DECEMBER
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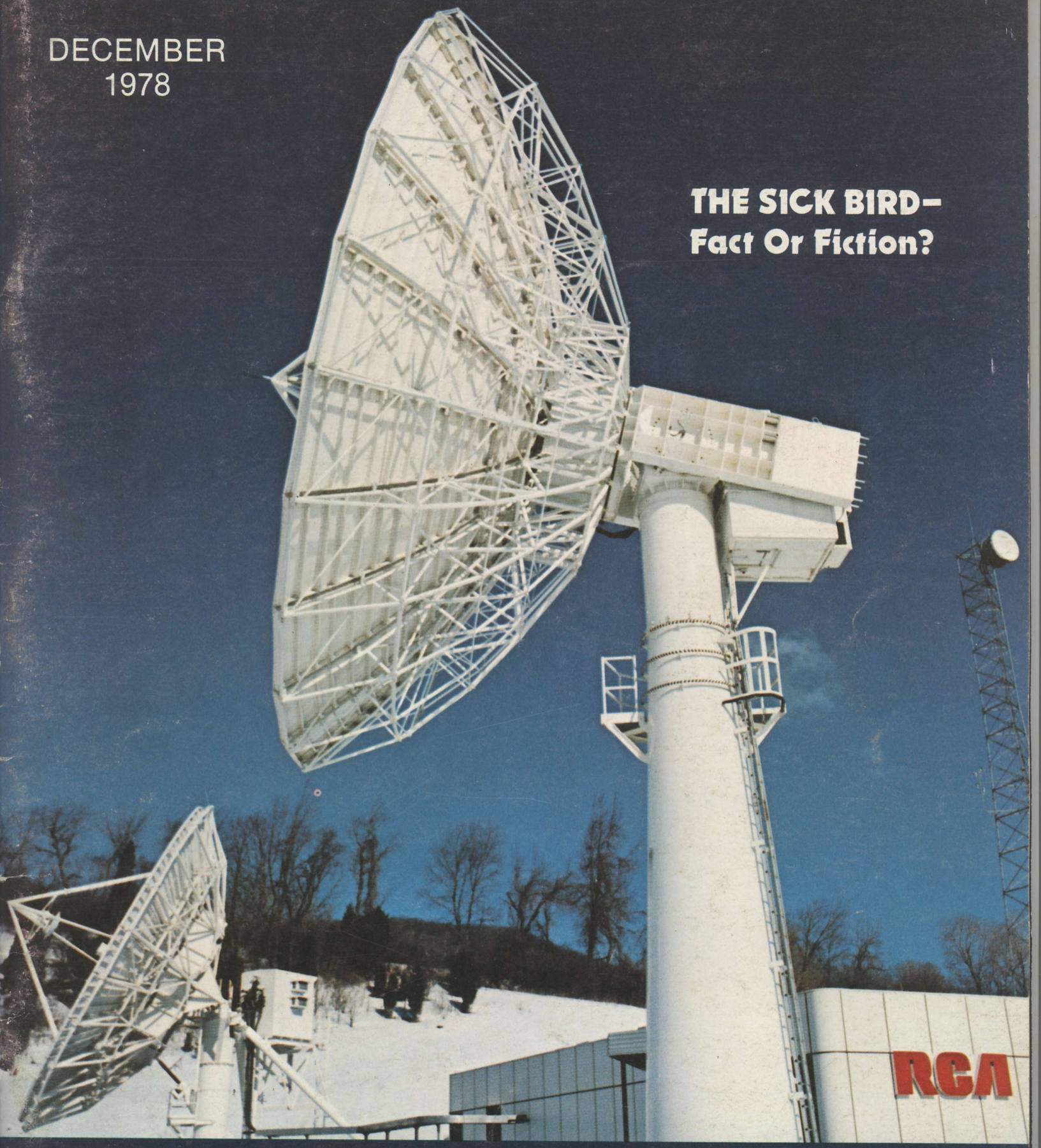

CATJ

OFFICIAL JOURNAL
OF THE
COMMUNITY ANTENNA
TELEVISION ASSOCIATION

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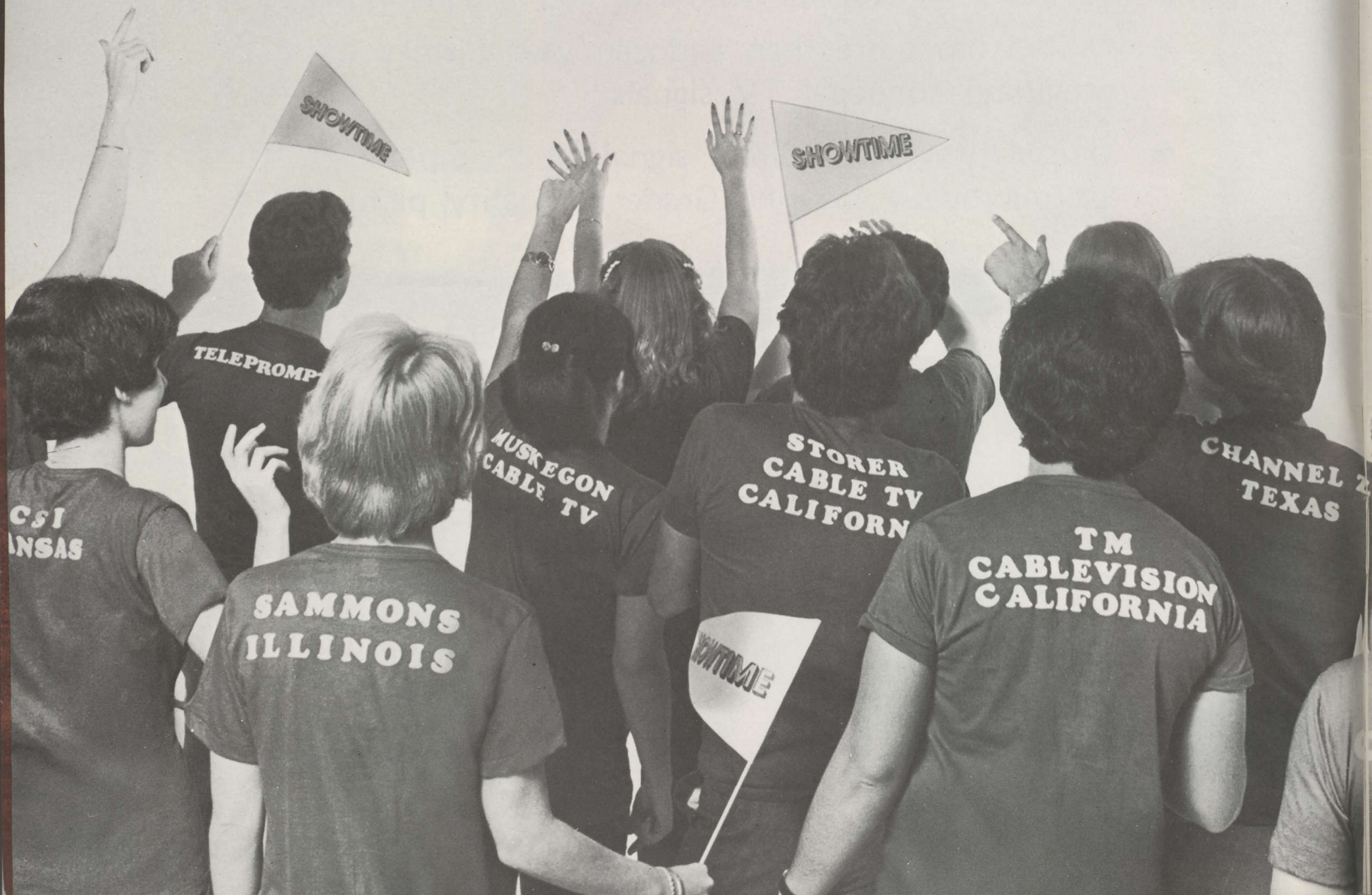

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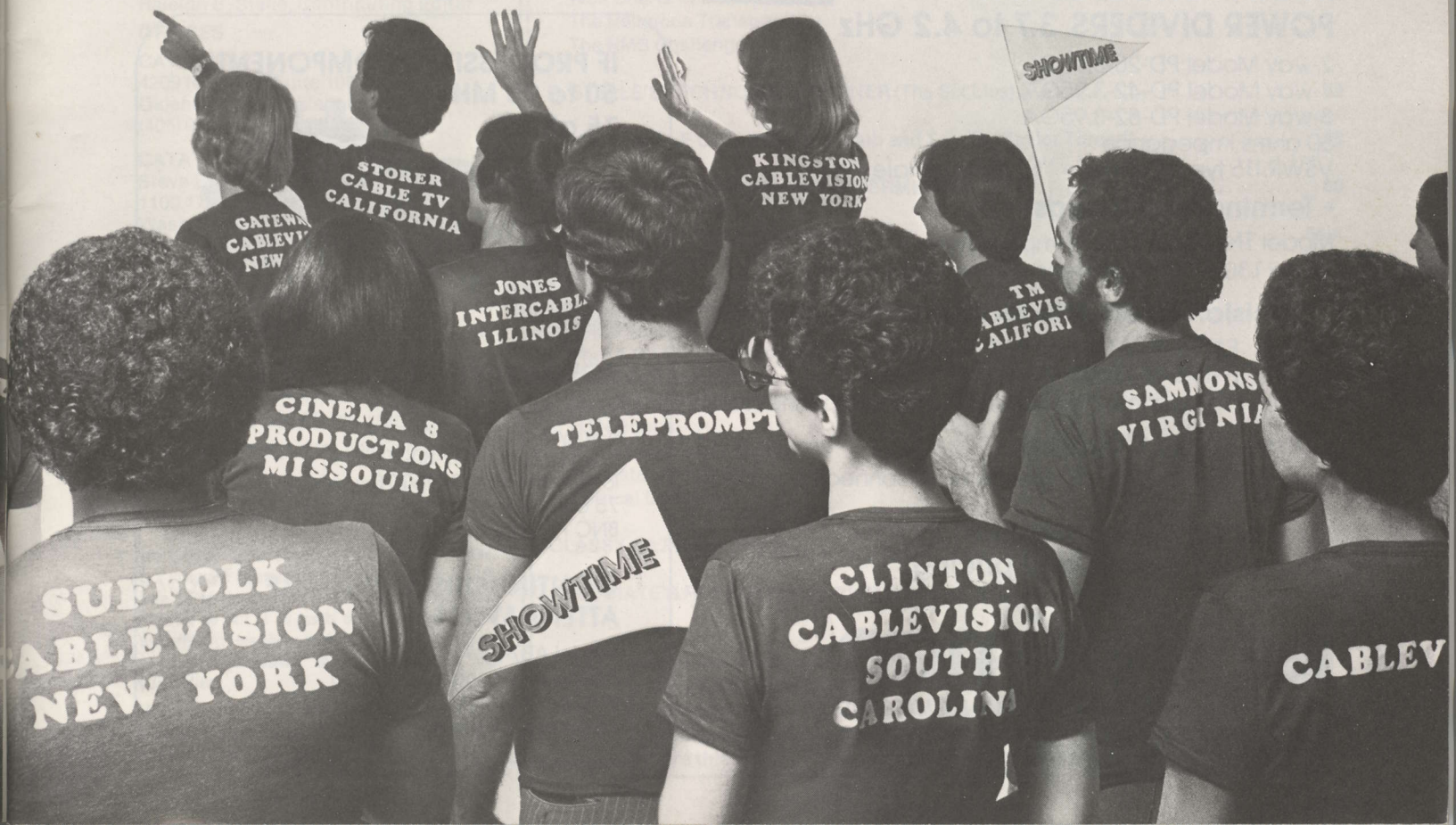

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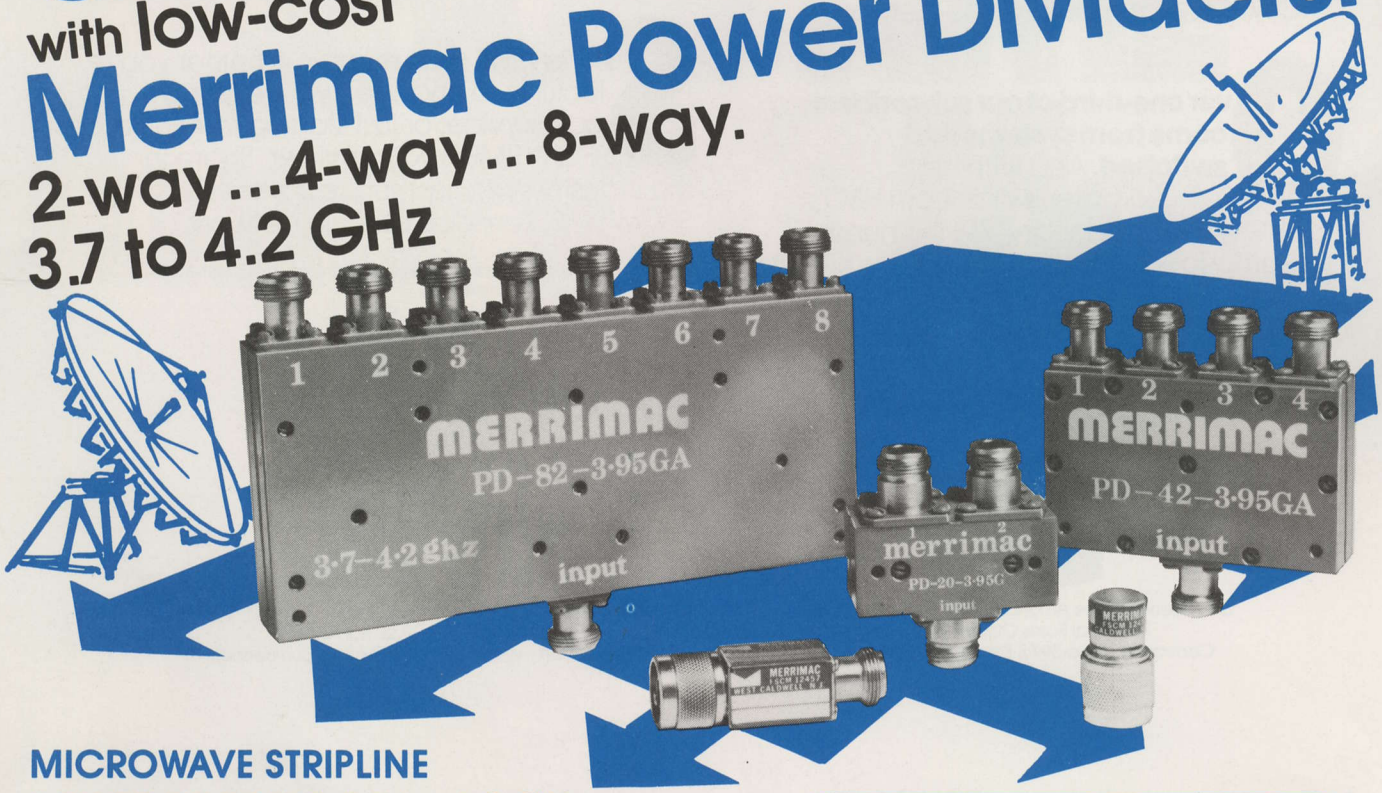

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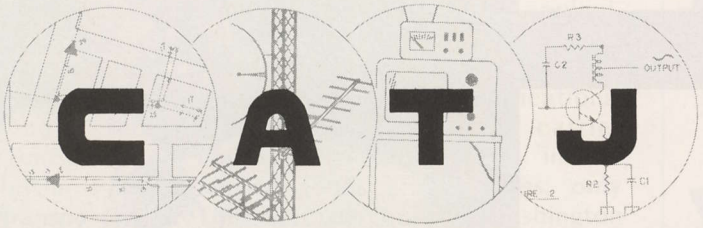

CATJ

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VOLUME 5 NUMBER 12

PUBLISHED MONTHLY, AS ITS OFFICIAL JOURNAL, BY THE COMMUNITY ANTENNA TELEVISION ASSOCIATION, INC., OKLAHOMA CITY, OKLAHOMA, AS A SERVICE TO ITS MEMBERS AND OTHERS PROVIDING CATV/MATV SERVICE TO THE TELEVISION VIEWING PUBLIC AND BROADBAND VIDEO/AUDIO DATA COMMUNICATION SERVICE.

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The Community Antenna Television Association, Inc. is a nonprofit organization formed under Chapter 19, Title 18 of the Statutes of the State of Oklahoma. As such, no part of its assets or income shall be the property of its members; such assets and income shall be devoted exclusively to the purposes of the Corporation.

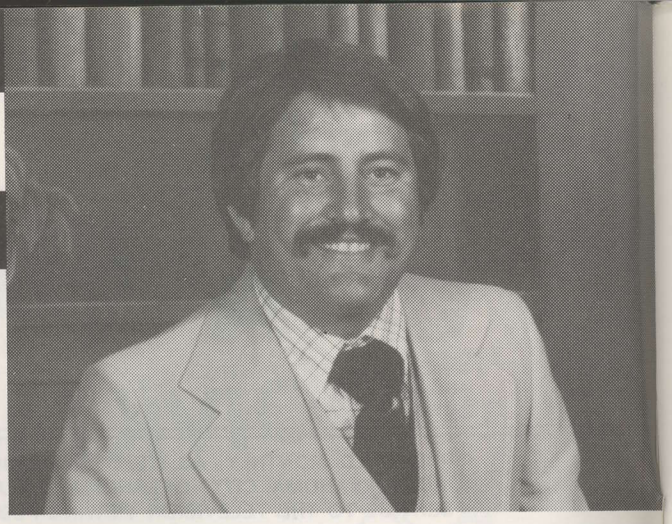
—FEATURES—

—DEPARTMENTS—

OUR COVER

RCA Vernon Valley. Where F1 (and F2) are 'flown' and maintained 'by remote control'. CATJ (and 'Satellite Magazine') visited this impressive facility to prepare a report on the 'health' of the satellites; page 20 here this month. Photo by John Semonish of Focus Photography.

CATA-torial



BEN CAMPBELL, President of CATA, Inc.

Power Center Shift

For more years than most of us care to recall, the bulk of cable's problems have originated at 1919 M Street NW in Washington, D.C.; at the FCC. Events of recent months suggest the industry is in a transition state as the FCC is phased out of heavy handed rules and new legislative initiatives in Congress gain momentum. The FCC's activities on our behalf have not always been greeted with enthusiasm, but at least we knew where we stood; even if it was in quicksand.

The industry has far less experience in dealing with legislation originating in the Congress and where we have had experience we have not always fared well. Let's review what the Community Antenna Television Association has been able to accomplish in recent years since CATA formed to work for a better world for the smaller cable system operators.

1) **Copyright**—here is an example of legislative attack on the industry; one that went back nearly a decade **before** CATA came on the scene. When CATA entered the battleground **all** cable systems were going to pay **big** bucks. Because of the CATA efforts small and medium size system operators ended up paying either token fees or much reduced fees. This was a major concession for the copyright proponents to make and it was a heck of a battle. Hopefully we will never have another one like it.
2) **Small satellite terminals**—here is an interesting example of Congressional pressure exerted upon the FCC. CATA had the opportunity to bring the issue to the attention of Congressman VanDeerlin in late May of 1976. The good Congressman understood our plight (big terminals were too expensive and unnecessary for quality pictures) and he put pressure on the FCC to change the rules. CATA filed a petition to change the rules and the FCC acted.
3) **Small system exemption**—an example of FCC rules, adopted during the 'fear days' at the FCC, which lumped **all** cable operations (from San Diego **to** Gridley) into one category; creating rules which made no sense to small cable systems, and which were certain ultimately to kill cable in small communities. CATA went after exemptions first for systems below 500 subscribers and then for subscribers to the 1,000 mark. And we won again.
4) **Certificate of Compliance**—another example of bureaucratic overkill, adopted during the 'fear cable' days at the Commission. CATA filed a petition to eliminate the CAC, and sure enough after several years of experience with the CAC process (and a change of leadership at the FCC) **even the FCC** was glad to be rid of the procedure.

With the FCC backing out of many areas of cable a vacuum has been created. The FCC, largely to save face, points at the one battle we lost and lost badly **(fines and forfeitures)** as **their** rationale for getting out of complicated cable rules. The FCC believes that now with fine power they can afford to relinquish their complicated rules in exchange for violation notices and monetary fines. We lost the fines and forfeiture battle (although we did manage to delay it one year) primarily because we were fighting a legislative battle as a split industry.

Which brings us to the battle ahead and the messages of the past. The battle ahead may well shape up to be the most intense of any to date. It will also possibly be the most confusing because cable will be but a small part of the halocaust. The battle is of course the overhaul of the 1934 Communications Act.

Every FCC governed service is likely to be affected. This brings into the field every group from CB'ers to broadcasters, cable to telephone companies. The battle field will be Capitol Hill.

We've not done too well in the past "on the hill"; and we usually had the advantage, perhaps, of being the only player on the field at the time of the battle. The 'powers' in Washington have been circulating their thoughts for some months. **Their thoughts suggest they think that cable is looking more and**

more like a common carrier service. One where something called 'separations' should be applied. Now what is this all about?

A common carrier is a 'transportation company'; hauling freight, or electronic communications. Under federal thinking a common carrier 'transportation company' should **not** be in the business of providing goods and services; **only transportation.** They get nervous in Washington when one company dominates **the creation** of the product, **and the distribution** of the same product. "Separation" of the production and the delivery is their solution.

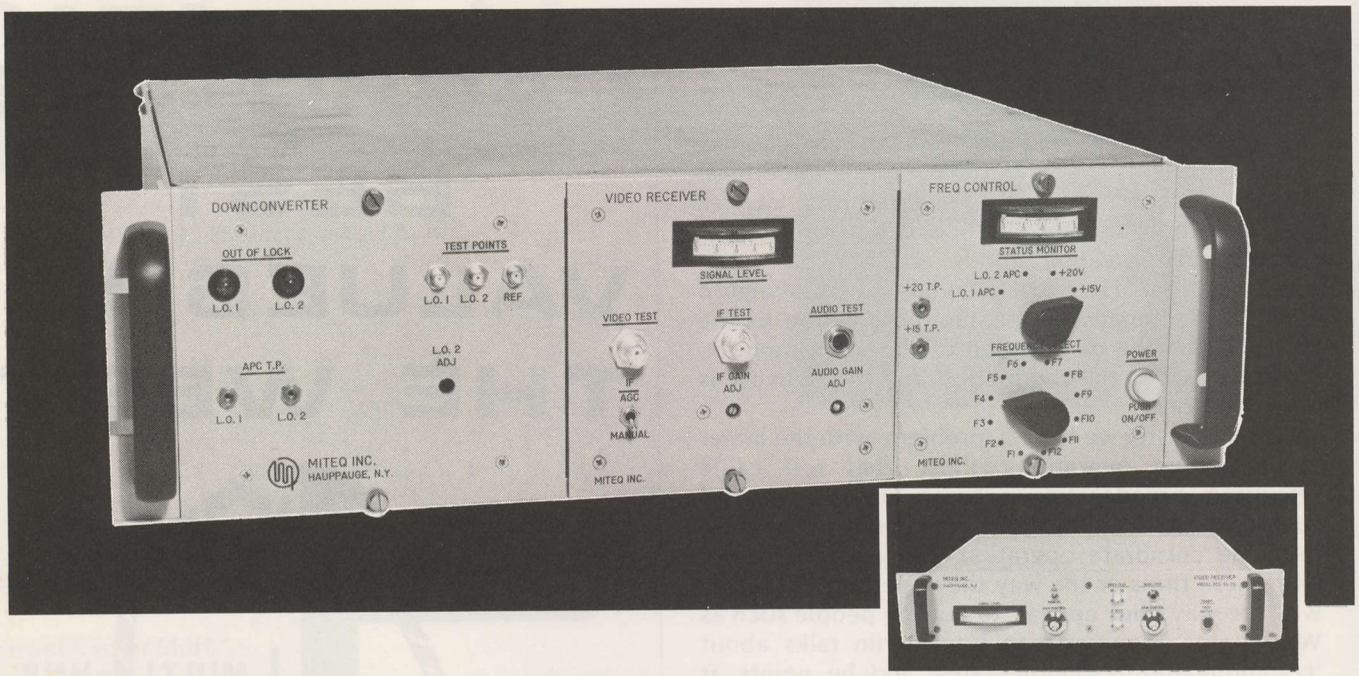
As an industry we have a 'problem' with the larger cable system operations; those that roll cable television, broadcasting, program production, and sometimes newspaper and print media publication into one corporate operation. The problem is **not** with these firms or the way they operate, but rather with the way **'they appear'** to outside people such as Washington. Congressman VanDeerlin talks about 'communication conglomerates' and he points at Time-Life/HBO/ATC, or SHOWTIME/TelePrompTer, or the proposed GE/Cox combination as an example of 'big is unhealthy' . In the Washington setting these 'conglomerates' **look** unhealthy. Never mind whether they are good or bad; to the regulators they 'look suspicious' and reciting them in a long list makes good news copy.

The job at CATA in the coming year of legislative pre-action is double edged; **first** we have to stay on top of the 'winds of Washington' to insure that as the 1934 Communication Act Re-write/Renovation heats up that our membership does not get caught up in a prairie fire. Second, we have to make and re-make the point that it is a minority of the total cable systems in the country which are caught up under Congressman VanDeerlin's "conglomerate umbrella"; that **most** cable systems are owned and operated by **small** business firms.

We trust that the NCTA, as the representative of the MSOs in Washington, will do its best to fend off the attacks of those in Washington who view "conglomerates" with suspicion. On **their shoulders** will fall the task of defending the "giants". On **our shoulders** falls the job of defending the "little people".

Ultimately I am sure that the NCTA and CATA will be fighting on the same side of this issue. But how we get there, and how NCTA gets there, may for at least a little while carry the appearance of separate defenses. To those who might read this with some joy (**"Look here. . .the cable people are fighting amongst themselves again!!!"**), let me caution such people that such is **not the case.** CATA's job is to serve its members and to insure that the best interests of **our** members are carefully considered by any regulatory or legislative body that might somehow mis-conceive **what** it is **we** are, or **how** it is **we** function in the marketplace.

So let's draw no intra-industry battle lines here just yet. Rather let us all understand that "separations" is just as ill conceived for the small operator as it might be for the larger owner/operator.



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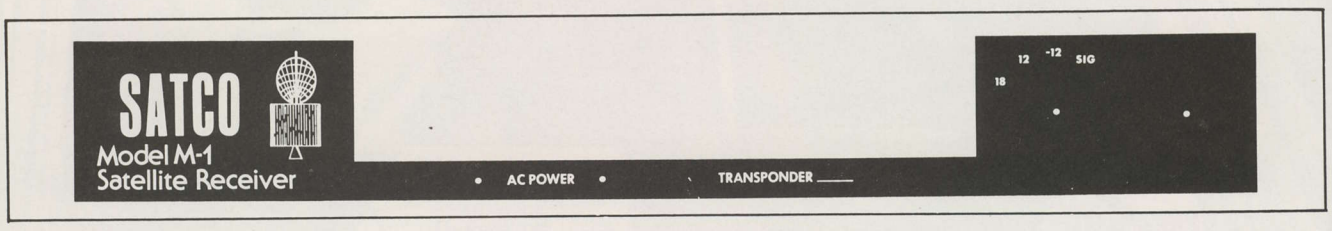
TVRO RECEIVER
MYTH NUMBER ONE

"Satellite Receivers . . . Are Expensive. . ."

This is no myth. TVRO receivers are expensive. And for good reason. **Frequency multipliers** in most receivers are manufactured by high technology houses. They cost as much as **$325 each** and they are in great demand. **High quality mixers** cost your receiver supplier as much as **$100 each.** 3.7-4.2 GHz input **filters**. . .another **$100** item. And the list goes on. TVRO receivers are high technology boxes, and they are expensive. So SATCO set out to bring down their cost. By adopting a unique MASTER and SLAVE receiver concept. **One** high cost frequency multiplier, **one** high quality mixer, **one** 3.7-4.2 GHz input filter **for two to twelve separate receivers!** One MASTER does the work for up to 12 separate satellite channels. This brings our costs down; **four full TVRO channels,** for example, **cost you less than $2,225 per channel.** End of the myth. And the start of common-sense priced satellite receivers.



TVRO RECEIVER
MYTH NUMBER TWO

"Satellite Receivers Are In Short Supply. . . "

Short supply is no myth either. Those frequency multipliers, mixers and bandpass filters that cost so much? They are hand fabricated one at a time in small, high technology 'job shops'. Only a handful of such 'job shops' supply these products to virtually the entire list of companies producing complete TVRO receivers. **There's a bottle neck here.** And SATCO deliberately set out to eliminate that bottle neck. By offering our unique **MASTER** and **SLAVE** approach to receivers. After you purchase your first "single channel" MASTER from us, as you add up to eleven "single channel" SLAVE receivers you never again buy another long-lead-time, expensive (1) frequency multiplier, (2) SHF mixer or (3) 3.7-4.2 GHz input filter. SATCO trimmed the expense and the long lead time out of TVRO satellite receiver delivery. We're not quite 'off-the-shelf' yet, but we are getting close. Find out the full SATCO story today.

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On weekend afternoons in May 1978 WTCG programmed movies and Braves Baseball, and captured the following shares of *total* market viewing (cable and non-cable homes): Albany, Ga. (14%); Zanesville, Oh. (11%); Meridian, Ms. (10%); Anniston, Al. (13%); Alexandria, La. (10%) and McAllen-Brownsville, Tx. (16%). With cable penetration in these markets ranging from one-fourth to one-half of the television homes, WTCG was frequently averaging between 30 and 40% of the viewing occuring in CATV households!

Although movies and sports are mainstays of WTCG's programming, Channel 17 has built a solid record with other types of programming as well. In Zanesville, Ohio, for example, WTCG is the leading station for kids 2-11 from Noon-7:30 PM, M-F. During the 7-9 AM period, M-F, more of Zanesville's kids 6-11 watch WTCG than the rest of the stations combined, and Channel 17 averages an 18% share of the market's households viewing during the time period!

During the 7-9 AM early morning hours, M-F, WTCG is the leading station among kids 2-11 in Panama City, Fl., while in Meridian, Ms. and McAllen-Brownsville, Tx., WTCG takes the lead for kids 6-11 during the 7-9 AM daypart. And in Anniston, Al. WTCG leads among teens. M-F, 4-6:30 PM.

Source: May 1978 Arbitron local market ratings. ADI reports.

WTCG, Cable Relations, 1018 West Peachtree Street, Atlanta, Georgia 30318. (404) 875-7317

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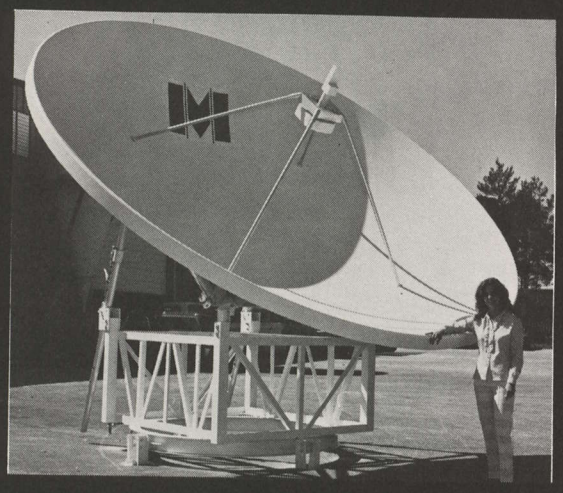

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4. **Proven Dependability** - Over **880** systems are now in use. The most sound method of proving product dependability is successful field operation.

5. **Versatility** - The TEST Scramble Guard System provides security for CATV, MATV, and MDS systems. It is available for low, mid, and high band use.

6. **Simplified Installation** - Our decoder can be quickly and easily installed by the salesman. The head-end modules are supplied with a removable front panel, for either rack or wall mounting.

7. **Theft Protection** - Secured by a built-in anti-theft device, our decoder self-destructs when removed by unauthorized personnel.

8. **Service**- With better service, we want to build a reputation of satisfaction.

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The Subscriber 5000 from Toner: proven hardware, created and serviced nationally by Texas Instruments; proven software, designed and written by CATV people, for CATV people.

All in an on-line, on-time alternative to the cost and delays of manual ledger cards or remote batch processing services.

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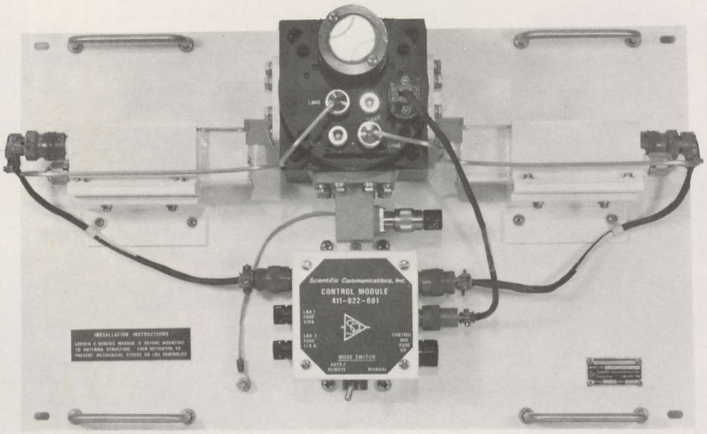
ONE STOP SHOPPING FOR TVRO ELECTRONICS

REDUNDANT FET AMPLIFIERS



The SCI Model SCF-306 Series Redundant GaAS FET Low Noise Amplifier Assembly provides amplification of RF signals in the 3.7 to 4.2 GHz frequency range. The assembly consists of two GaAs FET amplifiers, a low loss transfer switch, and a transfer switch control module. The entire system is mounted on a single plate designed for mounting near the antenna. Interface connector pins provide system status information for remote monitoring.

The two LNA's are in a redundant configuration. Either LNA may be "on line"; that is when the amplifier is connected between the RF IN and RF OUT ports of the transfer switch. The other LNA is "off line" and operating. The input and output RF ports of the off line LNA are terminated at the test ports of the transfer switch. The off line LNA may be tested or replaced without affecting the normal operation of the on line LNA.

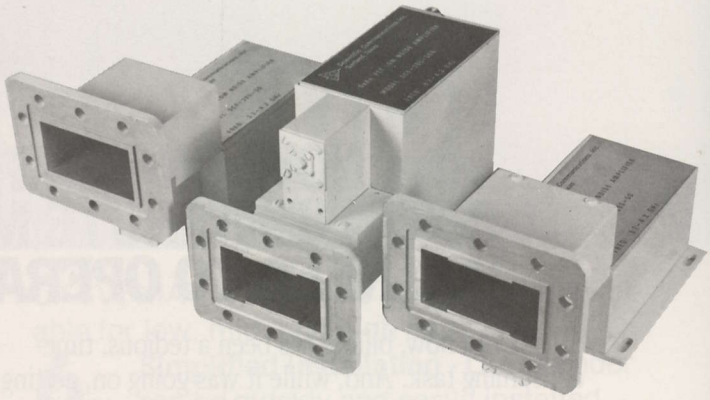
Scientific Communications offers standard 3.7 - 4.2 GHz FET amplifier models at guaranteed noise figures from 1.3 to 3.5 dB at 25°C. Waveguide input (CPR - 229G flange) and type "N" output are standard on all 50 dB gain units. Other options include 115 VAC or 15 - 28 VDC (positive or negative) operation, other gain values from 20 to 60 dB and fault monitor circuitry. All models employ specially designed bias networks for maximum power handling capability and optimum gain stability over wide ambient ranges.

SCI FET amplifiers are housed in weatherproof enclosures and utilize power connectors for installation convenience. An internal IC voltage regulator prevents gain changes due to input voltage variations, permits operation over an input voltage range of 15 - 28 VDC and rejects hum and noise on the DC input lines. The amplifiers also feature short circuit, overvoltage and reverse voltage protection. Waveguide inputs are pressurizable and all waveguide units are supportable by the input flange if desired.

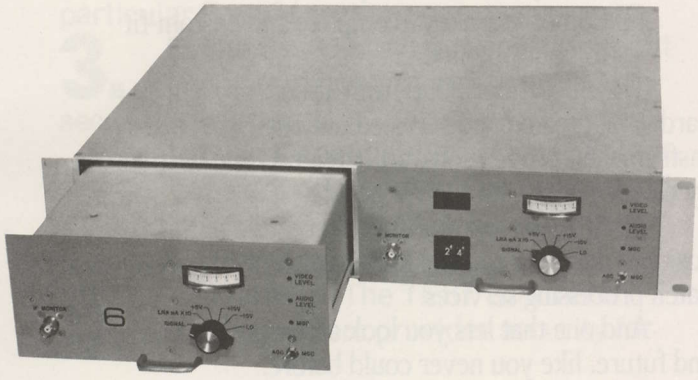
MODEL	FREQUENCY RANGE (GHz)	GAIN (dB min.)	GAIN FLATNESS (+ dB max.)	NOISE (1) FIGURE (dB max.)	VSWR IN (max.)	VSWR OUT (max.)	POWER OUT AT 1.0 dB COMPRESSION (dBm Min.)
SCF-395-50	3.70-4.20	50	0.5	2.6	1.25:1	1.25:1	+10
SCF-395-50A	3.70-4.20	50	0.5	2.0	1.25:1	1.25:1	+10
SCF-395-50D	3.70-4.20	50	0.5	1.8	1.25:1	1.25:1	+10
SCF-395-505	3.70-4.20	50	0.5	1.5	1.25:1	1.25:1	+10
SCF-395-507	3.70-4.20	50	0.5	1.3	1.25:1	1.25:1	+10

(1) at 25°C

GaAs FET AMPLIFIERS



SATELLITE VIDEO RECEIVERS



The SR-4000 and SR-5000 Satellite Video Receivers provide quality picture and sound reception of satellite television transmissions. They have been specifically designed to cost/performance criteria for CATV earth stations.

The SR-4000 is a fully agile, synthesized 24 channel selectable model. The transponder number is selected by thumbwheel switches on the front panel with LED readout of the selected transponder number.

The SR-5000 is the fixed channel version with provision for transponder selection by a crystal change and retuning.

Both units are compact with module interchangeability between unit types except for synthesizer/ L.O. source modules. They each have phase-locked loop demodulators to provide excellent FM threshold performance.

The compact design of these units allows two complete receivers to be mounted in a standard 19 inch rack only 3½ inches high. This feature minimizes the rack space required for multiple receivers when several satellite transponders are to be utilized.

A unique feature of these receivers is the availability of a second subcarrier demodulator. This feature is pre-wired on all units so that the addition of a printed circuit card can provide a second subcarrier for audio, slow scan TV or other software which may be offered by the programming originators.

The SCI receivers were specially engineered to provide simple methods for testing in an operational environment. A meter and selector switch on the front panel permit the monitoring of critical voltages and the IF monitor ouput is available at the front panel to facilitate C/N testing. An AGC/MGC switch and a manual gain adjustment are located on the front panel to further facilitate testing. The rear panel contains an auxiliary video output to allow monitoring of video performance without disrupting programming and an extra pair of audio outputs to facilitate audio monitoring.

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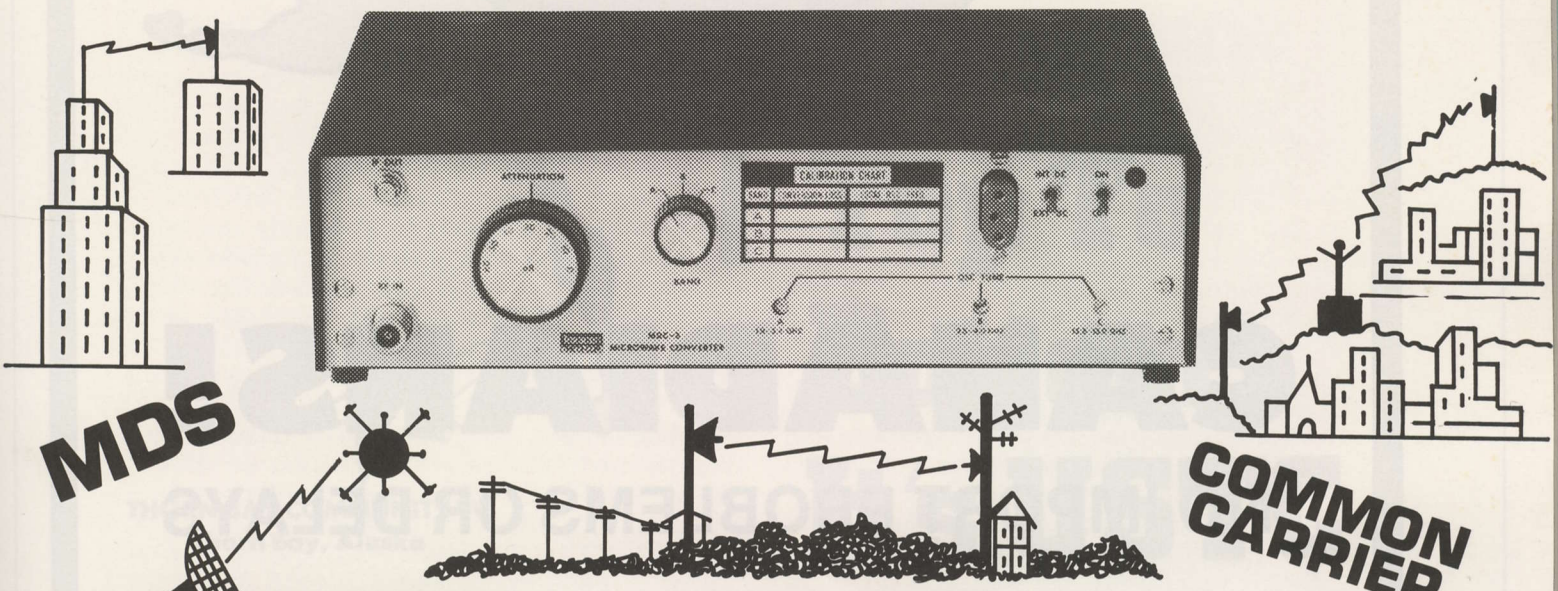

Texscan's microwave down converter permits measurement in the MDS (2.1 GHZ) TVRO (3.7 GHZ) and CARS (12.7 GHZ) band with existing VHF test equipment. Spectrum analysis, signal strength and even microwave sweeping are possible with the MDC-3.

Available as an option are three bandpass filters which speed and simplify the measurement process. The filter kit is required for sweep operation. The MDC-3 has a calibrated insertion loss and adjustable local oscillator for each band. Other frequencies are available.

Texscan

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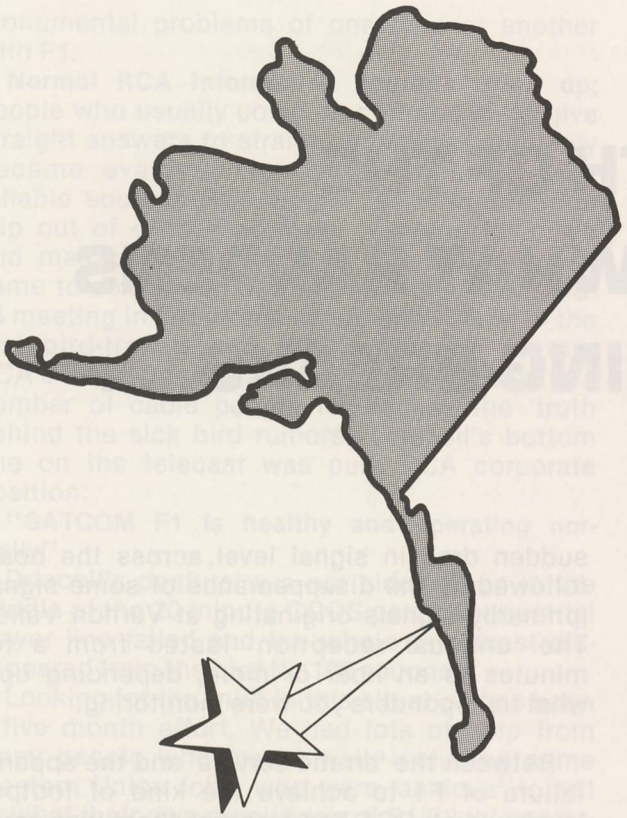

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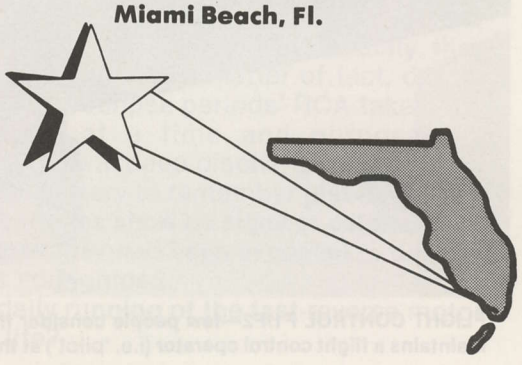


How's Their Health?

THE MYTH OF THE SICK BIRD AND WHAT HAPPENS WHEN SOMETHING BREAKS. . .

When the cable industry changed tenancy from SATCOM F2 to F1 on June the first there were a few surprises in store for the industry. After a relatively uneventful moving day it became apparent by mid-June that F1 was not providing the signal level contours to the United States that had been predicted. To add to the problem this brought on, there were indications that F1 was 'unstable' or 'erratic' in operation; that some signals would suddenly drop in level, or slowly fade (usually down although in theory they would eventually to fade back up) when systems monitoring the reception noted a sudden drop in signal level across the board; followed by the disappearance of some signals (primarily signals originating at Vernon Valley). The 'unusual reception' lasted from a few minutes to an hour or more, depending upon what transponders you were monitoring.

Between the 'erratic service' and the apparent failure of F1 to achieve the kind of footprint levels which RCA had forecast there was ample 'evidence' for most cable people to 'indict' RCA and their F1 bird. Rumors swept the industry and most of them suggested that RCA was having

FLIGHT CONTROL F1/F2—few people consider that once into orbit a satellite must be 'flown' (attended) **24 hours per day, RCA maintains a flight control operator** (i.e. 'pilot') **at this position full time to constantly keep tabs on both F1 and F2 satellites.**

monumental problems of one type or another with F1.

Normal RCA information sources dried up; people who usually could be counted on to give straight answers to straight questions suddenly became evasive. To replace these usually reliable sources RCA began to let information slip out of offices normally reserved for sales and management functions. The status of F1 came to something of a head during the CCOS-78 meeting in Oklahoma in mid-July. There in the last bird-transmitted CCOS program feature RCA's Larry Driscoll appeared on a panel with a number of cable people to discuss the 'truth behind the sick bird rumors'. Driscoll's bottom line on the telecast was pure RCA corporate position:

"SATCOM F1 is healthy and operating normally".

Driscoll's posture was not aided when in the middle of the 20 minute CCOS panel a terrestrial power line failed and the whole broadcast disappeared from the bird for 128 seconds!

Looking for the truth in this situation has been a five month effort. We had lots of help from many people who meant well; including some Western Union folks who were 'anxious' to tell us what their own monitoring of F1/F2 telemetering links had revealed. The problem was actually more of a 'double-problem' since seemingly no one single hypothesis 'fault' of the bird could explain **all** of the observations. Re-stated:

1) **Bird signal levels were below projected levels** (in some areas by as much as 2.0 dB), and,
2) **Bird service was at best erratic with unexplained and unpredictable** (as far as the cable operator was concerned) **level changes;** mostly down.

Various explanations, mostly rumors in that they could not be substantiated through RCA, predominated. Among the most persistent rumors, one lead the way in both its oft-repeated nature and its logic. Simply re-stated, it said:

"When RCA launched F1 a cable which attaches to a bracket on the solar panel array support arm snagged. This bracket/cable hampers the full rotation of the solar panel array which must make a complete 360 degree rotation every day to track the sun (for solar power). **Because the panel will not rotate the full circle RCA must at a precise time each day command the solar panel to stop tracking the sun, and put it into a 'fast reverse' mode under manual control, turning it back around in the opposite direction. When the panel reaches a point just after the bracket/cable snag the panel is stopped and allowed to sit until 'the sun catches up with it'. Then the tracking motor on the bird** (which allows the panel to 'step ahead a notch' every 35 seconds) **is turned back on."**

This turned out to be more than a rumor. RCA, in our CATJ 'Satellite Magazine' video taped visit early in October admitted to this problem. But there was one catch. **"This problem is with the RCA**

KEEPING TABS ON THE BIRD—Triple monitors above RCA control position report on the actual status of both birds at all times. A total of 128 measurement points per bird are monitored, telemetering data is sent in 'bursts' in two second intervals and all monitored points are updated 30 times per minute. Data is also stored on permanent mag tapes for computer memory and control simultaneously.

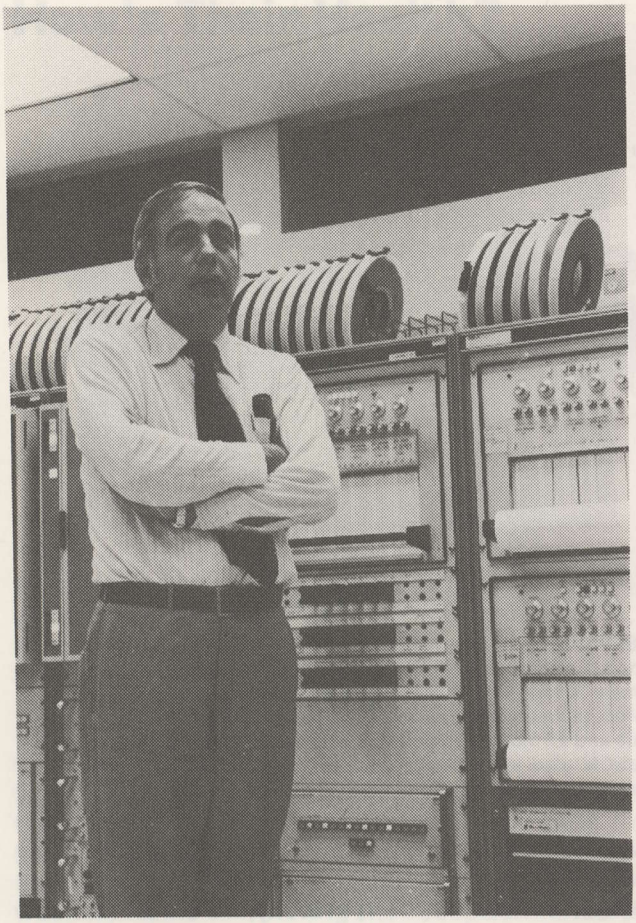
SATCOM F2 **bird, not the F1 bird"** noted RCA's Archie Miller. **"It is unfortunate that this rumor has been associated with F1; actually, we did announce this problem 'to the industry' shortly after the bird was in orbit. But I guess people tend to forget after three years. . .".**

For those bird technology buffs Bob Youngblood explains **"It takes about 45 minutes for the solar panel to 'fast reverse' backwards to the opposite side of the high friction area. During that 45 minutes reverse period the solar panel is not collecting sunlight so we switch to the battery supply system to run the bird. This uses up about 25% of the battery capacity for the bird but during the subsequent period of operation for the other 23 hours and 15 minutes or so the solar cells recharge the Nicad batteries back to full capacity levels."**

Will this problem with **F2** shorten the life of the bird?

"Battery people tell us that we are actually better off taking batteries into a discharge mode on a regular basis. Nicad batteries have a memory factor and unless they are dis-charged on a regular basis 'they forget just how much capacity they have' " notes Miller. As a matter of fact, during the twice a year 'eclipse periods' RCA takes one battery (bank) at a time and purposefully commands it into a 'deep discharge mode' to recondition the battery to remember just how good it is. **"The batteries show no signs of deteriorating any faster than they had been expected to deteriorate"** notes Youngblood.

Will the daily running of the fast-reverse motor shorten F2 life?



ARCHIE MILLER FLIES THE RCA BIRDS—Miller is responsible for all F1 and F2 bird housekeeping functions and maneuvers. He is standing before a small portion of the equipment racks which house the HP 2100 series computers which assist in the bird control functions.

"Not at all; there are two motor systems here; a primary and a back up and we are using it at a rate far below 10% of its rated use level".

Again, F2 is the bird with 'this problem'. **Not F1.**

Yet as those of us who have witnessed F1 service can attest, there is indeed something erratic about its service. June 21st for example.

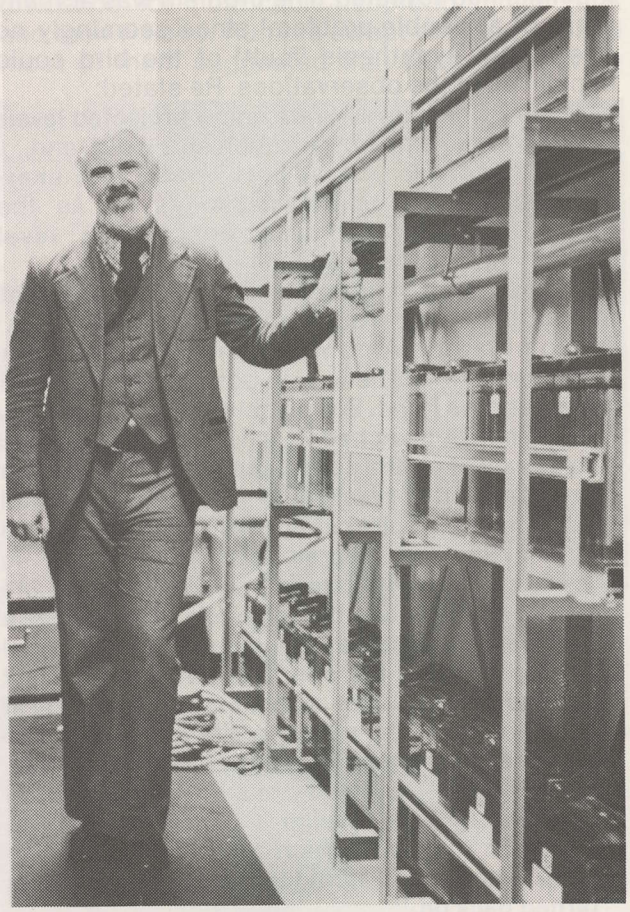
It all began around 10 AM eastern time. Service on transponders 10, 12, 20, 22 and 24 went off; abruptly. Service on transponders 2, 6, 8 and 14 stayed on but degraded by 6-10 dB equally abruptly. Within 20 minutes or so the 'missing transponders' re-appeared, while slowly service on transponders 2, 6, 8, and 14 came back to 'normal' levels.

For this particular incident, which rates high as the most unusual case ever witnessed, RCA's Vernon Valley station manager Bob Bennett has an explanation. Again, this explanation comes out on the CATJ 'Satellite Magazine' program video tape for the first time. Up to this point we had no official RCA explanation:

"From the middle of May through the June first change over from F2 to F1 RCA was dual-feeding the signals from Vernon Valley to both F2 and F1. This was done to accommodate the cable industry; to allow them to make the switchover from F2 to F1 with a minimum of down time. We recognized that not everyone nationwide could make their antenna moves at precisely the same time so we fed to both birds where practical for several weeks.

"On June 21st we were ready to terminate that arrangement. The move was over. Now even though we would no longer be feeding the same (HBO, SHOWTIME, etc.) **signals to both birds simultaneously, we did need the ability to go back and do that on short notice just in case the backup bird was needed. When the cable industry was on F2, the 'backup bird' was F1. Now with the cable industry on F1, the 'backup bird' became F2. So it was necessary for us here at Vernon Valley to redo the 'waveguide plumbing' which allows us to interconnect the various high power amplifiers to** either **of the two antennas** (one transmitting to and receiving from F1, the other for F2) **on command.**

"To re-do the waveguide plumbing we had to install a new 12.5 kW 'dummy load' to absorb the power from the HPA's which was not going to F1; a dummy load that is ready to be by-passed on command to allow the signals to be fed to F2 as a back-up. Our crew had prepared all of the waveguide parts, fittings and so on in advance and we had several people assigned to the project. At the word 'go' we shut down certain transmitters and started tearing out waveguide plumbing, replacing it with



BOB BENNENT RUNS THE FACILITY—Bennent is responsible for the uplink facility at Vernon Valley for RCA. Here he is before a small portion of a large bank of batteries which provide instant standby power in tandem with twin standby 250 kW diesel generators should commercial power fail.

the new configuration. This took us several hours to complete although we had the signals back on within an hour.''

So the June 21st 'incident'; it was not a bird problem at all, but rather it was merely the Vernon Valley facility making waveguide changes?

''Absolutely'' says Bennett **''We were doing some work that had to be done''.**

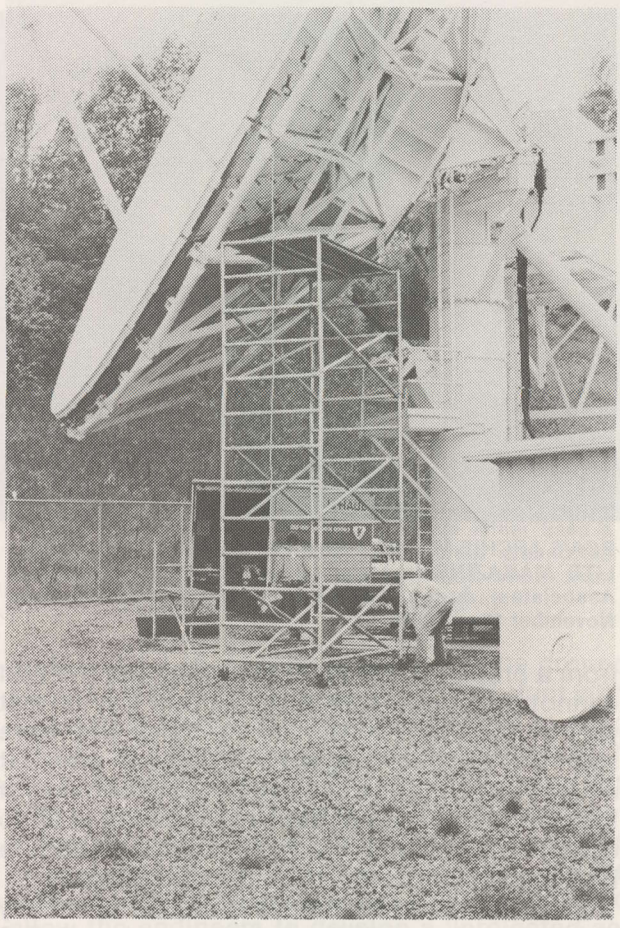
The industry should understand that the (F1) bird receives its various uplink signals from several locations. For example:

Transponder **2** is sent **direct** to the bird **from PTL** in North Carolina; transponder **6** is sent **direct** to the bird **from Atlanta;** transponder **8** is sent **direct** to the bird **from a CBN uplink** in Virginia; transponder **14** is sent **direct** to the bird from the Trinity facility **in southern California.** Transponders 9, 10, 12, 20, 22, 23 and 24 originate at Vernon Valley. In the new-to-the-bird category, transponder 3 originates at Lake Geneva (Wisconsin).

So when we talk about transponders going 'bad' in the sense that picture quality suffers, even if momentarily, we need to keep in mind:

1) **Which transponders are going bad,** and, ask ourselves. . .

CARL HANSEN—of RCA Technical Services brought the RCA TK-76 'Mini-Cam' camera to Vernon Valley and all of the shots you saw during the CATJ 'Satellite Magazine' **program were shot from his shoulder! (Now don't complain when you have to hold your own 'portable' camera for a few minutes at a time; Hansen did it all day.)**



PREPARING FOR WINTER AT VERNON VALLEY—scaffolding under F2 antenna is in place to allow crew to install a de-icing system under the lower 50 percent of the antenna. Two severe winters in a row pushed decision to eliminate ice build up before it starts, even though New Jersey area of terminal does not usually experience heavy ice and snow loads.

2) **What do they have in common?**

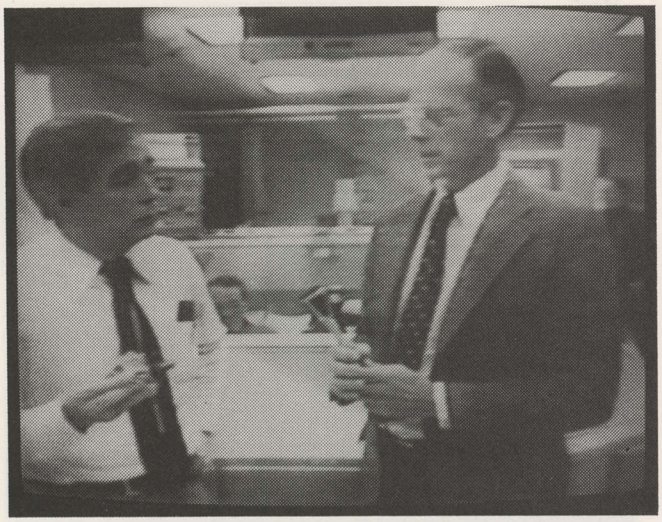
For example, on June 21st **all of the Vernon Valley transponders** left the air; adequately explained by Bob Bennett who admits they were taken off at Vernon Valley. But why did transponders 2, 6, 8 and 14 which do **not** originate at Vernon Valley also degrade (if not actually leave the air) at the same precise time? Bennett has no explanation.

During CCOS-78 **an RCA person** had his own explanation. He offered it to us without prompting:

''The bird got away from us; a controller made a mistake in firing some of the hydrazine control rockets. It took several minutes to bring the bird back to the proper boresight.''

The same RCA person no longer admits this 'might have happened' yet lacking an adequate explanation from Bennett (or chief bird 'pilot' Archie Miller) this remains a plausible explanation.

Miller, during our CATJ 'Satellite Magazine' visit to Vernon Valley, depicted the bird flight control and monitoring operation as being too tightly constructed for such a 'mistake' to **ever** occur. During the VV videotaped tour portion handled by J. Duke Brown, Miller pointed out that **any** bird maneuver has to be inaugerated



RCA'S ARCHIE MILLER (left) fields a question from SATELLITE MAGAZINE 'reporter' Duke Brown (of Microwave Associates) during videotaping of the program aired November 16 and 30th.

from a prepared computer program; that the bird cannot be simply 'told' to move this way or that way by the flight controller. As those who have seen the 'Satellite Magazine' report can attest, it all looks very tightly constructed and certainly **if** the June 21st incident did have anything at all to do with a mistake in the flight control procedure it is no longer possible to do it that way again.

So **unanswered** for now is the question **"Why did the non Vernon Valley fed transponders** (2, 6, 8 and 14) **also degrade substantially while the Vernon Valley signals were taken off the uplink by Bennett and his crew"?**

June 21st has not been the only time such an erratic behavior has been noted. Several other dates in June and through the middle of July come to mind. July the 4th was one where transponders 6 and 8 both degraded substantially for perhaps ten minutes time. Keep in mind they come from **different** uplink points. RCA's official position is **"it didn't happen. . .check your own TVRO facility; it must have been a problem with your receiving system".**

One of the parameters that cable system operators must keep upper most in their minds is that we are dealing with an FM (as in frequency modulation) format. That is, the uplink signal is deviated in frequency as a function of the modulation material present. So when, for example, **two FM signals** appear on **the same frequency** at **the same time** the type of picture one sees is in no way similar to what one might see when two AM signals appeared together (AM being what we utilize for our regular terrestrial off-air service). Every cable operator has seen co-channel interference; horizontal lines across the screen as the weaker signal 'beats with' the stronger signal. However, in an FM system we don't have 'horizontal lines' when there are two signals on the same frequency at the same time. What we do have is 'noise' in the picture; random bits and pieces of noise that look for the world like a weaker than normal signal.

All of which is by way of saying that if somebody, at some uplink site, **happened to hit a button** that 'turned on an uplink transmitter' on a frequency that was already occupied by another signal. . .unless you happened to be monitoring the received carrier level (as is done in **C to N** measurements) you probably could **not** tell from the picture on the monitor whether the degraded picture you saw was due to (1) reduced carrier level (i.e. weaker reception), or, (2) degraded picture caused by interference to the primary picture from a second uplink transmitter. If the second uplink transmitter (the one that was there 'by accident') was not being modulated with a normal video format signal, you'd have almost pure 'noise' in the picture.

Is that what happened to transponders 6 and 8 on July 4th? RCA won't say. They do maintain that transponder **carrier levels** did **not drop** below their normal values at the time in question. RCA **monitors** the **carrier level** present on all transponders at all times. There is an alarm system built into Vernon Valley (and elsewhere) whereby if say transponder 6 drops off a couple of dB in level after going up to the bird and back an 'alarm' sounds. Keep in mind **this alarm system** keeps tabs on **the carrier level,** not the video signal to noise. It is therefore plausible that the carrier level alarm would **not sound** when interference appeared. There are other ways that RCA keeps tabs on **video** signal to noise ratios but these techniques are not 'alarmed', so if it happened an operator would have to catch it on the spot.

Yet there have been a number of substantiated periods **when cable operators have measured** substantial drops in the signal levels received. More and more systems are 'watching' the received signal levels with chart recorders these days and many are noticing what has become known as 'localized outages'. Again, RCA says **"When you experience an outage like this, check your own system out".** Many systems do this by simply calling a neighboring system or two to confirm whether the 'localization' is spreading beyond their own terminal or not.

Back to one of the initially apparent problems with F1; signal contours not up to predicted levels. This one is even tougher to pin down. RCA just plain does not want to talk in detail about the nature or scope of the problem. In fact they continue to maintain that **"F1 is achieving the signal level contours which had been anticipated".**

Signal levels anticipated is an even tougher thing to grasp. Now when a company, such as RCA, goes to the FCC to request permission to launch a domestic satellite into orbit they must include in their application a full set of 'predicted signal level contour maps'. Such maps are on file, and even available for public inspection, at

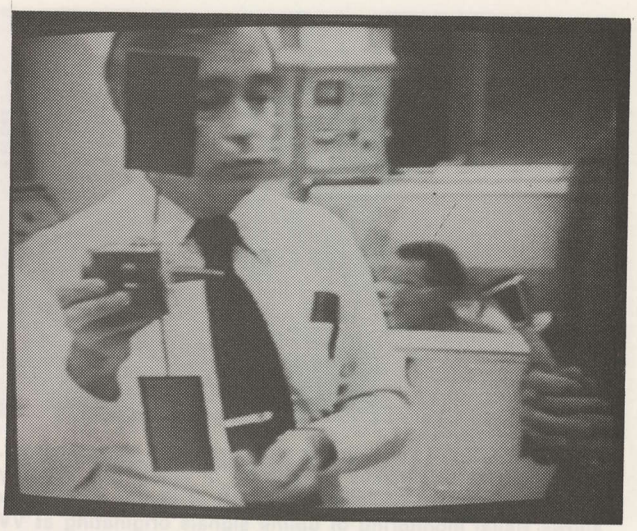
the FCC's Common Carrier Bureau and in the Public Information Office. **RCA F1 maps** have appeared in CATJ from time to time; the most recent being the **May 1978 issue.**

These signal contour maps are computer derived. And surprise; they are not done by taking measurements of the bird after it is in orbit. Obviously the maps must be prepared **prior to launch** since they are a part of the FCC application which requests permission to launch. So how are they done?

When the satellite is initially constructed it is built in pieces or sections. The antenna array, for example, is constructed and then tested and retested on an antenna test range. Anyone who has ever worked with an antenna test range knows full well the limitations of such a system; ranges must be constantly calibrated for changes in ground characteristics, foilage on trees, cows in the field and what have you. Not all antenna test range tests are repeatable; in fact few are from day to day or test to test. **Therefore the numerous tests** (perhaps dozens over the design phase of an antenna array) **are averaged;** to develop a set of numbers (gain and directivity patterns) which best represent the particular antenna array.

Because there are 'ground effects' with an antenna test range, the people running the tests

ONE OF THE TWIN ANTENNAS—at RCA Vernon Valley site. This antenna has the ability to move very rapidly during a launch phase of a new bird to assist in commanding the bird into its prescribed orbit. This is called a 'TT&C' antenna and it is left on F1 for day to day operations.



MILLER FLIES THE BIRDS—RCA's Archie Miller uses a model to illustrate how the solar panels 'step' around the body of the bird tracking the sun each day. Photo from November 16/30 SATELLITE MAGAZINE program.

do their best to 'negate' or wash out the ground effects noted. This is particularily important with an antenna array that will never have any 'ground effects' in its real operational environment; such as a satellite transmitting (and/or receiving) array. This is one of the most difficult aspects of antenna range tests; to properly 'wash out' the ground effects so that the data taken on the range can then be transferred to a computer to allow the engineers to develop a "projected antenna pattern" for the real environment; in this case space.

Here is what we think happened. The antenna test range tests for F1 were in error by some amount; perhaps well within a +/− 1 dB region for most portions of the antenna. But, **we suggest,** by as much as −2 dB in some portions of the transmitting pattern.

Keep in mind that on F1 (as well as F2) there are actually four separate antenna transmitting patterns; transponders are grouped six to a transmitting antenna to allow slightly different (on purpose) EIRP contours for different sets of transponders. Therefore when you 'measure' a −2 dB "error" on one set of transponders (or one channel) you may end up with a "no error" or a substantially lower "error" on another transponder or transponder set.

RCA maintains the test range results were accurate and they stand by their on-file EIRP contours. This is of course an absurd position when perhaps 100 cable operators have taken accurate (within the measurement capabilities of each) measurements since June, on a regular basis, and all find **consistently lower** (or consistently different-than-predicted) **signal levels present.** While RCA can well question the measurement techniques employed by individual operators, it has a difficult time responding to consistently "lower than predicted" contour results. In short, we as an industry may not have the precision of an RCA measurement, but what we lack

RCA VERNON VALLEY—uplink monitoring and control center. Equipment to left makes up portion of alarm and security monitoring system while gear just left of center in tall rack allows visual monitoring of uplink signals originating at VV site or in New York and brought out to the site via terrestrial microwave.

in precision we more than make up in quantity. **Our best argument is simply that we consistently find levels lower than the RCA maps say they should be.**

Several systems have been forced to install better LNA units for F1; units previously adequate for F2 are simply not cutting it with F1. Most of these systems are located along the Gulf Coast from eastern Texas on around to Florida. For systems previously utilizing 120 degree K LNAs the next step better is a tough one, to the 100 degree K region. Production of this top of the line (i.e. best possible with today's state of the art) level device has been slow but LNA suppliers report as of mid-November they are "about caught up" in this area.

RCA, meanwhile, has approved the running of additional field measurements by a well known field engineering and measurement firm. Tests run on transponder 20, 22, 24 during the daytime hours through late October and early November (un-modulated carriers or grey screens, no energy dispersal waveform, no audio) facilitate these field tests. To the best of our knowledge this is the first time anyone (meaning RCA, Western Union, or ATT/GT&E) has actually gone into the field to make a large quantity of field measurements.

What will the measurements prove? Probably nothing that we do not already suspect.

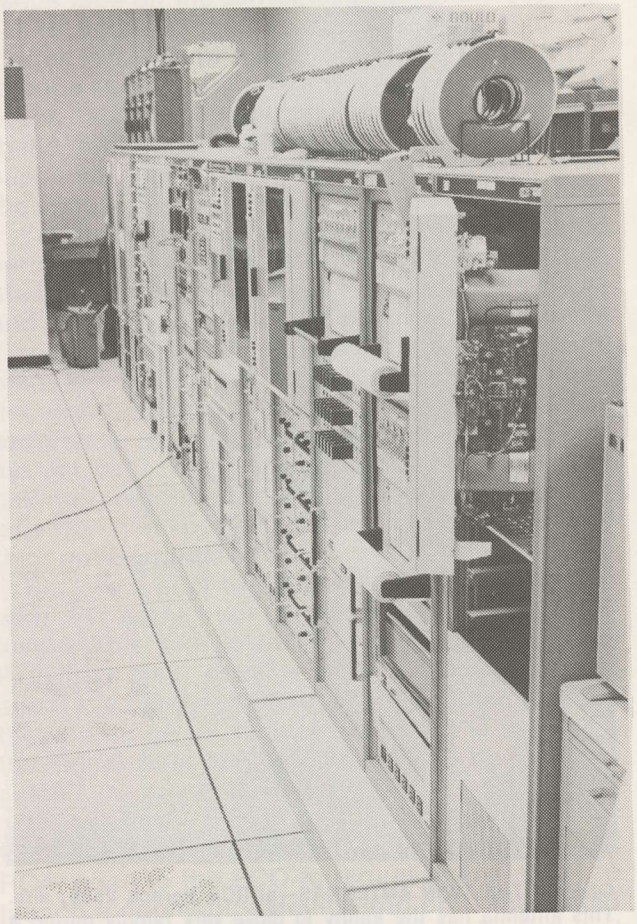
What will the measurements accomplish? That's the bottom line. Is there going to be relief ahead for the industry? That is, will such tests (and other activities now going on) result one day in signal levels 'being adjusted back upwards' to the RCA maps on file with the FCC?

We must suggest that we don't think so. That is, what we now have **(we believe)** is what we can expect to continue to have for the balance of the life of F1. Signals won't (we believe) get any better and as time wears on and the bird degrades on its own just because it gets old, the signals will go down. Hopefully slowly.

CATV suppliers have been particularily bitter over this problem. When they use and depend upon RCA contour maps for calculation of CATV system receive terminal parameters, only to later discover that the contour maps were generously optimistic of the real world, the suppliers are caught in the middle between a customer who expected a certain 'margin' and a terminal that is doing everything it is capable of doing but which still falls short simply because the input signal level from the bird is below the predicted levels.

RCA says **"Suppliers should be more careful with their system design; they shouldn't be trying to squeeze every tenth of a dB out of a terminal".** The suppliers respond **"That's not the problem. . .your predicted levels are low and that's where we get into trouble".**

When it first became apparent F1 contours were lower (at least on some transponder sets) than predicted, back in June, in areas such as the Gulf Coast, Florida and New Englad, many suppliers felt that New England would never 'fly' with less than a 6-7 meter antenna. Florida has always been 6-10 meter country but with the switch from F2 to F1 many suppliers felt that the 'higher predicted contours' from F1 into New England in particular would make the northeastern states 'five meter country'. By mid-June a panic set in. Several suppliers, with many bids out for 4.5 and 5 meter terminals in New



TWIN HP 2100 COMPUTERS—are in use at the Vernon Valley site to constantly log, verify and approve any maneuvers which the 'human controllers' might institute.

England, froze in their tracks; convinced at the time that anything smaller than a six meter was suicide in New England. **This area of the country has a double problem;** not only are contours below 'predicted' levels but the 'look angle' (i.e. the elevation above the horizon to 'see' the satellite) is very low, dropping to 8-9 degrees in extreme cases. The low look angle creates two problems:

1) It makes **clearing terrestrial objects** such as buildings, hills and foilage more **difficult** for some sites;
2) As the antenna goes to lower and lower 'look angles' the natural **'heat/noise'** of the earth begins to **degrade the video signal to noise ratio.**

Smaller antennas (i.e. 4.5 or 5 meter) are quicker to start noticing 'earth noise' than larger antennas.

Well, experience in New England in the interim seems to suggest that the smaller antennas will in **most cases** still work adequately. Of course the 100 and 120 degree grade LNAs are uniformly utilized with these smaller size antennas in this portion of the United States. Still, many systems that had originally been thinking about the two small size antennas have upgraded to six meter antennas before making the actual installations. This turns out to be an individual system decision; one which long term may make a great deal of sense.

During the CATJ **'Satellite Magazine'** visit to RCA Vernon Valley we also asked the RCA people to discuss with us the long term life expectancy factor of the satellite; and its individual transponders. There are two types of failures of concern:

1) **The catastrophic failure,** wherein something happens to the bird's powering system or something ruptures the outer skin of the bird rendering it useless, out of control, or both;
2) And, **the localized failure** wherein some portion of the satellite ceases to function.

The catastrophic failure, should it happen, will probably give us little or no warning. A meteorite punctures the bird, or some portion of it. Something suddenly dies in the powering system draining all of the power off the battery supply (as happened this fall with a 90-day-in-orbit SEASAT bird). In the event of a catastrophic failure, what happens to cable?

We are supposed to move back to RCA F2. At Vernon Valley the transfer would take Bob Bennett and his crew only seconds. At other uplink sites, such as CBN, PTL, Trinity and Atlanta the antennas utilized to send the signals to the bird would have to be re-positioned. June 1st all over again, in reverse. RCA has an arrangement with the Canadian ANIK operators to transfer, on an emergency basis, all of their RCA Alascom traffic from F2 to one of the extra ANIK birds should the need arise. This agreement covers utilizing 11 of the 12 transponders on the 'spare ANIK'. The primary rub here is that RCA

WESTERN UNION—although cable use of WESTAR family of satellites has been slight, WU actually preceded the RCA SATCOM bird into orbit by approximately one year.

Alascom may at any given moment have 15 transponders in service. Eleven and fifteen are not the same numbers and that leaves four RCA Alascom service channels looking for a home.

If F2 was the one with a catastrophic failure the RCA Alascom traffic would still move to ANIK but that would of course leave F1 traffic with no backup. It is food for thought.

The 'localized failure' is more apt to happen of course. Other than the recent SEASAT catastrophic failure such events are rare. **Localized failures can occur at anytime although they tend to give some warning.** RCA, for example, constantly monitors 128 different 'test points' per satellite. Temperature, voltages, power and other factors are sensed, converted to digital signals and transmitted down in 2 second data bursts. At the Vernon Valley site this information is displayed on a series of video monitors, compared against normal operations data in a computer, and converted into constantly running strip chart recorders. It is a very neat system with plenty of safe guards. Seemingly unless something goes 'bang' there will be plenty of warning.

Most systems have backup equipment **on the bird.** There is redundant just about everything except for the output power stages in the downlink transmitters. A transponder (i.e. one transponder) can go 'sour' without impacting on any other portion of the bird. To date there have been two such failures on F1 and at least one over on F2. Initially transponder 4 on F1 failed; there is some conjecture it was 'still born' before it got into orbit position. Most recently transponder 13 failed although in fact it had initially failed much earlier. Transponder 13 was to have been the 'home' for Southern Satellite System's WGN offering (see **Coop's Cable Column,** this issue).

Transponder 13 has a heat problem. Initially RCA sources reported the transponder would not come on, on command. Later they reported the transponder was 'fixed' from earth by commanding the bird to a different configuration. Still later transponder 13 was 'officially broken'. Actually, according to RCA sources, 13 does work but it

WU GLENWOOD (Vernon Valley) does full time monitoring of all Western Union uplink sites via 'remote control'. Operator/ technician can 'punch up' a whole series of video displays that report to him everything from status of uplink transmitters all across the country to whether the tower lights are operating in San Francisco (or any other uplink terminal). **Remote monitoring is 'two-way' in that when technician detects malfunction he can command a change to backup equipment.**

heats up beyond limits. RCA has around 4-6 hours per day which they **could** use 13, after which the heat build up becomes dangerous to other equipment on the bird. So they must shut it down after abbreviated use. For a near-full-time service such WGN this would not be acceptable of course.

RCA's Bob Youngblood does not subscribe to the often repeated 'rule of thumb' which many satellite engineers are quick to quote. It goes like this:

"In a 12 channel bird you will lose one transponder of capacity every two years; in a 24 channel bird you will lose one transponder per year."

If RCA has lost two on F1, and the bird has been in operation since 1975, either RCA is luckier than the rule of thumb, the rule of thumb is in error, or, we can expect another failure or two before the end of 1979. RCA's Archie Miller admits that transponder failure (i.e. localized failure) will possibly be the factor that determines when a bird is replaced in orbit. As Miller pointed out in the CATJ **'Satellite Magazine'** visit, RCA says they currently have enough fuel on board for nine full years of operation. Fuel, hydrazine gas, is utilized in the 'station keeping' of the satellite and when it runs out the satellite will drift out of its assigned orbit spot and become useless for commercial communications. Nine years added to the 1975 launch date brings us to 1984.

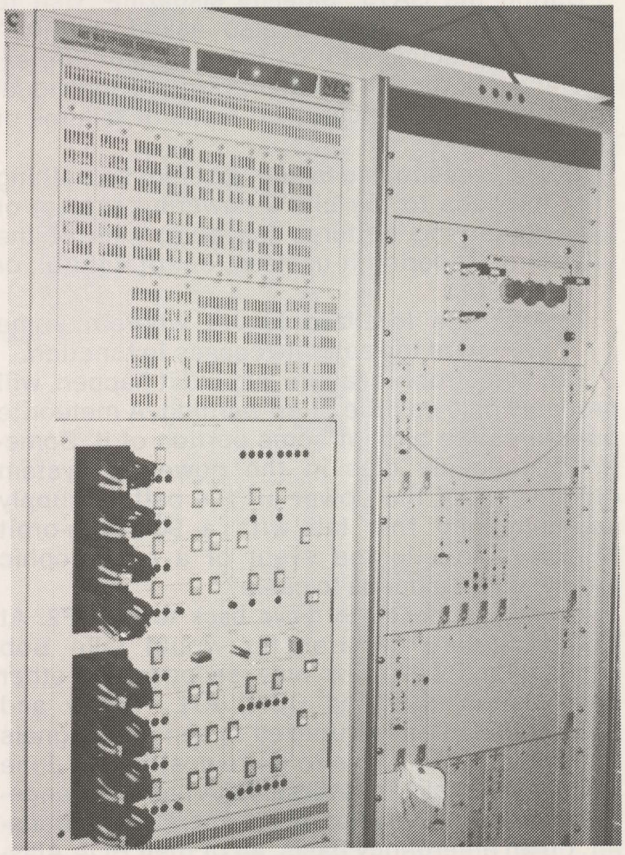
"The satellite, like anything else, has a finite life. There are things in it which will eventually fail and for which there is no backup system (i.e. the TWT tubes in the output stages of the downlink transmitters). **At some point in time a decision has to be made whether to keep the bird in operation or replace it."**

The bird remains a large investment; to put up a new 24 channel bird **today** costs in the neighborhood of $50 million; launch costs included. If a bird is capable of returning a maximum of $18 million per year (when fully loaded with 24 full time service channels), seemingly a 7-9 year lifetime would be long enough to get back the costs of the bird, the launch. . .and the annual costs of operating the system. However not even F1 is full and as transponder quit the maximum realizeable annual revenues drops down with each failure. That's the equation which Miller references to when he says **"At some point in time it is more expensive to keep the bird in orbit and continue operating it than it would be to replace it".**

Through the next few years of operation on F1 we can safely assume only that some additional transponders will indeed fail. What happens if a transponder you are using for a CATV program service fails?

The answer depends upon the type of contract between RCA Americom and the program service. There are three 'classes' of service and each has certain rights in the event of transponder failure.

Those folks with **'guaranteed service'** have the assurance that short of a catastrophic failure they will have a transponder to go to in the event of a localized failure of the transponder they are on. Under their contract with RCA Americom if their transponder fails, RCA must provide them with a replacement transponder virtually instantly. Where does that transponder come from if the bird is full? We'll see shortly.



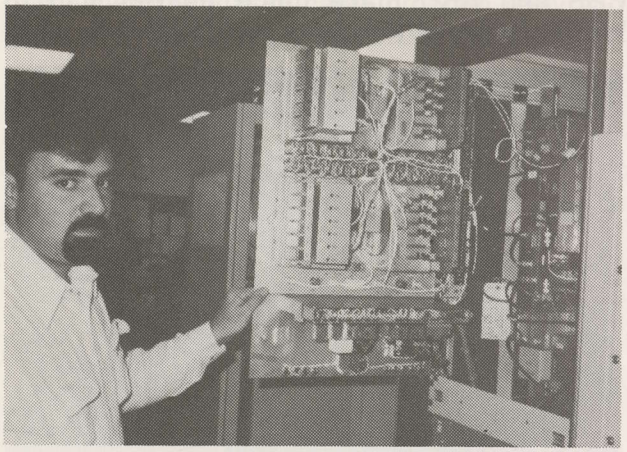
DIGITAL VIDEO IS COMING—Western Union actually has a digital system 'on the air' and in operation on a daily basis. System is an NEC (Japan) design and serial numbers 1, 2 and 3 are owned by WU. WU engineers are currently pushing the bandwidth limits with 62 + megabit data per transponder.

Then there is something called **non-pre-emptible service.** That simply means that RCA Americom can**not** call your program supplier in the middle of the night and tell him (a) **"XYZ Programming is off the air due to a transponder failure"**, and, (b) **"We are taking** you **off the bird so they can have your channel".** Like we said, this is **not** going to happen to those firms renting non-pre-emptible transponder time. But, by the same token, there is no guarantee from RCA to the firm renting the transponder that if **their own transponder fails** that RCA can, would or will find them a replacement.

Finally there is **pre-emptible** time or a pre-emptible transponder. As you might guess, this class of service costs the least to rent. But by contract RCA Americom has the right to bump this class of service off of the bird when someone's guaranteed service transponder fails. They can also bump this class of user for other reasons as well. This guy is short of riding 'standby class' in the coach.

Every transponder leasee has to face the fact that when he elects the class of service he wishes, he is assuming the risks involved. Take Trinity Broadcasting as an example. They have pre-emptible class service on transponder 14. **If 14 fails they are out of business** until they can figure out what **other bird** could carry their traffic. If some higher class of service (say SHOWTIME on transponder 10) fails then RCA Americom would run their finger down the list of pre-emptibles and they just might stop at Trinity and make that middle of the night telephone call. SHOWTIME has guaranteed service.

Most of the early transponder leasees decided to take non-pre-emptible service. Some, such as HBO, have a built-in safety factor because they have within their corporate transponder package some room to move around if a failure occurs. Obviously there can only be so many guaranteed



CABLE MAN WHO MADE THE JUMP—Western Union technician John Morovich is employed now at WU Glenwood/Vernon Valley site. John began in cable in southern New York, has worked in cable system construction and management in that state plus New Jersey and Pennsylvania. John reports he loves being directly involved in satellites but still would like to be back in the cable end of it one day.

CONTROL FOR WESTAR—this control console is the spot where both of the WESTAR birds are 'flown'.

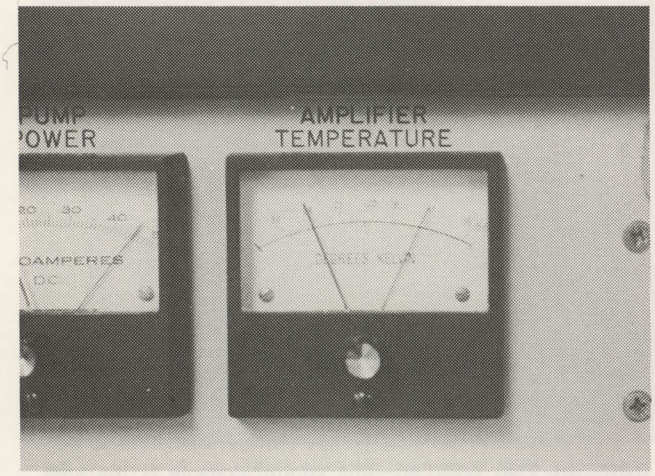
service level transponders since for each one that is guaranteed there must also be one that is pre-emptible. As best we can determine everything left, or virtually everything left, is pre-emptible. Which is another way of saying that **the last on** may well turn out to be **the first off.** In Ed Taylor's case with transponder 13 it was a short ride indeed; his SSS had transponder 13 for less than a month and in fact he never put a signal through it before it quit.

The primary message here for cable affiliates of satellite delivered program services is simply this:

1) **Your service may fail;** or again it may not.
2) **If it does fail,** it may be out of business; forever.
3) Or, if it has some contract rights for re-assignment, it may move 'suddenly' to a new transponder. **You should be prepared to move with it,** in a hurry.
4) And because not all transponders are created equal, there may be a dramatic change in signal level when the transponder changes. Only six of the transponders on horizontal (2, 6, 10, 14, 18, 22) and six on vertical (1, 5, 9, [13], 17 and 21) put a useable signal into Hawaii; for example.

What about a replacement bird? This brings the FCC into the picture once again. There are only a limited number of 4 GHz 'down' orbit spots up there assigned to North America. They start at 70 degrees west and end at 135 degrees west. At the present time, between Canada and the U.S. domestic birds, only four spots remain open and all of these are at the **east end** of the belt. Going further west than 135 would not be of much use; the 'look angle' in New England is already scraping the ground at 135 degrees. Going further east than 70 degrees would cause similar problems with Alaska; which is already in trouble in some portions with COMSTAR III at 89.5 degrees.

Western Union is preparing for launch of WESTAR III, which **they hope** will come off in mid-May of 1979. They are presently at the FCC trying to get approval to use one of the four eastern orbit spots; there is no guarantee at this



READ IT AND WEEP—this meter monitors the temperature in degrees K(elvin) of the cooled parametric amplifier on the receive port of one of the two antennas at the WU Glenwood/ Vernon Valley site. That is 17 degrees Kelvin (approximately 0.26 dB noise figure)! **Pointer to left is 'alarm pointer' which is set at 24 degrees K. That's a heck of a long ways from our typically 120 degree Kelvin units.**

point the FCC will 'allow' them to park there (85.0 degrees is the next available spot east).

RCA has had SATCOM F3 built and in storage for several years. In theory it is a replacement bird for a catastrophic failure of F1 or F2. Just for the record, **even on an emergency basis** it appears that between 90 and 180 days would elapse between a catastrophic failure and the launch of F3. Alot of havoc would be created for those months of course. **RCA has another alternative.** They could wait until the 1982-3 time frame and loft F3 into orbit with the new space shuttle system. That would shave millions of dollars off of the launch costs when compared to the present 'dedicated rocket' launch approach. Or, they could visit with NASA about an earlier launch aboard a conventional (Thor-Delta) rocket. It turns out that this is apparently a possibility; RCA Americom President Andy Inglis was in Florida in mid-October and there was conjecture at the time that his visit to NASA dealt with the possibility of an earlier launch. **How much earlier?** Say 1980 or 1981 at the earliest. Would it **replace** F1 or F2, or would it hopefully go into one of the last three remaining orbit spots? Too early to tell, and the final decision might not be made until late in the game as "localized failure" of transponders progresses.

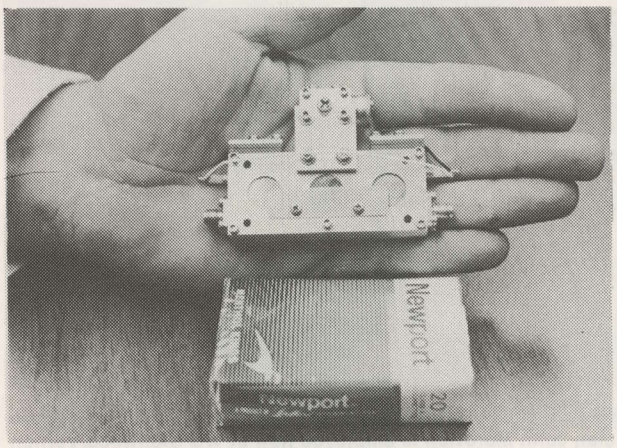
Archie Miller again. **"There has been some conjecture that if we had two birds with multiple transponder failures that as they neared the end of their useful life we might consider moving them into a very close formation and** fly them together **in one 'assigned' orbit spot".** RCA did this one before, during the F2 turn on period when F1 was already in orbit; keeping the birds approximately ten miles apart. **"If we did this and we had different transponder failures on both or largely different failures we might be able to get another year or two out of the combined operation of two ailing birds".**

Through all of this Western Union has stayed virtually uninvolved with the cable industry. A **CATJ** visit to the Western Union Glenwood/Vernon Valley site at the same time as the RCA visit is reflected in some photo illustrations accompanying this report. At Western Union they tell a number of 'stories' which pretty well tell the history of the company in the communications business.

"Back some 85 years or so ago a man named Edison came into Western Union with an invention. Western Union saw no future for it and sent him on his way." Or, **"A chap named Bell tried to talk us into adding voice to our telegraph lines back around the turn of the century. We didn't think it would ever amount to much and he went on his way."** WU employees tell these stories, and more, not out of malice but more out of recognition that at one time **Western Union was the communications giant** of this country. The WESTAR I satellite **was the first** U.S. domestic bird in space providing regular satellite relay in the present frequency band and in fact they did have a one year jump on RCA. (RCA responds that they were the first with 24 channels through frequency re-use and they feel the one year wait was worthwhile.)

Western Union has approached satellite traffic and satellite customers with a different philosophy than RCA. Very few WU customers have their own terminals. Most WESTAR traffic originates at a WU uplink site and comes back to the ground at a WU downlink site. WU appears to be expanding owned and operated downlink sites faster than RCA.

On a day to day basis WESTAR I and II handle approximately 30% of the video traffic as SATCOM I and II. And this includes their largest single user (and the exception to the WU owned and operated terminal rule), PBS. However, Western Union does have as much and perhaps more 'occasional use' video traffic than RCA. CBS and ABC make much heavier use of WESTAR than they do of SATCOM; and even



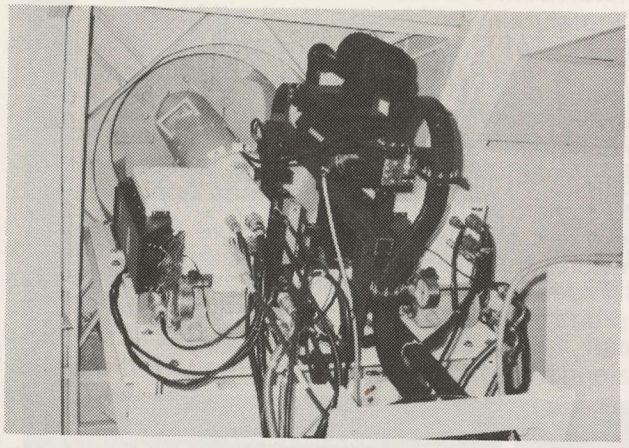
HEART OF A 17 K LNA—this tiny module, smaller than a pack of cigarettes, is the noise determining front end of a parametric amplifier. Don't get too attached to it or its 20 degree (or less) **K spec. The price is around $50,000 for the complete unit!**

NBC (which is owned by RCA) has a considerable amount of traffic on WESTAR.

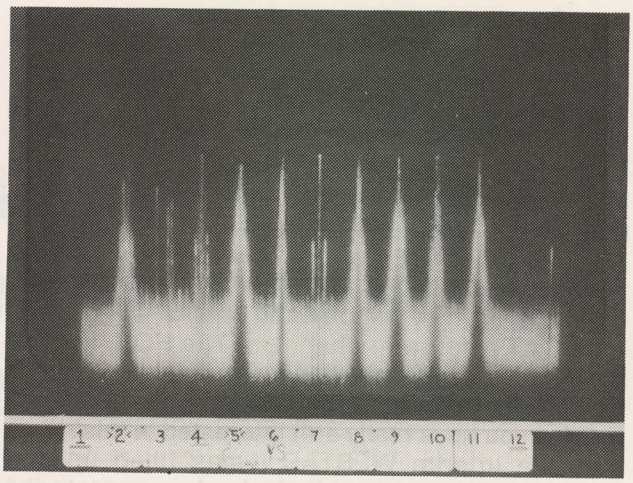
Because their two present (and one future) birds are 12 channel (Hughes) satellites, they have had perhaps more incentive to be looking for clever innovative ways to expand the amount of data they can send on a single transponder. Western Union has been experimenting with digital video and a number of other very high speed systems which they feel may ultimately make a single 36 MHz wide transponder carry the effective load of two or perhaps 2.5 times as much traffic as it will now handle. Such innovations are a routine part of the WU operation and one of the clear differences apparent to the visitor that stops at both New Jersey sites is the large amount of floor space at WU dedicated to rack after rack of equipment for 'experimental services'. There is even one transponder (10 on WESTAR 1) which is 'dedicated' to advanced level WU tests. Many of the WESTAR engineers, the chaps dedicated to advanced projects, are British; brought on board some years ago to work on communications systems perhaps years or even decades down the road.

When we visited the Western Union Glenwood/Vernon Valley site in early October construction was just beginning for the expansion of the site to WESTAR III operations. When III is launched a launch crew from Hughes will bring several trailers loaded down with launch control and telemetering equipment to the site and they will be responsible for getting the bird from its initial launch orbit into the transfer orbit. A new (third) antenna is going in for the third WESTAR and plumbing and hardware changes are underway throughout the building.

Western Union missed the boat with cable television. They made a stab at it when HBO first got interested in satellite relay in early 1975 and did in fact provide some early CATV relay demonstrations in that era. Apparently they failed to grasp the potential of cable program relay and when they next made a run at it, in the latter part of 1977 and early part of 1978, RCA's position was already too well established for Western Union to have much of a chance. There is **conjecture** that WESTAR III may be their growth bird and that ultimately there may end up being another play for the cable market.



INSIDE THE UPLINK/CONTROL ANTENNA—at the Western Union site. The LNA on the 4 GHz receive port is housed in the large white (cooled) **box on left; plumbing and other hardware creates separation between 6 GHz uplink and 4 GHz downlink lines.**



WESTAR I—spectrum analyzer display at WU Vernon Valley shows the status of the WESTAR bird that carries PBS and many other video signals; analyzer is part of control panel at WU uplink and control site.

The facts are these:

1) WESTAR I and II are in **peak** traffic periods **virtually filled to capacity today.** Many of the WESTAR transponders are dedicated to voice and data message traffic, and while individual transponders may have growth room **within** the transponder for additional voice or message traffic, clearing a complete transponder or set of transponders for new full time video customers would at best be difficult.
2) Occasional use video, such as the network news feeds and the large quantity of sporting events carried for independent TV stations bringing out of town professional sporting events back to their home markets, is growing at a rate of approximately 100% per year. **This is a 'peak load' business;** which means it often occurs at about the same busy period (such as noon to midnight). This means that although you **could** buy transponder time on WESTAR for video, **you might only be able to buy it in the middle of the night** on a seven day a week basis.
3) WESTAR III must carry WU from the time it is launched through 1982-3, when the next generation of satellites will be launched aboard the space shuttle. That is 3 to 4 years of time during which transponder use requirements are expected to double and then double again. Without WESTAR III, Western Union would shortly find itself unable to compete for expanded business from **established** customers.

Western Union business will probably **always** be more slanted towards the occasional (i.e. non full time and non-regularly scheduled) user. This

creates peak-load-demands which are largely foreign to the RCA approach to the business. It seems to be a matter of corporate philosophy and even the launching of WESTAR III is not likely to change that philosophy.

The latest and possibly the last attempt to get in on the regularly scheduled 'full time' CATV video relay business at Western Union was the ASN (Americom Satellite Network) program unveiled early in 1978. WESTAR (II) **was** to have been the carrier for four full time or almost full time CATV program channels. The FCC, in their October 25th decision, went back to ASN with simply this question:

"Are you guys really still **interested in this?"**

In the interim WESTAR II has filled up and today if ASN was suddenly (and unexpectedly) approved by the FCC, it would have no place to operate; at least not on WESTAR II.

What about the 'health' of the WESTAR birds? The corporate line is that all 12 transponders are working perfectly. There are very few 'rumors' about concerning the health of either WESTAR bird; although it is **the Western Union** 'rule of thumb' that forecasts 1/2 transponder loss per year per bird for a 12 transponder bird. If there are problems with WESTAR they don't appear to be eliminating any of their transponders from daily operation at the present time. Some of the transponders may not be working to full output power but with so many large antennas at their own company operated terminals and their 17 degree K LNAs they can stand to 'back off' their EIRPs a considerable amount without endangering their normal operations.

There is one factor that is unique to the WESTAR family of satellites which RCA is quick to point out. Because of the limited amount of battery capacity on board, during the twice-a-year 'eclipse' periods Western Union must shut down two transponders per bird for some period of time each day. The 'eclipse' period lasts up to a month or more, and this costs them 1/6th of their capacity of each bird during the affected periods. They call this transponder turn off exercise 'load shedding' in the trade. On WESTAR I transponders 1 and 10 are typically 'shedded' and on WESTAR II transponders 1 and 12 are dropped. RCA likes to note that **they have** 'battery capacity to spare' with their RCA designed satellite and in fact RCA routinely 'dumps' unneeded current created by their solar cells into 'shunt resistors'. Several amps or more is 'dissipated' in this fashion on the SATCOM birds.

Any student of the present state of the satellite art must come to the conclusion that there are no simple problems nor are there simple answers. Virtually everything that is done or might be done in a given set of circumstances has side effects. As cable continues to grow, and our use of satellites continues to expand, we can only look forward to increased complexities and bigger numbers of dollars at stake in the satellite game. If you have been harboring the feeling that once you got your own system terminal in your life would settle down to an easy, predictable format; think again. You have just bought a ticket on a roller coaster ride.

What You See. . .

THE CATV MODULATOR TAKES ON ADDED IMPORTANCE AS MORE AND MORE SIGNALS 'GO SATELLITE'

In the best of Flip Wilson adages the cable 'modulator' is proof that "What you see is what you get". Modulators have been with us since at least the mid 50's when adventurous systems such as Batesville, Arkansas experimented with cable only distribution of films. A cable modulator is really a (very) low power television "transmitter" since it creates a (standard) TV signal from the combination of sound and picture input. In fact in some remote areas of Canada and elsewhere in North America cable "modulators" plugged into power amplifiers operate as local, low power, TV "stations" to serve a mile or few mile radius of the "station" transmitting antenna.

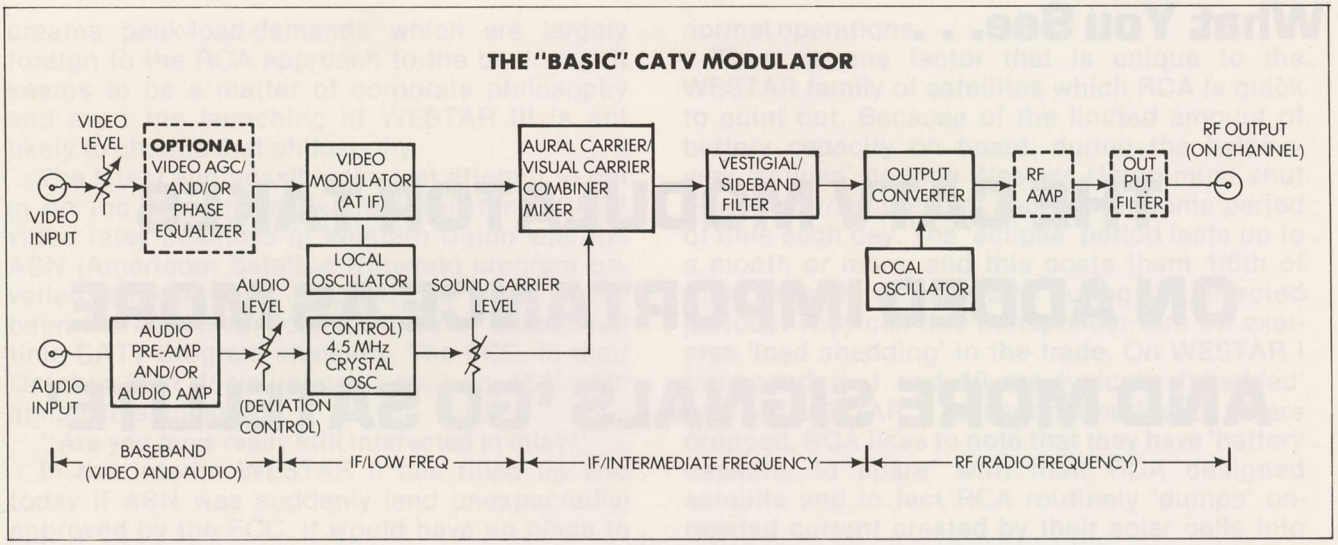
CATV modulators sell in the $400 to $2,500 price range. Less expensive modulators are available but they generally lack refinements the cable operator wants included. "Modulators" for TV are all around us; that TV "game" you recently purchased for example. TV (video) games interconnect from their 'baseband' (video) generation equipment to the standard TV set through a very low power RF 'transmitter' called a modulator. Perhaps one of the least expensive "modulators" ever conceived appeared in the March 1975 issue of **CATJ** (page 59); total cost less than $10.

To most cable operators the modulator is simply an "interfacing system"; installed to turn some baseband (video and audio) signal into a cable carriage channel. The baseband signal(s) can originate at the system (VTR deck, weather channel, studio cameras, etc.), at some distant terrestrial point (microwave relay delivered signals) or via satellite. It has been the rapid development of satellite delivered signals which has sparked the current rush to modulator channels on cable.

When our baseband signals are locally generated at the system, the baseband signals may often have quality limitations imposed by the **video equipment** that generates the baseband signals. Signal to noise ratio, bandwidth, color phase purity and other technical factors which determine how good the picture "looks" to the cable subscriber are usually set **prior to the modulator.** Which simply means that if one or more local video technical parameters falls short of **the technical capabilities of the modulator** itself, the final cable-signal-picture will not be determined (or limited) by the modulator at all. The baseband gear ahead of the modulator will be responsible for the "quality" of what you see and get from your modulator channel. Prior to the arrival of satellite signals in the cable headend it was not unusual for the baseband inputs to modulators to be in the 40-44 dB signal to noise ratio region, video bandwidth to be around 3 MHz and color phase to be in the +/– 10/15 degree region. **Satellites have changed all of that** and now we find that with much improved signal to noise ratios (50-54 dB is common), bandwidth (4 to 4.25 MHz is typical) and color phase purity control (+/– 1 degree is not uncommon) the modulator and its technical capabilities to reproduce faithfully the input baseband signals takes on new importance. In a nutshell, where previously the modulator might be 'sloppy' and the picture quality would not suffer (because something **ahead of** the modulator set the true quality 'window' for what you saw), the arrival of high quality baseband signals has shifted the responsibility for cable picture quality on "modulated" channels back to the modulator itself.

Necessary And Optional

The present generation of modulators offers extremely high quality RF generation from baseband signals. However as anyone who has recently studied modulator pamphlets can attest, there are many 'options' available which are at best confusing to the inexperienced buyer of modulator equipment. There are multiple video inputs, video signal loss alarms, aural signal transfer options, group delay compensation net-



works, vestigial sideband filter "options", aural AGC and visual AGC, powering options, phase lock options and a host of 'switching' options. Deciding what you need now or in the foreseeable future can be a difficult job. And suppliers compound the problem by often labeling the **same** function **in a different way** from their competition. Is, for example, an "Audio Modulation Limiter" the same as an "Audio AGC"? Or, is "FCC Group Delay Pre-Correction" the same as a "Delay Predistortion Network?" More important, **is either necessary?**

Modulator terminology is perhaps the key to intelligent modulator selection. We'll dwell on that phase of the modulator selection problem here as the major component of our initial look at CATV modulators.

Video Options/Terminology

The most obvious parameters of a modulator are:

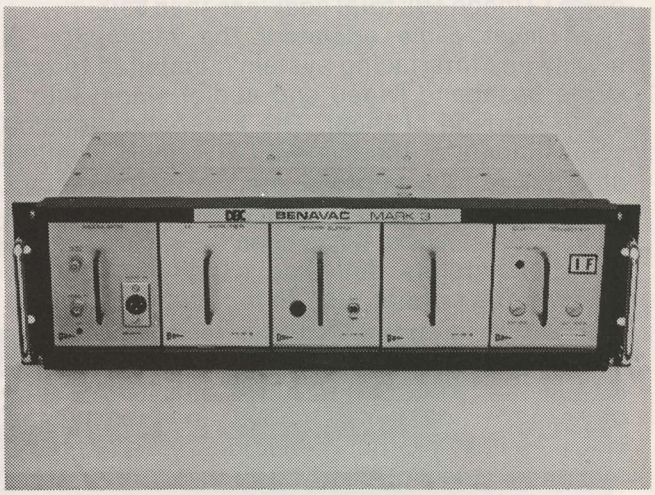
1) RF output level
2) Baseband input level(s) required for full modulation of the carrier(s)

The CATV modulators to be discussed here all have comparable picture quality parameters. That is, given laboratory test conditions the differences between any of these units should be minimal if the specification sheets are accurate indications of performance. For example:

Model	Freq. Response	Diff. Gain	Diff. Phase
Blonder Tongue TVM4930	+/– 1 dB to 4.2 MHz	+/– 1 dB at 87.5%	+/– 1° at 87.5%
Jerrold Commander III	+/– 1 dB to 4.18 MHz	+/– 0.5 dB at 87.5%	+/– 1° at 87.5%
Phasecom 2105	+/– 0.5 dB to 4.2 MHz	+/– 0.5 dB at 87.5%	+/– 0.5° at 87.5%
RCA CTM10	+/– 0.5 dB to 4.2 MHz	+/– 0.3 dB at 87.5%	+/– 0.5° at 87.5%
Scientific Atlanta 6350	+/– 0.5 dB to 4.2 MHz	+/– 0.18 dB at 87.5%	+/– 0.5° at 87.5%

Let's see what these numbers mean. Frequency response is the ability of the modulator to pass along to the cable customer the faithful 'full fidelity' of the video signal fed into the modulator. Every manufacturer strives to keep his RF passband (the output channel width) as 'flat' as possible. The flatter the frequency response, the better the picture looks to the eye since all portions of the picture are 'amplified' through the modulator at about the same level. The video 'baseband', or the **width** of the picture signal, normally extends to just over 4.0 MHz. (Our reference signal throughout all of this is the baseband video signal delivered to us at our headend by our TVRO receiver. A typical TVRO receiver provides a baseband output that is 'flat' to 4.2 MHz, within +/– 0.5 dB. Therefore our system operating quality limit is set at this point by that [+/– 0.5 dB] specification.)

Differential phase and differential gain are very complex measurements which are beyond the capability of most cable systems. Basically, less of either is best. You **notice** excessive different gain and phase as smeared color image edges and undistinct vertical lines in the video picture. That is, the edge of a table should have a clearly defined border on the screen; if the color bleeds or the vertical table leg wanders you may have objectional differential gain and/or phase problems. Again our reference signal is the TVRO receiver output capability in this area; and



CATJ LAB LOOKS AT MODULATORS

We began our ground work for this look at CATV modulators more than one year ago. At that time we borrowed a channel 6 modulator from **Blonder Tongue** (their model TVM4930, discussed here) and we put it into full time service at the Lab.

In the interim the unit has been run continuously. We have used it to carry our satellite fed signal from our TVRO receiver to a number of other TV receivers on the premises. For more than 14 months this modulator has performed without the slightest hint of problems. In fact it has become almost 'opaque' to the TVRO test system maintained at the lab; you almost have to sit down and remember it is "in line".

Our particular unit has an option not discussed in this report; the ability to take a composite input signal (visual and aural on a 4.5 MHz sub-carrier) and extract the aural from the sub-carrier for local "remodulation" on channel 6. We asked for it this way primarily because we felt that we wanted to be able to feed the output of our 'Mini-Wave' Lab developed microwave into the modulator for 'cable carriage'. This provided us with an unexpected method of checking our own modulation parameters with the Mini-Wave aural sub-carrier. We found that if we set the aural modulation up to the 'occasional LED twinkle' level with the normal TVRO signal we could then switch to our Mini-Wave 4.5 composite input signal and actually go back through the microwave to adjust the modulation control **on the Mini-Wave transmitter** to correspond to the same modulation level. This is, admittedly a backwards way of setting modulation on a low cost microwave link but it did work for us!

Our bottom line on the Blonder Tongue TVM4930 is that it has proven to be a very good unit with high reliability.

We also had the opportunity for a much shorter period of time to check out the performance of a **Phasecom** 2105 modulator on channel 11. The Phasecom unit is exceptionally well laid out and the construction practices are in the 'Mil Spec' region. Additionally, the Phasecom **manual** is perhaps the most complete of any we have seen in the modulator field; somebody has gone to a great deal of trouble to get you everything you might ever need to either maintain or repair this unit.

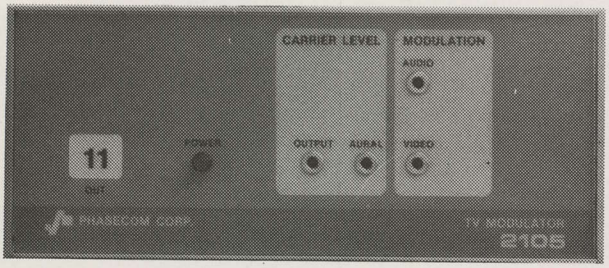
Our short period of testing consisted of running the same audio and video as we were feeding into the TVM4930 into the Phasecom 2105 and then allowing a number of people to compare the on-cable performance of the two modulators. As most users of satellite now know, **the best test** of system capability is when you are tuned into color bars since a 'moving picture' is sometimes difficult to perform an eyeball comparison on. The 2105 specifications (in channel flatness, differential gain and differential phase) suggests it might be a tad better in these departments than the TVM4930 which we use for our reference. In actual practice, with out particular TVRO test feed (in the 52 dB signal to noise region) if there was an advantage to the 2105 it was very slight. A half dozen subjective viewers found the pictures either 'the same' or in two cases 'perhaps better on channel 11' (the 2105 channel).

Both modulators are quality products and in this day and age that is saying a great deal for any box.

a typical specification is +/– 0.2 dB maximum variation in differential gain, and, +/– 1° differential phase. If our cable-system quality is established by the weakest link in the chain and assuming the satellite receiver to be that unit, anything **better than that** will **not** be apparent (or measureable) on the system itself.

If the frequency response, differential gain and differential phase specifications are comparable between the five units selected here for discussion, and the use of any is ultimately constricted by the real-world operating parameters of the signal **fed into the modulator,** what makes a choice of one version more appropriate than the choice of another? Largely it is a matter of (1) options, (2) operating controls and preferences, and (3) pricing.

Let's look at options first. Because a modulator is first thought of as a video device, we'll consider video options initially. All five modulators have circuits which establish the video baseband gain parameters in accordance with FCC standards. The FCC has established something



PHASECOM 2105 MODULATOR is in 'half-rack-width' format; two units (second could be demod or processor) mount side by side to make up full rack width.

called 'predistortion standards' for the transmission of all (U.S.) TV broadcast signals and since the receivers which cable plays into are themselves 'reverse compensated' for the same distortion standards, a (CA)TV modulator must conform to the same standards if we want our pictures to look like broadcast type signals. **So there is no option here;** if you want to play in the game, you pre-distort. **Scientific Atlanta** calls their circuit a **"Delay Predistortion Network"; RCA** labels their circuit **"All Pass Delay Compensating Networks"; Jerrold** calls it a **"Predistorter".** Neither Phasecom nor Blonder Tongue get label happy. And this network, then, is **not** an option.

Another 'non-option' that is highly touted is the technique used by each of the manufacturers to ensure that the modulator does not do nasty things to one or both adjacent channels. Because the video signal is AM (amplitude modulated) when the modulation is applied to the carrier we get not one but **two** 'sideband sets'. A sideband is what is created by the sum of the modulation frequencies plus the carrier frequency. Broadcast television eliminates one of the sidebands (the lower) in the interest of preserving as much spectrum space as possible; it turns out that only one sideband (plus the carrier) is really required to reproduce (faithfully) the picture information at the receiver. To eliminate the unwanted (and unnecessary) sideband requires a special type of very sharp filter; one that passes the carrier frequency plus the upper sideband information. This device is primarily known as a **'vestigial sideband filter'.** The really low cost modulators (including those found in many TV

Somewhere in this picture there's a trouble shooter aimed straight at you.

You'll find an HBO regional manager, a real life original of the people in this picture, right near your market.

They understand your home territory because it's their home territory too.

If you're not an HBO affiliate, they're the people to contact. They'll explain exactly how profitable HBO can be to you. And handle all the details when you're convinced.

They can work with you personally to develop a launch marketing campaign customized to your needs. They can hold orientation sessions to familiarize you and your staff with HBO service. And they'll personally do all they can to help you launch HBO in your system.

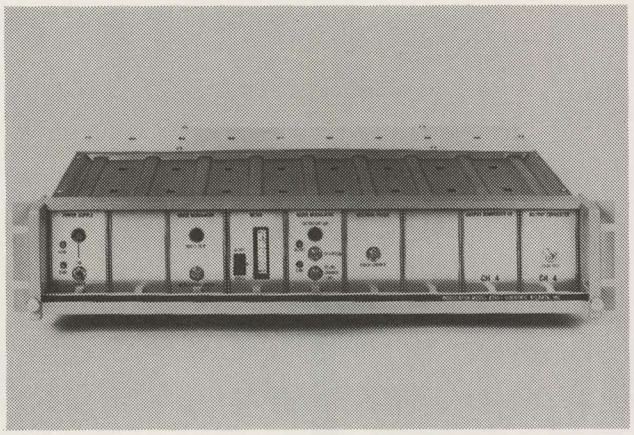
If you're already an affiliate, you know that these people can help you with on-going marketing programs to enlarge your subscriber base and increase your profits.

They're on our payroll, but they work for you.

Call one of our eager-to-help VP/General Managers:
Peter Frame (212) JU6-1212; Bill Hooks (214) 387-8557;
Don Anderson (415) 982-5000.

HBO

You know us. We know you.



set games, VTR's etc.) do **not** include such a filter.

All of the modulators discussed here apply their baseband modulation to an IF (intermediate frequency) oscillator; typically operating at 45.75 MHz. Then the modulated carrier is frequency upconverted to the cable operating frequency with an upconverter or mixer stage. Thus the often complicated, difficult to tune, and occasionally unstable 'vestigial sideband filter' need only be designed for a single stop-band frequency range; **IF.**

One manufacturer has incorporated 'a better way to do it' into this area of the modulator; Scientific Atlanta has a recently perfected device known as a **'SAW filter'** into the modulator as a direct replacement for the normal 'vestigial sideband filter'. The SAW filter is a clever bit of electronics that virtually eliminates many of the temperature and alignment problems inherent with the vestigial filter systems. SAW is short for "surface acoustic wave".

So this network is **not an option** with any of the modulators described here, although in many lower price level modulators it is either an option or it is simply not available. The bottom line is that without some approach to vestigial sideband filtering the modulator is useless for adjacent channel operation; at least on the lower adjacent side.

Are there other 'non-option' "options" in the video end of the modulator? It turns out there is one more. This is called **peak white-level clipping.** Now the manufacturer has no way of knowing just how the modulator will be utilized. It may be connected to a weather channel display, to a TVRO feed or any number of other baseband video sources. **Not all baseband video sources are created equal.**

Just as in a CATV amplifier you can create an operating situation where you can overdrive a line amplifier, so too can you feed too much (or the wrong type of) video information into a modulator. What happens to the picture, when this occurs, is devastation of the white (or lighter color) areas in the picture. In extreme cases of overdrive of the modulator, with excessive video level, the whites saturate and turn 'super white'. **This causes an annoying 'sync buzz' sound in the audio** and the whites may even so overdrive the modulator that they turn the image into a negative.

The modulators here provide for this unhappy situation by including something called 'peak white-level clipping' which does what the name implies; it senses when there is too much drive to the modulator and it clips or limits the amount of signal to some predetermined level. It turns out that most of the modulator designers have settled on limiting the video modulation to a maximum of 95% (100% being maximum, and also right on the edge of sync buzzing in many home receivers). Some of the modulators provide a front panel adjustment to set the white-level clipping point (the Blonder Tongue TVM4930 is an example of this) while others simply assume nobody wants the peak white level to exceed 95% and they provide a front panel light as an indicator when the modulation is at the 95% level and the clipper is doing its thing (the Scientific Atlanta 6350 is an example of this).

Back to why we have such a circuit. To ensure that over modulation does not saturate the carrier. Now it turns out that virtually any **broadcast** signal you receive, any **VTR** baseband **signal** that has been **processed** during the recording stage, and **all** of the **satellite signals** you receive **have been prepared before being transmitted to you** to ensure that nothing exceeding 95% modulation level is going to reach you anyhow. Yes, it is possible for somebody to mess up and it is certainly possible for locally originated programming, mechanical weather channels and other non-processed baseband video signals to reach you with nasty baseband overmodulation spikes in them. But for most applications this may not be as important a circuit as it was say five years ago.

Once again it is largely a non-option since virtually all of the quality modulators include it as a 'standard circuit'.

Now what about non-standard features, or the **real** options? There are more than you can shake a stick at although surprisingly few of them have any **direct** bearing on the actual performance of the modultor as a generator of a quality color ("broadcast quality") signal(s) for your cable system. Several modulators offer a video AGC system which differs from a peak white-level

THE MODULATORS DISCUSSED HERE

Sources for the five CATV quality modulators discussed here are as follows:

Blonder Tongue Labs (model TVM4930)—One Jake Brown Rd., Old Bridge, N.J. 08857 (201-679-4000)

Jerrold Electronics (model Commander III modulator)—Hatboro, Pa. 19040 (215-674-4800)

Phasecom Corp. (model 2105)—13130 S. Yukon Avenue, Hawthorne, Ca. 90250 (213-973-4191)

RCA Community Television Systems (model CTM10)—7355 Fulton Avenue, N. Hollywood, Ca. 91605 (213-764-2411)

Scientific Atlanta (model 6350)—3845 Pleasantdale Rd., Atlanta, Ga. 30340 (404-449-2000)

clipper largely in that the clipper 'chops off' excessive video modulation while the AGC actually operates as a control 'window' or range to not only inhibit high level spikes but also raise up low level inputs to the proper input level. All modulators described here require (a minimum) 0.5 volt (peak to peak) of baseband video to create a properly modulated RF carrier; with one exception. The Phasecom 2105 wants 0.75 volts. You see a great deal of discussion of the **87.5% modulation percentage index** in the modulator literature. This happens to be a 'standard' which the FCC and the broadcast industry have agreed to and since we are playing in their ballpark (and the receivers are all so designed) that is our 'number' as well. Virtually any baseband signal source has at least 1 volt peak to peak available (a TVRO receiver being a prime example) although it is possible that if you 'loop the baseband video' through several outlets before you arrive at the modulator (such as a color monitor, another modulator, etc.) that you might end up close to the 0.5 volt level. The Scientific Atlanta approach to the video AGC is typical; rather than monitoring picture content (i.e. the actual baseband video **information** present) the video AGC monitors the **sync tip** level; which stays constant regardless of the picture content. Video AGC "ranges" available vary from 8 dB to 20 dB and not all manufacturers offer this option. The bottom line should be "do you need it", or, are you **less** worried about **low** levels than you are concerned about too **high** levels? In which case the peak white-clipping circuit, built in, will handle your needs. It should be noted there is another form of AGC or two also around as options; we'll cover them shortly.

Switching and 'alarm' circuits are another popular area for options. Remember that the typical high quality CATV modulator does its modulation **at a standard IF region.** This makes the modulated signal, while it is still at IF and not yet upconverted to a cable operating frequency such as channel 6, compatible with any other IF range signal processing equipment in your headend. This being the case it should be no surprise that this modulated IF is brought out of some of the modulators to a coaxial fitting so that you can switch it into the IF input on another piece of headend equipment. And since it works this way, it should also not surprise you to note that some modulators allow you to bring an external (modulated) IF signal back into the modulator for upconversion to the modulator output channel. This could be a modulated signal from another modulator, from a signal processor or what have you. All of the units discussed here **except** the Blonder Tongue TVM4930 offer this IF switching. Some get extremely complex with both the switching possible and the various sensor circuits offered to make the switching either automatic or remotely controlled on demand. RCA's CTM10, as an example, allows an external IF switcher to override the internally generated modulated carrier, an internal switcher to do the switching, an internal tied-to-the-AGC line switch to command the input to an external source if the internal signal goes away (such as at the end of a day's programming). The Scientific Atlanta 6350 senses the loss of internal video and switches (with a front panel light that tells you the normal baseband is missing). RCA has a similar feature. There are lots of "bells and whistles" available for modulators.

Audio switching is another area where near-customizing is possible. All of the modulators have standardized on 600 ohm audio input lines; which happily matches the type of audio lines found in most TVRO receivers or other audio-designed systems. However the audio can be 600 ohms balanced (Jerrold Commander III, Scientific Atlanta 6350) or it can be either balanced **or** unbalanced (Blonder Tongue TVM4930, Phasecom 2105, RCA CTM10). It may not be 600 ohm audio at all, in which case the suppliers (well, some of them anyhow) offer additional 'options'. Blonder Tongue also offers a low impedance input option (50-250 ohms) for direct microphone feed. Phasecom is unique in offering a jack for a high impedance input (5,000 ohm, unbalanced) which happens to be the output impedance of the audio line of most Sony and other makes of VTR decks. Scientific Atlanta suggests that the user can make a 'simple field modification' to utilize high impedance bridged input lines. The audio input levels, by the way, are usually referenced to the voltage (or dBm)

BLONDER TONGUE TVM modulator is highly rated because of its multiplicity of inputs, monitoring of modulation parameters and small rack space.

level required to produce 25 kHz FM deviation of the aural signal. There is little danger here of not having enough audio to make the 25 kHz deviation standard since most audio sources (TVROs in particular) have 6-10 dB **more audio** available than you require to properly drive the modulator. About the only way you might get into trouble is to have such severe audio mis-match (between the audio source and the audio input line on the modulator) that more than 6-10 dB of audio power is "lost" in the mismatch. There is usually an inexpensive solution to this; an audio interstage matching transformer available through the local electronics parts house will set things right again for typically under $10.

Some of the modulator literature sheets tell you that their audio has "75 microseconds of pre-emphasis", or they say "the audio has the standard pre-emphasis curve". Once again we are playing in a ballpark where somebody else set the rules; and this simply ensures that our CATV system modulator channel audio fits into the format adopted decades ago for all broadcast TV signals. Since the TV receivers have been designed to extract audio in a certain format, we have to be sure that our own audio fits that format. With the "standard" or "75 microsecond" standard we do. **This is no option.**

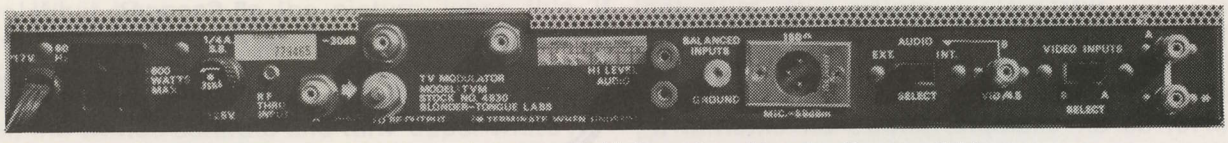
Back to the audio switching. Seemingly when you switch from one video source to another video source you would want the accompanying audio to go along. Most switching systems allow this to happen; automatically. Scientific Atlanta goes one better however by also allowing you to switch in an audio-only override source for the purpose of civil emergency alerting of the community.

There is starting to be some interest in "high fidelity audio" in the regular TV broadcast business so some passing attention might be paid to the audio bandpass characteristics of the typical CATV modulators. The TV broadcasters were constricted by the Bell lines that carried the audio signals to the TV stations, for years, in how much "fidelity" they could build into their sound portion transmissions. The TV receiver manufacturers, not to be caught providing more audio bandpass than the TV stations could supply to the TV receivers, responded by restricting the low and high audio ranges to around 8 kHz passband. Now the Bell folk have completed a new national network that allows them to transmit audio fidelity from around 50 Hz to as much as 15 kHz. The TV stations **could** 'increase' the high and low frequency response of their TV sound now they are getting higher quality audio from Bell, but there has been little incentive to do so since there are more than 100 million TV sets out there that couldn't tell the difference anyhow. The standard audio fidelity response on the TV modulators discussed here is typically +/– 1 dB from 50 to 15,000 Hz (or better). Which means we've been pumping "high fidelity audio" down the cable line for quite sometime and nobody even appreciated it!

Another option available is "Phase Lock"; a little understood system that ensures that if you happen (or are forced to) put your modulator on the same TV channel as is in regular broadcast use in your local area that you can do so without worrying about those annoying co-channel beats which the subscriber sees simply because the local signal gets into his TV set directly through the plastic laminated cabinet.

Phase Locking for cable carriers was first demonstrated successfully and put into regular operation by Phasecom; one of the five manufacturers of modulators discussed here. Basically in a phase lock loop system the unwanted locally available signal is fed into the "box" and it is stripped of its modulation. The carrier frequency of the unwanted signal becomes a reference carrier frequency to which electronically your own modulator is "locked". In effect, the modulator operates on the exact (to the nearest portion of a hertz) frequency as the unwanted signal. By doing this there is no "offset beat" created between the two carriers and consequently there cannot be "co-channel interference" between the unwanted local off-air channel and the modulator generated same-channel signal. Phasecom originally proved this concept in Canada where today some 1.2 million Canadian homes, served through the headends of Canada's largest cable systems, enjoy both locally generated television as well as heterodyne processed television via Phasecom phase lock loop headends.

Blonder Tongue's TVM4930 offers a phase lock options, as does the RCA CTM10, the Jerrold Commander III modulator and the Scientific Atlanta 6350. However **not all** phase lock sys-



REAR DECK for Blonder Tongue TVM shows the unusually high number of input options available.

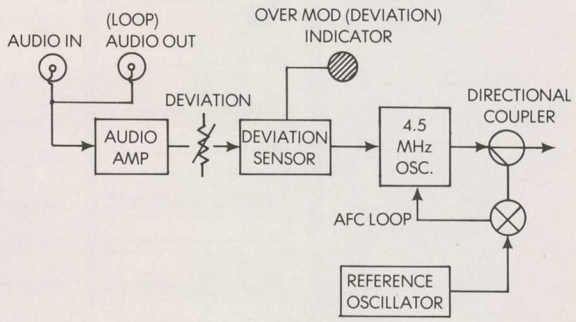
tems **are created equal.** There are three factors at play here:

1) **Acquisition range**—to ensure that the phase lock system in the modulator has sufficient frequency range to play around in, to find the proper center frequency of the local signal to reference to, the modulator's phase lock option requires a window or "acquisition range". With Blonder Tongue you must order your phase lock option by knowing the 'offset' of the local signal. RCA has a +/– 8 kHz range, which also suggests you need to specify the local signal 'offset' since the signal could be plus ten or minus ten to the nominal assigned carrier frequency. Scientific Atlanta provides a 25 kHz range and Jerrold a 40 kHz range.

2) **Input Level**—The reference (unwanted carrier) processing system requires some minimum amount of input signal (provided to the unit through a separate receiving antenna). In the case of Blonder Tongue this unwanted signal level must be +60 dBmV which suggests you will need to do some 'strip amplifying' of the local signal to bring it up to the proper level. RCA and Jerrold are both in the 0/10/20/30 dBmV region while Scientific Atlanta is in the –10 to +40 dBmV region.

3) **Gen Locking**—Unfortunately if you have a particularily **nasty** local off-air signal, **one that is very potent,** phase locking the two carriers to the same frequency may **not** eliminate **all signs** of the off-air signal in your system. When the two carriers are locked together, the **modulation products** from the off-air signal **may still be present.** This creates a set of not-in-sync "sync bars" which roll diagonally across the screen. The solution to this is to "steal the sync" from the off-air local signal and convert it to your own use. By "borrowing" the broadcaster's sync signal your sync and his sync become the same sync, and this allows you to operate without his sync bars crawling through your picture. Scientific Atlanta offers a "gen locking option" to accomplish this.

VARIATIONS AUDIO (4.5 MHz) MODULATOR



BY CREATING AN AFC LOOP WITH A SECOND 4.5 (000) MHz OSCILLATOR, HIGH STABILITY OF AURAL SUB-CARRIER IS ACHIEVED. (MODIFIED RCA APPROACH.)

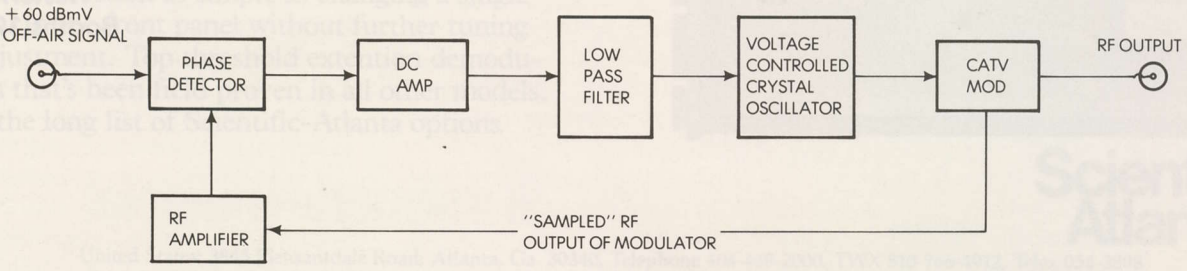
The people who started all of this, Phasecom, have their own advanced methods of phase locking these days and while certainly "phase locking options" are available through Phasecom they don't quite fit the format of those discussed here to this point. If you have a phase lock requirement they should be contacted directly along with the others noted here.

And Metering

In theory the modulator should be a set and forget box; especially since so much of its operation is automatic and well controlled by monitoring and compensating circuits. On the other hand many cable people like to 'play' with knobs and watch meters move around and LEDs flash. Back to the bells and whistles.

Only Phasecom provides no unit-mounted permanent meter. They do provide a Phasecom meter box which allows you to initially set up a modulator to the proper audio and visual modulation parameters using well marked and easily located test points within the housing, however. For people of good faith, or those system operators who don't want "unqualified people tweek-

BLONDER TONGUE'S APPROACH TO "CHANNEL LOCKING" (i.e. PHASE LOCK) MODULATORS TO OFF-AIR SIGNAL



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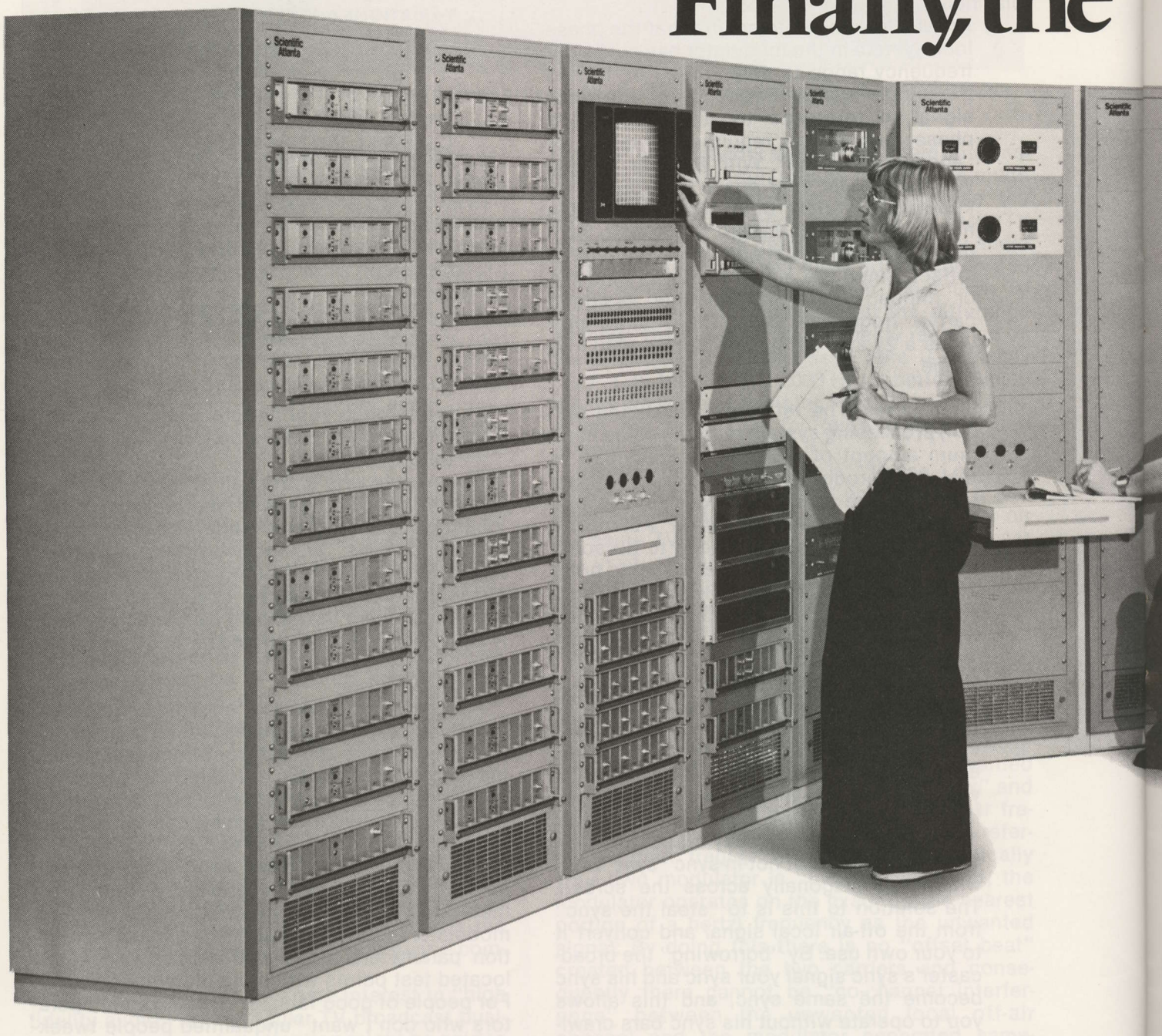

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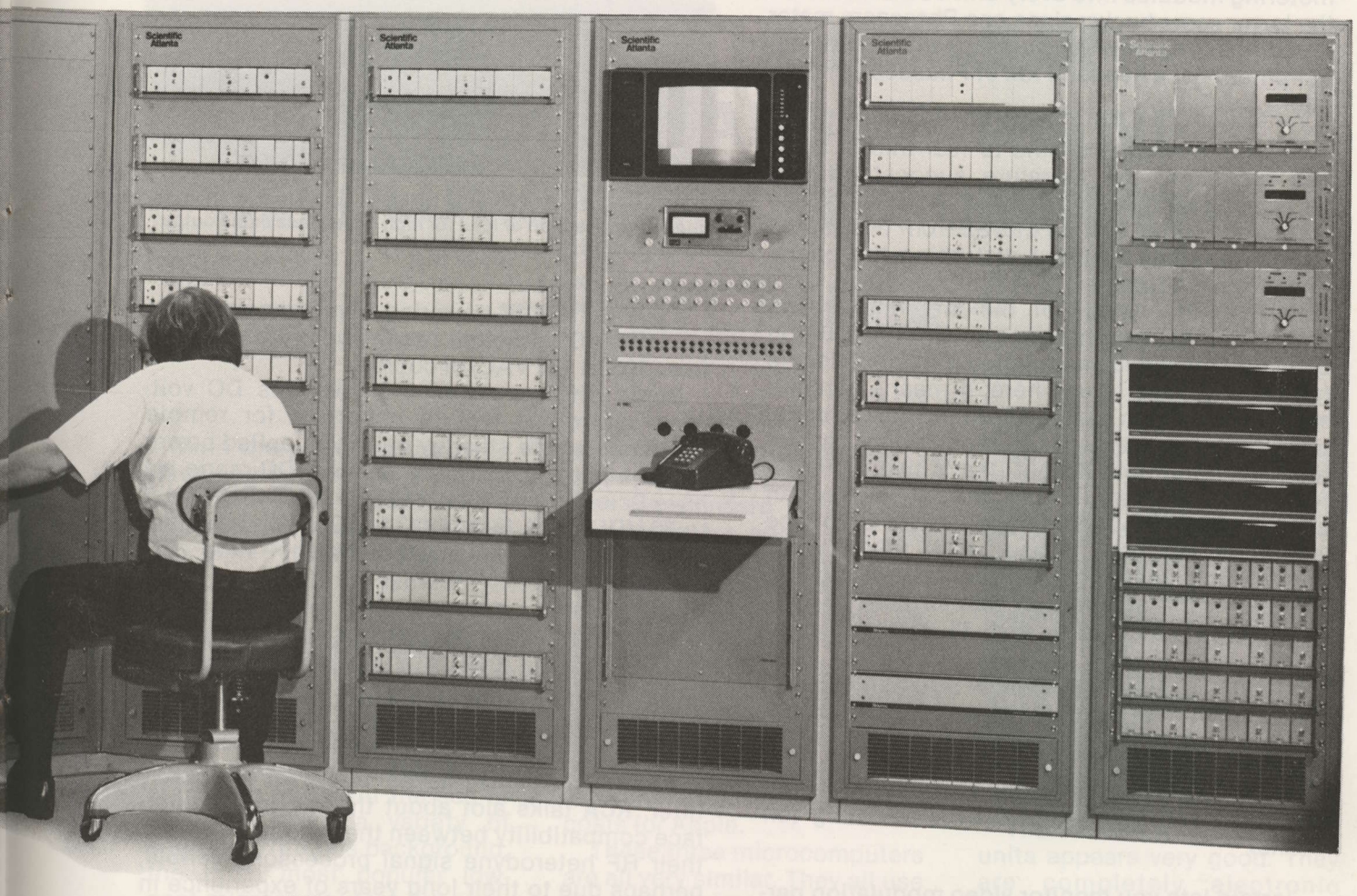


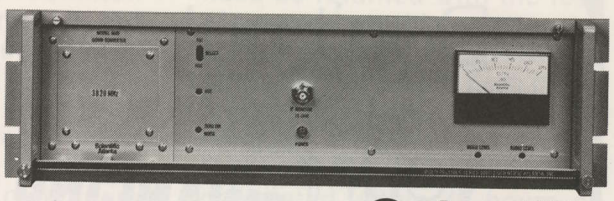
We never stop trying to make a good thing better for you.

If you like the way Scientific-Atlanta headends handle off-the-air and imported programming, you'll like what our cost effective single channel 6601 does for your satellite schedule. The newest addition to our headend line brings you the same quality as our processors, modulators and demodulators. And because it's a third generation satellite receiver, there are other significant advantages.

If you manage a CATV system, you get dual conversion from the manufacturer with long experience in building receivers with dual conversion. Channel selection as simple as changing a single crystal in the front panel without further tuning or adjustment. Top threshold extention demodulation that's been field proven in all other models. And the long list of Scientific-Atlanta options makes this satellite receiver into something more than a no frills unit.

For example, the baseband output can be made compatible with microwave systems by including our 4.5 MHz subcarrier card. And for additional audio services, you'll find provisions for 3 extra audio demodulators. So like our other headend products the future's built right in.

For more information call Mike Smith at (404) 449-2000, Or write us.



Scientific Atlanta

United States: 3845 Pleasantdale Road, Atlanta, Ga. 30340, Telephone 404-449-2000, TWX 810-766-4912, Telex 054-2898
Canada: 1640 Bonhill Road, Unit 6, Mississauga, Ontario, L5T 1C8, Canada, Telephone 416-677-6555, Telex 06-983600
Europe: 1-7 Sunbury Cross Centre, Staines Road West, Sunbury on Thames, Middlesex TW16 7BB, England,
Telephone Sunbury on Thames 89751, Telex 896015

ing on knobs" the Phasecom approach might be a good one. And the economy of not building metering modules into every unit could also save the buyer some bucks; since one Phasecom meter module will satisfy the occasional metering requirements of a headend full of Phasecom modulators.

Scientific Atlanta seems to feel this is not a bad approach; the literature suggests that a meter module can be 'removed' from their 6350 modulator series and be moved from one modulator to another "without disturbing the operation of the modulator".

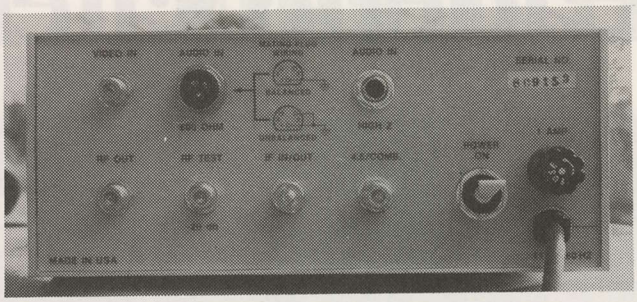
RCA is the "king" of the metering crowd; their's has six functions. With the CTM10 you can monitor video modulation (**"depth"** is the technical phrase in use here; it means percentage of modulation basically), sound carrier **deviation** (again, percentage of modulation), power regulator input and output (that's two metering functions), auxiliary IF AGC level (**if you have** an auxiliary IF input), and, phase lock AFC voltage (again, if you have phase lock). RCA makes something of their metering accuracy noting that it is +/– 1% accurate at the "critical" 87.5% modulation percentage and 25 kHz deviation points.

Blonder Tongue has a meter which measures both modulation percentage and by pulling on the knob, white clipping level (BT is the **only** one that lets you **set** the white clipping point). Two LEDs tell you when the video is over modulating on peaks and the audio is over deviating (on peaks).

Jerrold lets you monitor video modulation percentage, aural deviation (in kHz), and the auxiliary IF AGC level (if present).

Scientific Atlanta's moving meter module allows you to check overdeviation (a lamp), when the white level clipper is 'clipping' (another lamp), video modulation (they call it depth of modulation), aural modulation (they call it deviation), and, the regulated power supply voltage.

Nobody tells you when the Martini's are properly chilled; perhaps next year.



REAR OF PHASECOM 2105 includes multiple audio inputs including selection of feed for high impedance audio output of tape decks.

Finally there is powering. Everyone operates on 117 VAC (although many specify a range of from 100 to 130 VAC) of course.

Some offer operation from various DC voltages as well; a feature important for remote headends where standby battery supplied power is often put to use. In the positive DC range we have Scientific Atlanta (24 to 28 VDC), RCA (21.5 to 30 VDC), and Jerrold (23 to 30 VDC). Additionally, Scientific Atlanta also offers an – 19 to – 31 VDC option.

Synopsis

Modulators, like so many other cable products in the past five years, have grown up. State of the art is seemingly here and with the current satellite signal delivery boom going on modulators are in short supply.

Scientific Atlanta makes much of the SAW filter. **RCA** talks alot about the maximum interface compatibility between their modulators and their RF heterodyne signal processors. **Jerrold,** perhaps due to their long years of experience in this business, talks quietly about the "broadcast quality adjacent channel operation" of their units. **Phasecom** points with corporate pride to the fact that their modulators have met the test of time in Canada, many in phase lock configurations, and their availability in any 6 MHz wide segment from 6.0 MHz up to 300 MHz. **Blonder Tongue** leans on the wide range of modulator products they have available; the TVM4930 is but one of more than a half dozen which they offer.

Daly On Computers

HARD ON THE HEELS OF SATELLITE EXPANSION THE NEXT REVOLUTION WILL BE COMPUTERS

—PART THREE—

With the growing interest in microcomputers, many people are curious about how microcomputers compare. The first article in this series discussed the potential usefulness of low-cost microcomputers for a cable television operation; some potential pitfalls were explained in the second article. In particular, it is important to purchase a **popular computer** which meets (or sets) some standards to permit the use of programs from a variety of sources. With this background, the three most popular low-cost microcomputers are compared in this article.

Beyond just the price and surface appearance, the realiability, capability, expandability and compatibility of any computer must be considered in selecting a machine for any use. Using this criteria, an objective review of the three most popular computers is possible. And as a result, one will be able to make a decision on purchasing a microcomputer for a CATV operation.

The three most popular microcomputers are the **Apple II** by Apple Computer, the Commadore **PET 2001,** and the Radio Shack **TRS-80.** These units are purchased completely assembled and operational. Because of this fact they are sometimes called "appliance" computers. In their minimum configurations, they cost $1195, $799, and $599 respectively. This price difference is mainly because some features that are **standard** on the PET and Apple are options on the TRS-80. Even beyond these minimum configurations, accessories are available for any of these computers. It should be noted, though, that there is a **hidden expense with the Apple.** While the PET and the TRS-80 both are supplied with a cassette recorder and a video monitor, these are extra costs for Apple.

These three microcomputers are all very similar. They all use the same, **but not standardized,** computer language called **BASIC.** BASIC allows programs to be written in "English" instead of specialized code like most computer languages (see illustration). All three computers display their messages and answers on a video monitor or TV screen, through printers are available. Programs and data can be entered into the computers either with their keyboard or by a common audio cassette. And all are fairly compact, requiring very little power. Typically, they require less than 100 watts with much of the power required for the video monitor or television.

While all three computers can be made almost equivalent by adding options to their simple configurations, there still are important differences. First, overall the **Radio Shack** TRS-80 generally **costs less** than either the Commadore PET or the Apple. Second, **the Apple has a color video** output while the PET and TRS-80 only have black and white video. But, **the PET** does have **good graphics.** Third, the keyboards on both the Apple and the TRS-80 are better quality, typewriter-like keyboards while the PET keyboard has the keys closely **spaced,** very much like a calculator keyboard.

The reliability of all three units appears very good. They are completely electronic except for the cassette recorder which apparently is the most frequent, but rare, cause of difficulties. The **component design** of the **Apple** and the **TRS-80 is an advantage** compared to the compact, all-in-one package design of the Commadore PET. With the **PET,** if one part goes bad, the entire unit must be returned for repairs. With a component system, however, only the broken component need be returned with the rest of the system still operational.

For repairs, Radio Shack offers service which both Commadore and Apple dealers find hard to compete with. With Radio Shack all repairs are completed within 48 hours of being returned to their computer center, and they are made for a fixed fee after the 90 day warranty expires. For example, to repair the TRS-80 keyboard/computer unit costs only

$24, if the factory seal has not been broken. The "real" time for such repairs depends upon **how fast** your local Radio Shack store or dealer **can return your computer to their computer center,** where it will be repaired or replaced. Not many local computer stores which sell Apples or PETs can match this kind of service at this price.

The **capability** of a computer and computer accessories can be assessed in two ways: their **speed** and their **capacity.** All three low-cost, microcomputers have about the same speed. Tests can be made by running the same program on all three computers and timing the results. By doing this, all three work at about the same speed. The **capacity** of a computer is measured in its ability to both store data and the length of programs it can work with. The Apple, the PET and the TRS-80 all can be purchased with equivalent amounts of memory so that they can all run equally long programs. While **they are evenly matched** in this area, this does **not apply to data storage.** All three can store data and programs on cassette tapes, but only the Apple and the TRS-80 have 'floppy disks' available. These devices are important when working with and storing large amounts of information; such as the name and address of all subscribers.

The capabilities of the computer accessories or peripherals is also important. For example, a printer is very important in most applications. While the prices vary on the cost of printers, you pay for what you get. The **lower cost printers use electo-static paper** and even some higher priced units give only fair print quality. But more important is **the printing speed.** While it might be nice to send out bills to every customer printed on an IBM Selectric, it would probably take too much time. So a faster printer would have to be selected. Because most peripherals are mechanical, the speed of these units is more important than the speed of the computer itself.

Speed is why "floppy disks" are so popular. In a computer system they are used to store information. While the same results could be done with cassettes or other types of magnetic tape, 'floppy disks' are preferred. **With a cassette** you might have to read through **an entire tape** before you find the information you want. Obviously, this could take a long time. **With a "floppy disk"** it would be a matter of seconds, at most. A 'floppy disk' looks very much like a stereo record, but it is covered with magnetic material like a recording tape. To find any information on the disk, the recording head is moved like the needle on a record player is moved to a particular song on a stereo record. This is much quicker than finding a selection on a tape.

Expandability and compatibility are considerations for future uses of the computer. Traditionally, because of the

large amounts of money tied up in large computers, these considerations were very important. Now with the low cost and mass production of microcomputers this is not as vital a concern. All three of the low-cost microcomputers are expandable. **Both Radio Shack and Apple Computer are in very good position to supply peripherals** for future expansion of their machines. Unfortunately, it is reported that Commadore is not sufficiently staffed to provide such peripherals at this time. However, their computer is based on an IEEE standard so a wide variety of peripherials **may become available** for the PET. But at this time it seems that the TRS-80 is establishing itself as a standard as more and more manufacturers are making products which can connect to this machine. Just so long as a microcomputer has an adapter to attach through standard interfaces to printers and other accessories, **as all three of these computers do,** compatibility is not a major problem at this point in time.

With this background, it becomes clear that the Radio Shack TRS-80 is the outstanding product. The Apple can usually match the TRS-80 in features and even outmatch it with its color video output. But the TRS-80 not only costs less, but the service which Radio Shack offers is difficult to beat. And the TRS-80 lets anyone start with a small initial investment of about half of the total cost of the minimum Apple system. Though the PET may cost about the same as the Radio Shack TRS-80 in their simple configurations, Commadore does not offer either the servicing which Radio Shack can through their thousands of stores or the peripherals to sufficiently expand the system for the variety of possible business uses. But more important, it appears that the programs that are or will be available for the Radio Shack TRS-80 make it the "best choice". While this is somewhat of a subjective view, a review of the microcomputer magazines shows more software available for the TRS-80 than for the other two computers. And because of the increasing sales of the TRS-80, compared to the other machines, it appears that this trend will continue. Just like Apple Computer, Radio Shack does supply, and will continue to supply, a substantial amount of software for their computers. Specifically, Radio Shack plans to introduce several business programs in the near future. Because of this growing volume of software for the TRS-80 from both Radio Shack and a variety of sources, the Radio Shack TRS-80 is the top choice.

But, Radio Shack TRS-80 **does have two minor problems.** First, the TRS-80 is so popular that **many items are back-ordered** several months. So if you would like to get some peripherals or options you may

Computer Language

Any computer is programmed using a set of **instructions called computer language.** The most rudimentary of the many different computer languages is machine language. In this language all instructions are numbers which the electronics of the computer understands. These instructions are electronically stored in computer memory from which they are decoded and the instruction executed. This is the world of bytes and bits, micro and nano seconds, ROMs and RAM, and much more computer jargon. Obviously, **it is not very easy to program in machine language.**

In order to make it easier to program, computer professionals have written many different computer languages. The set of instructions are usually not numbers but English words. While these instructions are also electronically stored in computer memory from where they are decoded and executed, they are decoded and executed by a machine language program. In other words, there are different layers of programs. Or one program is just data to another program.

BASIC is the most commonly used computer language with microcomputers. Like any other language, BASIC has a vocabulary of words with very precise meanings. For example, PRINT, READ, GOTO, IF, etc. In addition, on most computers, if an error is made in the program, the computer will display the reason for the error.

There are many different versions of BASIC. For example, the BASIC in the Apple, the PET and the TRS-80 all have different features. In fact, Apple and Radio Shack both have two different versions available for their computers. Because of all of these different versions and all of the different cassette tape formats, it can be difficult to have programs written on one machine work on another computer.

Fortunately, one company—**MicroSoft**—has written the most popular versions of BASIC. They have written the BASIC in the PET, AppleSoft BASIC for the Apple, and Level II BASIC for the TRS-80. This makes these versions very much alike. **Because of this similarity, program listings in my monthly column will generally be written for TRS-80 Level II BASIC.**

have to wait several months. Second, **the TRS-80 works only in capital letters,** as sold by Radio Shack. While this is not important in many cases, in some applications it is useful to have lower case letters as well. **There is a modification that can be made for about $50** to allow the machine to work in **both** upper and lower case, but it **voids** the fixed repair rates and the warranty. (!)

If you are considering buying a TRS-80, I suggest that you start with **Level I BASIC.** This is the lowest cost version of the computer. **Level I BASIC** is an easy-to-learn **computer language** and Radio Shack provides an **excellent** instruction manual for Level I. With this you can learn **how** the computer works **and write** some computer programs. However, once you are familiar with the computer, Level II BASIC becomes very useful. And with the back order problem that Radio Shack is having, I suggest that you order **this option when you take delivery** of your TRS-80.

I think you will find the TRS-80 to be extremely useful for your business and this will be the focus of my monthly column starting in the next issue of CATJ. **"Ray Daly on Computing"** will cover how to make efficient use of your microcomputer (or computers), new technology, programs for your microcomputer, hardware modifications, how different people are using their computers, and many other subjects. While this article and the column will focus on the TRS-80, listings of most programs in the column will be in Radio Shack's Level II BASIC. **(Computer Cablevision will provide copies of these programs on cassette for the TRS-80.)** Since Level II is a version of "Microsoft" BASIC, these programs will be able to work in most microcomputers with only minor revisions required in some cases. If you buy a microcomputer or are using one in your cable television operation, please let me know.

TECHNICAL TOPICS

Who Has The Info?

"I have just finished spending 90 minutes on the telephone with Jim Vines of Paraframe. He suggested that I contact CATJ with requests for additional information.

"I have written to various manufacturers of semi-conductors for data sheets on solid state devices capable of being used at 4 GHz. To date I have not received a reply. Even after I received CATJ, and I wrote to Hewlett Packard for application notes on their HFET 1101, 1102 and HXTR 6101 and 6102, I also received nothing. I am beginning to wonder if the posture of the semi-conductor manufacturers is such that since it's against the law to receive signals without a license that they will not release the information!

"Steve Birkill's new CATJ column is bound to be a big help, but I don't want to wait for the next twelve months to get enough data to know where to start and how to get a terminal designed and running. It is very difficult to find good background data (books) on parabolics, feed arrangements, basic LNA theory, basic receiver theory; all of which inhibits the serious experimenter. No, I do not want to copy another person's work (reference the October CATJ statement) but I do need to review and study the available material so I can design and construct a broadcast quality system for myself. I am an electronic technician for the U.S. Navy (radar and computers) and do have a college background so it's not like I need someone to do it for me. But I do need some help running down some reference material and I bet other experimenters are in the same fix.

"Can CATJ help? I would certainly appreciate any information you have to offer on how to obtain the information. Perhaps you can straighten out the semi-conductor manufacturers and get them to make their data available. How about publishing a list of reference material. Anything will be better than what I have now. Jim (Vines) was surprised that I am having this difficulty and he has offered to do what he can."

Dwight Zeka
Jacksonville, Fl. 32211

We assure you that the semi-conductor manufacturers could care less about how you use their solid state devices; as long as you use them! They have no concern about whether you have a TVRO license or not (by the way—getting a license is a cinch; see CATJ, **Coop's Cable Column** for April 1978). **In the case of Hewlett Packard, our suggestion is that you leave the home** (Palo Alto) **office alone and bug the nearest regional office. The regional offices are usually quite good about getting your requests for application notes filled and if they don't have the data sheets handy they will usually see that they are sent to you. There is one good book about satellite systems available. It was published in Japan, but an English version is available. Try ("Satellite Communications Engineerng"), Lattice Co., 15-9, Haraikata-machi, Shinjuku-tu, Tokyo 162 Japan. The price is around $50 American airmail. However, be warned this book does not go into schematic diagrams of receivers in great detail. However as a foundation for how the satellite 'system' works, it is excellent. Beyond that, visit a local cable company with a terminal and see if you can get a look at a manual for a satellite receiver. . .and keep in touch with Vines. He knows what he is doing!**

The Numbers Game

"I was quite interested in the tabulations of TVRO sales (grouped by the various manufacturers) appearing on page 34 of the September CATJ. Just one point of clarification comes to mind:

Although the Andrew/Hughes category was recognized as being essentially one and the same, it should be pointed out that the same could be said for Harris (RMS) antennas which have been the Hughes choice to date for our six meter (antenna) installations. Thus when you include 'Andrew/Hughes' **and** 'Harris/6 meter' (into the 'Hughes Corner') our position as number 2 is actually much stronger than appears on the surface. Like Avis, we try harder!"

A.H. Sonnenschein
Manager—AML
Hughes Aircraft Company
Torrance, Ca. 90509

Agreed the FCC filing data does not accurately represent the total 'system package'. **FCC data released to the public typically specifies the antenna manufacturer involved with the terminal but** ignores **further break downs such as who supplies the electronics. In many cases the antenna manufacturer is not the prime contractor. A similar case in point is the Microwave Associates system sales which typically utilize Andrew antennas. Where you may have been 'shorted' with a separate listing for Harris** (RMS), **Abe, you probably got more than your share of the credit for Andrew sales, some of which belong to Microwave Associates and possibly others. We warned that FCC data was not perfect, only the best that happened to be available.**

Grow or Die

"You wrote an interesting editorial in the October CATJ on the late Larry Jacobsen's accusation that Cable TV operators brought on the FCC freeze and distant signal restrictions 13 years ago by bringing in distant signals. Your message seems to be that we are now baiting the AT&T tiger in his den by threatening to compete, and we should remain in our uneasy status quo and avoid a new 13 years of bloody battles with the telephone companies.

"It is ironic that you should write the editorial considering that your company, Tocom, is the acknowledged pioneer in conceiving and building systems which compete with certain profitable local telephone services—meter reading, fire alarms, burglar alarms, and the whole gamut of marketing and polling.

"Your editorial reflects concerns of much of our industry, but look at three recent industry reactions to innovations:

"Very few shipping companies got into the airline business. Grace Lines is the only one I know. Neither did the railroads.

"The railroads also refused to get into the oil pipeline business. When pipeline companies approached them to lay their pipelines along the rail routes, the railroads told them, 'If you can't haul your oil in our tank cars, we aren't interested.'

"Bell Labs invented the transistor, and let the radio industry walk away with the transistor market. Is the AT&T we've watched the past two years going to follow those clear examples of failure to move with the future? I think the "Bell Bill" shows they aren't going to repeat mistakes this time.

"You are aware that every one of 'our' cable manufacturers is getting into fiber optics. Right now, I'll bet all the troops at the cable yards in Phoenix are jes' settin' around at lunch time speculating along the lines of, 'Why don't we use fiber instead of copper for the center conductor, pull it into 412, and have it completely protected against damage by the polyethylene foam?'

"The telephone companies are going to be in the Cable TV business, well financed by REA. REA and the independents are dedicated to that, and they have invincible logic: 'The Cable TV companies had 20 years to provide

television to rural America and they haven't succeeded. It's time to let somebody else get in and do the job.' Naturally, REA will provide 35 year, two percent financing to let 'somebody else' get the job done.

"The Cable TV industry will have to compete or else fade away, and although Ma Bell's resources are awesome, we have a lot going for us. Cable TV's are generally lean and hungry, we know broadband communications, and we are at home with electronics. The new telephone switchboards are electronic, with all the advantages of integrated circuits, and loaded with goodies. Most of the telephone trunklines going in today use PCM carrier equipment which will carry about 192 telephone channels in a 6 MHz TV channel. (GTE Lenkurt showed it works great on a Cable TV system.) With fiber optics we can offer telephone, data, and Cable TV service.

"The Communications Act is probably going to pass. We need to stop fighting it and get it amended. Keep us classified as interstate commerce, prohibit local and state regulation, guarantee access to all poles and ducts, and let anti-trust and marketplace forces prevail.

"Let's have CATA work to get the Communications Act rewritten to keep us unfettered. In the meantime, if you have used up most of the depreciation in your system, why not mosey on by the local telephone company and see if you can't start depreciating that all over again?"

GUAM CABLE TV SYSTEM
Lee M. Holmes
President

Our October editorial was not a formal CATA position; only an attempt at bringing home the reality of the situation. Anytime you step on the toes of a giant you had better be prepared for the consequences!

Wall Charts In Canada

"Please find enclosed our money order for two copies of the TVRO data charts. If this chart is as useful as CATJ magazine, it will be invaluable. As you know, Canada still waits for formal government approval of satellite service. My own applications were to be heard October 17 and 18 in Thunder Bay (Ontario). The cable operators here pray that the CRTC will move forward on satellite approval in Canada and thereby allow Canada to join the 20th century."

John S. Emmons
Modern Radio & TV Systems
Geraldton, Ontario

24 Foot Parabolic Kit?

"Way back in the first few issues of CATJ you folks ran a series of articles describing 24 to 40 foot full parabolic dishes for CATV off-air reception. One of the antennas was, at the time, available as a kit; a 24 foot parabolic at $929 and the feed for same at $145. If this is still available please supply a brochure."

V. Hoglung
Darrington TV Cable Co.
Darrington, Wa. 98241

Sorry. . .as far as we know the 24 foot parabolics disappeared from the 'market' shortly after they were described in CATJ. Actually the July 1974 issue told a person everything he really needs to know to build such an antenna, from scratch, with locally available materials. And probably for several hundred dollars less than the $929 + $145 kit available at the time. How many readers built one of the 24-40 foot parabolics back in the summer of 1974. . .and still have it operating? We'd like to hear from you.

The Religious Transponders

"I read, with considerable interest, your article "Those Religious Transponders" in your September (1978) issue. The article said lots of things, most of which are reasonably true, but I got the impression the writer was not in full sympathy with religious broadcasters. As someone who has worked with religious broadcasters since the days of radio, I'd like to add my own two cents worth.

"Rest assured, for starters, that the three religious television networks are very sincere in what they are doing, and not out to make a buck except for the purpose (which seems fair) of expanding the service. Programming quality is improving, too. Just like commercial TV, Christian TV starts with a bunch of people talking on a fixed set, but has expanded to considerable variety. Future Christian programming will, no doubt, assume the formats of many types of TV shows. . .epic films, plays, soap operas(!), news reporting. . .and will consequently reach quite an audience. TBN, CBN and PTL are 'networks', too, in the sense that stations in various parts of the country carry programming from them. This, too, is likely to increase as programming diversifies.

"It is in the cable operator's interest to carry Christian television (even all three of them) for several reasons: it provides a unique service not available elsewhere (even over-the-air in many areas), it provides a service to people who wouldn't watch television at all otherwise (and consequently not subscribe to cable), and it doesn't cost much to add a receiver if you've got the terminal in already.

"As to the (article's) statement that the Christian broadcasters solicit money from the viewers; that is true. So. . .on commercial TV. . .do makers of cars, soaps, drugs, girdles, and feminine hygiene products. . .not to mention advertising for movies which compete with the cable operator's premium service(s).

"Incidentally, it has been my pleasure to meet Paul Crouch (whom your article described as 'pure Hollywood'), as well as some of the other TBN folks with whom cable companies deal. I cannot help but wonder how your writer would describe Jan Crouch. . . Paul's wife. . .an amazing woman who completely defies description!"

Jim Rieger, Engineer
PTBW
Ridgecrest, California 93555

Anyone who has seen Jan Crouch in action on the Praise The Lord show would have to agree with your observation. We believe that perhaps one of our favorite one-liner-creators (Jim Vines of Paraframe) would simply observe that Jan has 'soul'.

The RMS Challenge

"We are in receipt of your letter of September 26, 1978. After having read your detailed letter and plan and also the letter called "An Open Challenge" from RMS Electronics proposed by Mr. Don Edelman, Vice President, CATV Division, we are shocked that a trade journal would participate in such an obvious public relations promotion by a manufacturer.

"We have participated in many tests where editors have asked for samples of our products but never in a program where an open challenge is made by one manufacturer against the complete market.

"Although I feel that your organization would do its best to make such a challenge fair to all products, I believe the purpose and the principle of the challenge is definitely a publicity program by RMS. Proof of this is that the challenge letter is, as you indicated, being widely circulated at this time within the Industry. By doing this, they have taken advantage of their idea without first knowing whether or not anybody would accept the challenge and this turns it immediately into a publicity program for them.

"We are not one of the companies that have a Taiwanese version of RMS's transformer. Thank you for having sent me your letter of September 26th with the invitation, as I recognize your intentions were to advise me of this program and it is appreciated. However, for the above reasons, we will not participate in the program."

Readers should be aware that when RMS 'openly challenged' the passive industry to 'prove' their transformers were the equal or better than the RMS CA-2500, we agreed to conduct the testing of the various units at the CATA/CATJ Lab. Nobody responded to the RMS challenge by sending transformers for test. Intrigued by the 'intrigue' of this whole sequence of events our Gayland Bockhahn went into the industry to round up a quantity of different transformers from various cable companies and sometime this spring we'll report to the industry what we find, after subjecting all transformers sampled to our testing procedures.

Daniels & Associates

October 1978

Daniels & Associates acted as Financial Advisor to the borrower in the following transactions totalling $9.6 million.

$3,400,000
Clearview Cable TV, Inc.
Auburn, Washington
Senior Secured Notes
Due 1986

$1,700,000
Southern Illinois Cable TV
Senior Secured Notes
Due 1990

$3,400,000
Mahoning Valley Cablevision, Ltd.
Warren, Ohio
Senior Secured Notes
Due 1986

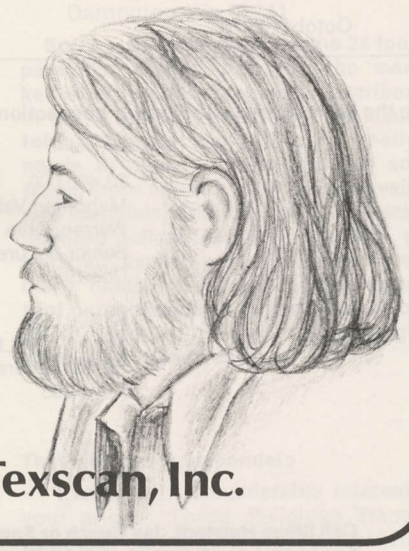
$1,100,000
Maui CATV, Ltd.
Senior Secured Notes
Due 1988

This notice appears as a matter of record only.

Call Steve Halstedt, Jay Busch or Sam Evans for a confidential review of your financing needs.

Daniels & Associates, Inc.
2930 East Third Avenue
Denver, Colorado 80206
303/321-7550

R. Stelle's Technology Corner



Raleigh B. Stelle - Texscan, Inc.

The FSM's Six Lies

A field strength meter is a superheterodyne receiver. It converts an incoming signal to some intermediate frequency (IF) which is usually lower than the desired receiver frequency. The reason for conversion is to generate selectivity and gain. This is more easily accomplished at relatively low frequencies.

To accomplish this conversion, a nonlinear device (diode) is excited by two incoming RF signals. The product at the IF frequency is equal to the sum and difference of the two incoming signals. See the mixer block diagram, **figure 1.** A bandpass filter is provided at the mixer output ("C") to select the desired mixing product. When a signal is present at the IF, the instrument shows a response on its indicator (meter, LED, etc.).

The FSM block diagram shows the basic layout of the 727 field strength meter. The input attenuator is followed by an input bandpass filter (BPF). This will be discussed further later. The input feeds a balanced mixer which is driven by a variable frequency local oscillator (LO). The mixer output is filtered by a 52 MHz bandpass filter of 0.6 MHz bandwidth. The BPF output is connected to a fixed gain IF amplifier which drives a detection circuit shown here as a simple diode. The output from the detector circuitry provides a DC voltage which, ideally, is directly proportional to the peak RF voltage applied to the detector. The speaker provides an aural indication of the signal present and also provides entertainment at lunch time.

THE MIXER

A = INPUT SIGNAL; B = LOCAL OSCILLATOR;
C = OUTPUT SIGNAL(S)

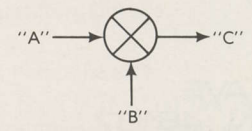


FIGURE ONE

The first lie!

When measuring large carrier-to-noise (C/N) ratios, we generally use high level test points such as bridger or line extender outputs. Signals of +20 to +30 dBmV are present at the FSM input terminals. **As input attenuation is removed to measure low level noise,** the signal levels arriving at the mixer "A" port can approach the level at which the mixer compresses the "C" output. At this point, "C" is no longer in 1:1 relationship with "A" and the indicated output will be less than the actual value of signal present at the input. See **figure 3.**

The second lie!

Under the conditions described above, a fault more serious than a little compression can occur. As signal levels **to the mixer** approach +10 dBmV, the simple mixing process of A + B = C becomes invalid. **Multiple mixing products** can now occur which will lead us to believe we have signals or beats occurring in the system where in fact there are none. It is relatively easy to determine this condition with low value **external** attenuators. Either use a 3 dB fixed pad or a 1 dB step attenuator. So long as the meter scale changes 1 dB for a 1 dB attenuation change, the meter is reading accurately. When the meter is overloaded, the meter scale will change 2 or 3 dB for a 1 dB change.

The third lie!

With high input levels, or with the superband or UHF converters, images become a problem. If the desired mixing product is A − B = C, the image is A + B = C. From the two graphs, **figures 4 and 5,** you can see the channel and frequency relationships. If you were measuring system noise just below Channel 7, you might get an indication of a signal which is really caused by Channel 4. There are three ways to determine if this is an image response. **(1)** If the signal "peaks", chances are good that you are measuring an image or a beat product from the second lie. If you are measuring **noise,** it should be nearly "flat". **(2)** Use the audio section of the FSM. Noise has only a "hissing" or "rushing" sound. There should be **no indiciation** of "sync buzz" or other audio information present. **(3)** Use a good sharp bandpass filter in front of the FSM. This will eliminate all responses but the desired signal frequencies.

The fourth lie!

Example: Your system must supply a 0 dBmV signal to the subscriber. You must maintain 36 dB carrier-to-noise ratio. With the 727 field strength meter, you read the following:

1) Carrier level—0 dBmV
2) Noise level— −36 dBmV

What is the carrier-to-noise ratio?? 36 dB??

NO!

Noise in a CATV system is specified as the noise **in a 4 MHz bandwidth.** But our FSM has a **much narrower bandwidth,** typically 0.6 MHz. Since the measurement bandwidth is much less than the 4 MHz required, we must make allowances. The **N**oise **C**orrection **F**actor **for IF bandwidth alone** is 10 log 4 MHz / B/W MHz. For the 727: **NCF** = 10 log 4/.6 = 8.239 dB. For narrower IF bandwidths, the number becomes increasingly large.

The nature of **noise** is such that it **has a very high peak to average ratio.** This means that a detector circuit which is designed to read **peak** voltages will read a higher value than the average, which is the quantity we need. So an additional correction in the opposite direction is now required. It is difficult to assign a value theoretically, so this number is derived experimentally by each vendor. For the 727, the number is 4 dB, making the overall noise correction factor approximately 4.0 dB. This number is **added** algebraically **to the noise** or **subtracted** from the C/N **ratio.**

In our example then, the C/N ratio would be −32 dB. . .out of spec. But, is this a reliable measurement? Again, the answer is **NO!**

The fifth lie!

In our example above, we observed the noise level to be −36 dBmV. The **ultimate sensitivity** of most FSM's is only **−40 dBmV.** This limitation is a result of the instrument's **inherent noise floor.** In order to measure a signal or noise **accurately,** that signal must be **8-10 dB above** the instrument's noise floor. At the given level of −36 dBmV, our measurement could be in error by a further 2-3 dB. At levels close to the noise floor, the detector in the FSM cannot distinguish **between** the **instrument noise** and the **input noise** (or signal).

FSM BLOCK DIAGRAM

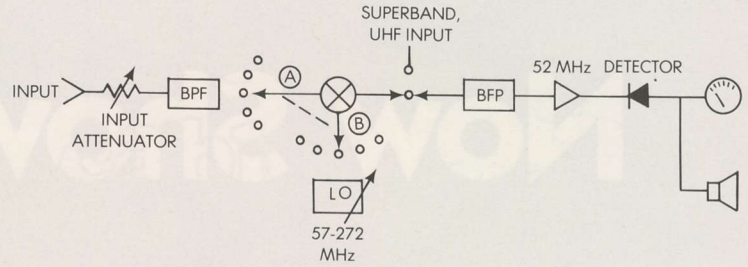


FIGURE TWO

HOW FALSE MIXING PRODUCTS OCCUR

"C" = "A" ± "B" (FREQUENCIES)

1) ASSUME "A" IS −10 dBmV
2) IF ≫ A ≈ +57 dBmV, THEN C WILL TRACK WITH A IN A 1:1 RELATIONSHIP, WITHIN THE DYNAMIC RANGE OF THE MIXER.
3) HOWEVER, AS "A" BECOMES LARGE ≈ +10 dBmV, MIXING PRODUCTS APPEAR AS:

2A ± B = C	A ± 3B = C
3A ± B = C	2A ± 3B = C
A ± 2B = C	3A ± 3B = C
2A ± 2B = C	

The sixth lie!

The circuit shown in **figure 2** (block diagram) **should be** a true peak detector. Unfortunately, the gulf between theory and practice has not taken some factors into account. In fact, most FSM's have an error between types of input signal, depending on modulation. Since the meters are calibrated on a CW source, they are accurate for that type signal. On video signals, some meters exhibit as much as 2 dB error. The answer is to check your meter against both CW and video sources and note the differences. The difference should not change with frequency, but may vary depending on where the pointer is on the meter scale.

Summary

The field strength meter is the cornerstone of our industry. It has done yeoman service for years and will continue to do so for many more years. But it is not an instrument without fault. Understanding the limitations of this instrument will enhance the usefulness of the information derived from it.

—ERRATA—

WGN Up!

At 5 PM on Thursday November 9th transponder 3 on RCA SATCOM F1 came alive with the programming of Chicago's WGN. The common carrier is United Video. The inauguration of the service was witnessed by several systems and one (Wellington, Kansas) laid claim to being 'first in the nation to put the signal on their system via satellite'.

For United's Roy Bliss the start up of service for the second independent to go out via satellite was the culmination of more than 15 months work and waiting for the necessary federal approvals. United first requested WGN service at the FCC back on the 2nd of August in 1977.

While WGN is not expected to take the same aggressive approach to promoting their satellite coverage as Ted Turner's WTCG, it is significant to note that the people at WGN have decided to at least get behind the project. WGN now agrees to send out their program schedules on a weekly basis to all cable systems **taking the service,** and two WGN representatives are due in Anaheim at the Western Show to make the rounds with United's Bliss. WGN has been talking with the folks who conduct rating surveys to learn what might be done to include WGN satellite coverage in the present WGN terrestrial survey base. The feeling at WGN is that **if** the rating surveys can be done in a way that will **add** these satellite viewers to the WGN 'viewer base', and WGN can therefore add these viewers to its 'rate base' (and thereby increase their advertising rates) that WGN will get much more interested in the project.

Bliss feels around 200 cable systems, representing perhaps 900,000 homes, will be plugged into the satellite service within six months.

Baptists On The Bird

A number of new, recently started, one program per week operations have been announced during the past month and one of the first of these is now being distributed Sundays at 9 AM (repeated at 10 AM) eastern time on transponder 24. The program is called **'At Home With The Bible'** and it is produced by the Sunday School Board of the Southern Baptist Convention. The program introduces the viewer to a Bible study program which the producers characterize as "unique and modern".

Cable systems wanting to cable-distribute this program need only arrange the TVRO receiver so that it will come up on HBO transponder 24 at either 9 or 10 AM eastern on Sundays for one hour. There is no charge for the program, and as a matter of fact the folks at 'Time Rite, Inc., Southern Baptist Radio Television Commission' (6350 West Freeway, Fort Worth, Texas 76150; 817-737-4011) are even ready to provide local newspaper advertising materials (and we understand pay some or all of the costs locally) to support the program in your cable town.

USTC LNA Power Supply

United States Tower & Fabrication Company (P.O. Drawer 'S', Afton, Oklahoma 74331) has announced a new 3-1/2 inch rack mounting power supply intended for 'safe powering' of TVRO LNA units. The unit, model **BPS1208,** is a 'floating standby supply' that powers the LNA through a battery bank (thereby isolating the LNA DC supply from the AC line nasties that blow up LNAs). The unit will provide 13.8 volts DC with a maximum output current of 500 mA; the standby capacity is 300 mA for 24 hours or 150 mA for 48 hours. The unit is metered with separate meters for the output voltage and the current load being drawn; fusing is on both the AC input and the battery (DC) output. Input voltage is 105-120 VAC with 0.8 amp load. Operating temperature range, largely determined by the battery bank, is −4 to +122 degrees F. Price range of the unit is $200.

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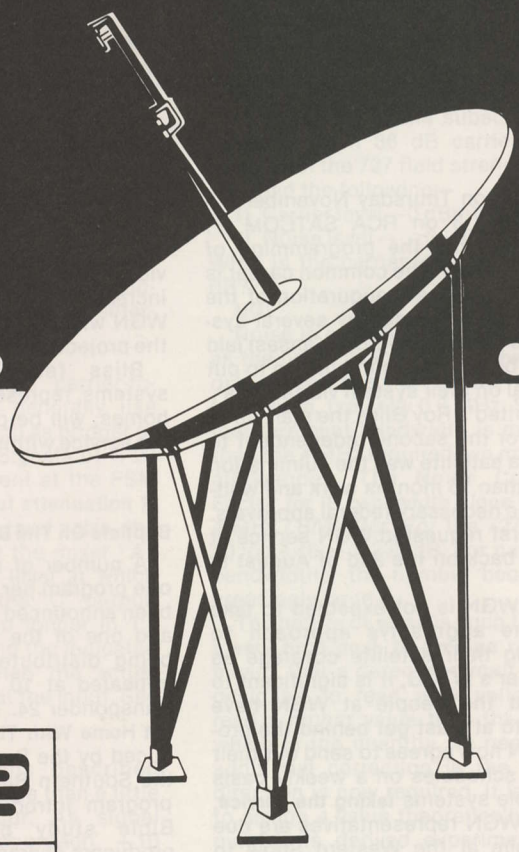

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Coop's cable column

bob cooper editor in chief
CATJ

Aftermath of TV GUIDE

Few of us are subjected to national publicity so there are few rule books around that tell you what to expect or how to handle your sudden illumination in the coast to coast spotlight. Here are a few candid observations for those who may follow me up the spiral staircase in the years ahead.

Rule number one—Don't let it go to your head. When the **TV GUIDE** article appeared in the October 21st edition I fully anticipated our CATJ offices would be deluged by people who 'thought' they wanted their own backyard satellite terminals. I was not disappointed. They walked, and drove and they telephoned. They sent telegrams and they tried to wheezle my unlisted home telephone number out of the local Bell operators. A poor chap with the same name as I, living in Oklahoma City and with the misfortune of having **his** telephone number listed, finally got through to my office to 'complain'. Seems he had finally taken his home phone off the hook to get a sound night's sleep after thoughtless folks in California would make an inspirational telephone call to him at 2 AM in the morning. He also had the misfortune to have his office telephone number listed next to his home telephone number. I sent flowers to his secretary.

Some calls did **get through to me.** We had a system pre-arranged where whenever anyone called that gave a name our telephone gal didn't recognize. . .we always asked **"Does this call relate to the article in TV GUIDE"?** If they responded 'yes' then we simply explained that for a nominal charge of $10.00 we would sent to them a whole 'packet' of materials that explained how a person went about getting his own terminal. This packet includes a new 52 page 'booklet' which I had whipped up the prior weekend and it lists alphabetically all of you terminal suppliers and TVRO equipment suppliers as well. So if you start getting strange telephone calls from people who want to put in backyard terminals you'll know where to send the sales commission checks.

Our front line defense against telephone calls (we stopped counting when they topped 250 calls in a few days) didn't deter the more persistent. One chap who lives in Oklahoma claimed he hired a private airplane and spent a Saturday afternoon flying radius circles around Oklahoma City, at low level, looking for a dish antenna. Sure enought he found me and then at 10 AM on Sunday morning he drove up in his sparkling Mark IV (or V. . .I can't tell them apart since I drive a three year old Dodge pickup). My usually mild mannered wife Susan answered the impatient knock at the front door. I was down in the lab writing some CATJ copy at the time.

"I want to see this Cooper fellow" he announced. My wife asked what it pertained to and he said he wanted to buy **"one of those earth terminal gadgets".** Susan tried to show interest and beg off letting him see me. He persisted. Finally she said 'no, he is too busy to see anyone right now'. The fellow then told her how ingenious he had been in finding us, and tried the old dangle-a-carrot trick. **"Look here lady"** (that got her, let me tell you) **"I'm about to spend $25,000 for one of these things and I just thought your husband might want a piece of that".** Susan took him back by explaining that her husband didn't manufacture terminals, sell them, lease them, rent them or install them. 'We just have one. . .that's all' she said slowly shutting the door. "Can I just walk around the disc antenna then?" he asked as the door went klunk in his face. That's a funny thing about neophytes. They see their first dish and they decide it is a disc. It happens 9 times out of 10 (that's an unofficial survey I might add). I think we blew naming the device, as an industry. If people think it's a disc perhaps we should re-name it!

Rule number two—you **should** talk to **some** people. There's a big trick to this, in selecting who you talk to and who you don't. My first instinct ws to talk to no-one. And we played it that way for several days at the office. Then the first mass-media people called. **NPR** (National Public Radio) wanted to do an 'open ended' telephone interview for a weekend radio show. I was flattered and accepted even if the guy did 'hype' his audience a tad. **"We reach between 6 and 7 million people a show"** boasted he. He probably meant on an annual cum basis. When it came time for it to run on the network I was tied up digging potatos in the family garden so I missed it. Apparently alot of other people did too because I heard zero from 'this' national exposure.

Then a chap from CBS television news called. He said he wanted to send out a 'Cronkite film crew' the next Monday. I figured this was a put on and although I told my wife about it and she told everyone within six miles I secretly figured somebody in New York was having the laugh of his life. Susan and I and the two kids spent the weekend doing a spring house cleaning (in October yet) and we mowed the already frost bitten lawn and the kids spent two hours with the garden tractor and trailer picking up every foreign object in the front two acres. I still secretly figured it was a put on but the house and yard needed a good cleaning so I went along with a smile.

Come Monday morning the office routine was no different than any other Monday. If you overlook the telephone calls from **TV GUIDE** readers spaced at 60 second intervals. The CBS guy hadn't said **when** to expect the 'crew' from Dallas so I had checked the airline guide to figure out the possibles. He had asked when was 'the best time' to catch a 'dial full of programming' and I had responded 'late in the afternoon'. By 1:30 I was just about convinced that the initial call had been a hoax. I reasoned **'surely** they wouldn't air **this** sort of thing on a **national** TV network', and, 'no one makes **one** telephone call on a Friday and then sends a three man crew into Oklahoma on a Monday **without confirming** the arrangements'.

Three shadowy figures passed by my office window. My pulse quickened a bit and seconds later Janet came into to announce **"Those guys from CBS are here".**

'Those guys' were lead by one Eric Engberg, a CBS staffer headquartered in Dallas. Engberg turned out to be a former ham radio operator and the sound man turned out to be an electronics tinkerer of the first order. We hit it off famously and headed for the house/lab. On the way Eric tried to calibrate where I was coming from. **"Is this thing a threat to the national networks?"** he asked. I assured him it was not. **"What about local stations?".** Again I told him no, and explained why. "I see this as an at-the-moment threat to no-one. It is an expensive 'hobby' and if it does ever go down to the masses it will be five to ten years. . .**after** we get a whole new set of

satellites designed **just for** direct-to-home-broadcasting". Engberg, with his ham radio background, grasped the significance of satellite transmitter power versus path-loss and receive antenna size quickly. **"I figured we would do this as a** 'trendy piece'. . .**but now I don't know"** he offered. 'Trendy pieces' run at the end of the Cronkite news, and they deal with fads or national phenomenon such as disco-dancing.

Engberg kept telling me and my family to "do whatever it is you normally do on a Monday afternoon and we'll just follow along and film you". Film was a bit of a mis-statement since they do everything on tape these days. **"Satellites have really changed the way we handle our news feeds"** he offered. **"Just a few years ago the brass in New York would spend lots of time debating whether to make a** 'switch' **or not; now with the satellite feeds we never think about the costs".** A 'switch' is their term for sending a news item from the field to New York. Before satellites it had to go via terrestrial microwave and the standard fee was $1200. With the satellite a 'switch' costs them $250 so they now take into New York virtually everything shot in the field.

"Lot's of stuff used to get shot but never moved to New York" commented Engberg. **"Now we have so much of it that doesn't get used in network news shows we feed up to an hour a day to our network affiliates for use in their local news shows".** He was telling me this just about the time we were tuning in something called the 'ABC DEF' which is a daily **d**irect **e**lectronic **f**eed (for DEF. . .such clever people at ABC!) over on WESTAR. We watched about 15 minutes of some of the most **boring** news film I had ever seen while Engberg and his two traveling comedians narrated what was happening for me. The camera guy finally said **"That's what is going to happen to this piece if we don't get busy!"** Engberg grimaced and we got down to work.

All told they shot perhaps 40 minutes of 'film'. They moved my two youngsters into my son's bedroom and he tuned up super-17 where 'My Three Sons' was just starting. Then they shot 'film' of the kids watching **their favorite** TV station. I figured that piece was headed for the cutting room floor (although I am always quick to point out how good looking **Susan's** kids are; when they are good they are hers, when they are bad they are 'mine'!) and then Eric surprised me again by using it as his opening when the piece did finally air on Halloween Day.

If you saw the piece on October 31st it ran a total of 2 minutes and 49 seconds. Right at the close of the newscast and in the 'trendy' spot in Cronkite. In that 169 seconds of national exposure Engberg managed to get in the whole story including the fact that **you should have a license** to own and operate one of these things. He even got in a nice plug for the cable industry. When Cronkite came back with **"And that's the way it is. . ."** and his now famous closing I was numb. My son told me he loved me and my daughter wanted to know if **'now'** should could run and get her halloween costume on **(!).**

Like I said, you have to be selective about who you talk with in a situation like this. You also need to have an understanding with the media people. Cronkite introduced the piece with some vague references to Thomas Edison and 'the ultimate TV receiver' and 'switched' to Eric in **Denton County, Texas.** Eric and I had discussed at some length how much 'this family' values its privacy. **"I understand"** said he. And sure enough he did. After that guy did an Oklahoma City small plane search for me, it will take a better intelligence effort than **that** to find us in **'Denton County, Texas'**!

CATJ SATELLITE MAGAZINE—SCHEDULE

Cable people with access to a TVRO receiver terminal should make plans to 'tune-in' the cable industry's very own weekly television show, **SATELLITE MAGAZINE,** every Thursday at 12 noon eastern on transponder 24. SATELLITE MAGAZINE is produced by CATJ magazine and CATA through the facilities of the University of Oklahoma School of Broadcast Journalism. This one hour program is a news and feature program for and about cable operations.

On the November 16th and 30th programs cable people visited the famous RCA Vernon Valley satellite uplink and control facility. During December the program scheduled for the 7th and 14th will further visit the RCA facility and explore the rumors about SATCOM health.

On Decmeber 21st and 28th SATELLITE MAGAZINE will focus on the events of the Western Cable Television Show held in Anaheim December 6-8. If you are not able to attend the Western Show, plan to tune in Satellite Magazine for a report.

On January 4 and 11 SATELLITE MAGAZINE will visit the subject of low cost microwave and re-visit the famous 20 minute videotape prepared during CCOS-78 which depicts the 'raising' of the 11 meter transmit antenna constructed for the CCOS gathering this past summer. If you have never seen this particular tape be forewarned it is one of the more hilarious pieces ever put onto videotape by the cable industry.

For those planning ahead Thursday **January 18th** is a 'holiday date' for SATELLITE MAGAZINE; the 'second season' of programs will resume on Thursday **January 25th** at 12 noon eastern on transponder 24. Cable systems are encouraged to tape these programs for re-use at cable meetings, company training sessions and other intra-industry events.

A Tangled Thread

Keeping up with SSS/SCS's Ed Taylor requires track shoes, a roadmap and the tenacity of a rally-road-racer. Case in point.

On September 29th RCA awarded Taylor a pair of transponders in their now (in)famous 'auction'. Taylor, for either SSS or SCS wound up with the RCA assignment of transponder 1 and transponder 13. SSS is Taylor's own company, SCS is Tayor's joint company with Holiday Inns. SSS was planning to bring up Chicago's WGN on one transponder and SCS would bring up KTVU.

Taylor was very unhappy with the way the 'bidding' was handled at RCA. He felt that he had been promised the last **horizontal** transponder, **18,** by RCA. He even has letters and other legal looking documents that go back to December of 1977 which indicate that RCA agreed to this plan. Certainly those of us who report on what is happening have assumed this to be the case and as recently as early summer an RCA source we used to use on a regular basis to confirm or verify transponder assignments was telling us 'off the record' that 18 was where KTVU was going to be.

Of course when RCA announced the results of their bidding contest at the end of September it was not SSS or SCS but rather Reuters that ended up on transponder 18. Taylor reacted by suing the pants off of RCA. He took them into federal court in Tulsa on October 20th and we attended the hearing. There the judge was faced with an interesting set of questions:

1) Did Taylor have an agreement, or contract, with RCA for transponder 18?
2) And, if he did have one at one time was it still valid on September 29th when RCA yanked 18 out from under Taylor and gave it to Reuters?

The RCA attorneys maintained that the only 'law' that the judge could address was **the formal RCA tariff on file at the FCC.** They even suggested, subtly I'll admit, that the Tulsa federal district judge would be better off passing on this one and letting it go on to a District of Columbia court. The judge got the drift of this and reacted by plunging ahead in his own court. I didn't figure the RCA folks did themselves a favor by trying to get the judge to bow out of the case; a matter of judis-pride you understand.

Taylor's attorneys entered into the hearing nearly 50 exhibits, including an exhibit that consisted of the May 1978 issue of **CATJ;** in which we listed the

When your picture is really lousy and the phone is ringing off the hook, who's going to explain to your subscribers about the few dollars you saved on that last receiver?

You have a choice. You can try to save a few dollars and end up with a lot of aggravation. Or you can specify Hughes Satellite Video Receivers and end up with the maximum number of hours of uninterrupted, no-complaints service. We can be quite confident about that because we include some very important extras as standard.

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transponder 18 assignment. Included were numerous letters, sworn statements and what have you that seemed to suggest that RCA was agreeing with Taylor that he did in fact have "18 reserved" for at least that immediate point in time.

RCA responded by suggesting that inspite of what letters, memos and so on as may have been sent to Taylor that **unless Taylor had a valid contract,** negotiated formally and signed **and accepted by RCA** according to the on-file-at-the-FCC tariff; Taylor didn't have any hold on anything. The RCA attorney applied the same "you don't have anything unless you have a signed and accepted contract" reasoning to communications between Taylor and virtually every level of RCA Americom management; including Andy Inglis at the top.

Several Taylor supporters were later heard to mutter **"What they are telling us is that RCA's word is not any good. . .you'd better have it in writing and then it had better be in the exact prescribed form and signed by everyone from that dog that used to appear in the 'His Master's Voice' photos on down the line. . ."**.

The judge on October 20th ran out of time and he 'continued' the case until November 2nd. Then the RCA attorneys later found out they had a conflict of dates on the 2nd and the whole thing was moved back until near Thanksgiving.

What Taylor was after in court was:

1) **A preliminary injunction** to prevent RCA from allowing anyone on 18 except SCS, until the full matter came to trial;
2) **And around $1.4 in damages** should the judge eventually find in favor of SCS.

Taylor wisely felt that if he could get KTVU up on 18, that he'd be assured of a better play for the West Coast indie than if he was up on a vertical transponder. **"I believe that a year from now, perhaps sooner, it** might not **make any difference whether you are on vertical or horizontal. But this first year, when vertical gear is so hard to get and when the first six to nine months of a new venture like this are so important, being on vertical could easily cost us well over a million dollars in lost revenues."** That's where the damages come in.

Taylor was initially hopeful that the preliminary injunction would be granted before the FCC got around to granting KTVU. **"Now I am not so sure"** he notes. The FCC is expected to pass at the staff level on KTVU and a few others (see **Satellite Technology News,** this issue) either late in November or early in December. If he gets it, and RCA doesn't push it on up through the courts further he'll pop up on 18 with KTVU when the FCC approves the indie. If not. . .he'll be down there on transponder 1.

Now RCA was not very happy with Taylor over all of this. There was some talk, quiet and guarded, that the FCC would get in the middle of the frey in their October 25th meeting. One source told me **"The FCC is very upset with the RCA auctioning process; they don't feel that RCA had any right to start collecting monies from transponder leasees months before the users were either ready or legally qualified to use the transponders. I suspect they may throw out the RCA auctioning results on the 25th"**. Only they didn't. In fact, come the 25th what they did was approve all four applicants who had applied to put Chicago's WGN up on SATCOM (the ASN proposal, through Western Union was not decided; they sent it back to ASN asking in effect "What the hell do you guys really want to do!"). That included Taylor's SSS and Roy Bliss's United Video plus two more terrestrial common carriers in the upper midwest. Only Taylor and Bliss counted since only they had gotten an **'RCA assignment'** back on September 29th. The other two had new cars and no gas.

Now the plot thickens. Taylor had been trying to get a 'sharing arrangement' with Bliss for nearly a year. Taylor felt that having WGN up there twice (or alternately, having the matter tied up before the FCC for more months or years because there were two or more applicants for the same thing) was wasteful. Bliss's United had said, repeatedly, "no dice. . .we are in this thing alone". Taylor tried one more time, after the 25th FCC award and for new, good reason. He had a new 'client'

interested in 13; a chap named **Turner** out of Atlanta. Seems that one Ted Turner, who has made something of a name for himself sailing large yachts and making baseball and basketball players wealthy before their time, has decided to take a run at the "National TV News Business". Turner has a masterplan wherein he will, out of Atlanta, put together a $20,000,000 (yup—that's alot of zero's) investment package to produce a twenty four hour per day live television news program. Seven days a week and so on. Turner's concept is that by perhaps mid 1979 or shortly thereafter there will be enough cable homes fed by satellite that a chap could distribute an all-news (sports, weather, etc.) program around the clock to cable subscribers. A really first class news operation using first class nationally recognized news people who would treat news in depth and with great professional skill. None of this still picture and voice over stuff for the man who recently was written up in **Esquire** and **Playboy.** He wants the 'best national TV news package' that money will buy. He figures cable is the place to distribute it, that cable homes will love having this 'exclusive service' and that national advertisers will pay big bucks to reach the cable audience. It is an intriguing concept. And Turner is the kind of guy who would have the influence, experience, guts. . .and yes, bucks, to make it fly. Only he needs a transponder for this. Taylor said "You can have my 13 if I can work out with United a WGN sharing arrangement".

However, **then RCA dropped the other shoe.** Now when they 'awarded' transponder 13 to Ed Taylor back late in September they told him **"Look Ed, actually we can only give you one transponder** (number 1). . .**that's all we have to sell right now".** While Ed stewed on that for a day or two and started making 'lawsuit noises' RCA came back with an alternate plan. **"Tell you what we could do for you"** said they. **"You can have 13".** Taylor responded **"Why didn't you suggest 13 two days ago. . .hey, wait a minute! Isn't 13 broken!!!".**

"Well" responded the RCA person **"Yes and no. Transponder 13 was having some problems with heating up but we cured those problems. Now it is just fine and we'll let you have it for your second transponder".** They were saying 'Take 13 or get only one transponder' to Ed and he understood it well. After he made a few more phone calls to get some advice on how well 13 was behaving he responded **"OK, I'll take it".** Some of those phone calls were to middle level RCA technical types. . . the kind of good ole' boys who make the birds operate, who are supposed to be outside of the inner-political-circle and from whom Ed had always previously been able to count on straight answers. They had assured him "13 is alive and well".

On October 30th the roof fell in on Taylor again. This time RCA had a new message. **"Transponder 13 has failed".**

It seems after they would run it for say four to five hours it started getting hot again. That's physically hot, like in if you don't shut it off it's heat would either ruin it or something else in the same satellite housing. **"I've got to have another transponder"** responded Taylor. RCA knew he needed one for WGN; but was not aware of the pending Turner news deal. They made him an offer.

"If SCS will drop the lawsuit against us over 18, we'll 'try' to clear transponder 21 for you". Taylor wanted to know on what basis. You see there are three classes of transponder rental agreements. There is the **guaranteed service** format where if you are on a transponder (say 21) and it fails. . .then RCA must (by the agreement and tariff) find you another transponder instantly. Then there is the **non-pre-emptible** kind of agreement where if someone else's transponder fails RCA cannot bump you for them (although if your's fails you have no place else guaranteed). And finally there is the **pre-emptible** transponder where if somebody else fails they can call you on the telephone and say **"We are shutting you down".** Taylor, by now very gun-shy, wanted RCA to make 21 a non-pre-emptible transponder. **"Cannot do that"** came back the answer.

"I'd be a fool to take 21 on a pre-emptible basis" notes Taylor. **"You can't invest millions of dollars into a new project and lose money for perhaps one or two or three years. . .and just reach the turn around point to live in fear that RCA is going to call you one day and tell you 'We are shutting you down' ".** And so on October 31st Taylor made a decision. Several actually:

1) To move ahead with the **lawsuit** over transponder 18,
2) To notify all SSS customers for **WGN** (there were 59 of them at moment) that they should go see Roy Bliss at United for their WGN service (Bliss agreed to extend his 'pre-sign-on special' through the end of November for the Taylor converts),
3) To sit down and work out a **plan,** which he intends to be circulating at Anaheim discussing, for cable to launch their own industry sponsored satellites.

That's not as far out as it sounds. . . as we shall see in January.

Steve J. Birkill On Experimental Earth Terminals

Steve J. Birkill
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Bandwidth Requirement

To continue our tutorial on earth terminal design, we shall now consider the factors that influenced our choice of a 27 MHz bandwidth for last month's hypothetical receiver. A widely accepted guide to the bandwidth required by a frequency modulated signal is known as **Carson's Rule.** Unlike amplitude modulation, in which the extent of the sidebands of the modulated signal (in the absence of subsequent non-linear distortion) can be defined purely in terms of the frequency spectrum of the modulating signal, **theoretical treatment** of frequency modulation **predicts** an infinite spectrum of side frequencies, even for the apparently simple case of sinusoidal modulation. Fortunately for us, the amplitudes of these components diminish rapidly with increased separation from 'carrier' frequency, such that a practical limit can be set beyond which **their contribution** to the demodulation process **is considered negligible.** Carson's Rule states that the significant **bandwidth occupied** by the spectrum of a frequency modulated sinusoid is **equal to twice the sum of the maximum frequency deviation** and **the modulating frequency.** Thus with a video signal containing frequencies up to 4.2 MHz, deviating our carrier frequency by ± 10.75 MHz, we would expect to require

2 (10.75 + 4.2) = **29.9 MHz**

Of course, to complete our 'satellite-ready' TV channel we also need to add an aural subcarrier (raising our base-band width to 6.8 MHz) and the 30 Hz energy-dispersal waveform, each of which results in a further 1 MHz or so frequency deviation, lifting our Carson bandwidth to around 39 MHz. However, the TV signal is far from sinusoidal, having (for **most** of the time) significantly more energy **below** 1 MHz **and around** color subcarrier than at other frequencies, so we should consider Carson more as a guide than a rule in this application.

Effective Receiver Noise Bandwidth

If we are to consider the effects of reducing bandwidth to improve the performance of an otherwise marginal down-link, we need to be a little more specific about some of the terms used. The 'bandwidth' of such importance in the 'link budget' equation is in fact the effective pre-demodulation noise bandwidth. This, for a realizable i.f. bandpass filter, is always **greater than** the filter's 3-dB bandwidth, since it is **an equivalent bandwidth** obtained by integration of the noise contribution from **all** frequencies in the passband, defined mathematically as

$B_N = \int_0^\infty |H(j\omega)|^2 \, df$, where $H(j\omega)$ is the Fourier transform of the network's impulse response. Or, put another way, **effective noise bandwidth** is the bandwidth of a hypothetical bandpass filter having ideal square upper and lower cut-off characteristics and transmitting the same power as the real filter when a signal of continuous uniform spectrum (white noise) is applied. As the number of poles in the filter increases, the noise bandwidth approaches the 3-dB bandwidth. For example, the noise bandwidth of a 3-pole Butterworth filter is 1.017 times its 3-dB bandwidth. For the sake of convenience, I shall assume the approximation receive system effective noise bandwidth equals receiver i.f. 3-dB bandwidth, for the remainder of this month's column.

FM Improvement Factor

Another oft-bandied phrase is 'FM improvement factor'. At least two definitions of this seem to be current, so let's see what it means. Diagram 2 **last month** showed the linear relationship (above threshold) between pre-demodulation carrier/noise ratio and demodulated video signal/noise ratio, expressed in dB. This apparent 'gain' of some 38 dB is often referred to as **'FM improvement factor'** but is in fact made up of several components:

Noise weighting factor = 10.2 dB, as defined by the CCIR curve.

Peak-to-peak conversion = 6 dB

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(SNR is peak-to-peak signal to rms noise)

Pre-emphasis factor = 2.5 dB (de-emphasis network attenuates higher frequency noise components.)

and FM improvement factor = 3/2 $(\Delta f / f_m)^2 B_N/f_m$, (power ratio), where

Δf = **frequency deviation,** = 10.75 MHz for video,

f_m = **maximum video frequency,** = 4.2 MHz, and

B_N = **noise bandwidth.**

Thus for a noise bandwidth of 27 MHz, FM improvement factor

$$= 10 \log \left[\frac{3}{2}\left(\frac{10.75}{4.2}\right)^2 \frac{27}{4.2}\right] \text{dB}$$

$$= 18.0 \text{ dB},$$

and S/N can be calculated by adding this, and the other three factors, to the carrier/noise ratio expressed in dB. Thus:

$$S/N = C/N + 18.0 + 10.2 + 6.0 + 2.5$$

$$= C/N + 36.7 \text{ dB}.$$

It can be seen that, given the maximum video frequency as constant, **a greater FM improvement factor** can be achieved by **increasing** either the **deviation** used or the **system bandwidth** (though for large changes both parameters need to change together, as suggested by Carson's Rule). So for a channel bandwidth of 36 MHz,

$$S/N = C/N + 19.3 + 10.2 + 6.0 + 2.5$$

$$= C/N + 38.0 \text{ dB}.$$

A useful approximation to these formulae, over the range of interest, can be had by taking

$$S/N = C/N + 10 \log (\Delta f^2 B_N) + 1.8 \text{ dB}.$$

Now, it may have become apparent that **we have a conflicting requirement here** for our system bandwidth. Firstly we say **it must not be too wide** or it lets in more noise and our C/N sinks below threshold. Then, once above threshold, **it must not be too narrow** or we miss out on FM improvement factor.

We can try the exercise of holding carrier/noise density constant, say at 84.3 dB Hz, and varying noise bandwidth. Let us assume normal transmission parameters of 10.75 MHz deviation and 4.2 MHz max video frequency, and not consider for the moment the audio subcarrier or energy dispersal waveform. If receiver threshold is a typical 10 dB, then that threshold is reached in a bandwidth of

$$\log^{-1} \frac{(84.3 - 10)}{10} \text{ Hz}$$

$$= 27 \text{ MHz}.$$

At this bandwidth, and at threshold, 1 dB below the linear portion of the S/N vs C/N curve, S/N = C/N + 10 log $(10.75^2 \times 27)$ + 1.8 dB − 1 dB

$$= 10 + 34.9 + 1.8 - 1 \text{ dB}$$

$$= 45.7 \text{ dB}$$

If we now **increase** i.f. filter bandwidth **to 30 MHz,** our new C/N ratio will be

$$84.3 - 10 \log 30.10^6$$

$$= 9.53 \text{ dB}$$

Reference to the S/N vs C/N curve shows this point to be 2 dB approx below the extrapolation of the curve's linear position. So the corresponding S/N ratio

$$= C/N + 10 \log (10.75^2 \times 30) + 1.8 \text{ dB} - 2 \text{ dB}$$

$$= 9.53 + 35.4 + 1.8 - 2$$

$$= 44.73 \text{ dB},$$

so the drop below threshold has more than cancelled out the increased FM improvement. If we now **reduce** our i.f. filter bandwidth **to 24 MHz,** we have a C/N ratio:

$$84.3 - 10 \log 24.10^6$$

$$= 10.5 \text{ dB}$$

This corresponds to a demodulated video S/N ratio of

$$C/N + 10 \log (10.75^2 \times 24) + 1.8 \text{ dB}$$

$$= 10.5 + 34.4 + 1.8$$

$$= 46.7 \text{ dB}$$

So the dominant parameter when working near threshold is the carrier/noise ratio, not the FM improvement factor. A small change in bandwidth can have a large effect on C/N while the FM improvement term helps but little. **Above** threshold **both factors** have the same degree of influence, 1 dB per dB (up to the point where S/N is limited by such things as local oscillator noise and intermodulation—but this occurs at C/N ratios higher than we will normally achieve with an experimental terminal).

So to complete the story, we now ask **what will happen to the recovered video signal as we continue to reduce our bandwidth well below the Carson value** in an attempt to maximize the signal-to-noise ratio. Authorities naturally disagree on just how far it is possible to go in this direction before degradation becomes 'objectionable'. Well, there are two separate options to consider. The first is open to us only if we are designing the entire system, uplink thru transponder and receive terminal. This involves **not** trying to squeeze a **wide** signal through a **narrow** filter, but making the original signal occupy less bandwidth. That way, all that suffers is video signal/noise ratio. **RCA Alaskom** is doing this with its Bush terminals, and Intelsat with the bulk of its TV traffic. The transponder bandwidth of **36 MHz** is divided into **two 18-MHz channels** and **each** of these is fed with an appropriately reduced deviation TV signal. These systems use a frequency deviation of between 6 and 7.5 MHz for video, and can use either a subcarrier above baseband or a separate carrier within the transponder bandwidth for audio. If we consider for a moment a half-transponder system occupying a total bandwidth of 17.5 MHz with a video deviation of 6 MHz and highest video frequency of 4.2 MHz, and we assume the link parameters to be the same as our previous example, yielding a carrier/noise density of 84.3 dB Hz, then:

$$C/N = 84.3 - 10 \log (17.5 \times 10^6)$$

$$= 11.87 \text{ dB}.$$

This is now comfortably **above** our threshold where previously it had been marginal. If we now calculate signal/noise ratio:

$$S/N = C/N + 10 \log (6^2 \times 17.5) + 1.8 \text{ dB}$$

$$= C/N + 29.79$$

$$= 41.66 \text{ dB}$$

So the reduction in transmitted bandwidth has resulted in a higher carrier/noise ratio in the band of interest (assuming EIRP values unchanged—there may **in practice** be a need to **'back off'** the transponder EIRP in this mode to reduce intermodulation products between the two signals) but a lower recovered video signal-to-noise ratio. **Or, the signal's easier to receive but doesn't look as good having received it!** To improve this half-transponder example, the deviation would have to be **increased** (so increasing the FM improvement factor) within the available bandwidth of 17.5 MHz, until a satisfactory S/N value was reached, or until other degradations began to intrude. Which brings us back to our other remaining option, in the case where we have access only to the receive terminal. **Table 1** is a set of experimental results published by **G.W. Beakley** of **RCA Laboratories** as part of a study to define suitable parameters for the Alaskan Bush system. By studying the result of varying deviations applied to a fixed 17.5 MHz receiver filter, they show the kind of degradation that will result with narrower-than-30 MHz filtering of a 10.75 MHz deviated TV signal. As the **ratio** of filter bandwidth to deviation **diminishes,** the first things to suffer are the short-time distortion, Luminance-chrominance gain, and Luminance-chrominance delay, i.e. the high frequency components of the picture become attenuated and some

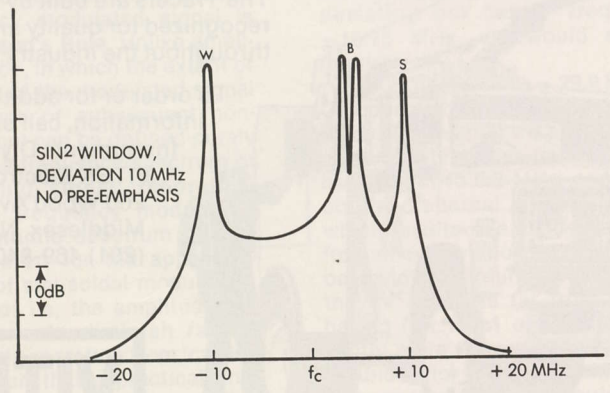


DIAGRAM ONE

chroma delay becomes apparent before the non-linear distortions (diff gain, diff phase) begin to show much degradation. **This is good news.** Now for the bad news: In the presence of aural subcarrier at 6.8 MHz, these components are first to see the filter edges as bandwidth is reduced, and this gives rise to attenuation of the 6.8 MHz component, and intermodulation between it and the video band. Since the majority of the video's HF energy is concentrated around the color subcarrier at 3.58 MHz, in-band intermodulation products are produced at 3.22 MHz (causing patterning of spurious color) and 360 kHz (showing as coarse bars in colored areas of the picture). These will tend to be the first degradation to be considered 'objectionable'. **And if we go further?** Truncation noise. We eventually reach a filter bandwidth where, irrespective of sidebands, the deviation limits of the video signal are passing **outside our filter bandpass.** This can be seen from examination of **diagrams 1 and 2,** showing the effect of **pre-emphasis** on the spectrum occupied by the FM TV signal. In diagram 1, with no pre-emphasis, the spectrum envelope of the sine-squared window test waveform shows strong components at f_C + 10 MHz and f_C – 10 MHz due to the proportion of time the instantaneous value of video (modulating) voltage spends at sync bottom and peak white levels respectively. Similar 'tones' are present corresponding to black level and blanking level, at about f_C + 5. The remaining area under the curve represents the energy contribution of higher frequency video components.

Now from diagram 1 it will be obvious that if our i.f. filter is narrowed **below 20 MHz** we shall begin to lose the peak white and sync tip portions of the modulated signal. As these fall outside filter bandpass, **demodulator output will fall to noise** at these times as the noise impulses rise above the attenuated vision component. So we shall have our familiar sparklies again, **white in the sync period** and **black during peak white,** but due this time not to threshold failure but to bandwidth truncation.

Pre-emphasis

So, unless we wanted to be rather clever and divide up the band among several filters and demodulators, this would represent an absolute minimum beyond which bandwidth reduction would give no advantage. However, in the interests of better employment of the spectrum, pre-emphasis is universally used on FM circuits. This is merely **the boosting of the upper range of baseband frequencies** according to a CCIR recommended curve, **diagram 3,** such that the necessary cutting of those same frequencies in demodulation (to restore a flat response) will also **reduce** the triangular (increasing with frequency) **noise characteristic of frequency modulation.** Now if the pre-emphasised signal is deviated also to 10.75 MHz, we see (diagram 2) that the low-frequency components now occupy only some 7 MHz at band center, the relatively more powerful HF content filling-out the remainder of the channel. This is the kind of picture shown by a spectrum analyzer looking at the FM generator output—at subsequent points it will be sharply band-limited to less than 40 MHz to avoid interference with adjacent transponders.

We now find that our i.f. filter bandwidth can be cut by a further amount while still faithfully recovering the low-frequency elements of the picture. At this point I shall leave it to the reader to decide how far down this trail he wants—or needs—to go. The photograph of the Indian announcer on Page 48-B of **October CATJ** shows the result of operating at an effective noise bandwidth of around 2 MHz—but this is where we came in.

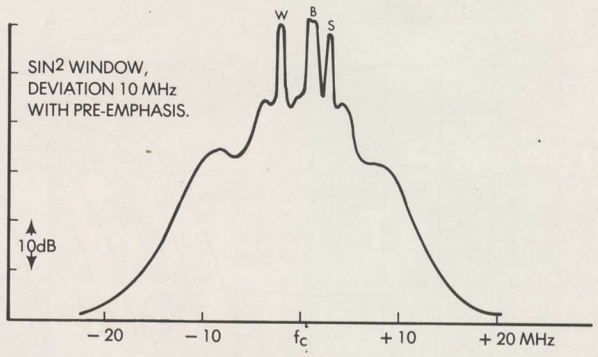


DIAGRAM TWO

ERRATA

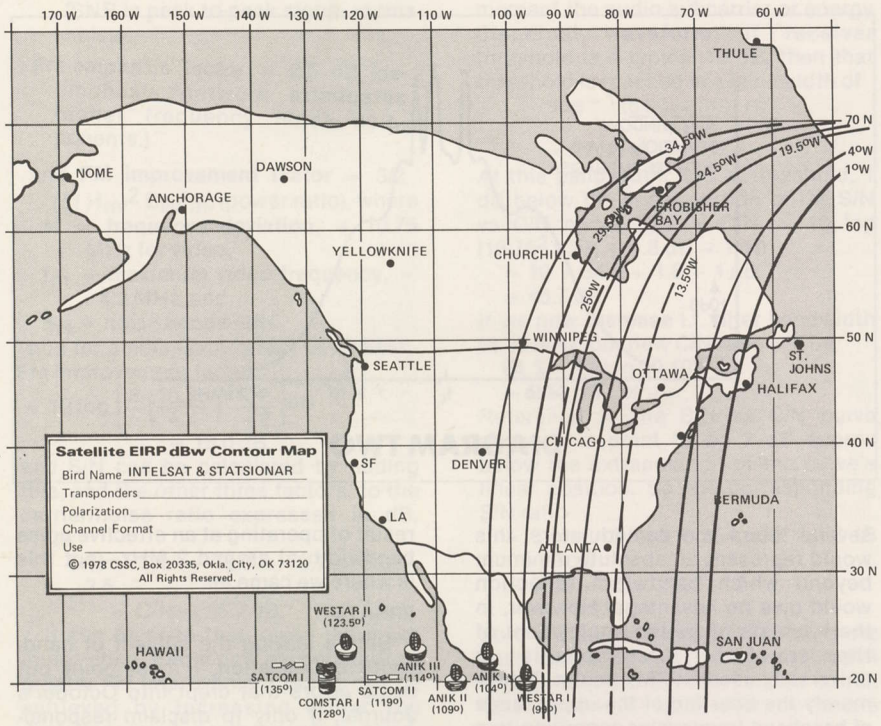
Before leaving the subject of bandwidth optimisation, I must point out some errors that crept into October's Journal, if only to disclaim responsibility! Of the three versions shown of the PLL video demodulator, only that on Page 48-A has escaped the blight. Page 23's version is a copy from an English journal that also got it wrong! The picofarad video couplers should all of course be in microfarads, and the video phase-splitter seems to need some untangling. The version on Page 24 has some transposed IC pin connections, incorrect values in the de-emphasis network and some curious biasing on the video output stage.

Meanwhile, on the eastern side of the sky. . .

To conclude this month's offering I shall introduce what to some will be an altogether new and untried area: reception of TV signals from non-domestic satellites. To the east of the US/Canadian Domsat arc lies the 'Atlantic' portion of the geostationary orbit. Comstar 'C' is parked at 89.7° west, then what? Not empty sky. . .We shall consider at this time only those communications satellites known to carry **television,** so as not to be confused by those providing communications for NATO, for ships or aircrafts,

VIDEO PERFORMANCE VERSUS DEVIATION FOR A 17.5 MHz RECEIVER FILTER

	Peak Deviation (MHz)					
	5	6	7	8	9	10
Short time distortion—SD	0.8%	0.8%	0.8%	2%	5%	35%
Luminance-Chrominance Gain	–1%	–1%	–3%	–5%	–7%	–8%
Luminance-Chrominance Delay	24ns	28ns	48ns	52ns	60ns	65ns
Differential Gain	1%	2%	2%	2.5%	3%	4%
Differential Phase	1.2°	1.3°	1.7°	1.8°	1.9°	1.7°
Chrominance-Luminance I.M.	<0.1%	<0.1%	<0.1%	<0.1%	<0.1%	<0.1%
Chrominance Nonlinear phase	0.2°	0.2°	0.35°	0.4°	0.45°	0.6°



or for other military uses. If we then list the satellites proceeding eastward, we have:

34.5°W Intelsat spare, currently IVA F4
29.5°W Intelsat Atlantic Major Path 1, currently IVA F2
25.0°W Statsionar-8 (USSR), 1980 launch.
24.5°W Intelsat Atlantic Primary Path, currently IVA F1
19.5°W Intelsat Atlantic Major Path 2, currently IV F3
15.0°W Sirio—Italian experimental 11 GHz communication satellite.
13.5°W Statsionar-4 (USSR), 1978-79 launch.
11.5°W Symphonie-2, experimental Franco-German 4 GHz comsat.
4.0°W Intelsat Atlantic Reserve, currently IV F2
1.0°W Intelsat special lease availability, currently IV F7

Intelsat are continually revising their satellite allocations, for instance to phase out the I-IV birds and replace by I-IVA spacecraft. (The Intelsat IV is a 12-transponder satellite while the IVA accommodates an extra 8 transponders by employing frequency re-use). Thus some of the above may already be out of date.

Naturally, not all those listed are within view from any location in the United States, though any reader in St. John's, Newfoundland, will find them above his horizon. As a guide to what may be possible, **diagram 4** indicates how the global beam tangents from these satellites meet the USA. The solid lines indicate Intelsat satellites at the longitude shown, the broken lines are for the Soviet Statsionar birds. Note that unlike the regular footprints these lines indicate **limit of visibility,** i.e. elevation = zero. In practice we need to be within (to the east of) the line to give us some elevation and prevent the antenna seeing hot earth. To attach EIRP values to these, we can be approximate and say that an Intelsat IVA on a **global beam transponder** (which may prove the most interesting) has a beam-edge (= edge-of-earth) EIRP of **22 dBw.** Its **hemispheric beam** would deliver **26 dBw** toward that horizon line, and were you fortunate enough to see its **spot beam,** that would carry **29 dBw.** By comparison, the **obsolete** Intelsat IV had a spot-beam (4.5°) power of 34 dBw at beam edge. Now unless you all write and tell me which transponders on which of these birds are carrying TV, and from what source, I shall be back in January with my version of what might be up there, plus some more detailed information on the Russian communications satellites, including the Molniya series in their ingenious inclined orbits. Time is such that I have to complete the February column before January appears, so acknowledgement may have to wait until March, but I would appreciate any private terminal news from readers, for future inclusion in this column. And does anyone know **for sure** what Molniya-3's down-link band is??

TRANSFER CHARACTERISTIC FOR PRE-EMPHASIS NETWORK

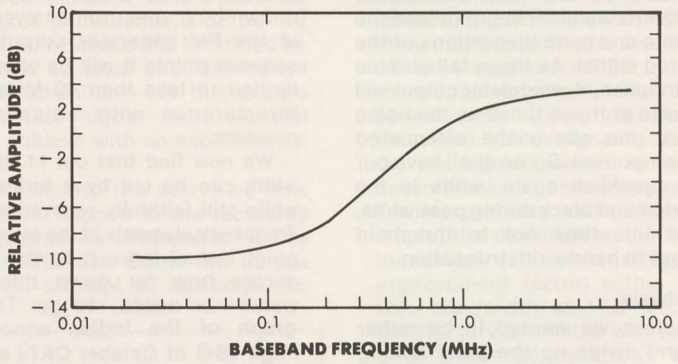


DIAGRAM THREE

December Stats

Perhaps the most impressive thing about the statistics for the month of October (last full month compiled in this issue) was the performance of "five meter size antennas" in the applications file. A total of **68** different CATV systems applied for CATV TVRO's during October; **specifying 5 meter antennas.** In any other recent portion of 1978 68 total applications, for all size antennas, would have been a representative month.

The folks who regularly process CATV frequency coordinations, prior to the actual applications hitting the Commission, indicate to us that the October filing month may be the last big 'bubble' for **CATV** applications. While TVRO applications continue to arrive at frequency coordination firms at a healthy pace the rate is dropping steadily from month to month and indications are the peak of the last few months may never again be seen in the CATV field.

A number of strange (or just plain 'late') station or signal sources were included in the October filings; interesting for their novelty. For example, VISTAR received one request at the FCC and an even older proposal cut of the same cloth, Network One, also received one request. Other applicants mentioned in the programming or station area included: PTL Club (5), Trinity (1), Spanish International Network/SIN (1), KTLA (1), KTVU (6), WGN (9) and UPI (1).

Finally this note: The first seven meter (Fort Worth Tower) antennas were filed for during October; there were a pair of applications for this new large fiberglass antenna which we understand is now finally into routine production.

ASN Update

What in the world has happened to ASN; the 'AmeriCom Satellite Network'? After making a big splash last spring with a proposed program to bring up four separate transponders intended for cable on WESTAR II, and a lively introduction of the service during the NCTA meeting in New Orleans, the ASN activity has slowly faded from view.

ASN originally maintained that they were **not** 'a common carrier'; that in their case Western Union was the common carrier and they were merely agents. They had used the corporate legal muscle of Western Union to push the applications for their service **into** the FCC but there the applications ran into road blocks. The Commission reacted by doing nothing; just sitting tight on the applications.

When, late in October, the FCC acted on the pending application to bring WGN up on SATCOM F1 they also addressed the pending ASN application to bring up WGN on WESTAR II. Basically the Commission said to ASN, in their October 25th consideration of the matter, **"Are you people for real... and are you still interested in doing this thing?"**

Since last summer many of the familiar ASN faces have dropped 'off the team'. Frank Merklein, the original out-in-front guy for ASN, quietly disappeared from view in late July although he surfaced once thereafter at the Southern Show still promoting the service. Bill Bauce, Merklein's marketing man, found other interests along about September and that left ASN's backer William McDonald as the only guy left actively on the team.

McDonald, with perhaps several hundred thousand dollars wrapped up in ASN at that point and very little to show for it took the FCC's October 25th question and advised his attorneys to go ahead and respond to the Commission that **'yes, ASN is still interested'.** The FCC then came back promptly with the suggestion that if ASN would file paperwork that indicated it would act like a regular "214 carrier" (i.e. common carrier) that the Commission would go ahead and process the ASN applications to bring up (1) Chicago's WGN, (2) New York's WOR, and (3) Los Angeles' KTTV before the middle of December. The Commission is trying to 'clear the decks' of all back 214 applications for cable satellite relay before the December Christmas season. In effect, they indicated they would treat ASN like anyone else if ASN agreed to act like everyone else.

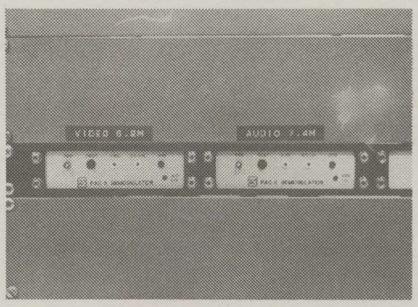
ASN then filed, through its Washington counsel, a 214 statement and thereby modified its pending applications through Western Union. The modified filing states that ASN is "requesting 214 status, **under protest**"; the protest being that they might want to come back later and ask to be 'de-classified' as a 214 carrier.

Now all of that sounds encouraging for those fans of ASN and Western Union service via WESTAR. However

CATV TVRO STATISTICS—DEC. 1978

Applications Filed/FCC	Aug 1978	Sept. 1978	Oct. 1978
1) 11 meter	0	0	0
2) 10 meter	0	1	1
3) 7 meter			2
4) 6 meter	6	5	12
5) 5 meter	41	42	68
6) 4.5 meter	21	19	29
Total Apps	**68**	**67**	**112**
Cost Max.	$62,000	$109,000	$136,200
Cost Min.	$12,600	$12,600	$17,815
Avg. Cost	**$34,424**	**$34,662**	**$34,123**
Channels Requested	214	136	284
Average Channels	3.15	2.06	2.5
Requesting WTCG	44	35	61
Requesting CBN	42	35	73
Requesting HBO	36	44	69
Requesting MSGE	19	13	38
Requesting SHOWTIME	10	5	12
Avg. Cost Per Channel	**$10,928**	**$16,826***	**$13,649***
TVRO's Licensed/FCC	**118**	**73**	**91**

Notes: *—may no longer be valid measurement stick due to method applicants now file with FCC. Data compiled from FCC sources, advances ahead one month with each issue of CATJ.



UPI DEMODS—Microwave Associates 'PAC-6' units interface into your existing TVRO receiver tuned to transponder 6 (F1) to provide baseband data to feed the Colorado Video 275S 'Video Expander' package.

now the 'ugly reality' of the situation comes into play.

WESTAR II is full. Perhaps, maybe if everything went just right, Western Union could clear space for say **one full time** transponder on WESTAR II for video; and maybe, again if everything went just right, they could find one or two **part time** transponders. Is this a recent development? Yes and no. WESTAR II was going to be strained to its capability limits back last May if ASN had moved ahead as fast as they had hoped. It would have been close; they may have had to settle for two full time and two part time **even then.** But today. . .well, no way. Not unless. . .and here's the kicker. . .Western Union is ready, willing and able to make massive re-arrangements in its own ground terminal installations. Insiders at Western Union indicate that would be a six to nine month job and a very expensive one.

Which brings us to the second 'practical problem' facing ASN; money. Back in May when they had 'the roll going for them' the money looked like it would be available to bring this off. Numbers like "$6,000,000 seed money" were quietly tossed about at the time. In the interim the bloom has fallen from the rose and now, with the 214's in hand, McDonald will have to go back out looking for the money necessary. Western Union, for one, will be watching this very closely and logic suggests that Western Union will not start 'massive re-arrangement of company owned ground terminals' to accommodate ASN until they are satisfied the bucks are in place.

There are other possibilities of course. Western Union hopes to launch WESTAR III this May and **perhaps** between their first two birds and III they would have the total capacity available to allocate four for full time cable use and ASN. **But that will be mid-summer or after at the earliest.**

Where does that leave the cable operators who liked the ASN approach ("the Great Headend In The Sky") and who signed up for the service? Waiting. And watching. And hoping.

New 3 Meter 'Petal-Bolic'

Anixter-Mark (Skokie, Illinois/Ed LeMarre at 312-675-1500) will shortly after the first of the year annouce a new '4 GHz receive only antenna' that has all of the ear-marks of an antenna intended for 'private' or 'backyard' installations. The new antenna is in the ten foot size, features a **polar mount,** Cassegrain feed **(with dual-pole option)** and consists of **12 metal 'petals'** not dis-similar in concept to the Stanford developed antenna described in the April 1978 CATJ **(see page 30).** Because of the 'petal' design the whole antenna will be boxed up in a five foot long by 30" wide by 30" high container making it ideal for bulk shipments and low cost shipping techniques.

Anixter-Mark believes the antenna can be produced 'in large quantities' at pricing below existing ten foot models. The actual target price is not yet available but should be announced in January.

UPI's NEWSTIME

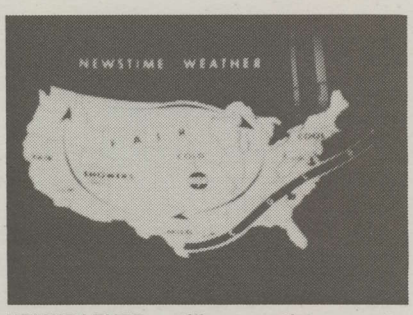
The first operation of the UPI NEWSTIME 'slow scan' newscasts began early in July of this summer, and the first demonstration of the **operational** system was at CATA's CCOS in mid-July. The system is carried on a pair of otherwise unused sub-carriers on transponder 6; floating along, as it were, with the normal visual carrier and the associated aural sub-carrier for Atlanta's WTCG.

Most people figure the UPI NEWSTIME audio (called voice-over in the trade) **and** the video are carried on a **single** aural bandwidth sub-carrier. Actually, the aural is carried on a sub-carrier of 7.4 MHz while the visual (slow scan video running at about 1/500th the bandwidth of a normal fast scan or real time TV picture) is carried along at 6.2 MHz. This means that the WTCG signal actually carries three operational sub-carriers (6.2, 6.8 normal WTCG audio and 7.4). This extra 'loading' presented some problems with some receivers in the field when the system was first turned on. Certain receivers developed a form of cross talk between all of the sub-carriers present and for about five weeks the WTCG operation was run at reduced power level, and even backed up on transponder 18, while retrofit kits were rushed into the field to correct the receiver problems.

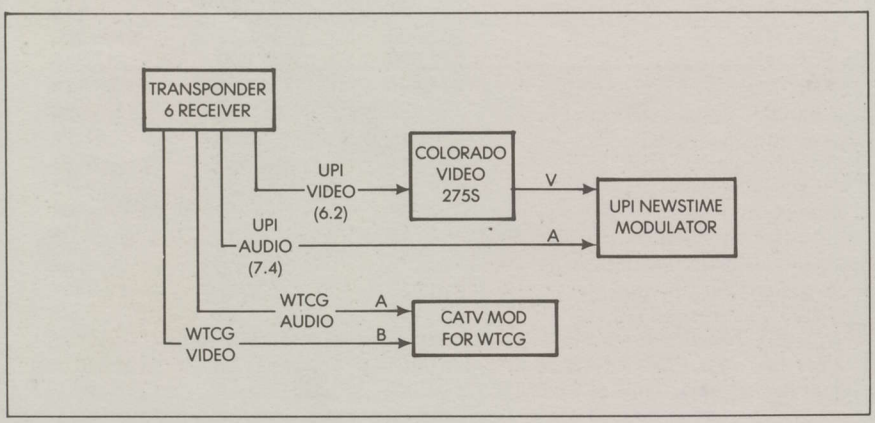
MIDDLE OF A WIPE—half screen video (left hand side—start of visual graphic for 'SALT Talks') moves across screen in 8.5 seconds as news story changes. Pictures are in black and white with a resolution of approximately 270 lines. 64 levels of grayscale are possible.

After that initial problem the UPI NEWSTIME operation has been smooth and without major hitches. At the present time there are approximately 50 systems carrying the service or readying themselves for carriage of the service. Here is how it works:

1) **UPI transmits still pictures** (such as you see in the morning paper) via slow-scan equipment created by the folks at Colorado Video. The pictures are sent out in the slow scan format on the 6.2 MHz sub-carrier.
2) **The accompanying audio,** or 'voice-over', is sent along on the 7.4 MHz sub-carrier.
3) At the cable system the video information is converted back to a still picture and fed into the system via a modulator. The aural



UPI WEATHER—utilizes weather maps to visually expand upon the aural weather information given to subscribers.



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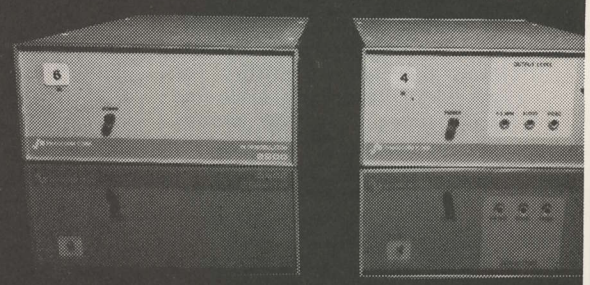
(213) 973-4191
13130 S. Yukon Ave. Hawthorne, CA 90250



MOVIES AND SPORTS—"play better" **and look better through Phasecom headend modulators, signal processors and demodulators because Phasecom has broadcast quality built in at prices every cable system can afford today!**

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OLD SITCOMS—take on "new life" **when processed through Phasecom headend modulators, signal processors and demodulators because Phasecom is 'Canadian proven' in every major system and in more than a million cable homes!**

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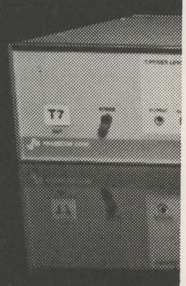
SATELLITE SIGNALS—"look their best" **on your cable system when processed through Phasecom 'broadcast quality' series 2100 modulators because at Phasecom quality workmanship and attention to broadcast standards is a way of life.**



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1) **Any member of CATA** (member-system, Associate member, individual member) qualifies for CLASSY-CAT advertising space free of any charge (limit 50 words/-numbers per issue);
2) **Member-systems** pay regular dues to CATA on a monthly basis; Associate members pay a one time annual fee; "Individual" members pay a one time annual fee of $25.00 per year.
3) **CLASSY-CAT advertising is also available** to non-members at the following rates: **50 cents per word** with a minimum per insertion of $20.00. A charge of $2.00 per insertion is made for blind-box numbers or reply service.
4) **Deadlines** are the 15th of each month for the following month's issue.
5) **Terms** for non-members is **full payment with order** (no invoicing).
6) **Address** all CLASSY-CAT material to: CLASSY-CAT Advertising, CATJ, Suite 106, 4209 NW 23rd Oklahoma City, Ok. 73107.

TECHNICIAN WANTED

Vikoa System 25 mile, Buena Vista, Va. Send resume to Lexington Cable Co. P.O. Box 1097, Lexington, Va. 24450 or Call Gary Judy at 703-463-7161.

Progressive MSO looking for installers, technicians, engineers. Now currently building 800 miles of plant in metro area. Call Mike McKee, (405) 348-6243.

Company has converted to larger system and has the following for sale: I B M Sys/3, MOD 6
#5213 Printer (Bi-directional); #5406 Processor (12K); #5444 Disk Drive Capacity 5.4 Megabytes) All I B M maintained. Also 8 disk packs available.
MAKE OFFER
Avenue TV Cable Service, 1954 E. Main St., Ventura, CA 93001 (805) 643-9971.

GENERAL MANAGER

We are looking for a person with substantial experience and successful record in management and operation of a large cable TV system to assume full management control and responsibility for rapidly expanding system in a major market in the Eastern U.S. with a current gross annual income of approximately $3 million.

Generous fringe benefits includes incentive plan, a company car, life, health, accident and dental insurance.

Master's Degrees in Business Administration or Economics desirable, but not required.

Minimum starting salary $30,000. All replies held in strict confidence.

Reply To:
Box 111378
% CATJ

Former system owner/operator with extensive CATV background and acquisition expertise. Available for short assignment with expanding company.

Reply to: Box 11978, c/o CATJ,

MANAGEMENT POSITION

A challenging management position is now available with an established consulting firm. We are looking for a person with in-depth, hands-on cable system operations and administrative experience who is currently employed by one of the top 50 MSO's. Salary commensurate with experience. Generous fringe benefits. All replies will be held in strict confidence. Please submit detailed resume to: CATJ, Box 10978.

SYSTEM TECHNICIAN

Grow with ATC in Beloit, WI's 200 mile system. Must have min. of 2 yrs. cable technical experience. Contact:
Dennis Ritter
Beloit Cable TV
1837 Park Ave.
Beloit, WI 53511
608/365-9555

Small System needs about 8,000 ft., 3/4 in. foam, flooded cable, call 213-957-0618, Mr. Braun.

is fed to the same modulator.

4) In the home the viewer sees a 15 minute 'newscast' that includes approximately ten seconds of video for each picture (time varies with subject material). As each news 'item' finishes a new picture comes up on the screen with an 8.5 second duration 'wipe' that replaces the existing picture with a new one from left to right.

The format includes commercial time which is sold to national advertisers (Pabst Brewing, etc.) on the basis of 90 seconds of national commercial time per 15 minute 'newscast'. An additional 90 seconds is available for local cable company sale and insertion.

Those Transponders Again

The 'final assignments' of services to the RCA SATCOM F1 satellite, made by the folks at RCA subsequent to the late September 'channel bidding process' have been slightly upset by more recent events. All of which proves that the CATV use of F1 may perhaps never become a totally stable commodity.

For example, WGN was approved by the FCC on October 25th; the Commission said that **all four** of the applicants for the service could begin service as quickly as some minor '214 paperwork' and other technical arrangements could be made. That 'as soon as' date turned out to be around the 9th of November when WGN was scheduled to be put on transponder 3 by United Video and on transponder 13 by Southern Satellite Systems. United made arrangements to pick up the WGN signal in downtown Chicago and carry it out to the Lake Geneva (Wisconsin) uplink site via an 11 GHz common carrier microwave network. SSS was going to take the signal off the air at the cable headend of Peter Athanas's Lake Geneva system and then microwave it a couple of miles to the RCA site.

But alas, on October 30th **RCA** advised **SSS** that transponder 13 had **"died"**. The transponder, which acted up shortly after launch had laid dormant until June of this past summer when it again responded to commands from the ground. At the time, as reported in **CATJ** for October, it appeared the transponder was going to function properly. Not so. RCA now says the transponder has a heat build up problem; it is unable to run within the proper temperature ranges and like all electronic equipment if it is run in too hot an environment it may well do permanent damage to not only itself but other equipment as well. That left WGN on United's transponder 3 (only) and SSS subsequently notified all of their WGN customers that service would not be available through SSS.

The Commission had granted the multiple applications for WGN with the attached statement that while they did not really 'approve' of the concept of two or more transponders relaying the same terrestrial service signals, that they did **not** feel they had the legal right to deny applicants simply because the service would be redundant. At the same time the Commission dealt with the policy question of handling the multiple applications for WGN, they instructed the 'staff' to work up approvals for the remaining 'qualified' applicants for additional transponders. This means that existing applications for carriage of Boston's WSBK, New York's WOR, WPIX, Los Angeles KTTV would be processed "fairly rapidly" at the staff level. It was anticipated that KTVU, to be brought up on transponder 1 by SSS (see **Coop's Cable Column,** this issue for more on this situation) would be processed first by the staff. Taylor says he is ready to turn on KTVU within a few days of receipt of the FCC approval; and there remains a **chance** that it may come up on transponder **18** at least through the end of December.

Other new users of the satellite (i.e. Warner, ESP, Reuters) have made no **formal** announcements as of press time of their start dates. It is not anticipated that any will begin regular (commercial) service any earlier than January first however.

The revised transponder list follows:

Transponder	User
1	**KTVU** (SSS) *
2	PTL
3	WGN (United) **
4	broken
5	Warner Star Service (west) ***
6	WTCG/UPI Newstime
7	ESP ***
8	CBN
9	Madison Square Garden
10	SHOWTIME (west)
11	Warner Star Service (east) ***
12	SHOWTIME (east)
13	**broken**
14	KTBN/Trinity
15	RCA message traffic
16	Fanfare
17	RCA message traffic
18	Reuters (HTN and possibly KTVU until 1-1-79)
19	RCA message traffic
20	HBO spare/Madison Square Garden ****
21	RCA message traffic
22	HBO (west)
23	HBO (family channel) ***
24	HBO (east)

And the asterisk explanations. *—KTVU start date depends upon FCC approval, could begin before this is in print and may actually begin on 18 rather than 1 in which case it will most probably move to 1 on January first. **—WGN was scheduled to begin November 9th or shortly thereafter. ***—These services likely to start approximately 1-1-79. ****—Madison Square Garden will continue to feed on transponder 20, along with 9 (their primary channel) until sufficient terminals affiliated with MSGE have been retrofitted for the vertical polarization.

The Occasional Feed

To date virtually all of the CATV satellite relayed feeds have come along at specified times, on a scheduled basis, intended for real-time (i.e. "live") connection to the cable system. There are indications that during 1979 there will develop a second "class" of satellite user who intends that his programming materials will be utilized by participating cable systems. That will be the occasional user of satellite relay.

When a potential user goes to RCA and rents transponder time he is paying for such factors as (1) the amount of time he utilizes in a year, (2) the scheduled or non-scheduled nature of his time, and (3) the time of day he selects for his transmission. Certain hours, such as 12 noon to 12 midnight, are obviously more heavily utilized than other times (such as the 12 midnight to 12 noon slot). As the transponders have filled up RCA has been encouraging companies that do not require 'real time' feeds to consider utilizing 'off hours' at either reduced rates or with better flexibility.

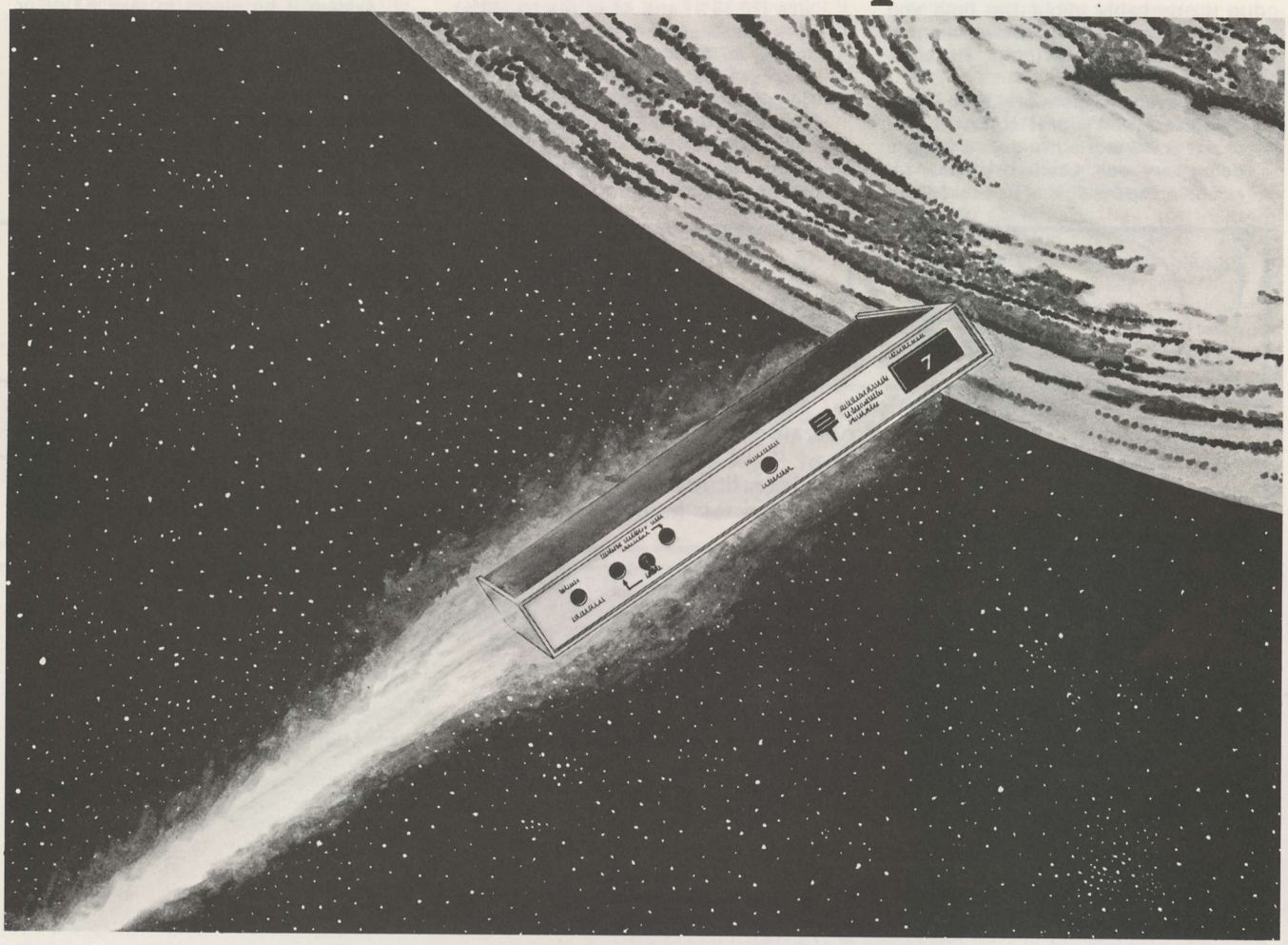
Where this impacts on the cable operator is at his headend. If you have the capacity to take a midnight to 5 AM feed, for example, and tape it for later playback at a time more apt to connect with viewers, you'd be in good shape regardless of when the feed comes down the pipe. However most cable systems do not have that type of tape and playback capability. Having it can cost quite a few bucks and unless it is automated it can also be a severe drain on manpower to operate.

Look for a substantial increase in 'off hour' feeds via satellite in the year ahead, and, look for firms that offer tape and playback equipment to come into the marketplace with hardware designed to be programmed into this type of operation. Automation is obviously the only way to go.

HTN Bonus

Home Theater Network, the Maine based G and PG film package distributed via transponder 18 (for now; 1 after 1 January) has come up with a novel method of handling it's cable affiliates who want to keep the 'HTN

Track a shooting star for down-to-earth profits.



— it's Dynamatic.

Out of this world performance in a single strip amplifier that's a practical solution for any CATV headend application. Not just low cost, but designed to function as a "building block" — allowing future specialized equipment to be added only to those channels actually requiring it.

It's **Dynamatic** — new from Blonder-Tongue — unique in concept, employing the common sense approach of minimum alteration of the received signal. See how this basic system eliminates many of the problems inherent in the heterodyne processor approach. Check out these important features:

- No spurious output signals as caused by heterodyne oscillators.
- Tolerates far stronger off-channel signals than a heterodyne processor.
- Built-in capability for high isolation alternate channel output mixing.
- Unique patented companion Audiomatic* Aural Level Control maintains constant visual-to-aural ratio over a wide range of inputs.

Dynamatic — with the performance, reliability, stability and ease of installation you've come to expect from Blonder-Tongue ...sure to help you blaze the profit trail with quality pictures and high system up-time.

Available through the following Blonder-Tongue stocking distributors:

Arkansas—Davco Electronics, Batesville (501) 793-3616; **California**—Anixter-Pruzan, Santa Ana (714) 556-6270; Cable TV Supply Co., Culver City (213) 390-8002; **Colorado**—Mega Hertz Sales, Englewood (303) 761-3304; **Florida**—Dow Electronics, Sarasota (813) 365-3393; **Georgia**—Anixter-Pruzan, Atlanta (404) 449-6533; **Michigan**—Klungness Electronics Supply, Iron Mt. (906) 774-1755; **Minnesota**—D.F. Countryman Co., St. Paul (612) 645-9153; **New Jersey**—Anixter-Pruzan, Pinebrook (201) 227-9580; Cable TV Supply Co., Cinnaminson (609) 829-0100; **New York**—Telewire Supply Corp., Great Neck, L.I. (516) 829-8484; **Oklahoma**—Eales Electronics Corp., Oklahoma City (405) 946-3887; **Pennsylvania**—Toner Cable, Horsham (215) 675-2053; TVC Supply Co., Hershey (717) 533-4982; **Texas**—Cable TV Supply, Inc., Houston (713) 681-6141; **Washington**—Anixter-Pruzan, Seattle (206) 251-6760; **West Virginia**—Midwest CATV, Clarksburg (304) 622-4700.

*U.S. Patent No. 4,081,839

BLONDER TONGUE
LABORATORIES, INC.

One Jake Brown Road Old Bridge, New Jersey 08857 (201) 679-4000

system channel' **filled up** on a twenty four hour per day basis.

Peter Kendrick (see **CATJ** for **February, 1978)** reports that HTN will 'bonus' affiliate systems by paying their per-subscriber charges for either KTVU (San Francisco/Oakland independent due up probably about the time you read this), or, the UPI news channel service (UPI Newstime). Here is Kendrick's reasoning:

"The system operators have been doing very well with HTN. Our format of a G or PG movie five days a week is doing very well. Leeds, Alabama, for example, reports 80% of its subscribers are taking HTN as an optional service, and here's the real kicker... Leeds is getting 67% penetration of all homes passed. Blue Springs, Missouri reported that in their first promotion effort they knocked on 72 doors. 55 out of those homes took the cable service (76.39%) and 44 of the 55 (80%) took pay. Blue Springs offers two pay levels, an $8.00 stand alone package and our lower cost HTN service. Of the 44 taking pay, 33 (75%) took the $8.00 package and 11 (25%) took the HTN lower cost service."

But what about systems that are concerned about the fact that the HTN service amounts to approximately ten hours per week? What does the cable operator do with that channel the rest of the time?

"We will pay the per-subscriber fee (typically ten cents for KTVU or about half that for UPI) **for the cable system if he elects to take KTVU or UPI. The cable operator buys his own hardware of course."**

That gives the cable operator a 'wrap around' for the HTN service; one that he can use to sweeten the HTN offering to subscribers. KTVU runs around 20 hours per day of programming while the UPI service is twenty-four hours per

CATA ASSOCIATES

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

AEL, INC., CATV COMMUNICATIONS DIV., P.O. Box 552, Lansdale, PA 19446, (**M1, S2**) 215—822-2929
AmeriCom Satellite Network, Inc., 6350 LBJ Freeway, Suite 148, Dallas, TX (**S4**) 214—341-4502
Anixter-Pruzan, Inc., P.O. Box 88758, Tukwila Branch, Seattle, WA. 98188 (**D1**) 206—251-6760
Applied Data Research, Inc., Route 206 Center CN-8, Princeton, NJ 08540 (**M9**) 609—921-8550
Avantek, Inc., 3175 Bowers Avenue, Santa Clara, CA 95051 (**M8**) 408—249-0700
Belden Corp., Electronic Division, P.O. Box 1327, Richmond, IN 47374 (**M3**) 317—966-6661
BESTON ELECTRONICS, INC., 903 South Kansas Ave., Olathe, KS 66061 (**M9 Character Generators**) 913—764-764-1900
Bestvision Home Cinema, Inc., 5540 W. Glendale Ave., Suite C-106, Glendale, Az. 85301 (**S9 Pay-TV programming and marketing**) 602—931-9157
BLONDER-TONGUE LABORATORIES, One Jake Brown Rd., Old Bridge, N.J. 08857 (**M1, M2, M4, M5, M6, M7**) 201—679-4000
BROADBAND ENGINEERING, INC., 1525 Cypress Dr., Jupiter, FL 33458 (**D9, replacement parts**) 1-800-327-6690
Budco, Incorporated, P.O. Box 4593, Tulsa, OK 74120 (**D9 Security & Identification devices**) 918—584-1115
Cable TV Supply Company, 11505 West Jefferson Blvd., Culver City, CA 90230 (**D1, D2, D3, D4, D5, D6, D7, D8, M5, M6**) 213—390-8002
CCS HATFIELD/CATV DIV., 5707 W. Buckeye Rd., Phoenix, AZ. 85063 (**M3**) 201—272-3850
C-COR ELECTRONICS, Inc., 60 Decibel Rd., State College, PA 16801 (**M1, M4, M5, S1, S2, S8**) 814—238-2461
Century III Electronics, Inc., 3880 E. Eagle Drive, Anaheim, CA 92807 (**M1, M3, M4, M5, M7, M8, S1, S2, S8**) 630-3714
COLLINS COMMERCIAL TELECOMMUNICATIONS, MP-402-101, Dallas, TX 75207 (**M9, Microwave**) 214—690-5954
COMM/SCOPE COMPANY, Rt. 1, Box 199A, Catawba, NC 28609 (**M3**) 704—241-3142
COMMUNICATIONS EQUITY ASSOCIATES, 651 Lincoln Center, 5401 W. Kennedy Blvd., Tampa, FL 33609 (**S3**) 813—877-8844
COMPUTER VIDEO SYSTEMS, INC., Suite E, 6290 McDonough D., Norcross, GA 30093 (**M9**) 404—449-3800
Comsearch, Inc., 2936 Chain Bridge Rd., Oakton, VA 22124 (**S8, S9 earth station placement frequency coordination**) 703—281-5550
ComSoncis, Inc., P.O. Box 1106, Harrisonburg, VA 22801 (**M8, M9, S8, S9**) 703—434-5965
C R C ELECTRONICS, INC., P.O. Box 855, Waianae, HI 96792 (**M9 Videotape Automation Equipment**) 808—668-1227
Custom Building Products, Inc., P.O. Box 32231, Okla. City, OK 73132, (**S9, Underground Boring Equip.**) 405—495-1935
Daniels & Associates, 2930 E. 3rd Ave., Denver, Colo. 80206 (**S3, S9 Brokerage**) 303—321-7550
DAVCO, INC., P.O. Box 861, Batesville, AR 72501 (**D1, S1, S2, S8**) 501—793-3816
DF Countryman Co., 1821 University Ave., St. Paul, MN 55104 (**D1, S1, S8**) 612—645-9153
Durnell Engineering, Inc., Hwy. 4 So., Emmetsburg, Iowa 50536, (**M9**) 712—852-2611
EAGLE COM-TRONICS, INC., P.O. Box 93, Phoenix, NY 13135 (**M9 Pay TV Delivery Systems & Products**) 315—695-5406
EALES COMM. & ANTENNA SERV., 2904 N.W. 23rd, Oklahoma City, OK 73107 (**D1,2,3,4,5,6,7,S1,2,S7,8**) 405—946-3788
FANFARE TELEVISION, 10 Greenway Plaza, Houston, TX 77046 (**S4**) 713—960-8731
FARINON ELECTRIC, 1691 Bayport, San Carlos, CA 94070 (**M9, S9**) 415—592-4120
FERGUSON COMMUNICATIONS CORP., P.O. Drawer 871, Henderson, TX 75652 (**S1, S2, S7, S8, S9**) 214—854-2405
Gardiner Communications Corp., 2000 S. Post Oak Rd., Suite 1490, Houston, TX 77056 (**M9 TVRO Packages, S1, S2, S8**) 713—961-7348
GILBERT ENGINEERING CO., P.O. Box 14149, Phoenix, AZ 85063 (**M7**) 602—272-6871
Heller-Oak Communications Finance Corp., 105 W. Adams St., Chicago, IL 60603 (**S3**) 312—621-7661
HOME BOX OFFICE, INC., 7839 Churchill Way—Suite 133, Box 63, Dallas, TX 75251 (**S4**) 214—387-8557
HUGHES MICROWAVE COMMUNICATIONS PRODUCTS, 3060 W. Lomita Blvd., Torrance, CA 90505 (**M9**) 213—534-2146
Ind. Co. Cable TV Inc., P.O. Box 3799, Batesville, AR 72501 (**D1, S1, S2, S8**) 501—793-5872
International Microwave Corporation, 33 River Road, Cos Cob, CT 06807, (**M1, M4**) 203—661-6277
ITT SPACE COMMUNICATIONS, INC., 69 Spring St., Ramsey, NJ 07446 (**M9**) 201—825-1600
JERROLD Electronics Corp., P.O. Box 487, Byberry Rd. & PA. Turnpike, Hatboro, PA 19040, (**M1, M2, M4, M5, M6, M7, D3, D8, S1, S2, S3, S8**) 215—674-4800
JERRY CONN ASSOCIATES, INC., P.O. Box 444, Chambersburg, PA 17201 (**D3, D4, D5, D6, D7, D8**) 717—263-8258
Klungness Electronic Supply, P.O. Box 547, 107 Kent Street, Iron Mountain, MI 49801 (**D1, D8, S2, S8**) 906—774-1755
LARSON ELECTRONICS, 311 S. Locust St., Denton, TX 76201 (**M9 Standby Power**) 817—387-0002
LRC Electronics, Inc., 901 South Ave., Horseheads, N.Y. 14845 (**M7**) 607—739-3844
Magnavox CATV Division, 133 West Seneca St., Manlius, N.Y. 13104 (**M1**) 315—682-9105
MICRODYNE CORPORATION. P.O. Box 1527. 627 Lofstrand La., Rockville. MD 20850. (**M9 Satellite TV Recs.**) 301—762-8500
MICROWAVE ASSOCIATES. INC., 777 S. Central Expwy., Suite 4-C. Richardson, TX 75080 (**M9 Microwave Radio Systems**) 816—891-8895
Microwave Filter Co., 6743 Kinne St., Box 103, E. Syracuse, N.Y. 10357 (**M5 Bandpass Filters**) 315—437-4529

day. The hardware for KTVU is relatively minor since KTVU and HTN share the same transponder. What **will be done** to 'protect' the 'security' of the HTN feed, **starting around January first,** is to put the HTN audio on a 6.2 (MHz) sub-carrier; while KTVU will run on the (standard) 6.8 MHz sub-carrier. So if the system opts for the 'KTVU Bonus' their additional expense is simply the extra aural demod and some clever scheme to switch to and from it. The UPI package involves adding a set of demod's for the UPI 6.2 and 7.4 MHz sub-carriers transmitted on transponder 6 plus the local equipment for the generation of the slow scan format.

Vertical Update

As additional services have begun on vertical transponders the critical nature of 'vertical conversion kit' delivery becomes more and more important to cable system operators. We last discussed this in our October issue.

The first regular user of vertical, **Madison Square Garden on transpondér 9,** has been feeding simultaneously on transponders 9 (vertical) and 20 (horizontal) since they began their 'fall' season in September. Officially, MSGE was feeding 20 as their 'primary feed' up through October 31st and 9 was their 'secondary feed'. On November first, as more and more existing systems were ready for the transponder 9 vertical feed, MSGE swapped the two feeds. . .**on paper.** Now transponder 9 is the primary and transponder 20 is the secondary. Madison Square Garden was scheduled to continue feeding on transponder 20 **"at least through the end of November"** although they are quick to add **"we have to make the decision a month at a time since the real termination of feeding on transponder 20 will depend upon the availability of 'antenna' conversion kits".**

MSGE began feeding on transponder 9 in September largely because their new Hawaiian system affiliates could not receive an adequate signal level on transponder 20. Since that date there has been an ongoing shortage of **every** part required for vertical reception. Howard Hubbard of AFC notes **"You would like to be imminently fair with every customer; to see that everyone got what they wanted when they wanted it. But you have to sort out, or try to sort out, those who are really ready to do and those who are working on a longer lead time".** Hubbard's point is that while most of the talk of equipment shortages for vertical polarization reception centers around the cross-pole or ortho-coupler feeds, **the truth of the matter** is that the additional LNA required or the additional receivers are in just as short demand as the antenna re-trofitting equipment. **"We are all faced with the problem of doing an awful lot in a very short period of time".**

As much as a problem this is presenting to MSGE, they are in better shape than the others who have recently joined them (or are planning to shortly) on 'vertical'. United's WGN, for example, on transponder 3 reportedly has in excess of 100 systems **willing** to take the service; but equipment delivery is holding up **most** of these systems. Similar problems will affect others scheduled to begin vertical service soon. The real crunch will come late in December and early in January when an additional 3-5 new vertical services are scheduled.

MID STATE Communication, Inc., P.O. Box 203, Beech Grove, IN 46107 (**M8**) 317—787-9426
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VIDEO DATA SYSTEMS, 40 Oser Avenue, Hauppauge, NY 11787 (**M9**) 516—231-4400
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