CATJ

OCTOBER
1978

OFFICIAL JOURNAL
OF THE
COMMUNITY ANTENNA
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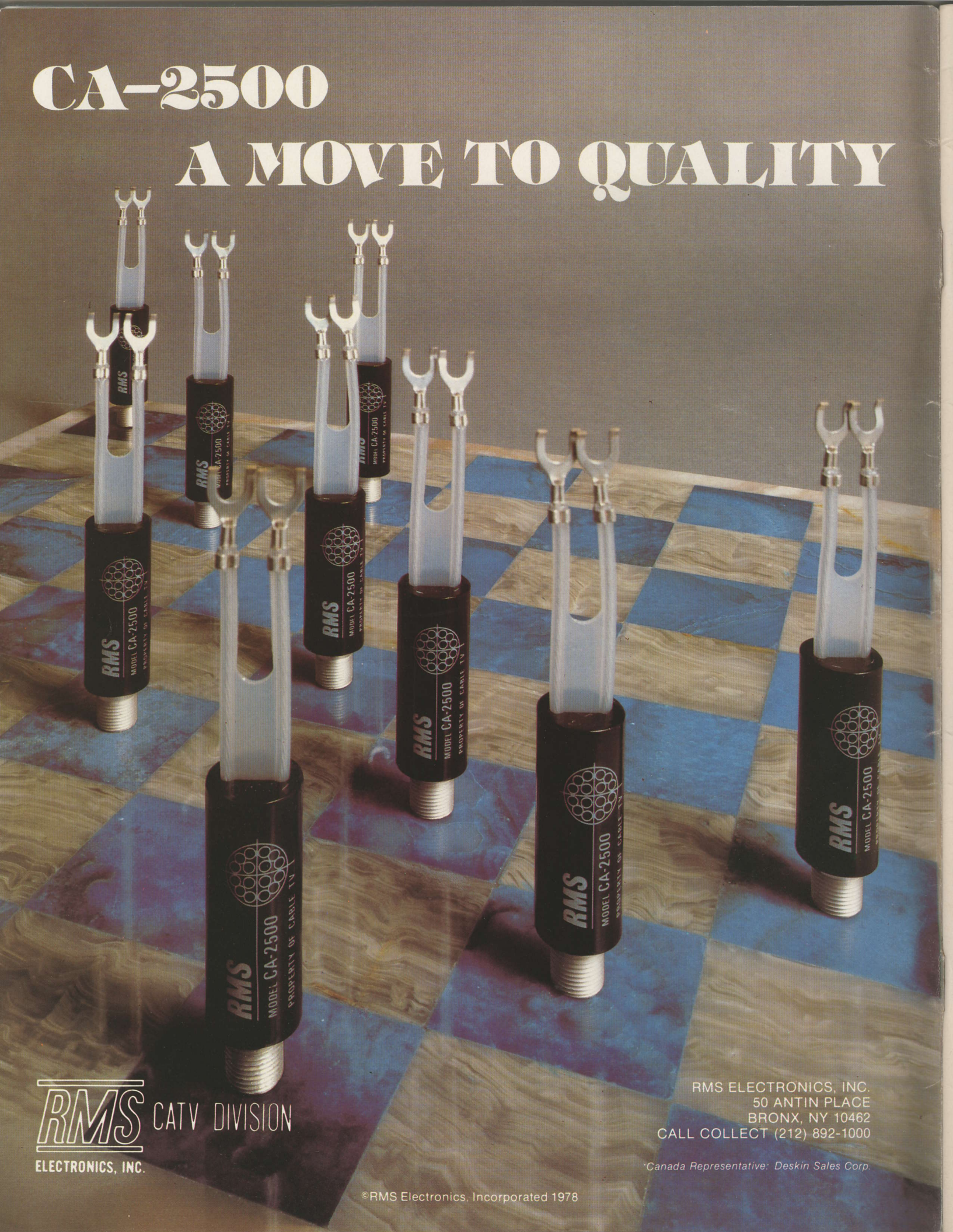

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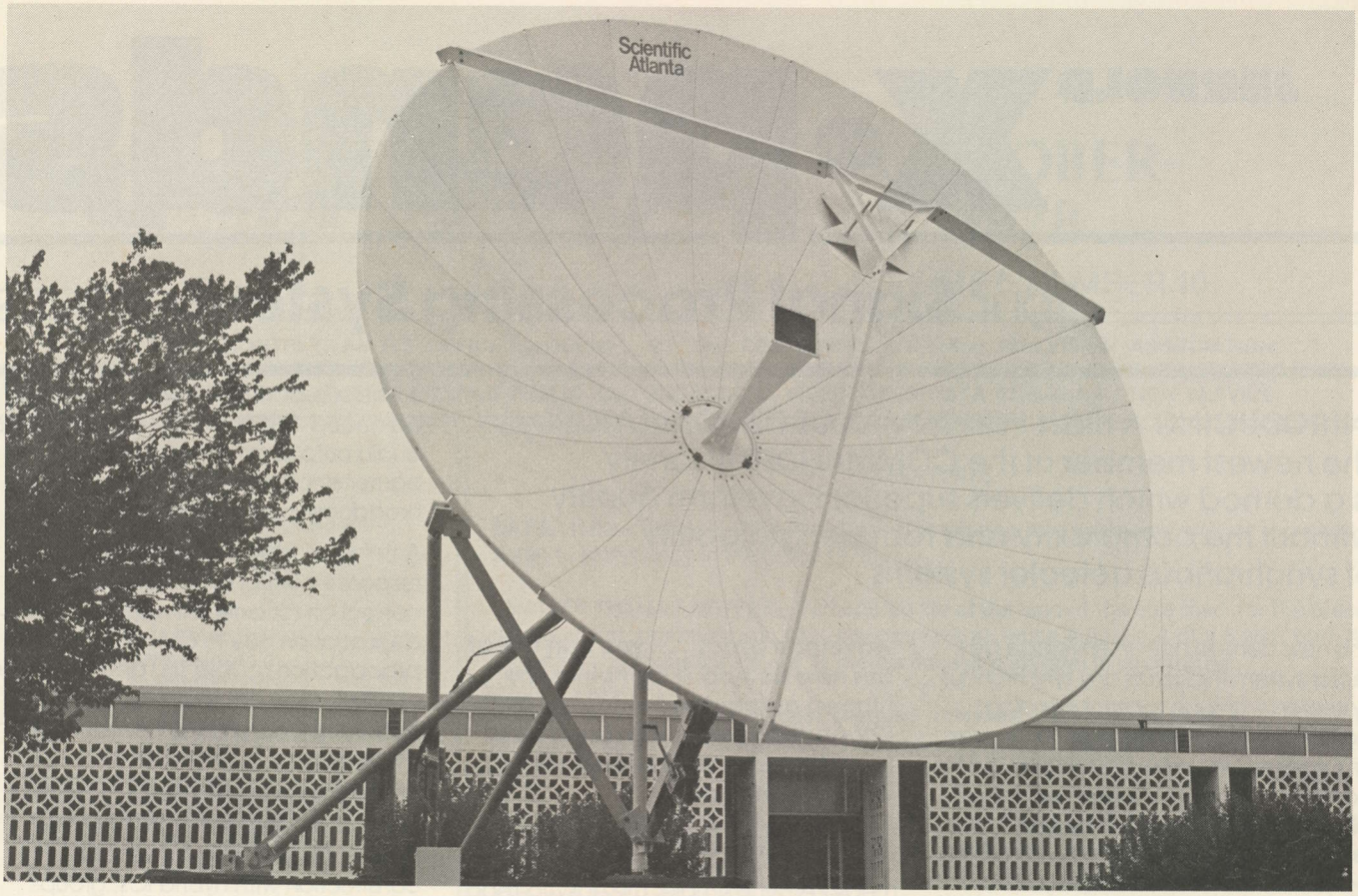

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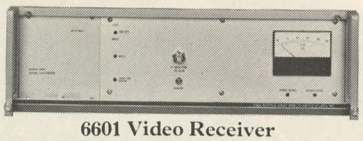

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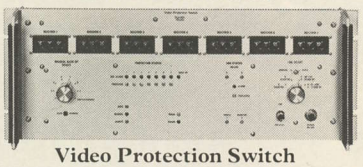

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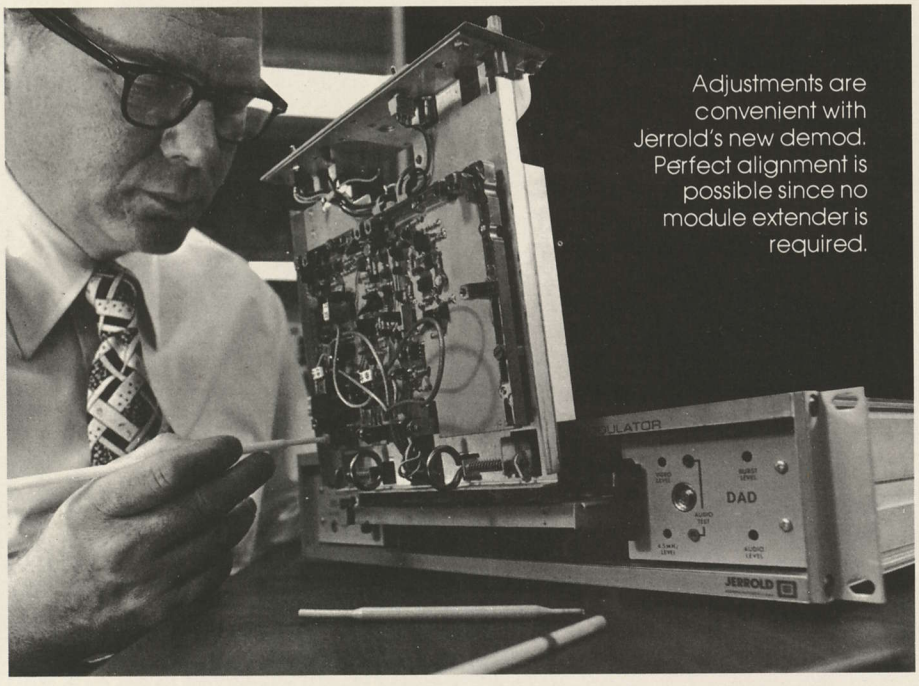

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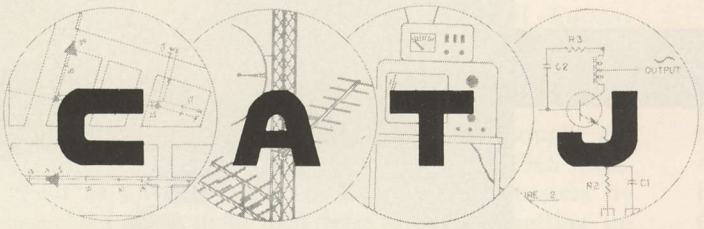

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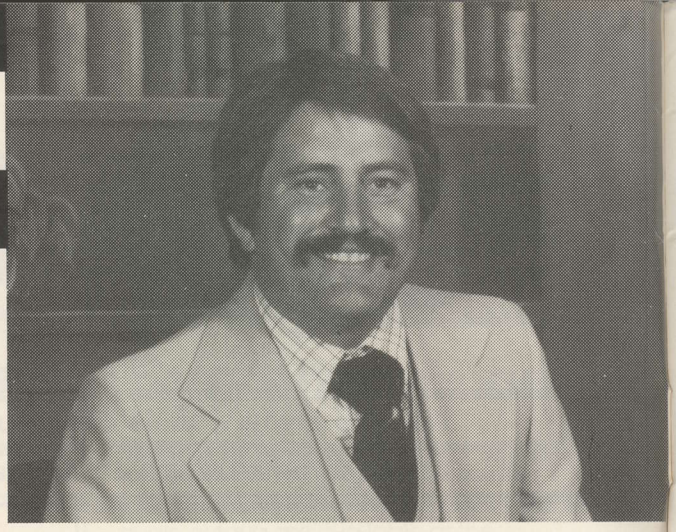
—FEATURES—

—DEPARTMENTS—

OUR COVER

Tonopah, Nevada. CATV as it really is. Manager Ed Lee makes a 'hobby' out of antennas, pulling very-long haul signals over the top of the Sierra Nevada range from California. As many as 16 antennas per channel, spread across the top of a Nevada Butte. The real CATV world. **Photo by Wiley Steakley.**

CATA-torial



BEN CAMPBELL, President of CATA, Inc.

Making An "Issue"

Cablevision magazine in their August 14th issue created a forum for industry discussion of HR 13015 which as most are aware is the bill now presently in the House Sub-Committee on Communications. In his editorial page Publisher Bob Titsch sets the tone for the issue by setting out a trio of objectives: **'To analyze** —objectively—the merits' (of HR 13015), **'to detail** specific examples of cable television participation in non-entertainment services', and, **'to provide** interested Multiple System Operators, manufacturers and programmers the opportunity to express their feelings about the bill through institutional advertisements . . .or. . .advertising support'.

The magazine then proceeds to dig into the present status of the bill and to focus on cable's part in the future of the nation's telecommunications grid. It is a worthwhile 12 pages of reading created by what is possibly the industry's best qualified **news**-journalism **staff.** And according to Cablevision this particular issue of the publication was circulated directly to the full House of Representatives 'as a means of bringing to the attention of Congress the importance of cable's position in this bill'.

Much of this is an illusion. First of all cable has no part in HR 13015. Not one single word is devoted to cable television. By ommission cable seemingly has no part in the future of telecommunications in this country. Pardon the pun, but the August 14th issue of Cablevision makes an issue out of a non issue.

Which is exactly what the thrust of the issue is. . .how can a landmark piece of legislation totally ignore a communications service now reaching directly into one American home out of five? A communications service growing at a rate which most feel will approach the one home in three region by 1985; perhaps sooner.

There is a certain amount of harmony between the Washington based NCTA and the Oklahoma based CATA on this issue; both cable trade associations feel that total ommission will be a mistake. NCTA wants specific language in the bill which recognizes that there is such a thing as CATV, and sets aside a certain domain' within which CATV will be legally recognized as the primary occupant. CATA believes that with just a few minor adjustments the present language of HR 13015 will be just fine.

NCTA says we need federal rules to protect us from such giants as the telephone companies and the broadcasting industry; CATA says that the present intent of the bill, to deregulate everyone, will be just fine as long as there are 'double negatives' in the language of the bill which not only prohibit federal agencies from regulating us but which also prohibit state and local agencies from regulating us.

Cablevision combines its 12 pages of direct coverage of HR 13015 with 7.5 additional pages that describe the two-way interactive cable system of the near future, utilizing cable to control electrical energy useage, and, utilizing cable service as an adjunct to operating a County Court system. In this way Cablevision seeks to display to the 435 members of the House of Representatives that cable is more than a tube through which entertainment, news and educational television flows.

Displaying these future (even if near term future) uses for coaxial cable gives us reason to reflect on two historical incidents in the cable industry upon which we believe there is a message for our future.

The FCC (remember them?) first took a grip on the cable industry in February of 1966. Retroactively in that month nearly 13 years ago the Commission announced they had assumed jurisdiction over cable and the one area they concentrated on was signal carriage. The cable industry was hard on the heels of franchises and deeply involved in system construction in **cities** such as Santa Barbara, San Diego and Wilmington and the broadcasters were plainly concerned that if cable continued to grow with no regulation of any kind that sooner or later cable would make substantial inroads on the broadcasting empires of America. In a little known incident immediately following this FCC grab for power a sizeable group of California cable operators met in Santa Barbara to debate the newest threat to their industry. Several industry leaders, including a few still about, took the podium to decry the federal action and to plea for support of the national association in its preparation for battle. Out of the crowd a veteran cable operator named Larry Jacobsen of Sonora (California) rose to speak his mind. Jacobsen had built his Sonora system up to around 2,000 subscribers by stringing RG-11 cable on 4 x 4 poles, roof eaves and tree trunks over a 13 year period and he was one of the pioneer operators in all of the country.

"I believe the FCC had no choice but to do this to us" said Jacobsen. **"And I blame not them but you. . ."**

pointing his finger squarely at a well known manufacturer of cable gear and MSO of that era **". . .for getting us into this mess".**

Jacobsen went on to outline how he thought the community antenna business got into the 1966 mess. **"First of all you have angered the broadcasters by marching into their own backyards and setting up shop".** He ticked off the then under construction or newly operating systems in cities such as San Diego and Santa Barbara. **"You are threatening to take money out of their pockets and I don't blame them for reacting as they have"** he went on. **"Then in addition to threatening to divide their markets home by home with outside broadcast signals, you are now putting onto the systems locally generated programming which they also see as competition. You say that this is public service and not entertainment but the wise broadcaster sees it for what it really is. . .the eventual day when you will be bringing first run movies and sports into his home market and competing directly with him for the local entertainment and possibly advertising dollar."** Larry drew a deep breath and then continued. **"Now you are calling on the whole industry to rally to** your **defense. . .to stand up and help you fight off this federal encroachment on our community antenna business. . .and you have the gall to stand up there and tell us this is OUR fight!".** With that Jacobsen sat down . . .for a minute, and then he hobbled to his feet on his bum leg and slowly withdrew from both the meeting and the cable industry. Larry Jacobsen died in 1970, a man convinced that his own industry. . .one he had built pole by pole with his own two hands. . .had been turned into a monster he could no longer understand.

In our second historical reflection, I am reminded of the March and April 1975 issues of this publication; in which a painstakeningly researched and prepared 46 page report in March and a 48 page part-two in April reflected upon the history of cable (community antenna) television during the era 1949-1975. These two issues of CATJ, like the August 14th issue of Cablevision, were sent directly to all members of the House of Representatives (as well as the Senate). In the weeks after their release CATA received 143 letters from Senators and Congressmen expressing their gratitude for having created such a report and for having sent it to their offices.

Cable drew the angry protests and direct anti-cable lobbying of broadcasters in the 60's and early 70's because the broadcasters perceived us as a threat to their pocketbooks. It has been nearly 13 years since Larry Jacobsen stood up on the floor of a California meeting to protest the actions of his fellow operators. . .but thank God the problems that began in 1966 are just about over. Riding atop a wave of unprecedented prosperity the broadcasters are hard put to defend their 1966 or 1972 version of signal carriage restrictions.

Having baited the broadcaster tiger in his den, and by some good fortune and clever work beaten off that attack (although it has indeed taken 13 years to do so) now we are baiting the telephone monopoly for a piece of their action. And I, like Larry Jacobsen must rise on the floor to ask much the same question that Larry asked.

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it's worth a good deal for both of us to put you on

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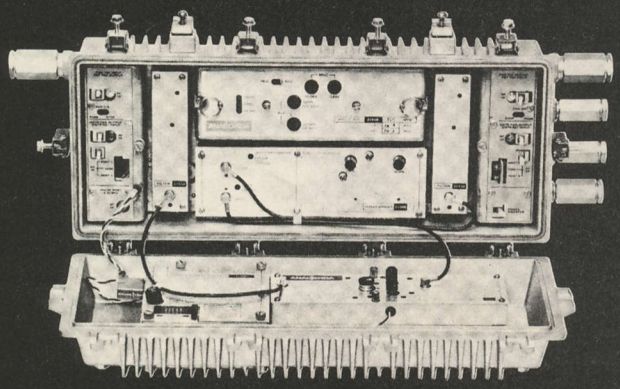

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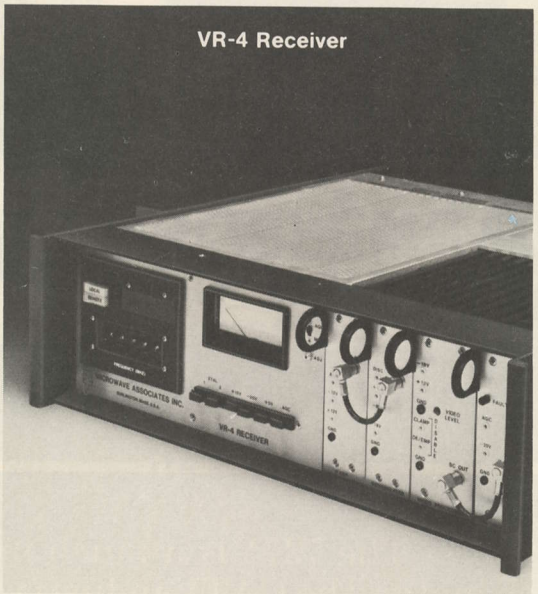
VR-3 Receiver

VR-4 Receiver



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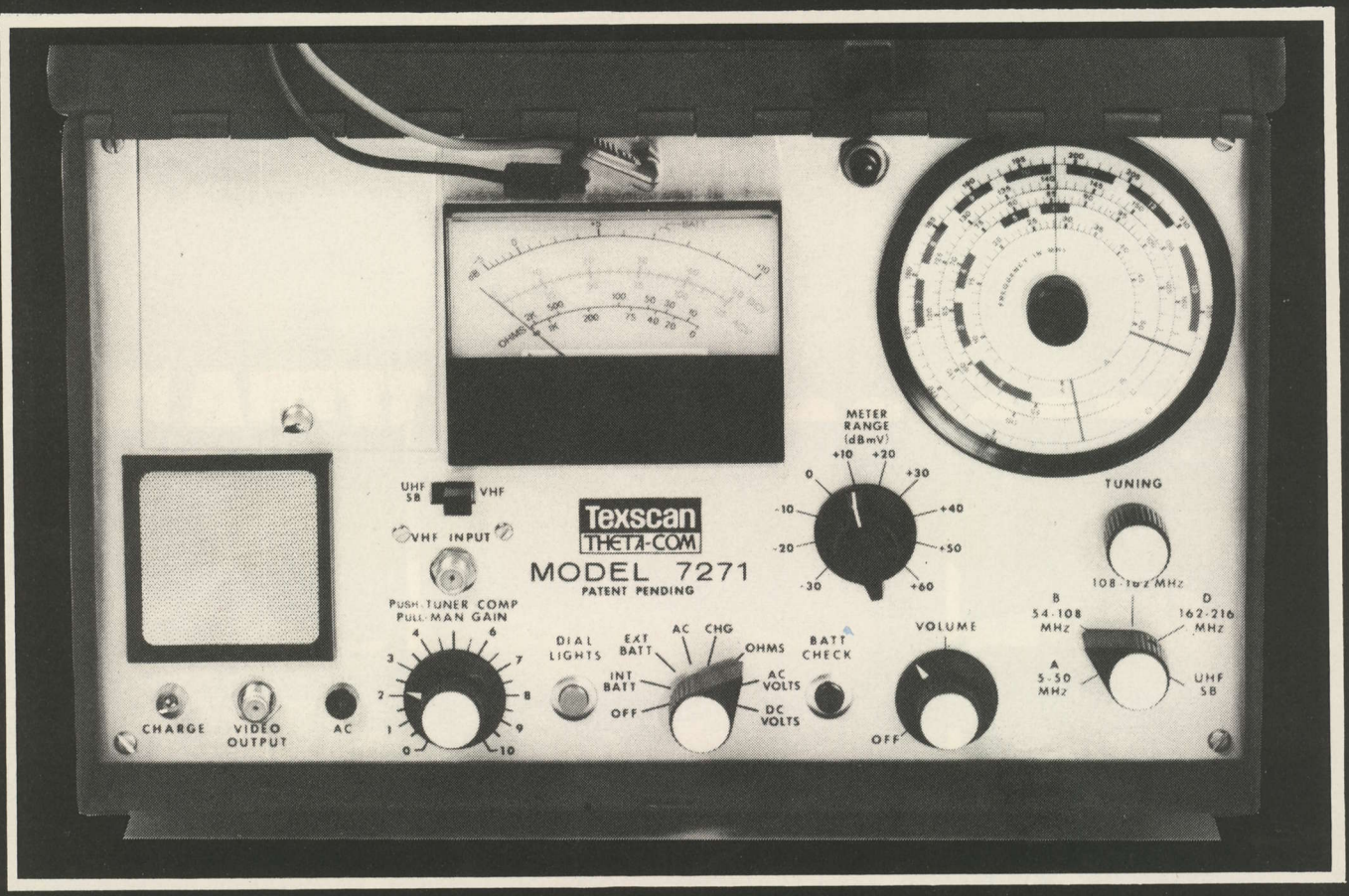

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Part Two of Two

UPDATE '78-MORE ON OUR INTENSIVE LOOK AT SATELLITE TELEVISION TECHNOLOGY IN THE FALL OF YEAR THREE

Smaller Than 4.5 Meter Terminals

When the FCC approved CATV system use of TVRO receive terminals smaller than 9 meters in size (see **CATJ** for January, 1976) that approval was generally construed to be limited to cable; there was no Commission indication that at least for that point in time other users of satellites would be allowed terminals smaller than the then-standard 9 meter minimum size.

The FCC's approval of smaller-than terminals for CATV was conditioned on the cable applicant being able to demonstrate that he would, with a terminal smaller than 9 meters, be able to **(1)** create an **excess signal margin** of approximately 3.0 dB, and, **(2)** maintain an **antenna sharpness pattern** equal to or better than something known as the '32 minus 25 log theta curve'. This 'curve' is an engineering method of determining how directional a TVRO antenna is and the Commission wants the antenna you use to be sufficiently directional so that you do not receive interference from either terrestrial or other satellite signal sources. An antenna that meets or exceeds the 'curve' assures that as a minimum it will not 'see' more than a **single satellite at a time** and therefore it will not produce pictures which have interference in them from an adjacent-in-the-sky satellite, operating on the same transponder at the same time.

During the first week in August, the Commission announced it had approved the first use of a smaller-than-9 meter receive antenna **for a broadcast station;** it approved a 4.57 meter size receive antenna for channel 21 in Phoenix, Arizona. Channel 21 is affiliated with Trinity Broadcasting, the religious broadcaster that occupies transponder 14 on F1. In the broadcasting industry the importance of the approval parallels the same smaller-than approval in December, 1976, by the Commission for cable system. Whether such approval will now be routinely sought by other broadcasters remains to be seen however; other broadcast applications to date have been for 10 or 11 meter receive antennas in the same $100,000 per installation range that cable was paying prior to the December 1976 decision.

But what about cable? Is the 4.5 meter size the end of the line?

The problem is possibly a non-problem. Antenna design engineers claim that 'yes' an antenna smaller than 4.5 meters **(of the parabolic family)** can be designed to meet the 32 minus 25 log theta curve. Several already exist which their designers claim do in fact meet or exceed that curve. Prodelin and Anixter-Mark both talk of 12-13 foot antennas which, for example, meet the 'curve'. USTC has a 13 foot which they claim should meet the curve.

The curve portion of the problem is largely a function of the feed support structure and the feed itself. The reflector surface is capable of making the magic curve, possibly down to the ten foot diameter size, provided the feed can be properly designed and hung in front of the antenna. The feed, or more particularily the struts, that support the feed, inter-act with the

In our September issue of CATJ we devoted approximately 22 pages to rounding up the current status of the explosive growth in satellite communications, as it impacts directly or indirectly upon the CATV business world. This month our special report wraps up with a look at TVRO developments in Canada, the problems the common carriers are having adjusting to CATV, terminals smaller than 4.5 meters, the growth of private terminals and a special report on tests conducted by the CATJ Lab on a 1.83 meter (6 foot) receive-only video terminal. If you by chance missed the September issue, a limited number of copies are available for $5.00 each postpaid by contacting Janet Stone at CATJ. Between the September report and this month's finale you have just about the most complete wrap-up on satellite television technology that could be assembled at one time. But, like any highly fluid and constantly moving industry, what was current yesterday may well be history today or tomorrow. You've got to have fast reaction time to play in this game!

pure reflector surface pattern creating ambiguities in the pattern. It is those 'glitches' created by the presence of the feed and its supports which are today limiting the commercial application of smaller antennas.

That is not the full problem of course; the FCC requirement for a 3 dB excess signal margin also gets into the act. The FCC rules state that your terminal must have an 'excess signal of 3 dB of carrier' above and beyond the receive-system's threshold. Most receive-systems have a 'threshold' in the 9-11 dB region; a function of the receiver and LNA selection process. A 'better grade' LNA, that is one with a lower noise temperature/figure, or a better grade reciever, that is one with a lower noise temperature/figure, reduces the amount of carrier signal required to maintain the '3 dB margin'.

Seemingly a system could combine the latest receiver 'extended threshold' technology with the latest 'low noise amplifier' (LNA) technology and a smaller-than-4.5 meter antenna. . .and still meet all of the FCC's requirements. The FCC, for their part, does not say that you **must** use an antenna 4.5 meters or larger; they only insist that you do make the '32 minus 25 log theta curve', **and,** the 3 dB margin. At least one application is now before the Commission in this area. That application, according to ICT's Pete Warren, is for Nogales, Arizona where an AFC (Antennas For Communications) 3 meter horn (10 foot diameter) is being combined with an 'extended threshold' Microdyne receiver (which the application notes has a 6.6 dB threshold) and a 100 degree K LNA. The application comes to the bottom line that in 'worst case clear sky' the carrier to noise ratio will be 9.8 dB some 3.2 dB above the receiver's threshold.

Will CATV antennas get smaller than 4.5 meters (the AFC horns aside)? That's the direction of the push these days but the push is not big nor universal. Unlike the approval of the 4.5 meter antenna size for CATV, it would appear that for smaller size antennas the Commission will simply stick to their 'curve' and 'margin' criteria; and if the application looks sound against those two bench marks, it will be approved quietly and without much fuss.

And With The Carriers

The Common Carriers operating the satellites themselves (RCA, Western Union and ATT/GT & E) are extremely wary of one another. It would be an understatement to note that they are consciously watching one another.

One of the favorite stories at one carrier is a situation which supposedly happened about 15 months ago. It seems that in their 'casual monitoring' of RCA some technical people at one of the COMSTAR receive sites discovered the 'benefits' of HBO programming. The all-night shift at the COMSTAR site got involved in the HBO movies for the night and when HBO signed off for the night they **forgot** to bring the big dish **back** onto their own bird at 128 degrees. Then the next morning when the day crew came in to conduct some routine tests they failed to note that the antenna was pointed at the wrong satellite. When the transmitter was fired up with the dish pointed at the wrong bird, the folks on SATCOM's network suddenly had all sorts of trash in their transponders. It took several telephone calls from RCA's Vernon Valley to trace the interference and naturally the people at COMSTAR were very upset about all of this. **When it happened a second time,** or so the story goes, Bell/GT & E installed time clock controlled switches on their terminal azimuth and elevation (motor driven) controls and developed a security system where each time the antenna(s) is moved a permanent record of the move and time are recorded on a chart recorder!

It is no secret that the satellite operators do regularly monitor each other's "load factor". Between carriers this remains a highly competitive business and it is worth something for carrier 'A' to know how busy carrier 'B' is these days. Seemingly, spectrum analysis of other birds is a routine procedure at all carriers. Such surveillance may not be limited to inter-carrier

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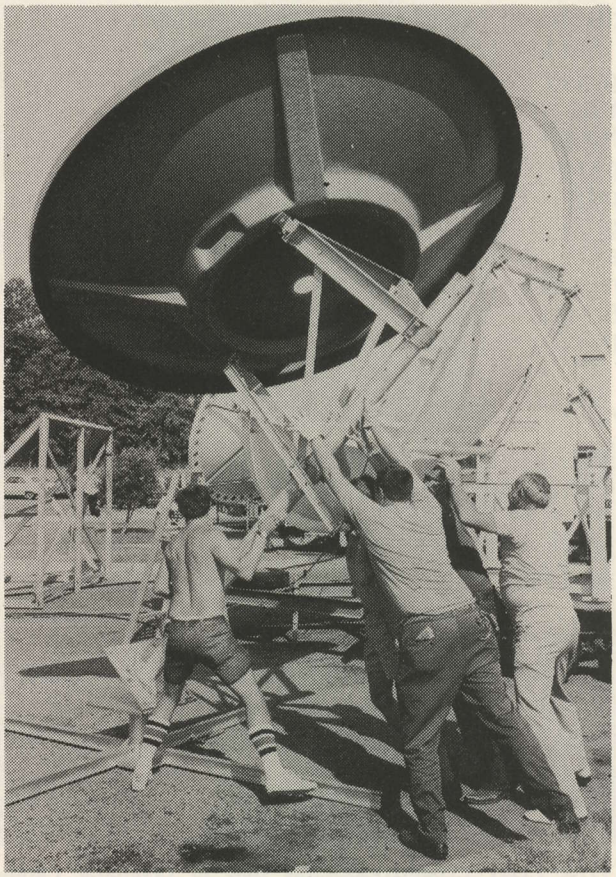

UP-UP AND OVER!—More volunteers hard at it as the CATJ Lab ten foot experimental terminal is hoisted from the ground to its moveable platform. Antenna bolts on the 4.5 inch vertical pipe and then the pipe hinges upward to allow a few hefty fellows to bring it upright. Terminal first appeared on front cover of CATJ for May as our "WF-92" terminal.

concerns. At one point a major satellite operator had a set of interference which he could not trace through the standard calls to other satellite operators. Finally in desperation a call was made to a Washington agency dealing with intelligence functions. **"What transonders is that on?"** asked the Washington type. "Oh no, we wouldn't be doing anything like that" came the curt reply. For ten more minutes the interference persisted and then suddenly it ceased. And the telephone rang again. The uplink operator had the Washington type on the telephone again. **"Has the interference stopped?"** he asked. **"No, we didnt have anything to do with it. . .I'm just checking to see if it stopped. . ."**.

The plain truth is that within certain technical limits the 6 GHz uplink range is one great big window through which anyone with just a smattering of knowledge can drive one or more signals. To some it may prove to be a very tempting challenge. To others it may be a 'quick and dirty' clandestine link. Both RCA and Western Union spend a great deal of time (and money) monitoring and identifying each and every carrier on each and every transponder on an almost twenty four hour basis. The 'possibilities' for clandestine operation have not escaped RCA and Western Union. And within 18 months or less there may be real problems in this area.

At least one well known Hollywood production group is working on a movie script for a movie that will be produced in 1979. The 'working title' for the movie is 'Video Bandit' although that will probably be changed before it is released. In the plot line a free soul with some electronics background discovers how he can point a relatively small parabolic antenna at a satellite and send messages to all of the people of the United States simultaneously from a hidden location. In the current script the guy is harmless; he is just looking for an audience for his beliefs. Others may not prove to be so harmless ultimately.

One of the favorite watering-hole topics for CATV satellite field engineers these days is the 'verbal creation' of a ransom scheme to take over control of a satellite and to 'hold it for ransom'. **Nobody is serious of course. . .**it just makes for fun discussion over a beer or two with compatriots. But the possibility exists and that is enough to keep Western Union, RCA and ATT/GT & E very nervous. They undoubtedly have some foolproof systems that can override a 'birdnapping'. . .and then again they may not.

Back closer to present day problems, the big concern at RCA these days is the inadvertent use by cable systems of bird common-carrier feeds for the networks or local television stations. The problem is unique to RCA at the moment because they are still using some of the transponders on F1 for network or independent station remote program feeds. An example: During July RCA used F1 on several occasions to relay an ABC Chicago news center feed to various other ABC locations around the United States. This was done on both transponders 18 and 20. **This was private material,** owned by the ABC network, **intended only for** ABC control centers. Several CATV systems, either on purpose or accidentally, stumbled onto the news feed and somehow the feed got out onto at least a few cable systems. The cable operator, if he knew he was feeding it into his system, perhaps thought it was cute. The cable subscribers may have been amused but the ABC network was not. At least some subscribers found some of the language used during the 'off-air' portions of the continuous (for several hours) feeds objectionable (studio people have a way of talking just like the rest of us and when they have good reason to believe they are not on the air, what they say out loud may not be 'G' rated), and viewers called their local ABC affiliates to complain. The message got back to ABC headquarters who in turn jumped all over the people at RCA 'for allowing this to happen'. RCA also heard from the FCC about this. The bottom line is that **(1)** you are **not** supposed to be 'eavesdropping' on feeds not intended for your own cable system, and, **(2)** if the event that you accidentially stumble across such a feed while changing transponders on a TVRO receiver, you are most definitely not supposed to be 'sharing' that illegal reception with your cable subscribers!

RCA is making an effort to get all such traffic moved off of F1 and onto F2. But that requires lots of hardware change and it will not happen overnight. For now, because few systems have ortho-couplers installed to allow them to tune up the **vertical** transponders, about the only transponders where you are likely to run across non-CATV traffic are (1) transponder 16 ahead of 7:15 PM daily when Fanfare begins service, (2) transponder 18 and (3) transponder 20. With Home Theater Network starting service for a few hours

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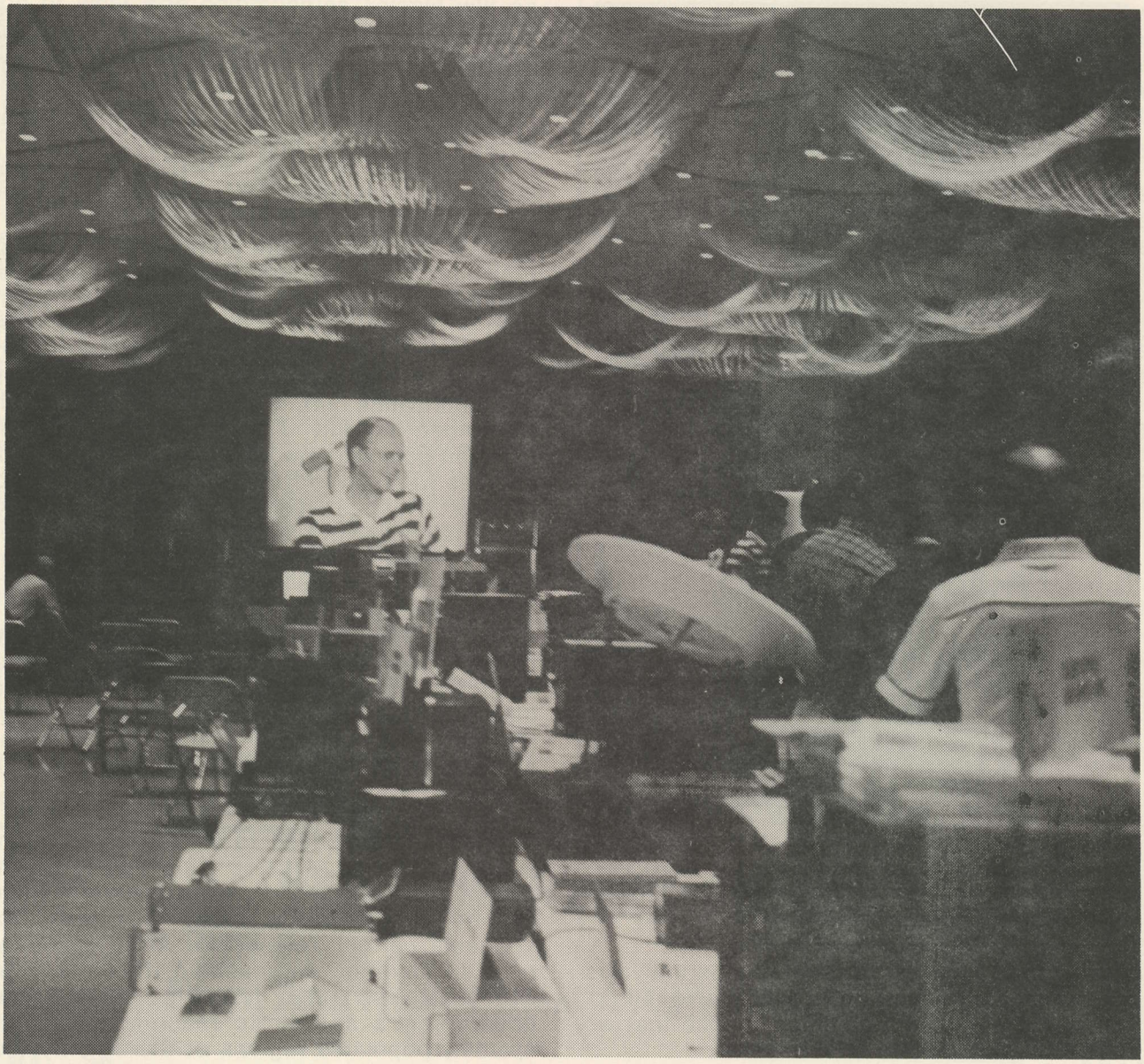
LOW COST COMPUTERS—Ray Daly of Computer Cablevision (center) described use of low cost computer equipment to operate your system, and, to bring to your subscribers telephone interconnected computer games they can play via touch-tone phone with other system subscribers. Bill Marshall, a system manager from Waynoka, Oklahoma and a contributor to CATJ, assisted Ray in the seminar session.



BIG SCREEN DUKE—the 10 foot General Electric projection screen system sat on stage at the far-end of the exhibit hall carrying the satellite delivered CCOS program schedule to hundreds who kept the exhibit hall humming for three solid days. That's Duke Brown of Microwave Associates on the big screen.

per night on September 4th on transponder 18, those systems equipped with transponder 18 receiving equipment should be particularly careful about installing their transponder 18 reception gear so that the video coming out of 18 is fed into the cable system **only during those periods when HTN is on 18.** Any other programming 'intercepted' is not for CATV use and is illegal to carry.

Ultimately RCA will move all of this traffic off the horizontal transponders on F1, and possibly entirely to F2. That will clear up this potential problem for all but the most deliberate tuner-inners.

The other big area for discussion these days amongst the bird operators is the recent (late June) launch by ATT/GT & E of their COMSTAR 'C' bird which is at 89.7 degrees west. There was some opposition to the launch amongst the carriers; reportedly monitoring of the existing COMSTAR 'A' (at 128 degrees west) and COMSTAR 'B' (at 95 degrees west) indicates that the 24 transponder telephone industry birds, like the 24 channel RCA birds, are anything but full. One competitive carrier told us **"You could fit all of the existing telephone traffic into six transponders on a single 12 channel bird and still have plenty of room left over".** For the telephone companies to have 72 (24 times 3) transponders available in orbit would, it appears, be a bit of overkill. One observer noted **"Perhaps what we have here is an example of how much money an orbit spot is worth. Is it worth $50,000,000 to hold onto an orbit spot today that you may not be able to justify using for perhaps ten years?".** The users of orbit spots are

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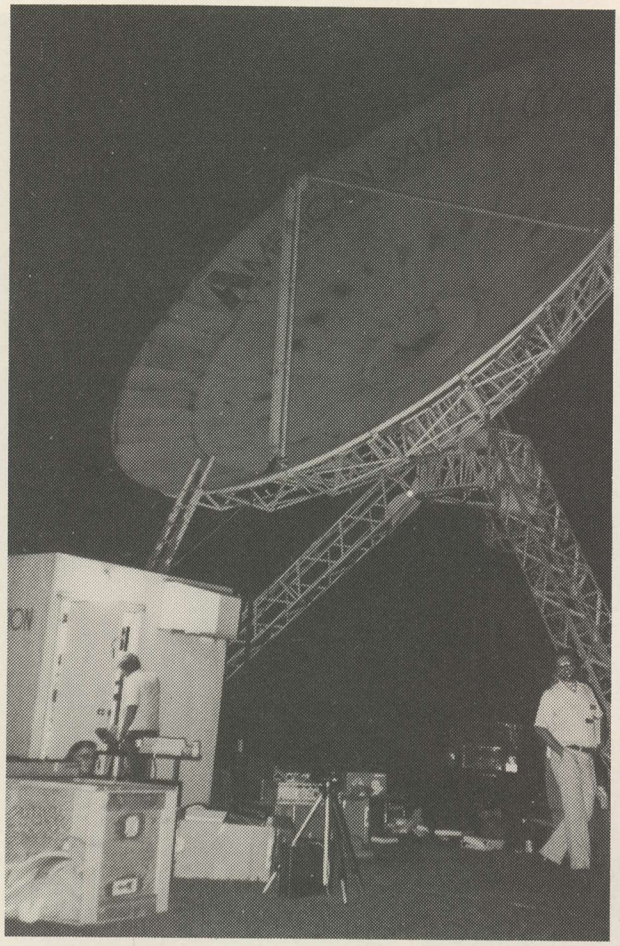

THROUGH THE NIGHT—all night long for four solid nights volunteer workers kept plugging away at de-bugging electronics and antenna malfunctions to bring the CCOS '78 uplink off as an industry first.

headed for a very real confrontation in the years ahead and as the orbit belt continues to 'fill up' one can assume with some assurance that we haven't heard the last of this yet.

The Worm Turns In Canada

The following report, part of our "Update '78 / Satellite Technology", suggests that Canadian satellite technology is stuck on dead center. Dead center may be shifting. **Item one:** Minister of Communications Jeanne Sauve has filed five separate proposals with Telesat of Canada **requesting** that Telesat re-structure its satellite tariffs and policies to allow fuller use of satellites by CATV systems and by non-Telesat firms. **The first four produced no results.** We understand the fifth told Telesat **"You should not count on the earth segment revenues from Telesat to be in your budget requests for the new year".** Translation? Either get off the stick or lose your control of Canadian satellite services. **Item two:** On October 17th in Thunder Bay, Ontario the CRTC will hear applications for 70 new communities in Northern Ontario and the Yukon to receive television service. One firm will propose satellite service from American satellites (i.e. FI). **Item three:** From October 19-26th Northern Satellite Systems will hold a 'satellite technology seminar' at the Airport Inn, Vancouver. Three separate earth terminals will be in operation. And TVRO gear will be offered for sale. **Item four:** Faro, Yukon is slated to turn on shortly. 400 homes, their first television. Service will be via U.S. SATCOM FI "And we'll do it with the blessing of DOC" notes Canada's Rod Wheeler.

And In Canada?

The Canadians are in a quandry over satellite services. They have an embarrassment of riches; three birds in the sky, and an equal embarrassment of poverty; three regular television channels in use.

On the bottom line the Canadian situation can be summed up by this candid comment of a former Telesat employee: **"Nothing in the Canadian satellite program has happened as a result of a rational plan."**

The Canadian satellite program is steeped in politics and internal bureaucracy. There are three Hughes constructed HS-333 satellites now in orbit (ANIK I, II and III) all offering 12 transponder capacity in the 4 GHz downlink band. Yet a fourth satellite, a new hybrid design 4 and 12 GHz downlink bands bird, is scheduled for launch in November. It, ANIK 'B', will probably end up in the orbit position now occupied by ANIK II (109 degrees west) and ANIK II will be taken "out of service". This statement is something of a joke since neither ANIK I nor ANIK II are **really** in service anyhow; they just sort of sit up there occupying space and holding down an orbit spot above the equator.

The Canadian cable industry desparately wants to be on the satellite. The quasi-commercial agency charged with the operation of the Canadian satellites and their ground support system (Telesat) acts just as desparate about having cable feeds on the satellites. But there it all falls apart.

Telesat is supposed to be in the communications business. ANIK is supposed to be the most modern domestic satellite communications system in the world today. The evidence suggests neither Telesat nor ANIK are being used to anything approaching their potential. ANIK has been widely touted as the Canadian government's answer to reaching the more sparsely populated regions of the country. Yet the truth is that ANIK has **largely** been put to work to replace **existing terrestrial services** in areas where some type of service already existed; not to reach those areas where there was no terrestrial services to begin with.

Telesat has either bungling leadership, or a deeply entrenched bureaucracy. And perhaps it has both. To begin with, Telesat prices their services far above the reach of the very people for whom they are intended. As an example, if a small community in the Yukon, now without television service, wants such a service, there is a scheme whereby the community can build their own receiving terminal and then turn it over to Telesat for a paltry one dollar. The Telesat 'act' restricts earth terminal ownership in Canada to Telesat; and the Telesat folks **refuse** to provide services unless Telesat in fact owns the terminal. If the hypothetical Yukon community wants service, it must either talk Telesat into building it or put it in on its own and then 'donate' the completed terminal to Telesat for a buck.

If you wait for Telesat to do it on their own, you may wait a very long time indeed. By the definition of what size communities Telesat will on their own put a terminal into, the Yukon territory qualifies for a single terminal. That community, Whitehorse, already had television and other ANIK type communications so when Whitehorse got its terminal it was as a 'parallel system' to the existing terrestrial services. Meanwhile the balance of the Yukon goes without.

Several Yukon communities have raised the dollars to build their own terminal, and have donated that terminal to Telesat. These terminals receive the ANIK CBC Northern Service feed, cable it into a local low power VHF **transmitter,** which then covers a radius of 5 to 20 miles of terrain with their first time television. Then on top of the 'donated terminal' the community must **also come up with** approximately **$13,000 per year** to pay to Telesat for the 'ongoing services of the terminal'. In a community of say 300 people, that works out to $43.33 per person per year for a single channel of television.

There are some 208 unserved 'communities' or 'camps' in the Yukon, according to Rod Wheeler of Whitehorse. A camp is anything bigger than a single family dwelling area; more than 100 have 30-50 people each working on road, mining or other projects. And they are essentially without television.

So the cable use of the ANIK satellites aside, even in that realm where the Canadian Telesat operation is required to be of service there is a strange reluctance to fulfill their obligation. Internally, Telesat officials grumble about 'policy' and 'costs'. Externally, Telesat looks like a conservative Wall Street investment agency that buys only secured municipal bonds. They show very little daring, virtually no flair, and it is difficult to imagine they are really in the space communications **business.**

If the ANIK/Telesat program falls short of its intended goals in operations, technically it is one of the better operating satellite systems around. That is not to say they are without technical problems; merely to note that the problems seem to be well in hand and for the most part under control. ANIK I, launched in 1972, was originally spotted at 114 degrees. This Hughes bird developed (or went up with) a 'ferrite switching problem' and consequently the service was unreliable. When ANIK III was launched in 1975 it was spotted at 114 degrees and ANIK I was moved back to 104 degrees; the furthest east geo-stationary orbit point for Canada.

ANIK II, launched in 1973, has also had its share of technical problems. Shortly after it went up it developed a problem that has been subsequently called **'a wandering RF notch'.** Apparently because of a problem with an RF rotary joint on the despun antenna, there occurs a '6 dB notch' in the output passband of the transmitting antenna array that is temperature (or season)

sensitive. The notch, which attenuates slightly more than one transponder width (i.e. 40 MHz) at a time, starts near the high end of the downlink band (4.2 GHz) in the spring and slowly wanders 'down-band' during the summer. In the spring it starts over again at the top end. This does not make any ANIK II transponder **useless,** but the 6 dB power decrease does reduce the particular output level of the transponder affected at the moment (6 dB is equivilent to reducing the TWT output power from 5 watts to 1.25 watts, and the same 6 dB difference shows up on the ground as a 6 dB voltage reduction in carrier level).

The Canadians have insisted all along that their new satellites be built by a Canadian firm. That makes the new ANIK 'B' series bird, scheduled to be lofted in November of this fall, an RCA designed bird. RCA has built the new hybrid 6 and 14 GHz uplink and 4 and 12 GHz downlink bird through an RCA Canada company. From a user's point of view the new ANIK 'B' promises some interesting improvements. Prime amongst these is the 10 watt TWT power level for the 4 GHz downlink transponders (12 transponders, just as with ANIK's I, II and III; see **CATJ** for **April,** page 36-37). **ANIK 'B' is promising 'minimum Canadian service contours of 36 dBw'** which translates to 38-39 dBw over the majority of the Canadian landmass area. **That extra 3 dB of signal** into Canada will greatly reduce the requirements for **(1)** antenna size, **(2)** LNA noise temperature, and **(3)** receiver threshold level. Where the present 4.5 meter receive terminals function well (such as with a 3 dB margin), with ANIK 'B' in service the same signal levels will be practical on 10 foot terminals and antennas as small as 6 feet in diameter with 120 degree LNAs are expected to function well **within Canada** for 'private terminals'. Outside of Canada, where no **legal** service is possible, contours are expected to come up 3 dB above the present ANIK III service levels. This means that locations such as Oklahoma, for example, where now there is approximately 0 dB excess signal on a six meter antenna with a 120 degree LNA, the new ANIK 'B' service contours will be well above the sparklie region.

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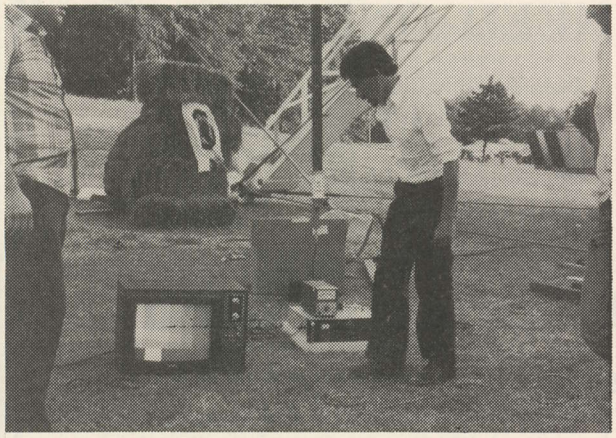


THERE IT IS—Canadian Wheeler catches the first glimpse of uplink signal on the receive port of the system. Color bar video generated in NTSC generator fed uplink on 6 GHz while 4 GHz receive portion of terminal brought the signal back down again. A 46,000 mile plus trip to cover less than 15 feet of terrestrial distance!

Yet the deployment or operation of ANIK 'B' is still not firm, even only months ahead of its launch date this coming November. About all that seems certain at the present time is that when launched it will move into the 109 degree west spot now occupied by ANIK II. Whether ANIK II will be taken down (or jettisoned up out of synchronous orbit), or moved over to the position occupied by the aging and ill ANIK I is still not known.

And will ANIK 'B' become the "primary" satellite for Canada? Because it is the "newest" bird one might logically believe so. Unfortunately there are potential design problems with this. Foremost amongst these design problems is the limited primary power on board. ANIK 'B' was not designed with sufficient primary power to allow **both** the 6/4 **and** 14/12 GHz transponders to run, full power **simultaneously.** In fact if the 6/4 transponders get full, there is virtually no power left for operation of the 14/12 GHz system. In a sense then it might appear that the ANIK 'B' is a hybrid in more ways than one; it combines today's 6/4 technology, where virtually all commercial traffic is, with 6 channels of 14/12 GHz service; the latter apparently for long term experimentation leading up to the next launch, in 1980/81, of the solely 14/12 GHz bird family represented by ANIK 'C'. In a paper delivered to the American Institute of Aeronautics and Astronautics, Inc. in San Diego in April of this year, R.M. Lester of Telesat Canada noted:

> **"During the planning of ANIK B, Telesat could not forecast with assurance the securing of a sufficient portion of the Canadian telecommunications market to justify the major step forward to a high capacity second generation of satellites which could operate effectively during most of the 1980's. Consequently the ANIK 'B' program may be considered as providing a means of continuing existing and growth services operating in the 6/4 GHz bands while having provided additional time to better assess the needs of the 1980's and to evaluate the technology available. . .".**

Canada's space effort is at best an example of engineering overkill and practical underkill. All of the **emphasis** appears to be on creating and launching **new technology** while the present, usually very adequate technology goes underused and often as is the case with the Canadian cable industry's desire to use satellite services is priced so far out of practical reach that it cannot be used.

Canadians close to all of this keep whispering **"soon. . .this will all change".** Perhaps.

And The Private Terminals

As Coop's Cable Column noted in the August issue of CATJ, private terminals are getting closer and closer all of the time. Several factors are at play, and foremost amongst these is the visibility of satellite television service.

The recently completed CCOS '78 session devoted a couple of informal (and one formal) session to the question. A few attendees wondered why CCOS (and therefore CATA) should devote **any time** or space to what promises to be a "competitive" medium. The answer is straight forward. **Private terminals are inevitable.** They, like the terminals that will be feeding UHF translators (see September Report on religious transponder users) **are** coming. There may well be a way here for cable operators to be a part of the action. Several people have suggested that if the rural cable system operators set themselves up as installing dealers for private terminals, that private terminals could be installed and operated by the cable operators under mini-system concepts. If the cable operator installed a low-cost terminal in an area where perhaps a mile or two of cable could reach 50 homes—homes that could not be reached by simply extending his existing cable plant, then the cable operator could, under his franchise, serve areas which he cannot now afford to reach. Others have suggested that cable operators in rural areas may well have from one to a dozen homes/ranches where a $100 or so a month charge for a leased terminal would be an acceptable fee for someone **without television service** at the present time. Not everyone can afford such charges of course, but there are a few such locations surrounding virtually every rural cable location. So as the private experimental terminals get simpler and simpler and the costs come down, there are bound to be many areas where the sharp cable operator can profit by being 'a part of the action'.

Keeping up with the progress of experimental terminals however presents a considerable problem to CATJ. **We have been under considerable pressure** to share with readers schematics of various segments of **commercially available TVRO receivers or LNAs.** Those making such requests have one goal in mind—to build on their own, by using someone else's hard design work, their own receivers. It happens that we do have one of (if not **the**) most complete files on TVRO gear schematics in existence today. Many of those schematics and the data that accompanies them were given to us in confidence so that we could stay current with the 'innards-technology' evolving in the field. To date we have been able to avoid sharing this data with anyone; in print or otherwise. We feel very strongly about divulging information shared with us in confidence; engineering data or otherwise.

Yet there are hundreds of well meaning, private terminal operators out there who read CATJ and who would like to improve their termi-

PARAFRAME BY VINES—stressed curve redwood strut parabolic by Jim Vines is one of several promising new approaches to low cost terminal antennas for non-CATV system use.

nals. How do we help them do that without stepping on the toes of the commercial suppliers who have hundreds of thousands if not millions of dollars at stake here? The answer, it turns out, was not so hard to determine; only difficult to pinpoint.

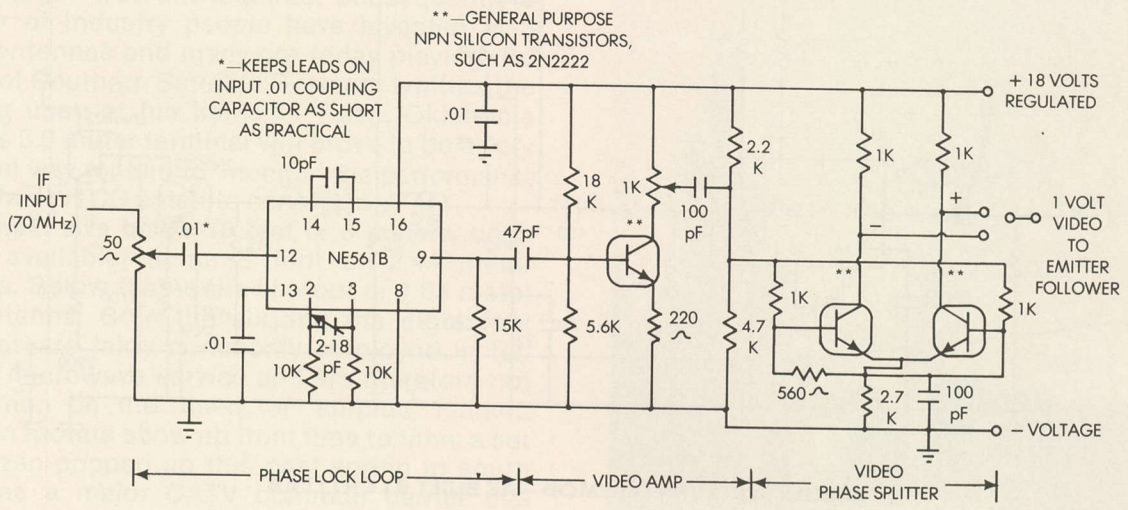
"If the material submitted for publication in CATJ appears to be unrelated to any commercial equipment design, we'll publish it."

Who knows. . .this policy might even result in the development of new techniques, in the experimental area, which will ultimately find their way into the commercial area. That direction doesn't bother us at all. . .as long as it does not go the other way!

Now where are we with experimental terminal designs? On the verge, we feel, of some very exciting developments. Take **Jim K. Vines** of PARAFRAME in Park Forest South, Illinois as an example. Vines has been building 12 and 16 foot redwood stressed-curve parabolics for various users for a couple of years now and he has a head start on a 0.1 inch skin tolerance 4 GHz screen mesh dish for TVRO service. Vines is a highly skilled craftsman working towards the eventual day when his PARAFRAME business will support him full time. He is looking at making 12 foot diameter 4 GHz antennas available in several formats; that is, various stages of completion. His concept is that an experimental terminal operator can select his own level of skills required to complete the antenna, buy just what he needs to complete his job, and save bucks in the process. The 12 foot size seems to be a comfortable size for backyard terminals; a sort of cross between the gain of a 15 footer and the ease of mounting of a 10 footer. Vines, for those interested in this approach to 4 GHz antennas, can be reached at **PARAFRAME, 611 Farmview Road, Park Forest South, Illinois 60466.**

In the LNA department, homebrew GaAs-FET devices may still be a little bit beyond the average experimenter. Englands's Steve Birkill, hardly average, is tackling the project however with an approach that may ultimately prove to be very useful for the skilled backyard type here in the states. **One** of the Birkill projects is to develop a two stage GaAs-FET front end and to offer the 25 dB gain front end either with or without the actual GaAs-FET devices. The concept here is that the cost of the actual microstrip amplifier, in a suitable weather tight housing, can be dramatically lowered if the unit is sold **without** the precious GaAs-FETs. How is that any good? Well, if you use the type of GaAs-FETs the amplifier is designed to utilize, and acquire your own in your own area (see report on LNA technology in September) the job of putting together a GaAs-FET amplifier can be considerably easier. Much of what makes one work is locked up in the board layout, the bypassing system and other circuit design tricks. Birkill prosposes to do all of that for the experimenter and then sell to you a unit into which you will insert (and tweek) your own self-acquired GaAs-FETs.

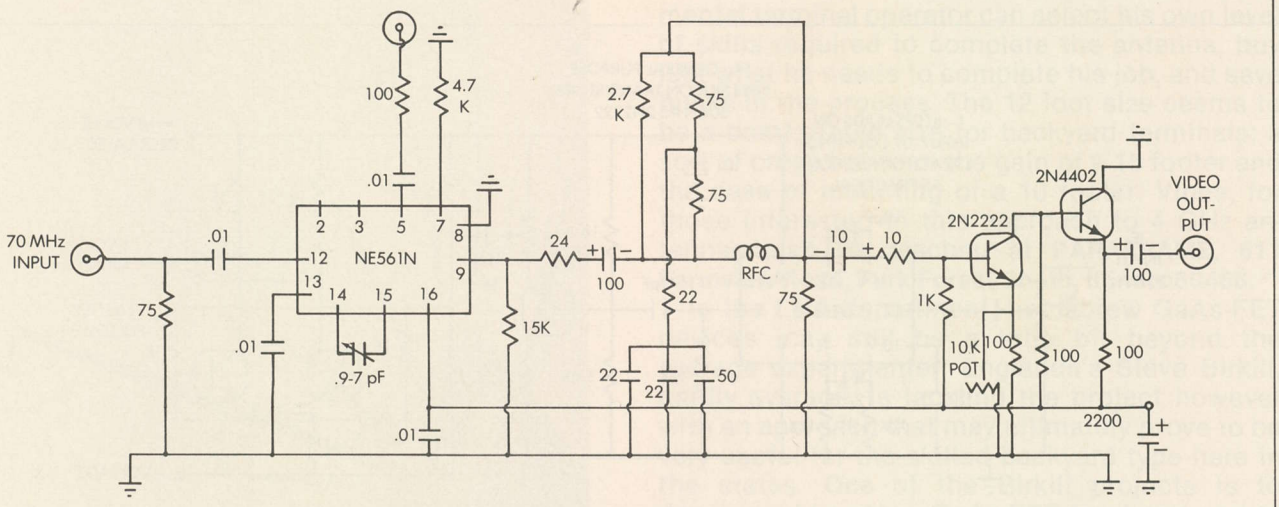
Another Birkill project is being followed along similar but not identical lines here at the CATJ Lab. Hewlett Packard has a printed application note out that describes a 3.7-4.2 GHz bi-polar amplifier with a 2.7 dB (250 degree K) noise figure. The application note includes a microstrip PC layout for the amplifier which you can directly 'print' from; using the HP HXTR-6102 bi-polar device. A slightly higher noise figure (3.0 dB or 290 degrees K) bi-polar, the HXTR-6101 (also now known as the 2N6617) will also fit the circuit. As the September report on LNA progress indicates, these are not really **cheap** transistors but they are readily available through HP distributors and we know of several private terminal operators who have followed the HP application note and made these devices fly with no special problems. Birkill proposes a line of ready-built 250 degree K amplifiers using these devices and with a little coaxing from us we hope to have him follow his GaAs-FET lead to offer similar two stages devices ready to fire up when the experimenter adds his own locally procured HXTR devices. The early experimenter LNAs may not measure up to the presently available 120 degree or better commercial units but with a ten foot (or larger) dish they will produce excellent quality pictures in the 35 dBw plus regions none



BIRKILL'S FM VIDEO DEMODULATOR

the less. And they will be something the devoted experimenter can work with on his own work bench.

The receiver area is "the last great frontier" for the private experimenter. We were introduced to the "**Birkill Phase Lock Loop Demodulator**" during this year's CCOS; we sat Steve down one day prior to CCOS and asked him to take a hand full of parts and build up his European PLL demod circuit. Appearing here are a pair of PLL schematics. The "FM Video Demodulator" circuit has already appeared in the British publications **Television** although as you see it here Tony Bickel has added a few parts to tame it down. Tony built it with**out** the 10 K resistor from pin 3 of the NE561B to ground, and with**out** the 10 pF



BIRKILL TVRO VIDEO DEMOD—AS BUILT AT CATJ LAB

capacitor between pins 14 and 15 (which is how it appeared in **Televisions**) and found it wanted to oscillate all by itself at around 95 MHz. After taming it down Bickel was delighted with the results. He reports that with an 18 dB front end noise figure and no LNA at all on his ten foot dish he was resolving sync bars and some video on SATCOM I with the circuit at the end of about 50 dB of 60 MHz IF gain. If none of this makes any sense to you, chances are you are better off skipping ahead to something less technical. If it does attract your interest, the message here is that an NE561 family PLL can be made to demodulate or FM detect even at our typical 70 MHz IF region. The second schematic, showing the "as built at the Lab" circuit is the unit Birkill put together for us while here. We went into the 70 MHz IF output on our Microdyne 1100 TVR (VT) receiver and drove the Birkill demodulator through a step attenuator; we needed to pad the input to the 561 down considerably to make it fly. Birkill was concerned about three things when he agreed to try out his circuit for us. **Number one,** he had never had nearly as much signal to work with as we have here; his 8 foot dish and 22-24 dBw Intelsat signals are just not in the same league as our 20 foot dish, 36 dBw signal contours and our 55 dB gain LNAs. We found the PLL circuit detected just fine, if you padded down the input by some suitable amount. **Number two,** he was concerned that the PLL detected bandwidth might be too narrow to pass color. No sweat there. . .it did just fine and while we had no time to measure color linearity we were satisifed with the 'look' of the picture. And **number three,** he was concerned that the 6.8 MHz audio sub-carrier might be so far 'down the slope' of the detected video that it could not be recovered from the output of the NE561. Again no sweat. . .while we never bothered to actually recover it (with another NE561 phase lock loop) we looked at it on the scope and determined it was well up in level to present no audio demod problems.

Like we said. . .is this is all Greek to you, move on to the next report. If it fires up your soldering iron and massages your sense of adventure, stay tuned. For about an hour's time and a few bucks in parts, you too can be playing with a demod scheme that you can work with directly out of the IF (assuming the IF is not in the UHF region!) **of your present system TVRO receiver.** Oh yes, the original English schematic appearing here shows phase or polarity selectable video. We left it intact, adding only the Bickel recommended two parts, just in case a reader someplace is in the same boat as Birkill with Intelsat reception from both positive going on and negative going modulation video signals. Simply select the appropriate polarity for the modulation present at the video output port(s).

Back to our editorial coverage problem. We are, starting this month in CATJ, starting a regular CATJ column titled **"The Experimental Terminal".** The conductor of that column is England's Steve Birkill and through Steve we will invite TVRO experimental terminal operators the world over to share with the rest of us their work in this most exciting field. **Remember our rule however—**the work **must be original** and must not, to the best of our editorial eye, duplicate some commercial work already in a product being offered on the market. That keeps us all honest and forces the experimenter who wishes to work through CATJ to innovate; not simply duplicate some existing commercial product in the field.

Oh yes—this "P.S.". That doesn't say that you can't submit "improvements" on gear already in the field!

The 1.83 Meter Terminal

When CATJ's Lab ran a public demonstration of the operation of our WF-92 3.0 meter (10 foot) terminal this past March (see **CATJ** front cover for **May,** 1978) it became evident to many that the ten foot terminal was a very acceptable terminal

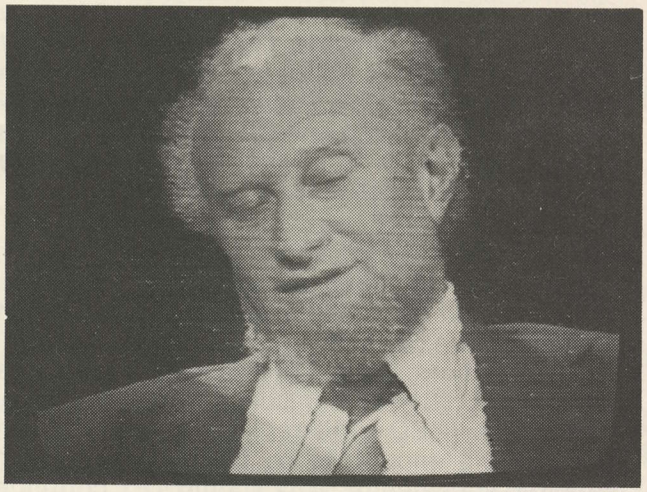
size for those applications where the full 3 dB FCC 'margin' was not required. Subsequently a number of industry people have invested in 3 meter antennas and many are today playing. Ed Taylor of Southern Satellite Systems typifies the 3 meter user; at his home in Tulsa, Oklahoma Taylor's 3.0 meter terminal will prove to be a very practical way for him to 'monitor' the performance of his own WTCG satellite carriage on F1.

The next size below 10 feet or 3 meters, commonly available, is an 8 foot or 2.44 meter antenna. Below that is the six foot or 1.83 meter size antenna. Both the six and the eight foot antennas are fairly commonly employed in terrestrial microwave service and are therefore not uncommon on the 'used' or 'surplus' market. Even ten footers show up from time to time; a set of a dozen popped up this past spring in south Texas as a major CATV common carrier dismantled some terrestrial paths and they quite quickly were all spoken for in the $500 each price range.

The six foot antenna, with the existing 35-36 dBw contours from the existing 4 GHz downlink bird, presents the potential user with no real challenges. But there are trade offs here which become evident for the first time as antennas progressively become smaller and smaller.

According to the standard catalog numbers, a 10 foot antenna for terrestrial service promises 39.4 dBi gain at 4 GHz while (for reference) a 4.57 meter antenna of the same family promises 42.9 dB of gain. If you assume the 4.57 meter antenna is just **at** the 3.0 dB FCC 'margin' point, then by simple subtraction the 3.0 meter antenna will be 3.5 dB below **this point** or perhaps **0.5 dB into sparklies.** Of course both numbers can be 'massaged' by choosing a narrow receiver IF bandwidth, a lower receiver threshold point, a lower LNA noise temperature and so on.

For reference, within the same family of antennas, let's look at the 6 through 12 foot sizes to see what one might expect in the way of satellite service performance:



RECEPTION ON the CATJ Lab six FOOT (not meter) Prodelin antenna with a 120 degree K LNA from WESTAR 1 transponder 9; sparklies are present but if a person was more interested in program content than technical purity he'd have few objections.

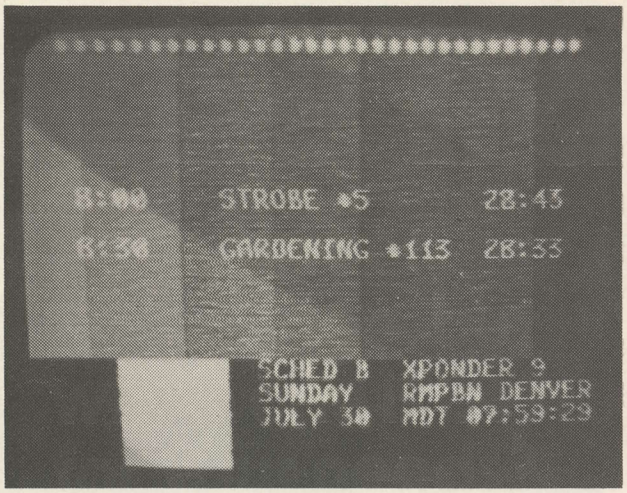
SMALLER AND SMALLER—CATJ's experimental six foot terminal (that's under 2 meters!) **is Prodelin terrestrial antenna with tilt mount. Reception depicted here was with various SCI and other LNA devices into Microdyne 24 channel tuneable receiver. For such a short downline run (12 feet) RG-214 cable is adequate.**

Foot Size	Meter Size	Gain (dBi)
6'	1.83	35.0
8'	2.44	37.5
10'	3.00	39.4
12'	3.66	41.0

If we work backwards from the service from a 4.57 meter antenna that we presume to be **exactly 3.0 dB above FM threshold** or the noise, we find that (all other factors staying the same) we will have:

Foot Size	Meter Size	dB Reference 4.57 Meter
12'	3.66	– 1.9 dB
10'	3.00	– 3.5 dB
8'	2.44	– 5.4 dB
6'	1.83	– 7.9 dB

The six foot antenna now in experimental service at the CATJ Lab is a **Prodelin** model 133-740 **terrestrial** antenna with a Prodelin 45-140 'vertical tilt mount'. The vertical tilt mount (and the antenna) are intended for terrestrial (not satellite service) reception but the difference in the performance at 4 GHz is no more than 0.1 dB from a similar Prodelin 6 foot antenna **intended for** satellite service. The full list price for the antenna and the



MORE PBS ON WESTAR I from the six foot experimental terminal; LNA in use at this point had specified noise temperature of 140 degrees K.

RECEPTION ON the same six foot terminal but with an 80 degree parametric amplifier; limit of present GaAs-FET devices is around 90 degrees K and my what a difference 45 degrees K does make!

mount is in the $1300 ballpark and with applicable discounts it nets out for under $1000 to most buyers.

What can you do with a 6 foot antenna? Well, as the tests shown here indicate, you can watch satellite television with not half-bad pictures. These tests were run on WESTAR I (99 degrees west) primarily because the look angle from Oklahoma is high (49 degrees) and the EIRP contours are known to be in the 36 dBw plus region for **most** of the transponders. As the photos here indicate, three levels of LNA devices were put on the six foot antenna to develop some feel for how sensitive the picture quality might be to LNA temperatures between 140 degrees and 80 degrees (the 80 was a parametric amplifier, not a GaAs-FET device).

The pictures pretty well tell the story. The six foot terminal mounts on a ten foot piece of 4.5 inch OD steel pipe. The pipe is bottom-welded to a flat plate which **hinges** to a mating plate welded on top of a sunk-in-concrete stand. This allows one man to mount the antenna on the ten foot vertical pipe while it is hinged over on its side parallel to the ground. Then two people can push the six foot antenna plus pipe back up into the vertical position, secure the two plates together with large bolts and the adjustments can be made on the antenna. The tilt mount allows you to move in ten degree steps between the horizon (0 degrees) and as much as 55 degrees above the horizon with a ten degree threaded bolt vernier to work between the ten degree 'hole steps' that come with the tilt mount.

The smaller the antenna gets the easier it is to find the bird itself; of course that assumes the antenna is big enough to capture a useable signal level in the first place. Smaller antennas have larger (i.e. wider) front beamwidths; the six foot, for example, has an 'E' plane half power beamwidth of 3.02 degrees while a 4.57 meter of the same family has a similar half power beamwidth of 1.02 degrees. In a nutshell, you can be three times as 'sloppy' or 'coarse' with the antenna's azimuth and/or elevation adjustment and still find the bird you are looking for.

The six foot with a 120 degree K LNA and a 9 dB region threshold receiver is capable, within 35-37 dBw contours, of producing pictures such as you might expect to see on a CATV system from terrestrial low band signals 90-110 miles way. That is, **there is a modest amount of noise** in the signal but it is not so bad as to be distracting to the viewer if he is 'into' the program contents. However, **unlike** the terrestrial low band TV signals the signal is not subject to fading or co-channel interference (assuming there is no terrestrial 3.7 to 4.2 GHz interference about) so there is a degree of 'higher perceived value' from the slightly noisy satellite signal that is not present with similar appearing terestrial signals.

The six foot antenna signal is such that just **another 2.5 dB of signal,** such as you would experience **with an 8 foot antenna,** would in many cases bring the satellite signal up to a point where only the hard liners would find fault with the pictures. This says that if the ten foot is still slightly too bulky for a non-CATV application, the 8 foot would seem to be the ideal compromise antenna size for such installations.

And The TelePrompTer Connection

It has been an 'open secret' for some time... TPT's Russell Karp has been very interested in 'doing his own pay cable thing'.

The numbers are all there. As the nation's largest MSO (1.15 million subs), with 255,000 pay cable subs (HBO affiliated) TelePrompTer certainly is big enough to be their own 'program supplier' via satellite. Why should TPT continue to pay a program supplier between $3 and $4 per month per cable home, and pay a profit to the program supplier, when it is as big today as say

CONTINUED ON PAGE 31

RETENTION. ANOTHER GOOD WORD FOR THE 325 CABLE SYSTEMS CARRYING CHANNEL 17.

Cable Operators know that keeping subscribers happy, keeps subscribers.

And, Channel 17's 24-hour movies, sports, and family entertainment is helping 325 satellite-served cable systems to retain happy subscribers in more than 1.5 million homes nationwide.

"In recent polls, our cable subscribers rate WTCG higher than WGN of Chicago and WTCN from Minneapolis."... St. Cloud, MN.

Here's what the A.C. Nielsen TV audience rating service is telling us about Channel 17's cable viewers:

After only a few weeks, more than 50% of the cable homes view Channel 17 regularly, and viewership increases in succeeding months.

Cable viewers nationwide spend as many hours per week watching Channel 17 as off-air viewers in Atlanta.

Cable viewers watch Channel 17 more or as often as other closer-in independents carried on many cable systems.

Estimates based A.C. Nielsen special tabulations for May and November 1977, February and May 1978.

"Most popular channel—People watch Channel 17 60-70% of the time as compared to network shows. Biggest draw to cable system."... Kenner, LA.

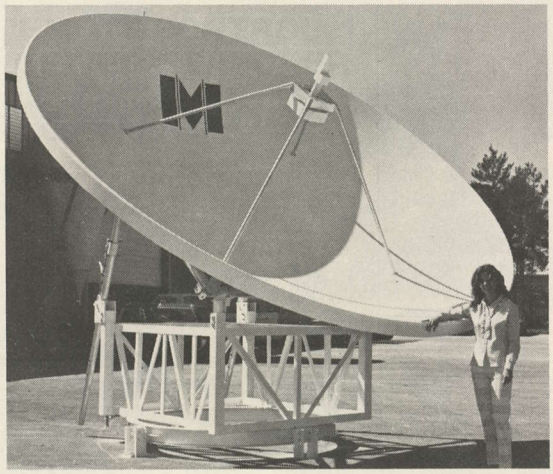
And, from across the nation, Cable Operators are also giving us the good word about Channel 17 viewers and the retention they have experienced.

"Almost immediately after adding Channel 17 our basic subscriber churn slowed down."... Little Rock, AR.

How can Channel 17 improve *your* subscriber retention... and growth? For information, write Cable Relations, WTCG, Channel 17, P.O. Box 4064, Atlanta, GA 30302. Or call (404) 522-7250. We'll get the good word to you.

ATLANTA'S SPACE AGE TV STATION **WTCG** YOUR CABLE CHANNEL

Let Microdyne turn you on . . .



1100-FFC(X1)

1100-TVR(X12)

The 'Let Microdyne Turn You On' theme introducing our SATRO-5M Five Meter TVRO Terminal and companion 1100-TVR (X12)/1100-FFC(X1) receivers at NCTA '78 was a tremendous success. The system's high reliability, unsurpassed performance and competetive price — without hidden installation or replacement costs — is continuing to turn on the CATV community.

Here's why . . .

- Microdyne's antenna foundation typically requires only 3 to 4 cubic yards of concrete.
- Our antenna can be installed by two men in only four hours, after the foundation is in place.
- No survey is required to align the foundation with the satellite since the antenna rotates 360°.
- Precision surface contour of the antenna dish permits future 12 GHz satellite reception without signal degradation.
- Proven reliability results in employing the same fiberglass and fabrication techniques that are used in Bell Telephone's horn type antennas.

Over 70% of all CATV Earth Terminals are now using Microdyne Satellite Receivers. So, why not let us turn **you** on by calling Microdyne Today!

Microdyne Corporation

P.O. Box 1527 — 627 Lofstrand Lane — Rockville, Maryland 20850
Telephone (301) 762-8500 — TWX 710-828-0477 — Cable MICRODYNE Rockville, Maryland USA

Represented in Canada by: Crowder Communications, Ltd.
4625 Lazelle Avenue — Terrace, B.C. V8G1S4
Telephone (604) 635-3990 — TELEX 047-85529

There are two words that describe the SATCO TVRO receiver.

COST EFFECTIVE

Our unique approach to TVRO receivers is the common sense answer to the satellite channel explosion. For example, **4 complete channels** costs you **less than $2,225 per channel**. We'll save you money. It's that simple. Call or write for the full particulars.

SATCO

Suite 211, 217 South Stemons
Lewisville, Texas 75067 (214-436-1571)

CONTINUED FROM PAGE 26

SHOWTIME? Could not TelePrompTer simply become its own pay cable programming company and cut out the middle man?

Several sources report Karp and other TPT officials have been looking for the right 'deal'. At 7 AM eastern time on the morning of September 13th they found it. As of that point in time TPT became married to the ownership of SHOWTIME Entertainment.

The official marriage having taken place, the honeymoon will begin on January first. That's the date when all of the TPT cable systems now receiving HBO pay cable programming will 'switch over' to the SHOWTIME service. And that is the date that SHOWTIME becomes, officially, a 'joint venture' of (1) TelePrompTer, and, (2) Viacom. . .which until now has been the 100% owner of SHOWTIME.

The 'deal' was a well kept secret until the contract was inked; even key SHOWTIME personnel were not aware of the move until a meeting just 15 minutes ahead of a general press conference.

What does this mean in terms of numbers? Well, TPT with a present estimated pay cable subscriber 'load' of 255,000 will add to the January 1 expected 'other customer total' at SHOWTIME of 300,000. With growth in the interim, SHOWTIME people feel this will make a minimum satellite pay service of around 600,000 homes. From a fairly 'weak' number two SHOWTIME becomes a strong number two.

The change over will cause some technical problems as well as the to-be-anticipated operational adjustments. First of all there are a number of TPT systems in the northeast being served by terrestrial microwave. Will they simply switch the microwave feed from HBO to SHOWTIME? **It is not that easy. . .**non-TPT systems also get the HBO feed on the same terrestrial links so the terrestrial feed cannot be simply cut over in New York. Could not a second terrestrial feed be installed? People in the business say **'not by 1 January'.**

There are apparently around 16 TPT systems involved in this 'minor' technical glitch; systems without satellite terminals. Steve Schulte, SHOWTIME's new Director of Operations and Broadcasting has been busily rounding up 'emergency bids' on six meter terminals for the upper New York and New England area since just after Labor Day. **Nobody knew what he was up to at that time. . .**and that was the **only** preliminary indication that 'something was up'.

HBO tried very hard to be brave about the 'surprise' announcement. They have had the feeling for some time that perhaps within five years there would be no fewer than three strong program supplier services on the bird; offering 'national service'. They were aware that TelePrompTer was more than casually interested in the getting into this aspect of the business. Their initial reaction was that this is not a simple 'disaffiliation from HBO', but rather it is the natural result of TelePrompTer expanding its corporate

investment base into a pay cable programming supplier. **Apparently there was an attempt** on TPT's Karp's part to 'do a deal' with HBO at one point. It didn't go very far because Karp wanted an 'equity position' and HBO wasn't interested.

It may surprise some to learn that TPT is not a new comer to the bird itself. In addition to having the largest single group of TVRO receive terminals, TPT began in August to utilize the bird to distribute something called **'Satellite Seminars'** to their own systems. These sales/management/operational training classes were first distributed to TPT systems via SATCOM F1 in August, and were repeated in September.

Another late announcement of an additional to-be-available-via-satellite service comes from a company named **'Modern Talking Picture Service,** headquartered in New York. MTPS will begin distributing five hours per day, on SATCOM F1, of 'free PR and other films' on January 1st. The firm specializes in documentaries, how to do it films and reportedly has been distributing their product to around 100 cable system on video cassettes. RCA says no transponder number has yet been assigned.

Part One of ???

RAY DALY ON COMPUTERS. . . RIGHT AFTER YOU GET YOUR TVRO PAID FOR. . .PLAN ON BUYING A COMPUTER FOR YOUR SYSTEM

As an alternative to the computer services offered by several companies, many CATV operators are naturally curious about buying a microcomputer for their system. Heavily promoted by Radio Shack and many other firms, microcomputers are advertised as costing as little as $599. But many of the terms in this field are new and it may not be easily understood about how they work or what they can do.

Most articles rely heavily on either digital electronics or computer jargon to explain computers. Instead, a comparison to a high-fidelity stereo system can set forth the important aspects. With this understanding, several examples are given in this article about how these low-cost computers can potentially benefit a cable television operation.

Microcomputers are packaged very much like stereos. That is there are both component systems and 'console' units. But even the complete package units have accessories available. In the computer field these accessories are called 'peripherals' with printers or cassette recorders being good examples. A good example of a component microcomputer system is the Radio Shack TRS-80. Three of the four components

The Start Of Something New

One of the more popular and acclaimed sessions during the July CCOS '78 was a 50 minute piece put together by CATJ Contributing Editor Ray Daly of Computer Cablevision. **Ray most recently appeared in CATJ in our June** (1978) **issue when he disclosed how you can license 'mobile microwave' equipment that has been homebrewed by the system operator.** Ray spent several years at the FCC handling CARS band microwave applications, left the Commission early this year to set up a computer programming business that includes several novel programs for CATV.

This month begins a series of articles by Ray, intended to acquaint you as a CATV person with mini and micro computers. **Where are we going with this and what does it have to do with CATV?** Well, let's put it this way. This publication, backed by the CATJ Lab and CATA was the first to see the 'wisdom' of 'small earth terminals' for cable. **We began pushing the concept in our May 1976 issue and never let up until they became a reality.** And just look what has happened since small terminals became legal! **In our crystal ball we see as much or greater industry wide impact from mini and micro computers.** What is missing, we feel, is a cohesive effort to unify computer users, computer programmers and cable operators into a single direction that is good for cable and cable subscribers. We'll attempt to provide that cohesion.

Daly will spend the next few months covering the basics of computers; what they do and how you make them do what you want them to do. Then along about January we'll add another new **Monthly** column to CATJ; **"Ray Daly On Cable Computers".** In his column Ray will tell you how to program low cost computers (such as the Radio Shack TRS-80 series) for everything from video games on your cable system to billing your subscribers and calculating system layouts. Ray will detail how you can set up a TRS-80 to monitor your system for you, automatically, while you are away. How to use it to design plant extensions, calculate TVRO system performance and much more.

We believe there is a computer in your future. And through CATJ we'll help show you why 1979 may well be the year that cable discovers computers.

are common items: the unaltered $50 audio cassette recorder, the small AC-DC power supply, and a video monitor. The fourth item is the keyboard computer unit to which all of the other components connect. A good example of the complete package units is the Commadore PET. In this system all of the various parts, the cassette recorder, the AC-DC power supply, the video monitor, the key-board, and the computer itself are all in one package.

Because most microcomputers are now completely assembled and in working order when purchased, they are easy to operate. In this way they are also similar to stereos. Once you connect the computer components, if you buy a component system, you just plug it in the wall and it works. For example, after you turn on the Radio Shack TRS-80 computer, it will tell you on its video monitor: "READY".

But like the hi-fi stereo system, you need program material in order to use the machine. Just as a high price stereo system is useless unless you have some records or tapes to play, so is a microcomputer unless you have programs. (Of course there is radio, but that analogy will be discussed in a later article.)

Programs for microcomputers are generally produced on high-quality audio cassette tapes. These cassettes are sold by several mail order firms, such as Computer Cablevision, and in computer stores including Radio Shacks. While most commercially available tapes are for entertainment, more business and engineering programs are becoming available. Unlike stereo systems where most equipment and programs material is compatible, this is not the case with microcomputers. For example, though my Beethoven record will play on your stereo, my computer **tape** probably will not work on your system **unless** we have the same computers. There is a lack of standardization and I believe Radio Shack computers may establish the needed standards.

To many it might appear that a microcomputer is nothing more than a sophisticated TV game with a keyboard. While many of the newer TV games are actually 'limited' microcomputers, they do not have either the flexibility or the programming capability of a standard microcomputer. In other words not only can a microcomputer 'play' program material but it can also create programs. This vastly increases their usefulness. **If you cannot find a program to do what you would like, you can write a program yourself.**

Another feature of the computers besides their programming capability is the ability to **store** information or data. This data is usually stored on and retrieved from some type of magnetic media like cassette tapes. Information is not **permanently stored** in a computer's **main memory** for several reasons. First, when you turn the power off to the computer you erase the memory. Second, the amount of data will often exceed the memory capacity of the computer. The computer can handle large amounts of information but it usually does so piece by piece. And third, computer memory is relatively expensive compared to cassettes or other media. The important point is that tapes can be used to both save data as well as programs.

The distinction between data and programs is an important concept. In order to explain, assume a computer is **programmed** to act like a simple calculator; to add two numbers and give the result. **The program would be the instructions to the computer** which makes it perform like a calculator. **The data would be both the two numbers to be added and the result.** The distinction in this case is rather clear. But data can also be considered part of a program. For this example, assume that the computer is programmed to add to any number the number "3". In this case the number "3" would be data that is part of a program. **It is the function of a computer program to manipulate data.**

But what can a computer do for you? Let's begin with a simple example: **payroll.** Paying an employee would be quite simple, provided you had the money, except for deductions and especially taxes. Need I say more? Figuring out the amount to be deducted for Social Security, federal taxes, state taxes, and local taxes is complicated. Plus you need to regularly **pay** these taxes. Radio Shack sells a program package for their TRS-80 computer to do payrolls. This system will handle from 1 employee to 11 on the standard TRS-80. With another option it can be used for about 175 employees. This package can really save time when calculating paychecks and it keeps your records for the taxman. For more details see the box.

You can also use the microcomputer for cable system design work. During my presentation on microcomputer at CCOS '78 a simple Cable System Power Design program for a TRS-80 was demonstrated which Bill Marshall of Waynoka Community TV in Waynoka, Oklahoma and I wrote one

Radio Shack's Business System Payroll

When paychecks are to be completed, another program is run which uses this **previously created data tape.** For each employee this program displays the information stored on the data tape. This includes the Social Security Number, marital status, number of dependents, whether salaried or hourly, and the rate. Also the last Quarter-To-Date (QTD) and Year-To-Date (YTD) figures are displayed for the Gross Pay, Federal, FICA, State and City taxes, and 'Other' deductions. For hourly employees, you then enter the regular hours and hours overtime. Then the program computes the Gross Pay and taxes for the current pay period. After any changes are made to these figures, the net pay is given and the QTD and YTD figures are updated. From these figures you can now write that employee's paycheck. When you are finished with the last employee, the program creates a new update data tape which contains the current figures.

There is also a program to give you just quarterly and annual summaries. This is useful when paying the withheld taxes and filling out W-2 forms and the like.

The Radio Shack payroll system is just that—a complete payroll plan that does everything **but** write the checks. In a straightforward manner, it takes you through the steps you must follow in its manual.

To implement their system, you run a program which asks questions about various tax and employee information. For example, "WHAT IS THE FICA %?" You type in the answers and this information is stored on a separate cassette tape: a data tape.

evening. Using this program you can quickly determine the location of power supplies for a cable plant. On another evening we adapted Bill's program for a Texas Instruments SR-56 to do CATV Feeder System Design (see August 1977 issue of **CATJ,** pp. 30-32.). One person later stated that they could have easily saved 4 to 5 hours of work on a calculator if this computer program were available for their use.

Several people at CCOS '78 asked if a microcomputer could be used as a low-cost, alphanumeric character generator. **Yes!** So when the computer is not being used for other functions, you could use it on the cable system. However, three factors must be considered. First, most microcomputer displays are black and white. Second, there is a problem with microprocessors generating radio frequencies (RF) which can cause problems at VHF (RFI). And third, for television you want a maximum of 32 characters per line, but most microcomputers have more than 40 characters per line. This can require a higher bandwidth than is available for television. This use of microcomputers will be discussed in more detail at a later time.

Since microcomputers have typewriter keyboards, it is assumed that you need to know how to type. Hunt and peck is fine, but you can learn on a microcomputer how to touch type. You can learn at your own speed and at your own time. And this is just one example of the educational potential of microcomputers.

In your office is another example of how a computer can be used. A microcomputer can be used for word processing where instead of directly typing onto paper, the information is displayed on a video monitor and stored by the computer. Then, at anytime, the computer can print the information.

The advantage of this method is that the information can be edited and more than one original can be printed. For example, a draft report can be prepared and corrected without having to completely retype the entire report. When it is ready to be printed, originals can be sent to each party. Word processing is also helpful in sending 'form letters' and preparing a variety of documents. I will use such a system in preparing future articles for CATJ.

And these are not the only uses for microcomputers. **Obviously subscriber billing can be done with a microcomputer.** Such systems are advertised by both Toner and Applied Data Research, Inc. Some cable operators have developed their own programs to do their billing. Many more engineering calculations can be made with computer programs. Also, it can be used for accounting and bookkeeping functions. There are general ledger and account receivable programs available, programs to determine depreciation under different methods, and programs to determine loan payments for different variables. And more.

In conclusion, two points must be remembered. **First,** the computerized way is not always the best or the easiest way. **And second,** you should make sure that you understand a program before relying on it. Make sure that it is operating how you think it is. Test it with a known problem to see if it comes out with the right answer. This does not mean that you have to thoroughly understand the program itself; you don't have to decipher the program language.

WHEN On The BIRD?

The first scheduled **'CATJ Satellite Magazine'** program will be seen on RCA SATCOM F1 on either Thursday, October 26th **or** Thursday, November 9th. As announced last month (see Coop's Cable Column, page 48-B in September) the cable industry will have a special satellite delivered program all of its own starting this fall. The program, being produced by CATJ Magazine, **will ultimately run one hour per week** at the same time **(12 noon eastern)** and same day **(Thursday)** each week. The scheduled **transponder** will be **24.** The use of this transponder is ahead of the normal HBO eastern and central time zone feeds that appear on this transponder starting around 2:30 eastern time.

Getting together all of the production arrangements for this program on a weekly basis is taking a bit longer than we had initially anticipated. For that reason the program **may** appear on **alternate weeks** for the first month or six weeks until the production bugs get worked out. The program is being produced in Oklahoma at the University of Oklahoma broadcast journalism department the week prior to the actual airing date, sent on 3/4 inch tape to RCA at Vernon Valley and then played directly via satellite to hundreds of cable terminals nationwide.

Out In Front...

PHOTO BY JAY CONRAD STUDIO

Because We Have The Most Cost-Effective TVRO Terminal Available Today!

A recent study of FCC data provides the proof (see CATJ for September, page 34). USTC six meter TVRO terminals cost less-per-channel to construct than any other large terminal available. Cost-per-channel delivered is the best way we know to compare competitive terminal prices. Cost-per-channel delivered takes in all factors. . .the cost of the antenna (installed), the cost of the LNA and the cost of the receivers provided. **FCC published data proves it!**

Don't throw money away. . .come to the leader in cost effective large terminals for the six meter performance so essential in today's expanding TVRO world. Come to the structural strength and design integrity of all aluminum (or all steel) design.

Come To USTC

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TECHNICAL TOPICS

225 Miles Of Noise?

Editor's Note: In our August issue a trio of CATV engineers employed by the Manitoba Telephone System described a new province-wide terrestrial coaxial cable trunking system utilizing feed-forward amplifier techniques (page 18). **Reader and accomplished engineer I. S. Switzer responds to that report in the following letter to CATJ.**

"The long haul trunk system in this article is ill-conceived both as to functional intent and engineering concept. A buried coaxial cable represents a very substantial investment and its installation commits its owners to a long term committment or else involves very substantial write-offs.

"The concept seems to be based on the idea that all it takes to build a successful long haul 'super-trunk' is a **super-amplifier.** A feed-forward type amplifier with additional redundancies and fault reporting is indeed a 'super amplifier' but by no means a sufficient answer to the problem of high quality long-haul television transmission in coaxial cables.

"Feed-forward amplifiers have not been widely used in the cable television industry. They achieve their very good low-distortion performance at relatively low signal levels and are therefore really more suitable for trunk use than distribution use. Cable television operators (generally) favor higher operating levels in distribution (portions of the plant) because of the proven economies in higher level distribution systems. Trunking doesn't seem to be a major problem to cable operators because new designs favor 'hub' concepts with short trunk runs (typically 8 amplifiers or less) emanating from localized 'hubs'. The hubs can then be linked by a variety of means including super-trunks, VCHM (our Canadian term for AML/FM) or replicated head ends. Conventional broadband amplifiers using currently available hybrid amplifier modules have no trouble providing very good performance in these 'hubbed' systems.

"Let us look at the problem of signal transportation to link local hubs or to link separate communities. The television system as a whole has generally been based on the concept of imposing the highest possible quality standards at the beginnings or origins of the system; and then imposing gradually reduced standards of quality as one transports signals away from the source to the final (home) receiver.

"Our broadcasters impose the very highest standards to picture quality; typically 54 dB is specified for their prime cameras, VTR's, STL's, and broadcast transmitters. The picture quality the public actually sees may on the average be somewhat less in its original quality but at least it starts out with (usually) high quality and with hopes that it will not be too seriously degraded down stream. Each link in the 'system' should be better than the one following it. Cable systems build their head ends to the highest quality standard possible since the pictures down stream will be no better than what comes out of the head end. Our trunks are better than our distribution segment and our distribution generally better than the subscriber's internal wiring and all of this is generally better than the average TV receiver.

"Here's the Manitoba Telephone System specification for their ICBN station at Brandon; 130 miles downstream along the proposed total distance of 250 miles:

1) **Differential Gain** ..... +/– 0.5 dB
2) **Differential Phase**... +/– 1 degree
3) **Cross Mod Distortion**.... – 59 dB minimum
4) **Inter Mod Distortion**.... – 71 dB minimum

"These are all very acceptable parameters. Differential gain and differential phase are not effected very much by a true broad-band RF system and the feed-forward super-amps have done their job with respect to cross mod and intermod distortion.

However, look at signal to noise:

5) **Signal To Noise Ratio** ..... 43.8 dB minimum

"This number (43.8 dB minimum and they specify 46.8 dB nominal), weighted to CCIR baseband, is considerably lower than one normally expects in a transportation system; certainly much lower than good quality FM microwave relay. In fact, this is a pretty mediocre type of system to put directly **between** the broadcaster **and the** cable head end. It is certainly not consistent with generally accepted overall system practice.

"In the present ICBN system the original source for most of their channels (to be carried throughout the province) is a head end of only moderate quality located on the border south of Winnipeg. This head end uses a 400 foot tower to receive signals from stations in North Dakota that are 80 to 120 miles distant. This flat prairie country gives you 'gain' for transmission and reception only by building tall towers. In this instance a taller tower is not warranted because increasing height will increase co-channel faster than it increases the desired signal. In this particular case the Manitoba Telephone System signals available for ICBN are mostly not up to broadcast standard (low 50's signal to noise best case). There may be a rationale here for making the transportation system of such quality; it is generally not much better than the signals being handled from the head end. But this (MTS) system is intended for general use and many signals going into it will (ultimately) be of very high quality (i.e. pay cable signals). With this mediocre cable transportation system none of the subscribers it serves will **ever** see a picture better than the 43 dB signal to noise provided by the ICBN trunk system.

"Communities at the far end of the Province will have an 8 GHz high quality FM microwave link connecting them to the tag end of the mediocre long-haul trunking system. Surely it should be the other way around; put your best technology (FM microwave) up front, and the low performance system at the 'ends'.

"Back to my comments that there is more to a super-trunk than just the insertion of super-amplifiers. Super-trunks using coaxial cable have in fact been built to broadcast standards (54 dB signal to noise ratio) over distances much longer than the 250 mile Manitoba Telephone System. Such systems are in operation in Saudi Arabia, Japan and in other locations; over distances as great as 700 miles! These systems are as different from the ICBN trunk as a milk wagon horse is from Secretariat. These long haul trunks have been built by telephone companies in various parts of the world using coaxial cable, vestigial sideband AM signals. . .**but**

1) **They used suppressed carrier techniques to reduce system loading,**
2) **They use frequencies only up to 60 MHz** to reduce cable losses (although higher frequency systems are being planned),
3) **They don't risk the problems** of two-way operation on a **single** coaxial cable, they use separate coaxial cables in each direction;
4) **They use a very high standard** of frequency response correction and equalization;
5) **They have very high standards of impedance matching** at splices, fixtures, amplifiers (etc.) and have very high standards for structural return loss within the cable.

"These proven long-haul cable systems are very expensive—so expensive that they could not compete with microwave except in certain special circumstances.

"Nevertheless, you cannot take low cost cable-television type technology and components and expect it to compare with these super-type cable systems I have made reference to by simply reducing amplifier distortion products. **And that is all that Manitoba Telephone has done**—use a low distortion amplifier in connection with regular medium grade lowloss coaxial cable(s). There is no proof yet that Manitoba Telephone will be able to adjust and maintain equalization and frequency response over this long distance to acceptable standards.

"I find it equally interesting that there is no specification or discussion in their operating parameters for return loss effects. There is no specification of echo-rating (ghosting) or K-factor (smearing, ringing and close-in ghosts). This important aspect of system performance has been completely left out of the discussion or ignored. CATJ readers are well aware of how rapidly these effects can build up in a cable trunk and how much they effect the 'perceived' quality of the television picture. It is my opinion that inadequate (system) return loss specifications at splices and 'fixtures' (including amplifier input and output ports) and the minute cable imperfections which cause 'SRL' are responsible for a very large number of very low level reflections in the cable system; and these tend to 'smear' the picture quality, ever so slightly or as a cumulative effect, quite dramatically.

"Where does all of this leave us? Well, here is my advice on television transportation and trunking over long distances; **starting with** the very **best** present system and then working downward in order of preference:

1) **Satellite** — A communications satellite is a two-hop microwave system with the intermediate repeater in outer space. It is a high deviation FM system with the same high standard of performance right across its total service area. No CATV 'hub' is more than two-hops away from the source and the communities can be served in any order, without regard to their location. This says you don't really have to build a 'railroad' from one town to the next in geographic progression. Cost is independent of transmission distance or the number of communities served.
2) **High Quality FM Microwave** — This affords very high quality transmission with reasonable flexibility. Microwave beams pass right over difficult to cable terrestrial terrain. For given distances there are fewer repeaters (i.e. amplifier stations) and reduced vulnerability to accidental damage.
3) **Fiber Optic Waveguide** — These are ready right now and are being installed right now although admittedly the price is still high. When operated with FM or PCM modes they give a very high quality of transmission. With PCM the fiber optic transmission system can be considered 'perfect' since you get out **exactly** what you put in. (PCM could also be considered for microwave but it requires very wide bandwidths which are usually not practical.)
4) **Coaxial Cable Systems** — A coaxial cable system has to be subclassified as to how it is utilized to transport broadband signals such as television. In this regard, FM would be the preferred transmission medium because of improved signal to noise ratios possible and the less objectionable effects of return loss problems (when compared to vestigial sideband AM). The return loss problems tend to show up more (in FM) as intermodulation noise and increased differential phase and gain problems. These are more tolerable than the ghosting and smearing that poor return loss causes in AM systems. And bandwidth is 'cheap' in coaxial cable systems. Cable loss at 300 MHz is only 70% more than at 106 MHz and a 300 MHz bandwidth system could transport as many as 10 high quality FM television channels.

"Now, if you really must use vestigial sideband AM it would be nice to suppress the carrier; but admittedly carrier supression terminals are rather expensive. However you can obtain almost the same benefits from the use of harmonically related carriers (HRC). This substantially reduces the cross modulation and all but eliminates intermodulation problems. And cross modulation could be further reduced by using frame synchronizers to synchronize horizontal and vertical sync pulses for all of the TV channels being fed into the cable. These are about $20,000 per channel **but** they need only be used at the cable system input so only one set has to be bought. On the other hand use of suppressed carrier techniques requires expensive terminals at both transmit and receive locations.

"**There are** noise reduction techniques available but we are dealing here with improvements in the 3 dB (typical) to 6 dB (maximum) region. Higher improvement in noise reduction equipment results in something known as 'motion smearing' which most people would find objectionable (early trans-Atlantic circuits used this approach and when people moved you saw a shadow or 'smear' of themselves behind them!).

"If you are going to create a long haul trunk, most certainly utilize a separate cable for each direction (i.e. when attempting two-way). Why create all of the return loss and maintenance (etc.) problems of 'filters' just to pick up a few channels in the reverse direction? The actual cost of the cable is low when compared to the cost of the installation labor. Once you are doing the construction work you might just as well put into the trench two (or more) cables instead of the one.

"Bob, your own editorial comments on the front page of the MTS ICBN article make some references to 'other communications' from the authors. Most of your readers (and especially those outside of Canada) will not understand your reference to 'basic political conflicts' which led to the development of the ICBN inter-city system. I believe that CATJ readers, of anyone in this industry, would probably agree that satellites have proven themselves as the best means of delivering high quality television to communities spread thinly over a wide area. I believe CATJ readers should consider the Manitoba Telephone System approach to signal distribution in the context of the following alternatives open to MTS:

1) **MTS is a provincially owned telephone utility** with a 'franchise' for telephone and 'related' services all over Manitoba.
2) **Telesat Canada,** a federally regulated company which is 50% owned by the federal government and 50% owned by the telephone carriers in Canada, offers the only available satellite distribution service in Canada. The 50% of Telesat owned by the telephone companies is roughly in proportion to their size within Canada; which means that approximately 2.5% of the equity stock in Telesat is owned by MTS.

"Now, as alternate number one—MTS could build several million dollars worth of cable and/or microwave. It would own this new plant 100% and be controlled by MTS 100% (at least the cable plant would be) and the cost of construction and the cost of operation would therefore be figured into the MTS rate base. **All of the profit from the system would accrue to MTS.**

"Then, as alternate number two—the service could be provided via satellite using Telesat Canada's ANIK satellite(s). MTS gets no new capital assets to augment its rate base (remember that even receive only terminals are owned by Telesat in Canada, not by the terminal customer) and all of the profits from this service accrue to Telesat. Therefore MTS gets only 2.5% of the profit from their use of ANIK (although of course they would also receive 2.5% of the profits of Telesat for services provided to other regions as well).

"Faced with these two alternatives is it any wonder that the telephone company chooses terrestrial services? I think not.

"What about various sub-alternatives? Well, there is microwave. This would be owned by MTS but licensed by the federal authorities (just as the FCC licenses microwave in the U.S.). And licensing implies some measure of control(s) over the operation.

"Or the alternate of microwave; a cable system. This is entirely within the province, crossing no international or inter-provincial boundaries. **And such a system comes entirely under province control.** Remember the MTS is a province-owned utility. Which is another way of saying that the provincial government is in the telephone (and 'related communications') business.

"Again, faced with these two choices was it any wonder that the provincial government owned telephone company chooses cable instead of microwave? Particularily if it can convince itself that the resulting service will be 'technically acceptable'. Knowing the Manitoba situation intimately **I believe** the MTS engineering department was simply called in and told '. . .**(You) build us a cheap cable system that will be outside federal jurisdiction and that will keep all of those cable subscribers as customers of MTS**'.

"American readers of CATJ should look at this situation as a prime demonstration of what can happen when you have government control of a communication system; and to further frost the cake, **government ownership** as well!"

I. Switzer, P. Engineer
Switzer Engineering Services Ltd.
Mississauga, Ontario L4V 1G2

The bottom line would appear to be double-edged. One, engineering and politics make strange bedfellows and when political decisions seem to dictate engineering design there is every prospect that engineering performance will suffer. And additionally, that wherever the blame must fall the Canadian's use of their expansive (and expensive) **satellite system continues to be a shining example of ineptitude. If the Canadian government had re-assessed the mis-use** (through non-use) **of their three ANIK birds two years or even one year ago, and had created a framework wherein in Canadian cable systems could be enjoying the same type of high quality signal distribution U.S. operators now have with the satellite, perhaps the MTS decision to use a 225/250 mile trunk system would have been a more difficult decision. Perhaps it would never of happened. Readers should note that Mr. Switzer does** not **in any way fault the** (Century III) **feed-forward amplifiers for the marginal performance specifications of the system. Rather he properly refers to them as** 'super-amplifiers', **finding system design faults elsewhere in the MTS project. The cable plant, like the full broadcast system is only as good as the weakest link in the chain. High octane jet fuel just won't make a 49 Ford Coupe run any better than 80 octane regular.**

Feedback On Copyright

"In the January 1978 issue of CATJ there appears an article by Craig S. McCoy, dealing with the implementation of the new Copyright Law. On page 34, center column, last sentence, he states that Cable TV systems cannot substitute commercials. This is generally true, **except for** systems in the U.S. Territory of Guam, the U.S. Commonwealth of the Northern Mariana Islands and the U.S Trust Territory of the Pacific Islands. **We are allowed to substitute commercials.**

We want very much to preserve our rights that we worked so hard to achieve before the law was passed. We believed that all Cable TV systems should be allowed to substitute for local commercials if they had to pay copyright and we tried to interest other Cable TV systems in getting the same 'rights'; but nobody cared enough to fight for it."

Lee M. Holmes
President, Guam Cable TV System
Agana, Guam 96910

Lee is of course correct. Cable systems like Lee's Guam and Saipan systems are given special rights by the 1977 law and he is wise to speak out when these rights are overlooked by sweeping statements such as those made by author McCoy in our January issue. Lee's cable systems videotape programming in Los Angeles (five channels worth for essentially the full broadcast day) **and send it westward via Pan Am jet to "tomorrow" where viewers stay current "today" with the same viewing we have here on the mainland.**

CCOS '78 Missed The Mark

"I would like to give my views on CCOS '78. Quite frankly I was disappointed in the method of holding the programs. I really did not feel that I should travel 700 miles to watch the meetings on a TV in my room or to try to watch them on the large screens in the lobby or the display rooms.

I lost touch with the speakers and missed the opportunity to ask questions from the floor except in a very few instances. I missed the hands-on workshops, and the equipment in the Swap Room. It seemed that there was just too much emphasis on satellite transmission and programming. I could have saved a considerable sum of money if I had just gone the 40 miles to Dubuque and watched it on their earth terminal.

I did enjoy the vacation atmosphere, the informality, the good food and the opportunity to meet old friends but it was not really what I would consider a very informative convention. Just a word about next year's selected spot; The Abbey in Lake Geneva. I have grave reservations whether we will be able to make it there as the $50 per day per room is pretty steep for our small system."

Neil A. Webster
Guttenburg TV Cable System
Guttenberg, Iowa 52052

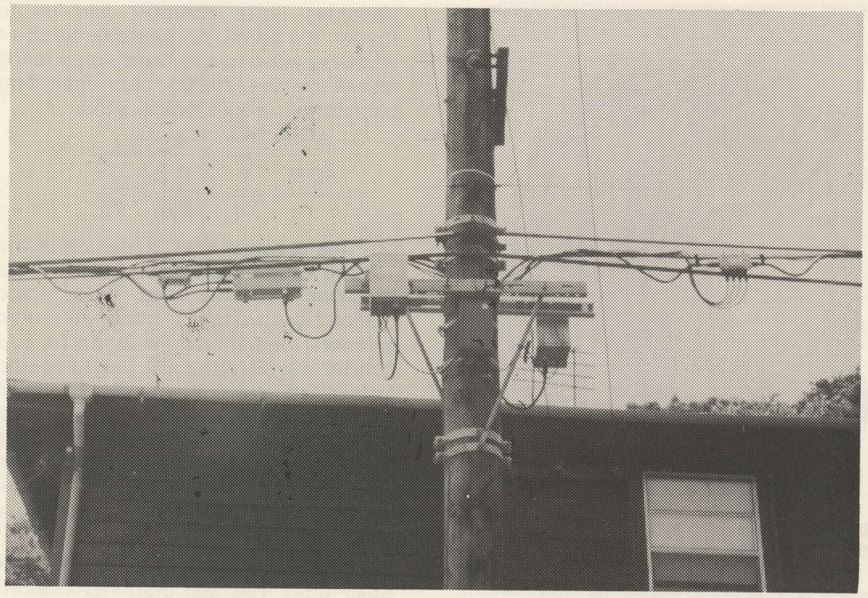
We all learned a great deal this year Neil; number one of which is never try to cram 1,000 plus people into a facility that holds perhaps 600 comfortably! Such severe over crowding created many situations that were unavoidable but, with more room in 1979, will be overcome. Sessions in 1979 will be held so that there is plenty of time and opportunity to (1) **question the panelists, and** (2) **'touch' the equipment and work with it. There will be room for a couple of hundred to sit in on the sessions as well. As for the expensive nature of The Abbey. . .there are several very close motels with more budget priced rates and everyone who wishes will have the opportunity to select accommodations to fit their pocketbook. We know you have attended the first three CCOS gatherings and hope you will come back in 1979!**

American CATV In Japan

"I thought readers would be interested in learning about the effort underway by the U.S. Forces stationed in Japan to bring American television to the world's most television conscious country; Japan.

On June 30th of this year Rear Admiral Thomas B. Russell, Jr., Commander of the U.S. Naval Forces (Japan) cut the ribbon to inaugerate service to the temporary studio of Yukosuka K.P.T.V.; the first American Forces television to be delivered to the troops stationed in Japan. The service is on cable. For the first several months the service is via a stand-alone Sony 3/4 inch tape deck. In October they are scheduled to being programming on a joint basis with all U.S. bases in Japan tied together through the auspices of the Far Eastern Network headquartered at Yokota Air Force Base; and from there delivered through the American bases via terrestrial microwave to other bases located at Totsuka, Kamiseya, Nagai, Negishi, Yokahama as well as Yokosuka.

Efforts to provide U.S. forces with television, via a low power 'on-base' transmitter, began in 1958. This attempt and subsequent attempts in 1963 and 1967 failed. When the U.S. Forces finally accepted the fact that the Japanese government was not going to allow American bases to use the Japanese VHF channels for over-the-air (although low power) broadcasting, they began designing a cable network for each base. Construction of the Navy system began on March 15 of this year through a contract with Nippon Electric Company (NEC). I had a discussion with Commander William J. North of Yokosuka and he said that 17,000 Navy personnel and their dependents will be connected to the completed network.



NEC line amps and power supplies; note there are two power supplies (30 volt but only 3 amp capacity each) on the same pole.

I also ran down a Mr. Kinja Isa, a technician for NEC Installation Company, Ltd. who gave me a guided tour of the system. I found they are using equipment similar to that we utilize here (all of NEC manufacture) with trunk/bridger approaches to system design and 30 VAC powering.

The taped delayed programs I saw were quite old; in June, during my visit, the programs being run had been seen in my Oregon system way back in the previous November."

Carl Schmauder
Lincoln Television Systems, Inc.
Lincoln City, Oregon 97367

Long tape delays may in a short while be a thing of the past as well Carl. There is presently a study underway by the Department of Defense to determine just how much **it would cost the U.S. Government to send what would essentially be the** 'same day U.S. television' **worldwide via either** (a) **existing commercial Intelsat satellites, or,** (b) **existing military satellites in the 7 GHz downlink range, or,** (c) **a combination of these. It seems that the present 'volunteer forces' approach is not resulting in the services getting the 'caliber' or quantity of personnel they feel they need. One of the ways they feel they can combat this is to bring U.S. television, in essentially 'real time' (allowing for time zone differences of course), to American Forces stationed** all over **the world. It will be interesting to watch how they finally thrash this out. Anyone for building a 7 GHz to 4 GHz converter?**

Broadband Grows and Grows

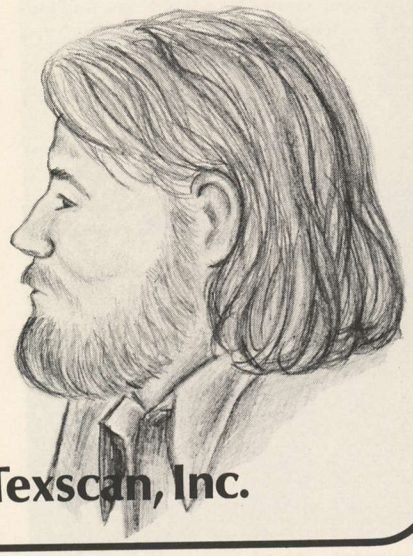
When CATJ visited **Broadband Engineering** (Jupiter, Florida) back in our May 1977 issue (see page 36) the "rebuild your amplifiers—not your plant" company was already busting at the seams. Broadband's Bob Savard has been working on getting the pioneering company into their own facility for at least that long and recently Broadband made the big move to a new office facility at 1525 Cypress Drive in Jupiter. The new facility has some 5,000 square feet of space (More than double the older facility), is equipped to handle not only Broadband's parts replacement business but also the growing 'Mod Kit' line of replacement amplifier module boards.

Late in July, Broadband held an open house and invited members of the industry to inspect their new facility. Several dozen turned out (Florida in late July is not exactly the best place to be. . .could you not have scheduled it for January, Bob?) and apparently everyone had a good time. In the "it is a small world after all" department the next door neighbor to Broadband is something called Logic System. Logic's Frank Aldridge is the fellow who designed the prototypes for Warner Cable's CUBE system. In addition to the new 5,000 square foot facility shown here, Broadband's Savard (right in photo) is shown visiting with John Calhoon of TelePrompTer of St. Petersburg; a system that has been a strong advocate of the Broadband module replacement program.

C-COR's In Encino

C-COR Electronics, Inc. of State College, Pennsylvania has been awarded the contract to supply 183 miles of trunk, distribution and extender amplifiers for the Theta Cable of California expansion into the Encino region. The new plant extension will supply 30 channels of television to approximately 9,000 subscribers in the Encino region.

R. Stelle's Technology Corner



Raleigh B. Stelle - Texscan, Inc.

Radiation Continued. . .

In our column last month we dealt with the basic explanation of why radiation control is essential, particularly where our supposedly secure signals might be mistaken as carriers in the air for aircraft direction finding and landing approach purposes.

Our cable systems contain energy at certain critical frequencies. If the system shielding integrity is impaired these frequencies can radiate and cause interference to other services. The cable system can radiate RF energy in many modes, depending primarily on physical parameters of the cable plant itself. What follows is a synopsis of several ways by which radiation can be produced by a cable system:

1) **The subscriber**

Many subscribers feel that they are clever enough to avoid cable system charges for 'extra set hookup' and for the monthly addition to their bill that goes along with an extra set or two. So they decide to do it themselves and the Radio Shack stores (and others) oblige by offering all sorts of 300 ohm and 75 ohm splitters, matching transformers and even prepared lengths of cable and twinlead. If the 'do-it-himselfer' is reasonably sophisticated electronically he will purchase 75 ohm parts including splitter(s), matching transformers and coaxial cable. Many of the people who attempt to do this are not in that league and because they have grown up accustomed to the 300 ohm flatline world this is how they tackle the job. Many simply parallel the extra hunk of 300 ohm extension line to the antenna input screws on the back of their receiver. In **figure one** we have the normal cable TV transition to 300 ohms (represented by the matching transformer in [A]), the 'extension' of that 'service' with hardware store 300 ohm line in (B).

In a balanced transmission line (which is what 300 ohm flat line is) the current flow in the (parallel) conductors sets up equal and opposite magnetic fields. This means there is **no radiation** from such 'balanced' line. . .**as long as the balance is maintained.** The balance is maintained as long as the driving or source impedance to the line, and the load or receiving impedance at the end of the line approximates the impedance of the line itself. The CATV matching transformer is designed to drive a 300 ohm load; the input to the television receiver. However when two or more 300 ohm loads are connected in parallel as illustrated in **figure one (B)** the impedance of the multiple sets paralleled on the 300 ohm line becomes quite complex and is no longer 300 ohms. An approximation of what happens to the 'load' impedance 'seen' by the 75/300 ohm matching transformer would look like this:

$$Z_S = \frac{1}{\frac{1}{Z_1} + \frac{1}{Z_2} + \frac{1}{Z_3}}$$

but this requires that Z_L (which is the TV set, or impedance load) itself be a balanced 300 ohm load. If for some reason Z_I is not a good 300 ohm balanced load, then $Z_S = Z_L/Z_O$ for **odd** quarter wavelengths at a (any) specific frequency, while $Z_S = Z_L$ for **even** quarter wavelengths at a (any) specified frequency. **(See figure two.)** The bottom line on this is that Z_S must be calculated for every frequency of concern and that gets pretty messy in a hurry.

So what happens when a customer does this? The 300 ohm "extension" radiates. And it will radiate in an almost unpredictable fashion. Whether it radiates on say channel 2 or 11 (or any other) depends entirely upon **its length.** The unbalanced twinlead now becomes an antenna. As an antenna it radiates best when its length is some multiple of a quarter wavelength; and the quarter of a wavelength requirement changes from channel to channel (and even within the channel slightly). Since it is impossible to preguess the length of 'extension lead' utilized to hook up extra sets it is also not possible to predict which frequencies will radiate from the 'extension lead' antenna.

Another type of 'illegal' hookup prepared by the do-it-himselfer is shown in figure one, (C). This guy not only has access to 300 ohm twinlead at the discount center, he owns (or has borrowed) a ladder. He (somehow) connects the 300 ohm twinlead into the tap; whether it is a DT or a pressure tap,

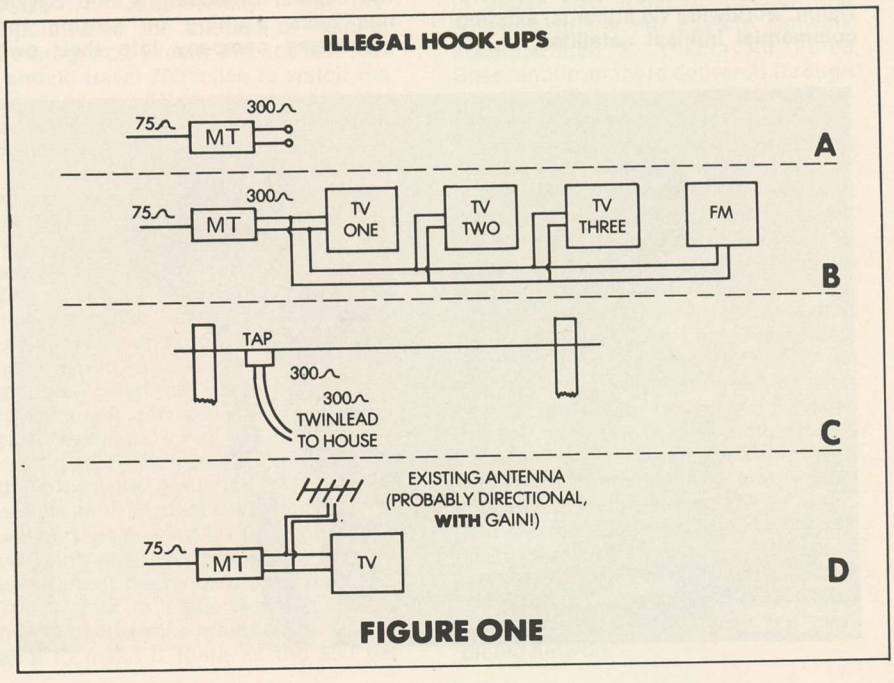
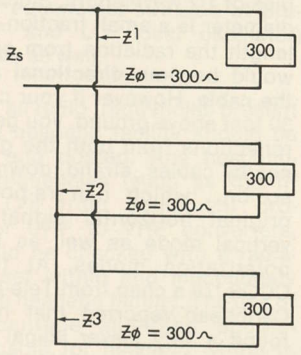


FIGURE ONE



$$Z_s = \frac{1}{\frac{1}{Z1} + \frac{1}{Z2} + \frac{1}{Z3}}$$

Zs SEES 100Ω

SINCE $Z_s \neq Z_\phi \neq Z_L$

THE CONDITIONS OF A BALANCED LINE DO NOT EXIST AND EACH CONDUCTOR NOW FUNCTIONS AS A RADIATING ELEMENT.

FIGURE TWO

left where his ladder would get him access to signal. The same conditions of imbalance (and therefore radiation) exists here as with the guy who does it all inside his home. The physical length of the wire will usually be longer here however, and being suspended on one end at the height of the cable feeder line the "flat line antenna" can be more dangerous as a radiation source here than with the inside extension. For a 'drop' of 150 feet the physical length of the twinlead will be on the order of 10 wavelengths at television channel 2 and 40 wavelengths at channel 13. When a 'radiator' becomes this long it tends to become a traveling wave antenna which concentrates the radiation near the 'plane' of the antenna and generally in line with it.

Finally at the subscriber end of the radiation source we have the guy who decides to 'help' the cable system (figure one, [D]). After your installer leaves the premise he decides to **reconnect his outside antenna** to the 300 ohm terminals on the back of his TV receiver. Now we have your 75/300 ohm matching transformer seeing a **pair** of 300 ohm loads; the TV receiver and the 300 ohm antenna. Your 0 dBmV (or whatever) signal now travels (in part) up his antenna downline to his (directional) outdoor TV antenna. If the outdoor antenna has 'gain' (most have some), the 'radiated' power could be as much as 10 dB above the voltage level arriving at the outdoor TV antenna terminals from the cable feed. Additionally, some radiation will also occur from the TV antenna feedline since it now sees **a** 300 ohm antenna at one end and **two** 300 ohm loads on the opposite end (thereby creating mismatch to the line and creating imbalance). So much for helpful subscribers.

In the system itself, the drop line may radiate signal. If the braid covering continuity is broken (or damaged) the chance for radiation becomes acute. The most widely used drop material is RG-59 in some form. This cable commonly has a braided shield which covers the dielectric. Numerous approaches to shield design are employed, each attempting to provide the most 'cost effective' shield to keep radiation (egress) and interference (ingress) to a minimum.

1) **The normal braid**—is usually specified in % coverage of the dielectric by the braid material itself. **Some** cables when new, have shielding in the 30-40 dB of isolation region.
2) **Double shielded braid**—is usually restricted to headend jumpers and other locations where high (RF) signal levels are contained within the cable.
3) **Foil shield,** with or without braid —is usually an excellent drop cable, initially, in the isolation department. There are some reports that aging, flexing and general use can deteriorate the effectiveness of the foil shield. Under certain circumstances the foil can seperate offering a path for radiation.

It is also true with any drop cable that **unless the fittings are properly placed onto the cable,** and they are tight on the tap, transformer or whatever they 'terminate' into, that radiation is likely.

In the distribution, trunk and feeder system. . .a newly designed and properly installed cable system will easily pass a radiation test. The isolation in solid aluminum sheathed cable is very good; on the order of 120 dB. And the present generation of RFI connectors is excellent. The latest RFI sealing is also generally very effective. But time changes many factors and mis-use of the equipment shortens the life span of even the best gear. Eventually, in time, the shielding integrity is impaired and the system can begin to radiate. The manner in which this radiation occurs depends on the type of shield(ing) discontinuity. Let's examine a few of the more common problems with system shielding integrity.

1) **The slot radiator.** In the antenna world, any current carrying element (i.e. the center conductor on aluminum jacketed cable) can be turned into a **directional transmitting antenna** by wrapping the current carrying element in a cover (i.e. the shield on the solid jacket cable) and then cutting a crack or opening in the cover to allow the RF current to radiate out. The same principal is employed in a line of high band VHF and UHF television transmitting antenna.

A modified form of this 'slot radiator' is found with a CATV amplifier. The current (RF) is at high levels within the amplifier and if the aluminum housing is 'cracked open' the RF not only has a way to get **out**, but the 'cracked-open' housing re-enforces the radiation or leakage of RF by acting as a slot radia-

AMPLIFIER HOUSING AS A CAVITY-COUPLED SCOT RADIATOR

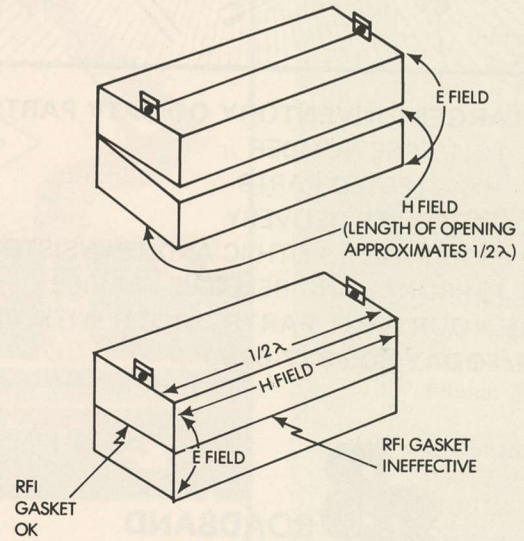


FIGURE THREE

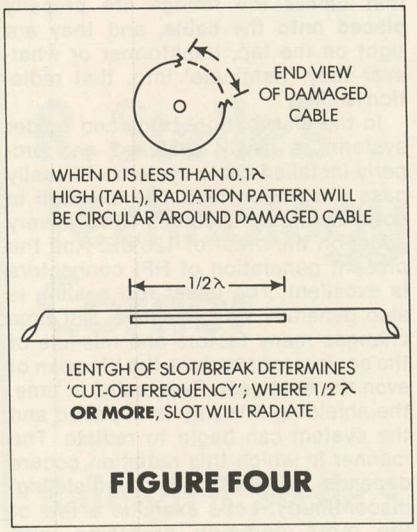


FIGURE FOUR

ting antenna **(see figure three).** The 'cracked open' case can be actually **physically shut** but in such a way that the RFI gasket originally supplied is no longer effective; leaving a thin (electrical/RF) opening through which the RF can radiate. The slot radiator is very frequency selective; that is, it starts to act like a slot when the slot opening is 1/2 wavelength or more long. That means that typical amplifier cases are simply not long enough to act as slot radiators below say 200 MHz which may help explain why some amplifier-housing radiation problems seem to be limited to the upper end of high band or on super band frequencies.

Another way for a 'slot' to form is on the cable sheath itself. In **figure four** we see this as a problem situation with aluminum jacketed cable although with certain coincidences it could also happen in flexible cables such as RG-6, 11 and so on. If a tree limb or the messenger rubs on the aluminum sheath, a rat or other varmit chews on the cable removing a 'strip' of aluminum jacket, you can have a slot radiator in the feeder or trunk line itself. Again maximum radiation will occur when the slot is 1/2 wavelength long, or multiples of 1/2 wavelength. Since the cable diameter is a small fraction of a wavelength the radiation from such a slot would be **omni-directional all around the cable.** However if your cable is 18-30 feet above ground, you get in-phase reflections from both the ground and nearby cables, strand, down guys and so on. . .which can re-polarize the original horizontal signal into the vertical mode as well as in-between polarization modes. At the recent CCOS '78 a chap from Tele-Haiti in the Caribbean reported that his system found a very clever illegal tap which involved the slot-radiator theory. They knew the illegal hook-up was getting signal but they couldn't find a drop running into his house. So they broke out the radiation equipment (they found a yagi antenna on his roof pointing at their nearby feeder line) and checked for signal. Sure enough, there it was. Climbing up into a tree they found where the fellow had very carefully filed a 'slot' cut into the aluminum jacket of the cable. He had apparently calculated the length for the slot and he was getting very good signals!

2) **Radial cracking.** Cable which has been subjected to radial cracking can radiate in either of two manners. In one case the cable has a single discontinuity at a pole **(see figure five).** It will radiate as a 'point source'. If the strand happens to be grounded at the pole where the radial break is located, the only radiation likely is as a point source. However, if the discontinuity occurs away from a pole or at a pole where there is no ground run the 'break' in the shield integrity can radiate as both a 'point source' and in the traveling wave mode as well. If energy from a point source couples back onto the cable sheath and/or the messenger it travels along the sheath/messenger and the sheath/messenger becomes a traveling wave antenna that radiates the signal (again see figure five). If the cable happens to be 'broken' in two or more locations you have multiple effects; point source radiation, non-resonant traveling wave radiation and then the piece of cable between the two breaks can become a resonant radiator with radiation maximums in 1/4 and 1/2 wave multiples along the isolated sheath section. Nor does it require a radial-cracked cable to produce the combination of point source and traveling wave radiation. In figure five we see how an improperly installed entry fitting on a cable amplifier housing can create the same situation.

3) **The headend.** The primary problem with radiation in the headend facility is the danger this radiation presents to our own operations; although of course anytime or place we radiate we might be endangering operation of ether-transmitted circuits on the same frequencies. Levels in the headend are generally as high or higher than at any

place in the system. Not only must we be concerned with radiation **at** cable carriage frequencies, but also **at processor IF and LO** (local oscillator) **frequencies** as well.

A list of all radio frequencies present within the headend facility should be compiled and posted. Any headend-created frequencies (such as the IF ranges, LO's from equipment processors or UHF to VHF converters, etc.) should be checked with a radiation test set **within and immediately outside** the headend facility. The use of high percentage shielding double-shielded cable for headend wiring is highly recommended; not only because radiation into the ether may be lethal to an ether user, but also because the presence of such extra signals in the headend area may cause reception problems to your own off-air and locally generated signals.

To this point little has been said regarding reflections and other phenomina which can mislead the 'radiation detective'. When the RF signal strikes a reflective or partially reflective and partially conductive surface it may change in polarization as well as direction of travel. After a few bounces the actual field present, or its original source, is anyone's guess!

In our column in November we'll discuss how to measure these fields.

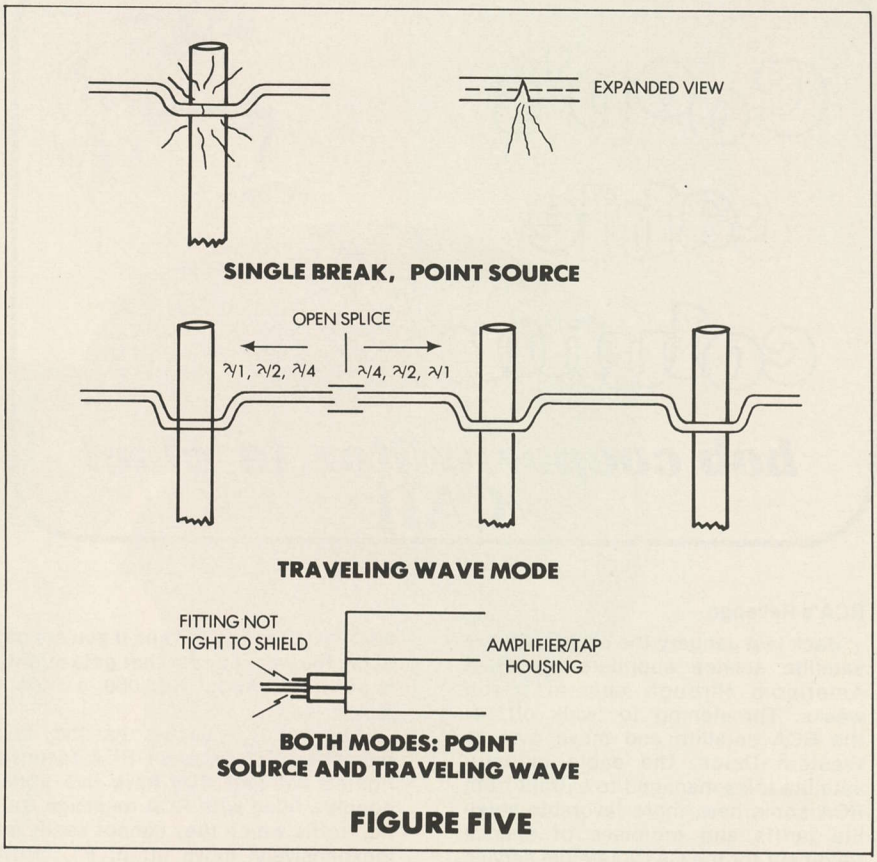
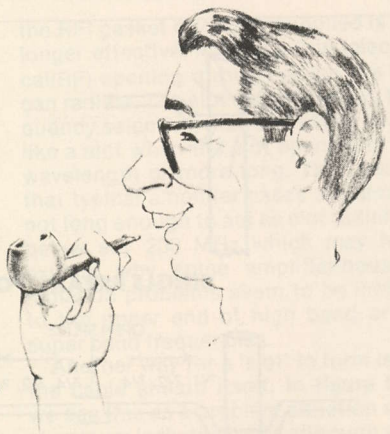


FIGURE FIVE

Coop's cable column



bob cooper editor in chief
CATJ

RCA's Revenge

Back last January the cable industry satellite service suppliers put RCA Americom through several rough weeks. Threatening to 'walk off' of the RCA satellite and move over to Western Union, the cable industry satellite folks managed to extract from RCA some new, more favorable satellite tariffs and promises of special treatment for the CATV satellite service industry down the road.

RCA may not have the memory of an elephant but then again they would hardly need it to 'come up with' a bit of 'revenge' in September. On September 13th RCA dropped a bombshell on the CATV industry. **"We have** only five **transponders left on F1 and we will take formal bids up through September 29th to determine** who **will get these last, remaining transponders.".**

Actually there are more than five left. Was RCA holding a "bare walls sale" when they had a warehouse behind the showroom stocked to the rafters with merchandise?

Here's what happened. There is presently CATV traffic on transponders 2, 5, 6, 8, 9, 10, 12, 14, 16, 18, 20, 22 and 24. **That leaves 1, 3, 7, 11, 13, 15, 17, 19, 21 and 23.** 4 you may recall is 'broken'. **HBO moved first.** Not wanting to be part of a bidding war they exercised an option in their existing contract **and took 23** for a new 'second level HBO service' (G, GP and children's features) which will start off January first. That left 9 vertical transponders, plus RCA wanted a **full time user on 18** (the last of the horizontals and the one 'reserved' for KTVU when the FCC finally approves it). In notifying all of the serious contenders for transponder space that they were 'going out to bid', RCA told Ed Taylor that his 'reserved status' for 18 was cancelled. **"If you want it, put up some money"** they in effect told Ed. Taylor naturally has delayed doing that for as long as possible since the FCC has not yet approved KTVU for satellite carriage. **"Remember everyday up there is around $2,000"** notes Taylor **"and if you are not using the transponder that gets mighty expensive".** About $60,000 a month expensive.

Why was RCA saying that they had only five left? Because RCA recently figured out that **they have** five transponders **filled with RCA message traffic,** traffic which they cannot easily (or inexpensively) move off of F1. **"RCA needs until at least the summer of 1979 to clear those five transponders"** noted an RCA source.

What RCA is saying is this. (1) **In the near term** there are only five additional transponders left. (2) **But,** by next summer there will be another set of five. They hope.

Since satellite charges are set by common carrier tariffs, obviously RCA could not 'auction off' the five presently available transponders on a 'to the highest bidder' basis. So they have come up with another approach. When the bids were reviewed September 29th, they were looking for:

1) **The applicant/**bidder which would **start service earliest** (the sooner you start, the sooner they start collecting money), and,
2) **The applicant** that would use **the most hours per day** (each hour costs money, the more hours used the more money for RCA).

Very clever these RCA people. And then next summer they anticipate having another 'auction' to clear the warehouse. At that time the last (five) will go.

Who reacted to this invitation? Many more firms that it would take to fill up five transponders. And some who were not formally contacted by RCA were upset by being left out. There may be some lawsuits when it is all over.

Here is out best 'educated guesstimate' of who will end up with the five transponders when the results of the sealed bidding are known:

1) **Warner Cable for two** (two time zone feeds for their Star Channel)
2) **Reuters for one** (slow scan news possibly using less expensive TVRO receive gear)
3) **Ed Taylor's group**(s) **for two** (KTVU and WGN).

What about Holiday Inn's movie feed? **It will wait.** What about a Disney channel? **It will wait.** What about the other indies (KTTV, WOR, WSBK, WPIX)? **They will wait.** What about. . .? **They will wait.** Since these 'waiters' add up to more than five, some of them will wait a very long time. Possibly until 1981. Or go to WESTAR.

RCA may have several options by the summer of 1979. The folks over at Western Union recently let slip that they are hopeful of being able to launch WESTAR III on or about May 9th. **If** they do this with FCC blessing (when ATT/GTE launched COMSTAR III last June it was with**out** FCC blessing!) that will make it difficult for the FCC to turn down an RCA request to launch SATCOM F3. It is possible RCA sees CATV as being too big for a 'single' 24 transponder bird to handle; the 'second bird in CATV's future' may well be an RCA bird. RCA has been investigating the possibility of launching F3 ahead of the current 1981 'shuttle launch' date using the standard booster launch format. **As things now stand** F3 is intended to **replace one of the existing** RCA birds in 1981; **not establish** a new spot in the orbit belt for RCA. With CATV outgrowing a single bird RCA might feel they have a persuasive argument for getting F3 up early.

About the remaining transponders on F1. Satellite engineers speak in terms of **"1 transponder per year failing on a 24 transponder bird".** This kind of talk sends chills up and down the backs of non-engineering types in the satellite biz. But those appear to be fairly accurate forecast type numbers. We know, for example, 4 is broken on F1 (as is 12 on F2). We also know that vertical 13 **acted broken** on F1 **until this past June.** It seems the transponder would not turn on. By diagnosing the telemetry data RCA determined that a gas buildup had affected a segment of the transponder 13 circuit; the gas caused several parts to 'change value' by placing them in an unexpected environment. RCA clevery figured out a way to 'belch' the gas out of the bird this past June and after 'burping' the baby has been acting normally. Transponder 13 is one of those transponders which will be 'released' to cable this fall.

HBO foresaw this long term problem and bought a spare transponder (20). If any of their three regular transponders (22, 23, 24) go before the bird is taken out of service they have someplace to move to. They are unique in this regard. If, for example, transponder 16 goes prematurely and the balance of the bird is full. . .FANFARE would be out of business until 1981 or after. **There is no panic here. . .**just the cold acceptance that if the satellite engineers know what they are talking about, **one transponder per year will sour** and somebody will be in a 'space of hurt' (that's satellite talk for 'world of hurt').

When you're pricing an earth terminal make sure you get the whole apple and not just the core.

Of the several ways to price an earth terminal we favor the Gestalt approach. The resulting number may not seem to be the lowest you will be offered, but it will be the most inclusive. Psychological aspects aside, it offers you a tremendous advantage. There will be no rude surprises in store for you later. Many of the features we include as standard are extra cost options from other suppliers.

Not only will the Hughes price include everything on the chart, it includes some very important intangibles as well. Hughes originated the development of synchronous communications satellites in the 1950's and has pioneered advances in this technology ever since. This expertise is incorporated in our current satellite earth terminals. You also benefit from our field service, covering everything from microwave path surveys to expedited spare parts, when necessary. And our periodic technical training seminars assure that your people will operate the equipment with maximum efficiency and profitability.

As a first step, study the inset comparison chart. It's a veritable primer on buying an earth terminal. Then call or write Hughes for more information. Hughes Microwave Communications Products, P.O. Box 2999, Torrance CA 90509. (213) 534-2146. Like the young lady in Eden, we know how to make an apple very tempting.

How well do others stack up against Hughes?

Item	Standard Hughes Features	Competitive Features	
		Standard?	Optional?
Threshold Extension	X		
24-Channel Agility	X		
Choice of Electronic or Manual Agility	X		
No Crystal Changes	X		
Transportation to Site	X		
Installation Supervision	X		
Installation Hardware	X		
Proof of Performance	X		
Pressurization for Transmission Line and Antenna Feed	X		
Low Attenuation 7/8" RF Transmission Line	X		
Antenna Sidelobe Suppression If Required	X		

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Now what happens this fall if the FCC finally approves the additional indies on the bird(s)? Well, two of them will make it if our 'guess-timate' of the five lucky 'auction winners' comes true. Both would be in Ed Taylor's camp. The others will either be out of luck until the summer of 1979, or, they will have to either go to WESTAR or perhaps go back to the FCC and ask the FCC to 'force SSS to split with them'. There will probably be some talk of lawsuits over this situation if it happens this way.

Back at CCOS-78 Ed Taylor sat on a televised group discussion that discussed where this industry was headed. **"How many CATV services might there be on the bird?"** everyone wanted to know. Ed created a monumental silence when he forecast in excess of 40 CATV satellite service channels in just a few years time. Politely no one on the panel questioned Ed's number but in the audience off camera dozens were shaking their heads in wonderment. One year ago this month there were four channels up there; CBN, WTCG and two from HBO. Now here we are counting 24 plus "if only there was sufficient transponder space". It may well be that even Ed was conservative; that RCA will within only a few years be hard pressed to service all of CATV's needs even if they do manage to launch SATCOM F3 and have at our disposal 40-plus transponders. As we reach January 1 there will be not fewer than 18 up there, from 4 on January 1, 1978. Can 40 plus by 1980/81 be so far fetched after all? We think not.

Edelman's Open Challenge

Don Edelman, Vice President of RMS's CATV Division, has plenty of guts. And he is also a pretty innovative guy. If you are on the RMS 'mailing list' you recently received an 'Open Letter' from Don in which he challenged 'all competitors' to a 'comparative analysis of 75-300 ohm Matching Transformer Specmanship'. Edelman wants somebody to take an unannounced sampling of every manufacturer's matching transformer(s) and conduct both electrical and mechanical tests of all samples to determine 'which is the best overall transformer'.

Well, guess who has been tagged to run these tests? Yup, we were.

We weren't sure how to handle Don's request initially. . .we could end up losing every other transformer manufacturer's support of CATA and their advertising in CATJ if we blew this and we told Don so. So between us we decided that there should be a panel of witnesses and testors present when the tests are run and I suggested that we include somebody from the Cablevision/CED staff to insure that this doesn't turn into a 'CATJ Exclusive'. I figured if we were going to run the risk of losing the support of RMS's competitors in this thing I wanted Cablevision/CED right there with me!

Now how we conduct this comparative testing program will not be announced until after we've rounded up the samples. Edelman wants us to test a large batch of samples from every supplier (there are some 15 in all); he suggests 10,000 each. If we had to test 150,000 transformers and average the results we'd need Ray Daly's computer to sort it out and I figure we'd be done about 1984 or a tad thereafter. So we've decided to **'sample'** 10,000 transformers per manufacturer, but only test a reasonable quantity of randomly selected transformers out of each lot.

There is a bunch of preparatory work to be done here and since nobody is being charged by the 'CATJ Lab' for this time it will proceed on a time-as-available basis. We'll have a detailed outline of how all of this will work and a progress report in our December (Western Show Issue) of CATJ.

Oh yes, suppose RMS's CA-2500 matching transformer does **not** come out 'best'? We figure the odds are pretty good that any one of the 15 suppliers in the industry has the 'best overall' transformer. **"That's OK. . . although I honestly believe ours is best"** responds Edelman. **"But if somebody else's is better and tests prove it, then we'll simply learn from the tests and immediately correct where ours is not the best".** Like I said, Edelman is a pretty innovative guy. Now he has us doing his R and D for him. . .and for free yet!

Field Testing

One of the things I have wanted to do for some years is likely to be a reality before 1978 is over. Field testing of CATV equipment.

Since the first issue of CATJ we have had a facility of sorts in which we have conducted modest testing and evaluation of everything from $1.00 passives to $7,500 earth terminal receivers. In the first 30 months or so of CATJ we managed to run an equipment review on the average of once per month. Our "Understanding Field Strength Meters" and the subsequent evaluation of most of the meters in the market, late in 1975 and early in 1976, is something of a classic.

The CATJ Lab actually belongs to me personally. Back several years ago when I owned and ran a CATV manufacturing facility that produced CATV gear for small CATV systems I established the 'Lab Facility' as a place where that company's products could be extensively field tested during development and in many cases before shipments were made. The production crew knew that I was apt to drop into the final QC (quality control) department unannounced, pick a hand full of units destined for shipment off the shelf and take them home to see if they really were meeting spec. . .and that helped keep them on their toes. More than one QC guy lost his job for not properly specing a piece of gear and it didn't take long for the import of my unannounced testing to sink in.

When we began CATJ and I sold out the manufacturing company the Lab (which was built at my rural home) stayed with me. Having dozens of antennas hung on more than 600 feet of tower, and a basement Lab ready to go was too good an opportunity to pass up so it became the 'CATJ Lab'.

This worked fine as long as my time was not eaten up with other demands. But eventually I had less and less time to spend in the 'Lab' and we've run fewer and fewer 'equipment reviews' in recent years.

This fall we are taking a positive step to rectify that failing on our part. We are taking one of the 'barns' on my property and rebuilding it into a separate 'Lab' dedicated just to CATJ equipment testing and circuit development. The new facility will have a full time technician working in it; a person many of you will recognize when we make the formal announcement.

There we will be doing two things. Testing of equipment is going to have special emphasis **and as before** when we do testing we intend to point out both the weaknesses and the strengths of various units selected for test. One of the testing procedures will include our simply dropping into a distributor or CATV system operator and asking to borrow 'off the shelf' one of this and two of that long enough for tests. In this way we can avoid the possibility that someone might be tempted to 'hand-craft' a unit for testing.

In addition to testing we will be developing a 'CATJ Kit' program. Those who recall the 'Laufer/CATJ Low Cost Spectrum Analyzer' will remember that here was a practical, educational way to get system personnel into an advanced form of system maintenance and measurement without a large dollar investment (we initially provided some 225 kits in this series for around $50 each). We'll be re-visiting old issues of CATJ and packaging as kits various pieces of test equipment and other equipment which have already appeared here; along with extensive manuals that explain both kit construction and kit use. We will also be bringing out new kits many of which will be in the TVRO area following up on practical circuits to be published in CATJ by people like Steve Birkill (**see this month's new** 'Birkill On Experimental Terminals' **column**). The **'experimental** terminal' area is already well underway; we have been working with one designer who has 11 of 13 total required modules already up and running to build a complete 'experimental terminal'. I believe the complete set of 13 modules is going to sell for under $1,500 (24 channel tuneable receiver); at least that is our target price at the moment.

Our basic premise is unchanged from the first issue of CATJ more than five-issue years ago; namely that people learn by doing and if they do something with their **own** two hands **and exercise their mind** a little bit in the process what they learn will stick with them.

Steve J. Birkill On Experimental Earth Terminals

Steve J. Birkill
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Grenoside, Sheffield S30 3RX England

Let's start by outlining what I hope to do in this column over the next few months. Finding ourselves in CATJ, **exchange of information** must be what it's about. In the last few years the geostationary communications satellite has come of age. Things have come a long way since these things meant just transatlantic phone calls and Olympic Games telecasts. HBO has been on the bird(s) for three years now; TV studio-transmitter links have been provided in parts of the world by satellite since 1965; operational direct-to-home broadcasting satellites are already with us. No longer does the technology appear mysterious and unattainable. **We can all use satellites now**. I aim to provide a forum where those experimenting with their own TVRO terminals, be they commercial or 'home-brew', can exchange facts, ideas and experiences about their equipment, the program material they are seeing with it, and the latest news on just what's up there and where to look for it. We shall explore the technology as deeply as is needed to deliver results, and deeper. For instance this month we describe a single-chip FM video demodulator, to be followed in future months by a low-cost LNA capable of 180°K equivalent noise temperature, a dish feed adjustable for plane or either sense of circular polarisation, and then we shall include some details of 11/12 GHz receiving equipment.

But first some background to explain what this English guy is doing trying to teach Yanks to suck eggs. My apologies to all those I met at CCOS-78 or who saw us up on transponders 10 and 24 — some of this will sound familiar. My first encounter with real satellite TV signals came in late 1975, when NASA's ATS-6 satellite was in the middle of its Satellite Instructional Television Experiment (SITE), beaming educational programming to India on 860 MHz, with an EIRP of around 52 dBw, from an orbital station of 35°E longitude, above East Africa. The figures sounded hopeless. With a 3dB beamwidth of 2.8° from the spacecraft's 30 ft. antenna, my position in Northern England at some 10° off boresight might expect to be 20 or 30dB down in signal level compared with the (Indian) Subcontinent. Since the Indian community receivers were fed by 10 ft. dish antennas what chance had I with my 5 ft. dish putting me perhaps 30dB below the Indians? I had to learn just how much bandwidth I could trade off for carrier/noise ratio and still see something that looked like a picture. To gain even 10dB meant 2.7 MHz noise bandwidth rather than 27 MHz! And even this was surely absurdly narrow to resolve FM TV or was it?

December 1975 yielded the first pictures. A 3dB noise figure pre-amp fed a UHF TV tuner, converting to an i.f. of 35 MHz where a phase-lock loop demodulated the video signal. For my own work, I find the concept of **carrier-to-noise density** useful when comparing signals in my variable-bandwidth system. This simply relates carrier/noise ratio to noise bandwidth so as to be constant for a given signal strength and receiver G/T. Thus a **70 dB Hz C/N** density implies a carrier-to-noise ratio of **10 dB in a 1 MHz** bandwidth, or **0 dB in 10 MHz bandwidth,** or **– 5.6 dB in 36 MHz.** And this was about the level of my ATS-6 signal. At the loop's FM threshold of some 8 dB carrier/noise, this translated to a bandwidth of 1.58 MHz. Not much of a picture? Right — but recognisable. In fact the low-frequency video components of the pre-emphasized signal deviated the 860 MHz carrier only some 4 MHz peak-to-peak, and by using a **separate** phase-lock loop to pick out the sync-pulse tips, feeding them direct to the monitor, the 'video' loop could be set about mean picture deviation and be at, or just below, threshold throughout most of the black-white excursion. Of course, demodulated baseband frequencies were subject to the same bandwidth limitation, so the color subcarrier, not to mention audio, remained beyond my reach.

Now those of you who've noticed that the above figures don't quite add up must assume, as I have, that ATS-6 put more signal into the UK than expected, or that my C/N density estimate was inaccurate, or offer another explanation! Anyhow, inspired by the ATS results, I was eager to see some more satellite TV. But what else was there? The USSR had

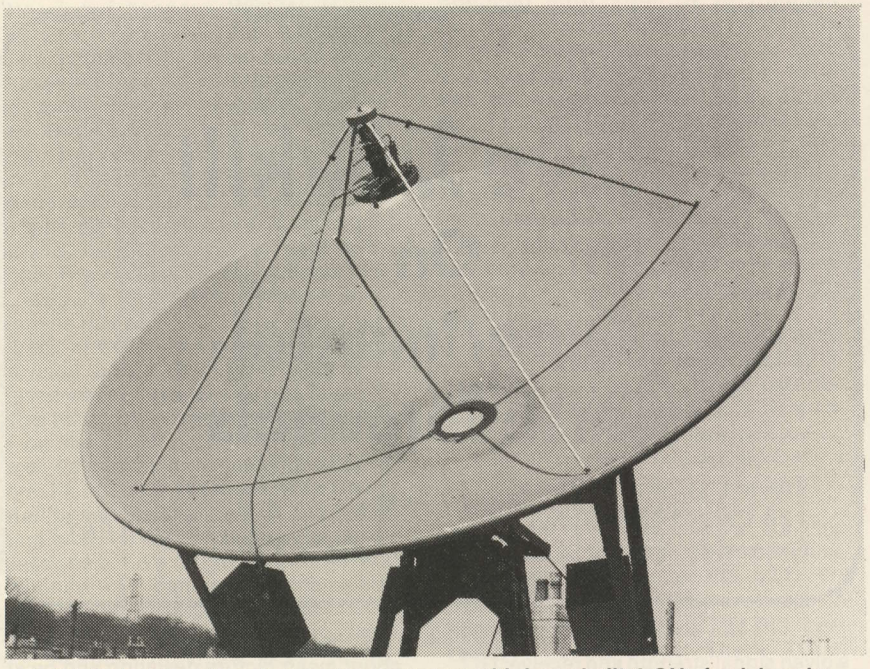
A Welcome To Steve Birkill

CATJ readers who were intrigued by the April 1978 report of private earth terminals will recall several references to **an English experimenter** with ATS-6, Statsionar and Intelsat experience. Those who attended CCOS '78 (either in person or via the uplink) saw, heard and perhaps talked with Steve Birkill of Sheffield, England. This month Steve begins a regular column with CATJ; a column devoted to (private) experimental terminals.

As another feature appearing here this month comments, our "Experimental Terminal Column" is for those people (both within and outside of CATV) who are finding satellite terminal construction and/or operation the greatest thing since Post Toasties. Birkill is uniquely qualified to conduct this segment of CATJ, as his introductory remarks in this first column should indicate. As a Senior transmitter engineer for the BBC he is charged wth keeping more than 50 VHF and UHF TV transmission systems operating to BBC standards. As a backyard experimenter he is tireless. As an original thinker and creator of hardware and electronic circuits, few in our own CATV terminal industry are his equal.

For all of his accomplishments he is quiet, shy by American standards and by his own admission "a bit eccentric". His visit to CCOS '78 allowed him to spend a day at SCI in Garland where he inspected LNA technology and a visit to Calgary where he got a week long dose of North American CATV technology. Now back home in England he is preparing to tackle the latest generation Birkill TVRO receiver and to put into operation his own homebrew 12 GHz receiving head for the recently launched OTS experimental satellite.

CATJ encourages readers with an interest in homebrew TVRO technology to communicate directly with Birkill at the address given here, or through CATJ. **But with this warning** . . . please do **not** expect a direct, prompt response to letters of basic inquiry. Birkill tackles TVRO activities in his spare time and if flooded with letters asking him to "tell me how to do it" he will soon find no time to push technology to new heights. And we will all thereby lose. Rather, **limit your letters** to specific comments, suggestions or information which others would like to know about. That's what this column is all about — the sharing of experimental TVRO technology on a world-wide basis.



BIRKILL's 8 foot 'surplus' Andrew antenna with homebuilt 4 GHz feed, in solar noise system calibration position.

their Orbita system using Molniya satellites in 63.5° **inclined orbits** such that they appeared **almost stationary** for around 8 hours near apogee. Information was sparse, but **Molniya-1** was **said** to use frequencies around 1000 MHz. This was not too difficult, and the locus of possible apogees arced northwards to east and west of a point almost overhead. So signals were duly received, but proved to carry FSK data at an uninterestingly low bit-rate. So perhaps TV service had been transferred to Molniya-2 at 4 GHz or even Molniya-3 at some unconfirmed higher frequency. At around this time, news was coming in of the Soviets' TV broadcasting experiments from one of their first geostationary satellites, **Ekran**, otherwise known as Statsionar-T. EIRP was quoted as 56.5 dBw, at 714 MHz, but the bird's longitude of 99°E put it well below my horizon. (More information on Statsionar-T next month).

The truth was rapidly dawning that the real pickings were in the microwave part of the spectrum, and that 3.7 - 4.2 GHz would eventually have to be explored. I had already persuaded myself that **something** could be had without needing an Intelsat B spec terminal in my back yard. But the 5 ft. UHF mesh dish and TV receiver transistors were just too far in the other direction. Something would have to come up. Something came up. I came into possession of a surplus Andrew 8 ft. dish, originally used for (BBC) 7 GHz TV links. This, together with an ex-ships-radar pedestal converted to an el/az mount and 2 cubic yards of concrete became the new wonder of the neighborhood. Was it a radio telescope or a giant bird bath? Microwave transistors though came expensive — I would have to be sure . . . A month later, 2 of Hewlett-Packard's HXTR-6101's were gracing the circular polarisation feed (made from 2-inch copper pipe) followed by five stages of 'noisy' 4 GHz amplification using out-of-spec 2 GHz transistors (all I could afford after the HXTR's!), a self-excited oscillator and transistor mixer to bring the satellite band down to a tunable first i.f. of 450 to 950 MHz. This was followed by some 25 dB of wideband UHF amplification so that signals could be carried the 50 ft. (inside) to the second conversion without undue breakthrough of strong local UHF TV broadcast stations. The remainder of the receiver followed the pattern used for ATS-6, but with facilities for re-inserting syncs phase-locked to the output of the independently-tuned sync demod.

This contraption was aimed at the (hopefully quiet) sun and carefully lined up for maximum solar noise. 5.5 dB above clear sky was achieved the first day which, with my assumed value for solar noise flux of 8 x 10-21w/m2/Hz translated to a G/T of 12.6 dB/°K. Or, with assumptions (as they had to be at that time) of antenna gain and noise temperature, we had an overall receiver noise figure of around 3.5 dB. This seemed to be in the ball-park (such Americanisms!) so with trembling hands the antenna was lowered onto the geostationary orbit arc. Minutes later the efforts were rewarded by the appearance of RTVE's (Spain) first program on the monitor screen, via the leased half-transponder 6 of the newly-flown Intelsat-IVA, F2, at 29.5°W. (This relay is, at the time of writing, now carried on the 34.5°W Intelsat).

So the Sheffield backyard terminal was born! Enough now of the writer's biography. Sufficient to say that subsequently a GaAs FET LNA was constructed using a GAT-5 transistor kindly donated by the **Plessey** company, an overall noise temperature of 185°K being attained with the prototype unit (the second stage still being the H-P bipolar), and many other (full-time) TV

NOVOSTI (news). Russian TV from Statsionar-2 as received on 3980 MHz. Carrier/noise density 79 dB Hz. Deviation 15 MHz peak-to-peak pre-emphasized including audio subcarrier.

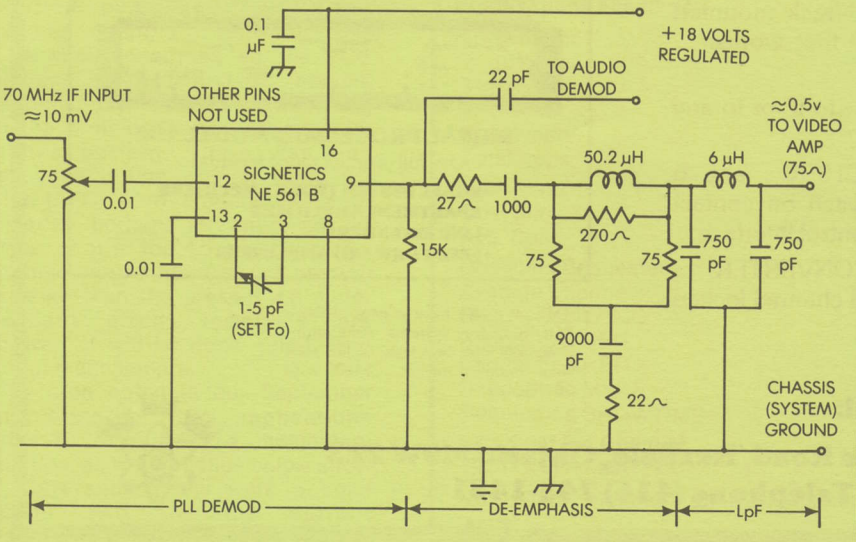
PRACTICAL 70 MHz Phase-Lock Loop (video) Demodulator

This is the 70 MHz US-system version of the FM-TV PLL demodulator. The loop is operating below limiting. With no external loop-filter components the tracking range is determined entirely by the input signal level. This gives us the variable-bandwidth facility to enable optimum compromise to be reached between noise and bandwidth when receiving low C/N density signals.

Maximum tracking range is +/- 15 MHz (approximately). With careful layout design and construction practices the **Signetics NE561B** (nominal maximum frequency of 30 MHz) will operate to 100 MHz. However all samples of the NE561B tested by the writer have exhibited instability of free-running frequency between 30 and 40 MHz. This can be overcome, if 35 MHz operations is desired (at the expense of some tracking range) by adding a 10K resistor from pin 2 to ground; thereby unbalancing the VCO.

The video output amplifier may conveniently include a phase-splitter to cope with either direction of frequency modulation that may be met, or, any combination of conversion oscillators either above or below the input signal.

Editor's Note: Anyone with a TVRO receive system that has a 70 MHz 'test' output may duplicate the CATJ Lab test of this circuit. Simply take your 70 MHz output through a 1 dB step attenuator and feed it into the demodulator shown here. Run the output of the PLL demod (video) to a video amplifier and then into your monitor. Adjust the input level to the PLL demod with the step attenuator to set the tracking range (i.e. pad for best looking picture). **As Birkill notes you will still have the 30 Hz dispersal waveform present at the output of the PLL demod** (which can then be removed by running the baseband signal through a clamp circuit) **but you will have the direct experience of working with recovering a TVRO video signal. One more black-art mystery revealed for its true simplicity!**



INDIAN SITE experiment from ATS-6 as received in Sheffield, England in 1976; C/N density 70 dB Hz.

transmissions identified to date. The Russian Statsionar-2 proved to be the brightest thing in my sky at 4 GHz, with its 29 dBw EIRP (as compared to 22 dBw for an Intelsat-IVA global beam and 26 dBw for hemispherical beam, minus the back-off for half-transponder working). Those readers within the 33 dBw contour of Satcom F1 please feel fortunate . . . So what does all this mean for the CATJ reader trying to think what 4.5 metres would look like outside his window? We shall consider the possibilities. First of all, for our own (private) consumption we can accept perhaps somewhat inferior video, particularly as regards signal-to-noise and linearity, than would be demanded by a CATV head-end. This comes down in the end to "how much **anything** is better than **nothing**"? But perhaps we need not go so far. While visiting Oklahoma for CCOS-78, I had occasion to construct a **phase-lock loop demod** operating at 70 MHz and tracking ±6 MHz, i.e. having a **noise bandwidth** of approximately **12 MHz**. This was fed from the 70 MHz output of the Microdyne receiver at CATJ Lab and, apart from lacking a line clamp to remove the energy-dispersal waveform, produced quite watchable color video. Further, when the Microdyne's 4 GHz **input** was attenuated to the noise **threshold** of the PLL demod, the microdyne output was almost total noise. This is not of course to say that our loop could in any way approach the performance of the professional receiver **above** threshold, with its 27 or 30 MHz i.f. bandwidth, but that an improvement in excess of 3 dB in effective sensitivity could be realized with but a small sacrifice in quality. Remembering that the CATV TVRO requires a 3 dB fade margin; so with the PLL demod we have already halved our antenna aperture (6 dB), or more than quadrupled our LNA noise temperature for similar performance!

This all assumes the US domestic satellites are our target. Rather than looking towards a smaller or noisier (and hence cheaper) receiving terminal, our experimenter may well wish to use his performance trade-off to see what other TV services are carried on the increasingly congested (at 4 GHz) geostationary orbit. **CATJ's TVRO Data Chart gives some idea of what he will find.** Next month we shall go into more detail on what can be expected performance-wise with terminals smaller than 10 ft. aperture, with varying system noise temperatures and bandwidths. Also charts of azimuth and elevation angles to bring us within one degree of any point on the visible orbital arc, knowing the geographical co-ordinates of our location.

October Stats

Once again the most recently tabulated full month (August) set new records in several departments and the growth of CATV TVRO terminal applications and licenses continues across a peak period.

Depending upon where you begin and end your 'counting period' for the month of August, the total number of new terminals approved by the FCC hit either 118 (as our records here indicate) or 150 (as FCC records indicate). The reason for the different numbers is simply the point where the FCC stops counting August and CATJ tabulations stop counting August. The last week of the **calendar month** saw 32 applications granted; and those 32 will show up in the November Stats for the month of September in **our** next report.

Applications for new terminals were actually down slightly from the peak month of 73 (reported for July in our September issue); to 68. However once again there is the cut-off point for the month to be considered and the slight slackening is not, we believe, indicative of the peak yet having been reached. On the other hand the number of new FCC grants for the month (118 or 150) **will** undoubtedly be an **all time record** for CATV terminals simply because the FCC played 'catch up ball' during the month of August turning on their new computer based processing program and disposing of all applications over 60 days old which had no defects in the applications. For those who missed the information in our September issue report, the FCC now expects to turn around new (properly prepared) applications in not over 60 days time and typically in 45 days from the date of application acceptance at the FCC. The word here is simply this: **if you are keying arrival of your TVRO hardware to your expected arrival date of your license/CP,** plan on between 45 and 60 days from the date the Commission receives your application for future applications.

The five meter terminal size continued to be the leading size specified by applicants in the measured month; a posture not likely to be shaken as long as the FCC maintains its present 3 dB 'margin' requirement for received signal levels, and, the 32 minus 25 log theta curve for antenna pattern. There was one application during August for a 3.3 meter (AFC) horn antenna however; indicative perhaps (if approved) of another shot at the 4.5 meter plateau. This time around however (we predict) **if** smaller than the present 4.5 meter 'standard sized' terminals **are approved,** it will be done quietly and without much fanfare.

The drop noted in our September issue stats for CBN applications seems to have been a momentary reduction; as the statistics below show the CBN applications were a solid number two for the current measurement month; just slightly behind Atlanta's WTCG. Ed Taylor of Southern Satellite reports that with the recent approvals it would have been possible for another approximately 250,000 homes to have been turned on for WTCG during September. . .**if the hardware had been available** for the installations covering the licenses granted during the month of August. It was only last April that WTCG's satellite reach passed the 1,000,000 home mark and it now appears rather solid that it will be over the 2,000,000 mark before April of 1979; perhaps considerably sooner than that 'anniversary' date.

Other than the five trend setting program services tallied in our box listing here, other applications during the month of August totaled as follows: **PTL** - 2, **UPI, WGN, Fanfare,** and **KTVU** one each. Keep in mind that applicants are **not required** to list **more than** a single satellite signal on the original application, and that licensees of TVRO terminals are allowed to add additional program services from the bird 'at will' provided only that they have the necessary CAC (for broadcast signals) or 214 clearance (i.e. contracts) for non-broadcast services.

Based upon the average terminal price of $34,424 in August and 68 terminal applications the volume of business for TVRO suppliers was $2,340,832; an annualized volume of $28,089,984 for a 12 month period centered on August of 1978. To this dollar volume must be added retro-fit equipment for vertical polarization signals (see separate report here) and additional receivers added to existing terminals as new satellite video channels are added to existing systems.

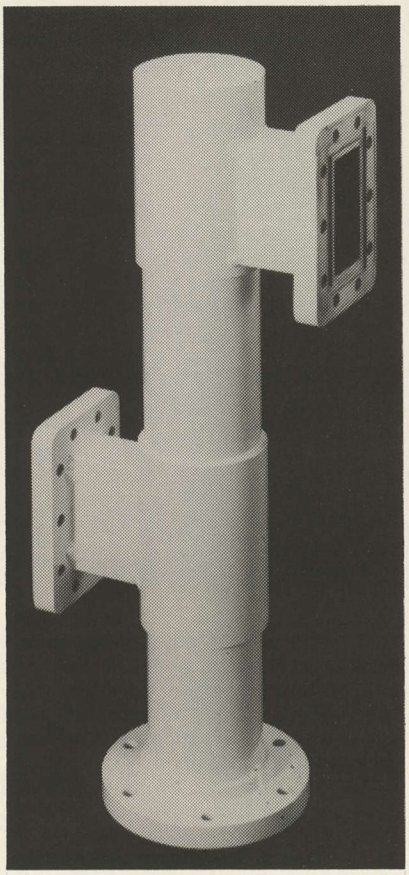
The Rush To Vertical

This is the month that the first regularly scheduled satellite transmissions begin on SATCOM F1, **vertical**

CATV TVRO STATISTICS—OCT, 1978

Applications Filed/FCC	**JUNE 1978**	**July 1978**	**Aug 1978**
1) 11 meter	0	0	0
2) 10 meter	2	1	0
3) 6 meter	20	12	6
4) 5 meter	22	36	41
5) 4.5 meter	24	24	21
Total Apps	**68**	**73**	**68**
Cost Max.	$96,412	$87,412	$62,000
Cost Min.	$22,500	$19,900	$12,600
Avg. Cost	**$34,024**	**$35,686**	**$34,424**
Channels Requested	217	237	214
Average Channels	3.19	3.25	3.15
Requesting WTCG	38	43	44
Requesting CBN	40	29	42
Requesting HBO	32	48	36
Requesting MSGE	15	12	19
Requesting SHOWTIME	13	11	10
Avg. Cost Per Channel	**$10,666**	**$10,980**	**$10,928**
TVRO's Licensed/FCC	**57**	**61**	**118**

Note: Data compiled from FCC sources, adjusts forward one month with each issue.



side. The vertical transponders are any 'odd numbered' transponders such as 1,3,9 or whatever all the way to 23.

When the announcement was made last December that RCA would move CATV traffic to F1, and that new CATV traffic beyond the 11 available horizontal transponders would be on vertical channels, there were optimistic guesses as to what this might cost the CATV operator.

Here is what is involved. Your reflector surface **sees** all polarizations; that is, it is not sensitive to polarization. **However, your feed system is.** To enable your terminal to receive simultaneous horizontal and vertical signals from F1 requires that your feed system be retrofitted. If your antenna has a prime focus feed (i.e. the feed horn is at the focal point and the transmission line connects to that feed horn [through an LNA]) then the polarization of your feed horn determines whether at any instant you are looking at horizontal signals, vertical signals or some canted polarization in between. If your antenna has a Cassegrain feed you have the same problem; only the polarization sensitive **feed system** is on the dish proper, in the center, where the focused energy is picked off.

To change the polarization sensitive feed portion of your antenna requires the addition of a microwave device known variously as a 'dual mode ortho transducer', an 'ortho coupler' a 'dual pole feed coupler' and so on. Everyone has their own pet name for their own device. Because no two antenna designs are alike, a 'coupler' that is designed to convert say the Harris 6 meter antenna to dual mode feed will not interchangeably function with say an RF Systems 6 meter antenna. Or any other antenna either, apparently. So each manufacturer of antennas has had to go back to the design boards either internally or outside to a microwave hardware supplier such as Randtech for a 'coupler'.

There are two primary ways to fabricate the highly precision 'coupler'. **Neither is inexpensive.** If the producer goes to something known as 'investment casting' he has a bunch of bucks tied up in a master 'mold' or form on which all units are produced. Prices such as $10,000 for the 'master' plus perhaps $5,000 for the design work are not uncommon. With 'investment casting' however the price per coupler comes down to a number that in quantity makes the most sense. Or, the producer can use hand fabrication techniques which get around the cost of the master (there is still the design cost) but which raises the price per piece by a factor of two or more.

Now if we knew about vertical transponders in December, and it was common knowledge in early May that Madison Square Gardens would be up on transponder 9 by mid-September, why was everyone running around like mis-directed robots as the 15th of September approached? As we have best been able to determine, Madison Square Garden has not done a good job of keeping the various suppliers advised of their plans. One supplier noted **"Until August 10th I had not even heard from MSGE and here I sit with ten customers using their service. All I knew was what I read in the trade journals".**

To our knowledge no suppliers have been able to get out as many 'couplers' as they would like. This means that on September 15th, when Madison Square Garden was supposed to take to the airwaves for the new season on transponder 9, probably fewer than 25% of their 'affiliates' were equipped for their vertical signal. A survey of the various antenna suppliers involved indicates to us that it will be mid November or early December before the present backlog for 'couplers' is caught up. What will Madison Square Garden do with these reduced audience figures for the interim? One possibility, and a good one, is that **they will continue to feed their signal on transponder 20,** at least through the middle of October, **simultaneously** to feeding it to transponder 9 for the early-equipped systems.

The coupler is a relatively simple device to install except for a handful of ten meter antennas which were perhaps not designed with dual-polarization in mind. For those handful of larger terminals numbers in the $5-$7,000 range have been quoted. For the balance the couplers seem to be in the low ball area of $400 to the high ball area of $1,200. Of course that is not **all** that you need.

If you are installing the 'coupler' now but do not yet have your LNA for the vertical port (you now need two LNAs; one for horizontal, one for vertical... plus a separate feed line for the vertical channels) you must cap-off the vertical port on the coupler to insure that moisture and bugs don't get into the coupler; and to insure that the pressurization system does not leak out. Can you cap it off with a piece of metal? There are two schools of thought here; one suggests that you fabricate a piece of thick plastic to fit over the port hole (see photo here which is the Andrew dual polarized combiner) making sure it 'seals' moisutre tight. Another school of thought suggets that a piece of brass could be used. If you use a piece of metal, we advise that you take **both** signal level measurements **and** picture quality measurements (i.e. eyeball it)

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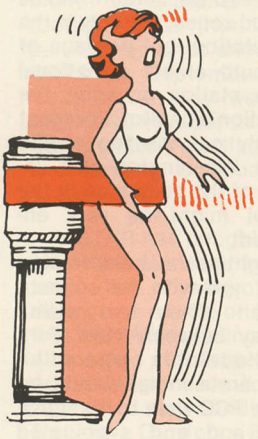
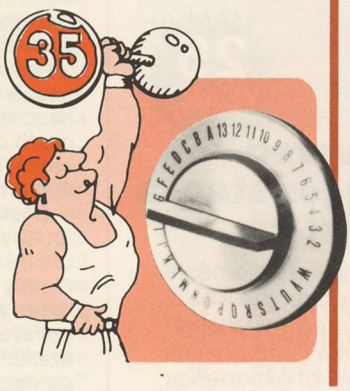
Now you can trim your hardware costs without shaking loose from famous Oak quality and performance. Trimline FT, an economy 35 channel converter, with manual fine tuning, is a new addition to the high-quality Trimline converter series. Very high adjacent channel rejection and low noise figure ensure unmatched reception quality.



35 channel strength

Trimline FT allows for full 35 channel coverage, with accurate tracking for minimum customer fine-tuning. Each channel has its own tuning potentiometer and frequencies are factory set to assure channel selection accuracy. Even if you don't need 35 channel capability, Trimline FT allows room for growth.



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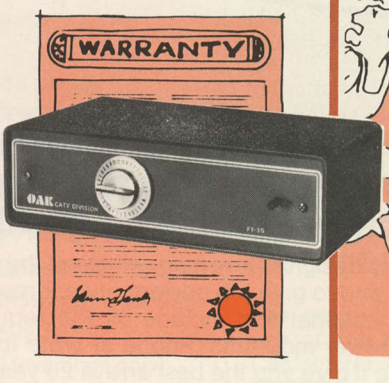

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with the port open and then capped off with the **metal** cover. Most couplers **should** function alright with a metal cap but there is the chance that somebody's design will cause reflected energy problems with metal cap.

Then there is a matter of 'port nomenclature'. Because no two coupler designs are exactly alike it may be difficult to decide as a matter of uniform policy which port is vertical and which is horizontal. If your flange hardware is square waveguide it is possible to be 90 degrees off and have problems.

Is that all there is to it? Yes and no. Some antennas will require more than the 'simple' addition of the coupler; they will also require re-trofitting of the antenna feed (some feeds are themselves polarized). If you are today ordering a new TVRO antenna, keep in mind that both RCA birds are 24 channel and that means that by frequency re-use they have the capacity to send signals to you in either polarization mode. Only the (present generation of) WESTAR birds (plus ANIK) are horizontal only.

Planning Ahead

There has been enough 'new' activity on the indies-via-satellite front lately to warrant an updated listing of those television broadcast stations being touted for satellite signal delivery. If you require CAC approval to add a new signal and you find one or more of these 'possibles' interesting you may want to consider getting the CAC processed cranking. . .that assuming that CACs are not on the endangered species list.

1) **WSBK** (channel 38), **Boston**. . . would be brought up on SATCOM I by Eastern Microwave. An indie, heavy on sports and syndicated material, Eastern has an extensive terrestrial network now feeding the station around New England.
2) **WOR** (channel 9), **New York**. . . would be brought up on SATCOM I by Eastern Microwave. Everyone knows what a great indie this station is. . .and again it is carried extensively in the northeast by the terrestrial circuits. WOR is **also proposed** on WESTAR II by ASN.
3) **WPIX** (channel 11), **New York**. . . would be brought up on SATCOM I by Ed Taylor Southern Satellite Systems. Another great indie, often offered on terrestrial microwave in the northeast.
4) **KTTV** (channel 11), **Los Angeles** . . .would be brought up on SATCOM I by Satellite Systems, the joint operation of SSS and Holiday Inns. KTTV is **also proposed** by ASN on WESTAR II.
5) **WGN** (channel 9), **Chicago**. . . is proposed by several applicants on SATCOM I. Station is extensively carried in upper mid west on terrestrial microwave. ASN **also proposes** WGN via WESTAR II.
6) **KTVU** (channel 2), **San Francisco** . . .is proposed for SATCOM I by Satellite Systems. Station was second indie proposed, is carried northward out of Bay Area on terrestrial microwave as well as east and south into central California.

Other indies discussed from time to time for satellite coverage have included Los Angeles channel 5 (KTLA), New York channel 5 (WNEW) and Washington's channel 5 (WTTG). The Washington (D.C.) station makes particularly good sense; not only is it a well run indie station, but carriage of the station would create a **national audience** for a station covering the 'news' of the nation's capitol. For most people who only get the top of the headlines from Washington this in-depth coverage of the goings on in the nation's capitol might be very enlightening indeed!

Southern's light-years-ahead thinker Ed Taylor has toyed with the concept of installing an off-air and uplink facility 'half way between' New York City and Philadelphia where he believes "8 separate indies would be available". If the FCC were to lift signal carriage rules and end syndicated exclusivity Taylor feels that a very highly rated 'packaged satellite programming channel' could be created by 'mixing' the eight available indies from New York and Philadelphia into a composite channel. **Who says creative thinking is dead!**

ANIK 'B' In Chamber

The next satellite to be launched which **may** have a bearing on the way satellite service is utilized in North America is the ANIK 'B' series bird. This combination 6/4 and 14/11 GHz satellite is still scheduled for a launch from the Cape in the month of November. In the middle of September the completed satellite went into a 'sealed test chamber' at the RCA AED facility near Princeton, N.J. where it will remain until the middle of October. Assuming the sealed chamber test goes through the paces on schedule and without hitches the satellite will then be transported to the Cape and prepared for a launch.

ANIK 'B', in addition to having 12 horizontal video channels on 4 GHz downlink and 6 on 11(12) GHz downlink, will also have **3 dB more 4 GHz downlink power** than the existing ANIK I, II and III family birds now in orbit.

Corrections On AMSAT

The Satellite Technology News for August discussed the use of WESTAR II and AMSAT as a common carrier customer of Western Union. The column reported AMSAT was currently using four transponders and may be adding a fifth. The column also reported that AMSAT was on WESTAR II.

AMSAT is currently utilizing **three** WESTAR transponders, on **WESTAR I** (not II); those being transponders 3, 5 and 7. AMSAT **is** expanding, adding some SCPC transponder space on transponder 4.

Transponder Update

The newest service on the bird, **VISTAR,** began their 'shake down month' on September 4th with a CFL football game (Hamilton/Toronto) as per their advance announcements (see **CATJ** for **September,** page **20**). On October 1st they were scheduled to begin a 10 hour per day feed on vertical transponder 5 starting at 3 PM eastern and running to approximately 1 AM eastern.

VISTAR has bought the rights to the New Orleans Jazz home games, will begin **live** coverage of 10-15 games during the month of October. Most of the VISTAR sporting events are live although a certain percentage of NHL and NBA games will be tape delayed "so as to not conflict with Madison Square Garden Event games," according to their Connie Smith. The key to VISTAR's success (or the barometer as you will) will be double edged. **One,** watch their announcements of **systems signing** up for the service (they have a goal of 1.3 million homes by 1-1-79; a very ambitious goal at that), and **two,** watch for commercial **time being bought** by advertisers. Most of the early advertisers are buying time in the live (i.e. NHL, NBA, etc.) **sporting events** although VISTAR expects some advertising contract signings shortly for their 'family viewing' period as well.

To tune in VISTAR on transponder 5, with a linear polarization feed antenna, you will need to rotate the feed 90 degrees (left or right) to pick up the vertical mode. That will get you by for a quick look. . .beyond that you need a terminal antenna capable of simultaneous reception of both vertical and horizontal signals (see separate report here).

The **"TCS Satellite Network",** which is bringing you the Penn State University football game schedule on a same-day tape delayed basis (see **CATJ September,** page **20-21**) is also off and running. They are utilizing transponder 20 which is the HBO 'expansion channel', under an arrangement with HBO. HBO has been paying for this third transponder (12 hours per day, seven days a week) since September first and TCS and other 'occasional' program sources wanting to reach CATV will probably come to you through this transponder (20) until further notice.

Madison Square Garden is feeding on both vertical 9 and horizontal 20 for the time being (see separate report here); probably will be phasing out the horizontal 20 feed in the later part of October as more terminals receive their vertical mode equipment. Again the termination on transponder 20 will depend primarily upon the pace at which vertical couplers and LNAs find their way into the field.

RCA is talking like they have numerous additional CATV-type-user clients just waiting in the wings. We read this to mean that there is apt to be a flurry of activity during the last few months of this year as **additional CATV program services** come on line.

Now for the current month, who is where? If follows.

Transponder	Service
2	PTL
4	(broken-no service)
5	VISTAR (3PM-1AM eastern)
6	WTCG
8	CBN
9	Madison Square Garden (primarily evenings)
10	SHOWTIME/mountain, pacific
12	SHOWTIME/eastern, central
14	KTBN-Trinity
16	FANFARE (evenings only)
18	Home Theater Network (evenings only)
20	HBO reserved, also TCS Saturday evenings
22	HBO/mountain, pacific
24	HBO/eastern, central

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No separate transmitter required. Both receivers operate with any cable TV video or pilot carrier.

Both are rugged, self-contained, powered by rechargeable batteries, offer a crystal controlled local oscillator with front panel frequency trim adjustment and many other features.

The "Tracer" Model TR-1

is a calibrated receiver system which assures absolute compliance with FCC regulated radiation limits. Its 40 dB logged scale is accurate to ±1 dB.

The system includes tuned dipole antenna with magnetic base, head phones and AC adapter/charger. Gell Cell batteries provide up to 50 hours of operation on a single charge. Weight: only 5 lbs.

The "Tracer" Model TR-2

is an economical field unit that can detect and locate RF leakage and can measure radiation with sufficient accuracy for general trouble shooting. Ni-Cad batteries provide up to 15 hours of use on a single charge. Includes AC adapter/charger. Weighs only 1.5 lbs.

"Tracer" TR-2 . . . for locating RF leaks **Only $300 ea.**
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We think you'll want them both.

The Tracers are built by VITEK, recognized for quality and reliability throughout the industry.

To order or for additional information, call or write:
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*The Tracer is a trademark of Vitek Electronics, Inc.

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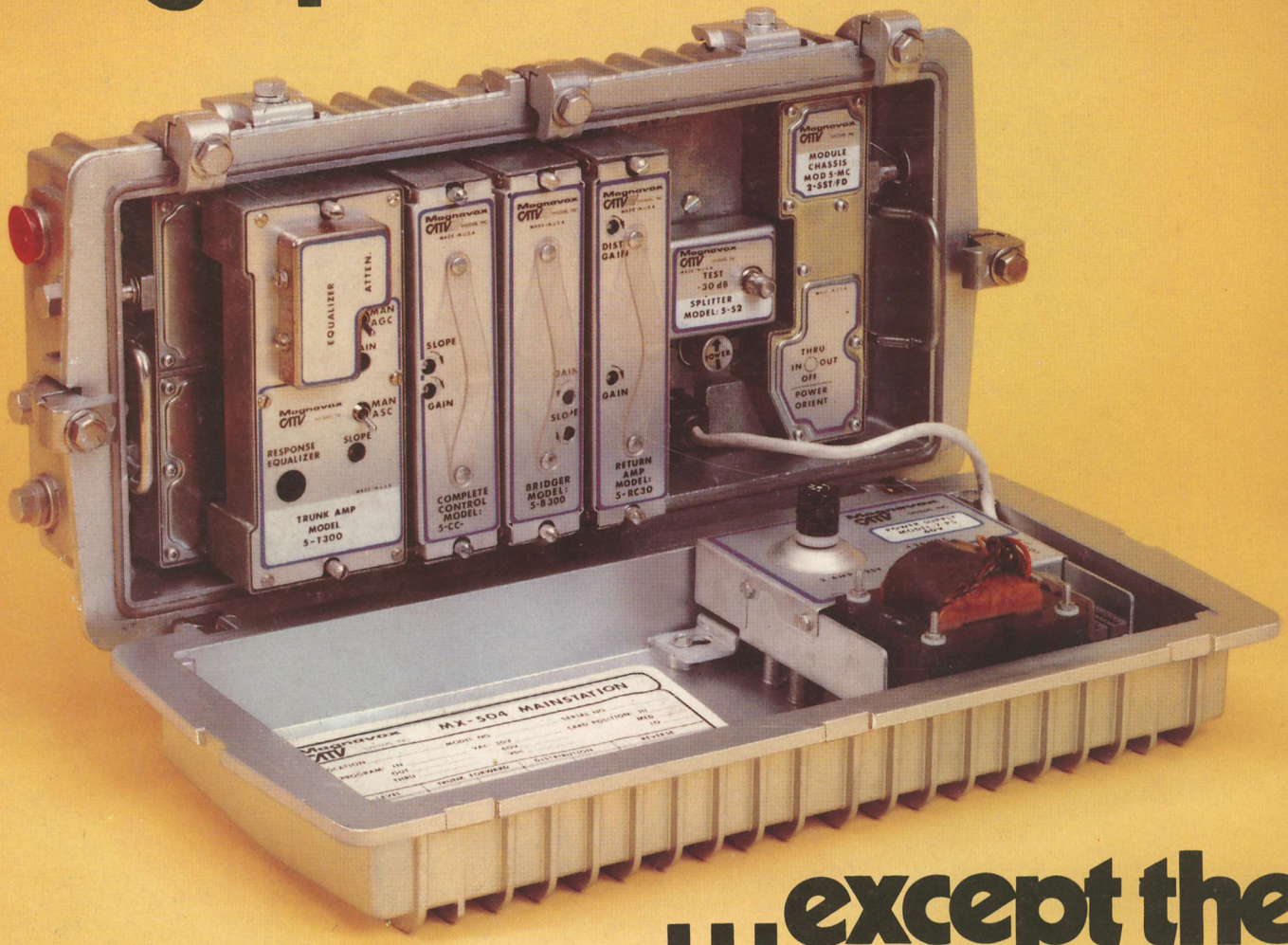

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