people in town who also have a franchise for my town. They are not operating a cable system there now, and they probably never will. Whenever my service slips a little, they remind me*

they have the franchise and I usually hot foot it over to see what their problem is."

"The Commission discussed adopting a provision in the 1972 rules which would have forbidden 'exclusive' franchises, but then it did a study of the various state statutes and codes and determined that most states already forbid them. It is not just Texas... most states prohibit exclusive franchises. Now there are any number of CATV franchises in existence which state 'exclusive franchise' on them, but the fact is that many of these are *not* exclusive, regardless of what they say, because of state statutes in the area.

Floor response: *"I might suggest this... your public relations work with your city and especially your city council has got to be excellent or somebody else is going to do it for you."*

"Exactly — the franchise and the CAC and so on pales in comparison to the problems you create if your service is not good. If your service is good, you can always straighten out the other problems. But if your service is poor, I don't care how good an attorney you have, you have bad problems."

Floor question: *"What happens if your city or county says you have an 'exclusive' franchise, and then it turns out that by state code or law that you cannot have an exclusive franchise? What can be done to straighten that out? Is the whole franchise illegal?"*

"This should not present you with any major problems. The word exclusive is *one* word, and it becomes null and void. The balance of the franchise is not affected. And when you go in for a modification or change or renewal, you can straighten the language out at that time."

Floor question: *"In Kentucky the county court would be the county franchising authority, if there was one at all. Do you know if such a court has franchising authority? Would it be sufficient for the county*

court to issue a letter stating that as long as you adhere to the same rules you are following in the franchised city or town, that you can carry on cable business in the county area?"

"That was one of the points in suggesting that you obtain a 'sole-source-of-service' letter from the county if you intend to expand into a county area. Yes, if they have the authority under local law, the FCC would accept such a letter from the local court.

Floor question: *"In my section of Kentucky there are numerous small systems in the county area. I would not be the sole source of signal. But the small systems do not want a franchise and the county does not want to franchise my operation. The county simply will not address the franchise matter."*

"You have a different type of problem then, or at least a compounded problem. Let's deal with the 'sole-source-of-signal' question first. If you can get such a letter from the county, it should also state that the county agrees that whatever provisions you are operating on in the city will be followed in the county."

Now in your case you have a situation where your county does not wish to grant a franchise. That is a very sticky situation. If the Commission finds that your city, county or whatever *does* have the state-granted authority to enter into a franchise, but the city or county *simply* refuses to do so, then the Commission will not accept your application for a CAC.

Floor question: *"In Kentucky, it is very questionable whether the county court has that authority or not."*

"That is understood. In situations like this, the Commission will accept whatever the local county attorney puts down on paper. If he says that *your* county lacks the authority to franchise, the Commission will buy that, unless there has been a written opinion by the State Attorney General to the con-

trary. If the State Attorney General has ruled one way and the local county attorney another way, then the Commission steps back and says 'We have to let the local people settle this one'. In the interim, your CAC application stops moving."

The Cable Television Bureau has an internal reference guide to the franchising methods in various states. In this guide, Kentucky has granted franchising authority to counties, cities, towns, taxing districts and other municipalities. The reference book also notes that the FCC has granted CAC's in Kentucky to cable systems operating in counties where the county maintains it does not have franchising authority.

These are processed at the Commission under something known as a 'Paragraph 116 Application'. In FCC-talk, this refers to a paragraph appearing in the Reconsideration of the 1972 Report and Order, in which the Commission recognized that in some areas of the country there is no franchising authority. Under paragraph 116 applications, the operator has to come to the Commission with his own proposal that sets out how he will promise to the Commission that he will operate his system based upon the six provisions of 76.31 which normally are found in a franchise. And he warrants or swears to the Commission on this point.

Floor question: *"Along these lines I have a similar situation where I have obtained the verbal assurance of the Cable Bureau that if I obtain a letter from the county stating they do not wish to grant a franchise, that my CAC for the county area specified will be processed."*

"You need to be very careful with the wording of that letter. It would be much better if the letter said 'The county does not believe it has the authority to grant a franchise'. This is a major difference from the county saying 'We do not wish to grant a franchise'."

The 'lead' case in this area was Leon County, Florida

where the county said to the operator and the Commission 'We have the authority to grant a franchise... but we don't want to bother with doing it. We do not wish to grant a franchise.' The county did not deny they had the authority.

At that point the Commission said 'No, you cannot duck your responsibility to grant a franchise and we are not going to take that authority over for you by granting a CAC before you

grant a franchise.'

It took a year and a half to straighten this out with the county and the operator and the Commission, but ultimately Leon County *did* grant a franchise.

So if you are headed for a situation such as that, make very sure the county attorney issues you a letter which states that the county does *not* have the authority to grant you a franchise. With that letter in

hand, then the Commission will accept your 'Paragraph 116' application for a CAC. Without that letter, they will not.

Next Month — More Magic Provisions

This series of CATJ reports, prepared from tape transcripts of the CCOS-76 Seminar on *Preparing For 1977*, will continue in our December issue.

WHAT WOULD FINES REALLY MEAN?

The Bottom Line On Fines Is Instant Replacement Of Lots Of Equipment

Green Stamps

A self governing nation reasonably expects of its governed that they will obey laws and rules and regulations, for without such largely voluntary obedience there will in short order be chaos. When voluntary compliance is not effective, the governing body usually elects to create a system of penalties for those who choose not to comply.

Traditionally in the United States, penalties have been a last resort, adopted only after all reasonable attempts at voluntary compliance have brought orderly development to the brink of chaos. Or, penalties have been adopted where the promise of large scale disobedience offers the probability that chaos will result if the laws or rules or regulations are not immediately obeyed and accepted by the governed.

In most cases, the adoption of the law or the rule or the regulation assumes that the public's own good is best served by such a law, or rule or regulation. Fifty-five mile per hour national speed statutes were adopted because it was alleged higher average highway speeds consumed fossil fuels at such an advanced rate that the available supply of such fuels would be depleted before science and technology could develop alternate fuel sources. Seat belts in automobiles became universal equipment because it was found that the use of seat belts considerably improved the chances for survival should the wearer be involved in an auto accident. National standards limiting purported harmful "X" ray radiation from color television receiver chassis units were adop-

ted because there existed the probability that continued exposure to dangerous levels of such radiation might result in harmful health effects to viewers. Automobile emission controls were adopted because it was found that the uncontrolled release of harmful chemical agents by automobile exhausts was adding to the lower atmosphere's destruction, in areas of the nation where such pollutants do not "wash away" with the winds and rain.

None of this has much (if anything) to do with operating a cable or community antenna system; but it does set the stage for the proposal that all cable or community antenna systems be required to observe all of the rules and regulations or the FCC; or, pay a monetary fine for their inability or refusal to do so.

In this nation there are laws and there are rules, and there are regulations. A law is a "rule of conduct, recognized by custom, or decreed by formal enactment, considered by a community, nation or other authoritatively constituted group as binding upon its members."

The Communications Act of 1934 is, for example, a law. It was decreed by formal enactment by the Congress of the United States, and signed (i.e. approved) by the President. Because the language of the Communications Act of 1934 was enacted formally, it has always

been considered to be "binding upon the members of the nation".

A regulation is "a rule prescribed for conduct". Virtually all dictionaries list regulation as a synonym of law. *They have the same meaning.* Other synonyms for law are statute and ordinance. A statute is a written law enacted by a legislative body. A statute enacted by a municipal body is an ordinance.

And rules or laws laid down by an administrative body, manager, etc. are regulations.

A rule is not so easily defined; nor is its relationship to the law, the regulation or the regulator so clear. A rule is "an authoritative direction respecting the doing or method of doing something". A rule is also "an established usage or law". And a rule is "a formal regulation prescribed by authority touching a certain matter".

The last definition may hold our answer. The authority is the FCC. The Communications Act (law) of 1934 said so. If a rule is a "formal regulation", and a regulation is "a rule prescribed for conduct", we have a circle. And because regulation is a synonym of law, a rule then becomes a "formal law prescribed by authority". *And the authority is the FCC.*

The FCC says cable or community antenna television systems must obey their regulations and rules. The FCC says too many cable or community antenna television systems are not obeying their regulations and rules. And so the FCC says they need the specific authority of Congress to enact new rules and new regulations (i.e. law) authorizing the FCC to assess fines and forfeitures against cable or community antenna systems not obeying the rules and regulations.

The FCC already has the authority of Congress, through an amendment of the 1934 Communications Act, to assess fines and forfeitures against licensees of the FCC. This Congressional authority, now nearly 15 years old, has been employed against licensed CB operators, marine

radio systems, point to point systems and broadcasters. But the authority of Congress granted some 15 years ago did not extend to *non*-licensees of the Commission. And for good reason.

The Communications Act of 1934 granted the authority of Congress to the FCC to create rules and regulations for the enrichment of the public good only in the area of (licensed) *users of the communications spectrum.* The 1934 act prescribes generally that the FCC has the authority to create rules and regulations governing the *licensing* of such users, and the standards by which they operate. The 1934 Act did not grant the FCC the authority to regulate or rule *non*-licensed persons, because in 1934 it never occurred to anyone that a person or corporation might "avoid" the rules and regulations by simply avoiding the licensing process.

Yet that is exactly one of the problems faced by the FCC today. Where the fines and forfeiture authority of some 15 years ago grants to the FCC the authority to levy fines and extract forfeitures (such as giving up the FCC license) where there are violations of the rules and regulations, the fine and forfeiture scheme did not grant authority to levy fines against violators who were *not* licensed. So today in the CB radio field, for example, we have a situation where people who knowingly violate the rules avoid FCC fines by simply purchasing their equipment and operating it *without a license.* Sure... that is illegal, and certainly the FCC does have the authority to *close down* unlicensed operators. The 1934 Act and the rules derived therefrom clearly give the Commission the authority to regulate *all users* of the airwaves, and it follows that one of the first steps attendant to regulation is the licensing of all users. So the Commission can, within the severe constraints of its Field Operations Bureau budget, locate an unlicensed operator (who is violating many rules, or who is violating the singular

rule of *not being* licensed), and shut him down. This takes a combination of an FCC inspector field person and a federal marshall; the FCC person to attest to the illegal operation, and the federal marshall to present and enforce the shutdown order issued by a judge or the local federal marshall's office. *It is a cumbersome procedure* and one employed only when everything else fails. And the FCC has a good case for wishing their fine and forfeiture authority expanded to include the ability to assess monetary fines against such *non-licensed* offenders.

A law then is, for our purposes, *the authority* of Congress to enact a rule or a regulation or both. And a rule or regulation, prescribed by "an authority" has the same force as law; that is, a law such as the Communications Act of 1934.

Cable television rules are law. That's the way it works, and while it may be easy to say "But the 1934 Communications Act does not even mention cable television...and therefore the FCC rules on Cable television are illegal", it is much tougher to get a competent court of law to agree with you that this is the case. Historically, and traditionally, the "authority" (i.e. the federal agency) has been found again and again to have the "approval" of Congress to enact rules or regulations *with the force of law.*

To be sure, there are many segments of the Cable Television Rules which are suspect as to their validity. Some of these are currently under scrutiny in the Gridley (Kansas) "test case" before the Commission. But the overall philosophical question as to whether the FCC has *any* jurisdiction over *any* aspects of CATV operation...well, that is another matter.

The 1934 Act carefully addresses itself to licensees of the FCC. *The same act prohibits the FCC from licensing receivers* although it would appear to authorize the licensing of *transmission systems.* An example of a transmission system is a point-to-point microwave installation,

consisting of a transmitter *and* a receiver. A further example of a licensed transmitter with *unlicensed* receivers would be the licensing of WCBS in New York, but the non-licensing of the millions of receivers purchased by the general public to receive WCBS. Seemingly, then, a receiver (per se) cannot be licensed under the statutes of the 1934 Communications Act, *unless it is part of a defined system* consisting of a specified transmitter *and one or more specified receivers*.

Is there, then, no present basis for Commission licensing of receivers not a part of a specified "system"? Does the Commission have *no* authority to

deal with receivers, *at all*?

No, that is not quite true. By special amendment of the 1934 Communications Act in the early 60's, the Commission was granted the authority of Congress to adopt rules and regulations (i.e. write law) which made it mandatory that all television receivers shipped in interstate commerce be factory designed so as to be capable of tuning all of the then allocated television channels. This was the "all channel receiver act", designed to insure that the UHF television channels had the same "viewability" as the VHF television channels. So in this *specified-by-Congress situation*, the FCC received authority to specify *cer-*

tain receiver parameters. And, there is one more area where the FCC regulates receivers.

Because any receiver has contained inside of its housing a "miniature signal generator/transmitter" known as a local oscillator, the Commission has felt it was on safe ground to prescribe "radiation limits" for these miniature, unlicensed transmitters. The local oscillator is something virtually all receivers require for the reception process; and the Commission rightfully decided that somehow the amount of signal *escaping from* the receiver's local oscillator must be controlled, to insure that this receiving-oscillator did not end up ruining the general reception of somebody else's receiver. So a "rule of conduct" was adopted setting out various engineering measurements to be performed on all receivers manufactured, and it was decreed by the authority that only receivers meeting these standards could be shipped in interstate commerce and sold to the public.

Additionally, the "limited radiation" rules were later expanded to include "receiving apparatus" on a situation by situation basis, *and even cable television systems* were specifically included in these twenty year old regulations. Engineering numbers and measurement techniques were first specified in Commission rules in the mid 1950's setting forth the "maximum permissible radiation from a cable/community antenna (television) system". Again the intent, like the intent with the restrictions placed on receiver "local oscillator radiation", was that a cable/community antenna system must not conduct its signal around its community in such a way that signals escape from the coaxial cable system with sufficient intensity to create receiving interference for non-subscribers to the cable/community antenna system.

The *basis* for these regulations, as with the local oscillator radiation regulations, was the broad mandate of the 1934 act granting to the Commission the

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authority to regulate *all transmissions*. But the *intent* of the Commission's actual rules was *to protect* existing receivers and new receivers from *harmful radiation* created by other receivers. So whereas the 1934 act did not allow for the *licensing* of receivers, the Commission's actions through the years indicate that they have always considered themselves to be "watchdogs" of any "communication systems"; and the receiver, to the Commission is a vital part of such a system.

The adage is as old as time. "If a limb falls from a tree in a forest, and there is no one there to hear it, is there a sound?" The Commission has always believed that efforts must be made to insure the quiet of the forest... *just in case a limb should fall.*

Now the Commission has maintained, from the inauguration of the Cable Television Bureau Application for a Certificate (CAC) procedure in 1972 that cable television systems are indeed not receiving "licenses" from the Commission. The Commission decision to call their grants of authority "Certificates" (of compliance) was made only after careful study of the powers granted to the agency by the 1934 Act, with amendments along the way. At no place in that 1934 Act, nor during any of the amendments adopted in the ensuing 38 years, did the Commission find "solid ground" to authorize the agency to license receiving systems. *Yet the licensing of the cable/community antenna system was essential* if the agency was to expect "obedience" with the rules and regulations they were creating for "the service". The CAC "scheme" was hatched to sidestep the authority - to - grant - licenses problem. In one of the lower level deliberations concerning the present Gridley, Kansas test case before the Commission, it was admitted by *Cable Television Bureau* attorneys that "Indeed, yes the CAC amounts to nothing more than a license" and, "yes, it is in fact a license; *we simply call it by another name*".

Does such an admission by a

Cable Television Bureau staff attorney amount to a broadening of Commission powers? Can a staff level attorney admission be considered "a formal regulation prescribed by authority"? It is more than a spurious question.

If the Commission can create regulatory definitions with such aplomb, and get away with it, what is to stop the agency from in turn determining that because "cable/community antenna television systems *are now* licensees, the 15 year old Congressional authority granting the agency the power to assess fines and forfeitures *can now be* applied to this service"?

Few attorneys get very excited about the legal definition of CATV systems. Whether we are licensees or wards or adopted children or possessions of the agency seem to bother the legal chiefs little. It is, however, the gnawing concern carried by virtually all *owner-operators* of cable/community antenna systems.

The Fines Structure

HR 15372, in the recently adjourned 94th Congress, would have extended the authority of Congress to the FCC thereby allowing the agency to create rules and regulations allowing monetary fines and "license for-

feitures (i.e. forfeiting the CAC)" for two *new* classes of FCC wards. The unlicensed operator of a transmitter (such as the fellow who set up shop with an illegal CB set, and operated contrary to the rules and without a license) would become liable for FCC fines when he was caught. This would allow the FCC to move in on such a fellow without the present hassle of getting together with a judge and/or federal marshall to "serve" the individual. This would free up the Commission's field people to simply drop into a suspect's location, show identification, and assess a fine on the spot if the operator was found to be violating Commission rules. The theory has been that the present procedures requiring the "cooperation" of locally or regionally assigned federal law officials often times prevents the FCC from acting as swiftly as it would like to act. By assigning such fine powers directly to the Commission's field personnel, the FCC believes enforcement activities will speed up.

HR 15372 also would have extended to the FCC the authority to establish a system of fines and forfeitures for cable/community antenna television systems. Like the illegal CB operators, at the present time cable/community systems are not generally conceded to have been li-

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censed by the Commission (the CAC procedure not withstanding).

An applicant for a license issued by the Commission agrees to some erosion of certain constitutional rights, as a "condition to the grant" of the license. Virtually all sections of the rules in all services provide for the "inspection of the licensee's station or facility" by authorized representatives from the Commission, at "reasonable hours". In effect, the rights of privacy and protection from search are identifiably handed over to the Commission by the "conditions of grant" attached to a license.

The cable television rules and regulations have several such examples, drawn (*perhaps prematurely*) largely from rule sections governing other "licensees". For example, section 76.401 provides that a cable television system shall file an "Annual Report". That report turns out to be a form and there is language on the form notifying the cable operator there are federal fines and penalties for not providing true and accurate answers. In a round about way, the Commission, through form 325, invades the *privacy* of the "licensee" and "*searches his files*" for information concerning the licensee's (private) operations. With gradual erosion of the extent of privacy afforded FCC files from the prying eyes of non-FCC personnel, the information contained in these filings by private cable operators has become increasingly more frequently distributed throughout Washington. And section 76.405 additionally requires the annual filing of a "Cable Television Financial Report". Again, the *privacy* of the operator's business is violated by FCC rule, and financial information often not even required or requested by the IRS is handed over to the FCC. It is "*search*" and an "invasion of privacy" of a "willing" nature; a *condition of the grant of a license*.

Section 76.601 (a) recites "The operator of each cable television system shall be responsible for insuring that each such system is designed, installed and opera-

ted in a manner that fully complies with the provisions of this subpart. *Each system operator shall be prepared to show, on request by an authorized representative of the Commission, that the system does, in fact, comply with the rules.*"

Section 76.601 (c) states "The operator of each cable television system shall conduct complete performance tests of that system at least once each calendar year... and shall maintain the resulting test data on file at the system's local office for at least five years. *It shall be made available for inspection by the Commission on request.*"

All systems were required to begin such annualized tests within the period March 31, 1972 and March 31, 1973. This included all *new* systems constructed in that period of time (systems which had to have CAC's to begin operation, and which would therefore today be considered 'licensees'), as well as older 'grandfathered systems' which have until March 31, 1977 to obtain Certificates of Compliance. Yet the results of the tests (76.605 [c]) and system compliance with other rules (76.605 [a]) is to be open to "*authorized inspection*" by Commission personnel even though the systems do not yet have to have Certificates of Compliance, and can not in fact by the greatest stretch of the federal mind be considered licensees(!). *And hundreds of such "non-licensee" systems obliged the visiting FCC field personnel.*

If the Commission's authority over CATV systems hinges upon the CAC-licensing process, and the "conditions of grant" attached to a valid CAC, one is at least apt to wonder why a system that is not required to have a CAC-license until March 31, 1977 is bound to observe any of the FCC rule requirements *before such a grant is made.*

These unanswered questions do not rest well at the Commission. Obedience to the rules is the watchword, whether the rules are defensible in court or not. And this is the stuff that FCC pleas for the authority of Congress to assess fines on

CATV systems is made of.

Fineable Offenses

The FCC, in HR 15372, was not specific in the content of its request for Congressional authority to fine CATV systems. The Commission was merely asking for the *conceptual authority* to fine receiving systems, such as CATV. The details, how much of a fine and for what offense, would be worked out by the FCC staff after the Congress approved the concept.

The Commission has never formally released a proposed schedule of fines and offenses for CATV. Some low level work has been done on the project, preparatory to the swift execution of its authority should the concept receive Congressional approval. And the only formal utterances on the subject have been through FCC Chairman Richard E. Wiley, who has generally conceded that CATV fines would be for "operator violation of signal carriage rules, CAC procedures, FCC testing requirements, maintaining proper records and...oh yes, maintaining proper technical specifications".

Signal carriage rule violations are an interesting sidelight to the fineable offense list. To be fined by the FCC, the cable operator would have to be found to be carrying one or more signals for which he had no CAC authority. The recently enacted Copyright legislation *also includes fines* for the *same* offense, although the language is not quite the same. If a CATV system carries any signal for which he has not received federal approval, he may be fined (*under the copyright law*) \$100.00 per day for the violation (or per violation); up to an aggregate total of \$50,000. for cumulative offenses. It was common knowledge in Washington during the waning days of the 94th Congress that the National Association of Broadcasters was in particular interested in seeing that the FCC received fine authority for CATV systems, to "help broadcasters" see that cable systems did not carry signals they were

not supposed to be carrying. The NAB was one of the prime pushers of the fines for cable concept; *and the signal carriage provisions were the primary reason for this push.* Why this might be so should be much clearer to you after the forthcoming December issue of *CATJ* (See "The ADI Tangle" in the December, 1976 *CATJ*).

So if the FCC eventually does manage conceptual authority for fines over cable, and if they determine that signal carriage violations should be included in the fineable offense list, there will be not single but double jeopardy for CATV systems carrying "stray signals" on their system.

The fines for CAC procedures provision is a mighty interesting discussion in its own right. Obtaining a CAC at the present time amounts to having (1) a system's signal carriage in line with the complicated "rights" set forth in the Commission's rules, (2) a system's franchise instrument in line with an equally complicated set of requirements (76.31). As the current CAC compliance series in *CATJ* is pointing out (see pages 35-43 October; 19 to 28 in this issue), there are dozens if not hundreds of rulings and contradictory decisions and interpretations in the certificate compliance process. And where now there seems to be a measure of latitude in the regulatory approach, one could surmise that given the opportunity to assess fines for compliance violations, the latitude might simply retreat to a thin, hard line; "comply, or pay the fine".

The ability to insure proper compliance with FCC testing procedures is another of those dangerous, how - far - do - you - think - we - can - go areas. The testing provisions (as set forth in 76.609) are far from exact. There is nothing approaching uniform test procedures, and the guidelines given in 76.609 largely require substantial investments in sophisticated test equipment; equipment *not found* in more than 90% of all systems, and equipment far outside of the budget of the same

90% of all systems. If the Commission's rules as prescribed in 76.609 are followed to the letter, or fines are the alternative, hundreds if not thousands of systems will be fined for merely not following Commission-acceptable testing procedures.

Maintaining proper records should largely be a matter of good housekeeping. Provided you know what proper records are. Having a complete and current (i.e. accurate to the day) set of FCC Rules and Regulations is *one of the requirements.* Seemingly, an inexpensive subscription to Part 76 rules through the Superintendent of Documents would be all that is required. Yet it is a fact that there is often a severe lag of several months between the adoption of some clarifying rule at the Commission and the appearance of that rule in an updated and "current" revision of Part 76 as issued by the Superintendent of Documents. And it is no secret that well over 60% of all CATV systems surveyed by *CATJ* this past summer do not now have (nor have they ever had) a copy of Part 76 of the rules. Sloppy operating?

To be sure. But that is the way it is, none the less. And unfortunately, possession of the rules (even if current) is no guarantee of correct understanding and interpretation of the often conflicting rules.

The big problem is the last area for fines. "And, oh yes, *maintaining proper technical specifications.*" The technical specifications are found in section 76.605 (a) (1-12). They consume barely 1.5 pages of the Commission's 338 page "Cable Television Report and Order and Reconsideration" released in the summer of 1972. They have attracted as much or more interest and concern as the other 336-plus pages of text.

Basically, the Commission says "Here are the technical specifications you must adhere to". And then with fines and forfeitures, the Commission will say "And... if you don't comply with these 'simple' technical requirements, we will fine you for each violation we find." The minimum fine envisioned is \$100.00 per offense. In other fineable services, an offense is considered to be any violation

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that takes place within a twenty-four hour day. The same 'offense', repeated two days in a row is now two offenses.

A much respected staff attorney for the House Communications Sub-Committee told *CATJ* "Look, why all of the fuss over these fines for technical violations? If the FCC gets this authority...so what? The Commission is short of money and that means they are short of manpower and short of equipment. Even if they have the right to fine you for low signal levels to a subscriber, if they don't have enough men or equipment to go around inspecting everybody, what difference does having these rules in the books make?"

The October issue of the *CATA NEWSLETTER* makes the observation that under this logic it is quite alright to hand a four year old a loaded machine gun...provided you keep him so busy that he never has the opportunity to pull the trigger. The subject is of course much

more serious than that.

The FCC has for decades specified technical parameters for broadcast equipment. The FCC has, for almost as long, specified tight parameters for broadcast test equipment specifications and procedures; to insure that when field people make measurements they are measuring the intended apples and not oranges. All of this is (as Mister Spock would note) "perfectly logical and correct"; *when it applies to signals sent through the public's airwaves* where maximum utilization of the airwaves can only result when there is orderly utilization of limited spectrum available.

The FCC responds that "CATV is a natural and progressive extension of the broadcaster's signal; and to insure that the public receives the broadcaster's signal in the original form, a form which is regulated by the Commission so as to maintain protection of the public interest, the Commission must have the right to prescribe and

enforce technical specifications for this 'link' of the total path from transmitter to receiver".

Humm. After all, the Supreme Court *did* rule at one point CATV is "a natural and logical extension of the customer's own receiver...". It follows that if in the Commission's eyes CATV is part of a "transmission system", consisting of the origination transmitter, the interfacing equipment and the customer/viewer's receiver, we seemingly are hooked for fines for non-compliance.

But of course this transmission system is not complete unless an unlicensed receiver, owned or operated by the CATV subscriber, is connected to it. "If a limb falls from a tree...and there is no one there to hear it...is there a noise?"

Can you license and regulate *all of one part* of the system (i.e. the broadcast transmitter), but only a segment of the second part of the system (i.e. the cable portion *but not* the receiver portion of the receiving terminal)? *The FCC is trying.*

The FCC, in creating technical rules for CATV systems, is far afield from its original 1934 mandate. If the 1934 mandate can be "stretched" to include CATV receiving systems, because a CATV receiving system is "A logical extension of the transmitter system", can the Commission sustain its public interest, convenience and necessity cornerstone?

The FCC regulates broadcast transmitter powers, frequency, operating hours, local oscillator radiation and CB antenna height regulations *only because* they are part of systems *which utilize the public airwaves*. And the airwaves, like the waterways and the public park lands, are fixed non-expanding "assets of the nation" reserved for the equal benefit, enjoyment and enrichment of all citizens. There are only so many radio frequencies, or acre-feet of public waterways or square miles of public park lands to go around. The airwaves may be available at no cost, but their utility is directly related to their intelligent utili-

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zation. Maximum public benefit comes only from intelligent use; regulated use.

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Public parks are much the same as public waterways. To protect their vitality as natural, public-owned resources, requires that they not be destroyed by private interests.

Try to make that argument for public interest, convenience and necessity for cable television systems. The broadcasters (and other users of the public airwaves) are using national (public) property. The cable system can be likened to a broadcast facility for but a portion of its operation.

The broadcast station has a transmission site, which is largely created by the broadcaster using his *private funds* to construct the facility.

The cable system has a receiving site, which is largely created by the cable operator using his *private funds* to construct the facility.

The broadcaster releases his creation into the *public* airwaves, and free of any transportation charges, the airwaves convey the broadcaster's private message to privately owned and operated receivers.

The cable operator releases his creation into his *private* cables, which he has utilized his private funds to construct. The cable operator pays an electricity charge to insure that his creation is transported through his privately funded cables 24 hours a day, 365 days a year. The cables are installed along public rights of way, to be sure, but the cable operator pays no fewer than two entities for the right to "rent" space along the public right of way. First he pays the existing utility company for the right to connect his cables to the

existing support poles, and then the cable operator pays the owner of the right of way (either a private individual or the public itself through the local government body) a "franchise fee" for that privilege.

The broadcaster gets a "free ride" on the "public airwaves"; and the cable operator pays for every inch of his ride.

The public has a vested interest in the operations of the FCC licensed broadcaster, because the broadcaster is utilizing the free-ride of the public's airwaves as his transmission medium. There is plain and simple "public interest" and "public necessity", and "public convenience" here.

The public has a much less clearly identifiable vested interest in the cable television system service. There is no utilization of public airwaves, and with the passage of copyright, there is no re-dissemination of private broadcast rights *without* just compensation. And even where the private cable company utilizes the public rights of way for the location of cable and amplifiers, the cable company returns to the community a franchise fee in the form of a rental payment for the use of those "public rights of way".

The Commission has through the years eluded to an "exclusive nature" of the cable or community antenna service; as a rationale for expanding FCC powers into the CATV arena. That bears investigation.

There are, by virtue of terrain or distance some cable served communities where without cable, television service is non-existent. That can hardly be said for a cable system serving North Little Rock, Arkansas or St. Petersburg, Florida. And where there is a "monopoly of service", there are bound to be some 'bad apples' in the basket. There have been some bad broadcasters through the years as well... just as there are bad operators of private water systems and poor operators of small, rural telephone companies.

The telephone is perhaps an

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identifiable parallel to the television receiver. Neither are generally conceded to be "an absolute necessity." They may not be as well informed, and they may not have the immediate assistance of a doctor or law person when they need such service, but by in large they do get along.

The telephone service became a (public) "utility service" regulated at local, state and national levels because of one crying need; a need for inter-connection between various local areas, to make the telephone a truly useful instrument of life. When the national concept evolved, with it came the recognition that two telephone services in the same area and down the same street made little (public) sense. If subscribers to one service were unable to reach subscribers to a competitive service, the usefulness of the instrument would diminish. *And so the public utility concept was created.*

There are more telephones in the United States (if one includes the telephones in business locations) than there are television receivers. The telephone industry has existed approximately three times as long as the television industry. And with the exception of limited use of the microwave and VHF-UHF radio frequencies set aside for their use, the telephone companies observe *no technical rules or regulations* or specifications of a federal nature.

To be sure, telephone companies have standards of service. And to be equally sure, many times these standards are not met. But the standards are voluntary and for the millions of miles of telephone plants scattered throughout the United States, *there are no federal standards administered by the FCC, with fines for violations.* When your long distance call to Duluth is shot-ridden by noise and static, you can complain and you may get an adjustment of the bill; but the telephone company (ies) involved runs no risk of being fined for producing a noisy circuit. And when you think about it, getting an adjust-

ment on your bill, for unsatisfactory service, is not a bad consumer-service supplier agreement. As their commercials used to say, "We may be the only telephone company in town, *but we try not to act like it.*"

Now suppose they *did* act like they were the only telephone company in town? What other alternative does a consumer have? Perhaps Western Union or the U.S. mails. But neither provide "real-time" capacity or real-time response. Both have long transit times.

And if the cable company acts like they are *the only cable company in town?* There is off-air service available, in some form, in more than 90% of all cable communities. To be sure it may not be as good quality or as plentiful as the cable provides, *but there is service* none the less. And if a town *really* wanted to provide its residents with an alternate television service, *there are translators.* More than 450 communities now *own and operate* their own translators.

But most of all, if a cable company "acts like" it is the only cable company in town, there is a local municipal body to appeal to; the franchising agency. There are plenty of checks and balances available for the community and its residents... without having federal inspectors crawling around looking for ways to fine a system into compliance.

The fines then are a valid tool when an entrepreneur is borrowing or leasing some public property for the conduct of his business or when he has a totally exclusive right to offer service. Fines are a valid tool when anyone mis-uses some public property or public trust. When a broadcaster mis-uses the public airwaves, he should be fined. When an individual or corporation degrades the quality of a public waterway with indiscriminate dumping of waste materials, he should be fined.

But when your telephone circuit is noisy, or the razor you purchase from Gillette through a local drugstore mal-functions, should the telephone company

be fined for noise or the drug store and Gillette fined for defective material or workmanship? Not as long as the public trust has not been harmed, and the general body-public's *property* has not been *mis-used.*

The key to public interest, convenience and necessity is the word public. To fine a man for violation of a public trust, the man must in turn be using something owned by the public, or he must be using public property in trust. Cable does not. Cable no more operates in the public domain than does the local paper boy delivering newspapers to your home.

Deprivation Of Private Property

For many decades as technology has increased the technical ability of two-way radio equipment to perform its function, the FCC has found new and better ways to utilize the available (non-expandable) spectrum to accommodate more and more diverse users. Through the years the frequency space between adjacent assigned two-way radio system (channels) has been reduced, through technological improvements. With each new technology breakthrough, and with each expansion of the ability of the fixed spectrum to accommodate more and more two-way radio channels has come new refinements of the then-existing FCC rules.

For example, many years ago there were 50 kHz spacings between adjacent-assigned two-way radio channels. When better receivers (and transmitters) were developed, the FCC determined that rather than 50 kHz spacings between channels, there would be 25 kHz spacings between channels. This effectively doubled the available spectrum space (i.e. the resource) for assignment of two-way radio stations.

Naturally at the point of changeover from 50 kHz spaced channels to 25 kHz spaced channels, there were hundreds of thousands (if not millions) of operating radios; all designed to

operate with 50 kHz spaced channels.

Did the FCC arbitrarily decide that at some effective date only the newer 25 kHz spaced channels and radios would be legal, and that all older 50 kHz spaced radios would have to be retired? Yes... it did just that. *But...* and this is a big but... *the FCC recognized that the owner-users of 50 kHz spaced radios had a vested economic interest in their radios, and that at the very least they should be accorded some reasonable period of time to continue using the "old-style" radios; to "write them off". That period of time has traditionally been five (5) years.*

The five-year-grace period for continued use of older style equipment has become almost standard operating procedure for the FCC. Even CB radios (with an average cost of around \$100.) in use in 1973 when new CB standards were adopted received until 1978 for continued use of the old style radios.

Look at CATV equipment in service. In most grandfathered systems (i.e. systems in operation prior to 1972), the equipment in service today was in service then. Most of that equipment, or at the very best, large chunks of it, will *not* meet the current technical specifications of 76.605 (a) (1-12). And the technical rules in the just cited section have not stayed static in that interim period from 1972; changes have been made in the past 12 months and yet more changes are contemplated shortly. To establish technical rules for cable systems, and to enforce these rules by fines (or forfeitures) without specific recognition of the vested dollar interest the cable operator has in the present equipment is at best a confiscation of property without allowing CATV operators a reasonable period of time to make the financial burden adjustment. This is not right... and any proposal for fines for CATV technical violations must somehow recognize the current state of CATV field equipment and make reasonable allowances

for the rights of the owners of such equipment.

As a matter of "form", most FCC violators first receive a "warning" (at least this is true with most of the *two-way* services), with a formal "request for explanation". The procedures followed also typically include a reasonable period of time during which the alleged violation can be corrected by some action of the violator, *thereby muting the liability of the violation.* This more rational approach is taken in those services where the FCC accepts that the licensee may not be an "expert" in either the full scope of the regulations or in the operation of the licensed equipment. Such allowances are generally *not made* for broadcast licensees; who are assumed to have good technical knowledge as well as good legal knowledge of the rules, requirements and violation liability. In the instant FCC proposal, *cable violations would fall on the broadcast side of the ledger;* where violators would simply be found *guilty* of a rule infraction and required to make payment in the amount of the assessed fine.

This seems to be a somewhat arbitrary approach. If the intent of the fines program is to insure compliance with the rules, and the "public interest" is best served by compliance with the rules, the *primary concern* of the enforcers should be *compliance* and not retribution. Logically, a warning that results in after-warning system adjustment to compliance better serves the public interest than retribution to a federal depository. This makes even more sense when one considers the complicated, oftentimes conflicting content of the Cable Television Rules and Regulations. Where there appears to be honest differences of opinion as to the intent and meaning of one rule section or another, a system may find it is "damned if it does" or "damned if it does not". Surely at some point some logic must enter the equation and the rules simplified to the point that an average operator, uninstruct-

ed by counsel, is capable of deciphering the requirements. Alas, such a time has not yet arrived... and the Commission itself accepts this as fact. To burden a system operator with fines when the rules are so unstable, and undecipherable as they are at the present time satisfies no public interest; only a bureaucratic interest demanding full compliance with every dictum.

The CAC Trade

It has been proposed that *if* the cable industry will support the FCC's request for fines and forfeitures with the Congress, that the Commission will in turn "relinquish" some of the pending requirements for March 31, 1977 "compliance". *What does that really mean?*

Returning to our four year old with a loaded machine gun, if you keep filling his hands with candy, he has no inclination to pull the trigger. Only when the candy runs out do his thoughts turn to the weapon in his hands.

Recall that the CAC system is a devious route to circumvent the 1934 Communications Act ban against the licensing of receivers. The CAC procedure is one of the points in contention in the pending Gridley, Kansas test case. Does the Commission really need the CAC process at all?

The CAC process was created to *confirm compliance* or obedience with the rules. It was created because CATV systems could not be licensed in the same way broadcasters or radio transmitters are licensed. If the Commission had full authority to *demand obedience* with the rules, or *assess a fine* against the non-obeyer, obviously very little of the CAC process need remain. If the FCC could visit a system, locate areas of non-compliance with the rules and assess a fine for non-compliance on the spot, what further need would there be for any CAC procedure? The answer is very little need... *if indeed any at all.*

The argument is made that the CAC procedure is cumbersome and filled with uncertain-

ty. That the procedure requires expensive attorney time and that because of the fluid, contradictory nature of the Cable Television Rules, the outcome is often not certain. And that much of the final outcome of a CAC application depends upon the way the application is handled internally by the Cable Television Bureau staff; as opposed to simple "go-no go" conformity with hard and fast non-pliable rules. This same argument suggests that the cable operator would be much better off "on his own" simply doing the best he can do, and if he should do wrong, taking his lumps in the form of a "simple fine assessment" in lieu of a long, drawn out legal battle with the Commission through the present cease and desist procedures. Several operators who have been through cease and desist procedures venture the thought that they would rather pay a fine than go through protracted legal hassles that drag out for months and years.

Now it is true that with the fines procedure, the system assessed with a fine is entitled to appeal the fine and request a hearing at the FCC; not unlike the judicial proceedings that follow the issuance of a cease and desist order.

The difficulty with the "let me pay now and get it out of the way" argument is that because many operators would choose to pay the fine rather than oppose the order on an appeal, that given a new "ratio of success" with field violation notices, the agency dealing out the fines would find new impetus to resort to fines much more often than it now resorts to cease and desist proceedings.

FCC Chairman Wiley described the cease and desist proceedings as "cumbersome". By that, it must be assumed he means they are unwieldy, clumsy and burdensome. Burdensome is perhaps the real key word here. It means hard or heavy to bear, or oppressive. If the Commission finds the cease and desist procedure hard to bear, the cable industry finds it oppressive. But for its weight, it has certain checks and balances built in which "instant - levy -

- fines" does not.

Bringing a system to the judicial forum in Washington, before the FCC, on a cease and desist proceeding requires a certain amount of FCC preparation, study and investigation. First there is the allegation of a wrong doing, to be made to the suspected operator. Secondly there is a response from the operator, in which he either admits the allegation or denies it. Third is an assessment of the response by the Cable Bureau, and a decision as to whether there seems to be reasonable doubt as to whether the system is or is not in fact in violation. Then all of the facts assembled to that point must go before an internal law judge at the FCC who, at the request of the Cable Bureau, either grants a cease and desist order or denies that request.

At every step of the way the cable operator has the opportunity to present his own facts and his own testimony. It is not unlike a grand jury proceeding where facts and counter facts on both sides are considered prior to the issuance of an "order".

It is not a perfect system by any means; the odds are stacked highly in favor of the resources of the Cable Television Bureau and its legal expertise. But it does have numerous checks and balances built into the procedure.

No such checks and balances are attached to the fine procedure. Upon investigation by an FCC field person, a fine is assessed. The first *formal* (i.e. before judiciary) opportunity for the cable operator to *oppose* the assessment is *after* the fact; after the fine has been assessed. The checks and balances against the mis-use of bureaucratic power begin after the fact; *after* the encroachment on the operating and property rights of the individual operator has been made, *not before*.

In the cease and desist proceedings, the operator defends himself against being ordered to cease or desist, using his facts as his defense. *If he loses, his defenses were inadequate.*

In a fines structure, the operator is *presumed guilty* (by the issuance of the fine) and he must now defend himself in an arena

of presumptive guilt. *This is backwards to the basic constitutional guarantees of presumptive innocence; guarantees that, for all of the other ills of the cease and desist procedure, at least carry through that procedure.*

The transfer of presumptive innocence for presumptive guilt and the new pressures that creates for an operator intent upon defending himself is the crux of the real problem with the adoption of a fines structure for CATV. When all of the other problems attached to public convenience, private cables, technical compliance and old equipment incapable of withstanding the rule requirements are stripped away... *the question of presumptive innocence versus presumptive guilt remains.*

FCC Chairman Richard E. Wiley, in questioning NCTA Chairman Burt Harris during the month of October (during an FCC EnBanc hearing at which NCTA testified), asked the question "During the past year, the NCTA was on record as favoring the creation of fines and forfeitures for the cable industry. . . Will the NCTA again support this legislation in the 95th Congress?"

To which Harris responded "Yes... *we will.*"

House Communications Subcommittee Chairman Lionel Van Deerlin recently stated that as soon as the 95th Congress comes into session, it is his intent to immediately begin legislative action on two urgent matters affecting the cable television industry. One would be a pole-attachment bill for cable... and the second would be fines and forfeitures for cable (and other non-licensed operators).

Thus the handwriting is on the wall and the messages are loud and clear. Cable, for its division on this issue, will be paying the ultimate price; a strong bill, introduced by an influential Senator and an influential Congressman, and favored and pushed by a federal agency intent upon having its way.

And if the proponents of this bill have their way... the next kid you see on your block with a machine gun may not be a kid at all.

P.S.

The October *CATJ* treatment of Rhombics was . . . well, traditional. In the *CATJ* tradition, we tried to boil down mounds of data into concise CATV-oriented data so the user could apply the material presented in its printed form.

Apparently we struck a responsive cord with the Rhombic material; one of the first operators to see the issue (while the ink was still wet he dropped in for a visit) spent an hour in a corner pouring over the material, and finally got up and headed for a door. "What was it you wanted to talk about" we asked. "Some other time . . . I'm heading back to my system to build two rhombics."

The Laport design is leading in the early "returns", that 27 dB of gain just naturally sets people to thinking about 140 mile distant signals they have written off in the past because they could not afford microwave hops! The available Laport data aside from the October referenced RCA Review for March 1960, is slim at best. One reader called to note "On page 240 of the *ARRL Antenna Handbook*, they give about 50 words on the Laport and a set of dimensions for 144 MHz. But they have 4.32 wavelength long L1 sides and 7.42 wavelength long L2 sides. Yet your published design is for 3.5 and 6.0 waves respectively. What gives?"

The original Laport material described an antenna that was optimized with 3.5 and 6 wavelength legs, respectively. The antenna was "modeled" in the 600 MHz region, and then constructed in the 8.5 MHz region. For the particular real-world use RCA intended in 1959, the Laport design was utilized on a trans-Atlantic path where the incoming wave front was around 7.75 degrees above the horizon. Laport reported in 1960 that as the operating frequency of the 8.5 MHz Rhombic increased and the leg lengths stayed constant at 3.5 waves and 6.0 waves at 8.5 MHz, the vertical angle of radiation dropped, so that at 12 MHz

RHOMBICS POST SCRIPT

Fine Tuning The October CATJ Report On Rhombic Antenna Design

(or 141% of the design frequency) the maximized radiation that had been measured at 7.75 degrees at 8.5 MHz was now lowered to 6.5 degrees above the horizon.

But all of this was based upon a fixed, pre-determined height above ground. For a height of 1.53 wavelengths at the design frequency of 8.5 MHz, the antenna with leg lengths of 3.5 and 6.0 wavelengths respectively produced a maximum radiated signal 7.75 degrees above the horizon. As the leg lengths increase with operating frequency, and the effective height above ground increases with operating frequency, the vertical angle of radiation comes down.

You can achieve the same effect by simply raising the Laport design above ground and leaving the operating frequency constant. The *ARRL Antenna Handbook* design, which is as noted 4.32 and 7.42 wavelengths respectively for L1 and L2, is for an on-purpose maximum radiation at an angle 7.5 degrees above the horizon at a height of 1.8 wavelengths. Our over-the-horizon signals, however, are either right at the visual horizon

or up to 0.5 degrees above it via the tropospheric scattering mode. So for our purposes, we want the radiation angle (i.e. maximum lobe) right at or on the horizon. This is achieved by simply raising the antenna high enough above ground that ground reflections are inconsequential. For the Laport design, this would be no less than three full waves above ground and preferably six waves above ground (see table 1, page 16, October *CATJ*).

Now it may well be possible that for your own installation, because of restrictions in obtaining adequate-height support poles and so on, that you cannot get that high above ground. The answer to this problem is simple enough, tilt the whole plane of the antenna down so that the nose portion (i.e. terminated end) is below a straight line drawn from the rear of the antenna (feed line end) to the actual visual horizon. There is some guidance in the Laport design data for this approach. If a 3.5 wavelength L1 and 6.0 wavelength L2 Laport Rhombic has its maximum radiation 7.75 degrees above the horizon at a

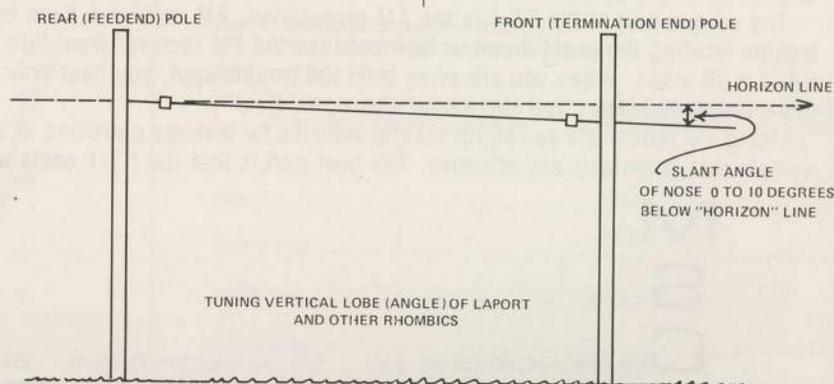


DIAGRAM 1

height above ground of 1.53 wavelengths, you can "steer" the maximum radiation angle back down to the horizon *by lowering the front (termination) end* by 7.75 degrees relative to the rear. This suggests that when you design your own Laport suspension system that you include an accurate way of determining when your nose is 1,2,3 etc. degrees (up to say 10 degrees) *lower than* the rear. Keep in mind you must lower more than just the front halyard lines. If the front lines are slacked off so the front support insulators end up 7.75 degrees (for example) below the straight line from the rear of the antenna to the horizon, then the side-pole supports, located *approximately half way* between front and rear, will have to be designed to slack off 7.75 degrees divided by 2, or 3.875 degrees. This will keep the "cant" of the antenna constant, from rear to front, so it forms a "level plane".

You may find, as many have in the past, your own "best performance" (which will depend

upon the height of the actual ground below *your* antenna plane, the terrain around *you* and the angle of *your* arriving signal) will come only after some experimentation. It would be best to select a "cant" or "slant" angle and set the array at that angle and then measure *for at least an hour* or more the relative signal level at *that* selected measurement angle versus a known test antenna (such as a yagi) at the same site. Then re-cant or re-slant the plane of the antenna up or down, and compare it for another hour against the reference antenna. After three or four such test-hours, you should find exactly where *your own* installation works best, and that may well end up being when the Laport rhombic does not cant or slant at all!

If this leaves you cold, you probably would be better off not playing with the Laport design. Remember, the performance difference between this 27.5 dB maximum gain antenna and a "store bought yagi" is largely

based upon the skill with which you design, erect and "tune" the Laport.

Finally, keep in mind that with the 3.5 and 6.0 wavelength per leg Laport design described in the October *CATJ*, the vertical beamwidth is only 6 degrees. That means that 3 degrees *above* the plane of the antenna *and* 3 degrees *below* the plane of the antenna the maximum gain realizable is not 27.5 dB but 24.5 dB (i.e. 3 dB points). So if your radiation angle is 7.75 degrees above the horizon, you are down in signal response around 6—8 dB at the horizon itself. This is a needless waste of 6—8 dB of antenna gain; especially after you have gone to all of the trouble of installing the Laport to begin with. So before you get all done, if you have *any* reason to suspect performance is *not* in the 27 dB gain region, re-adjust the antenna plane and make some reference readings as outlined here. You may have another 6—8 dB of real gain just waiting for you to drop the nose a few degrees!

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One of the most useful tools around the CATV test bench is a good marker generator. A marker generator in all other worlds is generally called a "signal generator" because that is what it does. Generate a signal. We have come to call such instruments "marker generators" primarily because more often than not we use them to "mark" or locate, or position a specific point in the spectrum. Most often they are employed in conjunction with sweep equipment, although as wide band noise tests become more common one would also suspect that the "marker generator" will become equally important there also.

In our application, following up on our October *CATJ* treatment of wideband noise generation for in-channel response testing, our application of the signal/marker generator is for the purpose of locating for us the precise frequency where some band or channel edge, or carrier, should be. Very high quality laboratory quality signal/marker generators include accurate frequency readouts, which tell us in the single instru-

TEST EQUIPMENT ALA YOU

Part Three Explores A Do-It-Yourself Signal (Marker) Generator

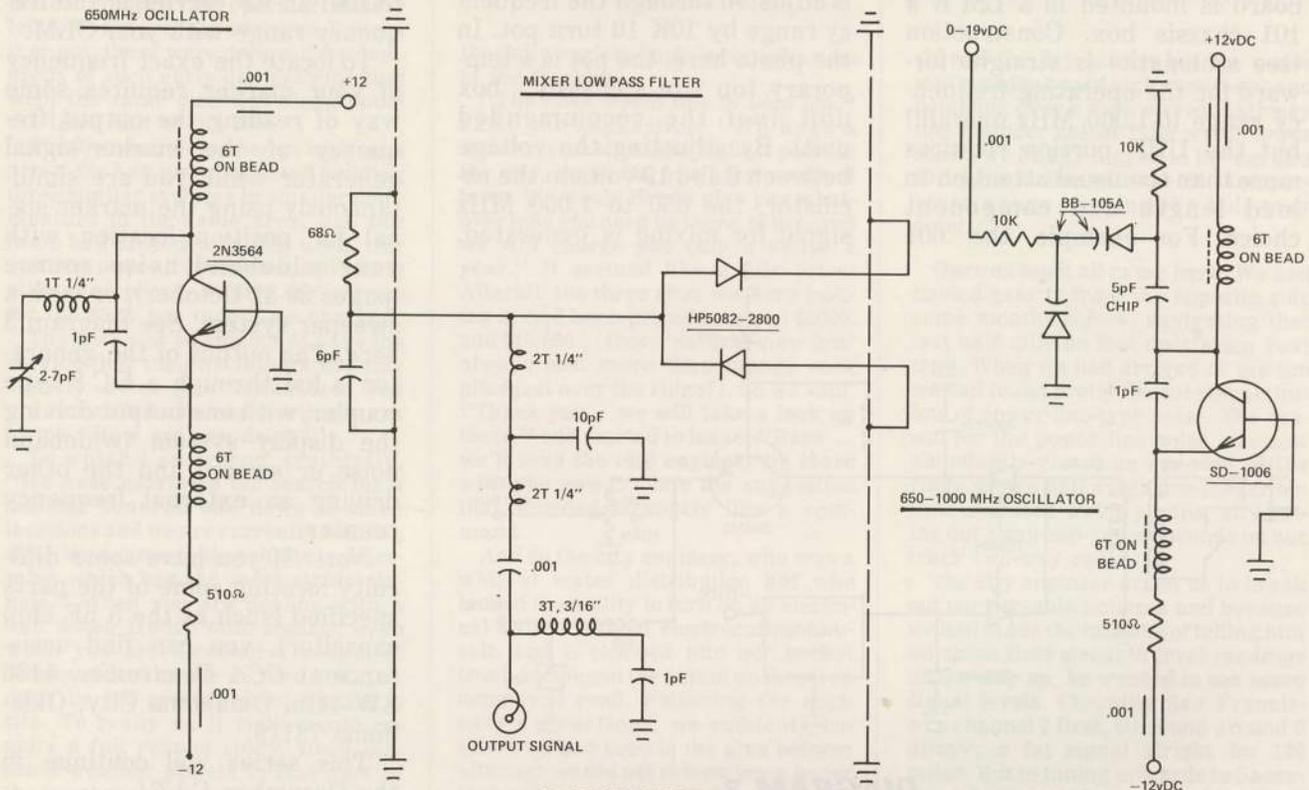
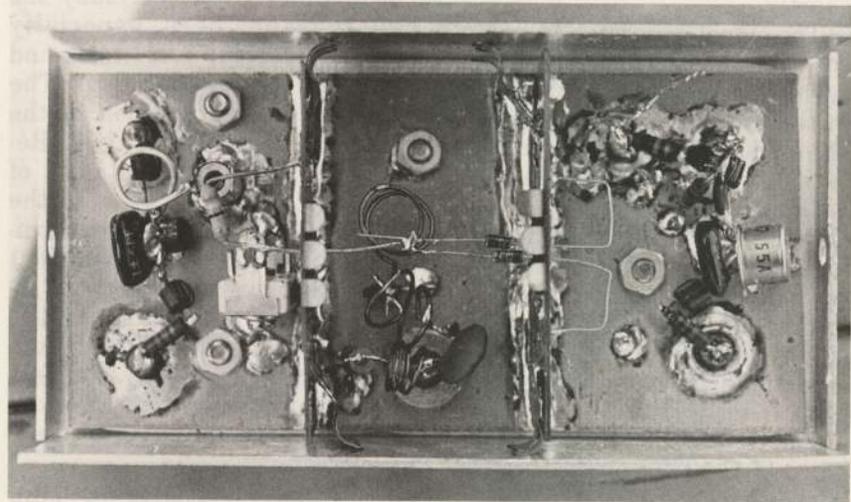


DIAGRAM 1

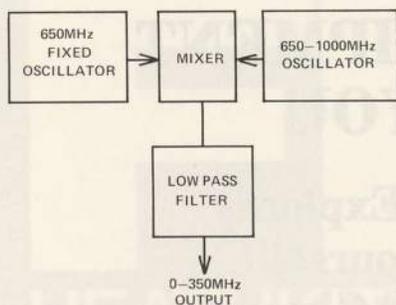


DIAGRAM 1A

ment where the generated signal is in the spectrum. For our purposes, we will have to rely on a second package or a separate instrument to measure the frequency. But more about that shortly.

The signal generator to be described is basically a heterodyne type signal generator. As shown in the diagram here, we generate a 650 MHz carrier with one oscillator and a variable 650-1,000 MHz carrier with the second oscillator. The two carriers (one fixed in frequency and the second adjustable) are mixed or combined in a single balanced mixer. The resultant output is adjustable from 0 through 350 MHz.

The circuit is constructed on a piece of G-10 circuit board (see photos here) and the completed board is mounted in a LM B # 101 chassis box. Construction (see schematic) is straight forward for the operating frequency range (0-1,000 MHz overall!) but the UHF portion requires more than the usual attention to lead length and component choice. For example, the .001

feedthru capacitors cannot be omitted or replaced with discs. The 5 pF chip capacitor in the 650-1,000 MHz oscillator *must* be a chip type capacitor. Normal disc capacitors simply have too much self (lead) inductance for use in this frequency range. The *base* of both transistors go *directly to ground*, and because of the frequencies involved, this base lead needs to be just as short as you can make it and still get adequate heat sinking applied while soldering between the grounded end and the case.

If you undertake construction of this unit, study carefully the photographs here, especially those of the 650-1,000 MHz and 650 MHz (fixed) oscillators. The lead dress, and position of the parts, is all critical at UHF. Remember *CATJ's* treatment of UHF to VHF converters in the June 1976 issue; what is a harmless piece of wire (as in a lead) at VHF becomes a capacitor or inductor at UHF. This can cause circuit loading, or circuit de-tuning which you will play the devil finding if you have not worked with UHF range circuits previously.

The 650-1,000 MHz oscillator is adjusted through the frequency range by 10K 10 turn pot. In the photo here, the pot is a temporary top - of - chassis - box unit (*not* the recommended unit). By adjusting the voltage between 0 and 19 volts to the oscillator, the 650 to 1,000 MHz signal for mixing is generated.

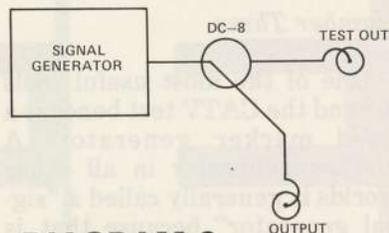


DIAGRAM 3

Set the voltage with the pot so there is zero volts present. Hook the output jack of the marker/signal generator to your external detector and run the detected voltage to the scope's vertical drive. When you have zero volts to the oscillator control line, you should have 0 MHz on the marker (i.e. a zero-beat display). At the opposite end of the range, when you have 19 volts to the oscillator control point, you should have 350 MHz out of the signal/marker generator. If you do not have a detector and a scope, there are at least two other options. A small audio amp connected to the output should produce an audio frequency beat (i.e. indicating a very small discrepancy between exactly 0 MHz and a slight beat between the two 650 MHz carriers), or, between the 0 MHz position (0 volts) and 350 MHz (19volts) you should be able to find an RF carrier in the frequency range with your SLM.

To locate the exact frequency of your marker requires some way of reading the output frequency of the marker/signal generator while you are simultaneously using the marker signal for position location with your wideband noise source (pages 29-32 October), or with a sweeper system. See diagram 3 here. The output of the generator is fed through a DC-8 type coupler, with one output driving the display system (wideband noise or sweep) and the other driving an external frequency counter.

Note: If you have some difficulty locating some of the parts specified (such as the 5 pF chip capacitor), you can find assistance at *CCA Electronics*, 1436 SW 44th, Oklahoma City, Oklahoma 73119.

This series will continue in the December *CATJ*.

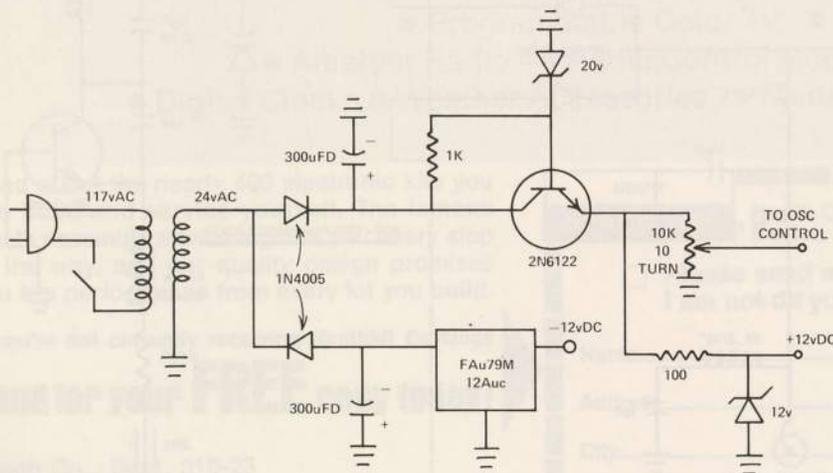


DIAGRAM 2

With Friends Like This....

Back in the mid 1960's I was fortunate enough to land the second generation CATV franchise for a small mining town of around 5,000 souls in the foothills of the Sierra Nevada mountain range, east of Sacramento. The town lay just east of a sharp ridge, which rose some 800 to 1100 feet above the community, which snaked in and out of a canyon and along a stream bed along highway 40 from Sacramento to Reno. If you live in that area, you will have no trouble identifying the town involved.

The town's approximately 1,500 TV sets had ghostly reception on channel 3, and poor or no reception on channels 10 and 13. The town needed CATV in the worst way. And, as a matter of fact, back in the early 1950's, when the first twin-lead and open-line systems were being built in this country, this town had such a system which in its peak of operation had perhaps 400 TV sets connected. But in time the original system operator, having collected his \$150.00 to \$200.00 "installation fees", had decided that keeping all of that open line and twin lead up in the air and those 12BH7's lit in the low band only amplifiers was just not worth the effort for his then \$2.50 per month, so slowly, over a period of several years, the system had fallen completely out of operation.

Along about the same time, television had begun to arrive in Sacramento (where there had been none until the mid 50's; TV being something that came the 120 miles from San Francisco) and fearing that the more-local-Sacramento signals would inundate the community, the operator silently left town for greener pastures. Believe it or not, there were dozens if not hundreds of such early-day systems that went the same direction along about the later half of the 50's.

The town had welcomed us with open arms. We had just completed building three similar systems in smaller communities in the same area, and our fame had preceded us into town. Our systems were all 12 channel, solid state plant, and people wanted our service for the \$5.50 per month we charged.

The town was so anxious to have the service that the city fathers one day shortly after the franchise was granted called a special meeting to ask of me "How are you doing?"

To which I answered, truthfully, "We have narrowed the search for a suitable headend site down to three locations and we are currently running week long surveys at each site to determine which has the most stable signals." When you are dealing with a half dozen 110-130 mile signals, even when you are elevated a couple of thousand feet on the receive end, you can't be too careful about picking a site. To really do it right would require a full year of study, since seasonal weather affects in that part of the country are more pronounced than

the daily variety back in the area east of the Rockies.

"The town would like to help out," came the suggestion. "We have a water reservoir on the highest point in the city, up on the knoll just south of town. We would like to give you whatever land you need up there, to use, and we will charge you only a dollar a year." It seemed like a fair price. After all, the three sites we were looking at had been priced between \$5000. and \$10,000., (those 'natural view lots' always cost more than mangy rock piles just over the ridge!). So we said, "Thank you... we will take a look up there," and started to leave. "Here... we'll send the city engineer up there with you now," came the suggestion that sounded strangely like a command.

And so the city engineer, who was a whiz at water distribution but who lacked the ability to turn on an electrical switch without electrocuting himself, and I, climbed into our bucket truck and began the ascent up the steep non-paved road. Following the engineer's directions, we suddenly realized we had been in the area before; although we did not remember a water tank at the top. After fording a stream

Coop's cable column



**bob cooper editor in chief
CATJ**

(it was the dry season but the water was running board high even then) and bouncing over a rock strewn pathway the engineer called "the water tower road" we finally lugged to the top of a 30 degree incline with the V8's temperature gauge pushing the boil over point.

Once on top it all came back. We had hauled gear in from the opposite side some months before, navigating that last half mile on foot up a steep goat trail. When we had arrived at the top we had found pretty decent signals but lots of power-line-type noise. The reason for the power line noise was now abundantly clear; on our side of the ridge were a half dozen one-lunger butane operated water pumps, all beating out a zap-zap-zap crescendo on our truck two-way radio.

The city engineer urged us to break out our portable antenna and because we had made the mistake of telling him all about field strength level readings on the way up, he wanted to see some signal levels. Checking San Francisco's channel 2 first, we found around 0 dBmV; a fat signal alright for 120 miles. But in tuning upwards to Sacramento's channel 3 we noticed the FSM

needle never dropped below -15 dBmV, beating (as it were) with the one-lunger pumps just down the hill. After checking all of the levels, including the 130 mile plus channel 12 signal from Chico (which carried blacked out 49'er football games) we were satisfied the site was producing good signal levels but the noise would be unbearable.

The city engineer decided signal level was the important criteria, and he wanted to head back to the mayor to tell him how good the signals were. We talked it out, and the engineer finally agreed to let us come back the next day to make further measurements.

Within hours, every city councilman in town had heard from the city engineer, and they had made up their minds that the CATV antenna site would have to be on the city property. We had somehow done such a selling job on "finding a site with strong off-

air signals" that they paid no attention to our noise-problem cries. Clearly, before the next day's comparison readings between our own favorite site and the city's favorite site, something had to be done to bring them back down to ground on the single criteria they seemed intent on focusing upon; pure signal level.

Early the next morning we got up and built a simple dipole antenna, using some telescopic rods from a TV set replacement set-top antenna and some plastic for the insulator block. Then we made up a short length of cable to run from the bucket on the boom truck pipe stub where the "test dipole" would be mounted, down to the ground where the city engineer, in his new moment of glory, was going to operate the field strength meter for the mayor and a contingent of city officials.

At the appointed time we met at our own personal site selection, and ex-

plained how the tests would be conducted. "I will take the test dipole antenna up in the bucket and holding it precisely 30 feet above ground I will adjust it to the proper length for each channel. The city engineer will operate the field strength and Mr. Mayor, we will ask you to record the level readings on the chart I have prepared."

As so it was done, on 9 VHF channels, at our own site selection. The signals ranges from -15 to -9 dBmV on the dipole antenna. Then after a brief ceremony while the mayor posed for the local weekly newspaper photographer, we headed off to the city water tower site.

The process was repeated, after a suitable pre-explanation for the benefit of the city engineer that the dipole antenna we were using today was the "standard for measurement" for the CATV industry, and as such it could not be expected to have "the gain" of the test log we had utilized the previous day. And sure enough, the levels ran 20 dB or more below those of the previous day, and sure enough, they were 8 to 10 dB weaker at the water tower site than they had been at our own personally selected site.

The mayor was disappointed. The council was disappointed. Only we were not disappointed. And sadly, the city abandoned its free (well \$1.00 per year is almost free) "offer" of the water tower site.

Later that day our chief tech was heading out to one of our other systems with the bucket truck to make a series of drop calls. "Do you want this dipole rig out of here?" he asked.

"Yeh... pull it down," we replied, sipping on our favorite beverage.

"Hey," he exclaimed, "I looked all over the shop for this all morning," he called down from the bucket. "How did this switchable pad get up here... and what is it doing buried down here under the bucket controls? Why do you know it is in line with the dipole drop line... and hey, it has 10 dB of pad in!"

We smiled... sipped on our beverage for a long thirty seconds, and rejoiced to ourselves silently that this was one 30 degree incline, stream fording, headend road that we wouldn't be climbing twice a day in the midst of winter torrential downpours or snow. And, our subscribers would never have reason to complain about black dots and dashes on our low band channels.

But most of all, we smiled because we had learned that morning the city engineer and the mayor had worked out a deal to buy the city's water tower from the community, and then lease it back to the city over a twenty year plan.

"A dollar down and then \$1,000. a year for the rest of your life," we whistled softly.

The chief tech just shook his head as he dropped the dipole and pad to the ground. "Boy, sometimes you are really weird," he said as he headed off, down highway 49 for points south.

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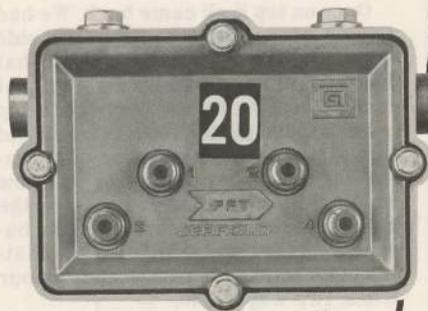
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TECHNICAL TOPICS

TECHNICALLY INCORRECT

"For the record, in Thin Margin III in the August CATJ, there are two analyses that are technically incorrect. These two areas concern system noise and effects of return loss.

1. NOISE ANALYSIS:

Antenna noise adds in power with the pre-amp input noise. Thus dBmV's must be converted back to power to make this calculation.

Referring to the article "Calculating System Headend Noise Levels" in the May 1975 CATJ issue of CATJ, a graph (figure 4, page 17) demonstrates how the system noise figure (SNF) contributes to the composite system plus antenna noise level (i.e. excess noise above KTb) for various TV channels. This graph was compiled by adding powers (i.e. noise from a 95% efficient yagi antenna plus SNF) and converting back to dB in excess above KTb.

For the operator view point, high antenna noise levels (at the lower VHF channels 2-6) can almost mask the input noise levels of a 2 dB noise figure pre-amp. That is, going from a 3 dB NF pre-amp to a 2 dB NF pre-amp on channels 2-6 would result in a very small improvement in overall system noise levels. However, on high VHF channels (7-13) and UHF, the noise received by the antenna is lower than the pre-amp noise. Thus, in these cases, the system noise levels are almost entirely contributed by the pre-amplifier input noise. The excess noise level for high VHF and UHF is the system noise figure.

With the aid of the graphs, figures 4 and 5 of the May 1975 CATJ noise article, the operator can see the actual noise trade-offs by moving the pre-amp downstairs.

2. RETURN LOSS ANALYSIS

On page 18, diagram ten, the analysis has 2.5 dB loss through a jumper cable due to a 15 dB RTL load, where in reality it should be 0.1395 dB. Perhaps using voltage instead of power in the calculation contributed to the error.

Although not much real power is lost due to the mis-match in this example (at least not until the RTL really gets bad), problems unique to the television screen can be caused by bad RTL. For example, let's examine the (example) channel 3 situation. Suppose we have the 15 dB RTL processor downstairs fed by a 6 dB RTL source pre-amp 300 foot up on the tower. Then part of the signal is reflected at the processor input and this is 15 dB down. This reflected signal travels back up the 300 foot of downline with a 3 dB loss and arrives at the pre-amp 18 dB down reference the level at the input to the processor. Since the pre-amp has a 6 dB output RTL, the signal is reflected again and now it is $-18 (+) -6 \text{ dB} = -24 \text{ dB}$ in level. After traveling back down the 300 foot of downline, and losing another 3 dB it arrives again at the processor input; down 27 dB, and delayed in time. This is no different than reflected path or ghost signals coming from McKee's tin bar or the Astroville water tower, except the time delay is less, but — still significant.

Delay in 412 cable is around 1.25 nS (10-9 sec) per foot. For the 600 foot round trip, the delay is 750 nS or a .75 uS. This works out to a ghost of over 3/16 inch on a 25 inch screen. If the system was running a 30 dB signal to noise ratio, the subscriber would probably never see the ghost or ringing. But when the system has a 40-50 dB headend signal to noise ratio, it would be discernible. Fortunately, nature is with us in this high S/N situation, since inserting a 3/6 dB pad between the pre-amp and the processor would have an insignificant effect on the system noise level (which is already super good), but it does add another 6 or 12 dB down to the reflected signal.

The point is: It is a round trip reflection that must be considered with RTL. A perfect 75 ohm load can be driven by a lossy match source with no problems, and vice versa.

The Thin Margin III article was well done and has a wealth of information in it. I would certainly urge all CATV operators and technicians to not only read it, but to keep it in their files for future reference."

Hansel B. Mead
V.P. Engineering
Q-BIT Corporation
Melbourne, Fl. 32901

Hansel—

Errors acknowledged and corrections made. But... we do have some real world problems with the flat statement that "on high band VHF channels... the noise received on the antenna is lower than the pre-amp noise." This may be true on paper, but we have seen too many (read hundreds) of examples to the contrary in the real world.



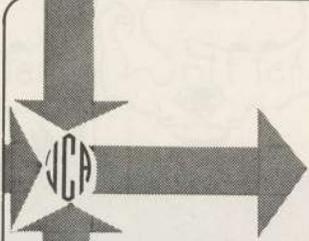
OFF AIR CHANNEL 7 — Admittedly not a great signal, with light 20 kHz co-channel in it...

Example "A" is shown here. This is an off-air (admittedly weak) channel 7 signal. The receiving array is an 8-bay log, 200 feet above ground. An "under 2.0 dB" noise figure pre-amplifier is at the antenna. We believe you will agree those funny little black dots and dashes are not amplifier generated noise (!). It is our ex-

perience that where there are layers upon layers of background noise from manmade (and galactic) sources obliterating most off-air low-band TV headend sites, the high band sources tend to be clearly defined "point sources"; such as a singular power pole ground, a defective electric fence, a two-cycle engine out of proper carburetor tune, and so on. Tracking noise at low band is tedious and often counter-productive; i.e. as soon as you pinpoint and cure a singular source, you find another one just slightly weaker in level right underneath the first source. At high band, there is more hope... because fewer man-made devices tend to radiate above 100 MHz, and the odds of finding the culprit or all of the culprits therefore improves.



BUT WHEN NOISE HITS — Electric fence (in this case) creates double-bars of modulating black and white dashes and dots (center of screen and starting again along bottom).



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BEST SHOW IN TOWN

"Guam Cable TV System, operating in America's westernmost territory, accomplished a first in CATV this summer in the cable industry as it entered the field of international program origination for two Republic of China (Taiwan) television companies.

Guam was host this year for the Far East Little League Baseball Tournament, with youngsters from Guam, Taiwan, Japan, The Phillipines, and Korea participating. The winning team (from Japan) went on to the Williamsport, Pa. Little League World Series.

Because of the complete production capabilities and the mobile van remote production center operated by Guam Cable TV, Taiwan Television Enterprises came to us to work out with them a sharing arrangement whereby we would produce for satellite delivery back to Taiwan live coverage of the Far East Tournament.

The arrangements took some special efforts on the part of Guam Cable TV; primarily because just 60 days prior to the scheduled event a 'supertyphoon' with sustained winds in excess of 190 miles per hour caused extensive damage to the island's communication system; including the extensive 300 mile CATV system. System Chief Engineer Walt Gerber and Cablecasting Manager Dr. Tom Brislin really put forth the effort, along with numerous other Guam Cable TV employees, to get sufficient service restored to allow the remote program to come off in time.

Guam Cable TV carried the games on local cable origination channel 6 while the games were simultaneously being shown in Taiwan on the broadcast facilities of two Taiwan television stations."

Lee Holmes
President

Guam Cable TV System
Tamuning, Guam
96911

Lee—

Too few people in this industry realize what an innovative CATV system you operate in 'western-most-America.' Not only do you have the most extensive system for providing (tape delayed) programs to your subscribers from Los Angeles, in the industry, but your dedication to 'total-television-service' which includes very extensive local origination work should be a model to all of those who find themselves in similar under-served regions.

CATJ TRANSLATION TO ESPANOL

"We would like to have your authorization to transcribe some CATJ articles and technical notes which we feel will be of considerable interest to our Association members here in Mexico. Our publication is new, and is intended to be informative and helpful to our cable operators here."

LAE. Enrique Castro y Amaya
CANITEC
Mexico 6, D.F.

Enrique—

Permission to reprint CATJ material is of course granted, provided CATJ is given as a source. As a result of Kyle Moore's recent trip to VIDCOM at Cannes, France, we are now preparing some guidelines for CATJ translation and re-publication in response to approximately a dozen different inquiries we have received. We

would also like to point out that where 50 or more copies of CATJ can be re-distributed in a country or region of the world, we have a "Bulk Redistribution" program that puts all of (not just pieces of) CATJ into the hands of (international) cable system operators each month.

"LOW" LOSS ???

Through the years as the cable industry has matured and equipment innovations have reached various seemingly states-of-the-art, we tend to forget just how recently it was that we were fighting 10 dB noise figure pre-amplifiers, 6 dB gain antennas, and high loss per-100 feet cable.

An advertisement appearing in the current issue of a popular microwave engineering publication sort of puts it all back into perspective. The product advertised is some new "extremely low loss" 0.141 inch diameter semi-rigid cable. The cable is intended for relatively short jumper assemblies between say mixers and i.f. strips and the like, in the microwave region. The cable line has a dielectric constant of 1.47, a frequency range of 0.2 MHz to 35 GHz (that's Gig-ahertz!) and a 50 ohm

VSWR of 1.04 to 1. The "extremely low loss" part being touted in the full page advertisement is specified as follows:

"Per 100 feet at 18 GHz... 50 dB".

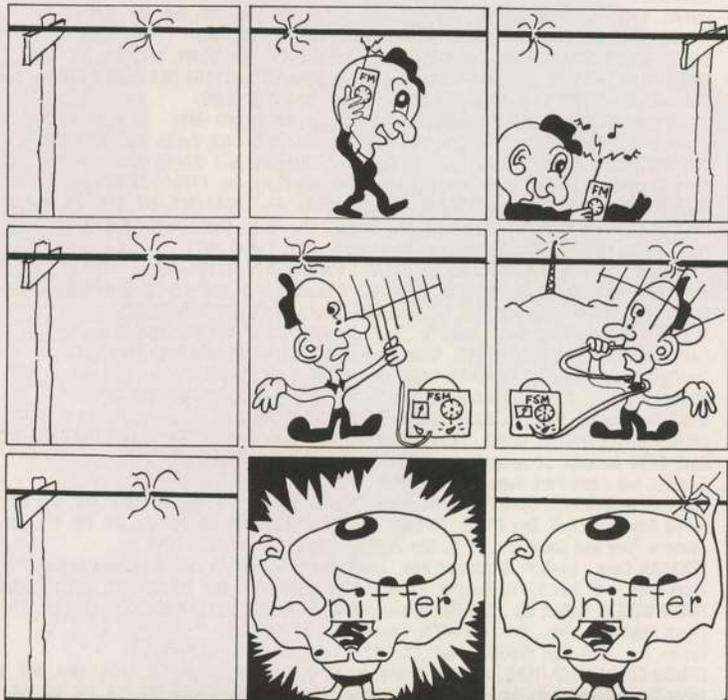
Let's see, with a 25 dB amplifier every 25 dB of cable, we would have an amplifier every fifty feet. A 64 amplifier cascade would be reached at the end of 3200 feet. Now...aren't you glad you are working at 0.18 GHz and not 18 GHz!

HAM CHANGE

"My (Ham) license renewal finally came through after 'only' 2-1/2 months, and having paid my \$25.00 extra fee, I have now secured my old call letters. Therefore please change my CATJ 'Hams in CATV' listing from K4FXK to W4GSF. Tks and 73."

Brinton 'Britt' Belyea
W4GSF
Newport News, Va. 23602

Mr. Belyea is Director of operations for Hampton Roads Cablevision, and operates 144 and 220 MHz. The April, June and August (1976) issues of CATJ carried listings of more than 150 "Hams in CATV."



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