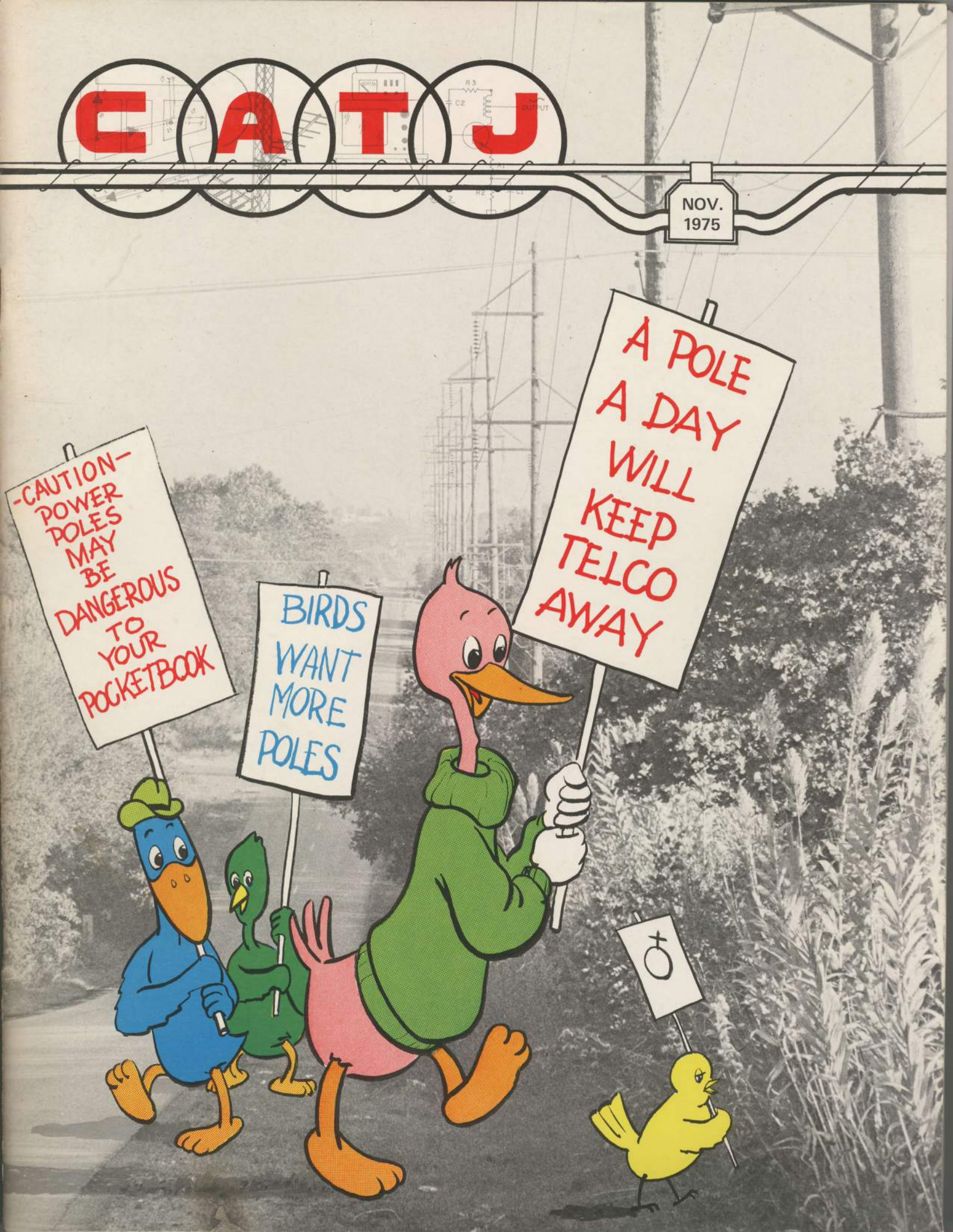
CATJ
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POWER
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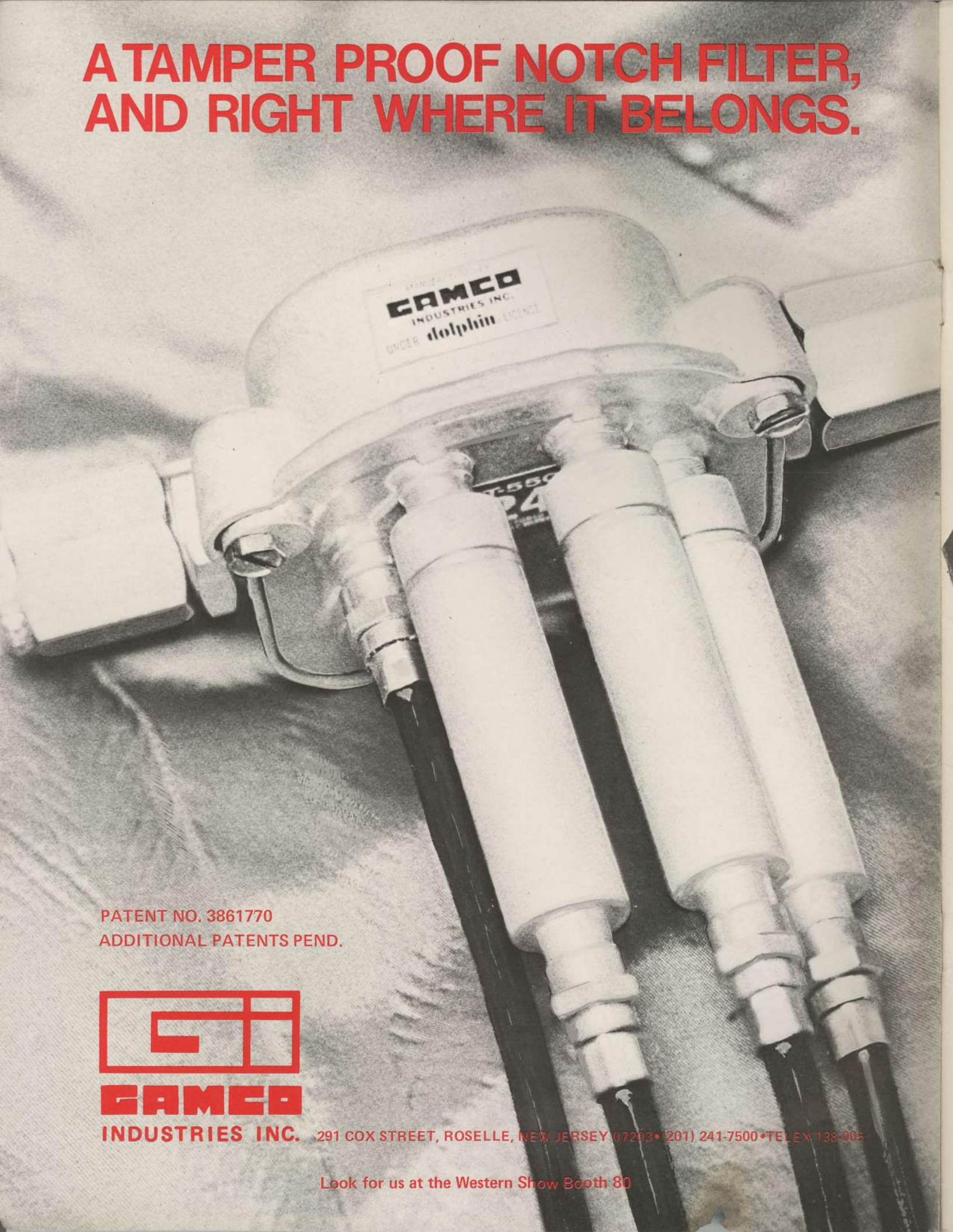
A TAMPER PROOF NOTCH FILTER, AND RIGHT WHERE IT BELONGS.



PATENT NO. 3861770
ADDITIONAL PATENTS PEND.

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1. Not a toy, the printed circuit used in the RMS CA-2500 matching transformer is one of exceptional quality.
2. The printed circuit allows for the exact placement of the three capacitor, one ferrite network, insuring consistant electrical performance of each and every unit.
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THIS ITEM IS SHOWN ACTUAL SIZE

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ELECTRONICS, INC.

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Scientific-Atlanta (Canada) Ltd., 678 Belmont Avenue West, Suite 103, Kitchener, Ontario, Canada N2N 1N6 Tel: 519-745-9445

CATJ

NOVEMBER 1975

VOLUME 2 - NUMBER 11

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—CONTENTS—

OUR COVER

Poles may evoke environmental controversies; they also may be the **only** way some communities will have CATV service. Our fine feathered friends are "one environmental group" that favors more poles but unfortunately they lack an organized lobby!

CATA –TORIAL

KYLE D. MOORE, President of CATA, Inc.

Undoing A Wrong

This coming Spring, in Dallas, this industry will hold its 25th annual meeting; the NCTA Trade Show. It will be the silver anniversary of an **organized** industry. It will, coincidently, be the 28th-plus birthday of the CATV industry itself.

This **should be** a joyous occasion. It **should be** a time for reflection, a time for recounting all of the many tales of the founding of this industry and the wonderful stories that go with any 25th anniversary.

This should be an occasion for NCTA to round up all of the living members of the original founders of this industry (including those who were not part of the NCTA's own founding), and to bring them to Dallas (at industry expense if necessary) to allow them to share with the second generation their memories of the experiences of the first generation.

Sadly, I fear none of this is likely to happen. What a wonderful opportunity we shall all miss, and what perspective on what we are doing today we shall all fail to perceive.

The founding of a national trade association in 1951 was a turning point. It signaled, if nothing else, the recognition that there **might** well be an industry here. Now, in 1975, we are approaching another turning point, perhaps one just as important to the next twenty five years as the 1951 founding of NCTA has been to the first twenty five years.

That turning point is FCC Docket 20561, which is now out of industry hands for all practical purposes and subject to the digestive processes of the bowels of the Commission. Docket 20561, for those who failed to take heed of its presence, and who consequently have failed to register their own comments with the Commission by the October 28th posted cut-off date, deals with the basic matter of defining what is a CATV system.

Prior to the Commission's intercession into our petty affairs, a man could run a Community Antenna System, TV Cable Service or TV Line pretty much as his own common sense dictated. If he could provide better TV pictures than a home viewer could manage with his home antenna system, then the entrepreneur was usually able to connect that home viewer to his master antenna system equipment for a monthly rental fee. Then in 1972 the FCC determined that a man could **continue** to provide this type of service **only if** he had FCC approval, and agreed to obey Washington rules.

In the process of regulating us, the Commission has established rules and regulations much too complicated or tedious to recount here. It is a fair statement that had these same rules existed in 1951, **there never would have been an NCTA;** there simply never would have been a CATV industry.

One of the more absurd rules is actually a definition; one that allows a man to run a community antenna, TV cable or TV line for up to 49 of his neighbors without federal regulation. But let him connect his 50th neighbor, and all you-know-what breaks loose. The wisdom of selecting 50 subscribers as a benchmark or breakover point is and has been subject to much debate. A 50 subscriber system at $6.00 per month per home, generates $300.00 per month gross income or $3,600.00 per year. An **individual** man, earning this kind of wage, is eligible for foodstamps, welfare assistance, and in many states unemployment benefits. A **business** earning that kind of revenue is almost below comprehension. If you **double** that number, you still have the individual grossing that kind of revenue eligible for food stamps, many welfare benefits and several forms of federal relief.

Now Docket 20561 seeks to readdress the matter of defining the basic matter of 'What is a CATV system?' **One of the questions** being studied is the matter of system size. Just what is a CATV system? At what point does a TV line serving a 'hollow' near Gilbert, West Virginia become a CATV system? Apparently the Commission believes the 50 subscriber benchmark may be in error. The Commission in Docket 20561's public notice suggests that 250 subscribers **may be** a more acceptable benchmark.

Now, since the FCC got into our act, there has been one series of numbers after another; none or very few of them realistic or acceptable to the CATV community. We've had 35 mile zones, 3,500 subscribers, 50 subscribers and 15 day non-duplication. And we've had 500 subscribers, 55 mile zones, 4 access channels, 2-way and 48 hour notices. If there is one thing the FCC does better than anybody else we know, it is to create benchmarks out of previously obscure numbers. This industry has suffered through more benchmark numbers than we have years!

So now we are looking at a new **proposed** benchmark, **250 subscribers.** And where do you suppose **that number** comes from? First of all, it is obviously bigger than 50, and smaller than say 1,000. It is round, firm, and easy to remember. It sounds big to the average man in the street. But what does it mean? **What is the heritage of 250?**

As far as we can tell, **it has no heritage.** In all of the FCC cable numbers to date, 250 is a brand new, virgin number. In carefully reading through several thousand sheets of FCC documents recently, I can find no previous useage of the number 250. Perhaps that is why the Commission is suggesting it; **it carries no tarnish and it has no previous bad image.** The danger the Commission runs in choosing this brand new, never before utilized **number** is that someday in the distant future when Commissioner Robert E. Lee is the William Douglas of the FCC, **they will run out of clean, new numbers** and be forced to resort to **re-using** some of the old numbers first introduced in the 50's.

Now back in 1951 a CATV system with 250 subscribers was big business. It didn't make any more money than it does now, perhaps even less at the then-traditional $1.75 per month service rates. But that was before big communities such as Dubuque, Jamestown, or Wilmington got the cable fever.

A 250 subscriber system **grosses** $1500.00 per month at $6.00 per home per month; $18,000.00 **gross** per year. If you operated a (small) retail shop selling some type of commodity which **grossed** you $18,000.00 per year today, you would be doing a walk-in trade business of around $60.00 per day. If you were open 8 hours per day, you would be **grossing $7.50 per hour.** If you sold $7.50 gross merchandise per hour at 30% mark-up, you would earn (net **before** overhead) $1.73 per hour for your time. Out of that $1.73 per hour net income, you would have to **subtract** your own salary (!), your rent, your electricity, your local taxes and whatever other G and A you had such as insurance, telephone, and so on.

Can you imagine anybody in their right mind agreeing to go into business today with the prospect of working 300 days a year, eight hours a day, for $1.73 per hour net income before operating expenses!

Now a CATV system that has 250 subscribers, and grosses $18,000.00 per year, is at very best an 18 hour per day, seven day a week kind of operation. That's a fact, I know, **because I am one of those guys that do just this.** So I am "on call" and working 365 days a year times 18 hours a day, or 6,570 hours per year. For this I take in $18,000.00 for a 250 subscriber system. That works out to $2.74 per hour **gross** income. Out of that $2.74 per hour I must pay all of my operating expenses, retire a very sizeable original capital investment, and try to stay alive. Unlike the example retail shop that grosses $18,000.00 per year for **300 days of 8 hour** per day operation, I have no accurate way to judge the net income on my avocation. I don't have the luxury of marking up my product 30% for resale. So I don't have the ability to tell you just what my net income per hour is out of my big $2.74 per hour gross.

But I can tell you that no matter what it is, even if it happens to be $2.74 per hour (i.e. **zero** operating costs and **zero** debt retirement), there is **no room** in there for even one more penny of expense. **And to me, the FCC is an expense.**

So what is the Commission's justification for a 250 subscriber benchmark? I assure you that I don't know, and furthermore, **I have every reason to believe that they don't know either.**

During the past six months the Commission has moved the benchmark non-duplication number from 500 to 1,000 subscribers. The Commission has said, in moving from 500 to 1,000, that **they can find no economic losses which television stations can claim,** to justify the continuation of forcing systems with 500 subscribers to provide duplication of program "protection." If a system is **not** a threat to a TV station when it has 999 subscribers, **why then is it a threat to anyone else and require federal regulation?**

The Commission took its **final cue** for CATV regulation largely based upon a Supreme Court Decision in 1968 which ruled that **where there was a danger** of CATV threatening the continued viability of "local" over-the-air television

(i.e. broadcasting), that the FCC had the "legal right" to regulate cable. **This was the San Diego decision.** Since 1968, through a crazy patchwork history of regulations, we have been regulated as if we **all** were an economic threat to broadcasting.

Why now, that our own operations at the 1,000 subscriber and down level have **proven** to be **not** an economic threat to broadcasting, **must we continue the ridiculous numbers game by creating a new benchmark at 250 subscribers?**

I would like to suggest to the Commission here, as CATA has done in formal comments filed with the Commission on Docket 20561, that **given the overwhelming lack of evidence that a 999 subscriber level system is an economic threat to anyone,** that the Commission begin to **consolidate** some of its benchmark numbers. Why not, for the sake of conformity **and the sake of reason,** settle the matter of Docket 20561 on at the very least the 1,000 **established** benchmark? Why not save 250, a virgin clean number, for the 1984 Commission to use in some really important matter, such as regulating how many times the word hell can be said on the Johnny Carson Show in one week's time?

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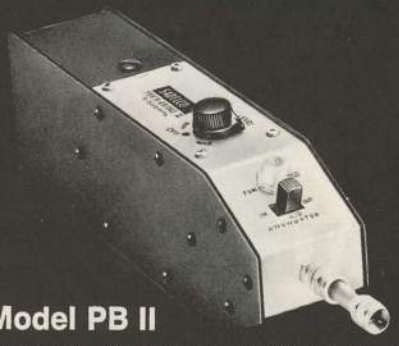

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Tel. 041-22 65 01 Telex Telfi 78168

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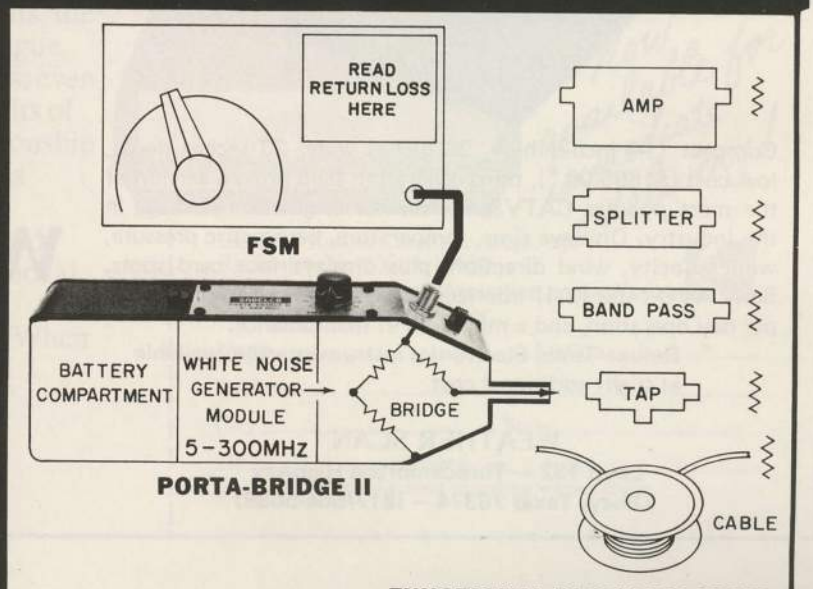

FUNCTIONAL BLOCK DIAGRAM

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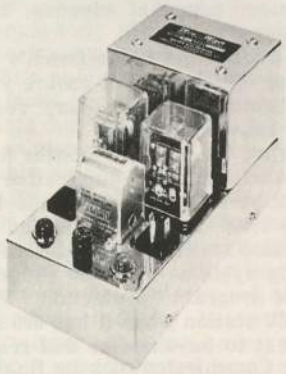
WARNER CABLE

"When we saw the first advertisement for the Brown Mini-Mizer in **CATJ**, we looked into the possibility that this unit would help our problem. We run 16 miles of rural trunk tieing the Cleveland system to other systems in Boyle, Ruleville and Drew. Along that trunk, which is powered by rural electrication systems, we have numerous hot-spots where sheath currents cause line amplifier failures. We get it from lightning, from power company surges and switching spikes. The Mini-Mizer seems to have helped our problems...." **Grady Rowsey, Microwave Engineer, Warner Cable of Mississippi.**

Mini-Mizer is a full one-year guarantee. Mini-mizer uses a patented approach to shunting surges and high transients to ground before fuses can blow or equipment can be damaged. There are several models available, including a 240 VAC model for microwave sites. Indoor and outdoor mounting configurations. **Protect yourself...with the Brown Mini-Mizer!**



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If you'd like to know more about the Supermatic videoplayer and super 8 applications, just clip the coupon and mail it to us. When you see what we have to offer, your format and your ratings may never be the same.

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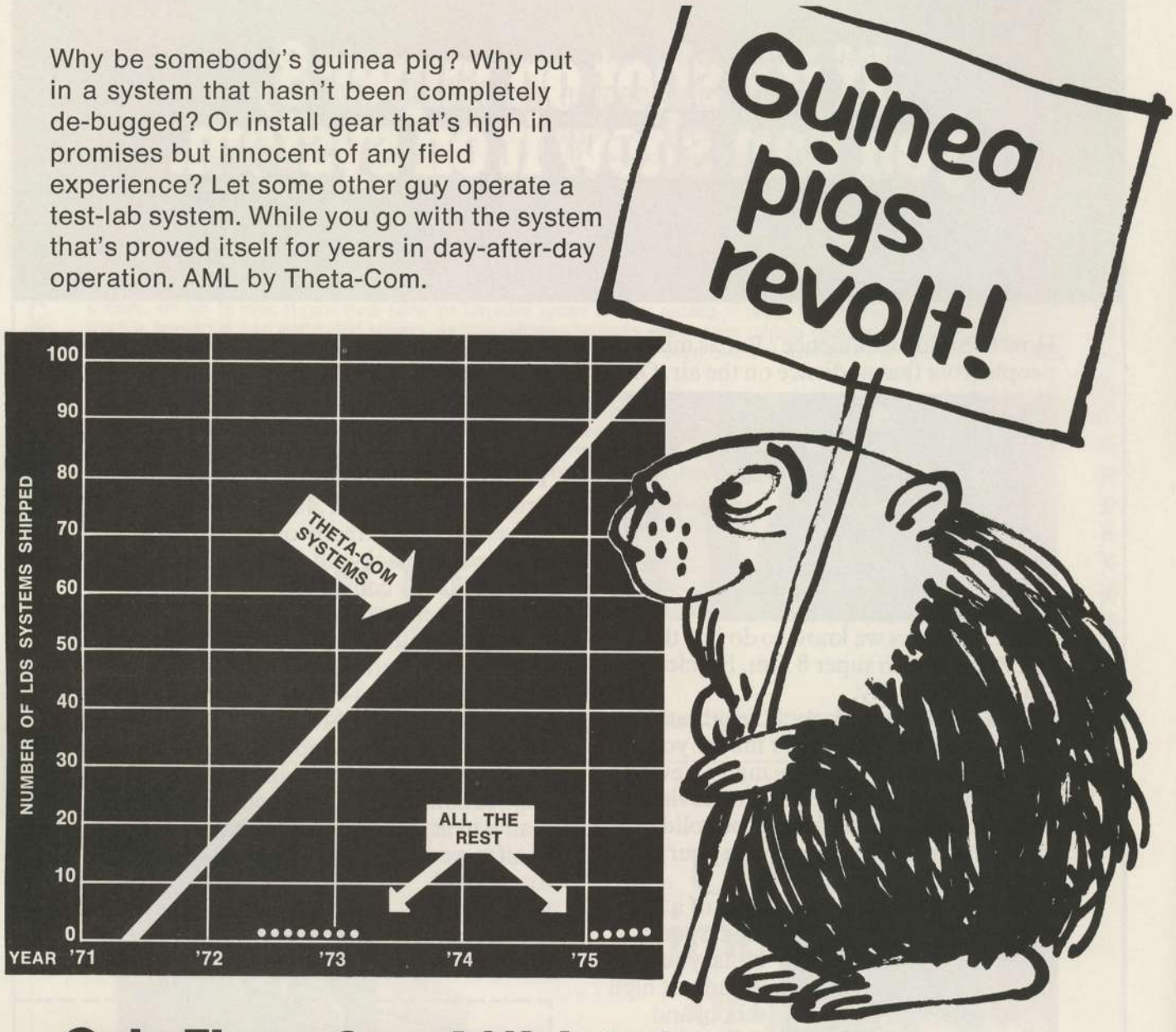

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Contact your nearest Theta-Com sales representative.
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In Canada, AML equipment is distributed to the CATV industry by Welsh Communications Company.

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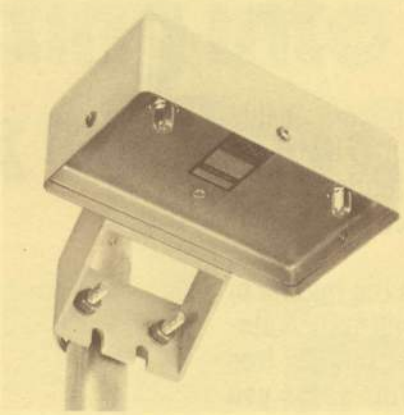

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A preamp for CATV tower service must be something special. Low noise and low signal distortion are only two of the requirements. It must be rugged, reliable and able to take what nature has to dish out. And if it does fail, it must be easily serviced. The Q-BIT SX-0500 preamps have been designed to meet these objectives. Send for complete literature / specs and see what we mean!

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Gain, 22 dB min
b/w, 54-216 MHz
Ripple, +/— 0.5 dB
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WE HAVE YOUR NUMBER !

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SO NOW WE KNOW who you are. And we are zeroing in on non-subscribing systems because you are spoiling our record!

SO HERE IS OUR NUMBER to you. **$7.50.** That's seven dollars and fifty cents. That is what you **save** by taking advantage of our special NEW-subscription-to-CATJ-offer **before December 15, 1975.** Full details on reverse side.

YOU QUALIFY for this special offer **if the address label on the rear cover of this issue of CATJ** has **"XXXX"** printed across the top of the label. That means your system is NOT presently a CATJ subscriber.

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Because of the high cost of this offer to CATJ, we cannot afford to keep it going very long. Therefore, the above two special offers which include FREE no-charge bonus copies of the CATJ Headend Wall Chart expires on December 16, 1975. Orders received after that date will be processed without the free Wall Chart bonus.

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Your Name _____

Company Affiliation _____

Address _____

City _____ State/Province _____ Zip _____

HAVE CATJ BILL YOU AND STILL SAVE $7.50

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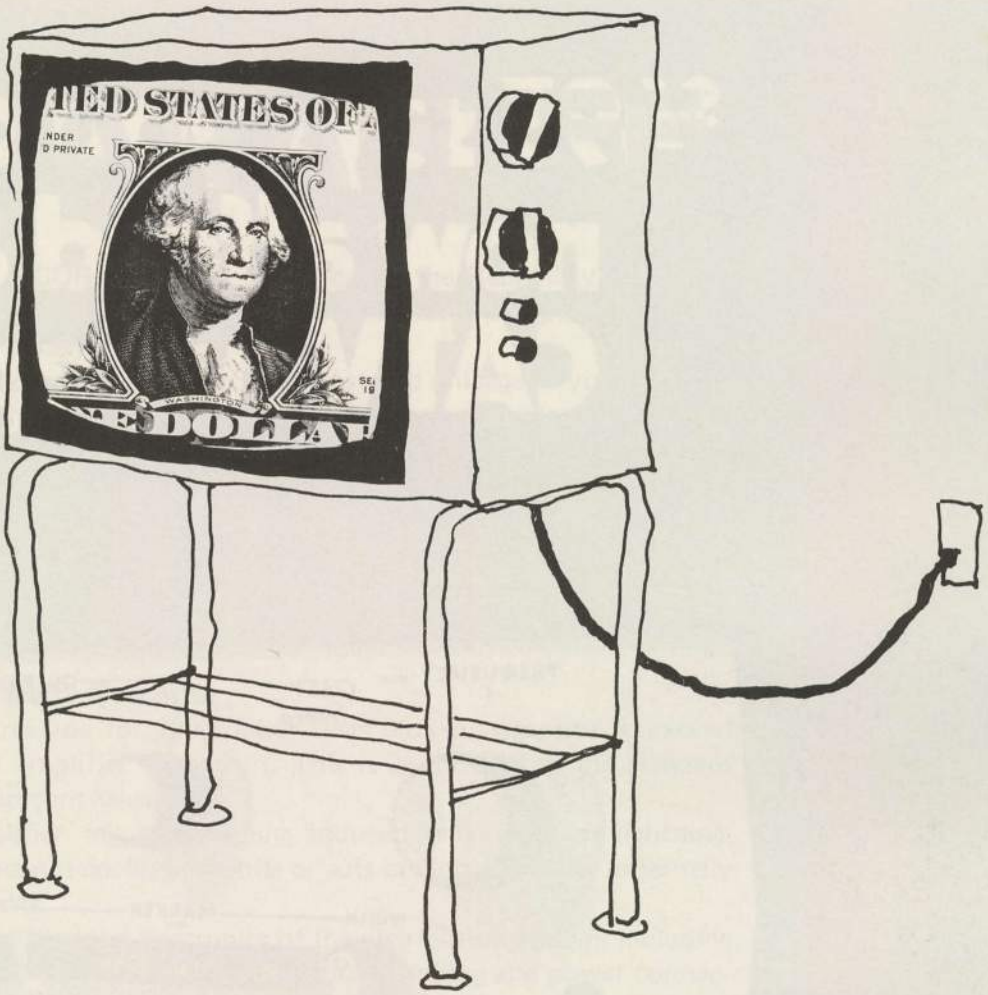

Pro Com is the only manufacturer whose major emphasis is on electronic hardware for the pay cable industry. So we have to know what we're doing. Pro Com has the electronics to solve pay cable problems you may not even be aware of yet. Are you going to trap non subscribers or de-scramble for those who want pay? A little simple arithmetric should show you that trapping is the less expensive of the two. You owe it to yourself to look at Pro Com's Notch and Band Elimination Filters before you make a choice. Even if you convert to a mid-band channel you still need the security Pro Com Filters provide. Have you considered offering only pay cable to non subscribers in your system? You ought to. It can be a nice source of additional revenue. If you do, you'll want Pro Com Band Pass Filters. Pro Com even has a P.G. Key for parents who are concerned about their children having free access to R rated material on pay. And that's not all. This fall, Pro Com is introducing its brand new "addressable tap." So, if you're thinking of moving into pay cable, let Pro Com show you around.

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JUST HOW BAD (really) IS THE PAY TV 'LANGUAGE LEAKAGE' PROBLEM?

Language Leakage

The September issue of *CATJ*, in our CATA-torial department, discussed some of the problems this industry faces relative to pay cable signal trapping systems. The CATA-torial noted that one of the primary techniques for blocking a pay-cable channel from a subscriber not wishing to take the service is through the installation of a single-channel trapping device on the customer drop.

Our concern, as expressed in the September issue, was that the current level of "trapping technology" concentrates on the installation of a suck-out signal trap, which eliminates (or attenuates) *selectively* the visual carrier (picture) signal on the pay channel; but which, by design, does *not* remove the aural (audio) for that channel.

There *are* situations, most will admit, where the thru-leakage of pay cable audio (especially that found in some R-rated movies) *may* create some uncomfortable moments for the cable system operator. If the language is offensive, and the non-pay-home finds it offensive, *there are bound to be complaints.* The subscriber may in truth be more offended than incensed, offended because his own personal sense of moral values is violated by R-rated-movie language which his youngsters, wife, or he himself "stumbles across" as the channel-selector switch is run through the cable channels.

Let's review the technical aspects of the problem briefly.

Broadband Vs. Selective

From the very earliest days of CATV, our whole bag of tricks has been based upon our ability to deliver a multiplicity of signals over a single piece of coaxial cable. This is correctly tabbed the "broadband concept." As everyone in CATV is well aware, once our signals exit our headend (origination point) all signals entered into the system at the headend are frequency-diverse but combined together on the single transmission medium, the coaxial cable.

Therefore, unlike a telephone system or other communications system where each "signal" has its own discrete transmission wire or cable, the CATV system has no quick-and-easy (read inexpensive) way to totally eliminate just one (or more, but less than all) of the signals on the system.

The problem this creates for the pay-cable entrepreneur is considerable. Pay cable operates on a single channel, typically. That channel is of value only when the cable/pay entrepreneur can *control* who receives that channel. Which is another way of saying that homes that take the service (and agree to pay for it) *will receive* the service; those who do not desire the service *will not* receive it.

The problem is sort of backwards, because the pay-channel service is introduced into the system at the headend and it goes toward *all* of the homes. *Every* home would get the service, *automatically*, unless some special steps are taken to see that certain homes do *not* receive it. It is not like an optional extra where the service is *added* to the basic service for those homes that desire it; rather, it is more like the fabled negative option where a home has to *not want* the service before it does *NOT* get the service.

The expense for the operator therefore relates *inversely* to the homes who take the service. They get it, at no additional expense to the operator. The homes who do NOT want the service *...they are the ones* which cost the operator money.

Back to the broadband portion of the problem. Everything in the cable-system distribution plant is designed to pass the whole cable spectrum. That may be 54-88 MHz (low band), 54-216 MHz (standard 12 channels plus midband), or it may be one of the many superband configurations that conceivably can extend all the way from 50 to 300 MHz. Isolating one single channel, or carrier, and taking it out, is not only *not* easy, it is *not* cheap. *Not if you do it right.*

So here we are at the drop into the home. Off of the distribution cable plying the streets and

alleyways and easements, we tap out signal and head for the house. Only before we get to the customer's receiver, we are asking ourselves to selectively take out *one of the channels* that has made the trip through miles of cable, amplifiers, splitters, and what-all.

Enter the second problem. The pay-TV channel is not just a *single* frequency; it is a *multitude* of frequencies. If you count discrete carriers and the color subcarrier, there are three in all. One each for the picture, the color, and the sound. Now everyone in cable knows that electronic magicians carry around a magic box called a "trap." Which is a device that sucks out (or traps) *one* carrier at a time. And if the magician installs his trap on the *picture carrier* of the pay TV channel, he can *selectively* wipe out that signal at that customer's home. Only what happens to the sound? *It is not trapped out*, and it therefore continues into the customer's receiver.

A lack of hard data on how traps work, or perhaps just a misunderstanding on the part of cable people on how they work is part of the problem. We'll look hard at how traps work or might be made to work shortly. For now, let's dispel a few myths about traps.

(1) *Traps Take Out a Channel*—Wrong. Traps take out a *single carrier* or signal. A channel consists of *three* separate signals, two of which are critical if you wish to completely eliminate all of the information (program content) on that channel.

(2) *Traps Are Very Selective*—Wrong again. Traps *can* be selective, but CATV traps are not. *Selectivity costs money.* It costs so much money that it would cost more to trap out a signal at a home with a truly selective trap than it would to *give* the home a converter.

(3) *Traps Are Very Broad*—Again, wrong. Traps are not very selective, *nor are they very broad.* They are in between very *either.* Which means that a trap that is designed to wipe out one signal (carrier) does *not* automatically wipe out another signal (carrier) although it may degrade a second signal (carrier) in the process of wiping out the first one. There is a *difference* between wiping out and degrading.

(4) *Traps Are Unconditionally Stable*—Wrong again buffalo breath. Unconditionally stable would mean that regardless of the environment (air temperature, humidity, etc.) which the trap functions in, the *original design frequency* for the trap (example—11 picture) would stay the trapped frequency. Traps are simply not stable, and changes in the environment *are a real problem.*

(5) *Traps Are Easily Defeated*—This one is a true statement. Traps are inserted into the drop line, typically at the directional tap on the distribution cable. They are a discrete piece of hardware, in their own miniature container. They insert in series between the distribution line and the customer's receiver. To defeat them, *simply take them out of the line.*

(6) *Traps Are Cheap*—Prices have come down dramatically in the past year. Prices under $3.00 are either with us or will be shortly, per customer trapping unit. But—*and this is a big but*—you get what you pay for. A trap is not unlike any other electronic device. Better traps cost more money than not-so-better traps. A so-so trap may (we said *may*) trap the picture carrier you want trapped, but it also *may:*

(A) Trap it only a minimum amount (i.e. not enough to totally wipe out that picture at the customer's set—just make it snowy);

(B) Wander around in frequency, as the environment changes (i.e. trap the desired picture carrier one day, and then after an abrupt weather change, trap the lower adjacent sound carrier the next day!);

(C) Trap not only the desired (to-be-trapped) picture carrier, but *also* degrade (if not outright trap) the lower adjacent sound in the process (i.e. *this* trap is *too* broad).

(7) *Traps Are Expensive*—Just what is expensive (cheap)? If you get $8.50 per month for your pay TV channel(s), and you spend $4.00 for a trap to see that a home does NOT get the service unless they agree to pay you an extra $8.50, is that $4.00 really expensive? *Or is it much more expensive* to buy such a cheap trap that the non-subscribing home *never does pay you* $8.50 per month because the trap does such a lousy job that the home gets an "acceptable" picture on the pay-cable channel anyhow, *without paying you for it?* (I.e., which is more expensive, $4.00 or even $10.00 for a really good trap, or losing $8.50 for 12/24/36 months???)

(8) *Traps are Transitory*—This argument suggests that the industry's use of trapping devices for pay-TV channels is only temporary; that sooner or later as pay TV grows, all homes will end up with descrambler devices (i.e. the headend will content-scramble the pay TV signal; a descrambler/converter in the home will display the signal unscrambled). This *may* be true, but if it is, there are going to be hundreds of thousands... perhaps millions of discrete carrier traps sold and installed in CATV in the interim. Traps *are here* today, at a price the system can afford. Descramblers...well, you have seen them at trade shows, but at the present time that does not seem to be the direc-

tion the industry is going.

Scope Of Trapping

Let's set up a typical trapping situation. See Diagram 1. Here we have channel 11 (it could be D, K, or whatever) as the pay cable channel. Anything on this channel is for an extra charge per month per home. Now on the two immediately adjacent channels (10 and 12 in our example), we have non-pay programming. Just to make things extra-tough, let's suggest that both are network signals with lots of general-cable-audience appeal. In other words, if you mess up either 10 or 12 in the process of trapping out 11 at the non-pay-subscriber's home, *you have problems.*

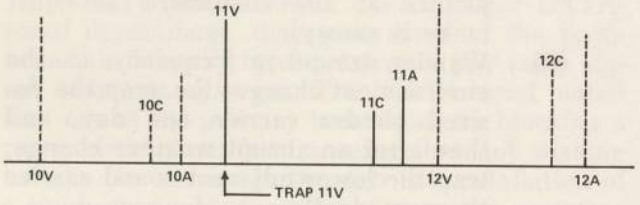

DIAGRAM 1

In the present situation, the pay-TV trap is installed on the drop line, and it wipes out channel 11 picture. Here is what is critical in this situation:

(1) If the trap on 11 picture is slightly *mistuned*, on the low frequency side, channel 10 audio is degraded (weakened). It results in complaints at that home about the *quality of sound on 10.* If the trap is *severely* mistuned, the subscriber in the home may even lose some or all of his color on 10. So a *properly tuned* trap is important.

(2) If the trap on 11 picture is *too broad* (i.e. it does not have steep attenuation "skirts"), it may be properly centered on 11 picture, but it also *degrades somewhat* channel 10 sound. Retuning the trap is *not* the answer. Replacing the trap *may not* be the answer, if it turns out that the *design parameters* of the trap are incorrect; because if the broadness is the result of a design parameter (call it "goof"), then all of the traps of that same design will ALSO be *too broad.*

(3) Regardless of the trap's parameters, tuning, etc., the carrier it is designed to trap is 11 picture. Nothing (or very little) is done with 11 audio. In our example, it rides through to the receiver essentially unimpaired.

(4) If the trap is set down in the middle of the channel (i.e. halfway between 11 picture and 11 sound), either by design, mistuning or by environmental change, neither the 11 picture or sound is degraded very far. The picture gets messed up, *but the program can still be watched and listened to.*

(5) Finally, if the trap is receptive to changes in environment to the extent that a temperature change results in a *trapping-frequency change*, then the whole system becomes unstable. If the trap drifts *down* in frequency when the temperature changes, the previously unimpaired channel 10 signal gets zapped. If it drifts up in frequency, the 11 picture will start to leak through, and perhaps if the trap drifts far enough upward, the 12 picture will be zapped, probably right along with the 11 sound.

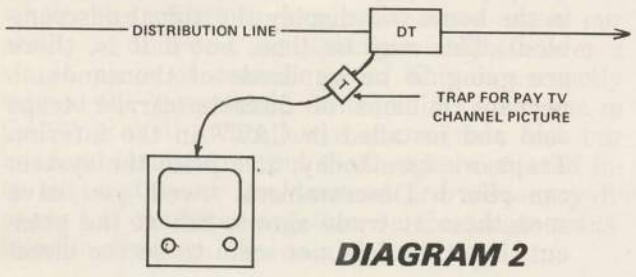

DIAGRAM 2

Some systems are therefore placing pay channels in midband and superband, and they are dedicating the *immediate adjacent channels* as "buffer zones." That is, use channel C but leave B and D open so that trap drift, mistuning, etc. does not injure the reception service in that home for adjacent channel program services. The concept will work for the 12 standard VHF channels as well (i.e. use 11 for pay, but leave 10 and 12 unused). However, few—*very few*—systems can afford to dedicate three standard VHF channels for a pay TV channel-plus-buffer-region. *The space is simply not available* for such poor spectrum usage.

Still other variations place the pay channels at a band edge. For example, put the pay channel on A and leave B blank as a buffer. The trap on A can drift *down below* A, but in doing so it drifts into a cable-unused piece of spectrum anyhow (no TV channels there). One where there is no adjacent channel to ruin in the first place. B becomes the buffer, but it is only a single buffer channel to give away for pay.

Even more-daring operators use A and leave B on the system, on the theory that traps on the *A picture carrier* have a very long way to drift before they get to the *B picture carrier* (admittedly, traps are usually not *that* unstable).

All of these "solutions" address themselves to the pay-TV trap ruining, getting into or degrading the non-pay adjacent channels. They do not address themselves to the more obvious problem: *language leakage.*

In the September *CATJ* CATA-torial, we raised the moral questions that are sure to result from leaky language. Blue movies are bound to offend *somebody sometime.* And sooner or later, somebody is going to (1) complain to your system, (2) complain to the city council, (3) complain to the FCC, and/or (4) complain to their local church. And not necessarily in that order.

So being concerned about the language on blue movies is not merely a moral flag we are carrying; it is a simple concern that if blue-movie language offends *anybody* at *anytime*, the whole pay cable program at your cable system *may well be jeopardized.* It is something that you should give some thought to, today. A good defense is important, before you get hit with a problem.

So what can an operator do? He doesn't manufacture the traps himself. He knows, he says, that he cannot afford a scrambler/descrambler system. He is at the mercy of the trap manufacturers.

But are you, *really?* Aren't you pushing the trap manufacturers to (1) bring down his trap price, and (2) speed up trap delivery? You are, and *you know it.* And you are getting exactly what you should get in a situation like this. You are getting traps that are based upon more and more mass production techniques, traps that are less critical to tune (i.e. align at the factory) simply because *they are* less efficient and selective. In short, as the price comes down, so does the quality. The trap you are considering for $2.50 each today may be similar to the trap that cost $8.50 last year. But it may not be the same *identical* trap. You may be buying headaches, heartaches, and pocketbook aches.

The trap manufacturers (there are four or five prominent ones at the present time) are anxious to sell *you* their products. Most are behind in delivery, and many users *CATJ* talked to said that some of the traps they are receiving are running as high as 50% reject-rate. Thank goodness most people are checking the traps before they hand them to an installer and turn him loose on a community! Wholesale installation of traps on all non-pay-cable homes...traps that are on the wrong channel, or are mistuned, can and will create a barrage of service calls such as you have not seen since your NBC affiliate lost its video feed during last year's World Series!

So slow down, consider what you are *really* doing, and pay some attention to people who have already been down this road.

Kill The Video / Garble The Audio

In discussing these problems with some designers and suppliers of pay-TV traps, we developed a number of interesting concepts. Glyn Bostick of *Microwave Filter Company* (E. Syracuse, New York) in particular had a number of what he terms "incubating thoughts." Or ideas which if properly explored can lead to some solutions to these problems.

Glyn thinks like any other first-rate engineer. But he also thinks like a top-rate businessman. For example, Glyn offered

"Let's examine the thesis that creates the conditions leading to the need for the improved family of single channel traps. The problem is with leaky language on blue movies.

A) *A sound trap may be or is required if the language is objectionable to parents of very young children;*

B) *Not* all *parents of very young children will object orally* (i.e. complain) *or disconnect from the regular cable service as a result of the blue-movie language;*

C) *Not* all *homes have young children;*

D) *Reasonable, childless puritans will be self-satisfied to simply switch off the 'dirty channel';*

This indicates that there may be an alternative to going into a wholesale trap-efficiency-improvement program. Perhaps those people who complain, for whatever reason, can be treated as special cases. Perhaps they can have two traps; one for the pay channel picture and one for the pay channel sound. In other words, continue with the present family of traps for the average family, the one that does not find itself tuning in the pay channel movies 'by mistake' *and being offended. That will be the standard trap the industry now receives, or as evolves through change and technology; one that is designed to mess up the picture only.*

Then make available for 'offended families' *a second approach to trapping. Install for them a form of double trap that kicks out both the pay TV picture and the pay TV sound."*

Of course the cost for the more extensive trapping must be borne by someone. Probably that someone is *you.* The economics of *selectively* trapping the sound (i.e. *selectively* meaning doing it where the need arises, *not* at every trapped home) could and should greatly reduce the additional expense involved for the operator.

Of course the CATV system is not totally obligated to pay for the extra trap; he could make some sound (pardon the pun) arguments for asking *the complaining viewer* to pay the cost of the sound trap. If the expense of the trap plus installation is nominal (i.e. under $15 installed), he *might* get away with it. He *also* might get the drop cable serving the normal CATV service to the home inserted into his posterior. Each system will have the decision to make.

Mentioning the possibility of two traps suggests that there is an alternate solution to the problem. In actuality, there are several. But to the best of our knowledge here at *CATJ,* nobody in the trap business is actively pursuing them at the present time. Or at least if they are generally available, there is not much talk about them.

(1) *Garbled Sound*—Many people do not realize it, but if you kill the picture completely enough, the sound will garbage up and go away also. This is based upon the principle that most television receivers employ something called "an intercarrier approach." Which means that the reproduction of sound (out of the receiver speaker)

depends upon *the presence in the receiver* of a picture carrier. In other words, sound is inter-related to the presence of a picture signal.

The magic number appears to be between 45 and 50 dB. That is, if you can knock the picture carrier down 45/50 dB, you will probably take the audio out also.

Is this a good system? Well, the answer seems to be that in theory the system should work. In practice, we have *two* new problems. The first is some channel traps currently available are not notching down 50 dB. That is some trap; more than some of the industry has today.

In real numbers, typically available traps talk about 40 dB average notch depth on the design frequency. A 50 dB down notch is quite another animal. Not impossible. Not difficult. Not even *that much* more expensive. Just another order of magnitude up the ladder.

The Tulsa, Oklahoma system is an example of a system that is entering pay cable with the garbled sound approach. Located in the so-called Bible Belt, the Tulsa system is keenly aware that it may be in for real customer pressures when nasty language comes out of the speaker. So Dan Pike for Tulsa Cable TV wants the manufacturers to bring him a 45 dB spec (i.e. 45 dB down *minimum*) trap. This will go on his channel A pay cable channel, where he has no lower adjacent channel to be concerned about. Then Tulsa Cable will offer the standard (45 dB down minimum) trap for all non-pay-homes; and, as Glyn Bostick suggests, hand select or minimum-quantity -order sharper traps for the home that insists that all signs of the sound are gone.

Pike told *CATJ*, "We ran tests on one of the more sensitive receivers we could find, a top-of-the-line Sony. Our input levels were over +10 dBmV. With 45 dB down on the visual carrier frequency, the sound was badly garbled. You could still pick out the language if you tried real hard, but a person would have to want to learn those words awfully bad to want to sit and listen to that noise buried audio!"

Pike found several trap sources that *said* they can meet the Tulsa minus 45 dB spec; and as this report is prepared, Tulsa is making a decision on which packaging configuration (and therefore, supplier) they will select.

So much for the first problem, that of finding traps with 50 dB or so picture carrier rejection. What is the second problem?

Stability.

A trap becomes more sensitive to environmental changes as the depth of the notch increases. See Diagram 3. A trap with a 30 dB notch has a 3 dB bandwidth (*in our example*) of +/— 300 KHz (at the bottom of the notch). A trap with a 50 dB notch has a 3 dB bandwidth of just +/— 150 KHz (again, this is an *example*). In short, as the notch gets *deeper*, the *selectivity* of the trap *goes up*. The 3 dB measurement points get closer together.

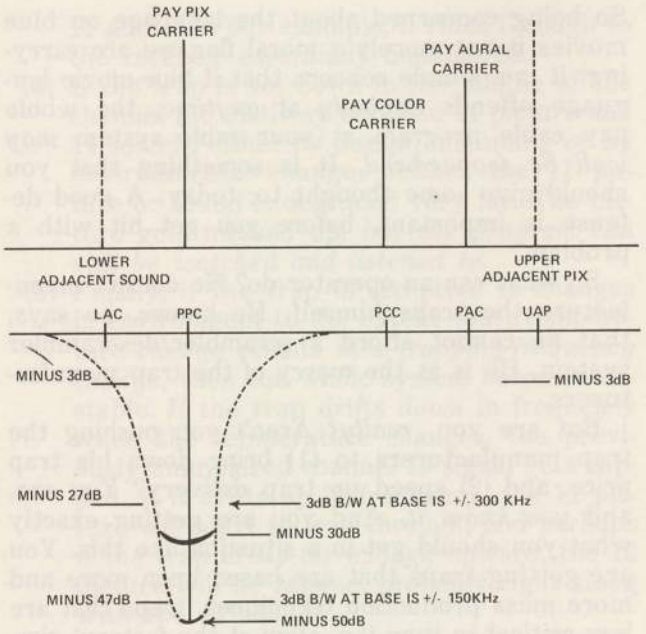

DIAGRAM 3

To put it another way, the trap can drift 300 KHz in the 30 dB down notch trap and only change the amount of attenuation on the notch-desired carrier 3 dB. But in the 50 dB down notch trap, if the trap drifts 300 KHz, the attenuation of the notch-desired carrier will move approximately 10 dB. *That* is the second problem.

In the first trap, an environmental change causing a 300 KHz drift in the notch changes the spec from 30 dB down to 27 dB down. In the second trap the same environmental temperature change results in a change from 50 dB down to 40 dB down. Oops...there goes the integrity of the sound garbling. The picture still looks lousy at 40 dB down, but now the sound is up high enough that it can be understood.

The answer... is greater trap-design stability, *with* environment changes. *That answer...* may cost you additional money; because trap stability is a function of the way the trap is designed, the type of capacitors used for LC circuits and the way the housing for the device transmits environmental temperature changes to the components inside of the housing. It is *not* a no-solution problem. It is a cost-effective problem. Pay for a stability-proven trap; you will get a stability-proven trap. But not for $3 a pop.

Other Approaches To Problem

Glyn Bostick advises us that if the industry is willing to pay the bucks, there is technology around which is already developed; CATV users have to merely be willing to pay for more-sophisticated devices.

One is the wide-notch-trap (to include picture

and sound carriers). It works as shown in Diagram 4. This requires a 9-pole reject filter, which as Glyn points out would fall in the $35 each in mass production quantities arena. Note that the lower adjacent sound and the upper adjacent picture carriers are at the 3 dB falloff points on this type of device, although the desired channel signals are down 50 dB.

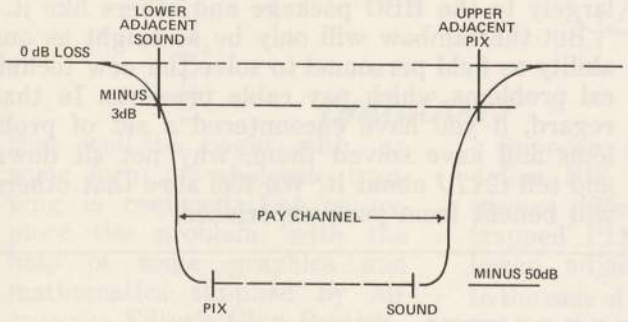

DIAGRAM 4

Then there is the two-notch-trap: *essentially two separate traps housed in a single container.* One of these gets after the pay cable picture carrier frequency, and the second goes after the pay cable sound carrier frequency. Again, the 3 dB points for the two traps fall on the two adjacent carriers while the maximum attenuation is in the same range as typical present-day picture-carrier-only traps, or down 40 dB spec.

This device, shown graphically in Diagram 5, would fall in the $10 range per unit, *if mass produced.*

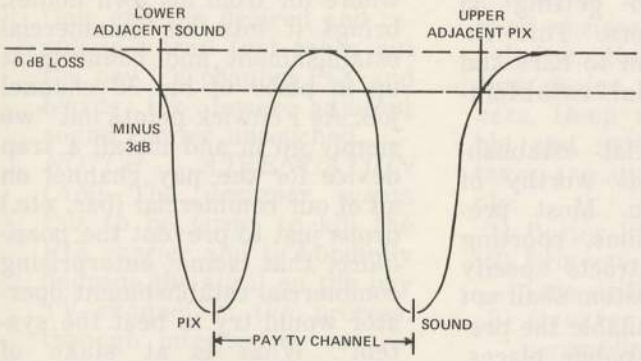

DIAGRAM 5

The *key* to either of these units is mass production. Don't expect to call any trap supplier and offer him $35 for a 9-pole reject device or $10 for a dual-trap in a single can device and have him accept your order for ten units. That is simply not in the cards.

The trap business is a part of the general family of passive business. The passive business traditionally has been a high-volume, identical-device business for years and years. It operates on a slimmer profit margin than active CATV electronics. Active electronic pieces often have several man-*years* of R and D in them. That translates into higher per-unit costs (to pay for that R and D). With units such as headend processors, where total production for the lifetime of the design may number into the low thousands, the R and D charge per unit is considerable. With most passive devices, where R and D time is measured typically in man-*weeks*, the R and D cost per unit is low. The whole premise is volume, hundreds of thousands and millions of identical cookie-cutter units.

So as *soon* as you say "OK, I'll buy 5,000 of those traps, but take the attenuation from 40 dB spec to 45 dB spec," *you have just created a new product.* If *enough* people say this, at about the same time, then you and all of the Tulsas of the country may have just created a new product at something approximating the old product (spec) price. We hope you get the message!

SPEC-MAN SHIP

The nature of the trap is that it attenuates the carrier it is designed to attenuate. As explained, this is a depth-of-notch and width-of-notch (3 dB points) and stability *set of problems.*

These are all specifications which a system can determine on its own. In fact many (read most) advise they are routinely checking the shipments from trap suppliers anyhow. This is a mixed bag of making sure the products meet the specs (for quite some time a very high percentage did not, according to industry user sources), and, it allows the CATV system to "grade" the traps. For example, as Dan Pike hopes to do in Tulsa, by checking specs he hopes to find a high enough percentage of graded units that meet the 50 dB (or better) number to allow *him* to *stockpile* those *extra-good* units for the *tough* customer that wants *every bit* of audio deleted from the channel. If not, as he notes, "we will go into a supplier with a small-quantity order of extra-good devices with a 50 dB or better spec and pay a premium for extra-high reject units."

Systems that are not willing to check each unit, or are not equipped to do so, are at the mercy of the integrity of the supplier and the accuracy of the supplier's quality-control system. Which leads to the battle for spec-man-ship. Every supplier is in business to convince you his product is the one you should buy. One way to do this is to promise a better-quality product than the competition. And one way to promise is to write out a set of specs which are, on paper, superior to those of a competitor.

That is the art of spec-man-ship.

The industry is presently looking for united ways of settling spec-man-ship arguments. *One of these* is for the industry to pull together and employ the outside services of a respected group such as the Denver Research Institute to evaluate all of the (for example) traps currently offered to the market. Then the sponsoring operat-

ing (system) firms would share in not only the expense of the tests but also in the results. Seemingly, this type of approach will help cull out some of the trap suppliers who have been having problems meeting their published specs.

However, the other side of the coin is that any manufacturer knows how to make a small percentage of his own units always meet spec. Just as a CATV system can grade units received, a manufacturer can grade units shipped. Therefore, units hand-selected for transmittal to an outside evaluation house run the risk of being something less than typical representations of what the system operator is liable to receive in his 1,000-lot order. People are not always dishonest, but sometimes they fudge a little. Everyone has their own set of inherent biases!

What Are You Doing?

The pay-cable rainbow looks much brighter this year than it did just one year ago. There is for the first time *some* improvement in the software (programming) end of the business, thanks largely to the HBO package and others like it.

But the rainbow will only be as bright as our ability as field personnel to solve the new technical problems which pay cable presents. In that regard, if you have encountered a set of problems and have solved them, why not sit down and tell *CATJ* about it. We feel sure that others will benefit from your experience.

HOW MUCH MONEY WILL THE 'LEAKAGE' PROBLEM COST TO SOLVE?

In researching our material for a frank discussion of the current state-of-the-art of pay TV traps, we keep coming back to the sound leakage problem. We also often end up wondering just how critical the problem really is, and whether there are other alternatives to traps at all.

Morris Cablevision, New Jersey, for example, approached the problem from a different direction. As George Fenwick relates "We have a virtually fully loaded 30 channel system operating here. Naturally this means every home has a converter going in. Then when we added premium or pay service, we placed the new service(s) in the upper end of superband (channel W for example). Our *standard 30 channel* converters don't cover this channel, so naturally when a home opts for pay service *in addition to* regular service, we have to install the 35 channel converter. This just about gets us out of the trap business, because the only homes that end up with the pay service are those homes ordering it, and getting 35 channel converters. This reduces our problem to bars and other commercial establishments...."

The "commercial establishment" problem is worthy of some explanation. Most premium service (films, sporting events, etc.) contracts specify that the CATV system shall *not* offer or make available the premium service in public places. That includes bars, clubs, and the like. So where CATV systems must be on guard is where a bar or club *owner*, aware of how the 30-35 channel system option works, merely picks up a 35 converter elsewhere (or from his own home), brings it into his commercial establishment and connects it up in place of his 30 channel job. As Fenwick points out "we simply go in and install a trap device for the pay channel on all of our commercial (bar, etc.) drops just to prevent the *possibility* that some enterprising commercial establishment operator would try to beat the system". What is at stake of course is the possibility that the CATV operator might lose his licensing agreement with the premium program supplier if it were found that the premium services were getting into commercial establishments. Such is the way most present premium program supply contracts are drafted, and it is *up to the CATV operator* to enforce the clause.

Not everyone has the 30 or 35 channel option Fenwick has at Morris Cablevision. In fact, most systems were not planned

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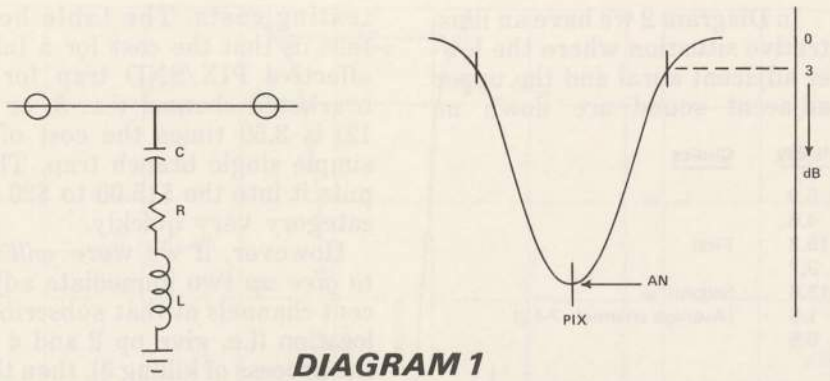


DIAGRAM 1

that well to begin with, so some form of wholesale trapping is required. Let us explore the problem, with the help of some graphics and mathematics supplied by Microwave Filter's Glyn Bostick.

Basic Single Resonator

Diagram 1 defines two important characteristics of simple resonators, such as are found in the basic PIX trap.

Bandwith (BW)—The designer wants this to be *small*, to protect the lower adjacent sound carrier. In other words, notch or trap bandwidth is a selectivity function, and the desired end result is a trap that takes out the pay TV channel PIX and leaves the lower adjacent sound carrier untouched.

NOTCH ATTENUATION (AN)—The designer wants this to be *large*, to kill the PIX carrier and to hopefully degrade the aural on the pay TV channel in the process, through intercarrier set re-response.

These two characteristics, at least in *passive* circuits, are controlled by:

$$AN = K \frac{BW}{Fpix} \times (\text{sales volume of box})$$

The sales volume is fixed by the (CATV) user demand. A narrow bandwidth (%) and a large notch attenuation (AN) are in opposition. That is, as long as the volume remains quite small, the BW vs. AN portion of the equation becomes at best, a trade off.

Suppose for discussion we define BW as *twice the frequency difference* between the trapped PIX carrier and the lower, adjacent sound (SND). In the case of channels 2, 5, and 7, we use the upper adjacent PIX carrier (3 for 2, 8 for 7) as the adjacent carrier of concern. We find that:

Channel	FPIX	BW	BW x 2 / F PIX	Choice
2	55.25	12	21.7	First
3	61.25	3	4.9	
4	67.25	3	4.9	
5	77.25	11	14.2	Second
6	83.25	3	3.6	
7	175.25	12	6.8	Third
8-13	196.5 (*)	3(*)	1.5(*)	

* (Average of channels 8-13)

Channel 2 is therefore the *most desireable* pay TV channel, from the vantage point of *trap design vs. trap effectiveness.* Deep notches are possible and certain other advantages are apparent. For example:

1) Better PIX blanking
2) Protection from temperature drift (*)
3) Greater probability of scrambling SND
4) Wider bandwidth circuitry is less critical to build, resulting in lower per (trap) unit price.

*—Note that deep notches get wider as they get deeper.

Therefore, in our example, immediate adjacent channels (2-4, 5-6, 7-13) have special problems primarily because of the *adjacent channel situation.* If the CATV system is using mid-band or super-band, and these mid or super band channels are *not* fully occupied, then the pay TV channel selection vs. trap selection becomes more manageable. See Appendix.

Language Trapping Methods

The present level of technology for curing the Language Leakage problem is rudimentary at best. We still have a long ways to go before we arrive at a totally satisfactory solution to this problem. It might be well, however, to adopt going in a *new* pay TV channel for the pay services where the audio solution can be dealt with most easily; when the low-cost solution finally does appear.

There are two promising solutions on the horizon at this time. One is double trapping, while the second is wide-band trapping. Let's look at what each has to offer separately.

Double Trapping: By definition, you place two separate traps into the circuit, one tuned to the sound carrier and one tuned to the picture carrier of the pay channel.

We will find, in general, that audio trapping (without injuring the immediately upper adjacent PIX carrier) is more difficult to do than PIX trapping (without harming the immediately lower adjacent SND carrier). We can stand less attenuation on the upper PIX and, hence, the audio trap BW must be smaller.

Or specifically, the percentage $BW : \frac{BW}{F\ audio}$ must be smaller. Let's define BW as twice the frequency difference between trapped audio and *upper* PIX (in the case of 4, 6 and 13, as between trapped audio and *lower* audio).

Note that except for channels 4 and 6, the % BW is about the same as for PIX trapping. Hence audio trapping will be *at least* as difficult (and costly) as PIX trapping. But, remember that BW for audio trapping must be somewhat smaller than these numbers because the up-

per PIX can stand less attenuation than the lower audio. Therefore, in general, *audio traps are more costly.*

Channel	F AUDIO	BW (MHz)	% BW	Choice
2	59.75	3	5.0	
3	65.75	3	4.6	
4	71.75	11	15.3	First
5	81.75	3	3.7	
6	87.75	12	13.6	Second
7-12	194.75	3	1.5	(Average channels 7-12)
13	215.75	12	5.5	

Now look at channels 4 and 6. Here the allowed % BW is over *twice* that for other channels, so audio trapping is quite feasible. Hence, great weight must be given to these channels when making the pay channel selection, against the possibility that audio traps *may* have to be installed in the future.

Using channels 4 or 6, it is reasonable to assume that an audio trap would cost the same as a PIX trap and that therefore *double trapping* (i.e. two separate traps, one for PIX and one for SND) will be twice the cost of PIX trapping alone. To hang a name on it, let's call the *added* expense (for the audio trap) the "sound surcharge" (SS).

By employing the "XY" strategy (see later in article) the SS can be reduced as low as 25% of the cost of a single trap.

Wide-Band Trapping (WBT): By definition, use a single trap device on the pay channel, with a trap notch which subtends *both* the PIX and SND frequencies of the pay channel.

This is what is generally known in the industry as a Band-Stop Filter (BSF). The systematic design of such filters —to *any* degree of sharpness (fall-off slope to protect the adjacent channel carriers) is well established. See *Microwave Filters, Impedance Networks and Coupling Structures,* Matthes, et al., McGraw Hill. Although it is perfectly feasible to design a successful BSF for a bracketed channel (3 for example, which is 'bracketed' by channels 2 and 4), the cost is prohibitive. Let's illustrate.

In Diagram 2 we have an illustrative situation where the lower adjacent aural and the upper adjacent sound are down no more than 3 dB on the BSF skirts. For such a filter to be successful, the BW must be 7.5 MHz. This is arrived at by:

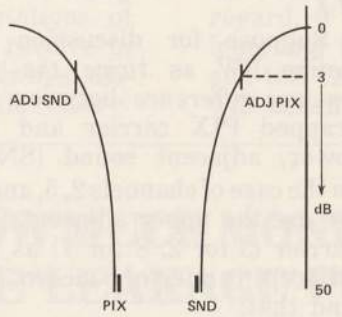


DIAGRAM 2

PIX/lower audio	1.50 MHz
Stopband (in channel)	4.50 MHz
SND/upper PIX	1.50 MHz
Total –	7.50 MHz

If the designer chooses a Butterworth type filter response (i.e. flat loss, within the passbands on either side of notch, no deliberately designed-in ripples), and we study cost and effectiveness as we increase circuit complexity (i.e. number of branches in the BSF), we find that:

50 dB NOTCH BSF (50 dB BW = 4.5)

Branches	BW (MHz) (3 dB)	Adjacent Channels Sacrificed	Cost BSF (*) / Cost Simple Trap
3	30.6	4	1.10
5	14.2	2	1.25
7	11.9	2	1.75
9	8.5	2	2.50
11	7.6	0	3.50

We have already discounted the simple single branch device (i.e. simple trap), because it has already been discussed. We are avoiding even-number-branch designs because they present the designer with hard-to-impedance-match problems, and much higher manufacture and testing costs. The table here tells us that the cost for a fully effective PIX/SND trap for a bracketed channel (i.e. 3, or 8-12) is 3.50 times the cost of a simple single branch trap. This puts it into the $15.00 to $20.00 category very quickly.

However, if we were *willing to give up* two immediate adjacent channels at that subscriber location (i.e. give up 2 and 4 in the process of killing 3), then the 5 branch BSF is the most economical choice (125% of the cost of a simple single branch trap). All of this assumes *quantity* manufacture; don't expect these kind of cost comparisons with small quantity orders!

Optimum Frequency Choice

To have a completely satisfactory solution, technically and economically, we must employ the most economical BSF in a frequency range where loss of two adjacent channels is of little consequence. We should also select the lowest feasible operating frequency to preserve notch depth (AN). *This may suggest mid-band.* Diagram 3 is a test plot of a 5 branch BSF for mid-band channel A. Note that 50 dB is easily achieved on channel A PIX and SND. By centering the filter on the PIX carrier, 70 dB rejection of the PIX carrier is achieved.

Diagram 4 is a data plot of a 5 branch BSF designed to trap out *two* contiguous pay channels: A and B in this case.

Trap Cost & Application

In today's marketplace, trap prices range from $3.50 per device to $7.00 per device with the average device centering around $5.00. And, as in just

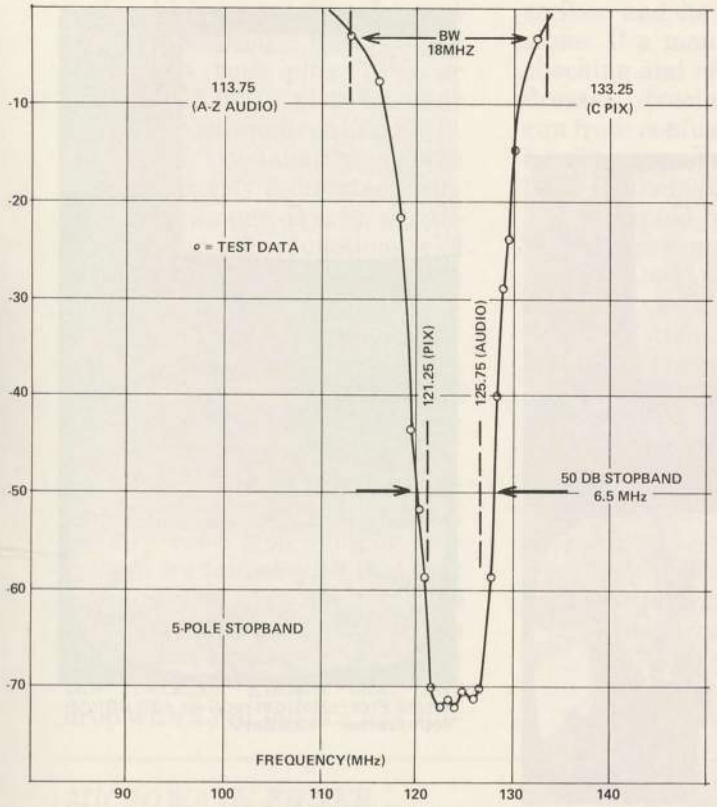


DIAGRAM 3

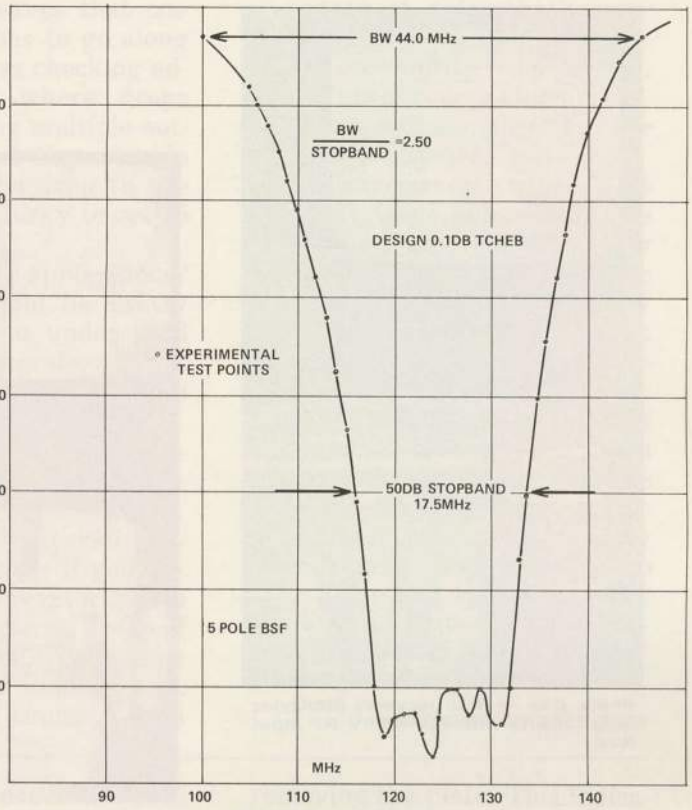


DIAGRAM 4

about any other commodity, you get pretty much what you pay for. If you merely need nominal trapping (35 dB) and are not overly concerned with the ruggedness, the less expensive unit will probably satisfy your needs. On the other hand, if you want a lot of customized extras (i.e. different connector arrangement, built-in jumper cable, special package shape or color, etc.), best you be prepared for the higher priced spread. However, for budgeting purposes, $5.00 seems to be a safe number to plug into your cash-flow or capital-investment equations.

Installation

Be prepared to check out every unit you receive from a supplier. One simple approach is to employ a signal source at the PIX carrier frequency (often a drop into the shop will suffice, even if you have to add an amplifier) and an SLM. Expect this to cost you not less than 5% of the basic trap cost. For example:

Test 20/Hour @ $4.50 /hr = $0.225 each

There are as many stories as there are practitioners when it comes to what it should cost you to actually go into the world and install the pay trap on non-pay subscriber drops. Ideally, this should be adequate:

Install 60/day/man $4.50 /hr = $0.60 each.

This works out to about 12% of the basic $5.00 average trap

Continued pg. 23

PICTURE QUALITY vs. TRAP ATTENUATION

The language leakage problem is *part* of the pay TV security problem. The other is the question of destroying the picture content sufficiently so that the non-pay subscribers cannot watch the pay program.

People will, we know, put up with some pretty cruddy looking pictures *if they think they are ripping the cable company off.* Getting something for nothing is *its own* attraction.

CATJ set out to test the effectiveness of trapping, as a function of *amount of* signal trapping. We took a +14 dBmV signal and ran it into a two-way hybrid splitter. On one output leg we ran directly to a receiver at +10 dBmV. On the opposite output leg we ran through one (or two in series) tuneable traps. By carefully adjusting the traps, we were able to reduce the signal on this "leg" in 20 and 10 dB steps and photograph the results.

Remember the basic input level to the receiver in the bottom screen is +10 dBmV. Note that these are tuneable, hi-Q type traps which have a very narrow trapping bandwidth at the bottom of the trap segment (i.e. the 3 dB bandwidth is on the order of +/— 200 kHz). This explains some of the *remaining video information* which you see on the top screen; the carrier is severely trapped, while the video information upwards of the carrier (i.e. towards the audio carrier) is not trapped as heavily.

Continued pg. 22

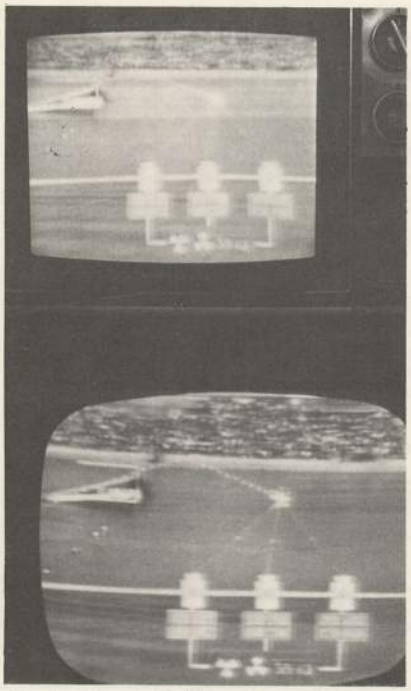


Photo One — Both receivers displaying signal quality with +10 dBmV RF input level.

Photo Three — Bottom receiver +10 dBmV; top receiver —20 dBmV.

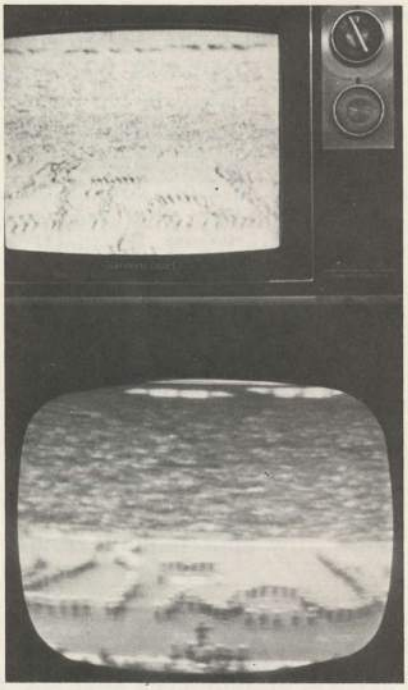


Photo Five — Bottom receiver +10 dBmV; top receiver —40 dBmV.

Photo Two — Bottom receiver still +10 dBmV; top receiver —10 dBmV.

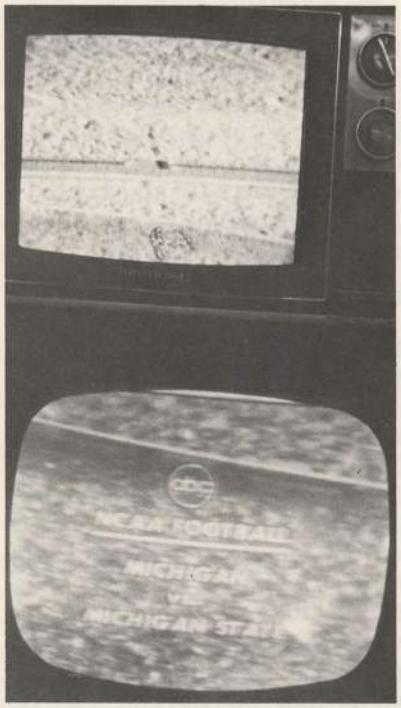


Photo Four — Bottom receiver +10 dBmV; top receiver —30 dBmV.

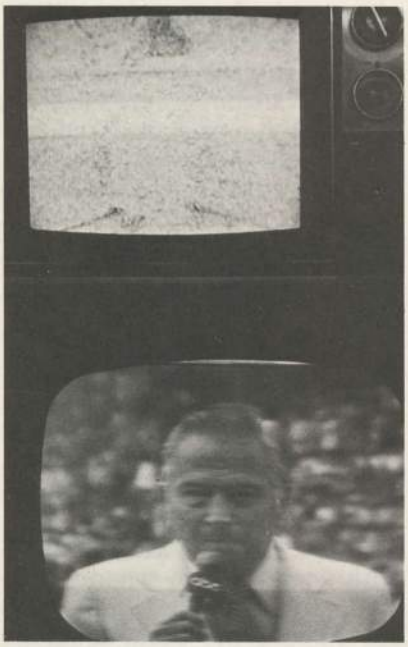


Photo Six — Bottom receiver +10 dBmV; top receiver —50 dBmV.

cost, which means that for test *and* installation, ideally, we have trap cost plus 17% or 117% of $5.00 to plug into our capital investment equation.

Whether installation people can be properly motivated to install 60 units per day, or whether your own office functions well enough to direct the installation man to 60 precise and pre-planned non-pay-taps in rapid succession is another matter. Most systems *CATJ* talked with said that *if* they got 60 per day per man, they would hold the biggest beer bust the company ever had. Many said 30 per man, per day was a *high* number. One system we talked with that *was averaging* 60 per day, per man said "We do it only because the drops are tagged in advance; the installer knows that any drop with a red tag is a pay subscriber and he leaves that one alone. If a man has to go along checking and cross checking addresses, tracing where drops run from confusing multiple-outlet line taps, and then double back following the drop to the DT, we would be lucky to get 15 per day per man".

What about trap applications? By now you should be pretty confident that you understand the why and wherefores, but we'll list them again just in case you are confused:

(A) *Full trap system*—all non-pay subscribers are trapped out;

(B) *Scrambler or Special Converter Backup*—If you isolate a circumventor, there is little you can do inside of the home simply because a man's home is *his* castle. You can, of course, add a trap at pole; that's *your* castle (well, your's and the local utility company's). This of course stops cheating without injuring the basic service.

(C) *Delinquent Cut-Off*—Most pay cable subscribers are billed separately for pay and regular service. If he is delinquent on his pay service, you are reluctant to cut-off his *complete* service. As a matter of fact, you might be in trouble if you dis-connected both services to get him on the dime for his pay service bill. So installing a pay trap is one solution to bring him into line to pay for his delinquent pay service.

continued on next page

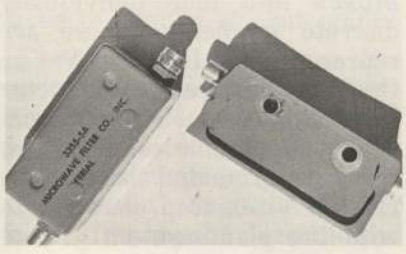
MICROWAVE FILTER TRAPS—

One Approach

Most of the traps offered to the CATV industry at this time are little blue/black/gray (etc.) *boxes;* with input and output fittings. Some of the boxes are rectangular, some are cylindrical. But they are all *basically boxes* with *discrete electronic components inside.*

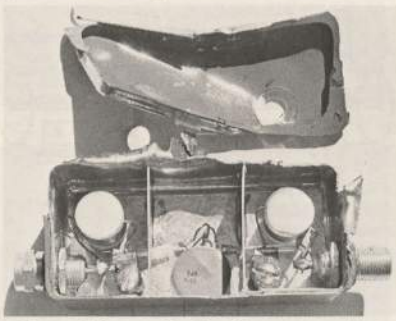
The combination of parts, design skill and alignment techniques, creates the desired user product; a trap that selectively sucks out or attenuates the design visual carrier frequency signal.

The *Microwave Filter Company* (6743 Kinne Street, East Syracuse, New York 13057) 3355 filter was inspected during the course of our study of traps on the market.



As the photos show, the 3355 filter has a pair of fittings. One readily screws onto the subscriber's directional tap output spigot at the feeder line, and the second accepts the customer's drop cable pre-fitted with an "F" fitting.

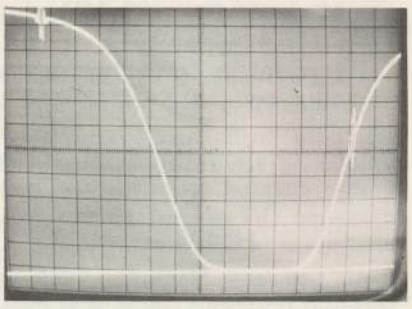
Inside of the 3355 there are three compartments. There are two caps on the bottom plate which a technician can pop-off for alignment. The unit is constructed and rough aligned, then the bottom plate is put on and the final tweeking takes place through the two holes in the bottom plate. Then the unit is cap-sealed and dipped with a paint coating.



In taking off the bottom plate to get at the inside for the photo shown here, we have moderate difficulty breaking the seal and removing the plate. This indicated to us that the RF seal for the trap is exceedingly good. A "radiation test" we performed verified this. Attenuation through the box was in excess of 80 dB.

The amount of *on channel* (5 in our case) attenuation we measured was between 64 and 69 dB on two units we sampled (note . . . units were supplied to us by manufacturer).

Sweeping a trap, with conventional techniques, is at best risky. The trap has such sharp skirts that following the trap to its nominal depth is difficult to do accurately, *without a tracking generator system.*



None the less, with that caveat, we display here some sweep displays of the 3355 unit.

continued bottom next page

Trap-Guarding Hardware (TGH)

Definition: Trap-guard hardware (TGH) is any device or operation (costing you money) attached to the basic signal-trap to increase the difficulty in circumventing the trap itself. This may take the form of connector locks, "security shields," shrink tubing sleeves, enclosures, welded straps, epoxy bonding, and so on.

Traps are installed on a very basic premise; you, the CATV operator, wish to be paid for your special premium service. Any circumvention represents an unauthorized (call it *theft* if you wish) use of the service. More important, it represents a loss of revenue.

In many cases operators view "theft" of services as a personal affront and *possibly* overreact. This can mean that you may rush out and adopt an "all means" prevention without rational examination of the costs vs. the payoff. The key word in this study and cost study equation is *potential* revenue.

Fact: All would-be-thieves who fail are *not* going to immediately (or soon, or ever) subscribe to the pay or premium service. So we should employ the mathematics of probability in figuring out just how much TGH is enough TGH. Uncontrolled, irrational TGH can easily double the cost of the basic trap device.

To avoid this emotional hang-up ("I'll fix that so and so; steal from me will he!!!") and to avoid overspending in your reactive process, the following analysis is suggested.

We can certainly agree on Rule One:

The Cost of TGH should not exceed the revenue expected to result from buying TGH.

Let's define some terms:

Pc = Probability (0.0 to 1.0) that the typical non-subscriber will try to circumvent the trap;

Ps = Probability (0.0 to 1.0) that an unsuccessful would-be-thief will subscribe, once thwarted;

E = Probability (0.0 to 1.0) of theft failure, if theft attempted;

X = Cost of TGH per non-subscriber;

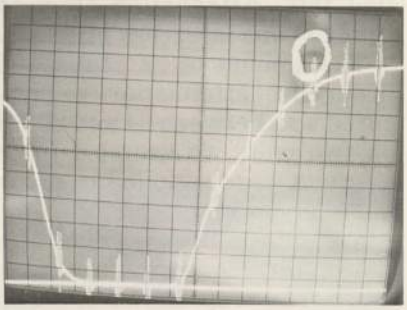
R = Net revenue per *pay subscriber* per year (taking into account that amortisation of basic trap and installation has already been figured into costs);

N = Number of Pay non-Subscribers

Therefore, the number of thefts actually prevented by TGH = (N) (Pc) (E).

And, the extra revenue realized as a result of the TGH program is = (N) (Pc) (E) (Ps) (R).

And, total amount spent for



The first photo shows the 80 MHz marker (right hand side of photo, up skirt) while the second photo shows the 1 MHz markers (count down from 80 MHz for 77.25 MHz region).

If you set up to analyze traps on your own, one of the best techniques is to take a signal generator and put it dead-on the visual carrier frequency. Then measure the output of the generator (gets you a relative number), and now stick the trap in the line between the signal generator and the SLM. The difference in level between no trap and trap is the amount of attenuation of the trap *on the visual carrier frequency.*

VITEK TRAPS

Another Approach

The Vitek Traps (Vitek Electronics, Inc., 200 Wood Ave., Middlesex, N.J. 08846) are the most *unusual* CATV pay TV traps on the market; and at the same time, they are the most inconspicuous traps of all.

In the photo here, it appears to be a piece of RG-59/U cable with connectors on either end. If this is all it were, the people at Vitek have a lot of black magic in their cable. Actually, there is not *much more* to it than that . . . and they *do have* black magic employed.

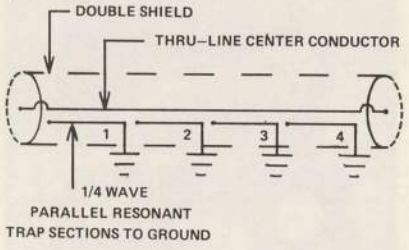
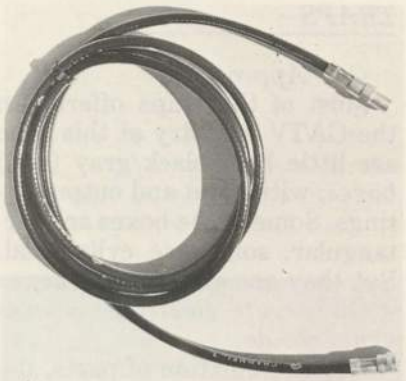


DIAGRAM 1

See Diagram V-1. What we have here is a piece of coaxial cable, *but not RG-59/U.* This is a section of balanced 75 ohm co-



axial cable; that is, *with a pair* of center conductors. Surrounding the pair of center conductors is a double-shield (i.e. very high shielding protection). Now one of these two parallel center conductors runs from input to output of the line section, just as a single center conductor would do in a normal piece of RG-59/U. The second center conductor is *broken* into four individually discrete segments. These are represented in Diagram V-1 as the lower four center conductor lines. Note that each is grounded to the double shield, which is in turn grounded through the DT the Vitek trap connects to with the plant system ground

TGH is = (X) (N).

Now for the return (extra revenue) / (TGH expense):

$$\frac{(N)\,(Pc)\,(E)\,(Ps)\,(R)}{(N)(X)} = \frac{(Pc)\,(E)\,(Ps)\,(R)}{(X)}$$

And referring to our Rule one:

$$(X) \leq (Pc)\,(E)\,(R)\,(Ps)$$

This may seem very analytical but it at least removes the irrational aspect of an emotional response to somebody stealing *your* pay signal! And now we can concentrate on finding a realistic number for each of our chosen symbols. Obviously, only the individual operator is in a position to insert reliable numbers. However, having gone this far with our anti-emotional approach to TGH, let us insert some numbers we believe to be reasonable for the exercise of the formulae.

Pc = 0.20 — It is difficult to imagine a situation, even in Hoboken, where 20% of the subscribers to the regular CATV service would attempt theft of the pay service. After all, the trap is 18 feet or so above ground, which immediately means the aged, the lazy and the infirmed are eliminated. (In Hoboken that doesn't leave 20% as even *capable*!)

Ps = 0.25 — This number may not apply to new situations where the pay service is offered the very first time the potential subscriber has the opportunity to take *any* cable service, but 25% (1 in 4) does seem a likely number for existing systems where cable comes along first followed some time later by the optional pay service.

E = 0.75 — It is hard to imagine any low-cost trick or device which would resist more than 75% of the concentrated tricks to crack or circumvent it.

So we have (X) = (0.20) (0.25) (0.75) (R) = 0.0375R.

If we estimate the resulting *net* (that is now much *YOU keep* after paying the program suppliers and delivery costs) at $20.00 per year, then X = $0.75.

Hmmm.

Ok, plug in your own numbers and see where *you* come out.

Minimum Cost Strategy — Double Trapping

Let us finally examine the conditions leading to a need for a second (audio/SND) trap.

A) Sound trap (or additional sound attenuation) needed only if language objectionable to parents of very young children or childless "puritans";
B) Not all parents of very young children will object orally or actively (i.e. disconnect);
C) Not all homes have very

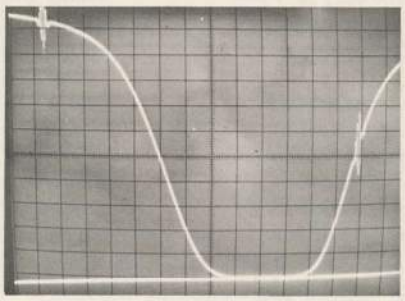
(i.e. strand, feeder aluminum shield, etc.).

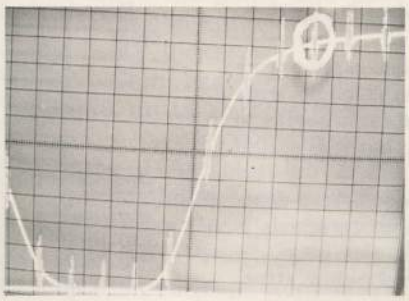
In effect, the second center conductor, broken into resonant 1/4 wavelength sections, couples energy in the frequency region represented by the resonant 1/4 wavelength sections to ground. The *total* piece of line radiates *within* the double shielded environment from the through-line center conductor to the broken-line center conductor. And energy on the 1/4 wave line sections ends up being trapped to ground.

We don't know how Vitek manages the clean look to their construction, but it takes a few minutes of looking, even knowing what you are looking for, to find where the slight indentations exist that indicate a 1/4 wavelength segment of the second center conductor has been forced to ground at that point.

The tuning of this device depends entirely upon the ability to separate the second center conductor into resonant 1/4 wavelength segments and take it to ground through the double shield. This means exceedingly close "whacking off" of the segments, after calculations have been performed for the operating frequency, the K or propagation factor of the particular cable, and the end loading effects of the globs of solder the magicians from Vitek somehow manage to squeeze down inside of the poly outer jacket.

The number of resonant 1/4 wavelength sections (there are 4/5 in the Vitek trap) determines the amount of total (i.e. sum) trapping on the resonant frequency. We received a channel 5 and a channel 7 unit from Vitek, and they ran from 78 dB (channel 5) to 80 dB (channel 7) on the visual carrier frequency.





This is really a pretty clever piece of design work, and equally important in our present trap environment, it is also a pretty innocent looking device. Even to a semi-literate electronics type trying to beat the system, unless he knew *this was a trap mechanism*, the relatively innocent section of 59-appearing cable, "spliced in" between the DT output and the drop run would never attract much attention.

The photo here shows the channel 5 Vitek unit with 10 MHz marker at 80 MHz; and in the second photo the 1 MHz markers indicating the general location of the 77.25 MHz visual carrier frequency. It was our observation that the bottom of the trap (i.e. the deep part frequency) bandwidth is about 40% wider than the Microwave Filter 3355 unit also checked at the same time.

young children;

D) *Reasonable*, childless "puritans" will be satisfied to switch off the "dirty" channel.

So we have a proposed X-Y strategy, as follows:

X) Install extra SND trap only upon subscriber complaint. The probability of the complaint is between 0.0 and 1.0 (i.e. Pc = 0 to 1). It won't be 0, and it won't be 1, so for discussion let's adopt 0.5 (50%).

Y) You *propose* that the *objector pay* for the trap. Probability that he won't pay (or become hostile) is between 0.0 and 1.0 (i.e. Pp = 0 to 1). Again, it won't be 0 and it won't be 1, so let's adopt 0.5 (50%).

Let Pe = pay penetration
S = total system subscribers
Ct = cost of single trap
Cp = cost of traps *per pay subscriber*

$$Cps = \frac{(Ct)\ (S)\ (1\text{-}Pe)\ (Pp)}{(S)\ (Pe)}$$

$$(Pc)\ (Pp)\left(\frac{1\text{-}Pe}{Pe}\right)(Ct)$$

or cost of sound traps per pay subscriber.

At the same time the cost of a PIX trap per *pay* subscriber is:

$$Cpp = \frac{(S)\ (1\text{-}Pe)\ (C+p)}{(S)\ (Pe)} = \left(\frac{1\text{-}Pe}{Pe}\right)(Ct)$$

Then, under the X-Y strategy the total cost *per trap* (of double trapping) is:

TC = Ct (1 + PcPp)
If Pc = Pp = 0.5
Tc = Ct (1.25) or 25% above single trap cost.

If we are more pessimistic and make
Pc = 0.7
Pp = 0.7
then:
TC = Ct (1.49) or 50% above single trap cost.

Appendix

Relation BW, NA and F

INTERCARRIER SETS—HOW FAR DOWN IS ENOUGH?

Signal trapping, until the advent of pay TV and "secure channels" has always been a headend kind of technology. Adjacent channel traps, often tuneable, from Blonder-Tongue, Jerrold, and some of the MATV units from Winegard and Channel Master are found in many (if not most) headends.

At the subscriber's drop, it is a whole new ballgame. There is considerable talk around about "trapping the video down so that the audio does not leak through." **What is that talk all about?**

Because of a television receiver design change first introduced in the late 40's, television receivers are designed around a principle known as "inter-carrier". An inter-carrier set (and all are now) requires the presence of a video carrier before the audio can be detected. The effective I.F. required to pass the **audio only** signal is around +/— 25 kHz. The effective I.F. required to pass video only is +/— approximately 2.0 MHz (4.0 MHz total). The combined I.F. bandwidth required to pass video, color and audio is approximately 4.5 MHz.

An audio only receiver (i.e. one designed **from scratch** to receive only television [FM] audio, and to do it with maximum sensitivity) can recover very good quality **audio** (at the speaker) with RF inputs to the receiver as low as 1 uV (—60 dBmV). On the opposite end of the coin, a video only receiver (i.e. one that forgets audio) would produce a slightly noisy picture with video inputs at RF of 100 uV (—20 dBmV). So the wider bandwidth of the video modulation products (4.0 MHz vs. 50 kHz) creates a situation where the video component is the limiting weak-signal-recovery factor.

The question, in CATV single channel video carrier trapping, is simply this. How far **down** must the video be, **from the audio on the desired channel,** before the audio begins to garble and get noisy? That is **the** question, **but it is stated incorrectly.**

It is **not** just **how far** below audio that video is trap-dropped; it is **at what level at the receiver input terminals** is there so little video left that the audio is **also** gone.

We have a **dual** requirement; video level **below** attendant audio level, and, **the absolute video level** itself.

CATJ has run a series of tests to determine, for our own information, just what type of numbers we might be dealing with. Here is what we find.

(1) **The absolute sensitivity level of the receiver is the most important ingredient.** For example, line up a sampling of home receivers now on the market, and feed identical levels into each one. We find that when the visual carrier level drops below —30 dBmV the **average** receiver **starts** to produce noisy audio. By the time we have a visual RF carrier level of —40 dBmV, **all receivers have noisy audio** and a few have no audio at all. And by the time the visual RF carrier level is at —50 dBmV the audio recovery on even the best (read most sensitive) receivers is gone, or so noisy that even with straining and close attention, you cannot understand the audio from the speaker.

(2) Therefore, you design for the worst case, and add a safety factor. To CATJ, this means insure that the receiver gets a visual carrier reading of —50 dBmV if you want nobody to recover audio; or be offended by the language leakage.

That is an absolute receiver input RF level; —50 dBmV. It has nothing whatsoever to do with the amount of attenuation the trap provides on the video carrier level, unless...

(3) ...you start off, **as everyone should,** thinking about the amount of trapping you need, **as a function of the drop levels present.**

Here is a table (table one) that puts that into perspective:

TABLE ONE — Subscriber Drop Levels vs.

Trap Visual Carrier Attenuation

Drop Level	40 dB down Trap	50 dB down Trap	60 dB down Trap	70 dB down Trap
+20 dBmV	—20 dBmV	—30 dBmV	—40 dBmV	—50 dBmV
+10 dBmV	—30 dBmV	—40 dBmV	—50 dBmV	—60 dBmV
0 dBmV	—40 dBmV	—50 dBmV	—60 dBmV	—70 dBmV
—10 dBmV	—50 dBmV	—60 dBmV	—70 dBmV	—80 dBmV

All simple traps are some variation of the circuit in Diagram 5. This is an L/r/C resonant circuit in shunt. The coil (L) is the heaviest contributor to circuit resistance (r).

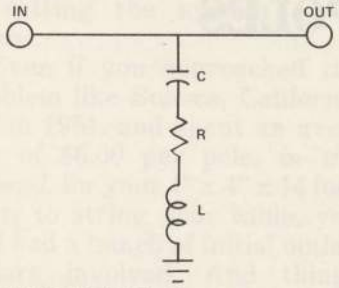


DIAGRAM 5

We adjust the L/c to resonate at thus:

$$(1)\ \text{Fpix (MHz)} = \frac{159}{\sqrt{LC}}$$

(L in UH, C in pfD)

leaving us with a shunt resistance (r) which gives us a notch attenuation of:

$$(2)\ \text{AN (dB)} - 20\text{LOG}_{10}\frac{75}{r} - 6\ \text{dB}$$

We also know that L and BW (3 dB bandwidth) are *inversely* related, i.e.:

$$(3)\ \text{BW (MHz)} \frac{Z}{4\pi\ \text{L (uH)}}$$

Which tells us we have to increase L to make BW smaller.

Suppose we wish to make BW smaller. We increase L to do this and then we find that AN also gets smaller in the process; I.e.:

addition of coil turns (to increase L) increases r.

Suppose we wish to retain BW and restore our fallen AN. We must wind a bigger coil (larger diameter and larger guage wire) to retain L and decrease r. This causes us to increase the container (can) size correspondingly, so the volume of the device goes up (i.e. it gets bigger).

Now suppose we retain L value (and hence BW) and the container size but wish to operate at a higher F (frequency); r *increases*, and hence, AN goes down.

We can then relate AN, BW, frequency (F) and volume (V) approximately as follows:

$$\frac{(AN)\ (E)}{(BW)} = KV$$

or

$$(AN)\left(\frac{BW}{F}\right) KV$$

And we see that *percentage bandwidth* is a key term.

THE PRO-COM APPROACH

Pro-Com Electronics (P.O. Box 427, Poughkeepsie, New York 12601) takes several *different* approaches to the pay-TV trap problem, and as a result, have several *unique* products on the market.

Pro-Com believes that there is no adequate amount by which the visual carrier can be "dropped" to *totally* kill the audio. *"If the set user fiddles with the fine tuning, he will find audio except in very severe trapping situations"* notes Pro-Com.

Their basic trap approach is to provide an extremely narrow trap-width at the bottom of the 'curve'; typically 30-50 kHz at the 3 dB points. *"We center this above the visual carrier frequency slightly; when the visual carrier is removed, this leaves the sync buzz in place to help tear up the audio."*

Additionally, Pro-Com offers, apparently exclusively, an 'indoor version' called the PG KEY (for Parental Guideance Key). The unit mounts inside, behind the converter, in a closet, etc. and the user receives a "key" to activate the passive trap when the parents (for example) leave the home and do not want the kiddies watching nasty flicks.

Pro-Com has more than 50,000 units in the field, some go back 'as far as' seven months. UA Columbia and Sammons have been heavy-users of the Pro-Com traps.

Finally, Pro-Com says their "cubed-trap" does less damage to the immediate lower adjacent audio than other designs; primarily "because of our steep trap skirts." They note that their low band traps attenuate the immediate adjacent audio 4 dB, mid band traps by 8 dB and high band traps by 12 dB.

Jerrold/Texscan's Model 727

SIGNAL LEVEL METER

the proven standard of the industry

...available from stock.

☐ **FREQUENCY RANGES: 5-216 MHz...Plug-in adapter extends range to 300 MHz. UHF plug-in adapter for 470-890 MHz range.**

☐ **MEASUREMENT RANGES: 10 microvolts to 3 volts (10 ranges, calibrated in dBmV).**

☐ **ACCURACY: measures any video signal-level amplitude to within ±1.5 dB.**

☐ **ADJACENT-CHANNEL REJECTION: 46 dB.**

Model 727 can be powered from its own rechargeable battery, from 12 V dc truck source, or from 115 V ac source.

Contact your man from Jerrold for complete specifications in new CATV test equipment catalog.

JERROLD

a GENERAL INSTRUMENT company

JERROLD ELECTRONICS/CATV SYSTEMS DIV.
200 Witmer Road, Horsham, Pa. 19044

EVERYTHING YOU NEVER HOPED YOU WOULD NEED TO KNOW ABOUT SETTING YOUR OWN POLES

A Step Backward?

Well, here we are in 1975 and talking about setting our own poles.

Good grief.

The very earliest systems had pole attachment problems. L.E. "Ed" Parsons, in Astoria, Oregon had them. His November-1948-inaugurated CATV system *also* had underground problems. In fact, the early Astoria system was a microcosm of just about every problem we have today with utilities. Therefore a brief step back 27 years is not out of line.

On Thanksgiving day in 1948, Ed Parsons began delivering master-antenna signals to residents other than himself, in Astoria, Oregon. His first drop lines ran vertically, down the side of a multi-story hotel building, to adjoining buildings. His headend was atop the tall building. Then he went down the *same* block a shortways by going from building to building. Finally, to avoid having to *even talk with* the local power and telephone utilities about using *their* poles (the very *thought* of using utility poles upset Ed), Parsons went into the City of Astoria *underground ductwork* and laid his cables alongside of the city liquid service pipes. The Astoria system spread underground, as it were, probably without anyone's permission. He didn't cross over streets, he went *under* them. At various manholes and water drain inlets Parsons brought his cable back into sunshine and ran *within* the block to houses along the way.

It was not until late in 1951, more than three years after Parsons inaugurated service for Astoria, that the city, insisting that Parsons get a franchise from them, also insisted that Parsons get *out* of the city ducts and into the open air. Parsons complained that the utilities would never agree to him attaching to their above ground poles; the city put on their Henry Kissinger profile and negotiated on Parson's behalf to create a sort of four party agreement: (1) The *city* would grant Parsons a franchise to operate, (2) the *power company* would rent Parsons pole space, (3) the *telephone company* would rent Parsons pole space, if only (4) *Parsons* would get *out of* the city's ductworks! Parsons finally agreed to vacate the ductworks, and by January of 1952 his system had a city franchise and the power and telephone utilities had a new tenant.

The Parsons agreement was hardly the *first* pole attachment agreement. In fact, his three-plus years of operation with*out* a pole agreement and with*out* poles probably set some sort of record that stood until much later "underground adventures" in communities such as Carmel, California in the early 60's.

If there was a first pole attachment permit in this industry, John Walson of Mahony City, Pennsylvania *probably* had it. His, dated October 2, 1950, with Pennsylvania Power and Light, allowed his "temporary connection" to 13 poles. Twenty five years later the temporary attachments are still there. And Walson has added "a few" additional poles in the interim.

Utility companies have always been something of a stumbling block to CATV. Very few, if any, utility companies had any policy regarding foreign attachments to their poles (i.e. attachments by a third party, the *first* two being the utility power and the utility Telco). A limited number had "procedures" established that allowed *municipal* departments (such as city street light departments) to rent from them pole space to run traffic light signal control wires, or even communication circuits between fire alarm boxes and a central point. But none, to our research and knowledge, had existing provisions for third party private entrepreneurs who wanted to run privately owned wires on their poles.

Some of the early CATV system builders *had to be good salesmen.* They succeeded in talking their respective utilities into allowing them to string their cables in places like Batesville and Panther Valley. Others, in towns such as Sonora, California were more like Ed Parsons; they didn't want *anything* to do with the utilities. Period. And so in Sonora, and in a very high percentage of other *early systems,* the systems went in *on their own poles.*

Because CATV has always been a capital-intensive business, requiring more cash to

construct the initial system than was ever on hand at one time, virtually every operator who has ever looked at a P and L or balance sheet projection has given short shift to the concept of setting the system's own poles.

Even if you approached the problem like Sonora, California did in 1951, and spent an average of $6.00 per pole, *in the ground*, for your 4" x 4" x 14 foot *posts* to string your cable, you still had a bunch of initial outlay dollars involved. And things have gone from a lot of money to a hell of a lot of money, for setting poles, in the 24 years since Larry Jacobsen built Sonora, California.

Consequently, people who have set poles in this business have been generally considered "far out," "poor businessmen," "crazy" or perhaps even "dumb." In the 50's and even into the 60's the argument against setting poles went as follows:

"You say you are setting your own poles? What is it costing you to set a pole?"

"Oh, $15.00 to $18.00 each perhaps..."

"Good gosh man, I pay $1.50 per pole per year rent. Now how in the world can you come out on a deal like that? Why I can rent poles for 10 or 12 years for what you pay out initially to put that pole in the ground!"

And the renter walked away shaking his head and muttering things like "crazy fool."

Well, maybe the pole-setter was not so crazy after all. Maybe he was smart, or, just plain lucky.

John Thompson, a modern-day operator at Atoka and Coalgate, Oklahoma told us *"I would set my own poles even if the rental fee for an attachment was just $1.00 a year a pole and it never could go up at all...."*

So in the 50's, a man who set his own poles, during an era when the utilities were *at best* confused and non-precise how they should *approach* CATV attachment requests, was considered crazy. Then the first set of attachment snags rocked the industry.

Carmel, California, was *one* of the first hit by telephone company and power company revolt. Carmel also had extensive portions of city utilities underground, so the builder of the first system there knew going in that he was going to have to emulate the underground boys in at least extensive parts of town.

Bill McPheeters remembered about the early Carmel underground experiment.

"I wish I had opened a car wash along with starting underground construction in Carmel. We spent several thousand dollars to have people go down and get their cars washed after we trenched alongside their parked vehicles and the concrete saw sprayed their fine autos with that pulverized dust!"

McPheeters and his partners were not short on stout; they were not afraid of the unknown and building an underground plant (one of, if not *the* first city-wide system in the nation) didn't deter them from their noble experiment.

California, including Carmel and Sonora, has always been a hot bed of your basic utility company unrest. It is best typified today by the strong anti-utility feelings that the California association has, and by California cable personalities like Bill Hargan and attorney Harold Farrow. Mention pole attachments to either and be prepared to empty a bottle of good Canadian spirits while they talk non-stop.

It was in California that the utilities discovered the art of freezing pole attachment agreements. Bell, and the power company majors, simply one-day *refused* to grant any new attachment agreements, for several years. Nobody thought to call it a "freeze" in those days, but freeze it was and the FCC probably got their own concept for freezing CATV from the same place.

So much for history.

Why today would a CATV operator give more than passing, mused thought to setting his own poles? Primarily because he may be faced with either setting his own poles and going into the CB business, or, alternately, going underground...or going into the CB business. The pole attachment problem is *that* serious.

Let's examine some numbers which have come out of the most recent Bell negotiations and agreement.

As Table One shows, rates for Bell pole attachments vary from area to area. It is unclear why they do, except perhaps this helps protect the Bell image of autonomous, independent, operating companies all under the Bell banner.

TABLE ONE –
AVERAGE BELL/ETC. RATES

Bell of Nevada	$4.00	
Cincinnati	4.00	
C & P of Maryland	4.00	
C & P of Virginia	4.00	
C & P of W. Va.	4.00	
Diamond State (De.)	**2.50**	**(Lowest)**
Illinois	4.25	
Indiana	3.25	
Michigan	4.00	
Mountain States	4.00	
New England	4.10	
New Jersey	3.38	
New York	5.00	
Northwestern	3.43	
Ohio	4.00	
Pacific California	**2.50**	**(Lowest)**
Pacific Northwest	2.54	
Pennsylvania	2.50	
South Central	2.59	
Southern	3.45	
Southern New England	**4.50**	**(Highest)**
Southwestern	3.00	

What Table One does not show, is what happens when you set about comparing Bell pole rates with *other* utility company pole rates. Table Two does that for you. Now, Table One comes from the FCC, where the Cable Bureau played the role of arbitrator between the CATV industry and the Bell Company. Table Two, on the other hand, comes from a CATA member study conducted this past summer. You will note that while Bell rates are *not* low, they are hardly the highest rates facing CATV operators. To no one's

TABLE TWO – CATA MEMBERS – AVERAGE

In July CATA asked members to supply confidential pole-attachment data for their systems. Molded into a single set of "averages", the numbers indicate how typically smaller, typically independent systems are currently being charged for pole useage.

Study By Rates Charged

Pole Rates	% Total Contracts	Avg. No. Poles Per Contract
$1.00 down	9.2%	384
$1/$2.00	20.4%	499
$2/$3.00	41.0%	523
$3/$4.00	19.7%	398
$4/$5.00	9.4%	396

Study By Pole Owners

Pole Owner	$1.00/down	$1/$2.00	$2/$3.00	$3/$4.00	$4/$5.00	$5/up
REA	0.8% (*)	2.4%	1.6%	0%	0%	0%
Local Electric	6.5%	4.0%	4.0%	1.6%	0%	0%
RegionalElectric	0%	6.5%	12.1%	12.1%	6.5%	0%
Independent Telco	0.8%	4.0%	4.0%	0.8%	1.6%	0.8%
Bell Companies	0%	1.6%	10.5%	6.5%	1.6%	0%
General Tel	0%	0.8%	1.6%	0%	0.8%	0%
City/Municipal Poles	3.2%	0.8%	2.4%	0%	0%	0%

*—Percentages are indicative of the percentage of pole contracts of members surveyed falling into each category. I.e., 0.8% of all members have REA contracts paying under $1.00 per pole per year.

surprise, the large, regional power companies are the culprits; they lead the pack in setting unreal pole attachment rates.

Which is another way of saying that if Bell rates are troublesome, regional power company rates are next to impossible. And they promise to go clear out of sight if recent (and current) "talks" between power company executives and CATV negotiators are any indication of the way the wind is blowing. Florida is facing a rate of approximately $8.50 per pole attachment per year; Kentucky and West Virginia are looking at a just under $7.00 rate demand, and isolated companies in Texas, and Louisiana report to us that one regional power company there is now talking about $6.50 rates per pole, per year *plus* a $1.50 per pole inspection charge per year *plus* cash bonds that average approximately *$25.00 per pole!*

Clearly, Larry Jacobsen in Sonora, California was *not* so crazy when he built his plant on 4 x 4s in 1951.

One *must* ask the $64.00 question, which is *"why?"* Why would the pole owners *suddenly* become so unreasonable in their demands? Why should regional power companies, people who have never been exactly kind but who until recently have not been "*that*" hard nosed either, suddenly stick out a stiff upper lip?

There is the conspiracy theory, best set forth by Harold Farrow. *"I can't prove it...I doubt anyone can, but I believe the power utilities are taking their cue's from New York offices of a certain large telephone utility"*. Farrow means a conspiracy.

If you follow that theory to its logical conclusion, you come to a crossroads towards the end of the trail where if you turn right you accept that the Bell people believe if they have the regional power companies asking for *outrageous* amounts of money from CATV operators, that the grateful CATV industry will be more ready to accept the simple *unreal* rates "requested" by Bell. In effect, the power companies bowl us over with their brashness, while Bell comes along and *by comparison* looks like a pretty good bunch of guys.

Or, down the opposite fork on the trail, you see at the end of the roadway a Bell man sitting with an abacus under one of his own poles keeping a running record of the average pole rates being negotiated by the regional power companies. The average goes up monthly, of course, and Bell stays on top of this average number so that in effect they have the power utilities testing the waters for them. That's called making the power companies the "point men" for the invasion force.

If you are *not* of a suspicious mind and the conspiracy theory is not your cup of tea, then you may accept the hard-fisted-businessman theory. The facts are there for this one too. *The power companies are in a hell of a cash bind.* Unlike the telephone utilities who, like everyone else, *merely* feels the inflation crunch, the power utilities are also *directly* feeling the fuel cost rise crunch. And that is a much bigger yoke to carry around than simply the inflation spiral. As the advertisement reads, "have you looked at your electric bill recently?" In many areas of the country it has gone up 300-500% in just one year. The national news media had a field day last spring with people (homeowners) in the northeast who all but emptied their bowels at their mail boxes upon opening their friendly electric company bill to discover that it now cost $400.00 for electricity for a single month for a simple 2,000 square foot home.

Electric company rates are PUC regulated; but, and this is a *big but*, in most states the rates are *automatically pegged* to the cost of fuel paid by the electric company to fire their generating stations. So, a fuel rate rise, to them, automatically, without a PUC hearing, translates into advancing consumer electric rates.

People having intestinal disorders at their mail boxes won't give electric company executives calm stomachs. It is not difficult to imagine a hard nosed accounting manager of a regional power company pour-

Continued pg. 32

RENTING COSTS

What does it **really** cost you to rent pole space? First there are make ready costs. Some utilities charge for strand walkout and pole checking; i.e. to determine what physical re-arrangements **may be** required. With those utilities that do charge for this going-in service, it averages 50 cents per pole for utility field and paper work.

Then there are pole make-ready charges. The extent of make ready required varies from utility plant to utility plant, and from utility walk-out supervisor to walk-out supervisor. Certainly $5.00 per pole average is not high, based upon CATJ studies. Some make-ready costs average far above this charge, in the $15.00 per pole range.

There is the time (i.e. time is money) expenses associated with negotiating the pole attachment contract; including the time of **your** attorney. If the contract re-opens every one, three, five etc. years for renewal, there is the likelihood that these negotiating expenses will **reoccur** in regular intervals.

There is the cost of the insurance and bonds, **required by the utility companies.** Most utilities ask (and get) no less than their full-projected costs of having to remove your lines, etc. from their poles at their expense; **in the bond.** The bond costs money, although it may be in the form of a personal guarantee from a system owner or stockholder.

Some utilities require a **cash** bond. One system in Texas, on 1050 poles in five communities, is currently being forced to put up a **$25,000.00 cash bond.** That works out to $23.80 **per pole cash bond!** Even **if** you have the idle cash around, you receive **no interest** on it while it lays in the utility bank account. You can be sure that they do collect interest on it. If you must **borrow** that cash money, you are looking at no less than the prime rate per year. In the case of the Texas system, $25,000.00 at 9% interest works out to **$2.14 interest per pole per year.**

Then there is the obvious annual rental fee. Plug in your own number.

And, many utility companies are also charging an annual "inspection fee" now. Our Texas example system is paying **$1.50** per pole per year on top of the rental fee ($5.50). This raises the effective annual rental rate by the inspection fee per pole.

Lastly, there is the cost of be-

HOW DO YOU FINANCE POLES?

There are two thoughts to this problem, **aside from** the obvious point that your total plant-cost-per-mile costs "simply go up" by your pole costs per mile.

One operator we talked with told us this is how he is doing it.

He is presently on approximately 700 of the utility company poles. He is paying $3.00 per pole per year **now.** He has been in business several years, and his bank loan is about 60% paid off.

He has determined that his own pole plant will be constructed primarily on **utility-grade** poles, which he is purchasing for $16.50 each. His freight cost per pole is $2.00. He will set them for $7.00 each, a total investment of $25.50 per pole.

He has taken to his bank his financial data for the last several years, and explained the problem. He makes a particular point of the **current** $3.00 per pole annual rental, **which he has been paying** to the utility company since day one.

His proposal to the bank is this; he will transfer off of the utility poles as his own change-over moves along, and cease paying the utility company as of the date he moves off their pole. He will, however, continue paying the $3.00 per pole annual rental, only **now it will be a bank payment** and not a rental fee. The bank has agreed to arrange the operator's loan so that he continues to pay the same fee for loan repayment as he has been accustomed to paying for pole rental. With bank interest, that works out to about nine years of financing.

The operator holds the option (which he plans to exercise) to step up his pole loan payments in another couple of years, as soon as his primary system construction loan is paid off. He has calculated that within four and one half years, he will be free of his original construction loan **and** his pole loan.

The second plan involves solving the pole-ecology problem at the same time. As noted separately here, a new set of poles in town is **not** going to be easy to "sell," even **if** you already have the right to do so under your franchise/permit terms.

As noted elsewhere here, one of the major stumbling blocks is the city/resident argument that **another set of poles** will make the streets look like a picket fence. The ecology argument held up the vital Alaskan pipeline for nearly a decade, so don't under estimate its vote-power.

But there is today, another rather interesting situation that virtually all cities find themselves in, called the **cash crunch.** Now if you take the **full scope** of your problems (i.e. the utility rates are impossible, and they **will** result in much higher cable rates very shortly, or in the alternative, no cable service at all) to the city, you will at least have their attention.

Explain that you now pay $3.00 ($5.00, etc.) per year for your pole attachment rates and rights; but that you have figured out that you can set your own poles and maintain the cable rates **near** where they are now (plus insure that they won't go up **because of** pole banditos), **if** you have **some help** from the city. The help you want is the right to set poles.

After working out your pole financing at your funding source, **throw in another $1.00 per pole per year.** Now take **that** dollar to your city and say "in addition to paying you our agreed to 3 (etc.) percent annual franchise fee, I also am offering you $1.00 per pole location per year to rent space, **on the ground,** in the easement itself, to install my new pole". This becomes an additional cost to you, but it may help persuade the city that your situation is one where they **can** add some money to the city treasury. If they like this idea, then you have just taken the argument away from the ecology buffs and put it on a dollars and cents **for the city** level.

If the ecology buffs are still strong, make a point that by using your own poles, you will use (i.e. set, new) far fewer poles per mile (like 22-32) than you are now attached to with the utility; in effect, **you will not double the number of poles** present. You will only raise the count by 50-75%. That is an important point, and should not be overlooked.

ing harassed and being placed constantly on the defensive. How do you compute the costs associated with forced-change overs (i.e. the utility company decides to change out a pole, gives you 48 hour notice that they will do so, and you have to be on hand with a crew to do your own changeover at the same time)?

When you list **all of the true costs** of renting, you may be shocked at how high they really are. And one thing is for sure, rental fees are going to continue going up, both directly and indirectly.

ing over his books in the dead of night (probably by candle light) searching for *any* income areas that are NOT pegged to the cost of fuel; where cash can be raised, quickly and painlessly, without *much* public fuss. Pole attachment rates may *not* amount to *that much* for that many utilities, but their unregulated status sticks out like a broken generating station.

Because pole attachment income is *not* regulated, it goes in to utility company books as *net* income. Sort of the same way yellow page advertising does for the telephone company. In short, raising an extra couple of mil by increasing pole attachment rates gets plugged in down there where the PUC's don't study it, but, where investors do.

And that is the key. *Investors.*

In spite of all of their noise about being public and investor owned, regional public power utilities are *just as concerned* about their investor image and their stock prices on the stock market as the average publicly held CATV company executive

GETTING PERMISSION TO SET POLES

Some systems already have permission to set poles. They can skip *most* of what follows. Other systems have a shade of gray going for them; the existing permit does not expressly *permit* setting poles, nor does it *prohibit* it either. That needs to be worked out in the positive before the first truck load of poles show up in your town.

Still other systems have permits/franchises which expressly *prohibit* poles. Some do so period. Others do so *unless* you obtain city approval for *each* specific pole. We will assume here that if you have or can get permission without re-opening your city franchise or permit (i.e. asking it to be modified to give you clear authority to set poles), that you also will stop reading here.

Now what about the system that simply has a permit/franchise that says *"and no new poles shall be set. . . ?"* Period. These guys have got one big problem.

A study done by CATA/CATJ indicates that probably 25% of *all* systems have such a problem. It varies, with newer systems having newer permits/franchises most often having a caveat *against* setting poles. Older systems almost universally have the right today to do as they think best.

There are some states where there is question as to whether the local municipality has the right to grant CATV systems rights to *set poles in the easements.* Such states routinely allow the municipalities to grant "air" easement rights, but preclude the local authorities from granting local *ground*-rights use for the easements. One solution to this problem is to encourage your state legislature to modify the state statute that presently takes that power away from the municipality.

Other than that specific problem, the right to set a pole depends largely upon *your ability to sell the municipality on your problem,* and with your proposed solution. One solution is to bargain with the city; i.e. agree to go underground in those areas where the cost per mile does not *exceed* what it would cost you per mile to set your own poles for the same stretch. Your real interest is to avoid areas of town with an underground plant where the streets and curbs and sidewalks are paved from building edge to building edge; making underground a very expensive proposition. This usually means that in largely industrial and/or business areas, you have costs involved in going underground which you cannot afford. This is where you want the city to *understand* your problem and let you go overhead with new poles of your own.

On the other hand, in alley-fed residential areas, and other areas where the cost of going underground is very comparable to the cost of setting your own poles (see *What Should it Cost To Set A Pole?,* elsewhere here), you are really *better off* taking the money you have decided to spend getting off of utility poles and going underground anyhow. The problem *is* an economic one, and *if you can accomplish your objectives* without spending any more money than you have to (i.e. underground is equal to or even less than your own poles overhead), then *that is the way to go.*

If you take this combination approach (poles where needed, otherwise underground), you will often find the city interested in helping you solve your problem. In fact, some systems CATJ talked with have stayed underground in alley way areas, but routinely come up "for air" at intersections, and rather than bore under the street (at an average of $3.00 per foot up), they set two poles on opposite sides of the street and cross over in the air, then go back underground once on the opposite side. Poles seem to be less obnoxious at intersections (i.e. street corners) anyhow.

The important thing to remember when seeking permission is that you have to maintain a serious, "we are doing everything we can to protect the appearance of our city" approach and attitude. Even *if you have* full, clearly spelled out rights to set all of the poles you want to, right now, a good appearing common-sense based approach to the problem and a good public attitude are very important.

is. So here is a few hundred thousand or a couple of mil of extra *net* income that can be dropped in where it will do the most good; *right close to the bottom line.*

The hard nosed accounting manager for the regional power company knows this.

So it simply boils down to stealing from the "rich" (*that's us* cable guys) and giving to the "poor" (that's the power utility).

And unfortunately, the power companys have man-in-the-street logic on their side. For example, *everyone knows* that *everything is going up* in price. The power companys in particular remind you of this everytime you tune in a favorite show on the telly which they sponsor. This creates a *climate* for their outrageous demands; a climate of pre-conditioning. They figure *you* won't absorb the added expense yourself. Sure, you'll scream and holler about it, but after you consider the alternatives, give in and pay their new rate, they figure you will figure out *some way* to go before your city council and ask for (and receive thanks to public pre-conditioning) a rate increase based upon your pole rate increase. The pole companies don't *really care* if you *do* absorb the added expense, you understand. They don't even care whether the city gives you one; *provided they get theirs.* They figure your's is your problem anyhow.

None of this of course attacks the logic of raising rates for a pole you have been on for ten years, a pole set into the ground twenty years ago, and a pole that will still be sitting there holding up wires twenty years from now. Which troubles CATV people who think logically. This is not your basic logical situation. Logic will win you no points when it comes to arguing a pole-rate-making situation before your city, state or federal mediators.

In a word, you probably *cannot win.* At least not in the final analysis. *Not unless you can prove the Harold Farrow conspiracy theory,* which may be difficult at best to do.

So if you can't win, what then?

You can adopt the posture of L.E. "Ed" Parsons in Astoria and avoid these *bandits* like the plague.

Going It Alone

Being free of the pole rate bandits simply means being *off their poles.* You have two choices, go down under them or go along side of them. Going under them will have to wait; our interest at this point is considering the economics of going along side.

Separately here we address ourselves to the very real problems of getting city permission to set your own poles. From this point on, we assume you have it or can get it.

Poles, Freight and Labor

When *you* come along as a renter, *you* attach to a pole that is already in the ground. That is, admittedly, some convenience. But for that you of course "pay the price."

Let's look at what it costs to get that pole into the ground, so it is ready for *you* to do your strand and cable stringing number.

The Pole—There is only slightly more to selecting a pole than meets the eye. The important pole parameters are:

(1) *Height*—Seemingly the pole needs to be tall enough that when it is in the ground a safe distance to hold it upright (under strand-stress), the top of the pole will be sufficiently above ground to allow you to run your lines a safe distance above the streets. Taunt spans and slack spans must be considered, and we'll have more to say about that shortly.

(2) *Stoutness*—The pole needs to be strong enough to stand up to strand-stress (usually applied at or near the top) without giving. Poles are conveniently "classed" by their dimensions at the top of the pole, which allows you to judge the pole stoutness vs. pole cost quickly.

(3) *Treatment*—Poles are a sufficient problem that you want to put them in and forget them. The Telephone companies commonly employ a 27.5 year depreciation schedule and you may also want to use this program. In any case, if the pole is not properly *treated,* it won't last nearly as long as you would like, or 27.5 years either.

Let's start at the beginning. Poles are grown to be poles. Yellow pine is a common base material, but by no means the only material poles start from. The pole as a tree is cut down, and hauled to a processing plant. There they are clean-peeled, and seasoned (i.e. allowed to sit out in the environment and dry out).

Then the pole is treated. Now there are two commonly employed treating *techniques.* One involves merely dipping the seasoned pole into a vat or container of treating compound. This procedure coats the *surface* of the pole, and in some instances a fraction of an inch or so deep with treating compound. That protects the *surface,* but it does nothing for the interior wood on the pole.

The preferred method is called pressure treating. In a typical pressure treating operation the treating material is no. 1 creosote oil or pentachlorophenol. By applying the treating material *under pressure,* the liquid treatment is forced *into* the pores of the wood. If sufficient pressure is applied, the treating material soaks not only into the pores of the wood, but clear through the pole. So that were you to cut the pole in half after treatment, you would find that the treating material was all the way down to the core of the pole. The logic of all of this is that when the creosote or other

treating material finds its way clear into the core, the pole is protected against rotting at any point, including from the inside out.

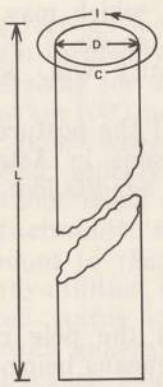
Pressure treatment is measured by *"pounds of retention per one cubic foot of pole material."* A pole that has a specification of "8 pound treatment" will have 8 pounds of treating liquid retained (i.e. absorbed and held) by one cubic foot of the pole wood proper.

Cresote, the most common treating compound, is a coal tar product made up from approximately 50 different chemical compounds. The effectiveness of the mixture comes from the highly toxic agents in the compounds; which individually or collectively are deadly to wood destroying insects and fungi. A pole that has been creosote treated has a characteristic black, oily appearance.

Pentachlorophenol, or "penta" for short, is primarily a heavy concentration of pentachlorophenol dissolved in number 2 fuel oil. Number two fuel oil is of course a petroleum product, and thus has been subject to the recent dramatic price rises attendant to all oil base products. Wood that is pressure treated with oil-borne penta preservative offers protection against both decay and insect attack.

In summary for treatment, a dip-treated-pole is *not* a good choice. It is often and in fact usually less expensive to buy *initially*, but, it is *not* going to last as long. How much shorter a time it will last depends largely on *where* it is utilized. Moist, damp climates shorten the life. So too would the *unlikely combination* of a heavy, damp fog that soaked deeply into the dip treated pole with air-borne moisture, followed closely (while the guts of the pole were still wet) with a hard, *heavy* freeze.

Penta or creosote pressure treated poles last longer. There is some debate as to which offers the best bargain. Power and telephone utilities seem to use both. Penta poles, because of their oil-base carrying mechanism for the penta itself, are likely to go up in price faster than creosote treated poles in the near term. Pressure treated poles should be bought based upon the amount of retained treatment per cubic foot of pole. An 8 pound treatment is considered adequate by most users; 10 is perhaps a luxury and it certainly is *more expensive.*



CLASS POLES — BASED ON MINIMUM POLE TOP DIAMETER, AND, CIRCUMFERENCE.

DIAGRAM 1

Returning now to the pole proper, let's talk about pole classifications. The pole manufacturing people generally agree on something called "Class Poles". These are poles which have certain minimum top circumference and minimum top diameters. See Diagram one.

Poles are generally classed between one and ten. The smaller the number in the classification process, the "stouter" the pole. Class 1 poles are monsters, class 10 poles are strictly for pole vaulting. See table 3 here for a break down of what determines what class a pole falls into.

Table 3 is a *minimum set* of circumference and diameters for "Class" poles. These are *standards* for the pole manufacturing industry, adopted in 1963. It is important when ordering poles to know from your particular supplier how he arrives at his "Class" pole determinations. If the supplier follows the guidelines of "A.S.A. 05.1-1963" (for Southern Pine poles, for example), you are getting what you probably want.

Table 4 is a table based *primarily* upon table 3, only *this table* has been prepared by a pole supplier (Weyerhaeuser Company). As you can see, Weyerhaeuser *exceeds* (in this table supplied to us) in *their own* min-

TABLE THREE – POLE CLASSIFICATIONS

Per A.S.A. 05.1-1963 for Southern Pine poles, the following standards apply:

Pole Class	Min. Top Diameter	Min. Top Circumference
One	8.59"	27"
Two	7.96"	25"
Three	7.32"	23"
Four	6.68"	21"
Five	6.05"	19"
Six	5.42"	17"
Seven	4.78"	15"
Nine	4.78	15"
Ten	3.81"	12"

TABLE FOUR – WEYERHAEUSER SPECIFICATIONS

Per Weyerhaeuser Company (Box B, Tacoma, Washington 98401) specifications for their own poles:

Pole Length	Class Five	Class Six	Class Seven
25 Foot			
Cir.	25.5"	23"	21.5"
Dia.	8.11"	7.32"	6.84"
30 Foot			
Cir.	27.5"	25"	23.5"
Dia.	8.75"	7.95"	7.48"
35 Foot			
Cir.	29"	27"	25"
Dia.	9.23"	8.59"	7.95"
40 Foot			
Cir.	31"	28.5"	n/available
Dir.	9.87"	9.07"	n/available

imum standards the A.S.A. 05.1 spec by quite a little bit. In other words, A.S.A. 05.1 is a *bare minimum;* you may find that your own supplier will give you stouter poles for your money (or the same money) than the A.S.A. 05.1 spec calls for. The pole business, like any other, is competitive. Oh yes, we have no idea what happened to Class 8 poles; they simply don't appear in tables anymore and we suspect they suffered the same fate as the 13th floor on hotels.

Note in table 4 that as the poles get longer, the Class system sizes change also. For example, because nobody would have any real use (in quantity) for a 65 foot pole that had a 3.81 inch top diameter, there is no such thing as a class 10/65 foot pole.

Note however that you can buy a class 10 (9, 7, etc.) 25 foot pole. Which immediately raises the question what class do you buy if you are using a truck load or two of 25 foot poles? Obviously, the stouter the pole the more it costs. Poles, when all is said and done, are sold (and shipped) *by weight* more than anything else. An 8 pound treated 25 foot class 1 pole weighs 990 pounds; an 8 pound treated 25 foot class 10 pole weighs 235 pounds. One you move with a crane, while the other two men and a small dog can lift into a hole.

A 990 pound 25 foot pole (1) holds more treating material, (2) has more cubic wood volume, (3) requires fewer poles per 40,000 pound truck load, and (4) requires much heavier equipment to move around once you get it to your site. So the CATV user needs to look closely at what it is he wants his poles to do, and then weigh the various factors involved.

For some guidance, most CATV companies *CATJ* talked with are buying class 6 and 7/25 foot poles (with 8 pound treatment). A class 6 pole, 25 feet, weighs 422 pounds. A class 7 pole, 25 feet, weighs 344 pounds. That 78 pound difference can be a bunch if you have to manhandle a bunch of poles into their final resting place. More about that shortly.

TABLE FIVE – WEIGHT vs. TREATMENT

Pole Length	Class	8 Lb. Treat	10 Lb. Treat
25 Foot	1	990 Lbs.	1026 Lbs.
	2	811	841
	3	674	699
	4	573	594
	5	490	508
	6	**422**	437
	7	**344**	357
	9	289	300
	10	235	244
30 Foot	1	1280	1327
	2	1082	1121
	3	921	955
	4	784	813
	5	**660**	684
	6	**550**	570
	7	**454**	471
	9	371	385
35 Foot	1	1567	1624
	2	1343	1392
	3	1155	1197
	4	1004	1041
	5	**862**	893
	6	**742**	769
	7	646	670

Note: **Bold face** indicates pole types most commonly utilized by CATV systems.

Table 5 here shows the differences in weight for 25, 30, and 35 foot poles of classes 1 through 10 (9 for 30 feet, 7 for 35 feet) with 8 and 10 pound protection treatments.

Not all poles being utilized by CATV systems are "Class Poles". In fact, of some 40 CATV systems *CATJ* talked with, we found 28 who are not using "class poles". The alternative is a lower grade pole that is known throughout the pole industry by a number of *different* names. Some suppliers (Weyerhaeuser for example) call this next lower grade of pole a "Utility Grade" pole. This is *confusing* because people who ask about quotations for "Utility poles" may think they are getting the same poles that our *friends* the "utility companies" are using. Not so... Other suppliers call the same lower grade poles "Construction poles", "barn poles" and "rigging poles" and "fence poles" (not to be confused with fence *posts*).

You can buy (and many systems do) "utility grade poles" that are sized just the way that "class poles" are sized. For example, you can purchase a 25 foot utility pole that the supplier guarantees will not have a smaller top diameter than 4.78 inches or a top circumference of less than 15 inches (see table 3). This sounds very much like a class 7/9 pole according to table 3. And you can buy a "utility" (etc.) grade pole by specifying not only the minimum diameter and top circumference but also the treatment. Order an 8 pound penta treatment, for example.

So, if you can order "utility" (rigging, barn, etc.) grade poles with the same size, length and treatment specs as a "class grade" pole, what is the difference? *Money,* and something subjective called quality. *CATJ* found that "utility" (etc.) grade poles often run 10-30% *less money per pole* than "class grade poles". That is a bunch of money, and it quickly becomes obvious why 28 of 40 systems *CATJ* talked with are buying the non-class grade poles.

There has to be a catch, right? *There is.* That subjective thing called quality involves the number of knots in the pole (too many knots, and a pole that would normally qualify as a "class grade pole" becomes a "utility" [etc.] grade pole.), and the straightness of the pole. Now straight is important. No-

body wants a pole with a 30 degree list unless it happens to be going at a point where a heavy back guy is required! Determining when a pole that you bought as a "utility" grade pole is *too crooked* for your own use in CATV is something that we can't do for you, or help you with. In talking with systems buying truck load lots of utility grade poles, we did learn that on the average in a truck load lot of say 110 poles, the CATV operator find 1 to 3 poles *per-truckload* which he wishes were not there. If these poles are simply not useable, *period*, then whatever you paid for 110 poles (i.e. price per pole) just went *up* by from 1/110th to 3/110ths *per pole*. On the other hand, most of the operators who have experience with these crooked poles say that overall they *very seldom find one* that they cannot use *"someplace"*. There is always the end of an alleyway, or a run through a field from the headend to the right of way where these 1-3 poles per load can be used.

A word of caution, however. If you are not familiar with your pole source, and you think utility grade poles (or whatever name they are called) sound good to you, it might pay to make a trip *to the plant* at the outset to inspect the first load of poles coming your way. Or, to arrange "return privileges with the supplier" if you end up with poles that simply don't fit the experience of others who have reported their findings to *CATJ*.

Summarizing the non-class grade poles; you can buy a "utility" (or other name) non-class grade pole for *less money*. It can be bought with the same "class specs" as you would specify with a class grade pole (i.e. *order Class 6, 25 foot, utility grade poles, 8 pound creosote treated* . . . for example). What you give up is a subjective measure of straightness and what you gain are more knots (or a combination of the two). Such a pole would be called a *cull-out* in other businesses. It is sort of like buying 26 dB return loss .412 cable on a special price in the CATV business.

The Freight—Once the poles are bought, your next problem is getting them from where they are to where you want them. There are three ways to do this, four if you are near a river. You can ship them by truck (with trailer of course), by flat car or by gondola car. If you are near a river and the supplier is also, you might barge them in.

Getting the poles to you is a double edged sword. Poles, like most everything else hauled these days, go by weight. In the case of truck load lots, you get from 40,000 to 45,000 pounds of poles per load. Going back to table 5, if you ordered a load of 25 foot class 6 poles, 8 pound treated, you have an average per pole weight of 422 pounds. That works out to 95 poles for a 40,000 pound load up to 107 poles for a 45,000 pound load.

Now suppose you ordered 25 foot, class 7 poles. They weigh

The Non-Class Pole

When you start studying carefully the ins and outs of non-standard poles, you quickly determine that standards are a good thing! Probably the pole manufacturing industry had the same problems until the A.S.A. (ANSI) standards were adopted some years ago.

Not all suppliers have non-class poles available. One Rocky Mountain supplier told us "Oh, you want cull-out poles?" We said "yes". He responded "we don't have any of those. . . if the pole does not make the class standards, we slab the pole for lumber. . . ."

Another supplier, in the Atlantic Coast region said "Yes, we have done business with CATV companies in the past. Most of them buy our building poles." We asked if those were the same as 'construction poles', 'barn poles,' 'utility poles', etc.

"Yes, but everyone calls them something different."

And that they do. What you want, when you are looking for less expensive poles than "class poles" are poles that cull out of the class process. Some plants, like the Rocky Mountain area plant that slabs these poles for board foot lumber, **might** be talked into selling them to you, with penta or creosote treatment, if you know what you want and agree to take a sufficient quantity to cause them to re-direct their processing procedures.

The utility companies simply won't look at or buy these **non**-class poles. They want the Grade A number one expensive poles. And because most pole manufacturers sell poles **primarily** to utility companies, it just never occurs to them that somebody running "utility-**type**-lines" might be in the market for something else. You, as a prospective customer for these "culls" have a small selling job to do in advance of getting your quotation. And, you would be well advised in many cases to make a trip to the prospective supplier to see what the "cull poles" look like; especially if you have no other operator around your area who has purchased non-class poles from the **particular** supplier you are talking to, and has been satisfied with the results.

Because the pole manufacturers are geared up to provide largely class poles, many, like the Rocky Mountain manufacturer, simply do not **maintain** moderate (or large) supplies of non-class poles. Again, many of these divert these cull-out poles for other manufacturing processes. And, again, most or many can be **talked into** re-directing their cull-out poles **if you show them** you are serious about taking them off of their hands; as culls.

What about costs?

This is one of those apples and oranges situations. Lacking hard and fast standards, what one supplier calls a cull another one might not ship. We have attempted to cut through this fog, but must point out that we were not able to visit and inspect the non-class poles being quoted. So buyer beware, or **caveat emptor** at least the first time around.

By regions of the United States, we found the following:

Region:	25' /C6 (*)	25' /C7 (*)	30' /C6 (*)	30' /C7 (*)
Atlantic	$20.13	N/A	$25.13	N/A
Midwest	N/A	$16.50	25.00	N/A
Southern	23.50	20.50	30.50	$28.50
Rocky Mnts.	25.32	N/A	39.42	N/A

The usual rules of shipping by weight and 8 pound penta or creosote treatment apply to these poles as well.

*—Poles are **not** class poles; but have top diameter and circumference specifications **equivalent to** C6 and C7 poles.

344 pounds each. That means 116 poles for a 40,000 pound load up to 130 poles for a 45,000 pound load.

The trucking outfit doesn't care how many poles you get for the load; he charges so much per 100 pounds of load anyhow. But you may care, if everything else is equal, because if the charge is the same for 95 poles as 116 poles, you obviously have more freight-per-pole with the heavier poles.

Going to the trucking industry, *CATJ* has determined the *approximate* rate per pole for trucking a full load of poles (45,000 pounds) over various distances. Here is how it works out:

TABLE SIX – FREIGHT PER POLE

Distance Trucked	25'/C7	30'/C6
100 M.	$1.46	$2.79
200 M.	2.00	3.49
400 M.	3.75	6.54
700 M.	4.41	7.68

By the time you get beyond 700 miles, the rate for freight-per-pole begins to climb rapidly. If you have to go beyond 700 miles, it may be that you need to locate a closer pole supplier.

One more point about pole weight. Yes, class 6 poles, 25 foot, weigh more than class 7 poles, 25 foot. So they therefore cost more to buy and they cost more to have delivered, *per pole*. So too does the weight per pole change with the number of pounds of retention of treating material. There is a 15 pound difference, *for example*, in per-pole-weight for 25 foot, class 6 poles treated respectively with 8 pound treat and 10 pound treat. Heavy treating retention means more treatment material per pole (and therefore higher per pole cost from the manufacturer), and, it means higher per pole freight costs.

The basic minimum truck load weight is 40,000 pounds while the basic maximum truck load weight is 45,000 pounds (per load). Over on the freight car side, which we did not price for distance because of confusing freight transfer situations (the cost of transferring from one line to another), the basic minimum freight car load weight is 40,000 pounds while the basic maximum single car load weight is 120,000 pounds.

What is most surprising about shipping rates is that normally you can ship via truck-freight (on a full load basis) for no more than (and often less than) the amount it costs to ship via rail.

The key is to order a full load (i.e. 40-45,000 pounds) at a time.

Pole Construction Techniques

When you start off on an already installed utility (i.e. Telco, power) pole plant, you don't have many options as to *which* poles you will use. You might bypass a pole now and again, but in the main you use all of the poles the utility companies use.

On the other hand, when you set your own poles, clean as it was without any particular existing pre-conditions, the facts are that you *can use* fewer poles per mile than the utility companies do. For example, two CATV construction firms completed a survey of existing pole plants in four existing CATV towns this past summer. *Burnup and Sims* studied CATV pole useage in Stockton, California and Hialeah, Florida. *Jackson Communication* studied existing CATV plants in Auburn, Indiana and Manahawkin, N.J.

In Stockton and Hialeah, Burnup and Sims found that by using the *same strand layout already in use* (i.e. the strand that had been originally dictated by the presence of the utility company poles), and by *maximizing the length of cable spans* (i.e. placing poles only where safe design practices dictated a support pole), the total number of poles that these two systems would utilize would be 21-22 poles per mile; vs. 39 to 41 "joint-use" poles. To be able to maximize (i.e. lengthen) strand

TREATED vs. UNTREATED and the ARABS

The penta or creosote treatment technique adds some cost to the basic poles. Obviously, you would not seriously consider installing poles that will not last at least twenty years; untreated poles will not.

So what **is** the price differential?

One supplier, located in Washington State, told us "We will sell your members Class 7/25 foot cedar poles for $11.50 each, FOB our yard. Or, class 7/25 foot white pine poles for $16.50 each, FOB our yard". Our pulse quickened. With trepedation, we asked, "this includes penta or creosote treating...?"

"No, that comes extra".

How **much** extra is $25.50 per pole for **treated** class 7/25 foot cedar poles and $31.50 for class 7/25 foot white pine poles. Or, **$14.00 per pole** for cedar and **$15.00 per pole** for white pine; for the **10 pound treatment** he was quoting.

It would seem that the cost of treating the pole, then, is roughly equal to the cost **of the bare pole.** Now...if somebody could come up with an effective, less expensive method of treating the poles, we could really shave pole costs!

As we talked with pole manufacturers throughout the country we always asked "What about pole availability?" Most said they saw no problems (see separate report here) but one said "Of course we have the Arab problem". To which we responded "you mean with the oil base for the treating compound?"

That is **not** what he meant. It seems that with many millions of the PetroDollars going **into** Arabian countries, the Arab nations are coming back shopping for new, sophisticated, modern-day land-line communication systems. It further seems that at least a few of the pole suppliers are quoting large lots of **certain range poles;** you guessed it, class 7/25 and class 6/30 footers.

"If they decide to go ahead in 1976, we expect a run on poles and a dramatic increase in pole prices through the whole country," noted one supplier.

spans, Burnup and Sims designed around 30 foot, class 6 poles.

It is worth noting that if the Burnup and Sims findings translate to other communities, that at 22 poles per mile, using the 30 foot class 6 poles, the CATV company would cost cut its capital pole cost (for the poles alone) to $620.40 per mile, based upon a per-pole-cost of $28.20 each at the pole plant (more about that elsewhere, here).

In Auburn and Manahawkin, Jackson Communication found that if the CATV plant were laid out based upon strand routing *only* where CATV strand was needed (i.e. in lieu of being forced to follow the existing joint-utility strand routes), that the average savings were as follows:

(1) Rather than 40+ poles per mile contacted, the two plants averaged 32 poles per mile, *using 25 foot class 7 poles*. No study was made of a 30 foot class 6 approach to the same plants, but one must *assume* that if the Burnup and Sims numbers translate well, that this would indicate that with larger, taller poles the CATV plants in Auburn and Manahawkin would also drop to 22 per mile.

(2) And, by using their own poles, located where safe design dictated a pole location, and where CATV routes were based upon CATV-need only, the total strand plant mileage was *reduced* by an average of 7%.

So it would appear that there is more to setting one's own poles than simply getting out of the way of the pole-attachment-banditos. There are very substantial initial plant savings; perhaps savings that would *in some situations* more than equal the going in initial cost of using joint-utility poles.

The arithmetic *might* work this way.

(A) Cost of installed plant mile —on joint-use poles. $5,000.00
(Not including pole re-arrangement costs)

(B) 7% of which is $350.00

(C) Cost of poles alone, using 30 foot, class 6 poles per Burnup and Sims study. . . . . $620.40.

(D) Cost of poles less strand mileage savings. $270.40

Of course we still have additional pole costs of a freight and labor to install the poles. On the other hand, we still have with the joint-use approach the cost of re-arrangements and the annual rental. *Forever.*

In most states the CATV company *with the local authority to set his own poles* is required to stay some safe distance *away* from the physical joint-utility pole. This distance varies from 18 inches to 30 inches in most areas; which means, per Diagram 2 that you must set your own pole no closer to the existing pole than that "safe distance". The distance is primarily to allow safe pole climbing.

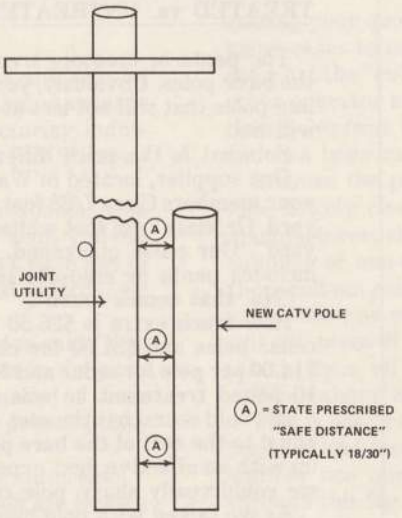


DIAGRAM 2

You have three choices in selecting a location for a pole when your pole line run must go down the *same side of the street or alleyway* as the existing utility.

(1) You can set your pole plant *behind* the joint-use pole (i.e. further back from the street or alleyway edge);

(2) You can set exactly *in line* with the existing pole line;

(3) You can set *in front* of the existing pole line (i.e. closer to the street or alleyway than the existing poles).

See Diagram 3.

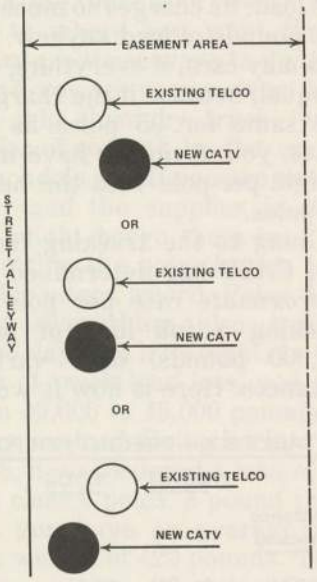


DIAGRAM 3

When you set *behind* the existing pole line, you have a problem with pulling your own strand and cable *through* their drops. Since they service back into the lot from their lines, you find yourself constantly going over, around and through drop lines. This obviously slows down construction, which drives construction costs up. It also presents some safety problems with power drops that run lower than they should.

When you sit *in line* with their poles, you have to go through their poles to make your pole contacts. This doesn't work, so you *offset* with an arm to the rear (which creates the problem of going through their drops) or to the front. Offsetting to the front (street or alley side) is the preferable direction because you have a minimum number of their drops, lines and wires to cross over, around or through.

When you sit out *in front* of their poles with your *poles*, you may often be pushing the outer extremity of the easement region. That is, you may be out of the easement and into the

Continued pg 40

CLASS POLES—WHAT THEY COST

Class poles, with 8 (or 10) pound treatment, are the most preferred poles for a CATV system setting its own poles. As noted here, they **do** cost more money, but, they have a certain amount of added respectability going for them.

Pole sources are not identified in this report. However, systems wishing to make further inquiry may do so by contacting Celeste Rule at CATJ (405/947-4717; or % CATJ, Suite 106, 4209 NW 23rd, Oklahoma City, Oklahoma 73107) for the pole supplier closest to you. Additional pole quotes are arriving weekly, and they are also changing at press time. CATA/CATJ has attempted to get quotes good for a 90/120 days from the date of quotation. Most quotation dates are around October first, and would therefore be good until the first of the year through the first of February.

These prices are presented primarily **as a guide;** although they are legitimate quotations and genuine offers to sell at the prices quoted to CATA/CATJ. It may well be that you can **do as well or better** on your own. However, if you cannot, **then** we suggest you contact Celeste Rule at CATJ for whatever assistance we may be able to give.

Pole Source Location	25' /C6	25' /C7	30' /C6	30' /C7
Maryland	$23.95	$21.76	$31.36	$27.13
Mississippi	$24.50	$21.50	$31.50	n/a
Arkansas	$20.45	$18.40	$28.20	$23.00
Minnesota	$25.60	$21.90	$37.25	n/a
Arizona	n/a	$24.22	$37.66	n/a
Wyoming	n/a	$29.72	$43.15	n/a
Washington (state)	$29.50	$27.25	$39.60	n/a

Additionally, CATJ has located a northern Texas source of in-stock big jobs **up to 90 feet** in height. We mention this because such poles are often **difficult to locate,** and are suitable for both difficult installations (such as crossing a wide river bed), and, are ideal for many headend antenna installations.

WHAT SHOULD IT COST TO SET A POLE?

Along with locating a reliable pole source, and getting the pole freighted into where you want it, the next problem is getting it installed in the ground. The mechanics of that are covered separately. Now, what should you expect to **budget** for such an operation?

Elsewhere in this report it is noted that systems CATJ surveyed and talked with indicate that a three man crew, intent upon what they are doing, should average three poles per hour or 24 per eight hour day, if they are properly equipped and supplied.

There are two options to setting poles; one is to hire it done, and the next is to hire your own people and do it yourself.

Suppose you hire the whole job done. What is a fair price?

CATJ has uncovered prices that go upwards of $30.00 per pole, for the labor of hauling the pole from your pole yard to the site, digging the hole, and shoving the pole into the hole. That kind of pricing, naturally, can put a big crimp in how you approach the pole setting problem.

On the other hand, CATJ **was** able to secure quotations from **several** midwestern and southwestern firms that ranged from $12.00 to $15.00 per pole, set for you.

Seemingly, it could be done for even less money **if you did it yourself.** Afterall, anyone you hire to do the work must make a profit to be in business. Where possible, you could pocket that profit yourself. The trade off is that **you** have to fool with the watchdogging of the job. It all boils down to what you determine your own time is worth.

CATJ checked over the in-house cost figures for several systems **doing the work on their own.** It averaged as follows:

Per Hour

Foreman (working)	$5.00
Two helpers	$7.00 ($3.50 each)
Pick-up truck, tractor pro-rated over 1,000 poles and resale value at end of job (per hour)	$4.50
Running expenses for crew	$2.50
Insurance, miscellaneous (*)	$2.00
Total Per Hour	$21.00

*—(Includes replacement auger bits)

Thus we have a basic $21.00 per hour cost, divided by three poles, or $7.00 per pole. If management can keep an eye on these guys and not spend their full time doing it, the **best low-bid price** of $12.00 per pole set is still $5.00 per pole **above** the $7.00 per pole 'your-cost' price tag.

Let's look at two total-in the ground situations. We'll add up the cost of the pole (worst case and best case from table presented elsewhere here for class poles [utility grade poles would be lower]), shipping for a 200 mile distance, and the cost of setting the pole at $7.00 per pole, and see where we end up.

Cost Category	25' /C7 (Arkansas)	25' /C7 (Wyoming)
Basic pole	$18.40	$29.72
Freight (200 m.)	2.00	2.00
Setting Cost	7.00	7.00
	$27.40	$38.72

At 32 poles per mile (based upon study by Jackson Communications), this works out to $876.80 per mile for the Arkansas source poles and $1239.04 per mile for the Wyoming source poles, using the 25 foot, class 7 poles. Again, recall that non-class poles cost **less** than the figures here.

Given the 27.5 year depreciation schedule practiced by the utility companies, and assuming that it **may** cost you 50 cents per pole per year for insurance (if you decide to insure them; most do **not**) and general record keeping, we have in 27.5 years $27.40 plus $13.75 (insurance, etc.) invested per pole for Arkansas source poles and $38.75 plus $13.75 for Wyoming source poles. This works out to $41.15 for 27.5 years of a pole (Arkansas source) to $52.47 for 27.5 years of a pole (Wyoming source). And that is $1316.80 per mile for Arkansas source poles to $1679.04 for Wyoming source poles, again, for 27.5 years.

In terms of the annualized cost to you, **less** the **cost of the money** you borrowed to put the poles into your ground initially, it works out to $1.496 (3636 etc.) **per pole per year** for Arkansas source and $1.9080 (etc.) per pole for Wyoming source.

And this is for **exclusive** use of the **whole pole,** not a mere one foot or so as you would otherwise (or now) rent from the friendly bandito utility.

street. *It is the easiest place to sit,* however, because your pole and its lines are on the street or alley side and that means you never have to work *through* or *around* them. This has the same practical affect of being *in line* with their poles with your poles, but you avoid having to use side arms to suspend your cable.

Side arms are an extra expense, and, they increase your problems with pulling up strand tension. Even the best sidearms tend to *give* under strand tension when you pull up on the strand, and this can cause the pole to twist in its hole (i.e. rotate on its base axis) or if the pole won't move, the sidearm may buckle when somebody get's careless while strand tensioning.

Setting The Pole

Most systems purchasing poles have the truck lot loads delivered to their own work yards and then poles are drawn from that location for each work day.

Some systems have developed programs whereby a single man is assigned the duty, working from a construction map, of *outfitting each pole with hardware* while the pole is still on the ground at the work yard. This means that the poles are tagged as to their hardware type and prospective location, and the pole setting crew takes with it (in each pole-load) the poles called out by the construction drawings. Systems who do this *claim savings* of several dollars per pole in installing hardware, based, they say, on being able to semi "mass-produce" pole attachment hardware installations *on the ground.* This, they say, saves having to run a hardware installation crew down the pole line after the pole setting crew has made its pass. The savings come, they claim, by being able to install the hardware with one man, and no elevation equipment (bucket truck, etc.). It makes sense, and certainly has merit. The trade off is the extra time required to design a work program that insures that the pole setting crew always has available to them the *properly outfitted poles in advance* of their needing the poles, and then policing the system, to be sure it is working.

Most systems *CATJ* talked with told us that a *three man crew,* properly outfitted, can be expected to set an *average of 3 poles per hour or 24 per day.* The key, they say, is *being properly outfitted* to do the work, and to have the proper equipment on hand when the crew needs it.

There are four main considerations with setting a pole.

(1) *The hole location*—not all holes are going to be so located that you can get to them conveniently. This means that if you are relying on a piece of heavy equipment to dig the hole initially, you have to be flexible enough to insure that where the location is not convenient, that the crew has an *alternate method* of digging the hole in a hurry.

Many systems have equipped a farm tractor, such as an older model 8N or 9N Ford, with an auger / post hole digging attachment. Because the tractor has a power take off to run the auger blade and to lift the auger into position (and out of the hole when completed), the major portion of the effort here is getting the tractor into position.

One system operator we talked to, who is working in soil that has a high percentage of shale rock, told us he had outfitted the rear of the auger with a 6 x 6 plank. While one man operates the auger/tractor, the other two men climb aboard (i.e. on top of) the plank that protrudes away from the back of the tractor *over the top* of the auger. "When the going gets rough these two pole setting crew people merely hop on board the plank and hop up and down; that helps the auger get through the rocky soil and we cut tough hole digging time in half that way. . . ."

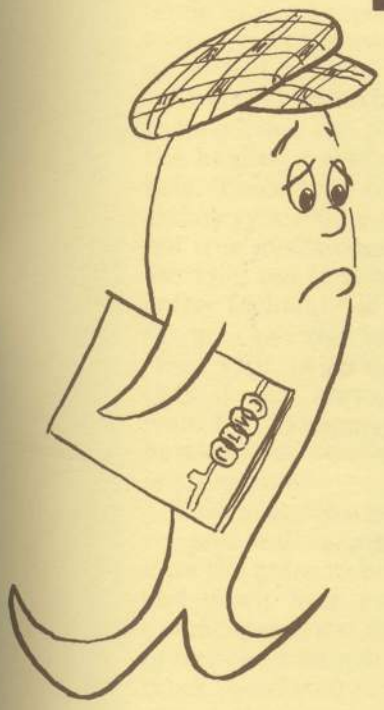
Most pole digging crews *also have* a portable one or two man motor driven auger along with them. These units, available commercially from $300.00 to $500.00, depending upon hole diameter and depth, have their own 2 or 4 cycle gasoline driven engines. In average type soil the speed of this rig is about the same as the tractor/auger approach; a hole in around 2-3 minutes time or less. They are *man-beating machines* however and systems who have tried to use this approach exclusively report "by the end of the day the crew may be down to less than two poles per hour with this hand (motor driven) auger. In the *long run,* this is more expensive than starting out with a tractor".

Of course there *are* many auger attachments for many of the bucket truck rigs commonly found in CATV circles. However, the trucks are often too big to be maneuverable where they are needed most, and it seems a crime to tie up a $10,000/$20,000.00 truck to dig holes.

Finally, in a moment of desperation, a system would revert to the tried and true post hole digger (muscle power) digging technique.

(2) *Transporting the pole*—Getting the pole to the desired location is the next problem. Many systems have designed special pole hauling trailers; one such is shown here. The basic design criteria seems to be to have a lightweight trailer that folds up to a smaller size when not needed for

Sorry Charlie



NO CATJ READER CONTEST THIS MONTH . . .

In the August **CATJ** we inaugurated our **CATJ READER CONTEST** and readers Thomas Bethel (Mt. Kisco, N.Y.) and Dennis Tretiak (Regina, Sask.) each won a Mid State Communications Model RD-1 Radiation Detector. In the September **CATJ** we reviewed the Microwave Filter Company Model 2903 Co-Channel Phasor, and here are the September READER CONTEST winners:

USA
Woodrow McHargue
Milan Cablevision, Inc.
Box 171
Princeton, MO 64673

CANADA
Gary Rahn
Saugeen Telecable, Ltd.
275-10th Street
Hanover, Ontario

Last month, in October, we reviewed the TOMCO Model SR-1000 headend signal processor; the winner will be announced in the December CATJ. Next month, we return to our contests again. **This month,** we have a special industry intensive opinion study **we must ask your help with.**

INTENSIVE CATJ INDUSTRY SURVEY INSTRUCTIONS . . .

This is a very serious survey. There are some things we simply must know. We are so serious that **we** are paying the reply postage! The card to the right perforates out of the magazine and folds in the center. Fill out reply card sides 1, 2 and 3; Then fold so side 2 meets side 3, and staple or tape shut. We pay the postage if mailed inside of the United States. Thank you.

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SIDE ONE

1) Our system presently ____ does ____ does not have any type of severe weather warning system for our subscribers.
2) If I could add a 24 hour U.S. Government Severe Weather Warning System to my system, and **rent/lease** a special receiver **to my customers** for $2.00 per month, I believe my customers ____ would ____ would NOT be interested.
3) If the FCC dropped **all rules** for CATV systems of **250** subscribers or less I know of at least ____ (number) new systems that would be built in the next 24 months.
4) If the FCC dropped **all rules** for CATV systems of **1,000** subscribers or less I know of at least ____ (number) new systems that would be built in the next 24 months.
5) We ____ are ____ are NOT interested in having a detailed step-by-step manual to complete 1975/76 FCC COMPLIANCE TEST MEASUREMENTS.
6) Our system ____ has ____ has not been inspected by the FCC Field Engineering people.
7) Our system ____ is ____ is not interested in getting **off of** utility rental poles.
8) Our system ____ is ____ is not interested in setting our own poles for at least some of our plant.

Planned for December CATJ

1) **FREQUENCY MEASUREMENTS** – What do you have to do for this new-this-year FCC Compliance test? Do you need to purchase new equipment? How do you make these tests? CATJ has the answers.

2) **HOW BIG FOR PAY?** – What are the real numbers for getting into pay TV? CATJ looks at one approach to getting into pay, with smaller systems.

3) **PLUS** – A hard look at modern line extenders, a Steve Richey special, and much more.

SIDE TWO

9) CATJ ____ should ____ should not provide more **management information.**
10) CATJ ____ should ____ should not continue detailed **equipment reviews.**
11) CATJ ____ should ____ should not provide detailed construction articles on CATV equipment (i.e. **how to build-it features**)
12) CATJ ____ should ____ should not publish more high-level engineering articles, **complete with mathematical analysis** where required.
13) CATJ ____ should ____ should not publish more material **prepared by** CATV equipment suppliers.
14) Because back issue-copies of CATJ are **not** available, I ____ would ____ would not be interested in purchasing a "CATJ ANTHOLOGY" for issues 1 through 18; with **most** all articles published in those issues in a **single** reference book.
15) I believe such an "ANTHOLOGY" should sell for no more than ____ $5.00 ____ $7.50 ____ $10.00 ____ $12.50.
16) Our system ____ would ____ would not be interested in detailed CATJ treatment of **underground construction techniques.**
17) This month's issue treatment of poles was:
____ appreciated ____ not appreciated
____ OK as published ____ not detailed enough ____ too detailed
18) This month's issue treatment of pay TV traps was:
____ appreciated ____ not appreciated
____ OK as published ____ not detailed enough ____ too detailed
19) If I was able to have **only one** single CATV magazine per month, the magazine I would choose would be _____

SIDE THREE

20) **Name of Person Completing Survey** _____
21) **My title/job function** _____
22) **Company Affiliation** _____
23) **Address** _____
24) **City/Town** _____ **State/Province** _____ **Zip** _____
25) (If CATV System)
Number of subscribers _____ Total Miles Plant _____
Year Began Service _____ Number of channels _____
26) Pay TV
We ____ do ____ do not offer pay TV service
If Not–
We ____ will ____ will not add pay TV in 1976

Thank you for your cooperation in completing this survey!

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MICROWAVE BRANCH		
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RECORDS & SYSTEMS MGMT BRANCH		
ANN MOREY	CHIEF	6218

easy transport; even inside of the bed portion of a pick-up truck, but which extends to the proper length to transport the average 25 or 30 foot poles.

The next criteria seems to be getting the pole from the hauling vehicle to the hole. Three men *can* move and carry a 400 pound pole, but it is guaranteed to tire the men out in a hurry. A better technique is to allow the pole to move to the desired spot in such a way that it can be off-loaded from the transport vehicle butt-end down *into the waiting hole.*

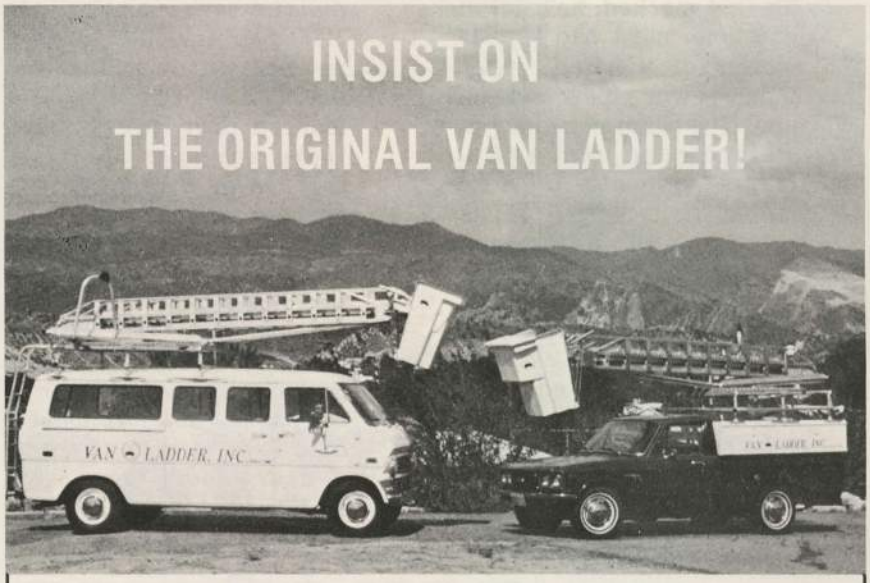
This suggests an *elevated* pole trailer; one that allows the poles to be slid off and down butt end first. Some operators therefore prefer the common pick-up truck "headache rack" that allows the poles to travel overhead. As a pole is required, it is slid backwards while the butt end is pulled down, heading (if the aim is good) into the prepared hole.

Several operators report they have designed *their pole trailers* with a winch system (many said they are using hand cranked boat-type winches) to winch-cable-lift the pole from the trailer up out of the "pile" so it is then over the trailer bed by several feet. Then it is slid into the hole. *CATJ* would very much like to encourage systems with such self-designed trailer designs to *share their designs* with other CATV system operators. *Photos and drawings submitted will appear in future issues of CATJ.*

(3) *Rocking The Pole*—This has different means to different people. Many systems use the same soil that came out of the hole to place back into the hole around the pole after it is in place. Once in the hole, one man can hold the pole in position while the other two return the dirt to the hole. The dirt must be tamped down after every six-nine inches of soil is returned around the pole, and for this job most systems use muscle power and some long steel bars with flat "tamping feet" welded on the bottom.

Some systems we talked with said they carried a 50 or 100 gallon drum of water on the truck to wet down the soil as it was returned to the hole. They caution against using too much water because it creates an ooze which leaves the pole less than rigid for the first several days.

Others said they haul a load of small crushed rock along with them and fill the bottom two feet to 30 inches of the hole with crushed rock around the pole, tamping it as they put it in.



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"This insures that the pole butt is well supported and it helps prevent the pole moving about in case of a particularly wet season" one operator noted. Then the balance of the hole is filled with dirt removed from the hole.

(4) *Insurance*—Finally, everyone it seems was aware that *before* the first hole is dug, an extra session with the insurance man is in order. One operator told of running through a multi-hundred pair telephone cable (not marked, he said) in one hole; most had similar stories of violated water pipes, sewer pipes, and the like. The champion story of all time came from a California operator *CATJ* talked with who told us "...Going into a new subdivision, our crew noted a 'Buried Telco' warning at the inter-section of the subdivision entrance street. The arrows pointed back and forth *along the main street* so they went ahead where the first sub-division pole had been staked. The hole went hard at first so the two extra men climbed on top of the 6 by 6 plank to give the auger some assistance. Suddenly the hole shot down and they were on the ground. Before they could get up off the ground, water and other materials started bubbling out of the hole. By the time we got the auger out of the hole and the tractor pulled away the whole area was a sea of water and debris. What they hit, one-two-three, was a city water pipe, the subdivision sewer pipe, and a 1200 pair telephone cable; not necessarily in that order!" The operator remarked 'dryly' we thought *"have you ever seen two telephone company line splicers, outfitted in yellow wet suits, sitting in a gaping hole ten feet in diameter, filled with water and sewage that the pumps cannot get out fast enough, trying to splice 1200 pair of telephone cable? It looked like two martian basket-weavers doing their work at the Hoboken estuary!"*

Photo One

Photo Two

Photo Three

POLE SETTING SCHOOL

During September, the Oklahoma CATV Association devoted a portion of its annual fall meeting to a "pole setting school". Oklahoma has a high percentage of its systems on system-owned poles, and at the meeting several additional systems reported they were in the process of converting over to their own poles at this time. The purpose of the "school" was to share pole setting expertise.

Bill Barnes, manager of the TV Cable Company, DeQueen, Arkansas, brought his system's pole hauling/setting trailer along for the school. Note in photo 1 that it stows away in the rear of his pickup truck for transport.

In photo 2, the trailer has been removed from the truck and the support bracket for pole lifting is being put into position.

The pole trailer designed by TV Cable Company is finding extensive use in the system for removing (or moving) existing poles *already in the ground.* A boat-type winch, strung from the trailer tongue (where the winch assembly mounts) through the base of the vertical height-bar and up through a pulley on the top end of the height bar allows one man to 'yank a pole' out of the ground. In photo 3 the trailer is being hand moved into position to remove a pole set for the demonstration.

In photos 4 and 5 the trailer, as a lift device, is in position for work. That's Kelly Stallings, Waynoka, Oklahoma (immediate past president of Oklahoma association) in photo 5 studying the rig closely.

In photo 6, John Thompson, Cablevision Company, Atoka and Coalgate, Oklahoma readying his pickup with pole carrying headache rack for dropping the pole into the hole (photo 7).

While most systems utilize tractor mounted augers for hole digging, this demonstration relied on a two man McCulloch chain saw (with auger attachment) for the hole digging exercise. In photos 8, 9 and 10 the hole digging exercise proceeds to completion. The fellow with the hardhat is DeQueen manager Bill Barnes. The fellow with the suit on is a regular contributor to CATJ (see Pages 4-5 this issue).

Photo Four

Photo Five

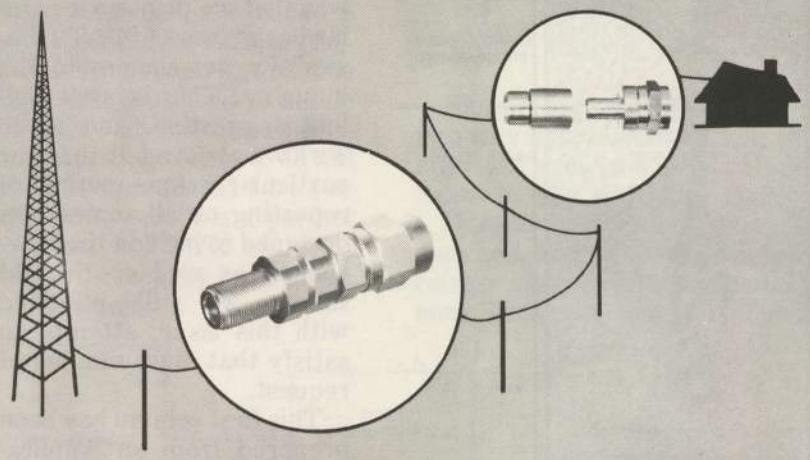
Photo Six

Photo Seven

Photo Eight

Photo Nine

Photo Ten



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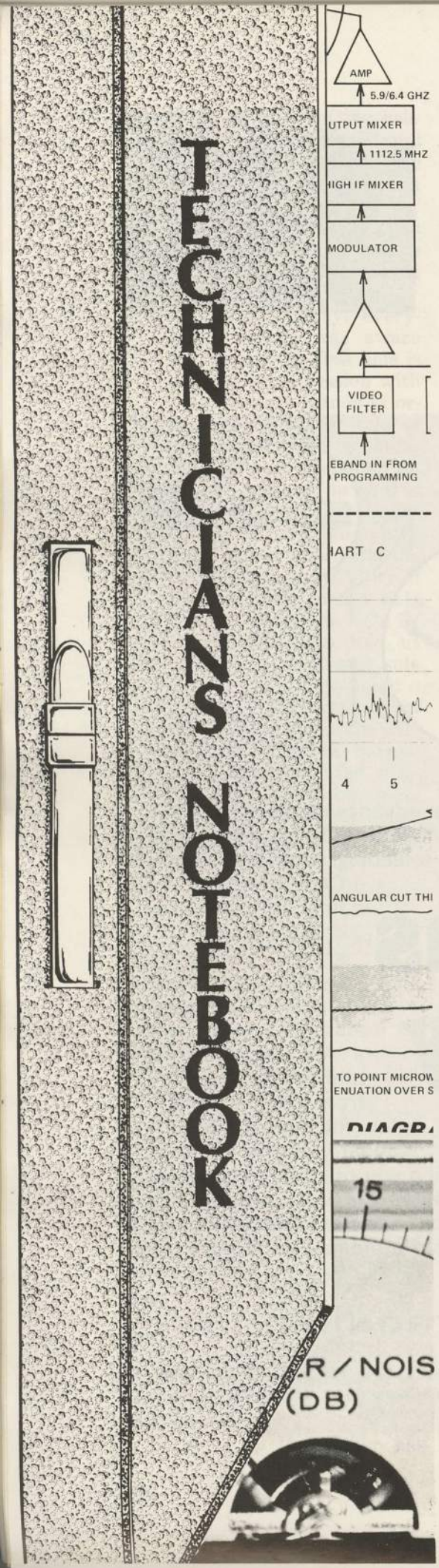

CATJ recently completed the 1975 version of our annual end-of-summer survey of reader interests and disinterests. Hundreds of readers responded telling us what you like and do not like about CATJ. More than 200 separate suggestions for *different* CATJ articles were also tallied; this should keep us busy for years just filling these requests!

One of the more frequently encountered suggestions was that we print on a regular basis a set of "CATV Basics" for newcomers to the industry. This is an excellent suggestion, and while we have always felt that our particular unique method of reporting on all topics was designed to include the newcomers as well as the old timers, we will, effective with this issue, attempt to satisfy that multi-numbered request.

This first column has been prepared from an Application Notes bulletin issued by the *Q-Bit Corporation* (P.O. Box 2208, Melbourne, Fl. 32901), and we hereby credit this source.

Impedance Matching Basics

The coaxial cable has become the accepted method of distributing radio frequency TV signals to multiple users. To obtain the optimum results, the system designer/installer needs to understand the effects that coaxial cable (coax) has on radio frequency (RF) signals.

In the television industry, there are two standard classes of transmission lines; balanced 300 ohm transmission line, and, 75 ohm coaxial cable of various sizes.

Characteristic Impedance

When a particular cable is said to be 75 ohm cable, it is meant that the cable has a characteristic impedance of 75 ohms. This means that when this cable is terminated with a 75 ohm resistor or a 75 ohm resistive load, and the impedance measured on the opposite of the length of cable, the load and the line look to be "one." That is, whatever energy is introduced into the line at the origination end, is carried through to the terminated end where it sees the same characteristics in the termination as it sees in the line itself. This is true regardless of the length of the cable being measured. However, if the cable is terminated with a load different than the characteristic 75 ohm impedance of the cable, some of the energy being carried by the line is not accepted by the load. This energy reflects back away from the load and travels in the reverse direction towards the origination point. This 'reflected load' signal is dependent upon cable length and the frequency of the RF being transmitted into the cable at the origination end.

Signal Transmission

Maximum transmission efficiency is realized when the 75 ohm cable is matched with a perfect 75 ohm resistive load. The RF signal transmitted over a cable experiences a delay of approximately 140% (1.4 times) than were the signal transmitted through the air. This is because the resistance of the cable materials is greater than the resistance of the air medium, and that resistance causes the signal to actually slow down in transmission.

The coaxial cable itself absorbs some of the signal, and this is called 'cable losses'. These losses are caused by the resistive (IR) losses in the center conductor of the cable and by dielectric losses caused by the insulation material between the center conductor and the shield. Cable exhibits higher losses at higher RF (frequencies) because dielectric losses increase with frequency.

Matching

When a 75 ohm cable is term-

inated with other than a 75 ohm resistive load, it is described as 'mis-matched'. Part of the signal that arrives at the 'mis-matched load' via the coaxial cable is reflected back toward the source of originating end. This reflection and return to the source of the signal is sometimes referenced by the phrase 'return loss'.

When there is reflected energy sent from the load back toward the source, the source now becomes the load because the source for the 'reflected path' has now become the termination load for the original downstream direction pass. If the source is well matched to the line, this reflected energy becomes absorbed by the original source; which is now acting as a 'load'. If both the original source and the original load are mismatched, it can become extremely difficult to determine the actual losses on the transmission cable since each trip down and back causes additional reflections and with each 'pass' smaller and smaller percentages of the original downstream signal are reflected and re-transmitted in the *opposite* direction.

Any device which is used initially as a driving source, and which displays a good output impedance match to the coaxial cable, is said to be 'backmatched'.

VSWR

The transmission of RF TV signals is actually a transmission of 'waves'. In the coaxial cable, because of the dielectric properties of the cable, there is a delay in time between delivery of the signal to the origination point and the receipt of the signal at the termination point. The phase and magnitude of a reflected wave (caused by a mis-match) is a function of cable length. At any point along the cable transmission medium, the forward direction wave *may* sum with the reflected wave, modifying the magnitude at that particular point on the line. If a voltage probe were to be inserted into a coaxial cable which has mismatch at the termination, and the probe moved along the line of the cable conductor, the magnitude of the signal present could be measured. At some points along that probe-run the voltages from the source and the reflective load would add together (i.e. sum); while at other points along that line the voltages would subtract (i.e. oppose). This indicates that on a mis-matched line there are varying magnitudes of voltage present. The measurement of these varying magnitudes is called a measurement of VSWR, or 'Voltage Standing Wave Ratio'. The term VSWR is utilized to define the quality of the impedance match of a device. Thus a VSWR of 1.0 to 1 (represented 1.0 : 1 or even VSWR = 1.0) is a perfect match, and a VSWR of 1.5 is considered generally to be an acceptable match.

Many undesirable things happen when bad mis-matches exist in a cable system. Some of these are:

1) Undesirable signal losses
2) The cable becomes an antenna and can radiate signal; additionally, it can now admit inward bound signals picking up non-source derived signals for further carriage through the cable plant
3) Source mis-match over long cable lengths can cause picture-edge ghosting
4) Source mis-match can affect the fine tuning on the subscriber's receiver
5) Source mis-match will destroy the output isolation of hybrid splitters and taps
6) Successive mis - match through low loss taps can compound the effects of VSWR.

A table depicting VSWR and loss follows:

VSWR (match)	Power Loss At Load	Reflected Power (return loss)
1.0	0 dB	———
1.2	– .03 dB	–21 dB
1.5	– .19 dB	–14 dB
2.0	– .50 dB	– 9.5 dB
3.0	–1.25 dB	– 6 dB
4.0	–1.9 dB	– 4.5 dB
10.0	–4.8 dB	– 1.8 dB

Finally, here is an example of a two-way hybrid splitter and the effects of various VSWR components in this simple system.

If the source is perfectly *backmatched*, there will be *no* second return of the reflected component from the original source (load), and the hybrid isolation would still be realized at a minimum of 20 dB.

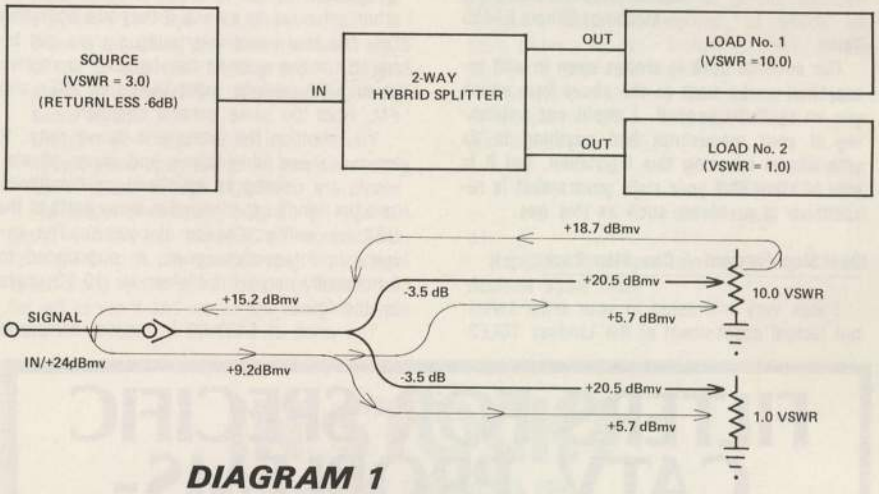

DIAGRAM 1

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TECHNICAL TOPICS

Fast Work

Editor:

I wanted to tell you that the article (**Perhaps Your Community Cannot Legally Grant You A CATV Franchise**) appearing in the August issue looked great. Your editorial inserts are a touch that many journals should adopt. Thanks again for your consideration, and effort—especially for putting out one of the most relevant industry/scholarly publications available.

Also thought you might be interested in knowing that on September 11th Illinois Governor Daniel Walker signed into law a bill which authorizes county boards to contract for, license or franchise CATV systems in unincorporated areas within their boundaries. The law was sponsored by Rep. Fred J. Tuerk, Peoria, who was quoted by the Peoria **Journal Star** as saying "The revenues derived from CATV in unincorporated areas rightly belongs to the county."

Thomas A. Geary
Assistant Professor
Division of Broadcasting
Western Illinois University
Macomb, Illinois 61455

Tom:

Our editorial desk is always open to well researched works such as the above item which you so skillfully penned. I doubt our publishing of your manuscript had anything to do with Illinois adopting this legislation, but it is nice to know that your state government is responsive to problems such as this one.

One Step Forward / One Step Back

I was very interested in your bitter-sweet, but factual assessment of the Lindsay 10LE2-13 FM-U Test, Search and Standby antenna.

Your people really did an excellent job of evaluation! Since the bitter (criticism) related to a lack of instructions, we have diligently worked on getting a practical, user oriented, easy to follow set of instructions prepared—for future users of this antenna.

You could have perhaps described better the many uses of this antenna. Here in Canada Sruki Switzer first proposed such an antenna, and Serial #1 is in use in one of McLean Hunter's Cable systems.

Several papers read at NCTA technical sessions have suggested the many uses of the Search Antenna. One paper by Steve Biro immediately comes to mind.

The Lindsay Search Antenna took seven intensive months of designing to get the gain and cleanness of patterns. We quit only when we could not squeeze any more performance out of this antenna. All of the elements are functional and this antenna was specifically designed for CATV headend use by our antenna engineer Koert Koster.

The Search Antenna serves atop one's tower as a "standby" should one of the regular arrays fail. It can be used to check out the other antennas to assess if they are operating OK. The sources of interfering signals can be traced, or the antenna can be used to receive several TV stations, both UHF and VHF, and FM, from the same general direction.

You mention the antenna is heavy duty. It is; but these dimensions and sizes of elements are needed to withstand ice conditions and the winds experienced in many parts of the USA (as well as Canada of course). The antenna is not over-designed; it is designed to functionally serve troublefree for 10-20 years on the tower.

The price at $403.00 is modest compared to many simple log periodic and other antennas offered. It is really a bargain when you see the product and particularly when you see its performance. And as you found, the Search antenna beats our own electrical and gain claims.

Thank you again for reviewing our product, and for providing such a useful publication to the CATV industry. Keep it up!

J.E. Thomas, President
Lindsay Specialty Products, Limited
50 Mary Street West
Lindsay, Ontario
Canada K9V 4S7

What's a dBi?

Editor:

I have just read the article on the Lindsay Log Antenna (Page 33, September) and I would like to make an observation and afterwards ask a question. I think you should have researched the theory behind the antenna more thoroughly before writing your review. Without seeing the antenna in person, one receives very little knowledge about the many physical details your article stressed. What 'theory' you presented was more conjecture than facts.

Can you explain what a dBi is? I've asked three fellow workers in my company (all of whom are 'old timers') and they don't know either. The gain specs on Page 37 are in dBi. Is this the same as dBj? Or are you talking about Imaginaries?

John F. Johnston
Cablevision of Colorado Springs
Colorado Springs, Colo. 80917

John:

We neglected heavy theoretical discussion of the Lindsay Search for two reasons: (1) The same issue of CATJ, Pages 25-33 carried Part Three of our CATV ANTENNA BASICS series, and it dealt largely with the LPDA antenna. Why say the same thing twice in one issue, we asked ourselves. And, (2), the Lindsay Search defies many of the better known, more rational approaches to theoretical analysis. The designer, as Lindsay President John E. Thomas points out in the letter just ahead of yours, Mr. Koert Koster, apparently spent seven months working and re-working many of the individual parameters of this antenna, to the point where he has undoubtedly fine-tuned this particular antenna, with its particular element spacings, element diameters and matching systems (all of which interact) **so that there are many parameters to this antenna which are not readily apparent to the eye; even the trained eye.**

As for the dBi...imaginary is not far away. Actually, it stands for dB of gain over that to be expected with an isotropic source. An isotropic source is an imaginary source, mathematical only, from which mathematical equations can be drawn to create real life measured gain. It is a constant source, unlike a standard dipole source, not subject to construction and installation variations. Therefore,

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(Glyn Bostick, Chief Engr)

dBi tends to be more "indicated gain" than dBd (db gain over a dipole). Typically, if you subtract 2.7 dB gain from a dBi reference you have approximately the gain of the antenna as related to dBd measurements.

One Tech's Opinion

I have completed the CATJ September Reader Contest and I want to tell you why I feel as I do on a couple of things. I will go by questions beginning with number five on the contest card (which read **CATJ is____ too technical ____ just right ____ not technical enough**). I have always thought of CATJ as the technician's magazine, probably the only one on the market. All of the other CATV magazines are devoted to management, financing, and organizations. Your 'CATA NEWSLETTER' is very similar to these, in content, while **CATJ** concentrates on technical problems. In the March and April 1975 issues you attacked the FCC and the broadcasters. These two issues were most interesting but did not help me with any of my technical problems. I fear your forthcoming November issue, concerning poles, will be the same way. This type of issue concerns management more than technicians and I don't feel it should be in **CATJ.**

Why not have an issue devoted to proof of performance with various types of test equipment? This type of issue would be just as interesting as your pole issue, and it would appeal to more people. Next you could have an issue on the different types of cable and their characteristics. Then, perhaps, something on headend lashup, mixing and adding. The technical subjects are vast and grow practically everyday.

Now for question number six (which read **CATJ will be enjoyed____ more____ less by the new larger format**). Personally, I have always liked the small size. I found it more convenient to carry and read. I appreciate your increasing the contents of 'CATJ' and think it is wonderful that the price will not increase, but I would rather have more pages than a larger size.

David L. Franklin
Chief Technician
Lafayette Cable TV
Lafayette, La. 70501

David:

Your points about devoting one entire issue to one singular subject are well made. Notice if you will that while poles gets some play in this issue, it is by no means the full issue. That is one of the things we are now able to do with the larger page format; say what we feel needs to be said about some in-depth subject such as poles, and still have plenty of room left over to deal with mundane things such as chart recording systems, pay TV trap technology and so on.

The format-size change has received mixed reviews to date. Some people love the larger size, others such as yourself say your pocket is too small to carry it around anymore. We wish we had a compromise, but we don't. Increasing the magazine in its former 6 by 9 size to say 72 pages a month (roughly equal to the 48 page magazine you have this month in this larger format) would have required one of two things to change, or a combination of the two. Either the CATV industry had to start acting like a growing industry again, with suppliers starting to catch up on the monstrous losses many have sustained in the past year to 18 months (thereby making more advertising dollars available), or, readers would have had to stand still for an increase to $12.00 per year for techs and $15.00 for companies. We saw neither happening, so we went to the larger page size to give readers the benefits of increasing the magazine space, simply because that was something we could afford to do without substantial new advertising or increasing subscription rates.

Sharp Eyed Reader

The July issue contained a most popular piece by Jerry Laufer of Gill Cable, San Jose called "Everyman's Analyzer." To date, it has polled more reader votes and mail than any other single article published by CATJ.

One reader, Ron Upchurch, believed he found several errors in the diagrams and he called them to our attention. We in turn went to author Laufer and Jerry responds as follows:

Diagram #5—Page 12 (July)...
R21 should be marked R1.
R11 should be in board position marked R8 and R8 moved down one set of holes so it connects between pin 1 and 5.
Diagram #4—Page 11 (July)...
shows a PC board bridge connection between pins 4 and 5 of the IC; remove it.
Diagram #3—Page 10 (July)...
there is a missing connection between pin 5 of the IC and the 'floating board dot' just above it; connect the two together on PC board layout.
Diagram #2—Page 9 (July)...
should show open end of R17 as connecting to + (plus) voltage supply.

For reader orientation, Diagram 3 (Page 10) starts with the top row of IC pin connections, far right pin, as pin number **one,** works **right to left** along row to pin 7; drops to bottom row far left as pin 8 and works **left to right** for pin **14.**

On Diagram 4 (Page 11), the **top right pin** is number 14, working right to left down to pin 8, dropping to bottom row with 7 under 8, and then left to right to pin 1 (**under pin 14**).

Finally on Page 12, Diagram 5, the LM3900 IC pin at **far right on top row** is number 1, working right to left to number 7, then dropping **down** (towards bottom of page) to pin 8, and working left to right to pin 14 which is **directly under pin 1.**

If you have gotten this far without swallowing twice, you may **proceed to go** and collect one million IC layout dots from our staff artist.

And thank you reader Ron Upchurch for being so sharp eyed. By the way, the schematic **is correct as shown** and if you built the unit according to that, with**out** using the Gill Cable PC board layout, you probably are already well into spectrum analyist displays. **Our thanks again to John Messmer and Jerry Laufer at Gill Cable for the fine development work on this unit!**

Engineering Opinion

Editor:

Much has been written on low-noise preamps, and I'm still looking for a good one that will really clean up a picture when dealing with 20 to 50 microvolts of input signal. Over a period of 16 years in CATV I've tried many, including some of the more recent crop. In my opinion, the best of the lot is still Blonder-Tongue's CMA pre-amplifier, of which we have dozens in use, including some of the very early production models.

I wanted to share my observations with other readers of CATJ. Keep up the good work and the best of luck.

J.J. Mueller
EMCO CATV, Inc.
Manchester, Vt. 05254

JJ:

Hopefully other pre-amp suppliers will not demand equal time!

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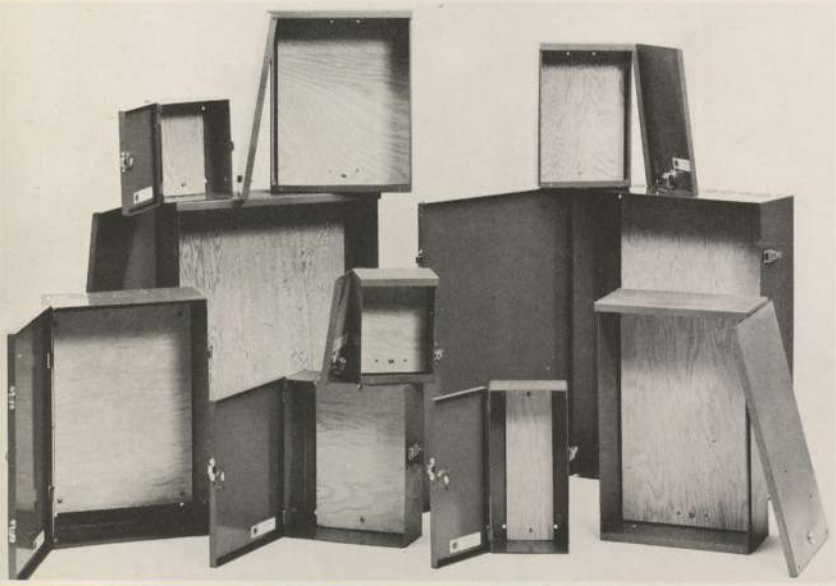

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