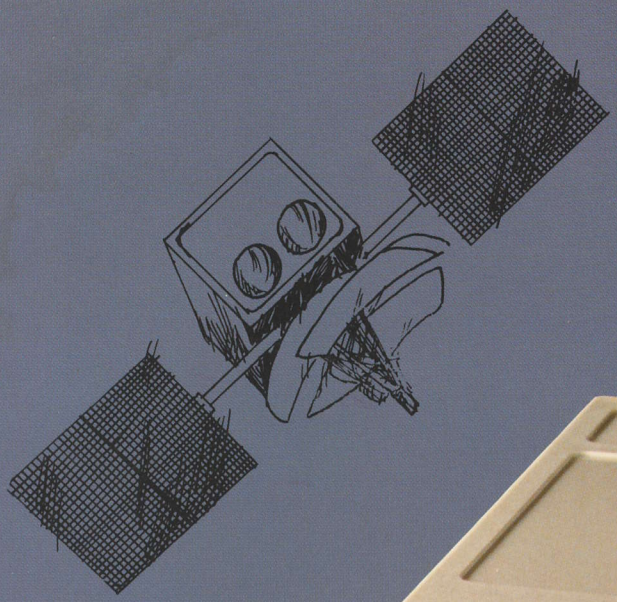
CATJ

APRIL
1978

OFFICIAL JOURNAL
OF THE
COMMUNITY ANTENNA
TELEVISION ASSOCIATION

Private Satellite Terminals – A THAW?



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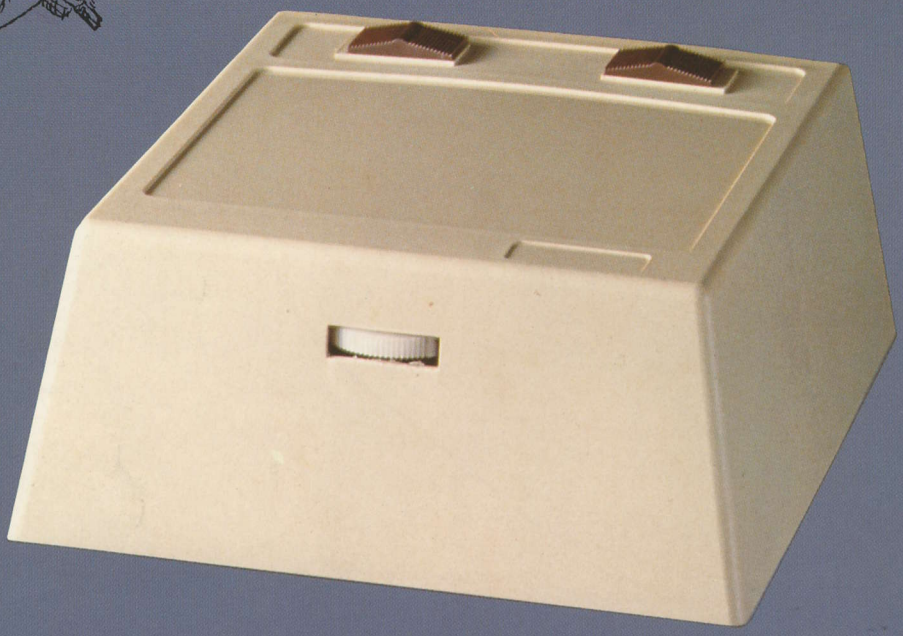

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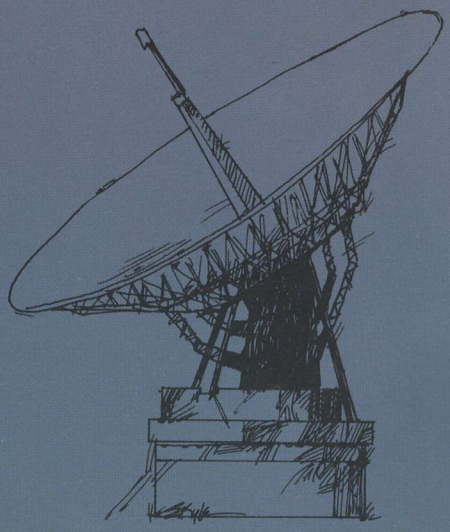

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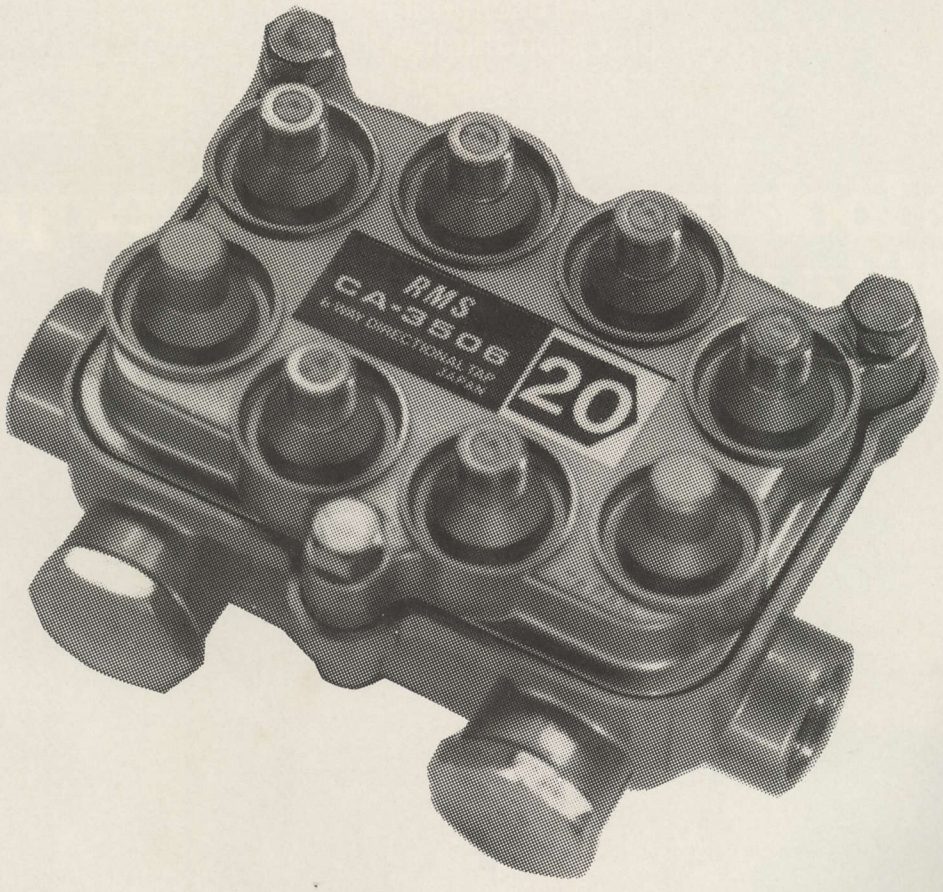

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—FEATURES—

—DEPARTMENTS—

OUR COVER

PRIVATE (non-CATV) TVRO TERMINALS—Will there by one 'in every backyard' one day soon? A very touchy subject in the CATV world these days as terminal prices come down and back-yard experimental terminals begin to multiply. Must reading begins on page 24.

CATA-TORIAL

KYLE D. MOORE, President of CATA, Inc.

Here Comes The Blue Sky Again!

When is a victory in court a loss? That's the 64 million dollar question these days as the industry grapples with the aftershock of the 8th Appeals Court Circuit decision late in February that **"the FCC had exceeded its jurisdiction"** in requiring cable systems to provide access channels.

Normally anytime the FCC has its wrists slapped by a court and is told 'Hey. . .you can't write or enforce rules like that' there is a loud cheer from the cable crowd. We've been saying for years that the Commission over stepped its very limited authority in the cable area by requiring us to do lots of things that we don't think they should be mandating. And access channels, those special channels which systems have been required to provide for local education, government, and so on have always been a thorn in the side of cable people who have difficulties swallowing government intervention into our private business activities.

But this may be one of those instances where federal regulations were better for us than a rash of poorly contrived local or state regulations. Basically here is what is involved.

An Arkansas middle-level MSO took the FCC to court because he didn't feel the Commission had any business telling him that any system he operated with more than 3,500 subscribers had to have an access channel. The same operator had been to court once before on a similar subject. In 1968 the FCC had decided that cable systems (with over 3,500 subscribers) should be required to originate their own programs. The operator took this case to the 8th Circuit Court and got a decision that said the FCC had no right to require such origination. The Commission then in 1972 got the case to the U.S. Supreme Court on an appeal **and there the FCC won;** it was decided that indeed yes the FCC did have the right to require local origination programming.

After the Supreme Court OK'ed the FCC local origination requirement the FCC then eliminated the local origination rule (**even though** they had the court's authority **to require** local origination) **and substituted** for this a rule that took the cable company out of the programming business. In substitution for this rule the FCC established a requirement that systems provide four dedicated or "access" channels if the systems were located in the top-100 markets. This had the affect of making many new systems at least four channels "Bigger' than necessary. **This rule,** it turned out, **was another mistake** so in 1976 the Commission modified it on their own (this time without a court telling them they had to) and allowed as how systems needed only to provide **one** "access channel". Only in modifying the rule the Commission enlarged whom it affected. Rather than requiring all systems inside the 35 mile zone of the top 100 markets to provide four access channels each, they decided to require **all systems with 3,500 or more subscribers** to provide one (composite) access channel.

It was this "every system with 3,500 subscribers or more" requirement which the Arkansas-based operator took back to the 8th Circuit Court. And he won. The Court said (amongst other things):

"Doubtless increasing outlets and augmenting choices are laudable, praiseworthy and desireable actions. It can be assumed that no agency will act toward objectives perceived as evil, but the world has come to regret many actions taken in the name of attractive euphemisms. . .We are here concerned, however, not with the Commission's psyche but with its action. The question before us is not the sincerity of the Commission or the glorious nature of its objectives. The sole question is whether compelling cable systems to build and dedicate facilities to essentially free public use was within the Commission's jurisdiction. . .(But) **nothing in the** (1934 Communications) **Act, or anywhere else, gives the Commission unlimited right to say to a private industry 'We believe we have seen the future and you must construct it'."**

These are harsh words for a court. Boiled down to their basic message, they say 'enough big brotherism—government does not always know best'. And we concur. We have held that belief for many years and the 1972 initial FCC cable rules were 'big brother knows best' rules from start to finish.

But there is a flip side to this coin. And that is the protection of the industry (and its subscribers) from the industry itself. Or from the over-zealous and often poorly informed local franchising authorities.

There was a time in the industry when in the heat of a franchising battle would-be operators were apt to promise anything. . .**anything at all**. . .to get the franchise. If the first would-be-operator into a town promised 12 channels the next one promised 20. If the second promised 20, the third promised 30 with special channels set aside for education and local government and the churches and the dog catcher and his wife. Then the fourth guy came along and promised 36 channels with multiple local free-access channels plus color studios and full time staffs and a $4.95 fee! Whether we realized it or not, the FCC's muddling around in the CAC process really protected us from our over zealous bed fellows. Because if someone obtained a franchise after promising a city more services than were logical or reasonable or practical, the CAC was often denied. Or held up for ever and ever.

Now with the 8th circuit decision the FCC's authority over not only access channels but **perhaps also** over the CAC process is tossed into a cocked hat. And there go the restraints of that authority. **No city** could have required you to provide **more than** a single access channel **prior** to the court decision because to have required more than one would have guaranteed that no CAC would have been issued. And thus there would have been no system. Now without the 'one-only-ceiling' of the FCC, a city can be manuevered into asking for four or forty access channels. If the city doesn't do it on their own you can be sure some zealous applicant will help them do it.

The franchising battles are starting anew. They have in fact already begun. A small (6,000 population) north Texas community that is a suburb to another larger city was in the process of considering a franchise applicant late in February. At the second reading of the franchise (which was the last step before granting the franchise to the applicant) a hand delivered letter asked the city to hold off the grant until **another new applicant** could make a formal presentation. To give the city something to 'chew on' the hand delivered letter proposed a tiered CATV system that would provide:

a) 12 channels of service for $5.50 per month,
b) **31 channels of service for $6.95 per month.**
c) Three levels of selection of optional 'premium' television with HBO at $6.95 per month, FANFARE at $8.75 per month or a 'Family Programming Movie Channel' at $3.95 per month.

The service proposed one 'composite' access channel (12) in the 2-13 spectrum **plus** (1) Composite Family channel, (2) Public Access channel, (3) Municipal Access channel, (4) Educational Access channel, and, (5) A dedicated to a local JC 'Access Channel'.

This town of approximately 2,000 potential connections would also receive, for the second-level $6.95 rate, the three network signals, an indie, a speciality station (the last two must come in via microwave), a program guide channel, sports and financial newswire channel, national and international news channel, Madison Square Garden Events channel (**not** optional—part of the 2-13 dial), an automated 'Swap 'N Shop' channel, CBN channel, PTL channel, and Spanish International Network channel (these three via satellite and via **two separate channel satellites or terminals at that**!), a Texas State Newswire channel, a color Radarscope channel, a time and weather channel, a Slo-Scan Video News Service channel, a consumer shopping guide channel, captioned PBS programming for the hearing impaired channel, color bars with talking books for the blind channel and finally a 'fulltime' financial newswire channel. For $6.95 per month. **For 2,000 potential homes.**

And there is more. For the operator promised to provide **"(a) complete studio facility, including three separate and distinct equipment packages and mobile capability. Programs of local interest can be videotaped. . .for viewing on the cable system.** (And) **a Community Video Advisory Board and Video Workshop will be established to stimulate the use of these diverse** (access) **channels** (wherein the cable company) **staff will coordinate the use of the production facilities and teach in the Workshop. . .".**

Per chance you suspect this application is backed by some **new** entrant to the cable industry who has been reading too many blue sky articles in the media, think again. This is one of the top (five) MSO's talking. Someone who should know better. And just in case you think this is an isolated example. . .think again here too. The same firm has been popping up all over the map in recent weeks with similar offerings. The name of the game appears to be **"promise them whatever it takes to get the franchise"** regardless of how difficult the promises may be to deliver.

Shades of 1971 or 1967 or 1965 all over again!

So here we are wondering whether the 8th circuit decision was a victory or a trap for the industry. Those system operators who believe in fiscal responsibility will be hard pressed to match **the promises** of those who are apparently back playing a much larger national game of hyping their stock on Wall Street. For all of the slings and arrows tossed at the FCC since the adoption of the 1972 rules little did many of us realize that at least **some** portions of those rules were better for us than a totally unrestricted marketplace. For if nothing else they forced us to protect ourselves from ourselves. Fearfully the era of the walking wounded may be returning. This is a time for quiet contemplation of who we are and what it is we want our industry to look like in the coming years. Restraint, common sense and bottom line fiscal responsibility are signs of a mature industry. If we are to truly grow there can be no other way for us to conduct ourselves.

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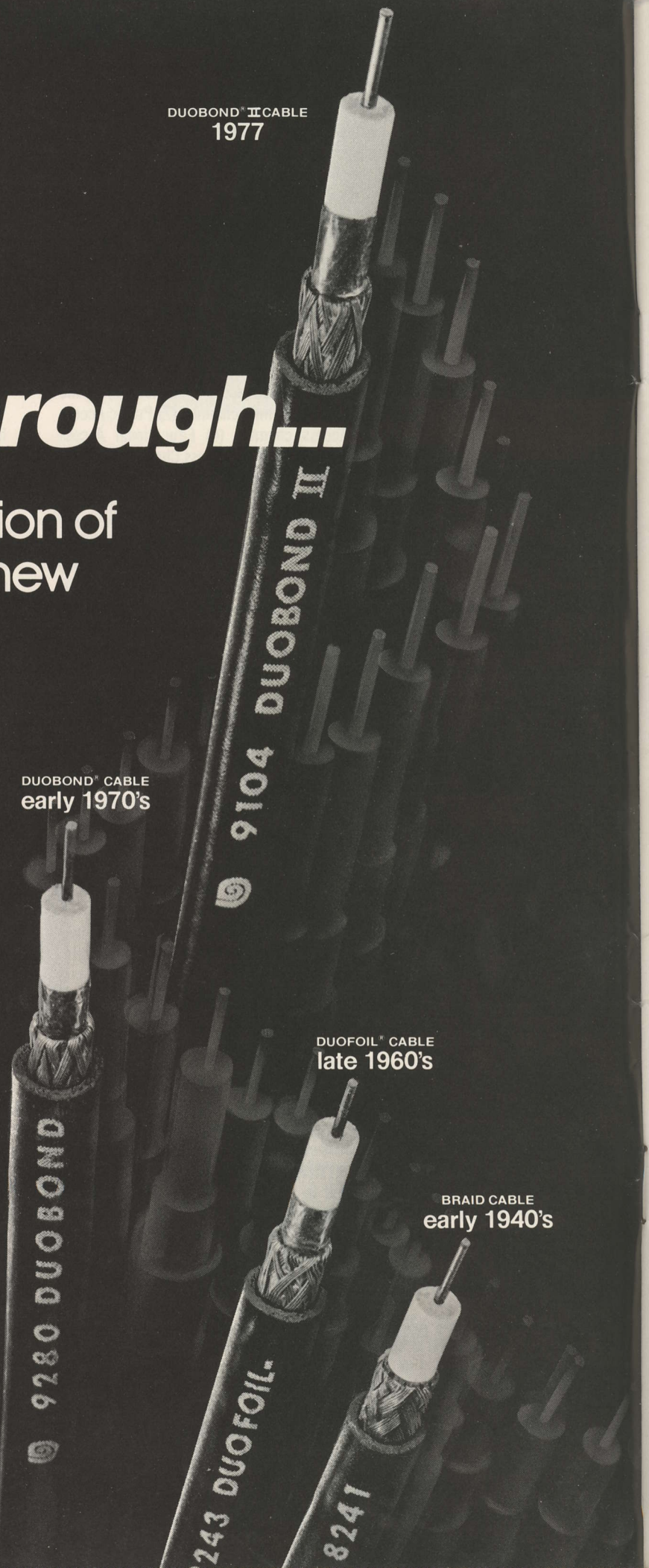

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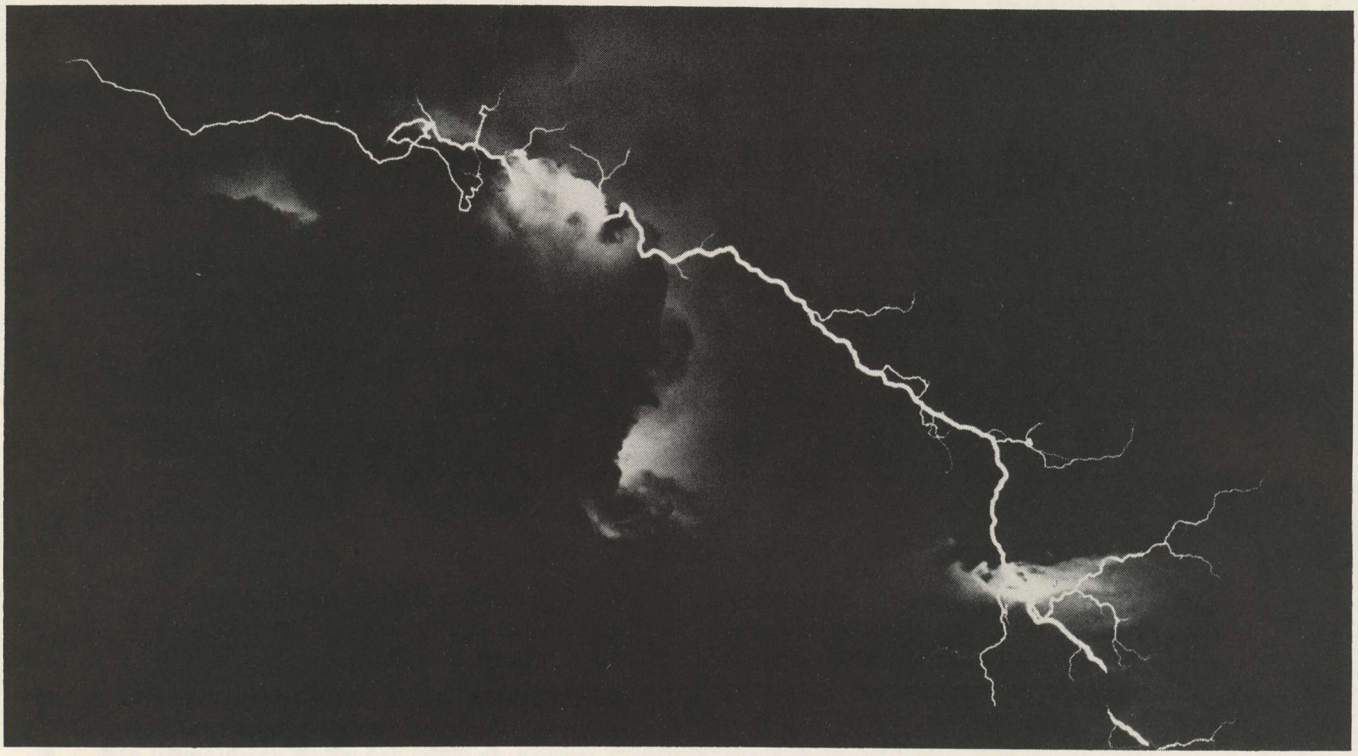

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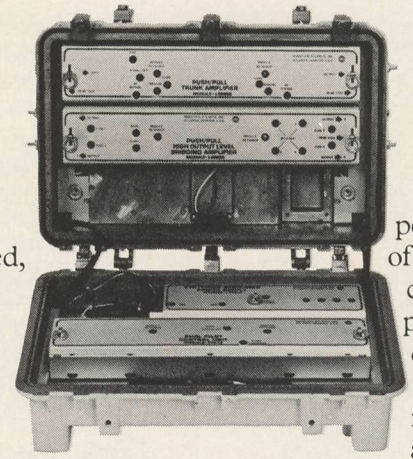

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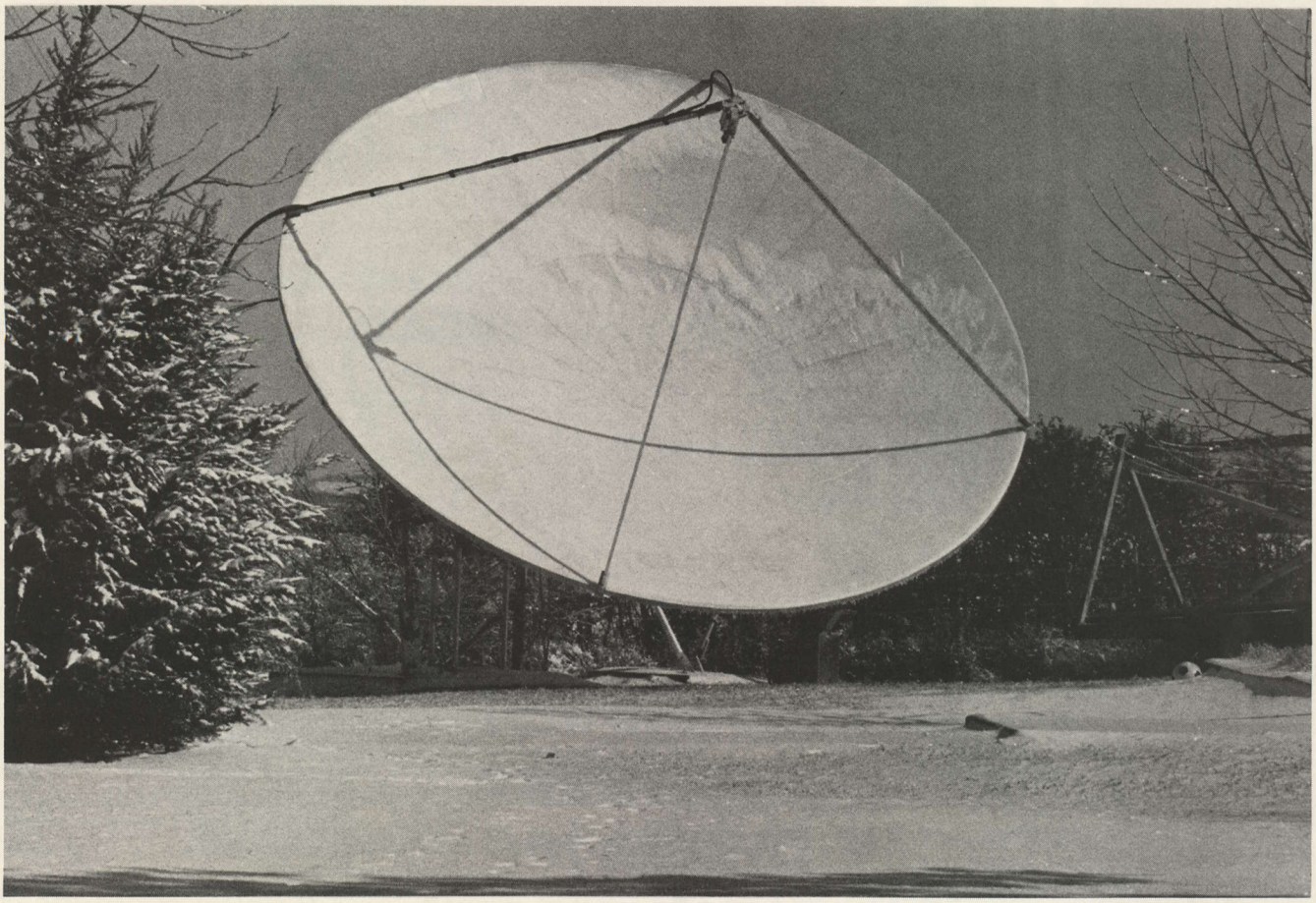

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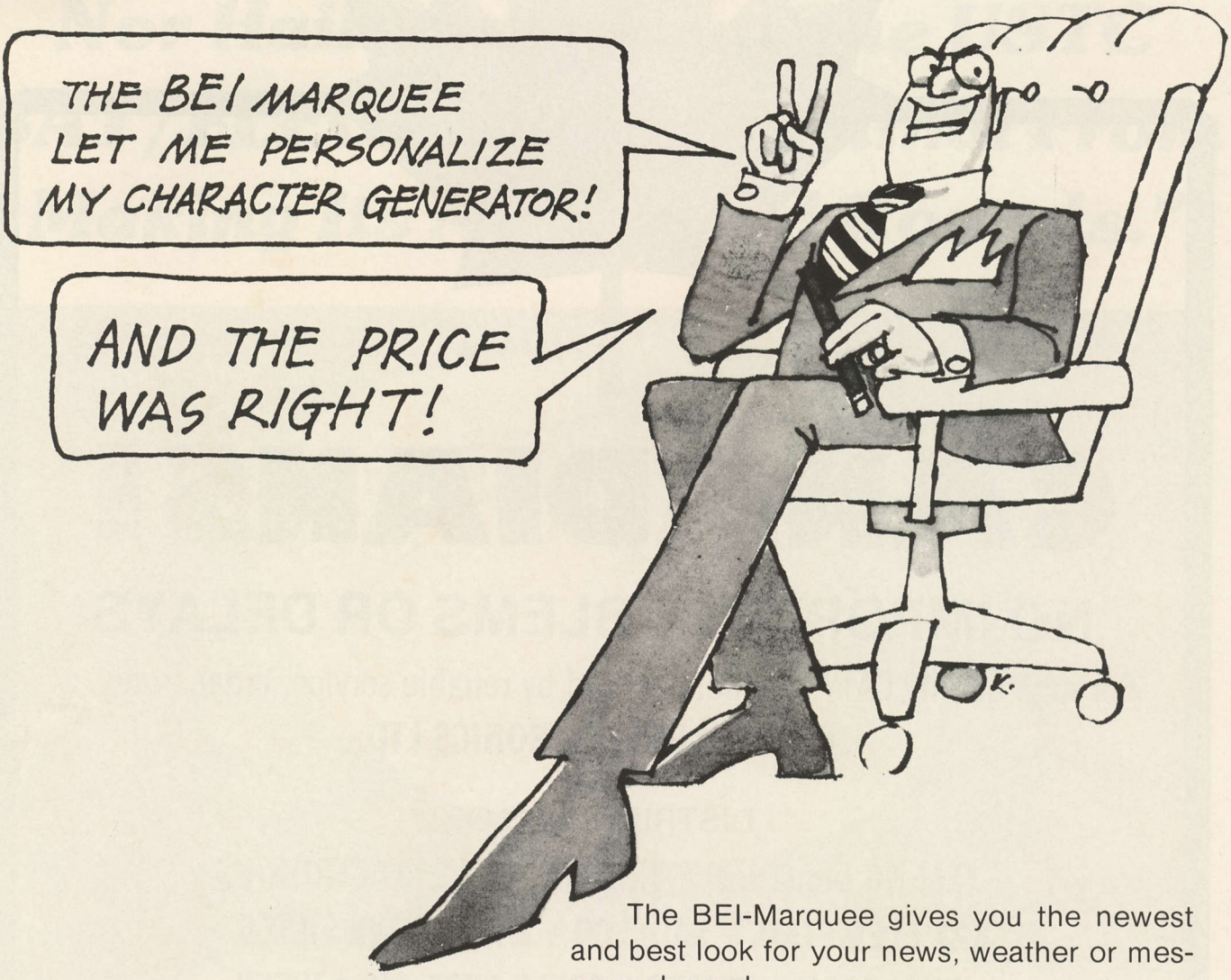

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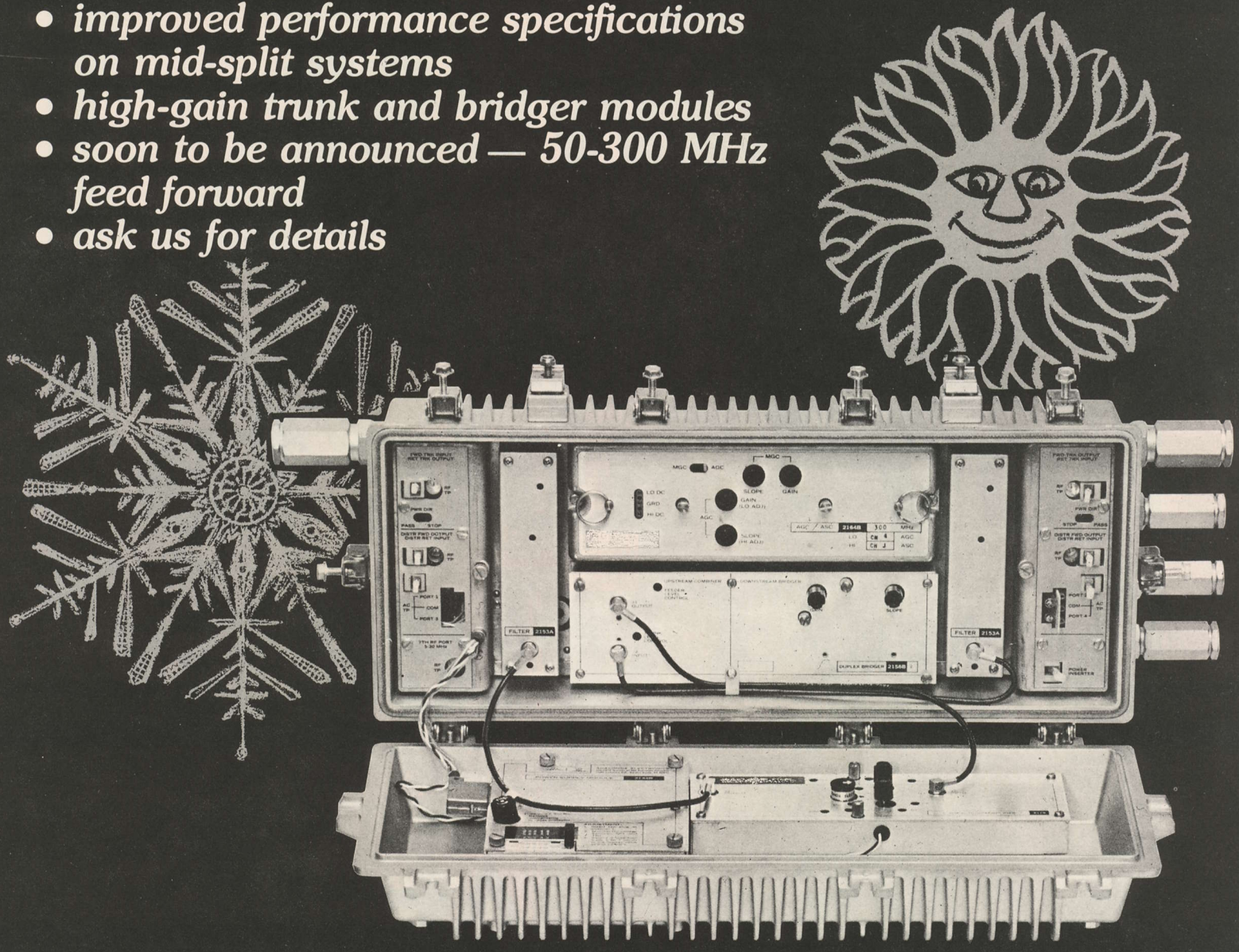

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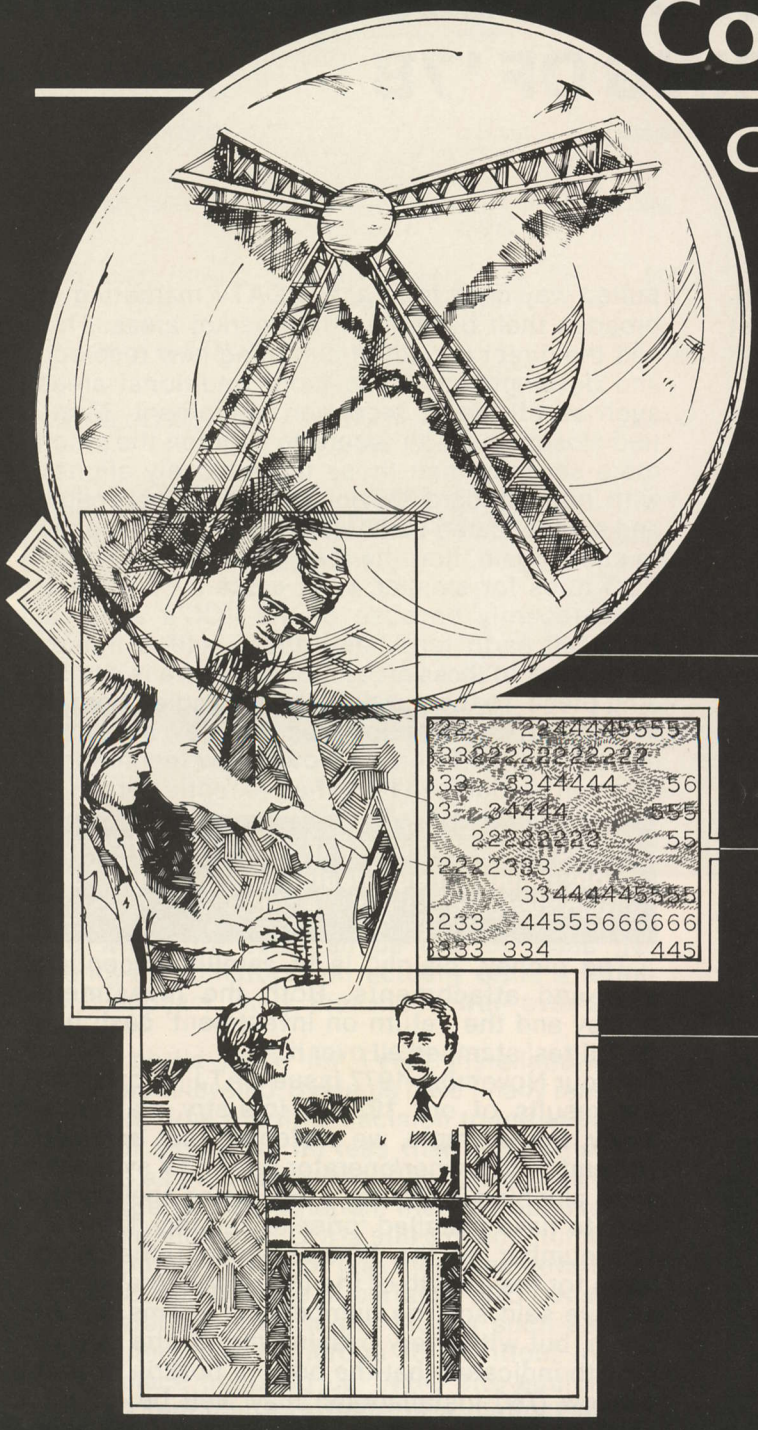

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Preparing For The Show?

HERE'S WHATS NEW IN CATV TECHNOLOGY FOR SPRING OF '78

Very Broad Growth

Any effort to 'survey' the CATV industry's technology base as of late in the spring of 1978 must come to a single bottom line conclusion. And that is that the technology advances are by-in-large somehow tied (even if rather percariously) to the run-away growth of TVRO (television receive only) installations. Firm after firm contacted by CATJ reported products under development that either relate directly to TVRO's (such as receivers or antennas, etc.) or which have a market only because of the rapid growth of TVRO's (products such as video cassette switching systems, sophisticated micro-processor based character generator display systems, and even passive devices such as multiple channel pay cable traps).

But the new technology does not stop with such directly (and indirectly) related TVRO hardware. Rather the growth in pay cable, and the growth in new multiple channel satellite delivered signals is fostering companion growth in many more traditional product areas as well. Modulators, microwave, 'old style' amplifier modification-kits and even new test equipment is coming on line. New system construction is on the increase (especially in smaller markets although there are some healthy large markets also getting underway) and virtually every supplier to the industry is either experiencing rapid sales increases or anticipates such increases in the near future.

"Overall the changes in the industry in the last year have been very positive. Existing systems are upgrading their plants, new systems are under construction and everyone is adding or talking about adding pay channels. And for the first time system people are beginning to consider connector selection as an integral part of their system planning." (LRC Electronics)

The industry has been in a slow down for several years. After the bloom fell off the 1972 FCC rule announcement and it became apparent the rules were **not** going to 'open up major new markets' the sales curves of many industry leaders fell into a state of dis-array. Some well established firms quit the CATV business and many more pulled way back from active CATV marketing to broaden their bases in other market areas. This had the direct impact of curtailing new research and development in the more traditional areas such as off-the-air reception equipment. Firms tied closely to off-air receiving gear felt the pinch more severely than those more closely aligned with non-standard services; such as pay cable and sophisticated technology. When sales began to climb again, first the result of slightly relaxed FCC rules for smaller, rural cable systems and more recently because of the FCC's approval of 'small earth terminals', the R and D money came back in **those** areas alone. If there is a 'missing piece' to the puzzle to be untangled here, it is in the off-air-reception area. Very few suppliers reporting to CATJ on their own 'new technology' mention products in the off-air reception area.

"Recent developments in 'Per-Program' pay cable should help hasten the viability of urban systems". (I.A. Faye, AEL)

The money, plainly, is in satellite reception aids and attachments. Both the investment money and the 'return on investment' cash has 'satellites' stamped all over it.

In our November 1977 issue CATJ reported on the results of our 1977-78 industry marketing study. For example, we projected that between 760 and 1080 'owner/operator run CATV systems' were planning TVRO facilities which they 'planned' to have installed 'prior to January 1, 1979'. The number, at the time, seemed rather high (even for the growth of the industry at that time); and we said so. The number still seems out of reach, but with every passing month the rate of growth indicates that the bottom portion of that window (760 installations) may well be 'attainable' before (say) **mid** 1979. By the time this material is read there will be right at 300 operating TVRO facilities in the United States. By cross checking with firms such as Compucon and SAFE, where TVRO would-be-applicants must go **before** they file with the FCC, it appears that more than 1,000 CATV TVRO applications have gone at least as far as the 'frequency coordi-

WHERE TO FIND NEW (and exciting) TECHNOLOGY AT THE NATIONAL

Company	Address	Booth Number	New Products/Technology
AEL (American Electronics Labs)	P.O. Box 552 Lansdale, Pa. 19446	**302**	Switching voltage regulator P/S; M4XE push-pull line extender (hybrid), low cost
AVANTEK	3175 Bowers Ave., Santa Clara, Ca. 95051	**214/215**	SL-300 signal level meter with interfacing for spectrum analysis, voltage measurements, chart recording
BROADBAND ENGINEERING, Inc.	1525 Cypress Drive Jupiter, Fl. 33458	**112**	'Mod-Kits' for Kaiser KCMG, KCAG; Anaconda 2033T/2130; Starline Twenty single-ended (SMM, SAM, SAS, SMM-S, SAM-S); others
COLLINS MICROWAVE	1200 North Alma Road Richardson, Tx. 75081	**816/817**	Modem MVR ( ) solid state, modular design CARS band microwave
COMM/SCOPE Company	Rt. 1, Box 199A Catawba, N.C. 28609	**606**	Fiber optic communications cable
CRC ELECTRONICS	Makaha Towers, Suite 1338 Waianae, Hawaii 96792	**924**	TD-100 'Time Delay' videocassette automation equipment
FARINON ELECTRIC	1691 Bayport San Carlos, Ca. 94070	**822/823**	FST 3001/3002 single channel and FV4F ESR tuneable TVRO receivers
LRC ELECTRONICS	901 South Avenue Horseheads, N.Y. 14845	**840/847**	'Integral part' design CATV system connectors
RIPLEY COMPANY (Utility Tool Div.)	46 Nooks Hill Road Cromwell, Ct. 06416	**1112**	Insulated coring tools for 'voltage activated' coaxial cables
RMS ELECTRONICS, Inc.	50 Antin Place Bronx, N.Y. 10462	**605**	Multiple new Unipower series passives for CATV distribution, trunk and subscriber lines
SADELCO, Inc.	299 Park Ave. Weehawken, N.J. 07087	**106**	Latest version of DL-100 digital FSM, other signal level and and test equipment pieces
TERRACOM	9020 Balboa Ave. San Diego, Ca. 92123	**307/308**	Expanded versatility TVRO receiving system equipment with switching/automatic protection/control functions
VIDEO DATA SYSTEMS	465 E. 900 South Salt Lake City, Ut. 84111	**920**	'Master Marquee' single package automated filler channel to compliment TVRO (or other) supplied special channel programming.

nation' phase of their installations by mid-March. And while not every single one of these frequency-coordinators will actually build a terminal it appears likely that most (well over 90%) will.

The 'bottle neck' for TVRO installations remains multi-leveled. Systems have finally realized that from time of initial decision to initial acquisition of signals is no less than 5 months and perhaps as much as seven. The paper work (first the frequency coordination, then the application to and through the FCC) is still a major stumbling block. On top of this of late there has developed a fairly deep shortage of certain TVRO construction materials. With major MSO's such as TCI (and others too numerous to mention) in the marketplace gobbling up TVRO site equipment in 40-60 terminal lots there is a distinct disadvantage in being a one-terminal-buyer. Suppliers are quick to take an order, but the demands of the marketplace are restricting their abilities to deliver the products on a timely basis.

Receivers for TVRO sites appear for the moment to be most afflicted with this 'delayed delivery' disease. When the first terminals went in there was only HBO 'on the bird'. But with the rapid proliferation of transponder 'dedicated to CATV' the average number of channels-per-TVRO has risen quite steadily so that today (based upon CATJ derived figures from FCC records) the

"(With pay cable and smaller dishes) the growth potential for small and medium sized systems has never been better." (Bob Savard, Broadband Engineering, Inc.)

'average application' calls for between 3 and 4 satellite channels per TVRO. If you add to that a 'spare receiver', you are into the 5 receivers per site region very quickly. With the addition of the AmeriCom Satellite Network (see separate report here this issue) to the TVRO 'game', and their four channels on WESTAR, the number of TVRO receivers per system is growing very rapidly indeed. A 'confidential' study performed by CATJ in February indicated to us that the (six) primary suppliers of TVRO receivers are currently capable of supplying a total of 170 to 200 TVRO receivers per month. With applications for new installations coming **off** the FCC line in the 50 per month region, simple multiplication suggests that if the 50 **new** terminals per month now

going in utilize 4 receivers each, the maximum capability of the receiver supply industry is taxed to the limit. On top of this one must add those **existing systems** which are continuing to add additional TVRO channels as they come up on the bird.

The addition of each new transponder dedicated to CATV can only increase the problem. We see no immediate relief in sight even with the potential of several new suppliers coming into the market during 1978.

But enough of the impact of TVROs on the marketplace, for now. It is very easy to 'slip into' the TVRO discussion area these days and we are no exception to this problem!

What To See

Our approach to this 'advance preview' of new technology to be shown for the 'first' time starting April 30th in New Orleans is rather straight forward. We asked the suppliers to the industry to share with us their 'show plans'; to reveal to us in advance of the show what it was they were planning to show and demonstrate. By the nature of our deadlines, suppliers had to have 'hard facts' and product photos (if available) into our hands by mid-February. For many, as we shall touch on briefly here, this was too far in advance of the show itself to provide the kind of data we requested.

Our intent was to recognize that this year's national trade show was going to be the biggest, best attended of any to date. And to recognize that if you have had some difficulty getting around to see **everything** you thought you should have seen in previous years, this year would be doubly difficult. So here we list with some detail those new product areas which were ready for at least some limited measure of public exposure by the middle of February. This is by no means everything that is new; you'll still have to do some 'free lance hoofing' while in New Orleans to see those product developments that probably were finished up only minutes before the show officially opened on the 30th.

"Introduction of receive-only earth terminals marked a giant step forward for the CATV industry. The benefits of cable television at a reasonable price can now be made available to more people than ever before." (George E. Price, Collins Microwave)

You will also do well to check into a few booths where the 'latest products' will **not be** on display **out in the open.** For example, we'd suggest that you corner somebody at the WAVETEK booth and ask them if you can see their new computer programmed sweep system. It will probably not be on the floor in the booth, rather it will be limited to 'private showings' in their suite (if you attend CCOS this year, however, it will be on display there in mid-July). You also might want to check into the AmeriCom Satellite Network booth to check out a new TVRO receiver unit that is scheduled to be bringing down the four ASN transponders from WESTAR. Price is the consideration here. Also in the test equipment area you should make plans to stop by the TEXSCAN booth to look at several brand new pieces of CATV test equipment created under the tutorship of Raleigh B. Stelle. The bottom line is that **this show,** more than any other we can recall in the past, appears to be headed for a fairly sizeable quantity of 'under wraps' new products. It will pay to keep your ears open; and don't hesitate to ask **"Hey—what's new that I** don't **see on display out here".** You might be very pleasantly surprised.

"Communications utilizing fiber optic technology is an evolving industry which has the capability TODAY of solving some specific transmission problems which are difficult (at best) to solve with conventional CATV transmission methods." (Greg Couch, Comm/Scope Company)

In alphabetical form here we have a table of new products from firms that had their work done by mid-February. To expand on this listing, we add the following:

AEL—The American Electronics Laboratories, Inc. group headed up by Irv Faye will be showing a new **PS-4S switching regulator power supply.** The advantages according to AEL are "higher efficiencies, more economical and easier to operate. The efficiency of the supply does not change under varying AC voltage conditions on the plant". AEL will also be showing a new **push-pull hybrid line extender** (model M4XE); a hybrid based design unit that drops the bi-directional capabilities of their M4X version in the interest of bringing the unit's pricing down to a lower level for cost-effective installations.

AVANTEK. . .will be back showing their **signal level meter** first announced and shown at the Chicago convention in 1976. The **SL-300** has met with mixed reviews and the CATJ Lab, which has **not** had the opportunity to check the unit out to date, is preparing a rather interesting 'top-gun-

shoot-out' approach to the meter for this summer. For the unwary, the SL-300 is a $1495 meter that has a built-in calibrator, single band electronic tuning, LED **frequency** readout and built-in hum-modulation measurement capabilities. With additional plug-in boards the meter also doubles as a spectrum analyzer, measures line voltages and allows the operator to run chart recordings of signal levels.

AVANTEK's Bill Le Doux recently asked us to do a **direct** CATJ Lab **comparison** of his SL-300 meter, the latest Texscan meter and the Sadelco DL-100 digital meter. We discussed this with Texscan's Raleigh Stelle and Sadelco's Harry Sadel and have decided that perhaps the best way to run such a 'shoot out' would be during this year's CCOS. As things now stand we'll set up the three meters at CCOS-78 and ask CATV operators in attendance to spend 30 minutes or so working with the three meters. Then operators will complete questionnaire forms we'll provide, from which we'll tabulate the results. It should be most interesting indeed!

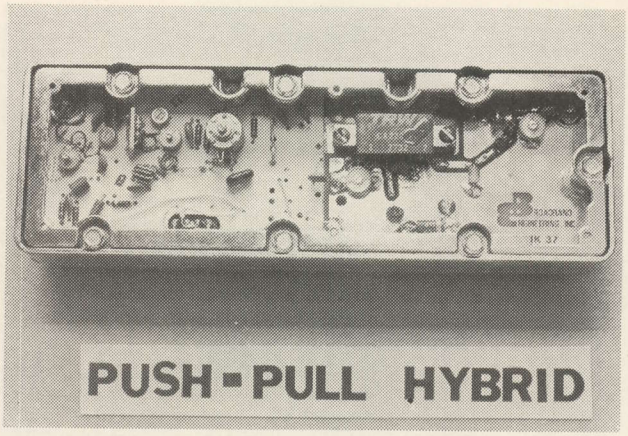
"Cable operators recent concentration on reliability rather than selecting products based upon what is 'cheapest' is a healthy sign. This is exemplified in the new interest in standby powering techniques." (Tom Carbaugh, Jerry Conn & Associates)

BROADBAND ENGINEERING. . .has been busy since last we visited them (see **CATJ** for **May 1977,** page 36) expanding their **'Mod-Kit'** product line to cover several additional older style amplifiers out there in CATV land.

For those that are not aware what Broadband does, they have gone into the original designs of old single ended amplifiers (such as Starline 12 or 20, etc.) and developed modification kits with which you can, in your own shop, convert the older style amplifiers into modern state of the art **push-pull** amplifiers. The kits are specific for the various amplifiers you have in your system (by model number and the generation of your model), and any half-skilled technician can take the 'Mod-Kit' and the instructions from Broadband and retro-fit an older style amplifier on your own shop bench.

This approach saves you dollars and it gives you performance equal to (and in some cases better than) modern day amplifiers. New in this series at the show will be:

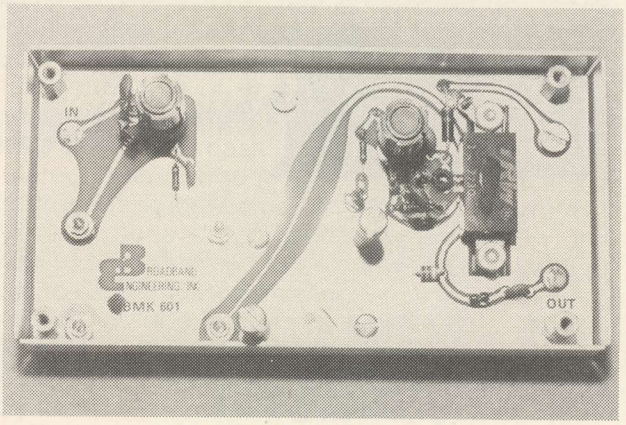
1) **BMK 216** and **BMK 217** kits, for **Kaiser KCMG and KCAG trunk and bridging amplifiers.** Allows this type of gear to be used for both mid band signal carriage and super band signal carriage (top of bandwidth is 300 MHz after the modification).
2) **BMK 601** for **Anaconda 2033T/2130 line extenders.** This Anaconda amplifier was designed around a **HP chip** which is **no longer available.** The retrofit kit is more of a 'save the housing and power supply' approach for those systems that have this amplifier

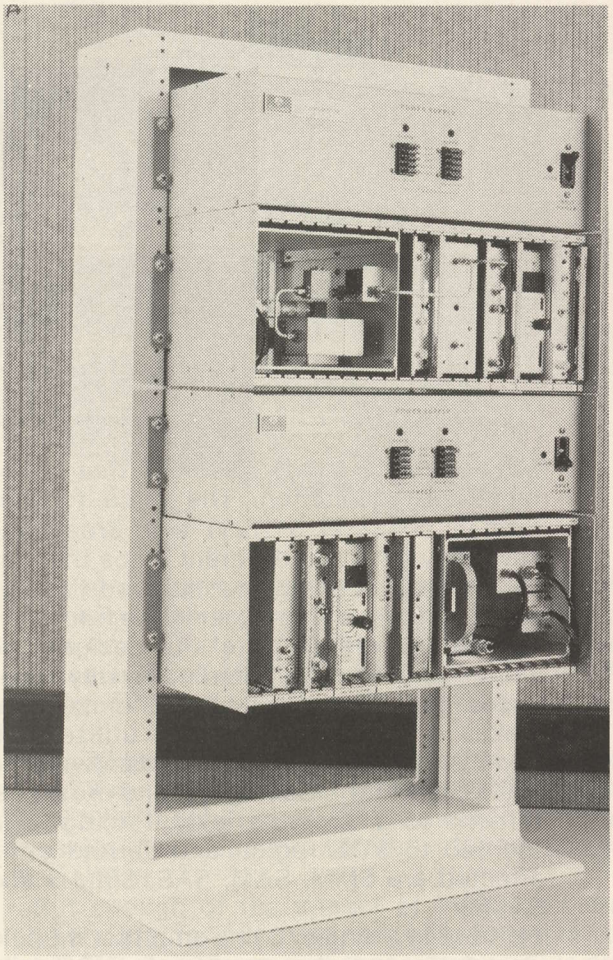


but no way to locate HP chips that are no longer in production. The price for this drop-in board is $126.50 and Broadband says they have two different chips that can be utilized, reducing the liklihood that the same problem will re-occur in the future.

3) **BMK-37 (38) (39) (40)** are kits designed to allow you to turn your **Starline Twenty single ended gear** into push-pull IC units. This makes it possible for you to utilize both mid-band and raise the upper bandwidth to 300 MHz while reducing second-order distortions to a tolerable level. Pricing is in the $90 to $130 region and Jerrold units affected are SMM, SAM, SAS, SMM-S and SAM-S.
4) **BMK-213** is a **single IC** line amplifier module intended as a **replacement for dual IC** hybrid amplifiers now commonly utilized. The use of a single IC reduces the power consumption (it operates at a nominal 22 volts DC); bandwidth is to 300 MHz and cross mod is specified at −65 dB for 30 channels operating at +45 dBmV.

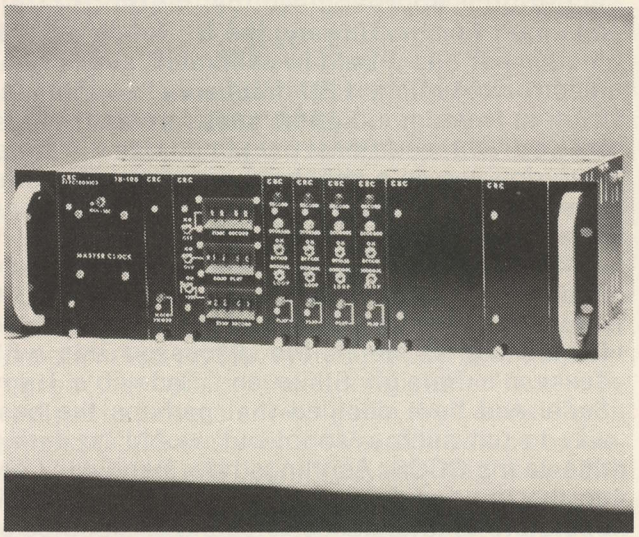
COLLINS. . .is actively **back** into the CATV industry with a line of **12 GHz microwave** (as well as some other frequencies which are useable for common carrier applications). Model MVR ( ) is a complete transmit and receive system "competitively priced" with interchangeable RF heads for frequency changes. The gear is all solid state, modular in design with plug-in audio sub-carrier boards and a plug-in clamp amplifier for the receiver.





Collins is supplying both terrestrial microwave and TVRO equipment to the now under construction PBS nationwide system. There have been (unconfirmed) **rumors** that Collins **may** 'officially' enter the TVRO field with some of the hardware they are providing to the PBS stations (or similar gear re-packaged for CATV).

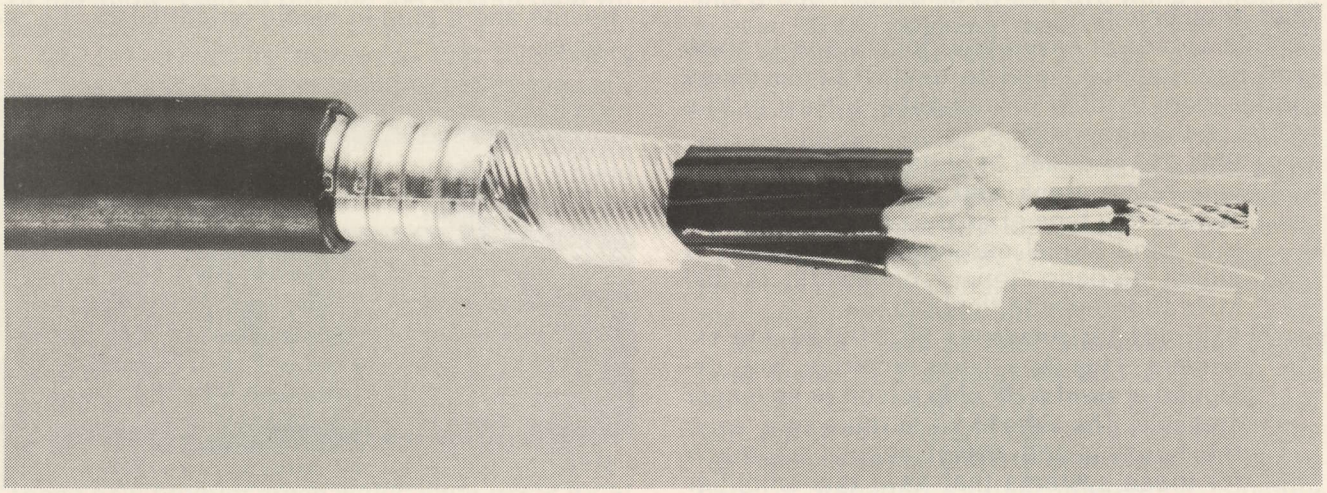
Comm/Scope. . .has had a year to bring the **fiber optic** technology along and to adjust their own marketing sites on just where fiber optics may fit into the grand CATV scheme; both **today** and tomorrow.



Reading between the lines of the material now available, it would appear that Comm/Scope is anxious to put some of the **fiber optic** cable into real world operating situations for (initially at least) **trunk applications** in CATV. The product is 'currently available' and systems with extremely long haul or wide bandwidth requirements or trunk noise problems may find this year's fiber optic displays closer to the real world than say 1977 was. Fiber optics is coming. . .it **may** well be here now. You'd best no overlook it until you've gotten some quotes on your own new trunk construction utilizing this approach.

CRC ELECTRONICS. . .has been supplying some very clever **'VTR programming systems'** for several years now and it appears that perhaps with the explosion in CATV earth terminal use that 'their time has now come'.

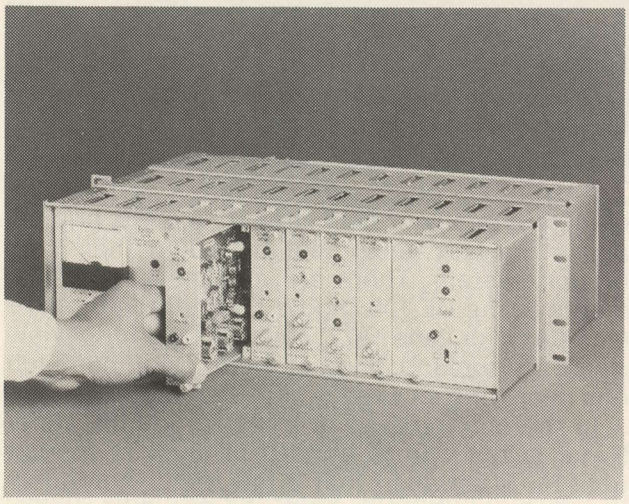
They will be showing and demonstrating their new **TD-100 'Time-Delay Cassette Control System'** which Jim Chiddix describes aptly as **'an extended delay line'.** What CRC has done is to marry the newer very high quality reproduction 3/4 inch Sony Betamax machines to a very sophisticated solid state programmed control system. The TD-100 is designed to **delay** any program for periods of one hour or more (in one minute pro-



gramming increments). One of the applications for this technology is in satellite feeds of say HBO or SHOWTIME or Madison Square Garden Events. Systems located where 'live showings' of the satellite delivered programming does not fit into the local time zone or living habits of their subscribers can interface the appropriate Sony Betamax machines and the TD-100 with the downlink TVRO delivered signal(s). The program material is recorded on the Betamax machine(s) automatically as it is received, and then played back automatically at the appropriate (pre-programmed) time. Initial delivery of the system is scheduled for this month (April) into systems in Hawaii and Alaska.

A similar in concept system was designed by CRC for the Warner QUBE system in Columbus, Ohio. There, a total of 33 videocassette machines plus a CRC P-1000 control deck provides programming for 11 of QUBE's Columbus channels.

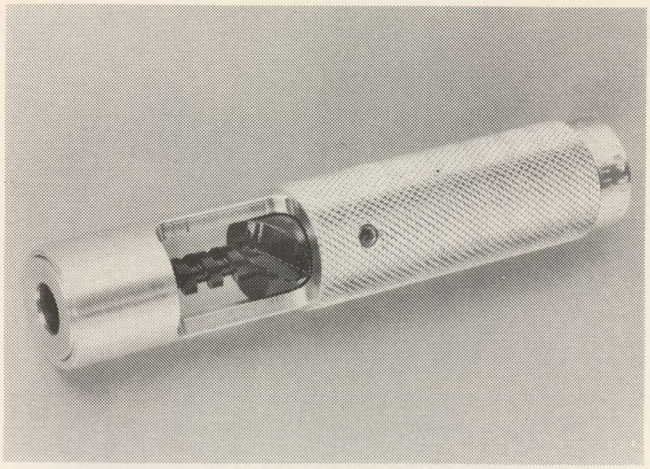
Clearly the advance of solid state technology and the companion growth of sophisticated CATV program delivery systems has created a technology need which CRC has filled.



FARINON. . .has continued to refine the sophistication of their two **TVRO satellite** system **receivers** since they were first shown one year ago and these latest refinements (plus a delivery record of product piled up in the interim) will be 'on display' in New Orleans.

The Farinon approach to TVRO receivers continues to be built around the concept that the satellite receiver must be an integral modular link of the full TVRO system. For example, the $4,000 price range **single channel** FST3001/3002 **receiver** to be shown has plug-in module change out for the addition of **extra aural subcarriers.** A 4.5 MHz aural carrier generator system can also be plugged into the receiver so you are ready to go directly from the satellite receiver to a baseband (composite) microwave feed.

The FV4F satellite receiver is their top of the line fully electronically tuned (BCD programmable) 12 or 24 transponder receiver. Some of its unusual features and/or operations include a 70 MHz feed for terrestrial heterodyne microwave systems (a plug in), the ability to remotely or on a pre-programmed basis switch from one transponder to another transponder (such as from Madison Square Garden to CBN), and primary powering selections of 115 VAC, 230 VAC, – 24 volts DC and – 48 volts DC.



RIPLEY COMPANY. . . Utility Tool Division is on hand to prove that sometimes the everyday things you do may mean more to you than some of the big decisions you wrestle with for so long.

They've come up with a very clever **insulated coring tool** which can be utilized (safely) on 'activated' coaxial cables. The whole idea is that when you have to make a line change or new connection on a hot line (such as adding a DT) you normally have two options; go back to the last power control point and cut off power on that line, or, be as careful as possible and then after you've shorted the line have to go back and replace a fuse or circuit breaker anyhow!

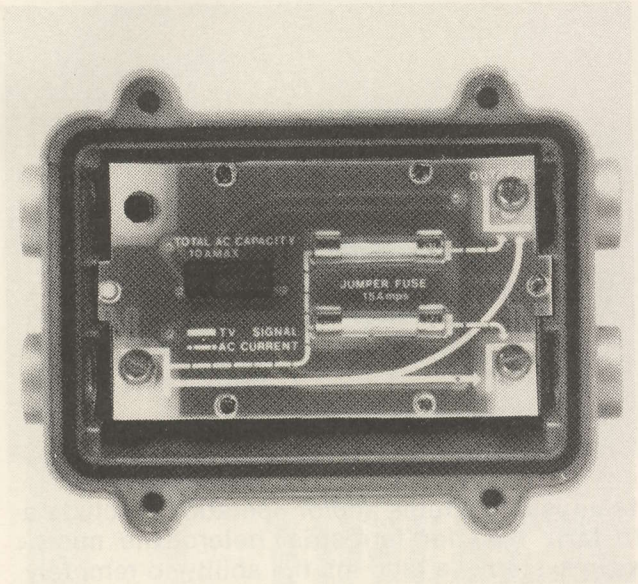
So with their new tool **you can work on hot lines** without the normal fear of blowing the fuse or tripping the breaker and that should mean that new work on a hot line goes faster and more smoothly. It's a nifty idea and the price range (list) is around $39.00 (there are two models; one for 412 and another for 500 cables).

RMS ELECTRONICS. . .is riding high on the wave of their new **'unipower'** series of passive devices. The CATJ Lab is looking at these devices at this time and we will have a detailed report on what we find in our May issue.

The new line of gear utilizes an approach of individually fusing output legs from two and three way power passing splitters and an encapsulated 'micro circuit' for the RF portion of the splitter. This leads to better system control of RF match on legs which previously utilized RF bypass chokes that had to be cut when line voltage was to be eliminated on a leg.

RMS has 'a minimum of eight new products' planned for the 'next few months'.

T.R. PITTS COMPANY. . .will be in New Orleans to prove that **not** all of the technology that directly affects us comes out of electronic laboratories.



They will be showing a new series of very cleverly designed fiberglass constructed **equipment enclosures** for underground cable systems.

By marrying modern fiber techniques to the exploding technology of 'climate control' the new series of housings offer unusually high degrees of protection against the environment and nature's little beasties. Using an 'interlocking' design the enclosures have the ability to lock out dust, dirt, rain and insects. All metal hardware (nuts and bolts) are stainless steel. A special approach to the fiberglass chemistry allows the enclosure to dissipate heat so it stays cooler in hot weather.

"The challenge to design and manufacture improved subscriber materials has never been greater. The positive effects on the industry of satellite programming and subscriber growth patterns is creating spontaneous growth at all levels." (Kerwin McMahon, RMS)

SCIENTIFIC ATLANTA. . .is one of those firms that has about all of the bases covered. In addition to having a lion's share of the TVRO market these days (there **are** some **new TVRO receivers** coming up soon from S/A; they **may not** be planning to show them in New Orleans so you will probably have to **ask** about them), they are out to capture a big hunk of the affiliated 'channel modulator' market with their new **Model 6350 modulator.**

The 6350 modulator is about as close to being a low powered television transmitter as any modulator on the market. For now it is the most recent entry and it reflects the latest technology in this area. Paramount is the utilization of a relatively new device called a **SAW filter** (for **s**urface **a**coustic **w**ave). The SAW device is used to control the (lower) vestigial sideband and that simply means you can use the modulator without worrying about what happens to the lower adjacent channel on your system. The SAW device is still pretty new, although it is finding its way into some of the newer version television receivers as an IF filter for signal processing. The primary advantages of the filter are superior out of band signal rejection, no requirement for delay equalization and the total lack of tuning adjustments (anyone who has ever attempted to align an IF range bandpass filter can appreciate that!).

Other features for the new modulator include the ability to accept either baseband or subcarrier audio, optional video signal loss sensing and switching, video AGC (that has become quite important with **some** of the satellite feeds), audio modulation limiting (also quite important now), IF switching, IF AGC and a number of different primary powering options.

CATJ intends to take a long, hard look at modulators late this summer after another couple of new units scheduled to be released in the next 90 days become available. At that time, with the cooperation of S/A, we'll include a look at the Model 6350. In the meantime you'll have to take your own look.

"The primary excitement will continue to be the increasing penetration of pay cable and the expansion of satellite program delivery. Some additional reductions in earth station cost may be possible but not of the magnitude of the past two years." (Jim Farmer, Scientific Atlanta, Inc.)

SADELCO, Inc. . .will be back with their complete family of **field strength meters,** bridges and other test equipment including their calibration system. There are a number of refinements in the DL-100 Digital field strength meter (see **CATJ** for **June 1977,** page 30 for a full review of the instrument); none of them major, but each one improving an already excellent meter.

In the continuation of a long tradition, Harry Sadel is not one to bring a product to market until he is satisfied that it has been thoroughly tested under field conditions. For this reason don't expect big changes in the DL-100 meter this year although perhaps by this time next year Sadelco will have another technology break through ready to display.

TerraCom. . .continues to take a relatively low profile in the TVRO and CATV microwave fields although their products have a great deal of 'class' going for them. The firm was very active in the early CATV TVRO arena when the ten meter antennas were the vogue, but of late has been less and less evident except at trade shows.

Inspite of this, the TerraCom receivers continue to be some of the most flexible and versatile around; coming as they do from a long line of successful terrestrial receivers proven through the years in microwave circuits for Bell and other terrestrial users (including many CATV common carriers).

Their approach remains one of selling **long term reliability** and attempting to point out to the

would-be-user that unless he carefully plans for the growth of the service he may end up with much less flexibility in his TVRO installation than he really needs. People who are finding their TVRO channel use loads growing might do well to spend some time in the TerraCom booth discussing ways that receive systems can be carefully designed from the ground up to accomodate the future growth of the service.

"The growth of single channel satellite receive only earth stations into multichannel stations will require the pre-engineered ability to adapt to increasing numbers of programming sources." (Les Bohn, TerraCom, Inc.)

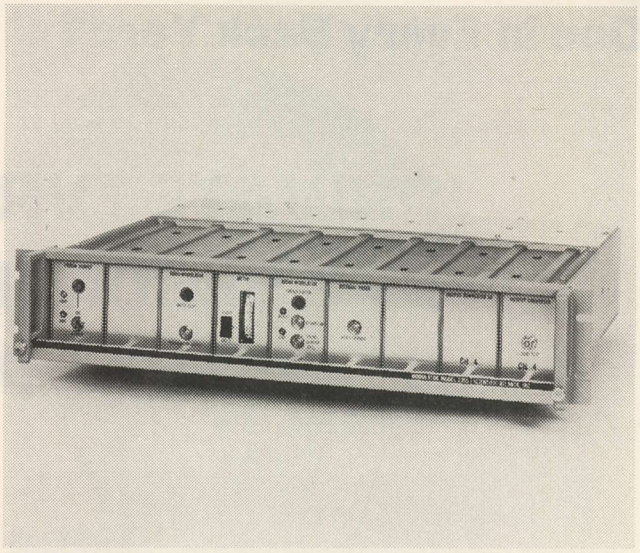
Video Data Systems. . .is finding the current growth in CATV TVRO applications ideally suited to the innovative line of **character generator systems** which they offer to the industry.

With systems adding satellite delivered services such as Madison Square Garden Events, HBO or SHOWTIME or FANFARE, part time (night-time) service from the likes of WTCG/ WTBN (etc.) the need for an 'informed viewer audience' continues to grow. One approach to this is Video Data Systems' Master Marquee which offers three different program formats in a single package.

The **Master Marquee** approach operates as a filler channel when no programming material is being transmitted to the subscribers (such as when Madison Square Garden is off), switching away from the 'character generator' video to the live (or tape delayed) feed with either a time clock, video detection or coded signal inputs. When the video comes up on line the system automatically can switch to a sync lock mode with superimposed crawl message which the operator utilizes to promote his service.

Their **MSG-1000** is a system designed to automatically **insert local advertising** messages into such satellite delivered programming as the Madison Square Garden Events. Up to eight pages of line by line filler memory can be broken up into blocks and inserted on time or MSG coded cue into the appropriate break spot in the *satellite delivered programming.*

Their new **MicroSystem I** character generator system is the latest micro-processor designed



system that allows a new degree of operator control and flexibility over the on-screen product/message. The operator can select from two different character widths, three different character heights, and seven different background colors on a line by line basis. The characters can be enhanced in several different ways, displayed in black or white colors (against an appropriately chosen background color), adjusted as to the appearance location on the screen, and moved from cable channel to cable channel.

"The recent technological advances in micro processor circuitry are changing the rules of the 'game' with character generation systems. We can't wait to see where the new challenges and opportunities will take us as our industry grows. We ARE excited!" (Bob Hall, Video Data Systems)

This Final Reminder. . .

There will be more 'under wraps' non-formal display of new products this year than in any recent past year we can recall. Make it a point to ask **"OK, now you have shown me what you have out in front. . .now how about showing me what you have hidden away"** because many of the firms *(especially in the active electronics area) will* have gear that simply was not 'quite ready' for formal display hidden away at the show.

Late Technology Additions

Data arriving too late for the report just finished here includes:

1) **Triple Crown Electronics** (booth 827) has a new low cost ($250.00) co-channel phasing system for elimination of off-air co-channel signal sources, at RF.

2) **Gilbert Engineering** (booths 808-809) has new below-grade equipment enclosures to protect DTs, line splitters and couplers. These are very innovative equipment enclosures.

3) **Blonder Tongue Labs** (booth 601) has the latest version of the 'Dynamatic' channel processing equipment and the Audiomatic visual/-aural carrier relationship control system. You also might ask them about their new low-cost demod that when available will be very suitable for 'low-cost' microwave feeds.

4) **Oak Industries** (booth 301) has a new Trimline FT-35 subscriber set top converter without AFC that will price out at $39.00 (in volume) for up to 35 channels of reception.

5) **Mid State Communications** (booth not available at press time) has a very-very new approach to a field strength meter; if you are at all interested in the latest technology in this area, see the Mid State display.

One In Every Back Yard?

'PRIVATE TVRO TERMINALS' ARE BECOMING AN INTER-NATIONAL PHENOMINON

There has always been, and there will probably always be, a certain number of people who see any new technology as a challenge. The presence of more than 30 geo-stationary satellites now serving virtually every part of the globe with some type of (largely) 4 GHz energy offers that challenge.

Geo-stationary satellites offer **more of a challenge** than say poking up a hunk of wire and tuning around the shortwave bands for some distant signal. The hunks of wire are rather precision pieces of equipment when they end up in the form of parabolic antennas. The receivers **look** considerably more complicated than the average shortwave set, although when you really dig into them there is less sophistication there than one initially suspects. If the electronics expert has stayed expert, kept up with phase locked loops and sophisticated FM demodulator and limiting schemes, and has some understanding of how frequency conversion schemes work, he has probably most of what he needs to tackle a reasonably state of the art demodulator (receiver).

There is one primary technology area in satellite receivers where 'keeping up with technology' may not be an adequate answer; and that is in the region of low noise amplifiers. LNA's are not particularily complicated as much as they are unpredictable and precision instruments. Even the most sophisticated of the producers of LNA's will admit, privately and off the record perhaps, that they really do not know how they get one set of results one time and another set another time. Getting repeatable results, time after time and 'on cue' is still something of a problem with LNA manufacture.

All of this says that a man with patience can build an antenna. It requires more patience than money and if it is a labor of love, the patience is usually there. **All of this says** that a man with some current technology at his fingertips can dig about and develop the circuits required to create a working receiver. He may spend lots of time at it, but that is the name of the game—patience. But alas the LNA. . .without the 1.5 dB (or better) noise figure and the high gain, the signals simply never quite look like they are commercial or saleable. There are amplifiers out there, **even on the surplus market,** which provide the gain. . .**but not the noise figure.** The recent and current family of LNA's is still such current technology that the inevitable surplusing of equipment or the 'dribbling out of do-it-yourself information' has simply not made it into the field. There are traveling wave tube 4 or 4.5 dB noise figure amplifiers available, often with 50-60 dB of gain, for less than $100. There are Hewlett Packard Application Notes that describe 3 dB bipolar transistor 4 GHz front ends which any skilled technician could build on his own. But 3 dB noise figure is not 1.5 dB and therein lies the tale of the private, non-commercial terminal. Such a terminal does produce signals, but they are not the type of signals which you would attempt to sell to a CATV subscriber. We'll look at some shortly.

TVRO hardware is on the market, and there is no rule or regulation or law which says that a ***buyer** with money, regardless of who he is or* where he is, can't walk into the door of a supplier and buy all of the parts he needs for his own terminal. Does that mean there is no legal question about the private use of a terminal? No. It simply means that the regulations or rules or laws that **do impact** on the private use or **reception** of satellite signals **does not impact** on the **seller** of the equipment. If you've got the bucks, you can buy one. No questions asked.

That suggests that someplace between the private back yard builder, who is no commercial threat to anyone, and the licensed and approved CATV (or other authority approved) commercial user of a terminal, there is yet a third category—**the private, non-commercial terminal** that typically comes up to the same operating specifications of a CATV (or other professional) terminal. There are some. Perhaps many more than you might suspect, although surprisingly not too many of them are in the United States. At least not at the present time.

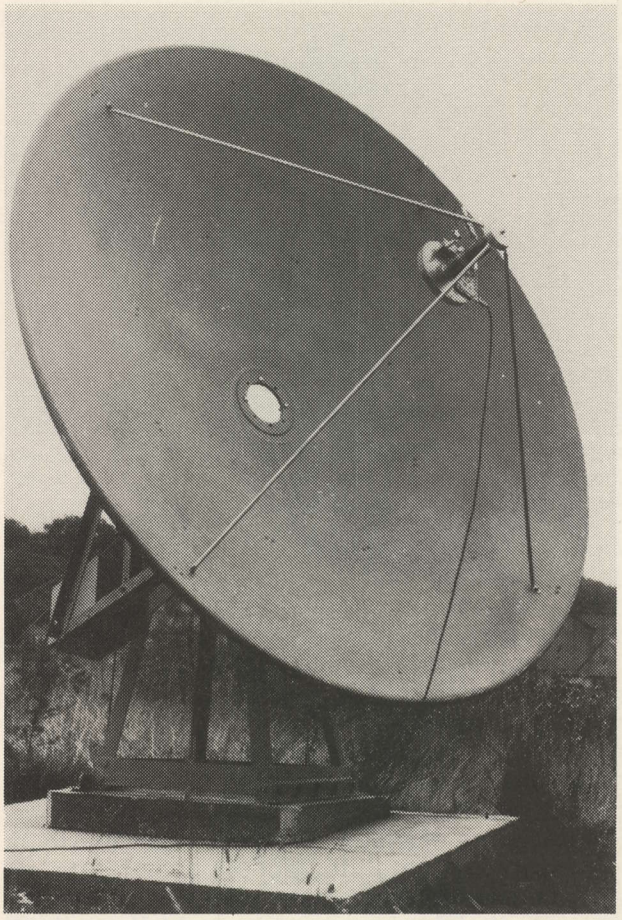
Let's define what such a terminal might be. It might be located on the private premises of a motel or a hotel or a resort. It might be in a community that has no regular television reception, where the operator of the terminal 'shares' the reception with another family or a whole town full of families. Let's talk about that one for a minute. If there are several families connected to the terminal, how is that **not** a CATV terminal? Well, if the inter-connection system is not a CATV system (in both the legal and the technical description) then the TVRO that **privately** receives the signals cannot be considered (in truth) a CATV terminal. Example, and a real one. There is in Canada a small community where direct reception of TV signals is impossible. Period. No terrestrial signals at all. The town is not considered large enough by the Telesat people in Canada to be worthy of a Telesat supplied receiving terminal and low power transmitter, as is the fashion all over Canada with their ANIK system. So an enterprising Canadian, responding to the need and his own unique knowledge of how TVRO's work, went into the community and installed a receive terminal. And connected up virtually every home in the small community to the terminal. And now they have three channels of ANIK television, their first outside connection to the world.

Only in Canada **CATV systems cannot utilize ANIK signals** or TVRO's for program delivery. And even though CATV systems are (as readers are well aware) heavily regulated in Canada this **non-system** is not regulated, either as a CATV system or as an ANIK inter-connected TVRO. The need is there, and absent any 'illuminating publicity', the need is filled without federal (or Telesat) harrassment.

The laws or regulations of an individual country severely impact on the status of terminals in a country; legal or private or otherwise. Canadian rules require **all terminals** operated off of the ANIK system **to be owned and operated by Telesat;** they are the people who operate the satellites. A Canadian is prevented from putting his own terminal in, for whatever the ultimate use, by the Telesat regulations. The United States is, at the moment, quite different in this matter from virtually all other countries in the world. **We allow privately owned** (that is, non-government or agency owned) terminals. Mexico does not, at least for now.

One is bound to ask why this might be so.

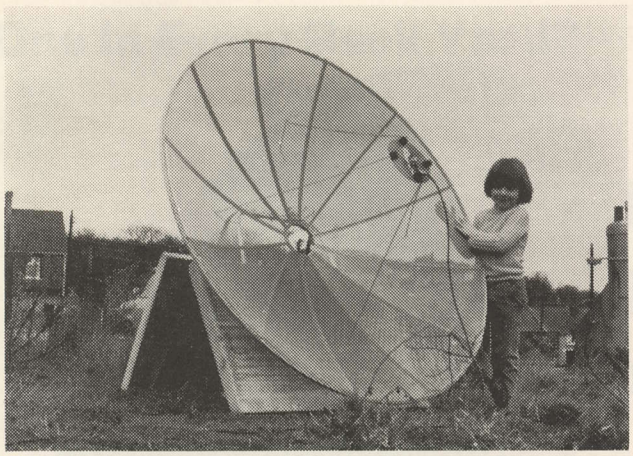
International communications law is not the problem; national communication law is. In most countries of the world **all** of the **inter-connecting facilities** that link stations together **are owned and operated by the government** itself. The Mexican government owns the vast majority of the nation's point to point microwave circuits. The post office is a common communications czar agency in many countries; Great Britain and its empire nations have pretty universally followed this format first adopted in the early 1900's when all transmitting stations were owned by the government.



38 dB OF GAIN at 4 GHz, circular polarized feed and electronics in this homebrew 8 foot terminal built in the United Kingdom. System is utilized for reception of Russian Statsionar-2 and INTELSAT IV-A birds. INTELSAT uses both 'global' and 'spot' beams, with EIRP of 37 dBw on spot beam and 26 dBw on Global beam. Most TV transmission noted by private terminal operators is on Global beam transponder 12.

This type of law or regulation is largely borne out of fear; fear by the government that **only** the government is to be **trusted** with such a powerful 'weapon' as communication systems. Take a country—any country and picture a coup. The first thing the new leader does after the coup is to rush to the microphones or cameras or both and proclaim his rule. Unless the government owns and operates the communication system the man might find himself speaking to a dead microphone or a studio monitor (or so the theory goes). On the other hand, if the government owns and operates the whole system, the communications medium is at the beckon call of the ruler whenever he wishes.

That's the way it works. Not in the United States, but in virtually every other country in the world. So we are the exception to the rule, and the rules are strict. So strict in fact that when the first applicant for a TVRO in Mexico asked for permission to install a 4 GHz receive-only terminal he got approval; but only on the condition that the applicant buy the terminal, build it, **and then turn it over to the government** for operation.



FINE MESH 5 foot ATS-6 (860 MHz) terminal in Europe was utilized to receive signals of American satellite while it was providing experimental service to India.

When the applicant pointed out to the SCT pencil pushers that his terminal was receive only—that it could not be used for transmission—he found the reaction understanding but cool. "Regardless, the rule says that all microwave system terminals shall be owned by the government" he was told.

Many countries have specific rules that make **reception** of satellite signals illegal unless the recipient has the necessary authorizations. Great Britain is one of those. It is a crime in the UK to intercept any satellite signals (regardless of where they originate from or who they belong to) without official government approval. If you think that has shut down private terminals in the UK, guess again. As several of the off-the-bird photos here show there is an alive-and-well cadre of private experimenters receiving a wide range of signals that have included the experimental ATS-6 transmissions on 860 MHz **when the NASA bird was parked over the equator way down south of India,** as well as the INTELSAT series of international signal carriers, and the Russian Statsionar series. We'll look further at what these private terminal users use and how it works shortly.

Inspite of the rules, regulations or laws stating that you can't do it, chances are pretty good (for now at least) that nobody will really get very prosecution minded **as long as** the private terminal builders carry on in their own backyards not really bothering anyone. In fact one view is that by 'allowing' these experiments to continue, the nation may actually be helping build for itself, at no real expense to itself, a good reserve of technically competent people who could be called upon to handle some very specialized communication needs if the call for help ever arose. And let's face the bottom line. . .as long as the pictures received on the do-it-yourself terminals are of the quality shown here, well, they are hardly a commercial threat to anyone.

Which is another way of saying that private experimenters can probably do their own thing without fear of federal harrassment (in most countries) as long as they are presenting no commercial competition to one or another organizations in the country with bucks at stake. Interpretation? Money talks.

As long as private terminals present **no threat** to established commercial systems in a country, the established commercial system people pretty much ignore their presence. And quite probably, as long as private terminals continue to produce the kind of pictures you see duplicated here their numbers will stay small; and their 'threat' to established broadcasting interests in the various countries involved will be no threat at all.

Back for a moment to the privately owned but commercial quality terminals. Most suppliers who have provided hardware keep it pretty close to their vest. But Collins Radio (Rockwell International) is known to have provided 'a number of' fully operational terminals to various Shieks and Potentates in that region of the world where oil is king. These privately owned terminals 'cherry pick' Intelsat and Stationair and (French) Symphonie Satellite signals. Some of the privately owned terminals distribute the programs received in miniature CATV systems installed throughout the grounds of Arabian palaces and a Los Angeles firm has been instrumental in putting the private 'pirate' terminals together. Nobody would dare raise a stink here however; again, money talks.

Closer to home another private commercial-grade terminal went into a Rocky Mountain area state during the fall at a tourist resort. Its location prevented it from having off-the-air television and the owner of the resort saw the TVRO as a means of keeping the folks from the big cities a little more in touch with the events of the world. He'd listened to complaints about not having television for several years and finally when he saw his first TVRO he knew he'd found the answer to his problem. Most of the time he

TWO METER (6.5 foot) terminal built by Dutch enthusiast shows off reception of ATS-6 transponder on 0.860 GHz when the bird was parked south of India for tests. Builder had three element yagi-type feed for antenna with wideband antenna mounted pre-amplifier (using Mullard OM335 devices). Receiver demodulated FM video and then video drove separate 'AM modulator' back to VHF channel E4 (62.25-67.75 MHz).

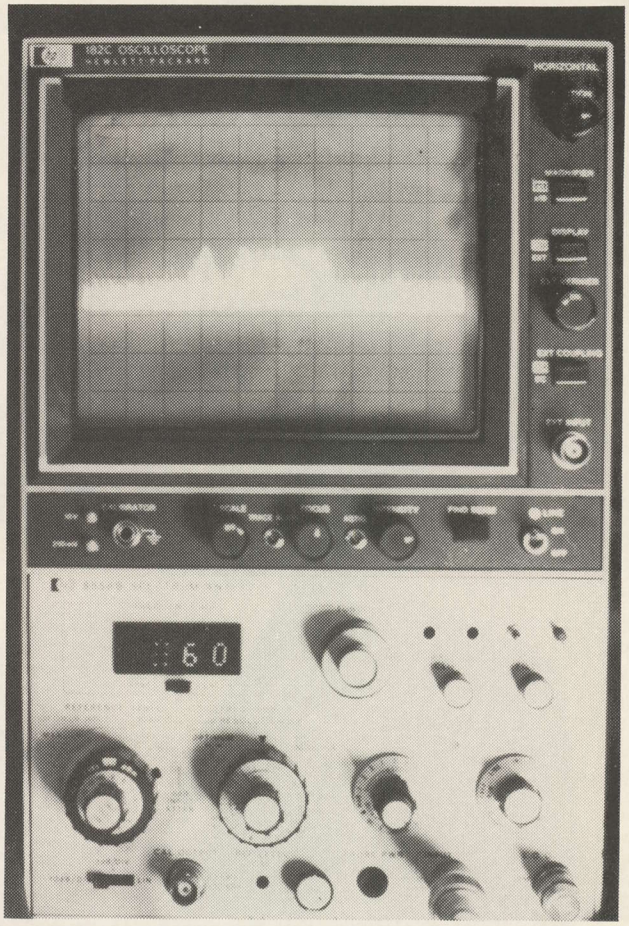
leaves the terminal parked on SATCOM II where he provides service from Atlanta's WTCG and CBN (avoiding on purpose HBO). But on special days, such as New Years, he moves the antenna to ANIK where he can pick up the bowl games that are not available on SATCOM. **He worries a little** about his uncertain legal status. . .**but not too much.** The winter skiing season was the best he's ever had and he thinks having good quality television really helped. Again, money talks.

This is the kind of installation that worries the 'para-legals' in the business. A $30,000 tag on a two or three channel terminal is hardly big bucks to a man who might spend $50,000 on an outdoor tennis court or $100,000 on a lodge hall to keep his customers happy, coming back and spending money. It is simply another capital investment, even if it is a risky one.

"It's simply a matter of time until the word gets out" notes one concerned CATV type. **"When enough people find out you can have several channels of super quality television for say $15,000 or even $30,000, we are going to have a revolution on our hands. You may not be one, I may not be one . . .but there are people out there who have deliberately sought out the peace or solitude of the great outback. Their remote locations have no television and satellites overcome that lack. It's just a matter of time".**

Time is working against several of the variables here. One is technology as an impediment to private system construction. The last real problem for the private terminal builder, the LNA, is in the throes of a revolution of its own. As has been documented here several times in recent months, LNA technology is getting less complex and more repeatable all of the time. That says the costs are coming down and the performance is coming up. Give it another year or 18 months at the outside and you'll not recognize the big fat prices you are today paying for LNA's. They may never get down to the point of being Radio Shack specials, but they won't be far away.

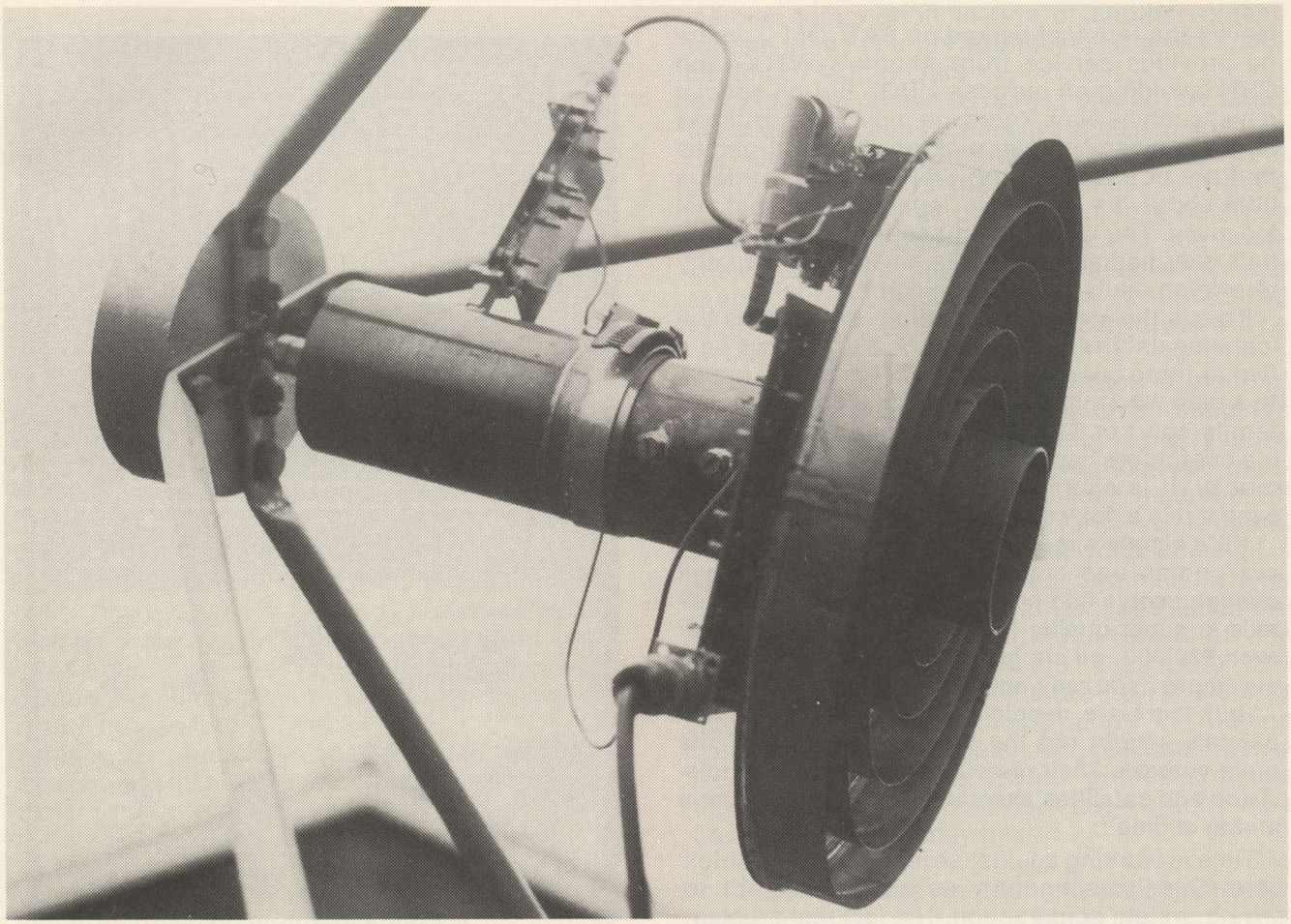
Time is also working to the advantage of the Japanese. They have stayed surprisingly quiet through the early stages of the 'satellite revolution'. And for good reason. For the market to be attractive to the Japanese it has to be a volume market—large quantities of products zipping through the assembly line and falling into styrofoam packing boxes. The Japanese have seen a high technology market so far (one they are certainly capable of competing in) **but not a mass market.** But. . .and this is where the Japanese think it's at, the launching this spring of the experimental **BSE** (Broadcast Service Experimental) satellite provides the bird-in-space for the testing of a **direct-to-home** television satellite. It's the first, extensive effort of this type in the world. And the BSE satellite? It's Japanese designed (Toshiba with the help of General Electric) and constructed; our NASA provided the lift to get it into geo-sync orbit. Its initial program will be directed towards Japan where they will explore



SPECTRAL DISPLAY of 860 MHz transmission of ATS-6 signal as received in Great Britain on five foot terminal. Bandwidth of analyzer is 300 kHz; note sync tip display to left, video information to right.

satellite delivery as an alternate programming delivery service. **But its real purpose is two-fold.** One, to allow Japanese electronic technology to move out of the laboratory (the NHK has published nearly a dozen highly detailed technical notes during the past four years explaining how their BSE system will function, and even describing in construction detail the 12 GHz receivers that go with it). And two, **and this is the one that counts,** to allow the Japanese electronics and aerospace industry to build a 'record' of achievement with BSE. The Japanese are looking at the still more than 100 nations of the world who have **yet** to go 'shopping' for **their own** domestic satellite systems. When a nation shops, it is out there in the marketplace as one national government buying indirectly from another national government. The Japanese with their mass production talents will undoubtedly take what they learn and can document from BSE **and go directly to the marketplace** with Japanese designed and constructed domestic satellites for sale to the nations of the world, and then turn around having provided the 'camera' (the satellite) and offer the 'film' (the receiving terminals) as well.

Back here at home time is also working against the present hush-hush undercover availability of TVRO signals. When it all began HBO



4 GHz FEED ASSEMBLY constructed for 8 foot homebrew terminal shown here. By 'panning' the terminal across the solar surface (which creates a relatively constant noise source for system measurements) the noise figure of the circular polarized · feed mounted LNA is 3.4 dB. LNA uses bi-polar HP HXTR-6101 transistors.

was parked on vertical transponders 17 and 23. For more than a year HBO's two channels of service were the only channels up there. Then the world began to turn around. Atlanta's WTCG joined HBO (who by now was on horizontal transponders 20 and 24) and during the latter part of 1977 the lid came off. By January of this year RCA was admitting that all of the horizontal transponders on SATCOM II were full; that CATV would be moved to SATCOM I where even there the 12 transponders were full or almost so. More channels of service plays an important part in the acceptance of the price tag by cost-conscious private terminal owners. Stop 100 people in the street in Chicago and ask them what they know about satellite television reception. The odds are none will even know about CATV's use of TVRO's (or CATV as far as that goes). Common sense says that if a person can spend $15 or $30,000 for a terminal that can receive four channels one day, and then several months later spend the same amount of money for a terminal that can receive 12 channels. . .well, it is not unreasonable to assume the tangible return on the investment will play a part in the growth of the technology. And when, as seems certain, the technology improves and the prices come down, any semi-skilled Japanese technology watcher will tell you there are virtually no limits to the impact the technology may have on the marketplace.

The United States is probably **never going to be a market** for the Japanese broadcast satellites or their receivers. Never may be a long time, but it will do for at least the next ten to twenty years. Back to money talking.

The established broadcasters of course have every reason not to allow broadcast satellites to happen. The 1934 Communications Act, the foundation for our present rules and regulations and FCC guided direction is another reason. **Broadcasting in the United States is** intended to be **a local service.** That's why so much emphasis is placed on local news and service by the FCC. And Congress likes it that way; a relatively small number of television stations, serving the constituents of a Senator or Congressman are much easier to 'manipulate' than a monstrous federally controlled national service. And a satellite service, at least one employing today's relatively primitive technology, **is** a national kind of service. So there is a road block here for the importation of Japanese technology. But the localism roadblock in the States is no roadblock in newly developing nations; rather, it is an asset.

Satellite television provides one of the most powerful tools a strong centralized government could have at its disposal in a country such as

OPENING OF RUSSIAN USSR-4 transmission at 1859 GMT from Statsionar-2 satellite as received on private 8 foot terminal on 3.85 GHz in Great Britain. Terminal is all home brew, apparent EIRP level at receiving site in 30-31 dBw region. Receiver employs novel phase lock loop discriminator that expands and contracts IF bandwidth as a function of video modulation index present.

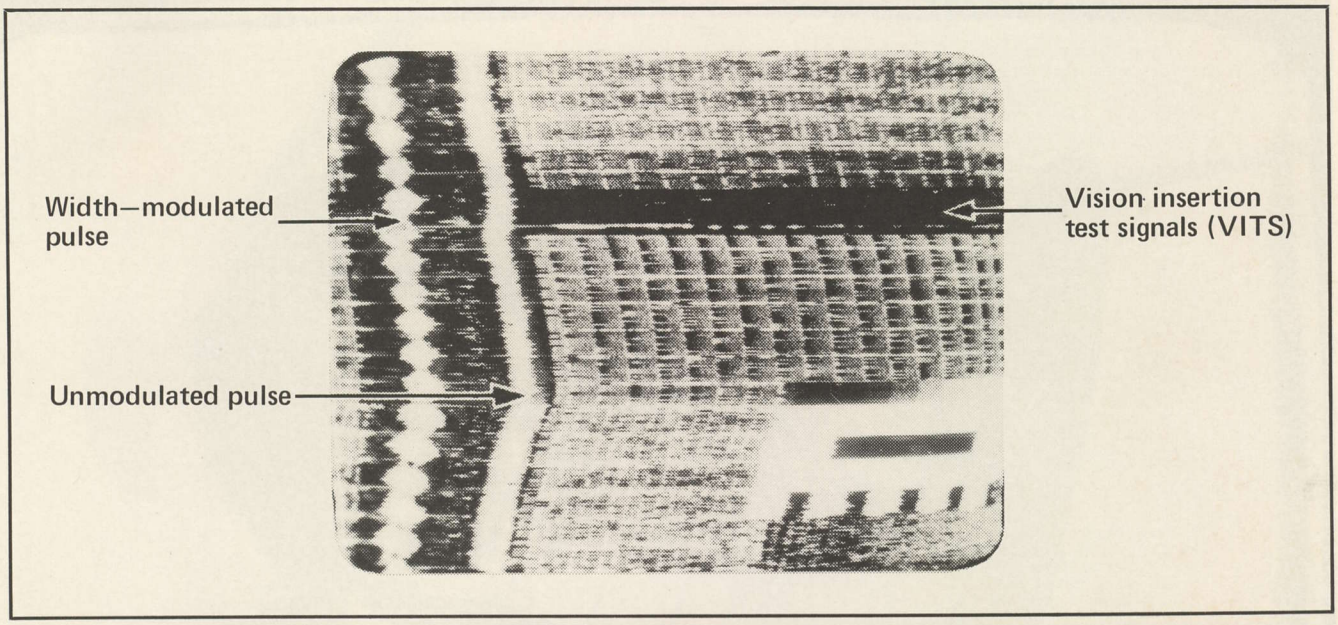
Ghana (which is embarked on its own domestic satellite program now). The all powerful 'national voice' of the leadership fits well into the way such countries operate. The Japanese see and understand this well. And they'll make big money at it.

There's that word again. Money.

The technicalities of direct-to-home (or small **community receivers** as were employed in India with the ATS-6 experiments of two years ago) service suggests that one of two things has to happen before direct-to-home satellite program delivery is feasible. **Home antennas must be small and the receivers simple.** That means inexpensive rather than technically simple perhaps. There are two ways to do this. One is to make the transmitter on board the satellite so powerful that the signal level on the ground can be intercepted and displayed with minimal receiving equipment. The Japanese BSE satellite, for example, will have a signal level on the ground some 1,000 times (over 20 dB) as strong as our present SATCOM/WESTAR/ANIK 'footprints'. The other technique is to raise the operating frequency of the downlink transmitter. How does that help? Well, with a given antenna size (say 6 foot for sake of argument) **as the frequency increases the gain of the antenna increases.** So if you take a six foot parabola at 4 GHz (the present downlink frequency range) and then use the **same antenna** at 11 GHz, you pick up a bunch of added gain, about 10 dB more gain to be exact. That simply means that where a 15 foot (4.5 meter) antenna is required to produce satisfactory (CATV type) reception today at 4 GHz, a 4 foot (1.22 meter) antenna would do about the same job at 11/12 GHz tomorrow, all other things being equal.

Only they are not equal. The satellite signal level is considerably stronger (20 dB or more) at 11/12 GHz so that it even further reduces the requirements for the antenna. For example, the receiver can be less sensitive and therefore more cheaply produced (as in mass produced in Japan) and do the same job we now do with our relatively expensive American built TVRO receivers.

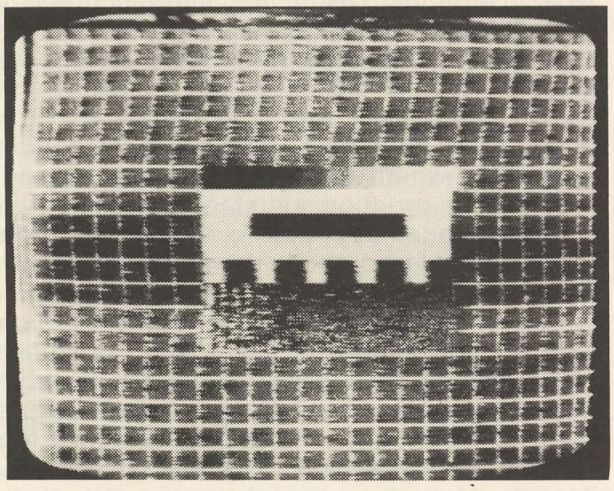
It is not mandatory that the satellite transmitter (downlink) frequency be raised to accomplish the ultimate goal of direct-to-home broadcasting. It turns out that if you are designing



TEST CARD of Russian (USSR-4) Statsionar is purposefully locked off of center of normal horizontal hold position to display the aural modulation which is transmitted with a 'width modulated pulse'. Second aural 'width pulse' is not modulated in this instance. Reception on private terminal in Great Britain using 8 foot parabolic antenna and home brew gear at 3.85 GHz. Satellite over Indian Ocean at approximately 80 degrees east.

high power output transmitters it is still easier to produce high power at lower frequencies. The 0.860 GHz downlink on the present ATS-6 **experimental** satellite or the 2.62 GHz downlink on the same ATS-6 bird are prime examples of how with proper satellite engineering receiver-system costs can be reduced dramatically.

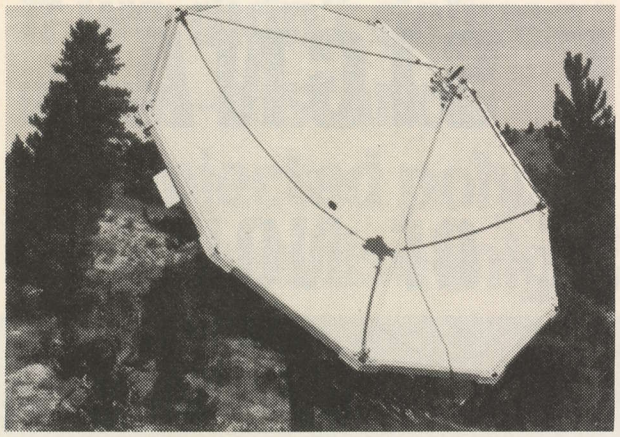
A learned example should suffice. In 1970 NASA went to three research scientists at the **Stanford University Center for Radar Astronomy** to seek a satelite system (**system**—the whole **package** of a satellite in geo-sync orbit **plus** the receivers required to produce high quality signals on the ground) design for 'developing nations of the world'. The Stanford study was built around a downlink at 2.62 GHz (2620 MHz) using FM modulation (as we do with SATCOM), 25 MHz bandwidth (we use 36), receiver noise figures of 7 dB (ours are typically under 2.0 dB which means ours are more expensive), receive antennas 7 foot in diameter and a satellite EIRP of 51.7 dBw (our present SATCOM/WESTAR/ANIK birds do well to make 37 dBw in the center of their respective footprints; remember that higher satellite powers reduce the receiver system requirements).



RUSSIAN STATSIONAR-2 BIRD parked at 35 degrees east is received with clockwise circular polarization at about 3.85 GHz and the 'apparent' EIRP into the United Kingdom (where these off-screen photos were taken) is around 31 dBw. This is from an 8 foot terminal with a 3.4 dB (340 degree K) homebrew bi-polar LNA mounted at the antenna feed. Audio is transmitted via a width-modulated pulse contained in the line suppression (flyback) period.

The Stanford study revealed that with a signal level 5 dB over threshold (CATV terminals typically run 3-5 dB over threshold) the terminals could be built in the United States for $35.00 total antenna cost and $87.00 total receiver cost—a whopping $122.00 per complete terminal! **Unreal you say.** No, not really. The antenna design developed by Stanford resulted in several patents (see photo here); a very clever design that allows flat metal sections to 'snap together' **as petals in a flower** to form a (parabolic) circle around an extruded aluminum angle frame. The whole antenna system knocks down into a 50 pound container for shipping; and the container fits into the trunk of a medium sized vehicle. NASA then funded testing of the package while the ATS-6 system was originally serving the Rocky Mountain area (see **CATJ** for **August 1974** and **September 1974**). The 7 foot version of the antenna was also utilized in the India ATS-6 experiments and for awhile a larger 15 foot version was under semi-serious consideration (during the mid-portion of 1975) by the Governor's Office of Telecommunications in Alaska when the state was just getting into the satellite business.

The design, even though patents had been issued and it had been proven in the smaller 7 foot format in conjunction with the ATS-6 experiments at 2.62 GHz, apparently was just a little bit too



SEVEN FOOT low cost 'petal-bolic' antenna designed at Stanford in the early 1970's had a price tag of under $50 in quantity; shown here at Roundup, Montana during ATS-6 experiments; 2.6 GHz feed and down converter is mounted on antenna.

revolutionary for the State of Alaska at that time; even though the price of $5,699 per 15 foot antenna system was undoubtedly far lower than other bids received at the time.

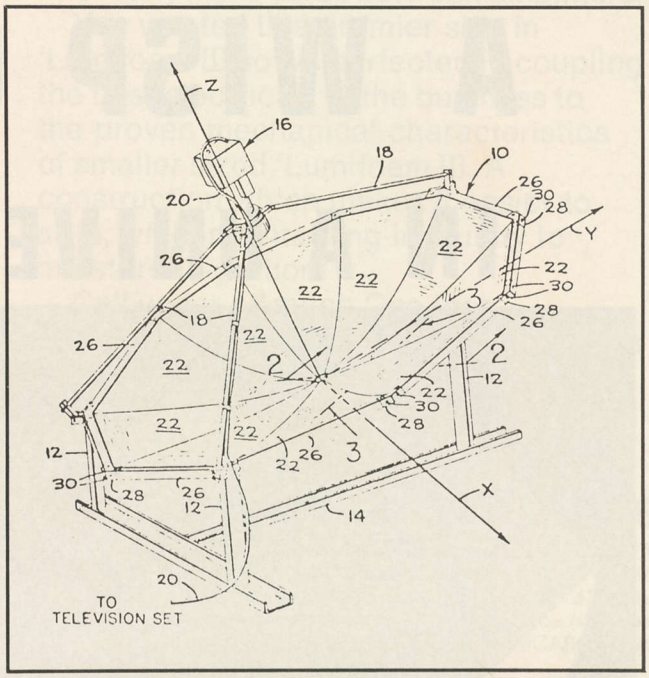
So it is not really up to the Japanese to discover or develop the basic hardware for low cost home receiving terminals; the designs are now some eight years old and even allowing for inflation on some parts costs the $122 cost-per-terminal could double or triple at the manufacturer and still be quite cost effective to the end user. American technology is capable, of course, of doing anything the Japanese can do. Only because of our own political and establishment-economic concerns that direct home broadcasting **not** get a foothold **here,** we don't perceive the market on a world wide basis as the Japanese apparently perceive it.

Since our U.S. (and perhaps Canadian) perception of what satellites shall be ultimately utilized for keeps creeping into the discussion, it might be well at this point to charge into the lion's mouth and look at where the restrictions are in our own regulations.

Satellite inter-connection is microwave interconnection. That is, the satellite is nothing more than a microwave relay station lofted into orbit and positioned where it will provide optimum service. Our FCC (and many other nations) looks upon frequency assignments first in terms of what they will do, and **then who will occupy the assignment.**

Microwave communication assignments are reserved in most areas for point to point communication. And point to point communications are considered private. The word **private** is important to the legal question of **who** is authorized to 'intercept' or receive point to point communications.

Most point to point communication systems are operated by common carrier licensees. A common carrier is a licensee of a **'system',** meaning one or more transmitters **and** one or more receivers. In all common carrier systems the material transmitted is material delivered on a hired-basis, which is another way of saying the



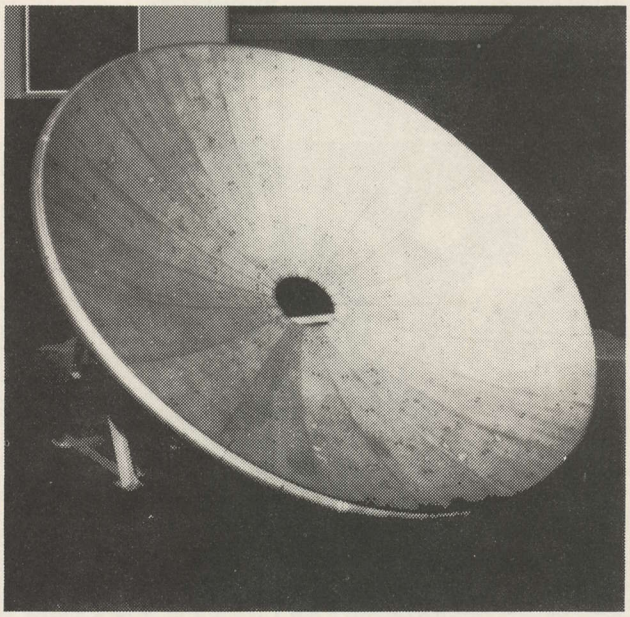
PATENTS ISSUED on two different forms of low-cost satellite terminal antennas covered both quasi-parabolic and regular parabolic designs. Work was done at Stanford in early 1970's.

'carrier' is not (typically) the originator **or the user** of the material.

Significantly, in microwave licensed systems **the receivers** are virtually always listed on the license **along with** the authorized transmitter locations. In a sense then **receivers are licensed as well as transmitters.** And this is an important point as we shall see.

Now in 1934 when the current (revised of course) Communications Act was drafted, there was some concern that firms that carried private

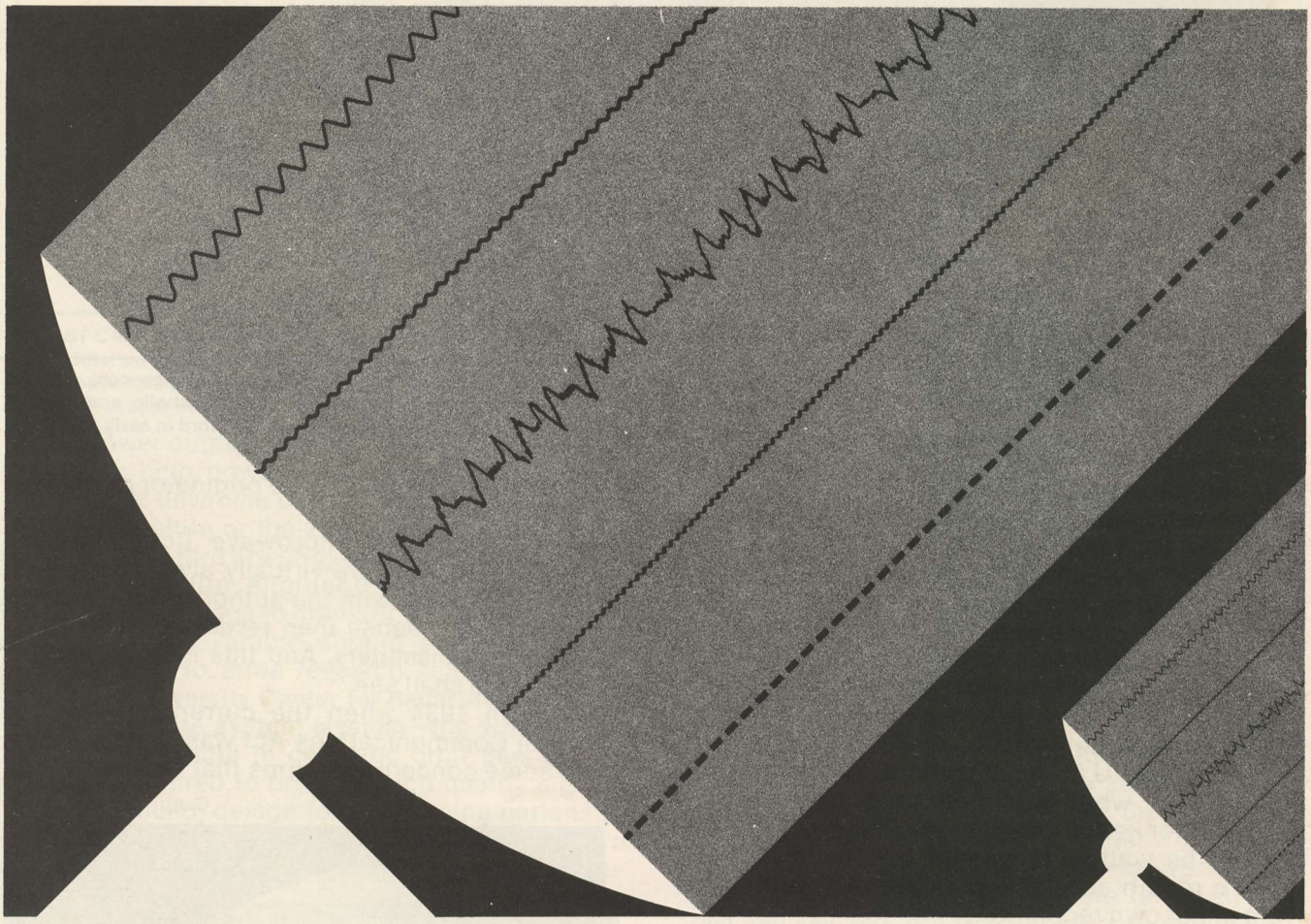
Continued on Page 34.



MORE REFINED VERSION of the 7 foot low cost parabolic still had costs far below present pricing structures and was capable of being shipped in a 50 pound container that fit into trunk of car. Antenna here was under going antenna test range evaluations at Martin-Marietta.

A WISP OF SIGNAL

IN A UNIVERSE OF NOISE



SCI

Low noise amplifiers are vital to the rapidly expanding technologies associated with satellite communications, radio astronomy and many advanced radars. Scientific Communications has designed and built numerous standard and custom amplifiers to meet the most demanding requirements in these and related fields. Whatever your low noise amplifier needs, SCI has the capability and experience to provide high performance, cost effective amplifiers to meet them.

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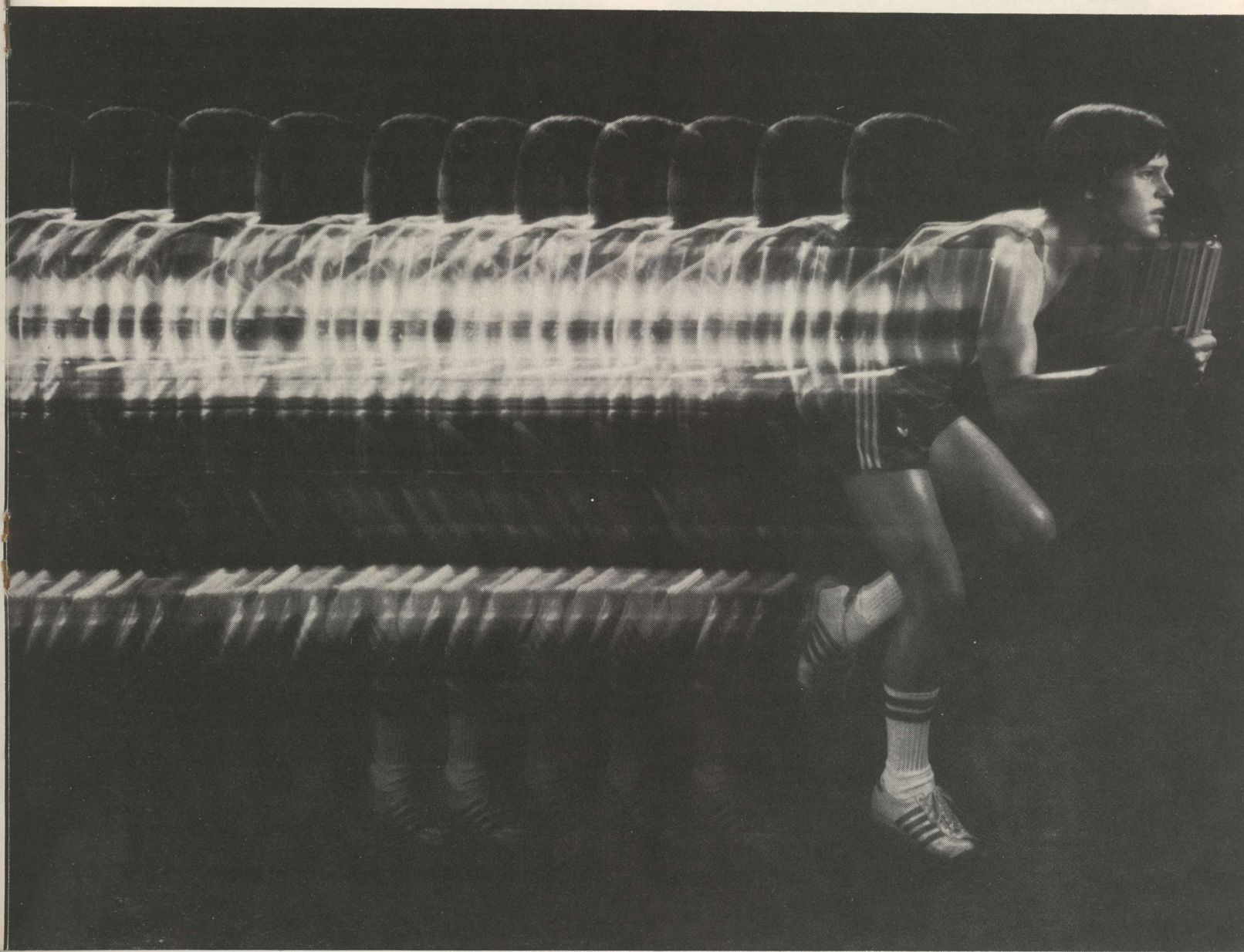
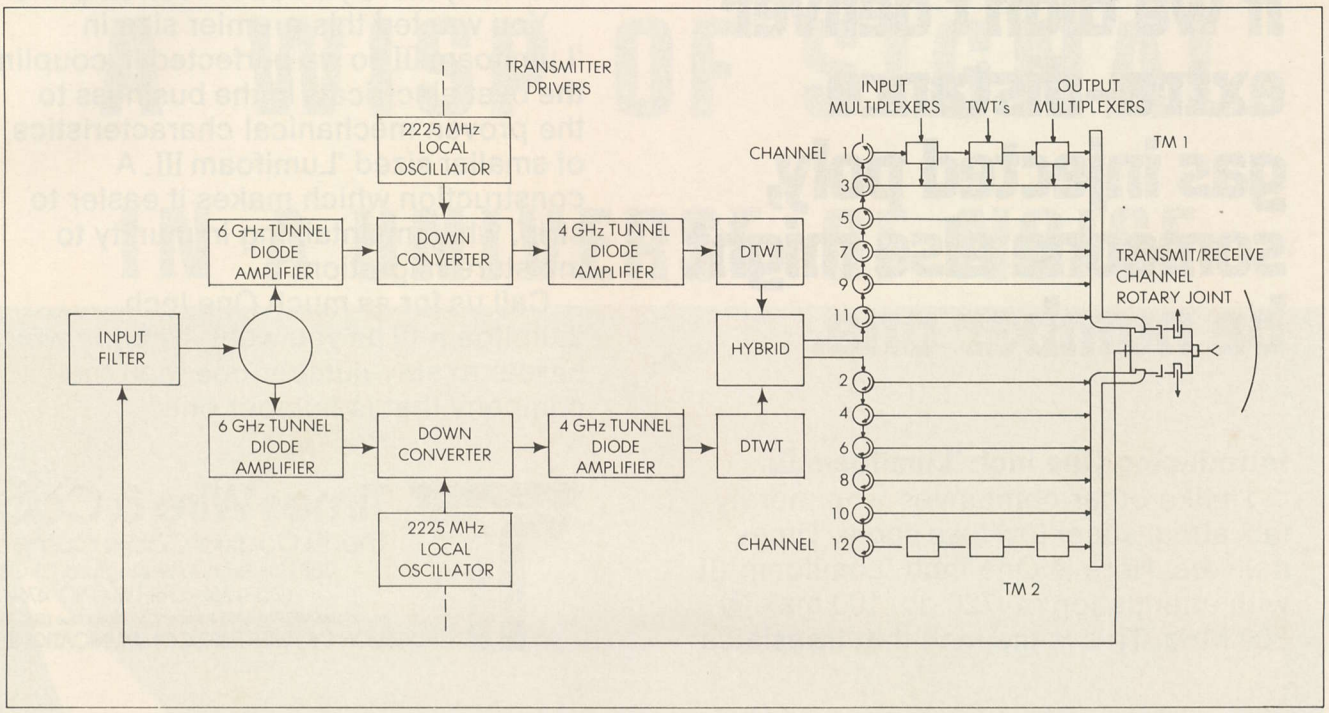




A TYPICAL 12 CHANNEL satellite. . .Canada's ANIK-A series (current series now operating with three birds) shows redundant packaging of electronics.

messages have some protection from eavesdroppers. Much of the business traffic transmitted for hire is private business (or personal) material, intended for one (designated) recipient. Such transmissions are not, as in broadcasting station transmissions, 'broadcasting material' **intended for general reception by the public at large.** So in the 1934 Act a section was penned in dealing with 'privacy of communications'. That section is Section 605 and it says:

". . .No person not entitled thereto shall receive or assist in receiving any interstate or foreign communication by radio and use such communication (or any information therein contained) for his own benefit or the benefit of another not entitled thereto. . .".

What does all of that mean?

Just this. Microwave point to point communication systems are reserved for use by licensees who have FCC specified transmitter locations and FCC specified receiving locations. And the communications material is not available for (direct) general public consumption; it is to be utilized only by those **authorized to receive it utilizing an FCC authorized receiving terminal.**

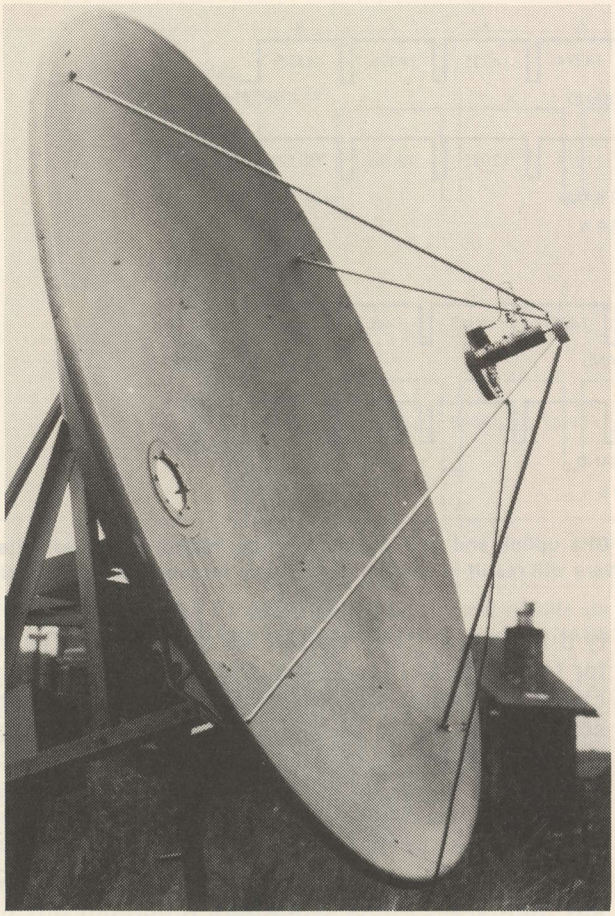
A private terminal, then, **not** licensed by the FCC is in violation of both the licensing statutes **and** Section 605 (if you are **not** licensed you cannot be an authorized reception point and you are therefore '. . .not entitled. . .to use such communications. . .for [your] own benefit. . .').

That seems clear enough but it may not be entirely valid under today's technology. The FCC generally does not license receivers (and it is in fact prevented by specific language in the 1934 Act from licensing private receivers) **unless** the receivers are a part of a specified point to point system (as in microwaves). Ten or twenty years ago when virtually all microwave transmitters had (typically) one microwave receiver 'attached' to them, the ratio of transmitters to receivers stayed pretty close to 1 to 1. But that was before satellites, where in theory one transmitter (the satellite) serves many receivers (the TVRO's). How many receivers can be served by a satellite transmitter? Infinite.

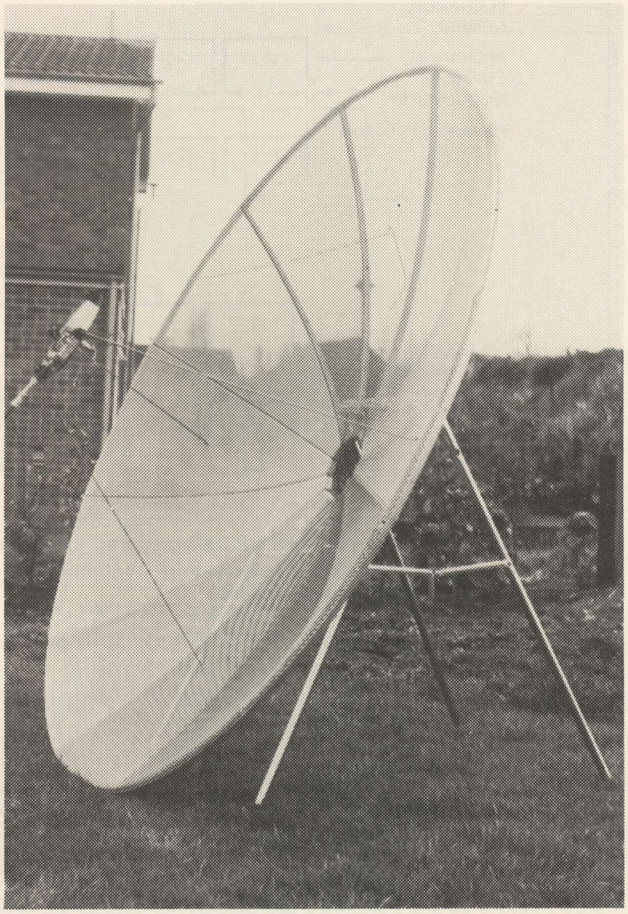
Must they all be licensed? A better question is "why **must** they all be licensed"? What actual need is served by licensing?

In the context of terrestrial microwave transmitters and receivers, licensing does two things. It primarily helps the regulators (the FCC or whomever) sort out the users so as to insure that each point to point system **operates without interference** from other point to point systems. That is a valid FCC function if for no other reason that orderly use (regulation) insures the most efficient use of a limited (i.e. not infinite) resource. So licensing performs a useful function in terms of efficient spectrum useage. But probably there is no other really valid reason for the licensing of receivers, especially in a high ratio service such as satellite to ground transmission.

What about the Section 605 problem? That's the business of unauthorized interception of 'private' (in our case common carrier) transmissions. Again, no easy answer. When the law was written in 1934 international common carriers such as RCA and ITT and others of that era were operating shortwave (high frequency or 3-30 MHz) links between North America and say Europe, or Africa, or South America (etc.). These shortwave HF radio links, some of which carried overseas telephone calls, some of which carried overseas telegrams and contracted-message-traffic, were 'sold' to users on the basis of providing two-way com-



ANOTHER VIEW of 8 foot private Intelsat reception terminal; terminal also used for reception from Russian Statsionar series satellite (in 3.7-4.2 GHz band that is common world wide).



ANOTHER VIEW of a tripod mounted 5 foot 860 MHz ATS-6 receive terminal of European origin.

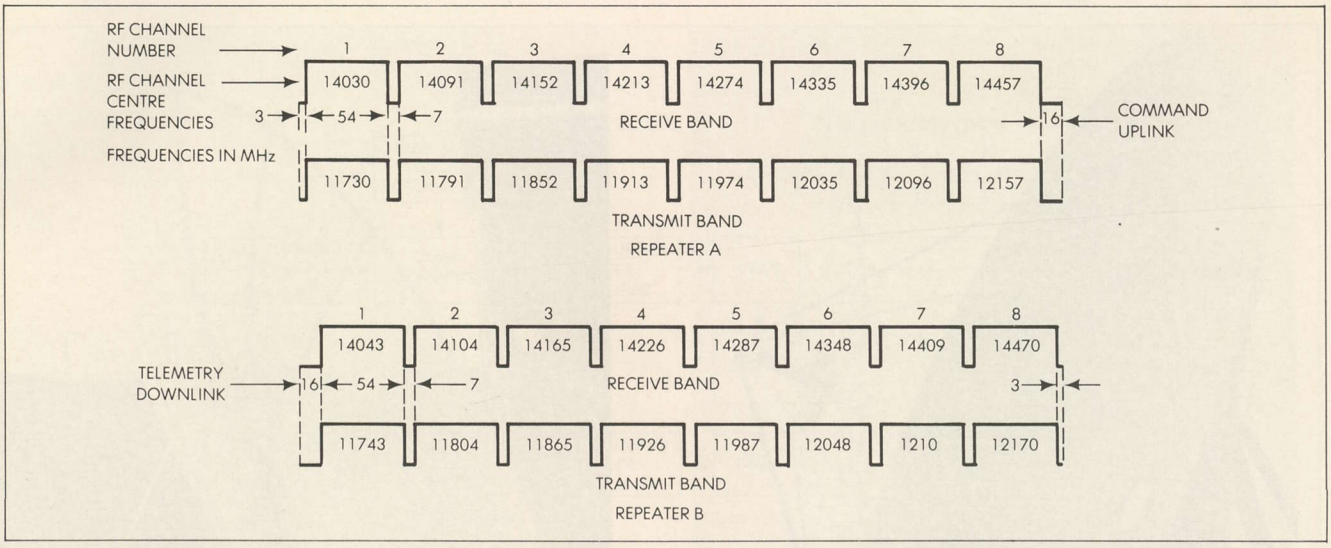
munications **of a secure nature.** A company selling oil on the international market would be reluctant to send privileged (private) communications from their New York office to the Paris office if they felt the privileged messages could be easily intercepted by a competitor **and the intercepted information used against the company by a competitor.** Having Section 605 on the books didn't prevent somebody from putting down $100 for a shortwave receiver and tuning in the overseas HF circuits, but it might make them think twice about divulging or using for private gain the message traffic they heard (the $10,000 fine attached to this is for reception **or** divulgence of the traffic intercepted, in fact, even the relating of the existence of such traffic or circuits was covered by the original meaning of the act.) Obviously this **was** a fair law, a good regulation that made sense in the context of private or privileged traffic intended not for general consumption but for private use.

Private message traffic should be private. Few would argue with that. But most of the transmissions we are discussing here are not **private message** traffic. Programming sent via satellite to (FCC authorized) CATV terminals travels from the uplink station to the CATV home **unedited.** Nobody censors any part of it and neither Super 17 or CBN or even HBO can really be considered private message traffic. To be sure, they **are** 'toll traffic' (that is, somebody must pay for use of the programming because there is a tariff or charge attached to **the use of the transmission system**) but toll traffic is not necessarily private traffic, at least not in the context of the original meaning of Section 605.

Even ANIK programming, created for sparsely populated areas in Canada, can hardly be considered 'private message traffic', for at the end of each uplink/satellite relay/downlink TVRO there is a standard VHF band (low power) TV transmitter which accepts the ANIK delivered signals and without editing or censorship rebroadcasts those programs out to whomever chooses to receive the signals in the area with their own private standard TV set.

There is no easy answer to the problem, at least not under existing guidelines and law. The U.S. law does not say that you cannot have a private terminal, **it simply does not say that you can.**

Could an individual install a terminal and pay the **toll rate** for reception of WTCG/WTBN or CBN or HBO? Again, no easy answer. Until the FCC acts on the first private (i.e. **non-CATV class**) reception terminal application, there is no formal policy in the area. One 'out' apparently being pursued by several would be operators of private terminals, is for the applicant to simply **'pretend'** he is a (small) CATV system. The fact that he only serves his own home (or fewer than 50 at any rate, in which case he is not formally in the FCC's



FUTURE ANIK-C band plan will utilize staggered channels in 14 GHz uplink and 11.7 downlink range. Higher power satellite transmitters combined with greater gain per antenna unit at receivers will result in smaller receive-only terminals that could ultimately serve direct-to-home services.

eyes a CATV system) apparently would be no stumbling block for licensing the terminal **if** the applicant went through the same Compucon/ SAFE frequency coordination study and put in the same type of professional (properly designed to meet the technical standards) terminal. Those who **are** pursuing this 'mini-CATV-licensing-route' regard the hassle and waiting period for a TVRO license 'good insurance' for their investments. One noted to us **"When I get done I will have around $30,000 tied up in this. . .I don't want to see it confiscated by some over zealous bureaucrat or have the reception ruined by some new Bell link".**

For the moment, however, most who are investing in private terminals (and many more are in the serious planning stages than **actually under construction** at the moment) are less inclined to take this attitude or approach. But without licensing there is a 'Catch-22' problem. If you don't have a license (and the CATV terminal licensing route is the only close-fit around) you can't get authority to use the signals, privately or otherwise. How's that?

Well, before HBO or WTCG or CBN (through the common carriers where applicable) **can allow you to use their signals** (i.e. authorize you to receive them), they must as FCC licensees or regulatees **insist** that you have the proper FCC license to receive the signals. So you can't use WTCG/ WTBN **legally** unless you negotiate an agreement with Southern Satellite Service (the common carrier), and, you can't negotiate an agreement **until** you have a license.

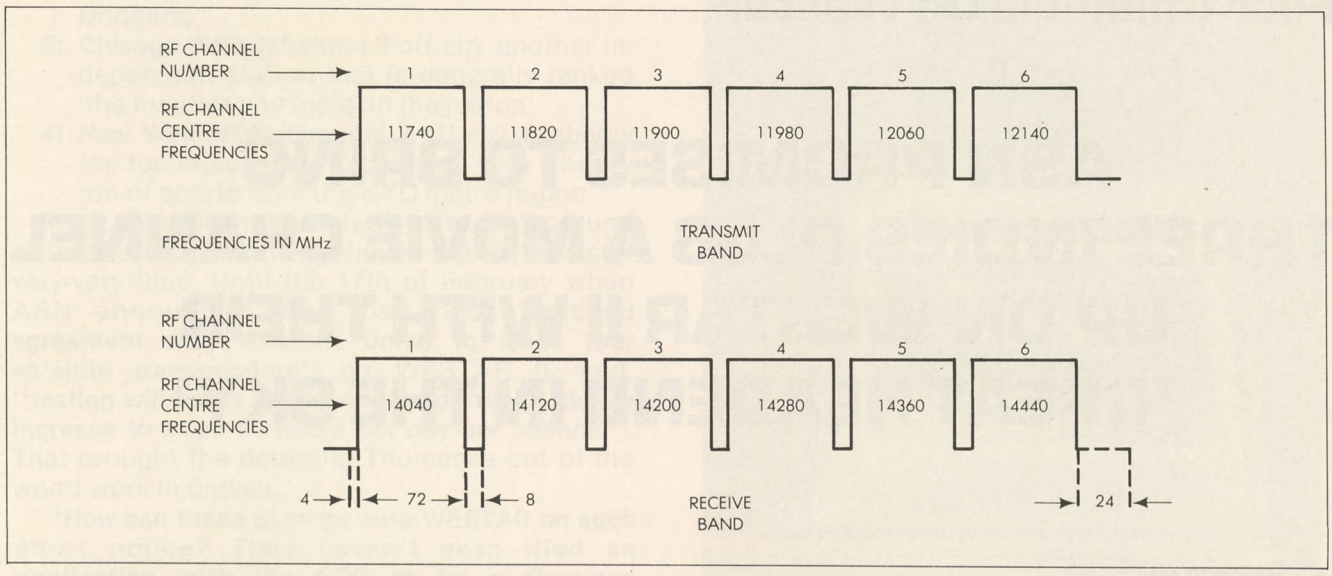
"The big mental hurdle facing would be private terminal users may be their mis-conception that any **signal that is in the air is free for the taking"** notes one Washington attorney. **"We have such a rich broadcasting-for-the-public at no direct-use-charge to the public service in this country that people just immediately assume** 'if it is in the air, it's free'. **That is of course not true with privately owned circuits such as common carrier microwave."** The resort owner in the Rockies who put in his own private terminal this past fall looks at it slightly differently. **"I've waited for nearly thirty years for television to reach here. Indirectly, when I purchase a product advertised on television, I carry some of the costs of their television advertising. I've been paying for television for thirty years, directly through taxes for PBS and indirectly through goods and services advertised on television and marked up to cover the advertising costs. I'm entitled to television and after I've spent $30,000 for a terminal, I am double-entitled."**

Ed Taylor of Southern Satellite notes **"I've had people send us money for private use of WTCG; they are trying to do the right thing, I know. But I have to return them their money because our common carrier relationship as an FCC licensee is such that if we serve even one non-(FCC)-authorized terminal and collect money for such service, we could have our business shut down in a minute. Regardless of how I might feel about private terminals and the people's right to television, I can't accept payment for service to un-authorized terminals".**

So don't send in those ten cents a month to Taylor. Or anyone else for that matter. Using and **not paying** for WTCG/WTBN (at ten cents a home a month) is one thing. It is, afterall, a commercial TV station signal and your payment is a pro-rata share of the cost of relaying the signal to you more than a program-use-rights fee. But what about private terminal reception of one of the pay-cable-services? Jeff Reiss of SHOWTIME observes, **"If a private individual came to us requesting service, I guess we'd be willing to negotiate for a service contract and rate. However, we have to live with the FCC rules and an FCC license for the receiver would be a pre-requisite to providing service on a business like basis."**

Catch 22 alright. No legal service without an FCC license, and unless the private terminal user agrees to follow the cumbersome and sometimes expensive CATV terminal licensing route, no license.

Might the rules requiring a license not change? There are some indications that perhaps they might in some **limited** areas. The Mutual Broad-



NEXT GENERATION Canadian ANIK-B system will include six 14 GHz uplink, six 11.7 GHz downlink transponders in addition to 12 'standard format' 4/6 GHz transponders. ANIK-B holds a NASA launch spot in November of this year.

casting (radio) Network proposal to install around 500 'small' (ten foot) terminals for radio networking of MBS programs is predicated upon the FCC dropping the requirement that each and every terminal be licensed in the fashion TVRO terminals are now licensed. Mutual is hoping (see **CATJ** for **January 1978,** page 42) that the FCC recognizes the crunch 500 terminals might cause on the licensing sequence and reconsiders the present licensing requirements. But granting a 'master' or 'blanket' license to MBS for 500 **audio-only receiver terminals** is a far cry from re-assessing the present FCC rules that simply do not recognize the microwave frequencies as 'direct broadcast frequencies'.

A wholesale revamping of the rules, recognizing the use of the satellite downlink frequencies for direct to home broadcasting in the United States, will not come easily, **if at all.** By leaving the FCC designation of the (presently utilized) 3.7-4.2 GHz region as "Point to Point Microwave", all of the restrictions that apply to this type of service apply. A ban against 'broadcasting to the general public' is included in these restrictions. It is a formidable hurdle and the present broadcasters and the networks like it right where it is, in place, and acting as a shield between their present lucrative business system and the way it might be someday in the future if direct-home-service were authorized.

Another Unsettled Year

So where does all of this leave us? Probably in for at least another year of uncertain application of the TVRO technology in the private sector. As long as the big push for direct to the home broadcasting satellites is off shore and away from the North American continent, it seems likely nobody will push for either rule changes or Congressional action in this area.

Private backyard low-cost experimental terminals will grow in number, but few will produce pictures of a saleable nature. It is however likely that in electronic journals of a general circulation nature there will begin to appear 'how to do it' articles describing some or all parts of the home terminal. The TVRO will come out of the 'closet' in 1978 and eventually many will be built.

The more professional unlicensed private terminals, 'mini-CATV-terminals' serving remote resorts or families will also grow. Sooner or later one or more of these is bound to get under the skin of either the broadcasters or the networks or the film product owners and a suit will probably be filed. It may be a copyright violation suit, or, it could be a 605 suit. The FCC may act reluctant to join the suit going in, but ultimately they will because they will have no other choice. How such a suit goes will depend to a large measure on the seriousness of those bringing the initial action. It could turn out to be one of those go-on-forever suits such as the current suit against Sony for home recording copyright violation. **On the bottom line, when technology moves beyond the language of old laws, it may be far simpler to re-write the laws than to attempt to force compliance through court actions.**

The only real unknown for the balance of **this** year is the question of how the FCC will treat private applications disguised (thinly at best) as 'CATV terminal applications'. If the Commission decides to let them pass, for the time being at least, perhaps the technology will have an opportunity to 'seek its own level' and develop along 'natural unfettered lines' for long enough that a clear, rational national policy can be addressed several years down the road. On the other hand, if the FCC shuts off the very small trickle of such private—**but legal** terminals as they first begin to appear, experience has shown that the FCC will simply drive the technology underground. That won't stop it of course, and by driving it underground the FCC may lose hope of **ever** developing a sane national policy in this area **when the time is ripe** some years ahead.

Four Channels On Westar

ASN PROMISES TO BRING THREE INDIES PLUS A MOVIE CHANNEL UP ON WESTAR II WITH THEIR 'GREAT HEADEND IN THE SKY'

A Second Start

To date virtually all of the cable television satellite relay has been accomplished on RCA's SATCOM II bird. From humble beginnings on September 30, 1975 with HBO providing first one and then two transponders of service the CATV use of the RCA satellite has grown and multiplied so that today all 12 of the horizontal transponders on SATCOM (II today, I after mid-May) are filled or dedicated to CATV program delivery services. Not only are the **12 horizontal** transponders active or spoken for, but, there are already people standing in line for the first of the (ultimately) 12 **vertical** transponders.

To date more than 1,000 CATV systems have submitted their applications to frequency coordination companies (COMPUCON, SAFE, etc.) and as our Satellite Technology News column reports monthly new applications going on file **at the FCC** are running around the **50 per month level.**

ASN QUICK FACTS

Company	**AmeriCom Satellite Network** (ASN), **Inc.**
Address (*)	6350 LBJ Freeway, Suite 148 Dallas, Texas 75240
Telephone	214-233-1729
Officers	Frank Merklein, President Bill Bauce, Director of Marketing
Affiliations	Digital Communications, Inc.
Service	Four separate transponders programmed with independent stations KTTV (11), Los Angeles; WGN (9) Chicago; WOR (9) New York City plus 'Channel 1', a movie/ sports channel
Satellite	WESTAR II (123.5 degrees west)
Uplink	Western Union sites Los Angeles, Chicago, New York City
Programming	Stations feature sports, movies, syndicated materials; 'Channel 1' features mixture of 'classic movies' plus G and PG newly released movies
Start Date	Limited service scheduled to begin 4-30-78 (see text)
Charges	15 cents per sub first indie, two indies 25 cents, all three for 30 cents; 'Channel 1' $1.30 per month per sub, bulk discounts for larger operators

***Office listed is Marketing Office; other offices Marina Del Rey, California and (Digital Communications) St Petersburg, Fl.**

Enter into this 'explosion' a group that first calls itself the American Satellite Network (later calling itself the AmeriCom Satellite Network) which proposes, during the course of the San Diego Western Cable Television Show this past November, to provide four separate **new** transponders of CATV service via the Western Union bird WESTAR II. On the surface the ASN plan for four channels of service on WESTAR II sounded all great and grand; three independent stations selected from three major markets in the United States plus a low cost movie and sports and information channel to be programmed twenty four hours per day. **All for the bulk-rate price of $1.60 per subscriber per month.**

One of the principals in the venture labeled the service 'The Great Headend In The Sky'. But not everyone shared the ASN vision and in fact many people in the industry felt that the only thing likely to be 'in the sky' was the deep color of blue. In short, very few people took the ASN announcement very seriously.

Undaunted ASN moved ahead. During December they restructured their programming approach and by January they had brought a few talented and experienced CATV hands on board to help work out the details. Foremost amongst those added to the ASN team is **Bill Bauce** who became the **ASN Director of Marketing.** Bauce comes to ASN from a circuitous route that included stops along the way at the mid-60's Time-Life entree into cable, and a period of cable management and operation.

By the end of January ASN was back in the press release business, reporting that their station line up would now be:

1) 'Channel 1', a movie and sports entertainment channel;
2) **Los Angeles KTTV** (channel 11 off air), an independent station that is highly rated and which features considerable Los Angeles

area professional sports including the LA Dodgers;

3) **Chicago WGN** (channel 9 off air), another independent station that is generally ranked 'the number one indie' in the nation;
4) **New York WOR** (channel 9 off air), probably the top indie in 'the big apple', with a heavy run of sports from the NYC metro region.

Most people responded with a 'ho-hum' attitude and apparently believed the sky was still very-very blue. Until the 17th of February when ASN announced that they had **"reached agreement with Western Union to lease four satellite transponders"** on WESTAR II, and, **"testing will begin late in April and then gradually increase to a full 24 hours per day per channel".** That brought the doubting Thomases out of the wood work in droves.

"How can these guys go onto WESTAR on such short **notice? They haven't even filed an application with the FCC to be a Common Carrier?"** responded one present day user of satellite transponder service. **"This thing is just a bunch of hot air!"** said he.

By way of explanation, when the pioneer in this business Southern Satellite Systems wanted to take Atlanta's WTCG live across the country via satellite it was necessary for SSS's Ed Taylor to make a formal application to the FCC to **(1)** be recognized as a 'satellite' common carrier, and, **(2)** get permission to 'trunk' WTCG all over the country on satellite. Similar approaches have been or are being followed for Taylor's planned additon of San Francisco indie KTVU (scheduled for an August 1 start on SATCOM transponder 18) and by United Video's planned offering of Chicago WGN on some (yet unspecified) SATCOM transponder. ASN, it says here in black and white, is **not** asking the FCC for (1) recognition as a common carrier, **or,** (2) FCC permission to trunk their three off-air indie stations around and about the countryside.

One must naturally ask **"How can this be?".** Or more simply **"Can this really happen?"**

The answer may not be as definite as you, the reader, would like. It is (your choice) a qualified yes, or, a qualified no. To be more precise, if they do it, then it is done. if they can't do it, then it can't be done. For we are firmly convinced, after several months of intensive investigation that if (or better yet IF) it can be done, this bunch will do it.

ASN **is** something of an inigma. It is a Corporation, with an Iowa base. It is a subsidiary of something called Digital Communications, Inc., a relatively small Florida firm located in St. Petersburg which has been rather heavily involved in pay-movie delivery and security systems (primarily for hotel and cable operations) for some seven years now. As a Digitial subsidiary (owned 49% by Digital) ASN has the inside track on some rather intriguing new technology which may one day create quite a stir in the satellite world. But more about that later.

DIGITAL's Key Cinema equipment should be familiar to those who spend any time in hotel rooms. Much of the Digital pay-view gear is proprietary to the firm and was developed by firm's Mike Paolini.

So what is ASN? Well, from all appearances it is a 'group' with extremely adequate financial reserves who are ready, willing and able to stand good for the (estimated) $6,000,000 per year transponder lease/rental charges on the **chance** that what they are offering 'for sale' to the cable industry will catch on and become financially viable. The finances for ASN comes from a group of investors headquartered in Des Moines, Iowa where ASN Board Chairman William McDonald (attorney and businessman) resides. The venture-capitalists associated with McDonald are variously described as "a closely knit group" and "very fluid with ready capital". The President of ASN is one Frank Merklein, a veteran of Twentieth-Century Fox, NBC and the old Time-Life cable division of the mid 60's.

Then there is Michael J. Paolini, the President of Digital and Donald Kirk, Technical Advisor to the firm. Paolini is young (36), a veteran of Philco-Ford (microwave and satellite divisions) and Jerrold (microwave division), and probably one of the ten hardest working, most work-driven people in the world today (and the other nine just

ASN's Donald Kirk brought Jerrold into the CATV microwave world, served at Philco as Head of Microwave Engineering and is now completing work on a totally new approach to digitalizing video so that two video signals can flow through a single transponder without degradation. Don is shown here with the Digital/ASN 4.5 meter terminal installed at their St. Petersburg, Florida home office.

died from heart attacks!). If you are going to keep up with Paolini you need winged feet and a universal credit card that is printed on something more durable than plastic (Paolini's American Express card is literally held together with tape and glue; he's the first person we ever met who had worn it out before the year was up!). Paolini is one of those 'unforgettable characters' you meet all too rarely in life; he has been involved in just about every technique and scheme for distributing pay movie programming created since the late 1960's. And as for his satellite experience. . .well, Paolini invented them. One (of a long line) of 'unforgettable-Paolini stories' involves his being in charge of a video surveillance project for the U.S. Army during the Vietnam period. It seems the Pentagon wanted to transmit television pictures of the Haiphong harbor back to Washington, in as close to real time as possible, to help the top brass decide exactly when and how they should mine the Harbor. According to Paolini there was considerable concern that the mines be placed in the Harbor at a time when there were no Russian ships there. To do this to the satisfaction of Washington, a video to satellite link was created using one of the very early **orbiting** DSS satellites. The satellite had a trajectory that made it possible (if the uplink station tracked the moving bird) to access the bird for just a couple of hours per day, sending the uplink signal back to a military downlink terminal site in Hawaii, where it was patched into another uplink terminal for relay (in real time) back to the Pentagon in Washington. Paolini was in charge of the 'Nam' effort. He recalls one occasion where the video (camera) feed was giving them fits and an impatient Pentagon officer on the radio intercom link was having fits because there was no **live** video of the habor coming through the system. **"What in the hell are you sending to us!"** yelled the Pentagon end commander.

"A test pattern" was Paolini's curt reply.

"You mean you have hauled a satellite uplink station and a squad of men down a trail through enemy territory that is mined with our mines and enemy mines just to send us a test pattern???" came back the incredulous answer.

Yup, that's Mike Paolini.

Donald Kirk, on the other hand, is to CATV microwave what Paolini probably is to satellite systems. Kirk came to Jerrold way back when as the owner and operator of something called K and A Electronics. If you go back far enough in this industry, that tells you that the Jerrold microwave for CATV was really K and A microwave, created, designed and built by Donald Kirk. In addition to being Chief of Engineering and Design at Jerrold, Kirk was head of Philco's microwave engineering division. Both Paolini (who is an electrical engineering graduate from Drexel) and Kirk hold patents in the microwave and cable fields.

Two very heavy guys.

Digital has been in and out of all sorts of episodes in the pay movie business for about ten years. Their 'Key Cinema' program that puts movies into hotels on a per-view basis was one of the first in the industry that worked well enough to be satisfactory to hotel clients and in the St. Petersburg area Digital still does a relatively small, but profitable business providing hotel room pay movie hardware and even the software (i.e. the movies). Paolini recently went through a bad year of law suits and court hearings on a matter involving electronics giant Motorola; a battle that revolved around

Motorola attempting to acquire Paolini's company and hardware (proprietary). **In the end Paolini won** (a bunch of money in a judgement) but the lost year for Mike did more to slow down his winged feet than perhaps anything previous in his business life.

So much for the people of ASN. We felt the background was important because who they are and what they are setting out to do is (generously) **very controversial.** ASN is not setting out to play the game according to the established rules, and anyone that is thinking about playing with (or against) them had better recognize going in that here is a group that does not take 'no' for an answer. If there is a way. . .any way. . .to accomplish their end goal, they will do it.

The Goal Is What?

Their goal is a large, nationwide 'affiliate' system of cable television operators who carry one, two, three or all four of their WESTAR II transponder channels. In the end they plan to make money on their service.

The first big hurdle for a cable system interested in their service is the signal carriage rule(s). Clearly many systems out there, at least the majority of the larger ones, have no room left in their signal carriage bag to add even one more independent signal. Not full time at least. That doesn't seem to bother ASN all that much; they think there are enough small, or rural systems (when carriage rules do not apply) to take them to the break even point at least. ASN's Bill Bauce sees a two pronged market there.

"First we have in the existing systems in the country around 1.2 million homes that could carry all three of the ASN independent signals if we could figure out a way to get the costs down where systems as small as say 200 subscribers could afford the terminal plus the service. We've done that. **Then there are those systems that could carry less than our full three indie signals** (say one or two), **and they represent perhaps another 800,000 such subscribers out there. Finally there are those larger market systems where New York Mets baseball** (from New York's WOR) **or Dodger baseball** (from Los Angeles' KTTV) **or a sports special from Chicago would sell well along lines not dis-similar to the Madison Square Garden Events channel. Between these three indies there is a potfull of programming available which systems could carry on a part time basis without ever running signal carriage rule restrictions".**

Bauce is right of course. It is Frank Merklein's 'Great Headend In The Sky' concept.

The initial thrust is to make available to those systems that do **not** have FCC signal carriage rule problems **the full compliment** of indie signals plus something ASN calls 'Channel 1'. If a system takes all four channels he will pay $1.60 per subscriber per month. Or, a system can take (any) **one** indie for **15 cents** per subscribing home, any **two** indies for **25 cents** per subscriber home or all **three** indies for **30 cents** per subscribing home. The way the 'sports and entertainment'

ASN's Bill Bauce is 15 year veteran of cable industry with experience at Time-Life Cable, VP for CATV at Reeves Broadcasting and Sammons Communications.

channel concept is presently being marketed (that's 'Channel 1') requires that **if** your system takes that channel you pay $1.30 for it (or $1.60 if you take all four) **for every home on the system;** it is **not** being offered as a 'pay channel with a special charge'. The three indies are not your twenty four hour per day seven days per week stations like Atlanta's WTCG, but they come close. By the time you allow for the three hour time zone spread between New York and Los Angeles you just about never run out of programming on at least one channel as a minimum. A comparison of operating hours and programming blocks for the three indies is shown here.

If the system is past the point of resolving his signal carriage rule restrictions the next hurdle is the money involved. As Bauce says **"We have solved that one".**

First of all the ASN programming will be up on WESTAR II. On the surface that sounds bad since everything else is on SATCOM; and as soon as the industry starts employing a second satellite everyone who already has service from SATCOM has to figure out how to afford **a second terminal.** It is a basic fact of life that it takes one satellite terminal receive antenna for each satellite you wish to look at (simultaneously). And given the 'broken field running' posture of ASN today it is not likely that every system that might want the service would be willing to 'spring for the special terminal' **until** the ASN operation has stabilized somewhat.

"We recognize that for a system to go on the hook for perhaps $30,000 for a terminal for WESTAR, we have to look pretty solid. And it will probably be a year or two before **we have been here long enough for people to** quit worrying **about whether we will still be here tomorrow. So we had to design a 'getting-in' system that made it very inexpensive for systems to add our** 'Great

REAL-TIME COMPARATIVE SCHEDULES

For the purposes of comparing how your viewers would be watching or choosing from programs from the three ASN independent stations scheduled for WESTAR II, here is a four-time-zone schedule for a typical **Friday** (starting midnight Friday EST but when it is still Thursday further west) for KTTV-11 (Los Angeles), WGN-9 (Chicago) and WOR-9 (New York City).

EST	CST	MST	PST	WOR-New York City	WGN-Chicago	KTTV-Los Angeles
12M	**11PM**	**10PM**	**9PM**	**(movie)**	**(movie)**	Merv Griffin
:30	:30	:30	:30			
1AM	**12M**	**11PM**	**10PM**	talk show	news	
:30	:30	:30	:30		**movie**	news
2AM	**1AM**	**12M**	**11PM**	news		Odd Couple
:30	:30	:30	:30			That Girl
3AM	**2AM**	**1AM**	**12M**			Cross Wits
:30	:30	:30	:30		Saint	**movie**
4AM	**3AM**	**2AM**	**1AM**			
:30	:30	:30	:30			
5AM	**4AM**	**3AM**	**2AM**			
:30	:30	:30	:30			**movie**
6AM	**5AM**	**4AM**	**3AM**			
:30	:30	:30	:30			
7AM	**6AM**	**5AM**	**4AM**	news	pub. service	**movie**
:30	:30	:30	:30	PTL Club	kids show	
8AM	**7AM**	**6AM**	**5AM**			
:30	:30	:30	:30			pub. service
9AM	**8AM**	**7AM**	**6AM**	pub. service	Jeannie	New Zoo Revue
:30	:30	:30	:30	talk show	**movie**	cartoons
10AM	**9AM**	**8AM**	**7AM**	Romper Room		
:30	:30	:30	:30			
11AM	**10AM**	**9AM**	**8AM**	Straight Talk		
:30	:30	:30	:30			Lucy
12N	**11AM**	**10AM**	**9AM**	news	Donahue	Family Affair
:30	:30	:30	:30	Topper		Andy Griffith
1PM	**12N**	**11AM**	**10AM**	**movie**	Bozo	Hogans Heroes
:30	:30	:30	:30			news
2PM	**1PM**	**12N**	**11AM**		Family Affair	**movie**
:30	:30	:30	:30		Jim Nabors	
3PM	**2PM**	**1PM**	**12N**	Ironside		
:30	:30	:30	:30		MM Club	
4PM	**3PM**	**2PM**	**1PM**	**movie**	Flintstones	
:30	:30	:30	:30			news
5PM	**4PM**	**3PM**	**2PM**		Gilligan	local program
:30	:30	:30	:30		Jeannie	Archies
6PM	**5PM**	**4PM**	**3PM**	Concentration	Bewitched	Flintstones
:30	:30	:30	:30	Jokers Wild	3 Sons	cartoons
7PM	**6PM**	**5PM**	**4PM**	Bowling For Dollars	Dick Van Dyke	MM Club
:30	:30	:30	:30	Newlywed Game	Odd Couple	sports
8PM	**7PM**	**6PM**	**5PM**	**movie**	Star Trek	Dodger Baseball
:30	:30	:30	:30			
9PM	**8PM**	**7PM**	**6PM**		**movie**	
:30	:30	:30	:30			
10PM	**9PM**	**8PM**	**7PM**	Untouchables		
:30	:30	:30	:30		news	Carol Burnett
11PM	**10PM**	**9PM**	**8PM**	Odd Couple	**movie**	Celebrity Show
:30	:30	:30	:30	**movie**		Merv Griffin

Headend In The Sky' **to their cable systems''** notes Bauce.

If you are not sitting down at this point, perhaps you'd better find a comfortable seat.

''We will be offering a full four channel satellite terminal delivered to the affiliate's site and with on-site installation engineering for right at $400 **per terminal per month on a five year lease (with option to purchase) program.''**

You read right. And the answer to your obvious question of "how can they do that???" is some of that Digital Communications 'proprietary engineering'. Here is how that is going to work.

The antenna to be offered is a 4.5 meter antenna. That is not to say that you can't (or in some cases won't need) a 6 meter antenna for the ASN WESTAR II service, this simply says that where a 4.5 meter will play, that's what they will offer to you. The **LNA** will be a name brand, but it will be **specially designed** for the WESTAR **four channel** transponder service offered. This means that they will be **centering the LNA** on the channels utilized by ASN on WESTAR II, which as the companion report here this month concerning LNAs explains brings the price down considerably. And then there is the receiver or

receivers. They aren't talking very much about this right now, but they will make four channels of ASN video from the satellite available for considerably less money than you are now accustomed to paying for TVRO receivers. Bill Bauce on equipment:

"We have gone out to all of the equipment suppliers in the industry with a 'Request For Quotation' on their equipment. We will be distributing to our affiliates or those interested in becoming affiliates a booklet which will list, in 'Chinese Menu' **fashion all of the equipment avilable in the industry today. Each piece of equipment will be priced and the affiliate will go through the selection of antennas, LNAs and receivers and choose exactly what it is he wants at his site. Then our engineering department will determine whether the equipment package selected will do the job and meet FCC criteria for a TVRO earth terminal. If it does, then we will purchase that equipment for the affiliate directly from the suppliers, and in turn lease it as a package** (installed or optionally allowing the system to install it) **to the affiliate. This is a low interest 60 month lease with a nominal cost purchase-option at the end of the term. From the numbers we have on hand, a system could get by for lease payments of around** $400 **per month for ASN satellite service if he is located in the 37 dBw portion of the WESTAR II footprint".**

Which brings up another interesting variation in the program; the footprint.

WESTAR II has a footprint that is for at least some portions of the country 1 dB 'hotter' than SATCOM (see map here). That means that your incoming or downlink signal is somewhat stronger than it could be for SATCOM, and that extra dB of margin reduces the requirements for the equipment you will select.

"Our approach here is very straight forward. We want the operator **to select the equipment** he **really wants. If he is very concerned about his monthly cost for the equipment plus the service, we are making it possible for him to get into satellite signal delivery for so little money that a system with as few as say** 250 **subscribers could have a stand-alone TVRO terminal. We see our service as a rate-making package; I don't know of a system in the country in the non-metropolitan areas that couldn't get a** $2.00 a month rate increase, **for example, if they brought in our three indie signals for example"** says Bill Bauce.

For those without a calculator at hand it works out this way.

1) **Lease payments** for terminal—$400.00 **per month**
2) 250 **subscribers** times ASN charge for three indies ($.30 each)—$75.00
   Total overhead per month for terminal and service— $475.00.

If you have 250 subscribers and you manage a $2.00 rate increase, that works out to $500 per month. And that's the **bottom** line. If you have **more than** 250 subscribers, or have fewer but

HOW WESTAR II MIGHT WORK FOR YOU

The EIRP coverage map for WESTAR II (shown here) indicates where the slightly higher level (than SATCOM) **+ 37 dBw EIRP** falls over the central region of the United States, and the progressively lower level areas either side of this region.

When the FCC determined that in order for a 'small' TVRO terminal to be licensed it should have a system carrier to noise ratio approximately 3 dB in excess of the receiver point where impulse noise (sparklies) begins to appear in the picture, many of the resulting system planning exercises revolved around +36 dBw EIRP as the highest EIRP likely to be encountered by CATV systems. The 'extra dB' from WESTAR II changes the game just a tad.

For most receivers the 'edge of sparklies' is **around** the 48 dB (video) signal to noise point. You might get lower than this with tighter IF bandwidths (such as 20/25 MHz) or with other 'tricks' that lower the receiver noise threshold but for discussion the 48 dB video signal to noise point is an acceptable 'knee' of operation. **If you add a 3 dB margin** on top of the 48 dB threshold point you should come up with a 51 dB level video signal to noise to be legal and licenseable.

There are three ways to improve the carrier to noise (C/N) at the disposal of most **system** planners:

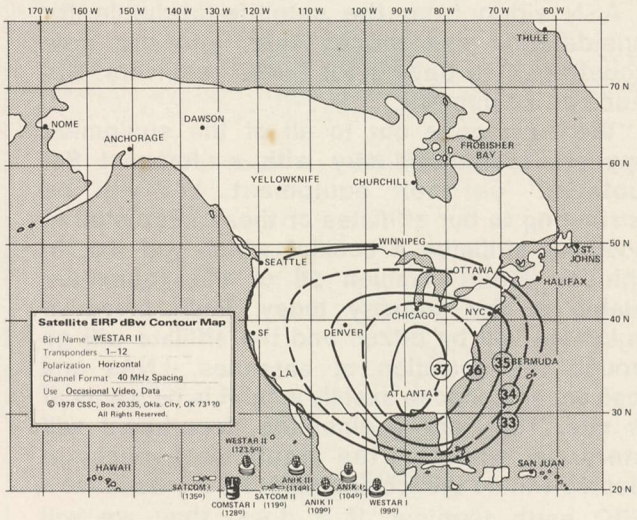
1) **Raise the signal level reaching the ground** from the bird by increasing the output power of the bird;
2) **Increase the capture area** (i.e. gain) of the receiving antenna;
3) **Lower the noise temperature** (or noise figure) of the LNA.

Within the 37 dBw EIRP contour of WESTAR II, you can back off the antenna size or raise the noise temperature of the LNA and still achieve results that are similar to those you would obtain within the 36 dBw EIRP of SATCOM (for example). However, the antenna gain is pretty much fixed by the present FCC 'sidelobe pattern' requirements since it is difficult to meet the 32 minus 25 log theta 'curve' with antennas **much smaller than** 4.5 meter aperture (diameter). So although a smaller antenna might give the necessary forward gain to produce the signal quality you need, the smaller antenna would probably not be acceptable to the FCC for certification of its sidelobe pattern.

This suggests that if a system was to design for the 3 dB margin required by the FCC for licensing in the (CATV) TVRO service, the only area where you **might back off** on your specs (and thereby lower your cost) would be the noise temperature (or noise figure) of your LNA. How far could you go and what would it buy for you? A few examples:

a) **A handy rule of thumb** (if you can get by without the last decimal in place) is that for **every degree K**(elvin) **noise temperature change in your LNA, you will improve** (or degrade) **your video signal to noise by .02 dB.** What does that mean? That as long as you are **above** the threshold point, if your LNA is 1 degree K(elvin) better or lower (for whatever reason) than another comparison/reference LNA the video signal to noise will be 0.02 dB improved (or degraded) also.

b) **In a 37 dBw EIRP contour** where you have **no** terrestrial interference and the uplink signal is 'clean' your video signal to noise with a 4.5 meter antenna and a:
   1) **120 degree K**(elvin) LNA will be **54.15 dB,** or,
   2) **170 degree K**(elvin) LNA will be **53.00 dB**



Remember the bare-minimum margin allowed is 48 + 3 or 51 dB video signal to noise. So if you set out to **degrade** the LNA noise temperature to the point where (in a 37 dBw EIRP area) under the conditions stated here you would have **just** a 51 dB video signal to noise, how far could you degrade (that's another word for 'cheapen') the LNA? It turns out (following the 0.02 dB change per degree K[elvin] 'rule of thumb') that you could take your LNA down to 270 degrees K and still meet the minimum criteria.

(**A word of caution here**—this is data for reference, **not** for design. In the **real world** there is virtually always **some** amount of terrestrial interference which results in degradation of the video signal to noise and the uplink transmitter is almost **never** operating totally clean or at full saturation of the transponder receiver.)

Now suppose you looked for the minimum system that would produce a signal in the +37 dBw EIRP contour that would be right of the edge of sparklies (48 dB s/n) with a 'normal' receiver. **How small** could you make the antenna, or what combination of small (er than 4.5 meters) antenna and LNA would just hit the 48 dB video signal to noise region?

It turns out that a ten foot antenna (39.5 dB gain/3.0 meter) antenna **with a 245 degree K**(elvin) LNA would get you the 48 dB video signal to noise ratio (in our non-real-world paper environment). On the other hand a 10 foot with a 95 degree (K)elvin/LNA would come in at the 51 dB video signal to noise ratio number in a +37 dBw contour.

What about an eight foot antenna (37.5 dB gain/2.44 meters)? Again in our paper study world an 8 foot with a 100 degree K(elvin) LNA would produce a video signal to noise of approximately 48.9 dB which is another way of saying a 8 foot with a 145 degree (K)elvin LNA would just hit the 48 dB criteria.

Finally, don't use these hard numbers to design a system because you will probably never experience the total combination of a noise-free uplink signal that fully saturates the transponder and a terrestrial location that has no degradation. **But if you did, that's just what you could expect.**

could get **more than** a $2.00 rate increase, you are home free.

"The big danger I see here is that people will figure our service is great for the small, rural systems but not worth much to the bigger metropolitan systems" laments Bauce. **"On the other hand I have got to believe that the bigger systems with their sophisticated marketing departments are smart enough to take the side by side program listings for KTTV, WGN and WOR and go down through a typical week to see that via ASN they can have a tremendous selection of program-by-program selected material which will really set them apart from the normal off-air-receiveable**

product. With today's sophisticated locally programmed information channel equipment and the sophisticated switching equipment available there is no reason why a big, major market system could not program a 'wild card channel' from the KTTV-WGN-WOR 'mix' available through ASN'' notes Bauce.

There it is. Frank Merklein's "Great Headend In The Sky".

Enter New Orleans

As we wind our way through April and head for the formal unveiling of the ASN service April 30th in New Orleans (at the NCTA annual bash) the ASN proposal is heading for the first **big hurdle** in their six million dollar steeple chase.

Not everyone in the CATV or satellite business is overly joyed with the ASN program. RCA, for one, is more than a little unhappy with the 'AmeriCom' portion of the ASN name. **''We began by calling ourselves the American Satellite Network''** notes Merklein, **''a name that we cleared for registration in our corporate-home state of Iowa''.** However it later turned out that a division of Fairchild had a subsidiary called American Satellite Corporation so ASN changed the 'a' to 'AmeriCom'. It wasn't meant to provoke RCA (RCA Americom is the division in the satellite business) but it did. **''Changing the name so often doesn't make us look anymore stable''** suggests Bauce, **''it is just one of those things''.**

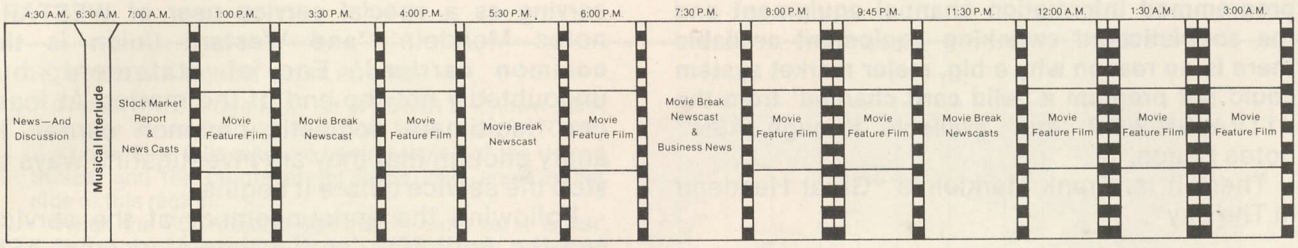
But that is perhaps a minor problem compared to the flak that has been generated by the formal announcement of the agreement with Western Union and the 'non-common-carrier' approach of ASN. The FCC rules regarding satellites and tariffs are at best confusing. It is said that two capable, qualified attorneys can read the rules and come to two distinctly different interpretations. It was the ASN legal staff in Washington (a well known communications law firm) prodded on by Frank Merklein that uncovered the approach being used. **''We are serving as a special service user of WESTAR''** notes Merklein **''and Western Union is the common carrier.''** End of statement, but undoubtedly not the end of the matter. At least one 'legitimate domestic common carrier' is angry enough that they are investigating ways to stop the service before it begins.

Following the announcement of the service and the April 30th 'partial time start date' ASN was barraged with telephone calls and inquiries from many quarters. Many came from large MSO concerns that liked the concept but who were worried about 'the copyright problem'.

''Hey, we have no secret formula or technique to 'get around copyright' '' notes Bauce. The cable operator is just as liable for signal carriage rules and copyright as he would be with any other delivery service. There is no secret.

So in New Orleans ASN will be set up with their demonstration system not on SATCOM (like everyone else), but on WESTAR II at 123.5 degrees west. And if the same guy who successfully sent television images of Haiphong harbor from North Vietnam via satellite to the Pentagon has his way and is able to pull all of the pieces together by April 30th, there in living color for at least four (demonstration) hours per day convention goers visiting the ASN booth will be treated to programming from KTTV-WGN-WOR. **And after the NCTA convention?**

According to Merklein **''We will program increasing amounts of indie plus our 'Channel 1' per day until we reach the point where we are full time on all four channels''.** How long might this 'phase-in' take? **''We would hope that by the time we all get to CATA's CCOS** (July 17-20) **we will be full time on the four channels''** notes Bauce. **''And, in the meantime, we will probably let the early affiliates have the partial time service without charging them for it''** notes Bauce.



CHANNEL '1'

Getting Equipped

If you have gotten this far into the scenario you may be wondering what you as a CATV system operator might have to do to get into the ASN affiliate group. The first step is to get some of the murky paperwork out of the way.

Assuming your system already has a TVRO license (or CP) for SATCOM, what must you do to add WESTAR (II) to your license? The first stop is your frequency coordination company. Bob Shannon of Compucon tells us that for $25 per site that already has completed its frequency coordination study for SATCOM (I, II or both) you can have the additional data for WESTAR II. If you are currently in the midst of your study, or are planning it, Compucon says they will simply 'throw in' the additional search time required for WESTAR for 'no extra charge'.

Bauce on helping small systems get into the game. **"Our lease approach includes (optionally) our staff doing (through Compucon) the frequency coordination and the license application preparation. When we talk about some set figure per month for the lease package, that includes everything from coordination to licensing, including the installation of the terminal** if **the affiliate wants it that way. Or the System can from our 'Chinese Menu' approach to the packaging elect to do** some **of this himself and shave the appropriate dollars off of his monthly lease payment."**

Is a system affiliating with ASN forced to lease?

"Of course a system can purchase **his own equipment and simply come to us for service"** notes Bauce. **"We emphasize the lease approach because we feel the smaller systems will want it this way".** For that matter anyone concerned about whether ASN stays up and operational might rather have a lease for the equipment than an outright purchase; regardless of system size.

"We are dead serious about alleviating the fears of the operators who are afraid to commit to the service until we are say a year or two old. Obviously it is in our best interests to have systems on the affiliate line as early as possible. So we have tailored the lease arrangement so a system can either walk away from the terminal or convert it for the unpaid balance **to his own** at any time **should ASN service cease to exist. For that matter, we will be financially responsible to the affiliate for whatever costs are involved in switching his terminal over to say SATCOM if something** should happen **to ASN down the road. There isn't much money involved in moving an antenna over a few degrees in azimuth, but the idea is that we want the operator to believe in us and to believe that we are sincere about him not having to worry about our long term stamina if he signs up with us"** adds Bauce.

How soon might a system get through the paperwork drudgery and be in business with ASN signals? It depends upon where you are and how big you are and to some extent who you are.

To our knowledge only a handfull of systems have gone ahead and requested FCC permission with their TVRO applications for 'access rights' to WESTAR II. So that's the first trick. The next trick is to be qualified to carry the KTTV-WOR-WGN signals, or some portions thereof. If you are a small system of 500 or fewer subscribers, you don't need a CAC for **any** signals and **if** you had the **WESTAR access permission** you could simply add the signals **as soon as** you were equipped with your terminal. If you have to have a CAC for full time carriage of one or more of these signals, you need to visit the FCC for a modification of your existing CAC. Or, if you are simply going to 'wild-card' cherry-pick some of the programs from the KTTV-WOR-WGN trio, you don't need CACs for the signals although there is some complicated Copyright Office logging to be done.

It may well be that the FCC will develop some 'streamlined' processing procedures for systems that already have CPs or licenses for SATCOM I (or II or both) which will allow the cable operator with TVRO 'rights' to simply add a second terminal for WESTAR. That however remains to be seen and it may well be a month or two more before that decision is even on the top of the pile at the Commission.

In the interim the pot is boiling and the players are acting out their parts. In our humble judgement **if** ASN can pull off the live demonstration of KTTV-WOR-WGN at the NCTA show in New Orleans April 30th-May 3rd, **they are past the first big hurdle of their game plan** and it may well be all downhill from that point onward. We would not be surprised to see sticks thrown and legal roadblocks manned from several quarters, but the bottom line is that no system that finds the ASN offering attractive will be in any jeopardy by talking to them at this point and even going so far as to sign a contract for the service. After all, if the roadblocks become too large or some other unforeseen problem does develop, you can't be held to perform for your

Digital's Time Compression Multiplex

Several approaches to 'shared use' of a single transponder channel for transmitting multiple (two) video signals simultaneously have been (and are being) employed in the satellite industry at the present time. The goal is or should be obvious enough; the transponders in geostationary orbit are like public transportation buses. There is only so much room, per transponder, to 'carry passengers'. When the transponder (bus) is full, there is no more 'room to let' and the transponder owner is forced to open up another transponder (or provide another bus) for the 'overflow' customers.

The Alaskan transponder in use on a regular basis (vertical transponder 23 on SATCOM II) spends a good part of its day carrying two video signals from the various U.S. uplink sites to the Anchorage mid-route station where television programming is taped for delayed playback to Alaskan bush country terminals. This RCA approach utilizes a 'half transponder' format wherein the 36/40 MHz wide transponder is split in half so as to accomodate two simultaneous video signals. There is signal to noise (carrier to noise) trade off here since the bandwidth of each respective video signal is reduced by approximately 50% and the so-called 'FM improvement factor' never really has a chance to do its thing.

Another technique, first tested on a live satellite on WESTAR II on this past December 4th (see **CATJ** for **February 1978,** page 40), was developed by CBS along different lines. CBS calls their system 'STRAP' which stands for **S**imultaneous **t**ransmission (and) **r**eception (of) **a**lternating **p**ictures. In the CBS system every other line in the video field is transmitted after selection by a vertical interval switcher and the resulting 'half picture' is put back together on the receive end by simulating the missing lines with data from the transmitted lines appearing immediately above and below the missing line(s). Regular use of this CBS developed system has been proposed by the Robert Wold Organization, which is currently 'bidding' against RCA for the future contract to deliver television programming to Alaska. This CBS system does not suffer from as much **signal to noise** ratio degradation as the 'half transponder' format of RCA, but it does degrade the picture detail by the alternate line transmission approach and, like Humpty Dumpty, once the picture is taken apart there is no foolproof **perfect way** to put it back together again.

Enter into the scenario a system developed by **Donald Kirk** on behalf of **Digital Communications, Inc.** Kirk has approached the problem with two objectives in mind:

1) The system must not ultimately degrade the video signal to noise ratio for either of the two video signals involved, and,
2) The system must be flexible enough to allow interleaving of not only the required video data but associated (or non-associated) audio and data channels as well.

Additionally, the system must be operable with current state of the art component parts priced reasonably enough so that the working package is price compatible with what a user would presently pay for two separate channels (transponders) of service; or less.

The Digital system developed by Kirk is currently in the process of routing through patent application channels. A technical paper describing the system is scheduled for presentation by Kirk at the NCTA convention in New Orleans. Additionally, a CATJ version of this paper will appear in the May issue of this publication.

Essentially, Kirk's system is **Time Compression Multiplex** (TCM). The two video signals are dissected into line-for-line component parts and 'stored' in chips that can handle one line of video. This storage of the line-for-line information takes place in 'real time' but when the stored information is 'read back' it is read sequentially at twice the normal reading speed. This causes the individual lines to time compress to half their normal time frame which in effect doubles the spectral frequency range of the outgoing signal (the same effect you experience when you run a tape recorder at twice normal speed). At the receiving terminal the process is reversed with the incoming signal read into 'storage' at twice speed and then read out of storage as separate lines of video in real time.

The basic system is simply explained but the peripheral circuitry required to maintain a high quality signal is rather complex.

Since the announcement of the system there has been considerable interest in the 'Kirk approach' by a number of satellite users and operators. Ultimately, according to ASN personnel, the Digital Communications system will find its way into the ASN operation thereby shaving ASN transponder leasing costs and reducing the costs of satellite transponder delivered signals to ASN (CATV) customers.

part of a contract if the other party does not perform either.

As one cable system operator in the far north of Michigan commented to us on hearing the ASN story **"I have been looking hard at a $700 a month microwave bill and $15,000 up front money just for the delivery of one channel of independent programming to my smallish system. It is almost too good to be true. . .three of the best indies in the country delivered to my headend for** (in his case) **around $500 a month total cost. Where do I sign up and how fast can they turn it on???"**

Start Looking For ASN?

If your CATV TVRO site has the 'capacity' to be looking for 'strange, new signals', you might find limited periods of **'testing'** on WESTAR II of Los Angeles KTTV, Chicago WGN and New York's WOR **as early as the middle of April.**

ASN will be completing arrangements to patch these three indie signals into 'as available' WESTAR II transponders several weeks **before** the April 30th New Orleans 'showtime'. It is probable that the four transponders utilized for ASN before, during and immediately after the New Orleans show will not be the same transponders the ASN service will eventually end up on when full time service begins later this spring. However,unlike other WESTAR signals, the ASN 'tests' will be conducted **with a 6.8 MHz aural sub-carrier** which means receivers set up for SATCOM II audio will find the WESTAR audio on the four ASN channels completely compatible.

It is likely that the first signal to be seen on testing will be that of WGN in Chicago. The ASN 'Channel 1' movie/-entertainment channel will be handled on a tape playback basis from the Los Angeles uplink site of Western Union during the NCTA show. Current plans are to run the three indie signals on a four-hours-per-day (each) 'minimum schedule' during the hours when the heaviest traffic is likely on the show floor in New Orleans. This suggests the period during the mid and late afternoon (CDST) will be the best period to catch the ASN tests on WESTAR II between approximately April 25th (set up day for the ASN exhibit) and May 5th.

If you are putting in a new CATV TVRO installation during this period of time you might wish to check out the performance of your system on the WESTAR II signals. Who knows. . .you might want to add one or more of the ASN channels before the year is out!

HOW EXTREMELY LOW NOISE, HIGH GAIN AMPLIFIERS WORK IN THE TVRO SERVICE

The Connection

The Low Noise Amplifier or LNA is perhaps the most critical component part of the typical CATV TVRO installation. The signal level reaching the ground from the relatively low powered transponder on SATCOM is frightfully weak and not many dB above the levels of galatic noise one finds in the same general portion of the 'sky' as SATCOM rests. Any contribution of noise from the receiving system itself further reduces the already thin 'margin' between the galatic noise and the very weak SATCOM signal.

The LNA performs a pair of exceedingly important functions:

1) It provides selective voltage increase (i.e. signal gain) over the bandwidth of the satellite downlink transponders (3,700 to 4,200 MHz), and,
2) By very careful design and construction its contribution of noise to the system is minimized.

Because the CATV TVRO (carrier) signal to noise margin is so small (typically between 3 and 5 dB with terminals smaller than 10 meters), and the FM (frequency modulation) format of the downlink transponders (and the uplink system), there are very significant differences in system performance with very small changes in the system (carrier) signal to noise ratio.

The LNA should establish the (carrier) signal to noise ratio for the full TVRO terminal. This is not an unconditional statement, but for virtually all properly operating 4.5 meter and larger 'professional' terminals, the statement holds true. See example here of such a computation.

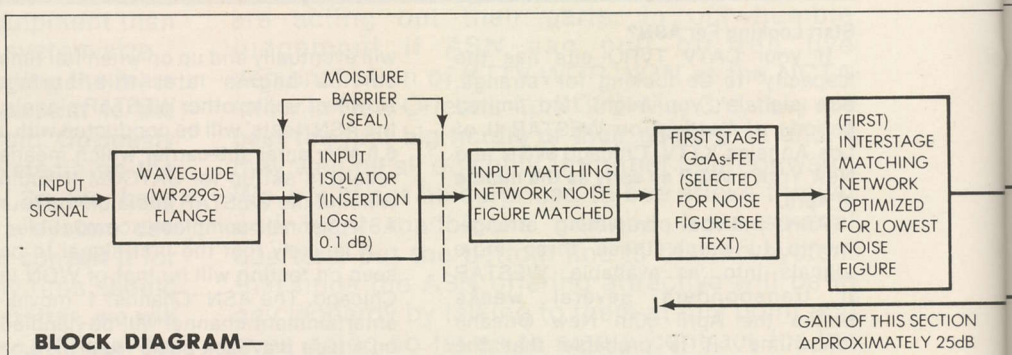
The LNA choice then is perhaps the most significant decision to be reached in the design equation of a TVRO terminal, and the ultimate performance of a typical CATV terminal. The LNA has been such a frequent topic for discussion in past issues of CATJ that a listing of these discussions (starting in the October 1975 issue) would be a wasteful use of space. Rather than belabor the past, our intent here is to update the LNA technology in the CATV area.

LNA Design

A low noise amplifier for CATV applications mounts at the TVRO antenna, either at the focal point (i.e. in front of the antenna with the feed antenna) or behind the antenna (at the end of a section of waveguide). The LNA must, because of the low signal levels present, be mounted as close to the 'feed antenna' as possible. When the 'safety margin' between a noise free (i.e. no sparklies) picture and the first hint of impulse noise is as low as 3 dB, even tenths of a dB become exceedingly important to a system designer. Losses between the feed antenna and the input to the LNA are irrecoverable losses; that is, signal lost is gone forever and may not be reclaimed by later signal processing.

To gather a solid foundation of the state of the art for this report, we spent time both in our CATJ Lab and in Garland, Texas with a number of people who make up the technical excellence of one of the LNA industry's primary suppliers; **Scientific Communications, Inc.** (SCI).

The basic 1978 version of the LNA is shown here in block diagram form. The specifications call for 50 dB (or slightly more) voltage gain, across the 3.7 to 4.2 GHz bandwidth. This specification, however, must take a secondary position to



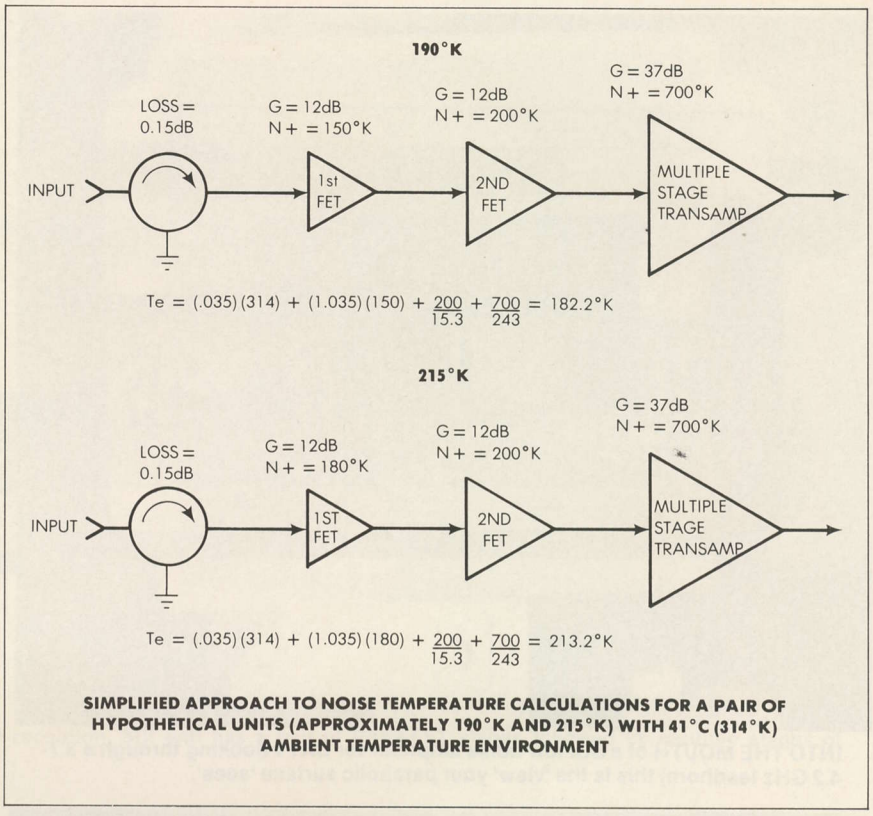
BLOCK DIAGRAM—
TYPICAL 50 dB GAIN GaAs-FET LNA FOR TVRO SERVICE

the noise figure specification through the same frequency range for it is the contribution of LNA noise to the receiving system which makes the most significant impact on the final system TVRO pictures.

In diagram one we see the input signal is routed into the LNA through a waveguide flange or connector. The flange could be connected in turn to either a feed antenna (such as a horn) in those situations where the LNA mounts in front of the parabolic reflector, or to a section of waveguide that comes to the rear of the parabolic antenna from the focal point feed antenna. The flange has a moisture barrier seal facing towards the input isolator; a passive device intended to insure that signals pass only in one direction through the LNA and can in no way leak 'backwards' towards the parabolic reflector.

Both the flange and the input isolator contribute some signal loss to the downlink equation; a not insignificant 0.1 to 0.2 dB in most situations. This signal after routing through the input isolator then goes to the input matching network for the first active (gain) stage; a GaAs-FET device.

The fancy lettering act **(GaAs-FET)** stands for gallium arsenide, a material that has been found to be especially useful in the creation of this special breed of field-effect transistors (FET). For now the GaAs approach to FETs for this type of SHF (super high frequency) service is about the best thing going. And although other 'superior approaches' appear to be on the horizon it is likely that gallium arsenide will continue to be the front runner for super high frequency transistor fabrication for the coming year or two.



SIMPLIFIED APPROACH TO NOISE TEMPERATURE CALCULATIONS FOR A PAIR OF HYPOTHETICAL UNITS (APPROXIMATELY 190°K AND 215°K) WITH 41°C (314°K) AMBIENT TEMPERATURE ENVIRONMENT

The first stage device is (as they said in the trade) 'selected'. That means that there has been a grading process of the GaAs-FETs before the actual LNA is assembled. In actual fact there are at least two grading processes for the finished GaAs-FET before it ends up in an LNA. After fabrication by the device manufacturer, it is graded or qualified by a technician based upon its operational parameters in a test jig. The FET fabrication company (Japan's NEC in the case of Scientific Communications LNAs) grades its production not only to verify which devices work and do not work, but, **which work better than others.** As the December (1977) issue of **CATJ** reported (page 40-B), the name of the game with GaAs-FETs is something called yield. Which means that when the transistors are fabricated, no two turn out exactly alike. Often the differences in the transistor's internal chemistry has a considerable impact on the operationing characteristics of the transistor. A supplier such as NEC would **like** to have **all** of its GaAs-FETS turn out the best of the batch, but unfortunately only a small percentage fabricated really turn out well (a percentage of around 10). The grading process sorts out which are 'apparently best', which are not quite so good, and so on. And then NEC (or any other GaAs-FET supplier) charges its customers (such as SCI) accordingly. The good ones cost more, the not so good ones cost less.

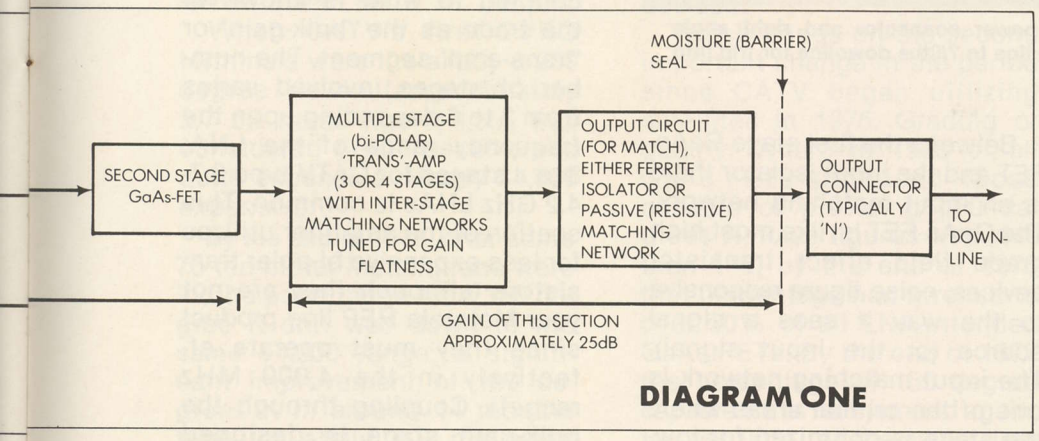
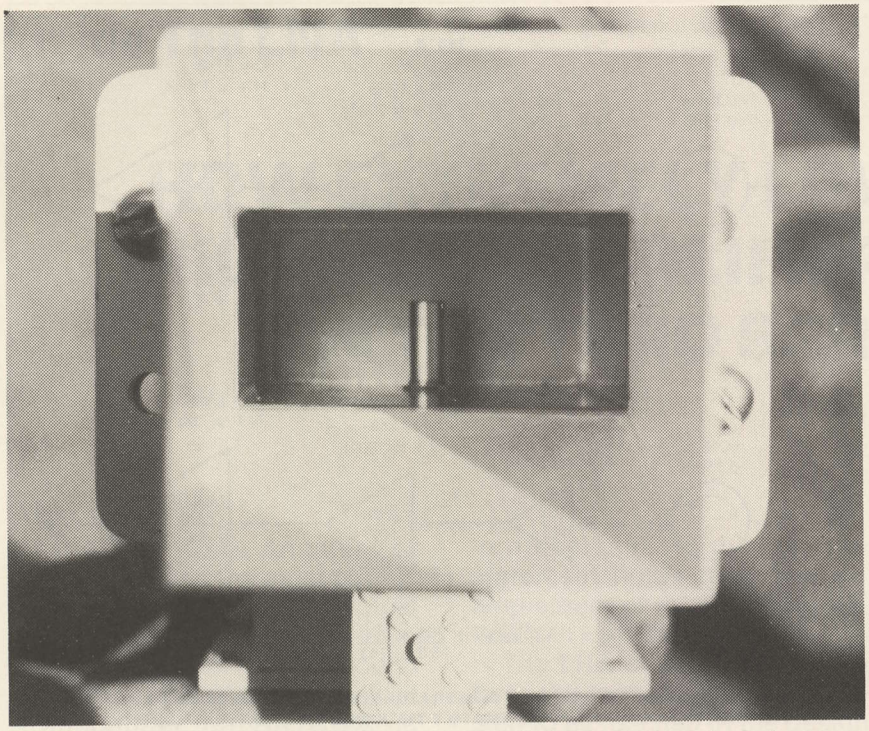


DIAGRAM ONE

Because these devices are expensive anyhow ($100-150. each), and more importantly because how good they are plays a large part in how good



INTO THE MOUTH of a SCI low noise amplifier for CATV (looking through a 3.7-4.2 GHz feedhorn) this is the 'view' your parabolic surface 'sees'.

LNA AFT END pointing out operating power connector and right angle transition fitting to connect 'pigtail' patch line to 7/8ths downline for trip into CATV headend.

the completed LNA will be, a second 'grading process' takes place at SCI. **"We are primarily looking for verification of the initial grading"** notes SCI's Bob Goodrich. Still the selection process does exist and it helps explain how the ultimate user ends up with a specific grade of unit, hopefully based upon his needs.

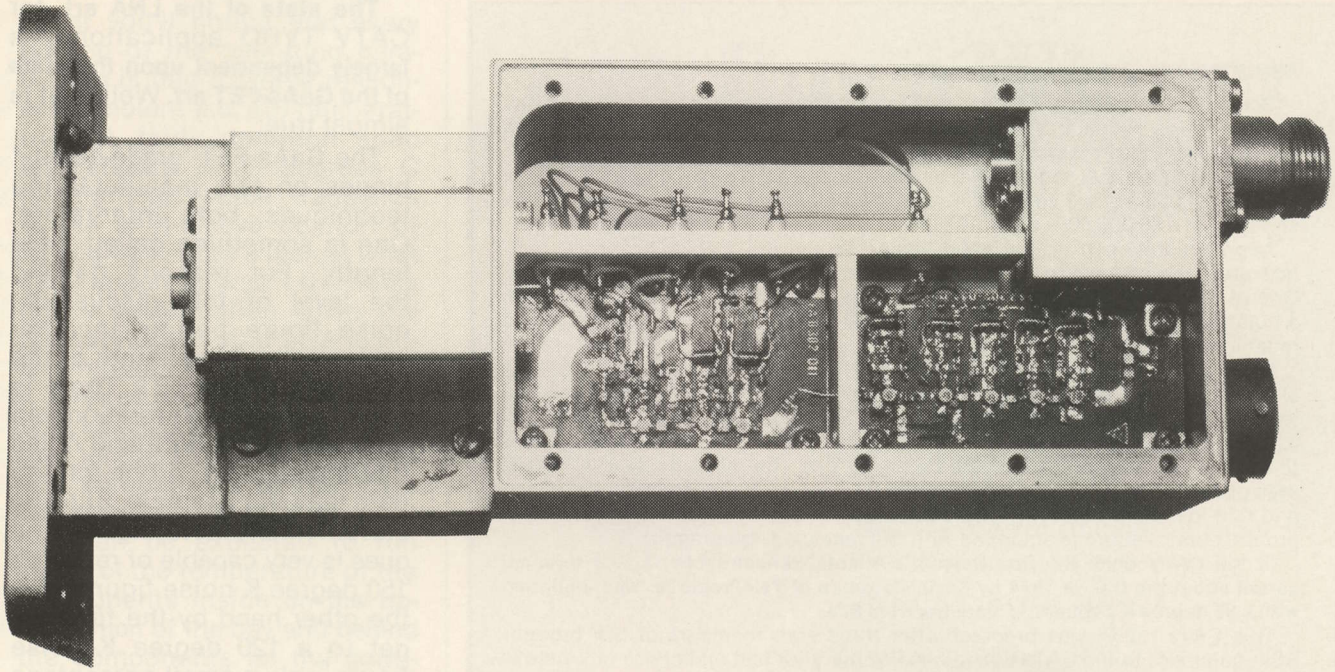
Between the first stage GaAs-FET and the input isolator there is an input matching network. The GaAs-FET is, like most high grade field effect transistor devices, noise figure responsive to the way it sees a signal source (or the input signal). The input matching network is one of the critical areas where the stage is optimized for lowest possible noise figure by tuning the input circuit for best energy transfer (i.e. match) to the source.

Between the first GaAs-FET stage and the second GaAs-FET (amplifier) stage is another important matching network; 'interstage'. Again, like most FET devices, the GaAs-FET behaves properly (i.e. has best noise figure and gain) when it's output circuit 'sees' a proper load or output match. Thus the interstage matching network does two things; it creates a proper load for the first stage, and, it again acts as an impedance matching network for the input to the second stage.

Between the two initial active stages there is approximately 25 dB of signal gain. The gain is easier to achieve than the optimized noise figure however. The circuit designer is fighting noise figure, gain-flatness (i.e. equalizing the gain across the full 500 MHz band) and stability initially. In production, the optimizing of noise figure typically takes only a few minutes per unit while as SCI's Tom Humphries points out **"they may spend 30 minutes or more getting the unit within the flatness spec"**; a point we'll return to later on in this report.

As the photo of the open LNA here shows the two GaAs-FET stages are housed in their own 'front end' cubicle of the LNA. Each stage has individual voltage feedthru capacitors to help maintain isolation between stages (important for keeping stability high and interaction down).

The output of the GaAs-FET section of the amplifier is coupled to what is known in the trade as the 'bulk-gain' or 'trans-amp' segment. The number of stages involved varies from 3 to 6 depending upon the frequency range of the LNA; 3 or 4 stages for CATV type 3.7-4.2 GHz LNAs is common. This section of the amplifier utilizes far less-expensive bi-polar transistors (although they are not your Motorola HEP line product since they must operate effectively in the 4,000 MHz range!). Coupling through the bulk-gain stage is designed



INSIDE THE TOP SIDE of an LNA for TVRO reception. SCI unit has a pair of GaAs-FET stages followed by multiple stages of 'bulk gain'.

again for achieving gain-flatness. Gain of the bulk-gain block is in the 25 dB region.

The output of the bulk-gain amplifier then goes through an output isolator which may be either a ferrite isolator or it could in some situations be a passive (resistive) matching network. This section provides both a proper impedance 'load' to the output of the bulk-gain amplifier, and, it also provides isolation for the LNA from whatever receiver generated energy (such as LO signal) that might work its way back up the downline. The output match circuit is moisture-barrier sealed from the output connector, typically a type 'N'. We'll get into LNA powering separately here.

State Of 'Our' Art

When CATV's first TVRO terminals were installed, a 250 degree Kelvin (approximately 2.7 dB noise figure) LNA was considered pretty decent; and quite expensive. Nearly $4,000 expensive.

By the end of 1976, after some 75 ten meter installations were in, the price range for a 150 degree K unit was down to the **same** $4,000 range; a significant improvement of 100 degrees K in around 14 months time (or about 0.9 dB noise figure improvement). **By the end of 1977** the LNA pricing and performance had improved again; with 100 degree K units available for something less than $4,000 and 150 degree K units available for under $2,000.

Two important things were happening at the same time; as the price came down, smaller and smaller communities could afford TVRO facilities. And so the 'base' of customers broadened, getting ever larger and larger. As volume for 3.7-4.2 GHz LNA's went up, volume for GaAs-FETs also went up. This volume brought prices down all across the board, and as the volume for the GaAs-FET devices went up suppliers such as NEC found better and better ways to turn out 'high grade' devices.

Which brings on the second important change in the period since CATV began utilizing satellites in 1975. Grading or quality. Where in 1975 of all GaAs-FETs produced those capable of providing 150 degrees K noise figures was less than 1%, by the end of 1976 that percentage had swelled to over 50% of all LNA-intended GaAs-FETs. By the end of 1977 the percentage of 150 degree capable FETs had jumped again, to over 80%. At the same time while 150 degrees became common place (and therefore less expensive) lower numbers became more realizeable. Today, starting the second quarter of 1978, approximately ten percent of all LNA-intended GaAs-FETs produced are capable of 100 degree Kelvin noise figures. A few, approximately 2%, are capable of noise figures down in the 85-90 degree Kelvin range.

ABOUT SCI

Scientific Communications, Inc. was founded in mid 1970 by current company President Joe Halpain, Vice President for Operation and Marketing Marvin Wallace, and Vice President for Engineering Britt Vincent.

The company has some 15 advanced degree engineers, operates from a modern 24,000 square foot facility in the Dallas suburb of Garland, and is shooting at a $6,000,000 year in 1978.

Approximately half of the firm's business is in the 'EW' or electronic warfare area; the balance in non-military areas such as DOMSAT system LNAs. One of the firm's first 'business coups' was a contract to provide more than a hundred solid-state 'L-band' parametric amplifiers for the giant Cobra-Dane radar installation at Sheyma, Alaska.

In the LNA field the firm has produced a wide variety of units covering virtually every military and domestic frequency from low UHF (400 MHz) to well into the SHF region (12 GHz). Satellite system LNAs include units for 2.6 GHz, 3.7-4.2 GHz, the military downlink range near 7 GHz. Receiving equipment to 40 GHz is a regular part of the company line; the present COMSAT satellites operating with 'test beacons' in the 20 and 30 GHz range (verifying space and rain losses in these two regions for future satellites) are operating with ground control stations equipped with SCI receiving equipment.

In the CATV field, the first Scientific-Atlanta transportable 15 foot terminal carted about the U.S. in 1974 by Kevin Gossman of TelePrompTer was equipped with a 65 degree K parametric amplifier from SCI.

This CATJ report was prepared after three staff members of SCI brought SCI equipment to the CATJ Lab in mid-February for test and check out, following which we re-visited (for the second time) the SCI facility in Garland, Texas.

Firm-**Scientific Communications, Inc.**
Address-**3425 Kingsley Road, Garland, Texas 75041**
Contact-**Tom Humphries**
Telco-**214/271-3685**
Products-**Low Noise Amplifiers and other receiving equipment for TVRO reception**

SCI'S BOB GOODRICH—"During the next two years GaAs-FET LNAs will continue to improve and prices will continue to come down. The key to improved performance is constant improvement of the FET device."

The state of the LNA art, for CATV TVRO applications, **is largely dependent upon the state of the GaAs-FET art.** Well, that is almost true.

The GaAs-FET 'grade-quality' hinges on two manufacturing techniques; both inter-relate. One is something called 'gate length'. For reasons beyond the level of this discussion, noise figure performance revolves around the length of the gate lead of the FET. There is a well established relationship between gate length and noise figure capability. A one micron gate lead, for example, utilizing current manufacturing techniques is very capable of repeated 150 degree K noise figures. On the other hand by the time we get to a 120 degree K noise figure, only a small percentage (perhaps 5%) of the 1 micron devices produced can grade out at that level. If you shorten the gate lead length to 1/2 micron, manufacturers of GaAs-FETs find that most of these shorter-length units will make the 120 degree K number and perhaps 20% will make the 100 degree K level.

There is much more to shortening lead lengths (within the GaAs-FET structure) than simply whacking away with your boy scout knife however. The geometry of the device requires exceedingly exact precision in manufacture; so exact that the very limits of technology are being pushed to create the 1/2 micron devices. Still, the evidence is considerable that shorter leads will bring better and better results. Tests are reported at device houses such as NEC and others to create 1/4 micron gate leads.

So the GaAs-FET technology is not standing still, and much of our future is dependent upon the results of this technology. Nor are the users of present day FETs for LNA designs sitting around waiting for improvements. There is an inkling of what may be up in the following data that relates to the performance of your LNA under various temperature extremes.

If you look carefully at an LNA data or specifications

sheet you'll notice that every portion of the operating parameters is tied to some reasonably ambient (i.e. air) temperature. A fairly common spec temperature is 25 degrees C (centigrade), which translates to the shirt-sleeve comfort of 77 degrees F. Let's look at what can happen to your LNA noise figure specification when the temperature of your LNA is different than 77 degrees F.

First of all, when the LNA is speced at 25 C/77 F that means the temperature of the case and components of the LNA. The case temperature on a hot day can be expected to run **ahead of** the temperature of the components inside **on the uphill portion** of the day and **behind** the components **on the downhill side** of the day. But for all practical purposes the case temperature, if you measured it with a thermo-couple, would approximate the component temperature to within a few degrees F.

According to Bob Goodrich of SCI there is a change of 0.5285 degrees Kelvin noise temperature for each 1 degree C change in the components. We assume here all the components run at the same temperature, although obviously this is not totally true since some components generate considerable heat. Overlooking that additional heat source, if your LNA has a specified noise temperature of 120 degrees Kelvin at 77 degrees F (25 degrees C), here is what happens to your LNA Kelvin noise temperature when the temperature varies either side of the 77 degree F range:

1) Reference temperature 77 degrees = 120 degrees K noise temp
2) **At 50 degrees F** the noise temperature = **112.073 degrees K**
3) **At 30 degrees F** the noise temperature = **106.200 degrees K**
4) **At 10 degrees F** the noise temperature = **100.328 degrees K**
5) **At 0 degrees F** the noise temperature = **97.392 degrees K.**

SCI'S TOM HUMPHRIES—"We are looking ahead to the eventual opening of the 11/12 GHz downlink band and are working on a 120 degree K LNA for this band at the present time".

Well now, that is quite an improvement for lowering the temperature of the LNA. In fact, if a 120 degree unit costs around $3,000 while a 100 degree unit costs around $5,000, **a person could save himself around $2,000 by figuring out how to keep his LNA in a 0 degree F environment!** We'll come back to that shortly.

For every good result there is logically an equal and opposite result. Such as what happens when the ambient temperature goes above 77 degrees F.

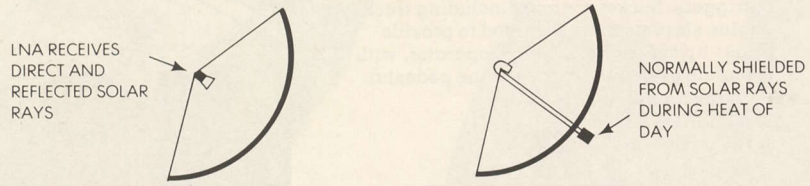
1) Reference temperature 77 degrees = 120 degrees K noise temp
2) **At 90 degrees F** the noise temperature = **123.817 degrees K**
3) **At 100 degrees F** the noise temperature = **126.753 degrees K**
4) **At 110 degrees F** the noise temperature = **129.689 degrees K**
5) **At 120 degrees F** the noise temperature = **132.625 degrees K**
6) **At 150 degrees F** the noise temperature = **141.434 degrees K**
7) **At 180 degrees F** the noise temperature = **150.242 degrees K.**

Ah yes, but what is any self respecting LNA doing sitting around in 180 degree F ambient air? It probably is not ever going to get that hot in the air, but keep in mind the LNA can sit out in front of the parabolic reflector **(see diagram 2).** That is one of the options you have with the selection of your antenna design.

And so? Well, while the LNA is coated with a specially created white 'ray scattering paint' to attempt to control just how much of the sun's energy is absorbed by the LNA metal container, **some** solar heating **is bound to occur.** And from **two** sources if the LNA is mounted at the feed; energy **received directly** by the LNA case from the sun, and, energy **reflected** towards the focal point by the parabolic reflector. True, the LNA mounts behind the **actual** focal point (which is sharply defined at the short wavelengths of the light) but the LNA is attached to the feed antenna **which is at the focal point** and the metal to metal connection of the two can transfer heat to the LNA case. There are not insignificant temperature build-ups at the focal point of the parabolic surface when the sun is passing the equinox period for example. One true story of an early non-white-painted parabolic reflector in use in the industry tells of coaxial and power cables **bursting into flame** from reflected solar energy. In theory, a 20 foot parabolic reflector unpainted can achieve focal point temperatures of 7,500 degrees C. It's not unlike starting a fire as a Boy Scout with a pocket magnifier only this is the big time. **7,500 degrees C is nothing to mess around with.**

SCI's Tom Humphries tells the story of an antenna installation in Florida where one of the AFC horn antennas was in

LNA LOCATION ON TVRO ANTENNA V.S. SOLAR HEATING OF LNA AND EFFECTS ON LNA NOISE TEMPERATURE



LNA AT FEED—WHILE LNA IS PROTECTED FROM 'FOCUSED' RAYS OF SUN AND DIRECT SOLAR ABSORBTION BY SPECIAL WHITE 'RAY SCATTERING PAINT', SOME LNA ENCLOSURE AND INTERNAL ELECTRONICS HEATING DOES OCCUR WITH FEED MOUNTING OF LNA.

LNA BEHIND DISH—PROVIDES SOME 'SHIELDING' FROM DIRECT SOLAR RAYS DUE TO SHADOWING BY PARABOLIC REFLECTOR; WHEREAS FOCUSED RAYS PRESENT NO HEATING CONTRIBUTION.

DIAGRAM TWO

use. **"There was no focused solar energy, only the direct ray energy plus the heat of the day. The installation had an LNA** (not an SCI) **that was painted gray. In the middle of the day the pictures went from good to sparklie, slowly. After doing some checking the system engineer decided his LNA was getting too hot so he fabricated an air-gap enclosure made up from some plastic garbage bags and a garbage can lid. This solved his instant problem; the LNA case temperature went back down and his pictures came back from the noise".**

Bob Goodrich on what happens inside the LNA when it gets hot.

"In any electronic circuit you have thermal noise, the result of electrons in motion. Electrons move faster when the material is heated and therefore temperature relates to thermal noise. There is an increase in thermal noise, and resistive losses also increase. At the same time as this happens active devices such as GaAs-FETs become less efficient with heating. Heat is a problem, just as cooling things off is good for our technology."

Which suggests another avenue for future advances; cooling some or all of the LNA unit. Only it is not as easy as it may sound. Nor as inexpensive.

There are probably a dozen ways to cool off a container such as an LNA. Some of these are not practical with a focal-point mounted LNA, others might be more practical with an LNA mounted at the back of a dish on the end of a selection of waveguide. For example, you **might** build a refrigerated box around an LNA mounted behind the dish where an identical approach for an LNA at the focal point would be out of the range of reason.

Goodrich on cooling.

"The most promising technology here is thermoelectric cooling, or TEC. A small TEC unit could be utilized to cool just the GaAs-FET stages (stages one and two). **Either the two GaAs-FETs would be sealed in their own container and the container cooled separate from the balance of the LNA, or, extremely small TEC devices would be used to 'spot cool' the first two GaAs-FET devices themselves."**

But implementing the TEC approach to cooling brings its own new problems. A cooling system works by taking heat out, not bringing coolness in. When you take heat away from a FET or a small container, it has to go someplace. Getting it out of a hermetically sealed container is not an easy trick and if you leave it around the container you end up trading cooler GaAs-FETs for hotter component parts. This means the cooling is not as effective as it might be.

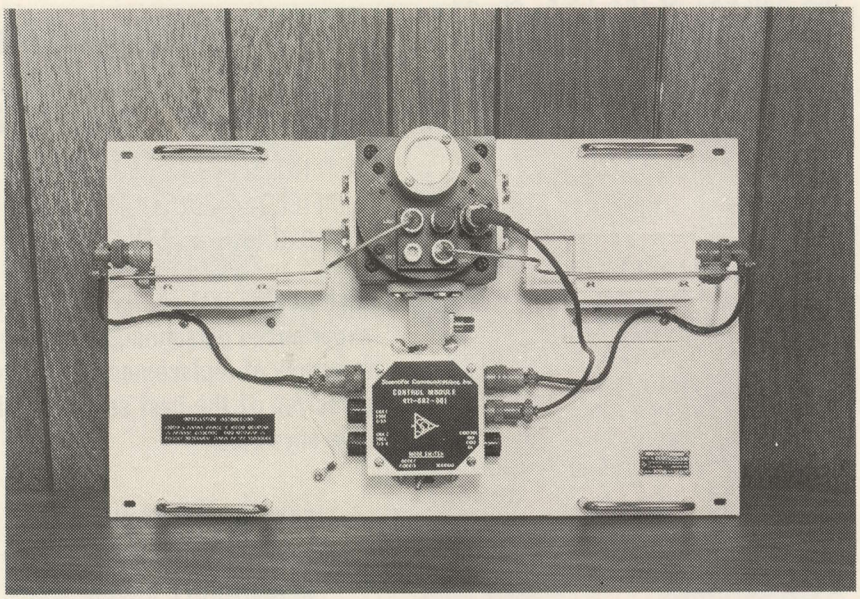
Getting heat outside to the ambient air requires some type of venting system, and that might increase the opportunity for moisture to get into the unit.

Goodrich on moisture.

"Moisture can be a disaster; that's why we hermetically seal the LNA. If a unit breathes freely, when it gets hot it takes moisture in. Then when it cools down the moisture is trapped inside and if the temperature reaches the dew point of the unit's interior you have moisture condensation".

The effect is not unlike a small climatic chamber. With moisture trapped inside, bringing the temperature down can change the climate inside the unit. It could even 'turn foggy' or 'rain' inside the LNA!

What about moisture getting into LNA units? Has that been a problem? They are, after all, exposed to the weather and if moisture has such potential to be a problem, what is the track record for TVRO LNA's?



REDUNDANT LNA DEVICES with automatic current sensing control module. This pair of 100 degree K units (matched to within 5 degrees K) were constructed by SCI for a well known operator of DOMSAT satellites.

Goodrich again.

"There have been a few failures, perhaps a percent or two, and most if not all of those were in the early years. We've taken those that failed apart, looking for an indication of how the moisture got in. Our present approach to moisture barriers is certainly the result of what we have learned, and hermetic seals have improved considerably with the LNA industry's experience. For example, in those that failed on us I was able to trace the moisture ingress with microscopic investigatory techniques by following the salt tracks."

The primary message here is one of caution. If, for some curious reason you take it upon yourself to 'crack the container' on an LNA, when you put the cover plate(s) back on the container there is no such thing as being too cautious about the way you reseal the unit. Moisture can be deadly. Better you satisfy your curiosity about what is inside with the material appearing here and leave the container buttoned up, the way it comes from the supplier.

Powering 'Problems'

There have been a fairly high number of 'expert statements' regarding LNA failures due to powering or voltage transients. At CCOS-77 several people suggested (and we quote) "You have a 50-50 chance of losing your LNA to bad weather or power surges during the first year. . .".

As more and more installations go in, there appears to be less and less evidence to

back up such a high failure rate 'story'.

Humphries on the learning curve.

"Sure, systems have lost LNA's due to lighting, or switching transients. But the rate of failure is much lower than has been quoted. And system installers are certainly getting smarter about how they install their LNA's and provide power to them."

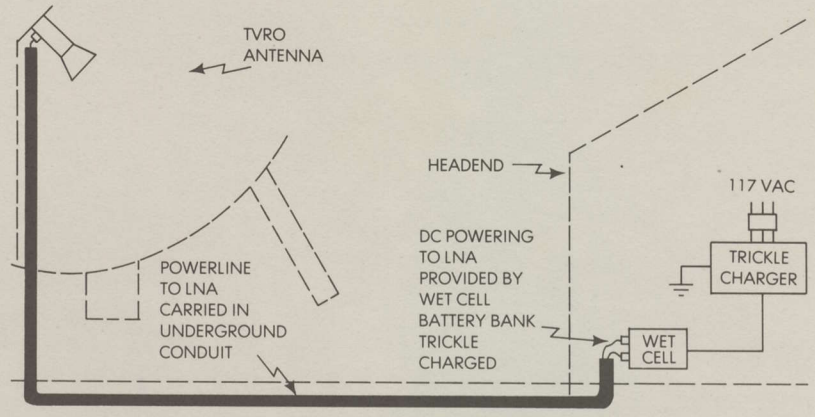
Antennas For Communications' Howard Hubbard (the outfit that provides the horn antennas for those systems unable to coordinate a parabolic antenna), for example, installs all of his LNA power lines in conduit, **similar to** the approach shown in **diagram three** here.

Goodrich on proper powering techniques and protection.

"I suppose the most practical ultimate system today is to separate the power line from the 7/8ths inch downline cable, running each separately in conduit. The conduit should be exceedingly well bonded in low-ohmic connections to driven earthen grounds, even when the conduit is buried. Installers should pay particular attention to conduit joints where two sections are joined. There should be virtually no difference in potential between sections. Then if the operator powers his LNA with DC and provides the DC through a wet cell battery which is trickle charged constantly the battery keeps the DC voltage from surging when there are switching transients on the headend AC power line."

Other recent reports indicate that perhaps the 'cone of protection' theory for low profile structures (i.e. a TVRO antenna) adjacent to taller structures (i.e. a 100-500 foot CATV tower) may not always be valid. Humphries notes:

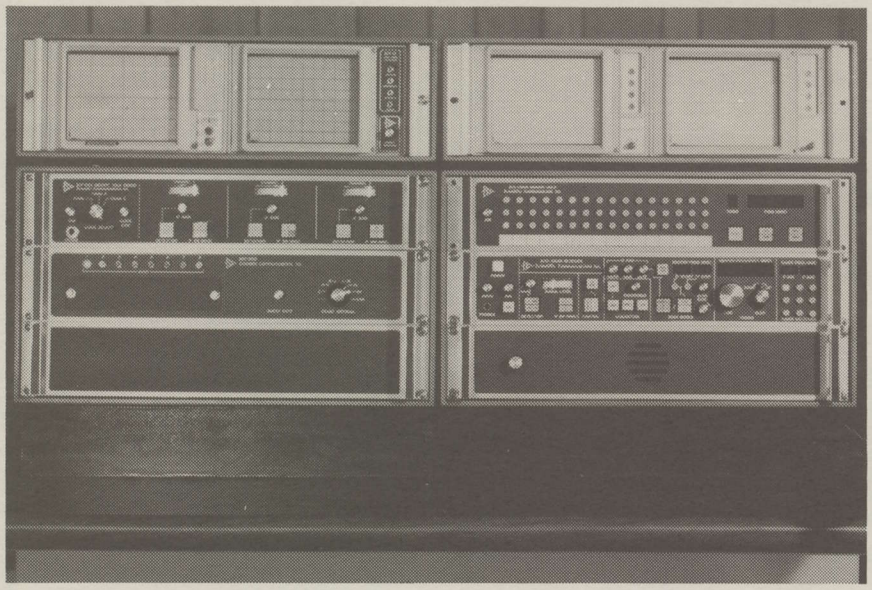
"A firm known as E.F. International has developed a very interesting technique to prevent something called 'side flashing', which is what happens when a lightning strike traveling down a conductor (such as a tall tower) **leaves the conducting structure and jumps across** (at an angle) **to other nearby ground potential objects; such as a TVRO antenna".**



THE EVOLUTION OF TECHNOLOGY FOR PROTECTION OF LNA'S FROM SWITCHING TRANSIENTS AND INDUCED VOLTAGES FROM LIGHTNING

DIAGRAM THREE

SCI HAS INSTALLED their own 3 meter (10 foot) terminal at the Garland, Texas headquarters where extensive LNA testing is performed. With 90 degree K GaAs-FET LNA the terminal has sparklie-free reception from SATCOM.



$200,000 of RECEIVER—Another example of SCI technology. This ultra-ultra sophisticated 'DC to 40 GHz' receiver has eight separate tuners each capable of independently 'scanning' (as in sweeping) or 'searching' (as in modulation recognition) a portion or all of the DC to 40 GHz range. Up to seven of the tuners can be controlled by a computer interface that does automatic surveillance. The receiver system is produced for electronic warfare 'counter measure' search and destroy missions, has 16 'scratch pad' electronic memories built in. The package represents one of the 'ultimate receiving systems' in use in the world today, which says something about the design and product capabilities of Scientific Communications, Inc.

The subject obviously still needs further study, although it would appear that anyone following the instructions here would be a step ahead of the game.

The Stability Of Specs

The CATV industry use of low noise amplifiers just sort of happened. The largest user group of DOMSAT (domestic satellites) services sudden entry into the terminal hardware arena caught many suppliers by surprise. Receivers initially offered, for example, were largely designed along either terrestrial telco microwave requirements or along Intelsat (international satellite) lines. The more recent family of receivers have been substantially lower in price than earlier versions offered **primarily** because the newer breed have been designed from the ground up to reflect the needs of the CATV terminal. Many of the 'whistles and bells' required for terrestrial microwave and Intelsat service are simply left off; we have no need for them and they drive the prices up.

Antennas were more or less created for CATV (or 'low cost' domestic) terminal use and consequently their pricing has been reasonably stable from the beginning (when you compare pricing on a size for size basis). LNA's on the other hand have yet to see that 'designed for CATV' approach. Humphries on this subject:

"It is unfortunate perhaps that so many Intelsat specifications **have ended up in the DOMSAT or CATV market. There are many examples where we build LNAs to specifications which** may be **unnecessary burdens for CATV operators. One prime example is the gain flatness specification. We work towards a +/- 0.5 dB flatness curve across the full 500 MHz bandwidth of the downlink frequency range. If that specification were changed to say +/- 1 dB we could knock quite abit off the cost of the units."**

Quite abit? Like how much might that be?

"Well, let's say that rather than having gain flatness and noise figure curves within the present spec range across all **of the 500 MHz band, we looked at** narrower **bandwidth units.** Just as an example, **if the user spec called for +/- 0.5 dB gain flatness over say 100 MHz** (2.5 transponder channels) **I believe the LNA industry could turn out these relatively narrow band units all day long for under $750 each with 100 degree K noise tempera-**

tures. Or, if we modified the spec from the 50 dB of gain to 30 dB of gain, but retained the +/- 0.5 dB gain flatness requirement we could probably provide this type of LNA with a 150 degree K noise temperature for under $750 per unit. These might be trade offs, but if a system operator is trading off something he does not really **need (such as wide bandwidth or higher-than-necessary gain) for something he does need (money), is it really a trade at all?''**

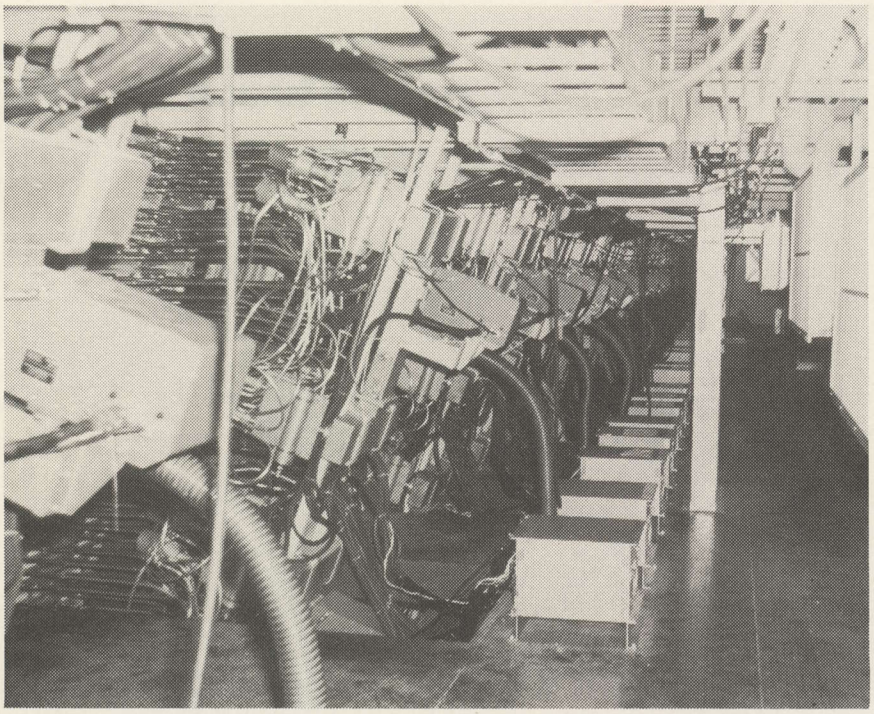
The discussion has merit. For example, with the recent announcement by ASN of their appearance on WESTAR II with four channels of CATV programming (see separate report in this issue), it might well be that a terminal dedicated to this ASN four-channel-set could approach system design parameters from a different direction than say SATCOM users. The combination of a hotter WESTAR footprint plus narrower-than-500 MHz bandwidth LNA's could really bring the LNA portion of the WESTAR dedicated terminal down.

Goodrich on LNA specs:

''Another area that concerns me is the output isolator. Do we really **need this type of isolation, for example. Here is a $100 component sitting in the LNA, designed primarily to insure that if a receiver LO goes wild and appears across the top of the downline after escaping from the receiver that it does not get back into the LNA. Do we really know what the odds of this happening are? And if it happens, do we really know whether the receiver would still operate anyhow with lots of LO leaking back into the downline? Maybe we are paying for protection here that we neither need nor can justify!''**

Needless to say Goodrich and others are looking closely at this. A $100 off-the-top savings for LNAs by replacing the high dollar isolator with a simple fixed attenuator pad for load match would certainly be a worthwhile savings. Goodrich again.

''Of course if we change out the isolator for a load match pad we have to also be concerned with the output capability of the



ONE FLOOR OF SHEMYA, ALASKA ELECTRONICS—The so-called 'Cobra-Dane' L-band radar array has 96 of the SCI parametric amplifiers. Under the adverse conditions of the Aleutian Island frontier these SCI units have chalked up 54,000 hour plus records between failures with no amplifier failures in 2.5 years.

LNA. We'll lose some signal in the match pad, but the evidence suggests that perhaps for most applications there is 3.7-4.2 signal voltage to spare anyhow. On the other hand if there is a need here for this type of relatively high output level, we might have to redesign the output stage of the LNA for higher output capability in order to maintain the third order intercept point. It is another trade off, but perhaps we don't really need what we would be trading away in the first place.''

Is the 50 dB of gain even necessary? Tests conducted during the CATA Mini-CCOS series this fall and re-run at the CATJ Lab during the winter suggests that for many installations it may be a generous amount of LNA signal gain. Perhaps under **some** circumstances it is not needed. Goodrich on gain:

''The gain equation is primarily an exercise in insuring that the voltage gain of the first low noise stages washes-out the higher noise figures of the following stages. You have to look at the noise contribution of each segment of the system. And what it takes to negate that noise contribution in the way of gain, so that the noise figure of the first low noise section dominates the noise equation throughout the system. For example, if you take a 12 dB noise figure receiver and add in front of that 8 dB of downline cable loss you have a 20 dB effective noise figure for that portion of the receiving system after the LNA. What does it take to wash out that 20 dB noise figure?

With 50 dB of gain the noise contribution to the overall noise temperature of the system by the feedline and receiver (20 dB) **is under 0.3 degrees K; 0.298 to be exact. Obviously that is tolerable. With a 40 dB gain LNA the noise contribution of the feedline and the receiver becomes just under 3 degrees K; 2.98 to be precise. That is still a tolerable situation. But when the LNA gain drops to 30 dB the noise contribution of the receiver and the feedline becomes 29.8 degrees K. Is that a tolerable situation? Perhaps for some systems it would be, but for others it would be a disaster.''**

The Road Immediately Ahead

The LNA technology area is anything but static. There is so much happening on so many different fronts that it would be worthwhile to recount them one more time.

In the GaAs-FET device area:

1) The geometry of existing 1 and 1/2 micron gate length devices is improving all of the time. With better control of the gate length comes more predictable GaAs-FET operating parameters and better 'yields' of low noise temperature devices.

We look for 100 degree Kelvin noise temperature 1/2 micron GaAs-FETs to be in the 50% yield region by early 1979 which simply means that 100 degree Kelvin units may well be down to around $1800 each (at the 50 dB gain level) by mid year 1979.

2) Work on 1/4 micron gate length GaAs-FET devices is moving ahead in the laboratory and with U.S. Government research money funding. Because noise temperature performance is so closely allied to gate length, one must expect that when 1/4 micron gate geometry is perfected the noise temperature of 3.7-4.2 GHz GaAs-FETs may well drop down into the 60-70 degree Kelvin region.

When this technology is perfected there is likely to be a year or more between its perfection and its appearance in sufficient 'yields' to make an impact on the market. Early 1/4 micron gate devices will be expensive, a function of that 'yield factor' again. By perhaps 1981 this type of device will be reaching the 25% yield region which will mean $2,500 to $3,000 price tag 60-70 degree Kelvin LNAs for the 3.7-4.2 GHz band service.

3) Work is also progressing on materials other than Gallium-Arsenide for FET construction. However until more definitive results are in the impact of this 'structural change' in SHF field effect transistor fabrication cannot be assessed.

In the existing-FET area:

4) Even utilizing existing 1 and 1/2 micron gate FETs, there are 'tricks' with device and unit cooling which could be employed to lower the effective noise temperature (contribution) of the LNA you now have in place.

Cooling is hardly new. TEC and cyrogenic cooling of Intelsat parametric (exceedingly low noise) amplifiers has been commonplace for nearly a decade. However the cost of the cooling system techniques often exceeds the costs of the amplifier itself, and for the relatively 'simple' TVRO type installations it would appear to be one of those problems which begs a 'new answer'. A certain amount of system experimentation could be conducted if the LNA is located where cooling techniques could be tried without having to construct a cooler at the focal point of the parabola. One experimental private terminal in Illinois, for example, utilizing a Prodelin-type button hook feed on a 15 foot dish has simply placed its LNA inside of a rebuilt portable cooler which maintains a 20 degree F temperature environment for the LNA even under blistering summer sum.

5) A readdressing of the CATV type TVRO LNA requirements is underway. It appears that narrower-bandwidth LNAs with 100 degree K noise temperatures will make their appearance for **certain** applications **this** year. The functional role of certain expensive component parts (such as the output isolator) are under review and they may well be eliminated or modified to less costly approaches.

After the initial surge of business ("ship me something... anything that will work...**only ship it today**!") people like SCI's Bob Goodrich are beginning to analyze the real requirements of the CATV TVRO. We look for more variety in the LNA field over the next year, with some cost effective models in the

narrow band 100 degree K range coming down to the $750 mark before the end of the year.

6) The present LNA designs are a hybrid of front-end-stages of GaAs-FETs and rear-end-stages of bi-polar transistors. The bi-polar stages are chosen because they are relatively inexpensive. With 150-300 degree K GaAs-FET pricing starting to tumble, the design approach to LNAs may change.

With approximately 12 dB of gain per stage it is possible to construct a 45-50 dB gain **all-GaAs-FET LNA** with four stages of active device. Or a 35-38 dB gain LNA with three stages of GaAs-FET. As long as GaAs-FETs were so expensive, it was not practical to do this. However as the 150 degree K up 1 micron devices start to come off the production lines with cookie-cutter regularity, at some point the cost effectiveness of a 'mixed device' LNA will tip away from the present GaAs-FET plus bi-polar approach. This will simplify construction, tune-up and costs will come down; not a great deal at first, but ultimately they may come down substantially as a result of this change over.

7) Many of the present 'equation-techniques' would disappear or re-arrange if the present design philosophy of TVRO receiving sites changed. For example, if the LNA were married **directly to the down converter** and the whole package mounted at the antenna with only a (70 or 700 MHz range) IF signal coming down the coax to the head end, the gain requirements of the first stage (i.e. the LNA) would drop measureably.

Several groups are known to be working on an 'RF head' appoach wherein the initial signal pre-amplification plus the down conversion from 3.7-4.2 GHz to an IF would be handled in a single antenna-mounted-box. The advantages are that by eliminating the downline loss at 3.7-4.2 GHz, the gain requirements of the LNA are reduced. And so is the expensive 7/8th inch downline (losses at 70 or even 700 MHz are more economically handled with conventional feedlines). There are other advantages as well, but for now there are **also** considerable disadvantages. Such as generating an LO signal out at the antenna and keeping it stable under environmental changes, or alternately generating it inside and feeding it back to the antenna head for injection to the receiver mixer.

And thus the clean lines separating the present day LNA technology from the present day TVRO receiver technology merge and fold one into the other. An LNA manufacturer may in fact one day become an LNA-receiver manufacturer and the receiver manufacturer may in turn become the same. And that perhaps is as good a place to leave this report as any, for the time being.

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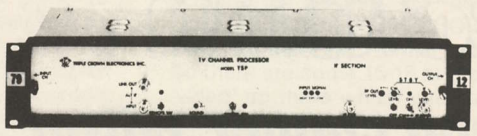

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Coop's cable column

bob cooper editor in chief CATJ

The Developmental License

Ever since word got out that I (as the responsible party for the CATJ Laboratory) had filed an application with the FCC for a 'Developmental TVRO License' there has been an almost endless number of people who have written or called asking "How do you do that???", and, requesting copies of my application to the Commission. So in self defense perhaps I am passing some information along to those who might wish to follow my steps in this area since as of February 6th I became the 'proud holder' of WF92, a one year term 'Developmental License Grant' in the Domestic Fixed Satellite service.

First of all, what is a "Developmental" license? It might be simpler to say what it is **not,** since that may well short-circuit your own interest in such an approach to TVRO licensing.

It is not:

1) A license which guarantees me any degree of protection whatso-ever from interference (created to my system or systems) from other properly licensed users of the 3,700 to 4,200 MHz spectrum. That is, unlike those of you who have full-blown TVRO licenses for your CATV systems (which you obtained after going through a frequency coordination program to determine how existing transmitters or planned transmitters in this frequency range might impact upon your planned TVRO terminal), I have **no protection whatso-ever.** Bell could set up a repeater site right next door and I'd have no recourse at the FCC.
2) I am authorized to utilize the facility only for **my own** 'communication needs', and any **rendering of communication service for hire is prohibited.** Which is another way of saying I could not allow a CATV system in the area (or an MDS system, etc.) to utilize the terminal(s) for receipt of satellite delivered signals for which they would engage in commercial sale.
3) The Commission reserves the right to change any of the terms of my license at will, to cancel the license with only 'reasonable' notice **and with no hearing required** (or allowed if they choose not to reconsider the matter), "if. . .circumstances should so require. . .".
4) The facilities may be utilized by the licensee only for the reception of programming material that the licensee has been authorized to receive by the (appropriate) owner of the programming material.

From this list of things you can**not** do with a 'Developmental Licensed TVRO' it should be apparent that this is no 'back door into a CATV terminal license'. We mention this because some people who have been in a bit of a hurry have asked if they might not get a 'Developmental grant' to be able to go ahead and **construct** their TVRO while their normal TVRO license for CATV use grinds through the channels.

The answer to that should be obvious. **I received** the WF92 license **February 23,** it **was issued** on **February 6th,** and, **I filed** my application for the license way back on about the **20th of October.** So there is no 'timely shortcut' here; if anything the very small number of 'Developmental' licenses granted may put them into a custom handling situation which probably slows them down.

Others have asked if they might not file for a 'Developmental License' as a prelude to later filing for a formal CATV terminal license. The answer is **they are not related.** If (or when) I have some commercial need for a regular CATV terminal license, I'll have to go back and go through frequency coordination, and submit a routine **brand new** application. I will have bought nothing in the interim with the Developmental License except perhaps the legal right to have the terminal in place and operating (although again—not commercially) while the routine license is winding its way through channels.

At least one party has asked if **since** the Developmental License application does not require a showing of 'financial ability' a person might get a Developmental License, build the terminal, and then turn around and file a routine regular CATV application and **avoid** having to go through **'financial disclosure'** to the Commission. That is a question without an answer for now; nobody's tried that one before. However, we are not sure what that buys you. There is a good chance the Commission may **remove** the financial showing requirement anyhow (they **are** considering it), and while you could make a good argument for a waiver of the showing **if** your terminal **was already installed** (and paid for), we really wonder why anyone would set out on such a long, circuitous trek just to get from 'A' to 'B'?

So who is qualified for a Developmental License? Virtually anyone who has a legitimate need to conduct tests of new techniques, new equipment or who must make receiving site tests related to the Communication-Satellite Service. If you are seriously interested, round up a copy of rule section 25.390 which is contained in Subpart E of the Satellite Communications section of the rules that became effective February 13, 1967.

Specifically, you are qualified **if:**

(1) **You are working on the development of new techniques which give promise of improvement in the Communications-Satellite Service,** or,
(2) **You are developing or testing equipment intended for use in the Communications-Satellite Service,** or,
(3) **You are conducting 'path loss tests' considered necessary to the determination of the location** (or equipment configuration) **of a newly proposed earth station in the Communications-Satellite Service.**

Now as to being eligible. There is a difference between 'qualified' to apply, and eligible to receive (a license). An authorization for developmental operation may be issued **"only to qualified parties who make a showing that they may be reasonably expected to contribute to the development of the Communication-Satellite Service. . ."**.That's a direct quote from 25.390 (b). And this simply means that a developmental license is granted to qualified people or firms who have some reasonable chance of doing something worthwhile **that has not been previously done.**

We doubt the Commission is going to get hung up on what has a reasonable chance of success and what does not have a reasonable chance for success. But, this developmental license business is **not** a substitute for:

1) **A legitimate** CATV system TVRO license, or,
2) A way to back-door 'legalize' **a backyard 'private' terminal.**

That needed to be said before people in droves begin innudating the Commission with these simple do-it-yourself (without counsel or engineering advice) applications.

Before moving on, it would seem that anyone who is in the commercial business of developing equipment for the (CATV) TVRO field **really should have** a 'Developmental License'. To

date only a handful have been issued, and if our list is correct, none of these have gone to the companies that routinely build antennas, design receivers or LNAs; although many of these firms have dishes of one size or another sitting out there on their sidelots. The Commission is probably going to be too busy for some years to get very anxious about pushing these firms to get some type of (Developmental) license so we'd like **to suggest** that it would simply be a sign of good faith and support for the Commission's rules that you people who fit this category sit down and fill out your own 'Developmental License' applications. **(I know . . .there is nothing worse than a reformed 'drunk' and here I am telling you to follow my footsteps!** However I really believe it would look a whole lot better to the outside world if everyone involved did take this painless, simple step.)

Anyone involved in the development of TVRO hardware (any type, seemingly that could include connectors or lightning protection systems or what have you) certainly **does qualify** under 25.390 (b). With a handful of exceptions. The usual restrictions concerning foreign corporations, corporations owned or controlled 1/5th or more by aliens, aliens themselves, and so on apply. If you have some foreign-blood in your company, even if in an officer or director position, you'll not qualify.

Must you be a big, giant conglomerate with teams of scientists and millions in sales to qualify? No. Anyone setting out to try to do something (in the TVRO design field) that (1) hasn't been done before, or, (2) has been done but only at (say) great expense qualifies. **The Developmental License is designed to foster experimentation** (under the proper framework of a license) which **might** ultimately lead to **some** improvement in the art; or the way (in this case) TVRO's are designed or work. A fellow working in his backyard, trying to make a bathtub an effective TVRO antenna or working with a conventional antenna but a new approach to receivers (as an example) would qualify. So don't be scared away by the grandeur of it all. The Commission is not even asking that you **succeed** in your attempts; they undoubtedly expect many experiments will fail. Only that **if** you are going to 'mess around' with (in this case) TVRO technology that you have a proper receiving terminal (developmental) license to engage legally in this type of work.

So how do you get one?

First write to the nearest FCC field office, or to the Federal Communications Commission, 1919 M Street NW, Washington, D.C. 20554 and ask for **two** copies of **FCC forms 403** (Application For Radio Station License—FCC Rules Part 25), and, **430** (Common Carrier and Satellite Radio Licensee Qualification Report). You want **two copies** because you may mess one up using it as a work sheet. You will fill out these two forms (about five minutes total time) and you will compose a cover letter explaining who you are and what you are planning on doing (or attempting to do) with your 'Developmental License'.

There are no fees, no Frequency Coordination Studies, and no engineering reports or financial qualification forms involved. Total time is about one hour.

How do you fill out the two forms? And what should the letter explaining your proposal say? I could lead you through the whole procedure step by step here but that seems like a terrible waste of valuable CATJ editorial space. So I have another plan. I will Xerox copy my own application, subtly re-done as an application 'master' with some instructions and make the whole thing available to anyone who writes for it. **(*) But not free.** CATJ is going to charge you a heaitny fee. . .**$5.00 to be exact.** . .to Xerox the forms and provide you with a model 'application cover letter' and instructions. No, we won't get rich on this scheme. We won't even cover the cost of the Xeroxing and the postage and Janet Stone's time to copy these for you at this rate, but by charging **something** for the package we'll weed out those people who like to clip coupons and write off for everything that is 'free'; whether they have any need for it or not.

You will recall (if you read carefully) that the term of a Developmental License is one year. So a few words about getting a renewal since some who apply will have an on-going need for such a license.

Not more than 90 days and not less than 30 days **prior to** the expiration date of the license you will file an application for a renewal of the license on **FCC form 405.** To form 405 you will **attach** a written report that explains:

1) **The final objective of your program** (you might say "to develop a terminal which can be mass produced in 1,000 lot quanities for under $1,000 each"; that would give the FCC something to think about!);
2) **An analysis of the results** of your first (something less than one year) operations, to the date of the renewal application;
3) **The number of hours** you spent on 'each frequency' (this seems like a kind of **dumb requirement** and we'll address that specifically **before** anyone else has a renewal due);
4) **Copies of any published reports** of your efforts or work (for us that's a cinch, but if you have no 'published reports' you simply so state).

And probably they will renew the license for another year.

There is one more thing. The license is your FCC authorization to **build** a (CATV type) TVRO but it is not your authority to **operate** it to receive **(programming)** signals from satellites. How's that again?

Your license will specifically state that:

". . .These facilities shall be used for the reception of only such programming **material that the** (license) **grantee has been authorized to receive and use by the** owner **of the programming material. . ."**

That simply means that a Developmental Terminal, just like a fully licensed terminal, needs to go to the owner of the programming material to obtain the **permission** of the owner of the material to **'access'** his material. Remember that we are dealing with Common Carrier transmissions through the (various) satellite(s) and the programming up there **is not** 'broadcast for the use of the general public' (see our feature article here this month on private terminals). Is this a roadblock?

No, not really. And here's why.

Color bars, for example, are hardly programming material. You could acquire, or access, **we believe** the color bar pattern of say HBO or WULA-TOC **without any formal permission.** So there are some 15-18 hours a day of 'video' up there which you can simply look at without fear of violating the 'acquisition rights' doctrine.

You can also go to kind people like Ed Taylor of Southern/Holiday Satellite Systems (or CBN, etc.) and by writing the **right type of letter** and enclosing a Xerox copy of your FCC authorization (i.e. your Developmental License), after you receive it, **probably** get from kindly Ed his written authorization to 'access' his common carrier signal of programming for say WTCG/WTBN, or later this summer KTVU. **People like Ed Taylor** are just as interested in seeing the technology develop as anyone else around, and **if** making you 'legally qualified' to access his common carrier signal will in any way move technology ahead, as long as you aren't making any money off of his 'programming', I'm sure he'll oblige you. On the other hand, you might not have the same degree of 'cooperation' or understanding from all 'programming sources' up there. . . although you probably run a very small **risk** by 'occasionally' looking in on what it is they have on the bird as you 'rapidly' switch through the channels on your receiver.

So there you have it, Well, almost.

Our WF92 allows us to set up and operate (with some minor notice requirements) in our case terminals 1.83 meter in diameter, 3 meter in diameter, 4.5 meter in diameter and 6 meter in diameter **at any point within the 48 contiguous states.** To run tests, conduct experiments and generally work under the guidelines we initially provided in our cover letter with our license application to the Commission. The significance of this is that **we are authorized** to 'experiment with' terminals **well under the present 4.5 meter** (minimum) **size criteria,** where we want, when we want. With the warm weather coming on and shows popping up all over the country, don't be surprised if you see the **'CATJ LAB'** logo scribed across a smaller-than-4.5 meter terminal someplace. That'll be us, out there conducting some type of test. Come one over and see what's cooking. **It might be very interesting!**

(*—Those wishing a copy of the TVRO Developmental License Pacakge should send $5.00 with the order to: CATJ, attention Janet Stone, Suite 106, 4209 NW 23rd, Oklahoma City, Ok. 73107.)

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Technical maintenance is the key to every CATV system's success. Technical understanding should not be a hit or miss proposition. This Seminar will present—in simple, plain language—Cable Television fundamentals for those directly involved in design, technical operations, and maintenance of Cable Television systems.

It will cover such subjects as:

- **PAY CABLE.** Understanding the various security techniques to determine which concept is workable for your system.
- **MODERN SYSTEMS DESIGN.** How to use a basic hand calculator to compute small extensions or sizable new plant.
- **BENCH TEST EQUIPMENT.** How to select and use test equipment you will need on a limited budget.
- **BENCH REPAIRING.** A logical sequence in understanding typical amplifier failures.
- **SYSTEM TROUBLESHOOTING.** Step-by-step procedures to determine failure area.
- **PRACTICAL "HANDS-ON" SESSION.** How to recognize cross modulation, hum modulation, noise, etc.
- **BASIC ORIENTATION.** Educating new technical personnel in understanding CATV systems technology.
- **THE FUTURE OF CATV TECHNOLOGY.** Practical description of fiber optics.

ATTENDANCE INFORMATION

ENROLLMENT is limited, and is on a first-come basis.

RESERVATIONS may be made by telephone, or by returning the coupon below with the Registration Fee, payable to Magnavox CATV Systems, Inc.

REGISTRATION FEE is $150 per person, in advance. It covers Seminar instruction, instructional materials, lunches, and banquet. Hotel room is not included in this Registration Fee. However, room reservations can be made through Magnavox.

SESSION LEADERS will be members of the Magnavox professional staff.

INDIVIDUAL CONSULTATION sessions are scheduled for discussions of participants' design, maintenance and engineering problems with the Magnavox professional staff.

For further information contact: Mr. Allen J. Lipp

Magnavox CATV SYSTEMS, INC.
133 W. SENECA ST., · MANLIUS, N.Y. 13104
PHONE: Toll-free, West of Mississippi: 800-448-5171, East: 800-448-9121. Or: 315-682-9105

Magnavox CATV Systems, Inc.
133 West Seneca St.
Manlius, NY 13104 (Attn: Mr. A.J. Lipp)

Please enroll me for the Magnavox CATV Technical Fundamentals Seminar, Hartford, Conn., May 18-19. My check for $150 is attached.

NAME _____

COMPANY _____

STREET _____ _____

CITY _____ STATE _____ ZIP _____

Please circle your position: Owner/Manager Chief Technician
System Manager Installer
Bench Technician Other _____