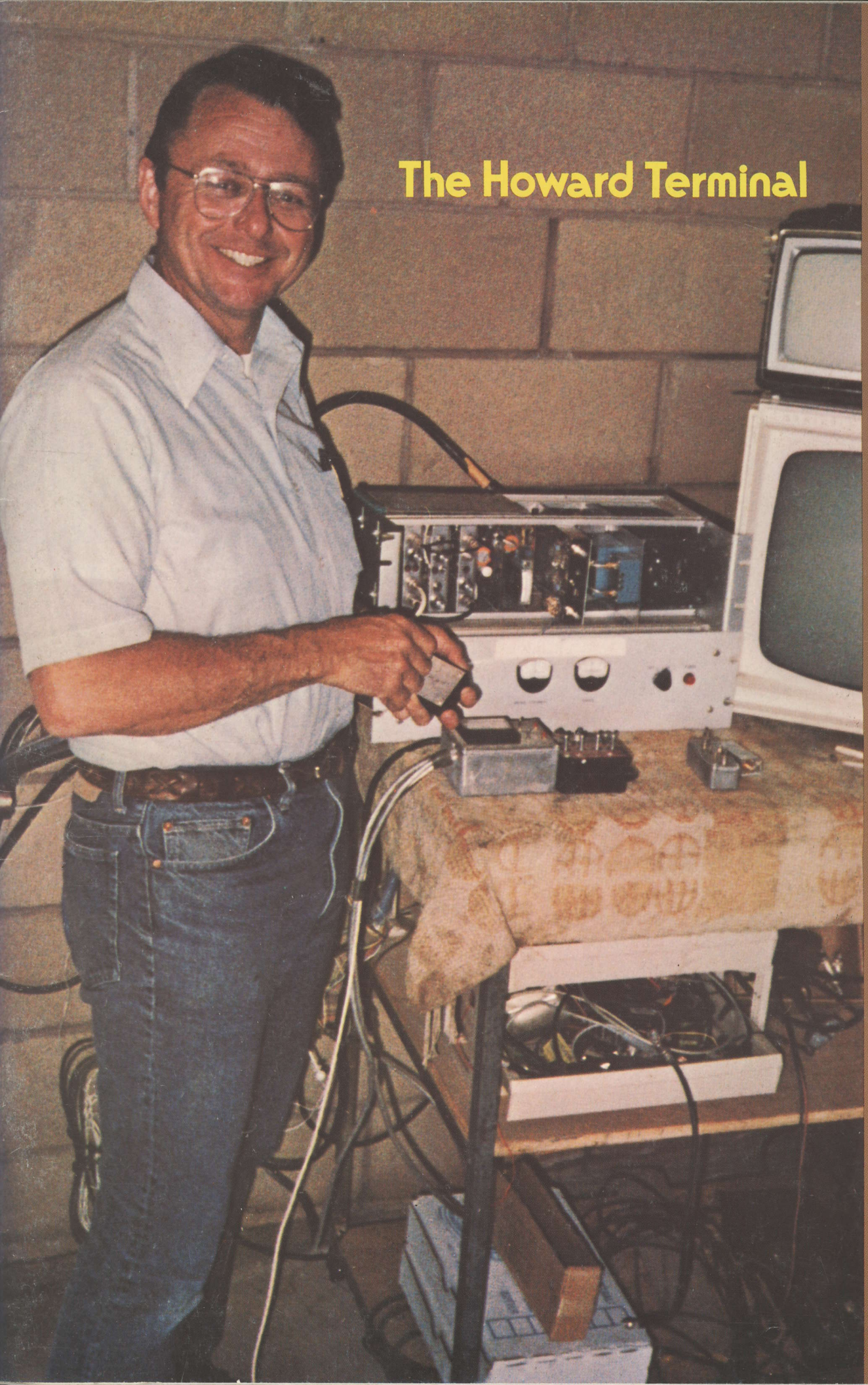

The Howard Terminal

CATJ

JUNE 1979

OFFICIAL JOURNAL OF THE COMMUNITY ANTENNA TELEVISION ASSOCIATION

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"With Oak, I know I'm getting my money's worth."

Bill knows he could buy less expensive CATV converters, but he also knows they could cost him more in the long run. You can't buy a more *cost-effective* converter than Oak. MSO's and hundreds of small system operators like Bill know that Oak offers unmatched quality and service.

All Oak products are designed, built and inspected by Oak people in company-owned facilities. Our investment in production facilities and skilled people is a symbol of the commitment we have made to our customers, to satisfy their needs; a commitment that results in unequalled product reliability for fewer service calls.

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Whether you are adding one channel or 35 channels, Oak has a converter to meet the needs of your system. The Oak product line includes the low-cost Econo-Line Thirty, 35 channel Trimline FT, and 35 channel Trimline with AFC.

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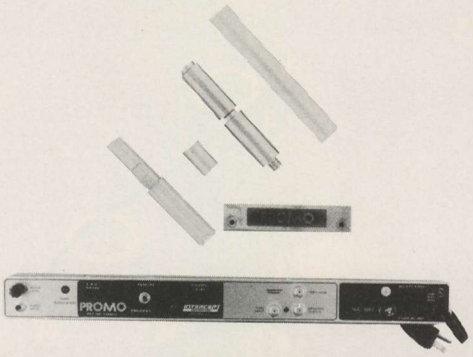

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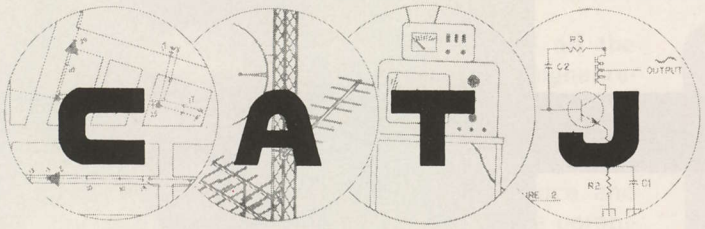

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—FEATURES—

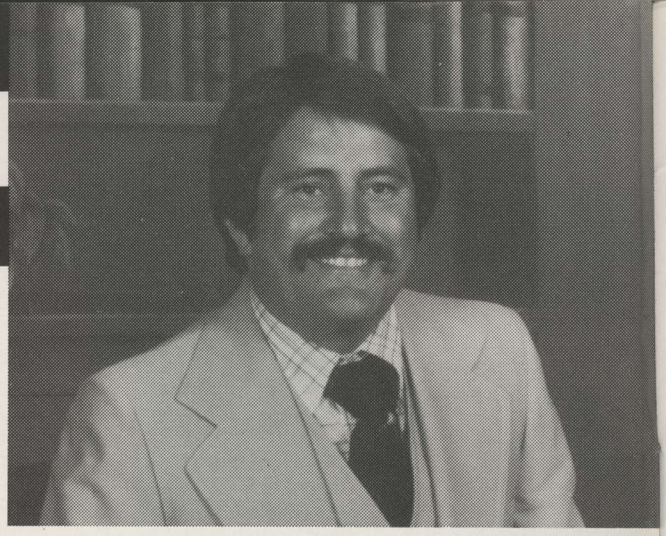
—DEPARTMENTS—

OUR COVER

HENRY T. HOWARD — low cost TVRO terminal pioneer (his has been operating since July of 1976!) with his frequency agile homebrew, self-designed TVRO receiver. Howard will be at SPTS '79 to describe his $1000 (or less) homebrew terminal electronics; see page 20 here.

Community Antenna Television Journal (ISSN-0194-5963) is published monthly by TPI, Inc., 4209 N.W. 23rd, Suite 106, Okla. City, OK 73107. Subscription price: $14.00 per year, $16.00 per year Canada, Mexico and foreign. Second class postage paid at Oklahoma City.

CATA-torial



BEN CAMPBELL, President of CATA, Inc.

SERVING RURAL AMERICA — THE TECHNOLOGY IS HERE TO DO IT NOW

The Community Antenna Television Association was started, and is sustained primarily by independent cable television operators serving the smaller, more rural cities and towns throughout the United States. While we have often been characterized as serving "rural" America, this is no longer the popular notion. "Rural America" has taken on a somewhat new meaning these days, especially when it comes to the legislators in Washington, D.C.

The new meaning for "rural America" does not relate to the population outside the major metropolitan areas of this country, or even the population outside the "big" cities in any given state. "Rural" has now come to mean those people who are totally isolated from cities, towns, municipalities, etc. The farm houses strung out across the country, the isolated pockets of a few people here and a few people there whose numbers do not even justify a post office or maybe even a general store. This is truly "rural" America.

As we all know, cable television operators have been fairly successful at providing services to the small towns of the nation. A town with 3 or 400 homes is sufficient to justify the building of a cable system, and certainly many of our members serve areas that are much smaller than that. But we have to admit that there is a limit. There is a point, in terms of the number of subscribers per mile, below which even we can not economically serve. Since the federal government has now announced that one of its primary communications objectives is to be sure that "rural" America gets full communications services, the question now becomes how we get that done.

The first thought of many regulatory-type folks is to say that the telephone company can do that job if we just let them. Well, that's probably true. The telephone companies, aided by REA funds which give them very low interest rate long-term loans, could probably, over time, do the job. Of course, so could we if we were given such government-backed low interest loans. The argument then goes, however, that if you **combine** telephone and cable service (as well as all other services) on one wire it is much more efficient, and much more economical than loaning money to two different people to run two different wires into someone's home when either one of those wires could provide all the services needed.

The problem, of course, with this notion is that if there is only going to be one wire, we all know who is going to control that wire: the telcos. They have the financial backing, they have the organization, and they have the reserves to get both political and financial power that we don't since we must deal in the open marketplace while they deal from the protected base of telephone service. This is true even if the current legislative efforts (which CATA support) are successful to allow REA-type loans for cable operators as well as telephone companies.

It is my view, however, that we are really looking in the wrong direction to begin with. Who says that "rural" America has to be "wired" for broadband communications in the first place? Is this really the best way to get basic communications services to those "rural" folks? I think not. Rather than replace all the telephone wires that are already in place in rural America with coax, or fiber optics, or whatever, why not use a combination of services that are far more economical than any of those alternatives?

The service I am talking about would combine cable and translators, MDS, low power television stations, etc. It would require some major changes in the present federal rules, but once that was accomplished, here is what I could see happening: A cable operator would serve the higher density areas with

regular cable service—this would include all the things we now provide, including television signal retransmission and pay cable. In all probability some of these services would be brought in by satellite. Then, using the same facilities, the operator would also provide television retransmission service and pay programming to the outlying areas by a combination of cheap technologies including MDS, translators, etc. Of course those services would have to be provided on a scramled basis, with the rural subscriber paying for them, just as his or her city counterpart does with cable service. There would be no cross-subsidy, like there is in the telephone business, with the city folks paying higher rates so that the telcos can afford to wire the rural area, there would be no need for such things. The services offered could be paid for directly by those who get them, and because of the economics of scrambled translator-type service everyone could pay his own way. There would also be no need for government hand-outs or low interest loans because the marketplace would survive on its own.

As the members of CATA know, this is not a new idea. We have been looking at it for some time now. There are loads of problems before it can be put into effect, however. The biggest is that we have to get a whole mess of changes in the FCC rules to 1) allow cable operators to also operate translator-type stations, 2) allow those translators to be scrambled, so the service can pay for itself, and 3) make sure that the translator-type service is authorized in such a way that it does not gut the cable service being offered in the non-rural areas.

There is some support now developing that would eventually result in the possibility that we could get the rules changed to the point of allowing this dream to come true. The National Telecommunications and Information Administration has already come out informally in favor of allowing "scrambled" translators. Further, there are several bills up on Capitol Hill that would allow Federal REA-type funding (if it were needed) to go to any entity, including a cable operator that wanted to serve an area with a **combination** of telecommunications services, including cable, translators, etc., and the FCC is looking at the whole issue of low power broadcasting, translators, MDS, and so on with an eye toward eliminating some of its unnecessary regulations. It's going to take some time though.

The first step, however, in all of this is to be sure that cable television as we know it today can continue to operate as a healthy and growing business. There is severe danger that we will not be able to do even that. As I have been warning for some time now, some of the legislation being proposed in Congress, and particularly the VanDeerlin "Communications Act Rewrite" (H.R. 3333) would probably put us out of business if the concept of "program consent" or "retransmission consent" is adopted. Before we can go on to complete the task of serving rural America we must be sure that we will be able to continue in business in the first place. The only way that will happen is if we all contact our elected representatives and let them know what will happen if H.R. 3333 is passed. Please—do it today.

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Satellite programming can be profitably marketed to your subscribers.

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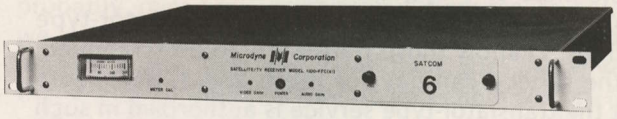
But first you should be talking to people: other station owners with on-line systems; equipment and system suppliers; and most importantly with experts who have knowledge and experience in this field.



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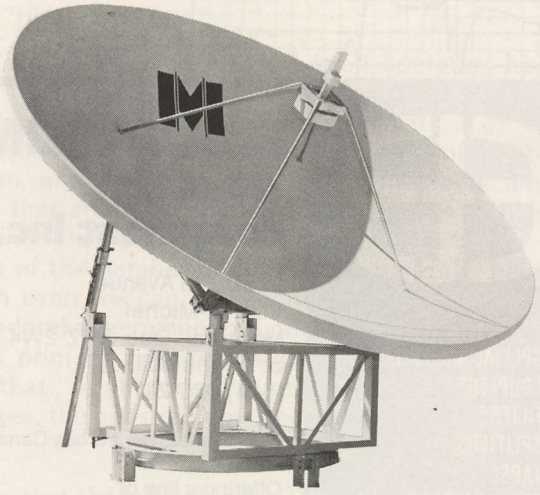

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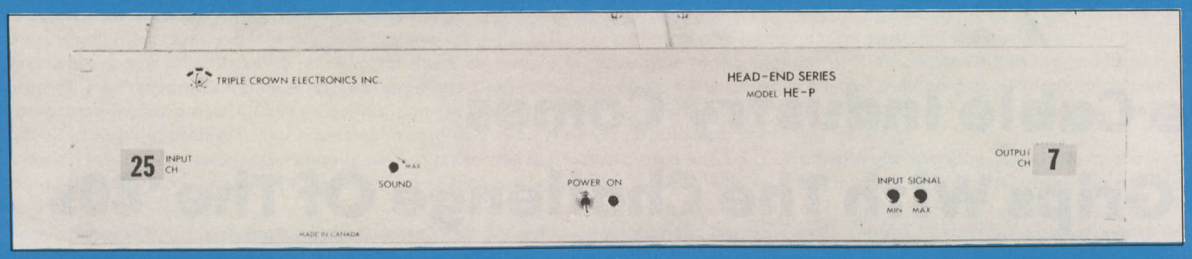

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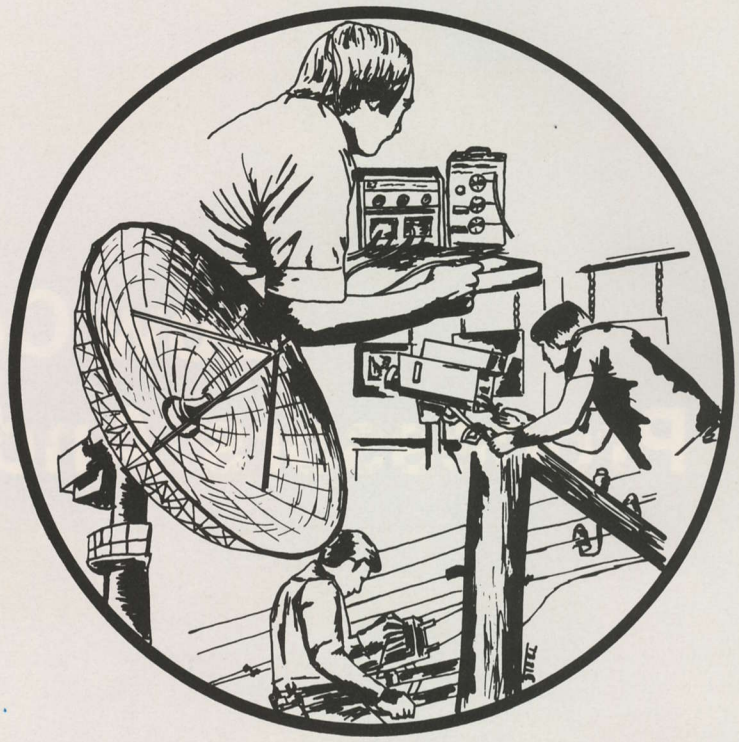
CCOS '79



The Cable Industry Comes To Grips With The Challenge Of The '80s

Changing times in the cable industry. Pressures from far and near are asking us to prove we have an on-going right to serve rural and suburban America with broadband communication services. The challenge of the 80's is clear; the rural and suburban cable operator must demonstrate by deeds, not promises, that he is willing and able to answer the broadband communication needs of America.

How will the typically rural and small cable systems respond to this challenge? Can we learn to cope with relaxed federal regulations and their logical replacement; the onrush of local and state regulations? How will systems cope with fast-paced satellite, fiber optics and computer technology? How will we meet the growing needs for training manpower, increased channel capacities and the satellite program explosion?

No single industry meeting can seek out and identify specific answers to such a wide variety of pressing problems and technologies in a single three day gathering. However CCOS '79, continuing the three-year tradition of innovation and perception will focus on as many of these issues as possible and CATA invites your participation to take a hand in analyzing and shaping the rural and suburban cable industry of the decade ahead. To register at CCOS '79, use registration card to right.

Complete Sets Of "Build-It-Yourself" Low Cost TVRO Plans

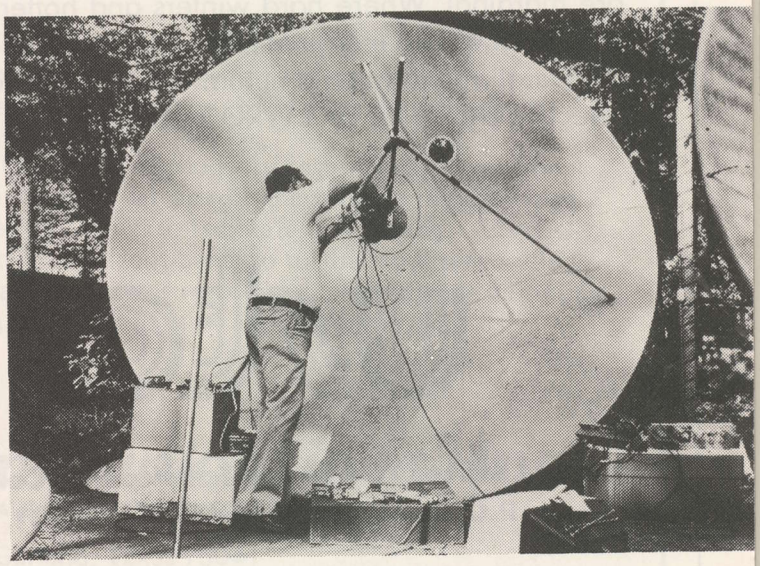
EVERY REGISTRANT AT SPTS '79 WILL RECEIVE TWO DETAILED SETS OF PLANS to construct his own backyard TVRO! Complete, detailed plans with all schematics, parts lists, parts sources. This is the first time, anywhere, that completely detailed plans have ever been made available for the construction of completely operational low-cost (backyard) TVRO terminals!

THE TD-2 CONVERSION. Imagine spending $5 to $25 for a surplus-market Western Electric TD-2 microwave receiver; adding a ten foot parabolic reflector, a homebrew feed antenna and around $200 or less in additional parts and receiving satellite TV pictures! And if you have a good 'junkbox' of component parts and surplus boards stashed away, doing it even cheaper! This is a real breakthrough in backyard, experimental terminals. On hand at SPTS '79, Robert Coleman will reveal how it is done, and teach you how to do it on your own!

PICTURES WITHOUT AN LNA. The 'Coleman TD-2 Conversion' is a natural for people who like to do things cheaply. It offers an opportunity to see operating results with a minimum of investment or time. And once you get a satellite signal locked up on your TV receiver, then you will feel the excitement and drive to set out to improve that picture to commercial quality.

THE EXPERIMENTER'S APPROACH. Because the proven 'Coleman TD-2 Conversion' is so basically simple, can be duplicated without fancy test equipment or an extensive background in microwave technology, it offers the neophyte with "just enough interest to see if he can do it" the opportunity to produce results without commiting to a full-scale terminal. Complete **'Coleman TD-2 Conversion Plans'** inside the registration packet for everyone signing up for SPTS '79!

THE HOWARD TERMINAL. The professional approach to a private terminal on an amateur's budget! Big, professional results with a relatively small investment. If you have a ten foot (or larger) reflector surface (or can beg, buy or 'steal' one!), that plus the investment of around $1,000 will put you into business with high quality, professional terminal pictures. You start with a reflector 'skin' and in the 'Howard Terminal' plans we cover everything else. The feed antenna, the LNA, the full and complete receiver including the VHF TV channel RF modulator that turns the Howard receiver baseband signals back into VHF TV receiver RF.



TAYLOR HOWARD WILL BE ON HAND. Engineers have called the 'Howard Terminal' plans "...the best engineered, straight-forward approach to a private terminal ever developed". We agree. Tay Howard has done a magnificent job tackling and solving everything from audio sub-carrier demodulation (for both 6.8 and 6.2 subcarriers!) to getting rid of the 30 Hz energy dispersal waveform.

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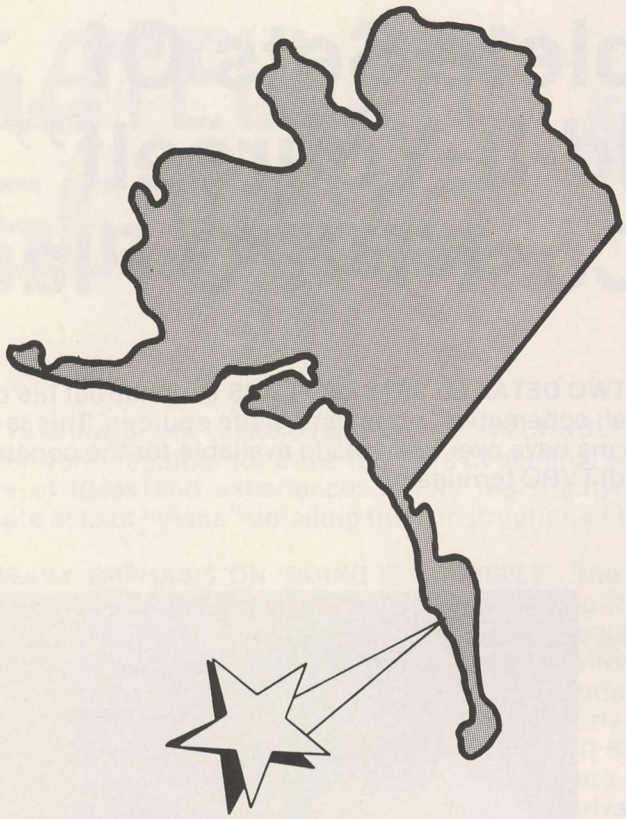

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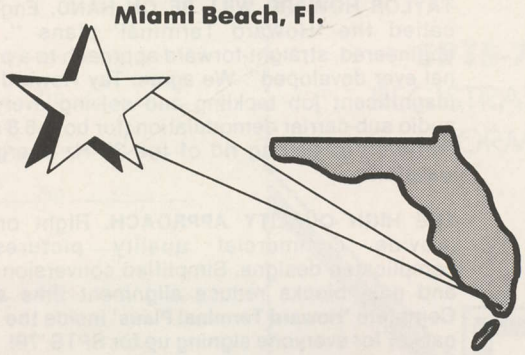

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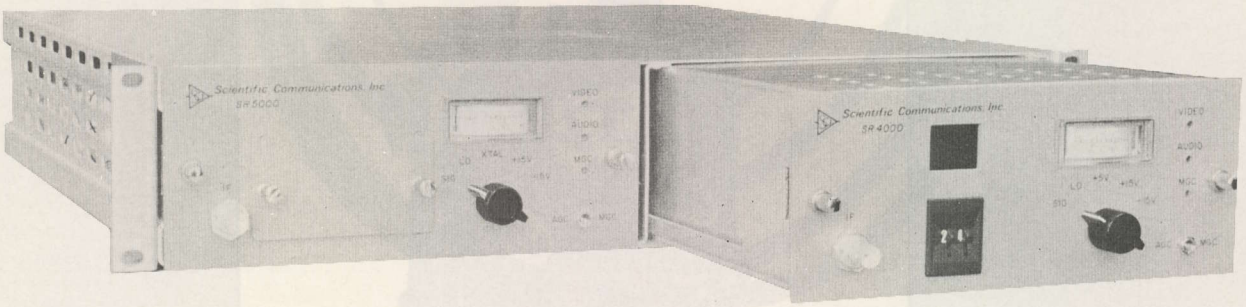

The SR-4000 and SR-5000 Satellite Video Receivers provide quality picture and sound reception of satellite television transmissions. They have been specifically designed to cost/performance criteria for CATV earth stations.

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 selection of a bianary code on a five position dip switch.

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 output 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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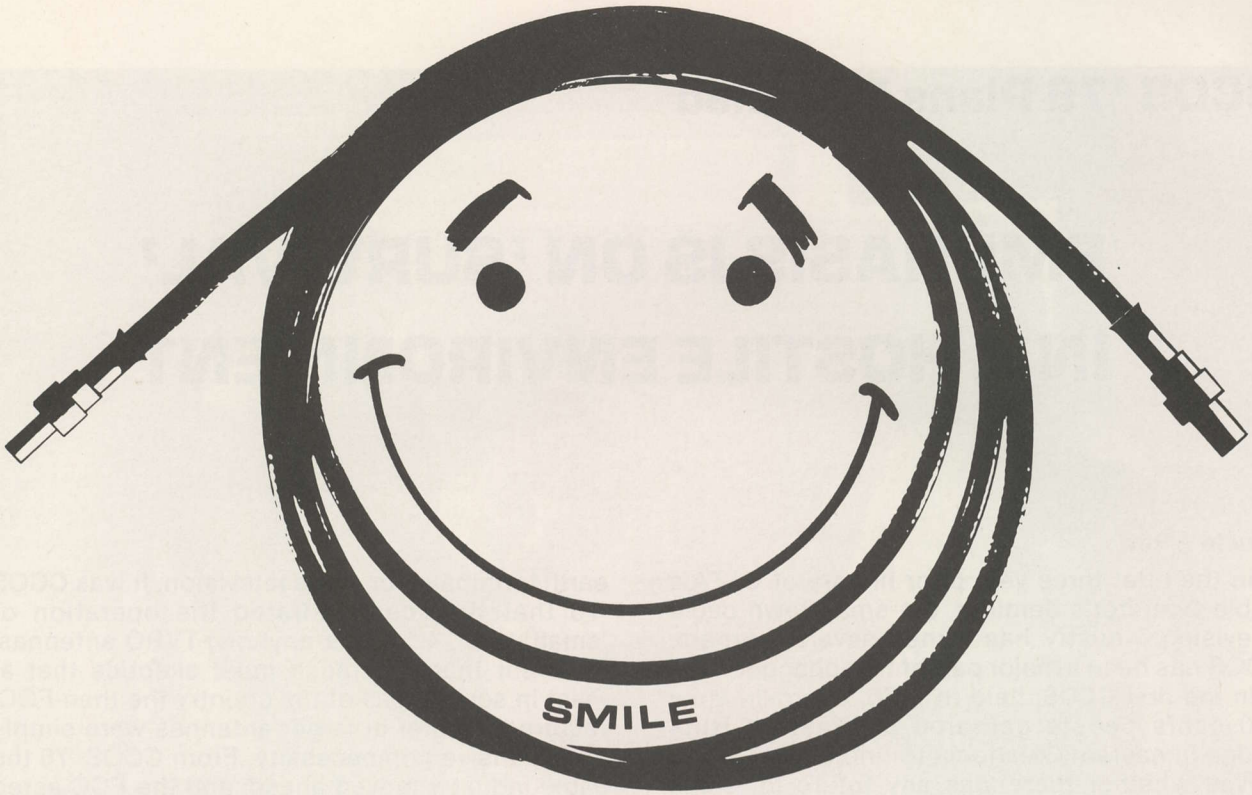

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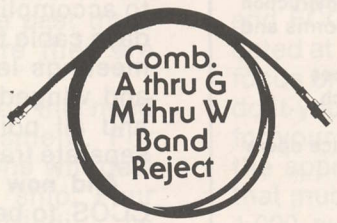
If you are rejected . . . so is their Pay TV Signal.

If a block is sold . . . simply remove the trap.

And if at some future date you wish to expand to additional premium channels and programming it's easy to do with VITEK Single or Multi-Channel Traps.



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With Vitek you get maximum security . . . with maximum flexibility . . . at minimum expense.

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CCOS '79 Plans Revealed

EMPHASIS IS ON 'SURVIVAL' IN A HOSTILE ENVIRONMENT

Four In A Row

In the brief three year prior history of CATA's Cable Operator's Seminar, the small town cable television industry has turned several corners. CCOS has been a major part of that change.

In the first CCOS, held in 1976, approximately 300 cable people gathered at Western Hills Lodge in eastern Oklahoma to find out for themselves whether there was any future in 'small earth terminals' for cable television. It was CCOS '76 that first demonstrated the operation of 'small' (well, 4.5 meter anyhow) TVRO antennas, an event that convinced most skeptics that at least in some areas of the country the then-FCC-required 9 meter or larger antennas were simply an expensive non-necessity. From CCOS '76 the cable industry moved ahead, and the FCC acted upon the CATA filing which requested that antennas smaller than 9 meters be routinely processed for licensing in the CATV receive-only service.

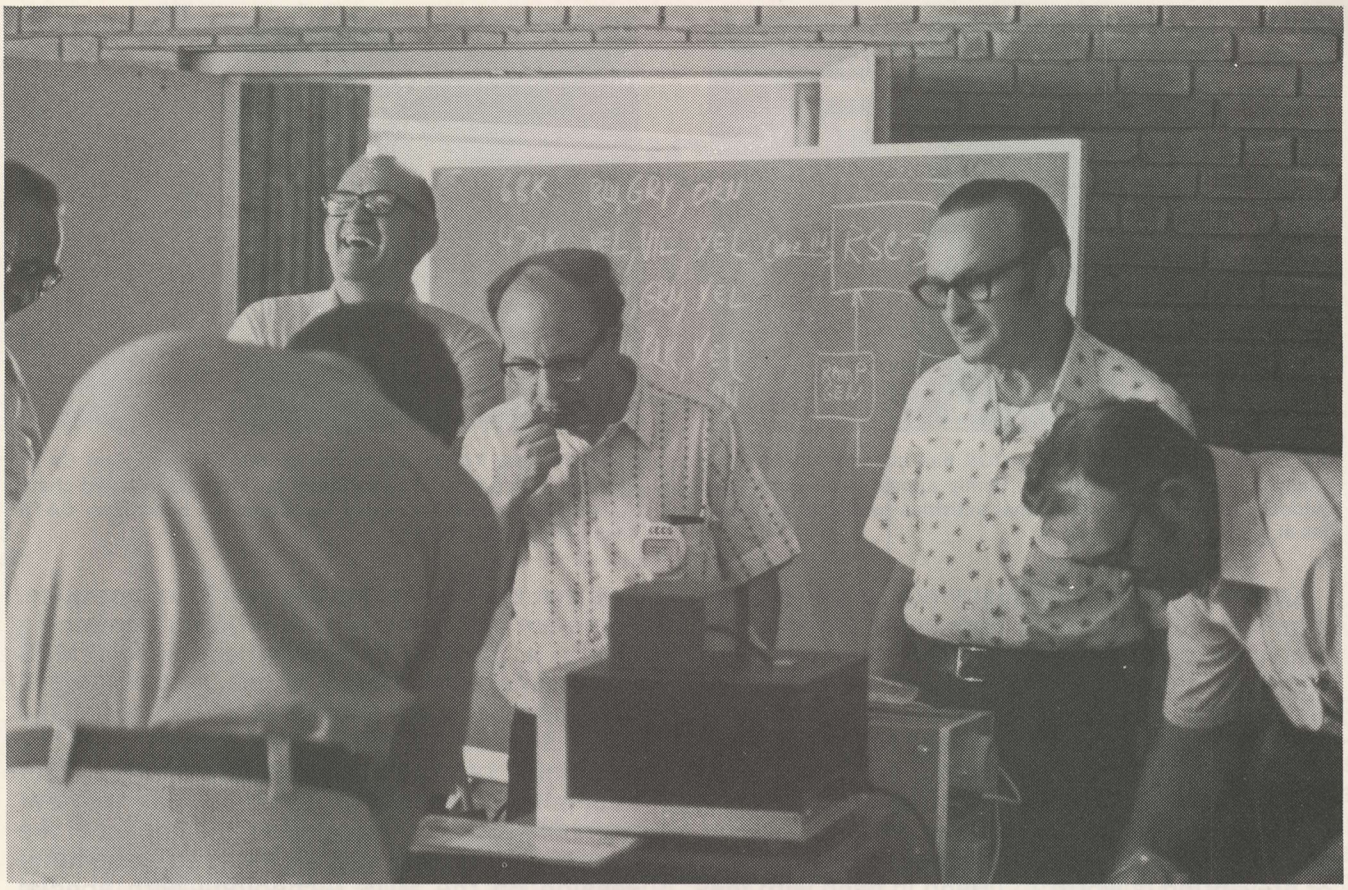
In the second CCOS, held in mid-summer of 1977 at Fountainhead Lodge in Oklahoma, approximately 600 cable people turned out to learn how FCC approval of small earth terminals might impact on their business, and to learn first hand about the newest technology 'baby', low-cost (Gunnplexer) microwave. Once again the stage was set for a new technical assist to small town cable operators; microwave equipment that cost from 1/2 to 1/3rd the price of previously available centimeter-relay gear was demonstrated, poked over and run through the paces.

In the third CCOS, held in mid-July and again at Oklahoma's Fountainhead Lodge, CATA set out to show the cable and communication industries just how far the satellite and low cost microwave technology world had moved in a year or two. Rounding up dozens of volunteers, a cranky old vintage 11 meter Intelsat 'transportable' (well, that's what they called it) uplink terminal and plenty of guts and sheer determination, CATA produced **the first** live-via-satellite industry trade show ever sent throughout North America via 'the bird'. The immensity of the project nearly swallowed the participants but once again CATA showed that difficult tasks only took more effort to accomplish than simple ones, and for two full days cable television technical and management meetings left Oklahoma's Fountainhead Lodge and winged their way from Maine to California and all points between on not one, but two, separate transponders.

And now the stage is set for CATA's fourth CCOS, to be held July 15-19, at 'The Abbey' near Fontana (Lake Geneva), Wisconsin, a convenient

CCOS '79 ADVANCE PROGRAM SCHEDULE

Sunday (7-15-79)	12 noon to 5 PM - **Registration** 7-9 PM - **Exhibits Open**
Monday (7-16-79)	8:30-12:00 **Earth Stations** (Construction, sighting, testing) 8:30-10 AM - **Management 1** (forms and filing) - **FCC Proof Testing** 10:30-12:00 - **Management 3** (marketing) - **MDS** 12:00-2:00 - Exhibits and lunch 2:30-5 PM - **Lightning** - **Management 4** (office operations) - **Oliver Swan** 5:30-7:30 - **Bar-B-Que** 7:30-9:30 - **Exhibits Open** - **Labs Open**
Tuesday (7-17-79)	8:30-10:00 - **Bonding/Grounding** - **Management 2** (survival) - **FCC Proof Testing** 10:30-12:00 - **MDS** - **Underground Construction** - **Earth Stations** (testing and alignment) 12:00-3:00 - Luncheon with (CATA) membership meeting and Washington Report 7:30-9:30 - **Exhibits Open** - **Labs Open**
Wednesday (7-20-79)	8:30-10:00 - **Computer Services** - **Management 3** (marketing) - **Bonding/Grounding** 10:30-12:00 - **Underground Construction** - **Mangement 1** (forms and filing) - **Computer Services** 12:00-2:00 - **Exhibits and Lunch** 2:30-5:00 - **Lightning** - **Management 4** (office operations) - **Oliver Swan**



HANDS ON ATMOSPHERE has always prevailed at CCOS where operators are given the opportunity to work with hardware under the tutorship of seminar session 'teachers'.

trip from the major air terminals at both Chicago and Milwaukee. Doing something to equal the impact of 1976 (first demonstration of small TVRO's), or 1977 (first demonstration of low cost microwave) or 1978 (first use of an uplink) would require a technology breakthrough of significant proportions. After you've hit three home runs in a row, the logical thing to do is to stand back and consolidate your victories. And that is precisely what CCOS '79 is setting out to do, not because another '78 uplink project could not be brought off, but rather because after all of the rush and excitement of the past three years the cable operators served by CCOS need to reconsider their own business situations as the cable industry rushes headlong into the technology of the 80's.

CCOS '79 is being characterized as a 'stand back and take stock' affair, which simply means that after three hectic years of monumental growth, the time has come for the nation's smaller, independent cable operators to re-assess where they have come in the past three years, and more importantly, where they are headed in the coming years.

The program for CCOS '79 reflects on this need for maturity and need for assessment. For example, five of the seminar sessions will deal with the need for running a tight ship. Four companion sessions, identified as "Management 1", "Mangement 2" (and so on through four) concentrate on office operations, marketing techniques, report forms and FCC filing and how to handle the eventual question of 'survival'—how do you set up your business so that a surviving spouse is able to cope with the business on a 'sole' basis.

A fifth session, in the same general family, concentrates on computer services. Two seminar sessions during CCOS '78 introduced micro-computers to the small, independent system operator and both were well received. One of those sessions, by Ray Daly, resulted in Daly now appearing in **CATJ** with a regular column devoted to low-cost computer technology for cable system operations. At CCOS '79 this will be a subject of additional focus as the fast exploding world of computers catches up to the equally fast growing world of small town cable. There is a marriage here and CATA wants operators to be prepared for it.

Two continuing areas of concern, earth stations and FCC proof of performance, will also be updated at CCOS '79. The earth station seminar will focus on construction, 'sighting-in' the bird, and do-it-yourself procedures for being responsible for your own installation. In the FCC proof area, the approach will also be 'step-by-step' testing that must be done by all systems with more than 1,000 subscribers to satisfy the FCC proofing requirements.

INFORMAL ATMOSPHERE OF CCOS has become a tradition. Sites for event are chosen for 'family appeal' with plenty of outdoor (and indoor!) recreational activities available for families of attendees.

EXHIBITS ARE TAILORED to the profile of the typical CATA operator with plenty of opportunity for informal, relaxed chatting with engineers and sales personnel on hand from CATA Associate member firms.

Construction, in an industry now experiencing a construction boom in new cable expansions and new system construction, will get two different seminar visits. Recent advances in understanding the lightning phenomenon and the companion power surges and transients that are death on plant and headend equipment will be the subject of one seminar. This one will point out both the problems and the steps to take to solve the problems before they occur—an ounce of prevention is worth. . . . Hand in hand with the seminar on lightning will be another on bonding and grounding; a 'touchy' subject these days especially in the region of the subscriber's house drops where various states have elected to push for uniform installations under the 'ground everything in sight' code.

In the same family of subjects, a little talked about aspect of cable installation, undergrounding, will be the subject of a third seminar. The emphasis here will be on cost saving techniques (with $1 to $3 per foot 'digging charges' not uncommon, this is a very important sub-topic!).

An old favorite will be back. Arizona's Oliver Swan, who appeared most recently on CATJ's **Satellite Magazine** program (over a period of six weeks in February and March) will be back for his third CCOS to share some of his special knowledge on bringing cable service into rural areas. As the Satellite Magazine reports aired this spring noted, Swan is able to serve areas with housing densities of under ten per mile because he carefully selects his materials, builds much of the headend electronics and antennas and plant electronics in his own shop, and he provides service in areas where without his service television reception is all but non-existent.

Is that the seminar for this year? No, not quite. There are proposals to turn MDS (or something akin to it. . .see **CATJ** for April and special MDS Report (into a **rural delivery system.** Actually several rural operators are already at work to take the MDS service concept into rural areas by combining off-satellite feeds into a twenty-four hour-per-day service on a single 'pay to view' channel. CCOS '79, recognizing the impact of the April **CATJ** report, will be holding a seminar session on the MDS technology with special emphasis on providing program services into areas not presently being served. If past 'technology breakthroughs' of past CCOS sessions are any indication, this one promises to be the 'low cost microwave' or the 'small earth terminal testing' of 1979!

A breakdown of the program schedule appears here separately. Note that the annual CCOS Bar-B-Que will be on the evening of the first full day (Monday the 16th) rather than towards the middle or end of the session. Also note that there are free hours for exhibit browsing for two hours on the 16th and 18th as well as three evenings. The traditional CCOS Labs will be back as well.

Registration? A handy card appears in this issue between pages 8 and 9. All CATA member systems had an opportunity to register earlier this spring as did those non-CATA members who attended CCOS '78. **Now the registration is open** to the industry at large. And while the Abbey has more room available than past CCOS locations, it does have a capacity below that of the expected attendees so any delay at all may result in your being turned away, or being housed at a hotel/motel other than The Abbey!

Mutual's 10 Foot Dishes

Citing a lack of response from the FCC, Mutual Radio has moved to square two in their game plan to outfit an estimated 500 MBS affiliates with radio receive-only (RRO) terminals in the 4 GHz band. Originally proposed early in 1978 (see **CATJ** for **January** 1978, page **42**) Mutual had sought a 'blanket FCC approval' to install a total of 500 ten foot (3 meter) radio receive only terminals throughout the United States at Mutual affiliates. The system would feed up to four 15 kHz audio channels to MBS stations.

When the FCC did nothing with the blanket application (which sought to avoid both present FCC antenna size restrictions [4.5 meters roughly] and frequency coordination), and in the interim approved a group of 4.5 meter audio RRO terminals for National Public Radio, Mutual decided to go back to the well with a new application.

AUTOMATIC SATELLITE RECEIVER SWITCHING SYSTEM

by
William H. Ellis
Evansville Cable TV
Evansville, In. 47711

The automatic satellite receiver switching system described in this article was designed to permit a single earth station remotely programmable receiver to be utilized for reception of two satellite signals. Specifically the design goals were:

(1) To time share one Scientific Atlanta Model 414 receiver **between** the Madison Square Garden service and late night programming of KTVU (San Francisco).

(2) To control the receiver from the system office (also the system headend location) using our automatic program timer even though the earth station is four miles away.

(3) To use the telephone system as the control communications path.

Although control of the satellite receiver using a separate timer at the earth station is possible, remote programming results in the following advantages:

(1) The system's program switcher, located at the office, can be utilized for **all** switching. Thus, reprogramming of the satellite receiver may be accomplished without a trip to the earth station.

(2) Switching via the telephone line allows for **manual remote switching** of the receiver for **testing** purposes.

To accomplish the outlined goals, the automatic switching system used some off-the-shelf modules and some in-house designed circuits.

System description - Automatic control over the telephone line requires an automatic control timer, a dialer to "pick up" the telephone line and dial the remote telephone number, a data transmitter at the headend, a device at the earth station to answer the telephone and a data receiver at the earth station to accept the incoming commands and translate them into actions. **Figure 1** shows the process in simplified form.

The timing device utilized called a **Coby 1** is manufactured by **Energy Technology, Inc.** of Las Cruces, N.M. It is a programmable timer capable of addressing up to 100 remote devices which can be turned on or off at any date and time programmed in the control unit's memory. Control of the remote units is accomplished via a carrier system over the AC power lines. **The remote units and the controller** must be powered from the **same** power company transformer. Remote units plug into AC outlets and contain a single AC outlet which becomes hot when the unit is turned on.

A **Monroe Electronics, Inc.** Model 3232 16-function dual-tone generator circuit card was selected as the **data transmitter.** It generates any of the standard touch-tone frequencies when activated at the appropriate terminal.

The dialer-communicator is a **Silent Knight Model 130** digital dialer. It is a very versatile unit that may be programmed to dial any local or distant telephone number by simply locating small pins on a printed circuit board matrix. Because the dialer is intended to communicate with a specific piece of equipment over phone lines,

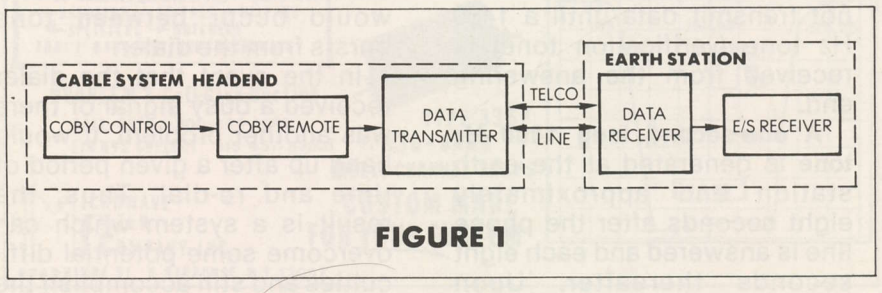
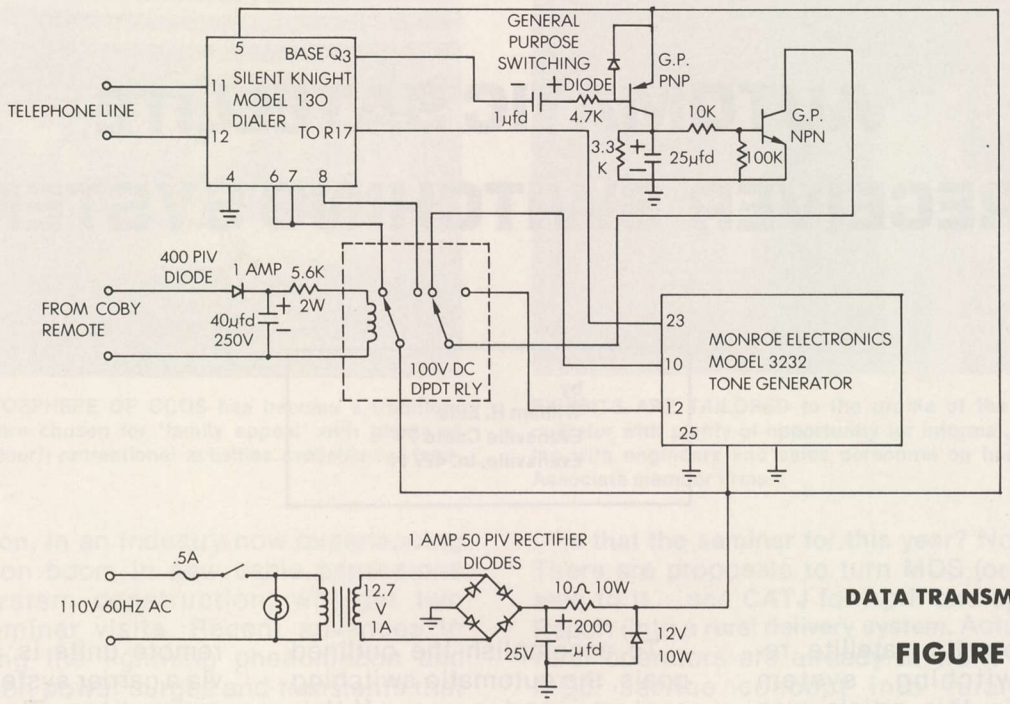


FIGURE 1



DATA TRANSMITTER

FIGURE 2

it was modified slightly and to accomplish the task at hand. The modifications are simple and involve only lifting one resistor and connecting a wire to a specific integrated circuit terminal.

The dialer is intended to be used as a fire or burglar alarm communicator, and, as such, it has several very useful "extras" for this application. In general, it works as follows: When one of the alarm inputs is activated, the dialer "listens" for a dial tone on the telephone line to which it is connected and upon detection of the dial tone, dials the programmed number. If there is no dial tone, the dialer attempts to clear the line and then dial. Once the number is dialed and answered by the automatic answering equipment at the earth station end, the dialer will not transmit data until a 1400 Hz tone (verification tone) is received from the answering end.

A one-second long 1400 Hz tone is generated at the earth station end approximately eight seconds after the phone line is answered and each eight seconds thereafter. Upon receipt of the first tone, circuitry within the dialer will respond with preprogrammed coded tone bursts. These tone bursts are not transmitted over the telephone line but are used to drive a transistor switch which activates the appropriate tone on the Monroe tone generator. The output tone from the Monroe card is adjusted to last about one second. The second 1400 Hz tone from the earth station causes the dialer at the headend to "hang up" the telephone line. Timing of control tones is critical. If the dialer is generating a tone burst when the earth station is sending its 1400 Hz tone, it will not hang up but will wait for the next tone. Since tone bursts continue to be generated by the dialer at intervals, it was necessary to select the earth station tone timing so that it would occur **between** tone bursts from the dialer.

In the event that the dialer received a busy signal or there was another problem, it would hang up after a given period of time and re-dial. Thus, the result is a system which can overcome some potential difficulties and still accomplish the desired goal. The telephone answering device and the tone controlled switch at the earth station are Monroe Electronics, Inc. Model 3137A and Model 3185 respectively. A locally designed circuit was used as the 1400 Hz tone burst verification oscillator.

Detailed block diagram — Figure 2 shows in detail the circuit used at the headend location. The telephone line is connected into the dialer through an appropriate coupler supplied by the telephone company.

Two of the dialer's three control channels are used. Although either channel can be operated by an open or closed circuit loop, they are wired for an open circuit loop. Channel 1 is activated by connecting the power supply voltage to terminals 6 and 7 and Channel 2 by applying the power supply to terminal 8. Activation of either channel will initiate the automatic dialing sequence. After dialing and upon receipt of the verification tone from the earth station, the dialer will generate a tone burst of 5 volts peak-to-peak from pin 18 of the large integrated circuit (also the

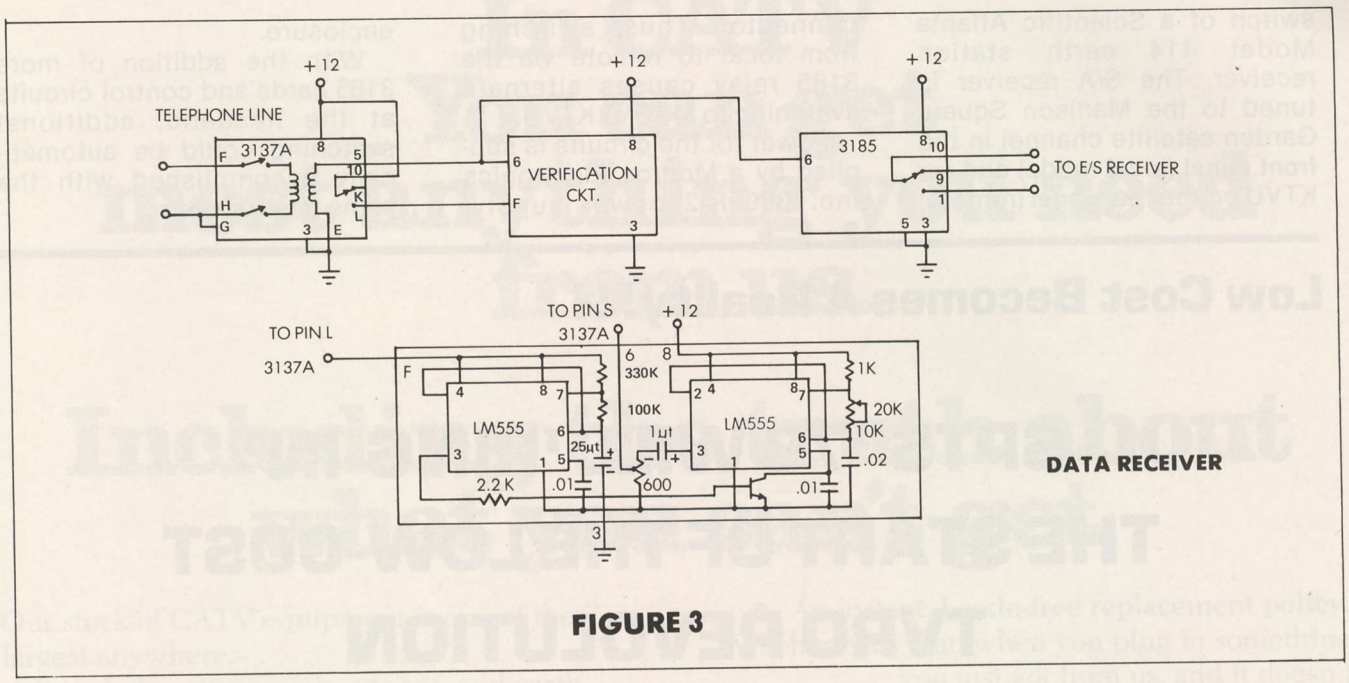


FIGURE 3

base of Q_3). That burst is connected to the two transistor circuit shown in the diagram.

The circuit functions as follows: The 2N2906 PNP transistor is biased off by the diode connected from its base to its emitter. When the tone burst is applied to its base, the transistor saturates and charges the 25 ufd capacitor to the supply voltage. That, in turn, saturates the following NPN transistor which is connected through the appropriate relay terminal to the Monroe Model 3232 dual tone generator card. In this case, the saturated transistor activates either the * tone or the # tone. The output winding of the audio transformer on the card is connected through R17 on the dialer circuit board to the **input side** of the **output transformer.** The output side of the dialer transformer is connected to the telephone line.

The remaining circuits on the card are power related. A simple full wave rectified, zener regulated, supply provides 12 volts to all of the circuits except for the relay. The control relay is provided 110V DC through the switcher remotes using a simple half wave rectifier and capacitor input filter. The 5.6 ohm 2 watt resistors in series with the relay was selected to drop the 170 VDC across the filter capacitor to the 110 VDC required by the relay. A circuit diagram of the receiving (switching) end circuit is shown in **Figure 3.**

The telephone answering device is a Monroe Electronics Model 3137A. When the telephone line rings, the 3137A closes a relay which connects the line to the 3185 tone recognition card as well as the audio output of the verification oscillator card. Another relay on the 3137A card closes and connects power to the verification circuit which consists of two LM555 integrated circuit timers with some ancillary circuitry. The **first timer** is wired to generate a **1.5 second pulse** with an off period of about eight seconds. When the 1.5 second pulse occurs, it permits the **second timer** connected as a 1400 Hz stable multivibrator to operate, **generating a 1400 Hz tone burst.**

This tone burst is coupled to the telephone line via a voltage divider. As long as the 3137A card has the line open, the verification card will generate the 1400 Hz 1.5 second burst each eight seconds.

Although the 3185 tone recognition card can be programmed to require a sequence of up to four tones for an "off" or "on" operation, it has been programmed for activation with a **single** tone. The output of the 3185 tone recognition card is a set of dry contacts that are used to operate the local remote

switch of a Scientific Atlanta Model 414 earth station receiver. The S/A receiver is tuned to the Madison Square Garden satellite channel in the **front panel** (local mode) and for KTVU on the **rear panel** (remote) connector. Thus, switching from local to remote via the 3185 relay causes alternate switching to MSG or KTVU.

Power for the circuits is supplied by a Monroe Electronics Inc. 3000R-2 power supply/ enclosure.

With the addition of more 3185 cards and control circuits at the headend, additional switching could be automatically accomplished with the same basic system.

Low Cost Becomes A Reality!!!

SPTS '79 WILL 'RING-IN' THE START OF THE LOW-COST TVRO REVOLUTION

SPTS '79 IN BRIEF

When: August 14-15-16 (17*), 1979
*-Optional Kit-building-day.

Where: Oklahoma City, Oklahoma at South Oklahoma City Junior College

What: A three day seminar on every aspect of designing, building, installing and operating low-cost television satellite receive terminals plus associated microwave video technology. **PLUS** - business opportunities in low cost TVRO terminals and numerous operating terminals.

Program: Professional (as in commercial) and 'amateur' (as in "I did it by myself just to prove I could do it!") experts in every aspect of TVROs will conduct 1 to 3 hour seminar courses.

References: Every registrant will receive as part of his registration packet two complete and detailed sets of plans; one describing conversion of the 'surplus' **Western Electric TD-2** (Bell telco) microwave video receiver to TVRO reception, and a second describing 'the complete-from-scratch' **Howard Terminal.**

Program Hours: 10 AM to 5 PM Tuesday the 14th, 9 AM to 4 PM **and possibly** 6 PM to 8 PM Wednesday the 15th, 10 AM to 4 PM Thursday the 16th.

Extras: Equipment display exhibits, videotape viewing (and dubbing) rooms will be open on specified hours announced in the program.

Fees: One person, $125. registration/attendance fee **including** the full technical data packet with plans and circuits; two people registering **together,** first person $125, second person $110. Three or more people registering **together,** first person $125, second person $110 and third and up $100 each.

Contact: SPTS '79, Suite 106, 4209 NW 23rd, Oklahoma City, Oklahoma 73107 (% CATJ Magazine at 405-947-4717).

Registration: See special insert card between pages 48 and 49 in this issue.

Real Technology Breakthroughs

For more than a year now we have been suggesting and forecasting in print, that **before 1979 was over** there would be a number of significant breakthroughs in low cost (as in cheap) TVRO hardware. Back last January when we developed the concept for the forthcoming **Satellite Private Terminal Seminar** we were 'betting' that by mid-August several of these 'technology breakthroughs' would be an accomplished fact. And further, that the people involved in this breakthrough would be willing (and able by mid-August) to share this new technology with a crowd of like enthusiasts.

Whew. It looks like we are going to make it . . . with time to spare. In fact, the developments are popping up so fast that what we report to you today will likely be superceded several times over by the middle of August and SPTS (August 14-15-16). Here is what we see coming out at SPTS '79 here in Oklahoma City:

1) **Modifying surplus equipment** - One of the popular theories around has been that if you took a suitable piece of surplus (as in cheap, dis-carded or thrown-out of an operating system) piece of microwave gear and made certain changes to it you **might** be in business with receiving 3.7 to 4.2 GHz satellite TV signals. Several problems cropped up between the theory and the implementation of this project. **Number one,** hardly any microwave equipment has ever been built in what we consider **volume quantity.** So while you might scare up for a $100 bill a piece of Lenkurt or Motorola microwave gear that **could be** converted to

In CATV You can get most anything you need from us.

Including the truth about what you can't get.

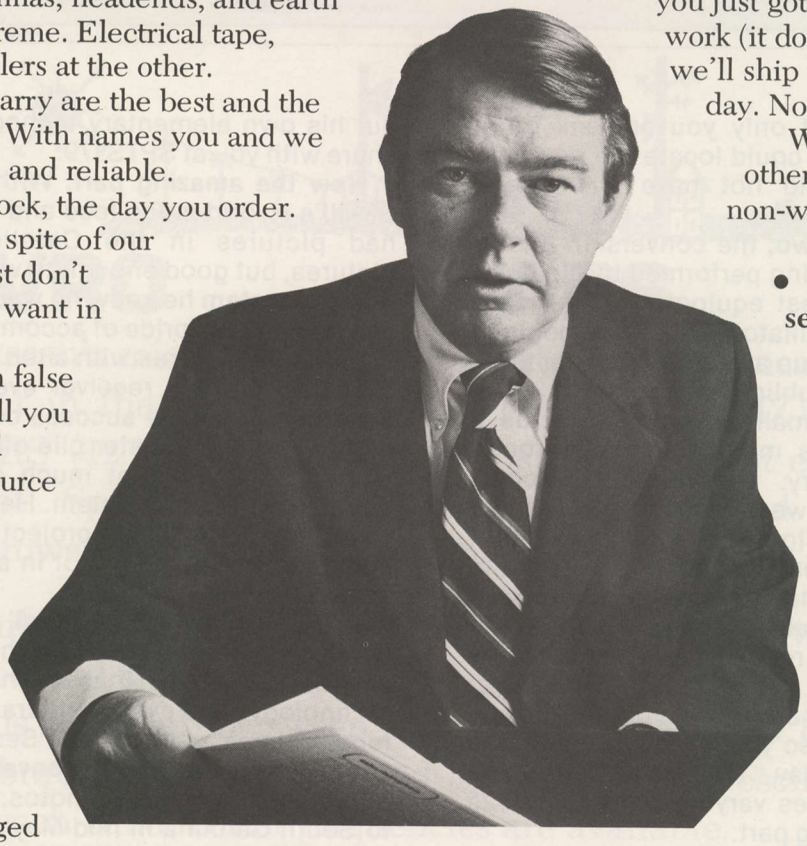
Our stock of CATV equipment is one of the largest anywhere.

It includes antennas, headends, and earth stations at one extreme. Electrical tape, crimpers, and staplers at the other.

The things we carry are the best and the latest we can find. With names you and we know as reputable and reliable.

We ship from stock, the day you order. But sometimes, in spite of our best efforts, we just don't have the item you want in stock.

We don't deal in false promises. We'll tell you we can't ship. And suggest another source if we know one.



Some things you can always get from us:

- **No minimum billing. No minimum order.**

You won't be charged $15 for a $5 item when you buy it from us. And you won't have to buy a lot of other things you don't want or need.

- **An instant, hassle-free replacement policy.** Which means that, when you plug in something you just got from us, and it doesn't work (it does happen) call us, and we'll ship you a replacement that day. No waiting, no quibbling. We don't—like so many others—tell you to ship the non-working unit back to the manufacturer.
- **CATV's best customer service.** Experts you can consult with any time on our toll-free line. Get simple and straight answers to your questions. Or comprehensive recommendations concerning sophisticated subjects. Like antenna systems design, and system layouts. Custom-designed headends. Free always. Call us now for our complete catalog. The phone call and the catalog are free. No obligation when you talk to us, ever.

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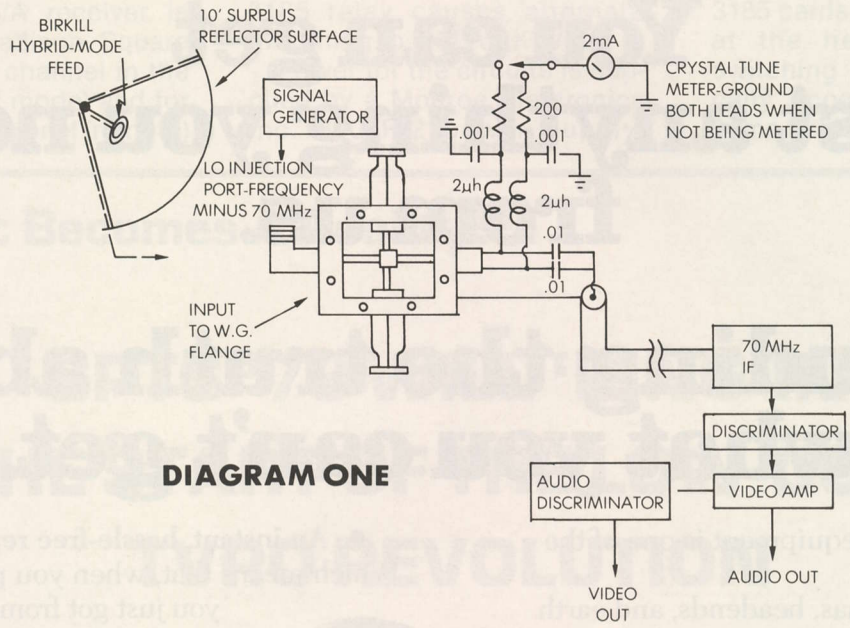


DIAGRAM ONE

TVRO service, if only you and six other guys nationwide could locate the gear, the conversion would not have widespread appeal.

And **number two,** the conversion had to be capable of being performed by a person with no fancy test equipment. That rules out retuning oscillator chains that begin at 8 MHz and wind up at 3,200 MHz after umpteen steps of doubling and tripling.

Well, with some small guidance from us a chap in the Carolinas made the breakthrough along about February. His name is **Robert Coleman** and for now we aren't going to tell you **where** to find him; we figure you should wait until SPTS '79. What Coleman has done is to take the only commonly available surplus microwave receiver there is available, the **Western Electric TD-2** (Bell) 4 gig video receiver, and make it work as a TVRO receiver. There are thousands of surplus'd TD2 units around (a photo of one version appears here so you'll recognize it since noplace on it does it say "TD-2") and we found a dozen locally for prices varying from $5 to $25 each. Now the amazing part:

Coleman built up the system shown in **diagram one;** the TD-2 is a front end and an IF (70 MHz). For an oscillator he initially rounded up a piece of (HP) surplus test equipment to provide an LO 70 MHz removed from the incoming carrier frequency. We've since sent him into using the Avantek VTO-8360 oscillator module which provides +10 dBm of LO signal for around $115. For an antenna, he had located a ten foot reflector surface and from the February **CATJ** he read about and then built up Steve Birkill's Hybrid-mode feed (see **CATJ** for February 1979, **page 46**). From 70 MHz to baseband he worked out his own elementary technology which we'll share with you at SPTS '79.

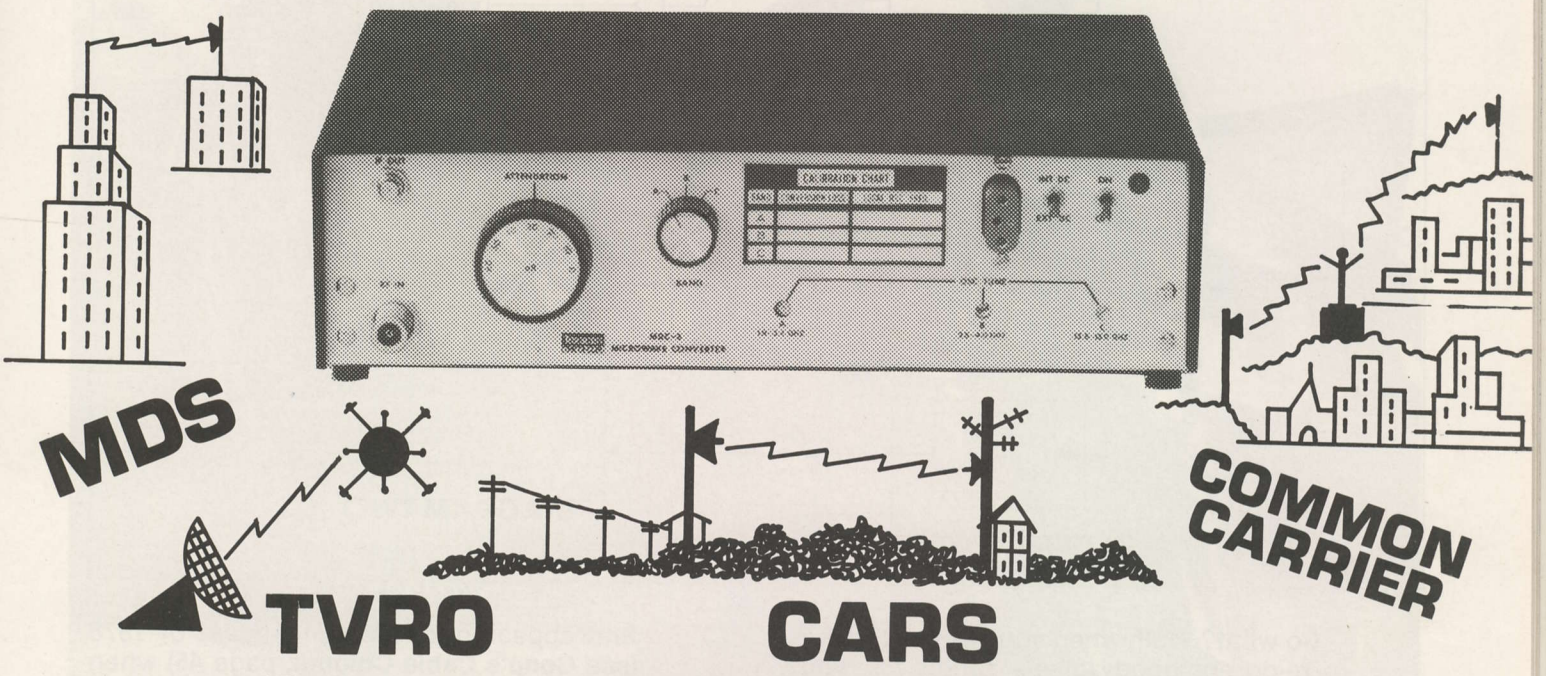
Now the amazing part. With a ten foot dish, Birkill's Hybrid-mode feed and the TD-2 mixer he had pictures in the Carolina's! Not great pictures, but good enough to watch and with this **no LNA system** he knew he was in business. You can imagine his pride of accomplishment to have satellite TV pictures with a ten foot dish, **no LNA** and a $5 surplus receiver even if he did have sparklies! His early success convinced him that it didn't take a monster pile of equipment to get started and with that much going for him he began to refine his system. He estimates he has **well under** $500 in the project to this point. We should note that he is not in an 'ideal footprint' area of the USA.

Robert Coleman will be at SPTS '79. He will show off his equipment and his techniques. He will lead a seminar that teaches his conversion technology. **And every registrant** at SPTS '79 **will receive** as a part of his 'Seminar Package' **a complete set of TD-2 conversion plans** (with complete schematics, photos, etc.). We traveled to South Carolina in mid-May to see the system in operation and at SPTS '79 we'll have an hour or so of color videotape we prepared at Coleman's TVRO installation.

2) **Building a complete system from scratch** - when you start out with a surplus piece of equipment, such as the TD-2 receiver, you accept certain limitations for the system. Some of these can be overcome (such as noise figure by adding a homebuilt LNA stage) with some ease, others are more difficult to work out (such as easy one knob tuning from transponder to transponder without re-tweeking the system).

MICROWAVE

MEASUREMENTS MADE EASY!



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

TEXSCAN CORP.: 2446 N. Shadeland, Indianapolis, Indiana 46219, (317) 357-8781, TWX 810-341-3184
THETA COM: 2960 Grand, Phoenix, Arizona 85017, P.O. Box 27548, 85061, (602) 252-5021, (800) 528-4066 TWX: 910-951-1399

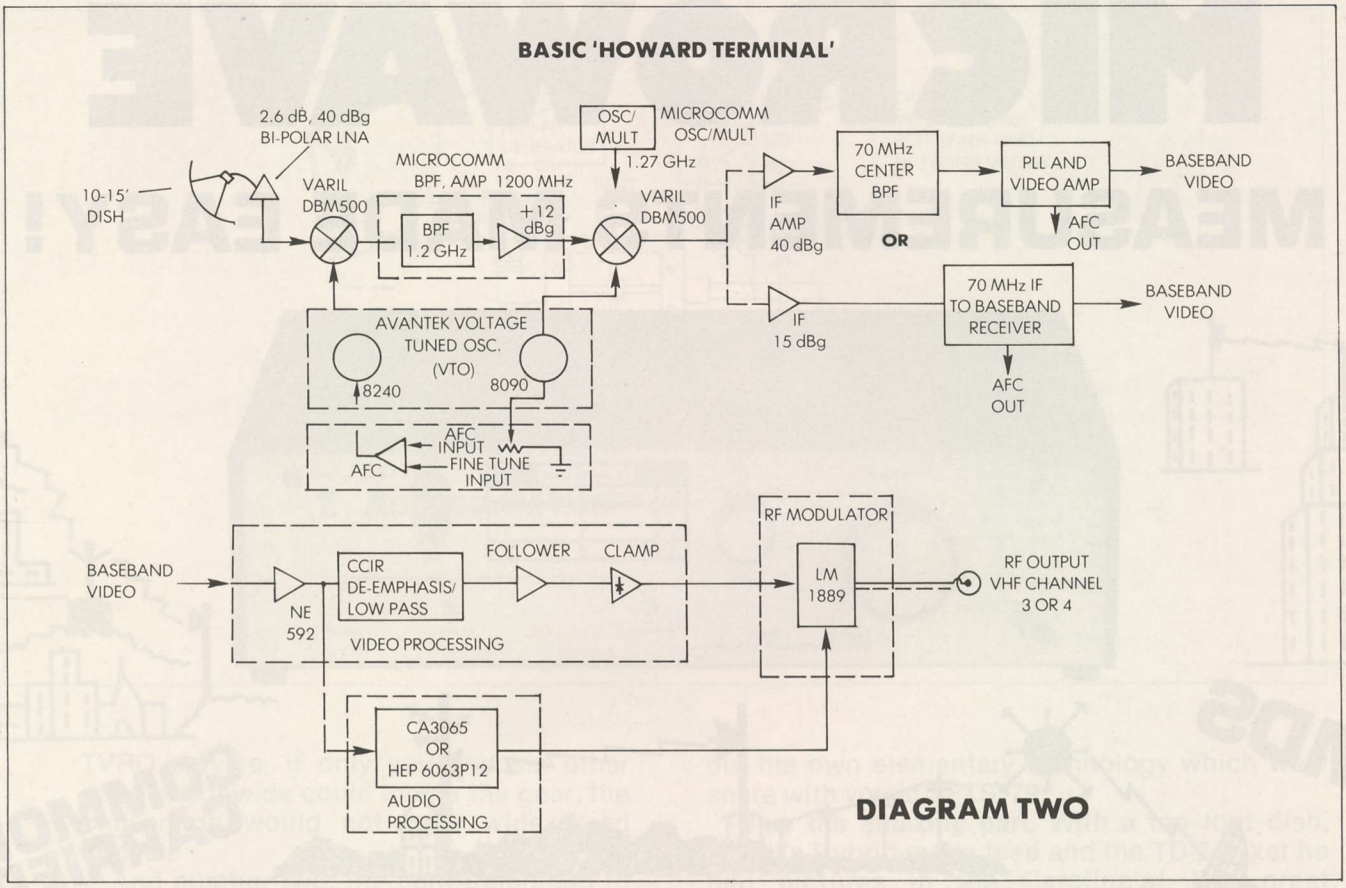


DIAGRAM TWO

So what? Well, when you start out trying to re-do somebody else's handiwork, you have to accept limitations of the original circuit. Or spend an unreasonable amount of time re-doing the original work. The solution? To start from scratch yourself and design the whole package to do just **exactly what** you want it to do; no more, and no less.

This is what a chap out of California has done. Tay Howard is his name and Howard first appeared in **CATJ** in August of 1978 (see **Coop's Cable Column,** page **45**) when we saw his 4.5 meter antenna system. Howard has designed **a complete receive terminal,** starting out with a bi-polar LNA that resembles the Hewlett Packard HXTR series transistors application note. He carries his design right through to an RF (re) modulator that brings you back out on either VHF channel 3 or 4. **Everything in**

A Top Engineer... On Fused Disc Cable

Bob Bilodeau, Vice President, Engineering for Suburban Cablevision of East Orange, New Jersey had this to say in a recent letter to us:

"...our use of General Cable's Fused Disc is based on its electrical properties and its installation handling characteristics.

"Since June, 1975, I've used Fused Disc to construct nearly 1,000 miles of dual trunk cable system. Neither Suburban, nor our contractors have experienced any mechanical difficulties with underground or aerial placement.

"Additionally, we are able to take advantage of the lower attenuation characteristics and lower loop resistance properties in terms of amplifier spacing (electronics density) and the parameters of power supply per mile of plant.

"I plan to continue constructing with Fused Disc cable for the remaining 1,600 miles of our franchised northern New Jersey area."

Suburban Cablevision is the largest CATV company in New Jersey and has recently connected its 50,000th subscriber. Our successes are mutual.

General Cable

A Division of GK Technologies Incorporated

Customer Service Center, 800-526-4241, 201-636-5500 (From NJ)
CATV Products Operation, General Cable Division, 1 Woodbridge Center, P.O. Box 700, Woodbridge, NJ 07095

between, including his proven design for a horn feed antenna (a very simple one we might add) that will work with any dish with a .3 to .45 focal length to diameter ratio.

Howard has researched and solved, in a series of simple to duplicate tricks, such fine points as getting rid of the 30 Hz dispersal wave (it takes **one** Schottky diode to clamp the sync tips), video pre-emphasis and switching between 6.2 and 6.8 aural subcarriers (or others if you wish). He utilizes a few modules from Microcomm (see page **45** for February **CATJ**) but most of the 'Howard terminal' is an original design. And where Microcomm quits (i.e. they leave you on your own at the end of the 70 MHz downconversion) Howard fills in the balance of the receiver in complete detail.

During May Coop traveled to Howard's site in California to spend a day with him going over the installation with a fine tooth comb. We also videotaped several hours of detailed discussion concerning the terminal, its design, assembly and operation. Edited versions of the **'Howard Terminal Videotape Tour'** will be available through TAPE TIME shortly on both VHS and Beta format.

Taylor Howard is planning to be at SPTS '79. He will explain, in a seminar session, how his terminal is designed and constructed. We believe you can build the Howard terminal (starting with your own reflector surface but lacking everything else) for between $1,000 and $1,200; or less. **Every registrant at SPTS '79 will receive a complete set of 'Howard Terminal Plans'** in his registration packet when he checks in. The Howard Terminal has been designed to produce 48 dB video signal to noise ratio pictures with a ten foot reflector surface in a 35-36-37 dBw contour. And that says you are building a 'quality' terminal with this approach. (For additional discussion concerning 'terminal plans' see Coop's Cable Column in this month's CATJ.)

All of that suggests that a fellow coming to SPTS '79 will go home with two complete sets of plans for getting a TVRO operating (when we say complete we mean even down to sources for parts) plus he will have the opportunity to play with the hardware involved, inspect it and think of new questions to ask the experts on hand.

In the antenna department **Jim Vines of Paraframe** is planning to bring down and set up a 12 foot parabolic antenna for which he now offers a complete set of plans (1). There will also be a ten foot trailer mounted trailer terminal owned by Dallas based **DALSAT**; a firm that specializes in going out and finding interference sources to TVRO reception, and in conducting 'mobile field reception tests'. **Scientific Atlanta** will have their new 4.6 meter antenna system set up and operating; this is the antenna they are now offering through their HOMESAT program (see **Coop's Cable Column,** page **66** for May 1979). **USTC** will have a four meter antenna that is designed for the 'private terminal market' on hand and operating. And if his health holds up and he doesn't get too tired out at CCOS '79 up in Wisconsin in mid-July, **Oliver Swann** would like to show off his 20 foot spherical reflector antenna (see **CATJ** for March 1979, page **59**).

Several people, including Vines, will discuss not just the technology of designing parabolic reflectors but perhaps of equal or greater importance, how you go about building it for as few dollars as possible. We've heard from many of the early registrants who have asked if they can bring equipment to swap-sell or otherwise dispose of. A chap in Arkansas said he will truck a pair of ten foot reflectors over to sell off and we anticipate there will be plenty of that sort of thing.

The LNA technology area will be handled by several people, most of whom have asked they not be identified as of yet. Our Robert Coleman (the convert-it-yourself expert) has built up some LNA stages using the HP HFET 1101 and 1102 GaAs-FET stages and he'll show how to get GaAs-FETs to work on the typical homebrew workbench.

(Cont'd. on page 30)

(1) A complete manual describing the design and construction of 16 foot aperture TVRO antennas utilizing readily available hardware store and lumber yard materials is available from PARAFRAME R & D, P.O. Box 423, Monee, Illinois 60449 (312-534-7435). This antenna has been developed primarily for duplication by private terminal enthusiasts and the manual describes step by step details including full parts sourcing. Price of the manual is $55, payment with order.

"OH NO, NOT AGAIN."

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On Showtime your customers will see only first-run feature films. Unlike other pay television services, we won't show movies already aired on regular television.

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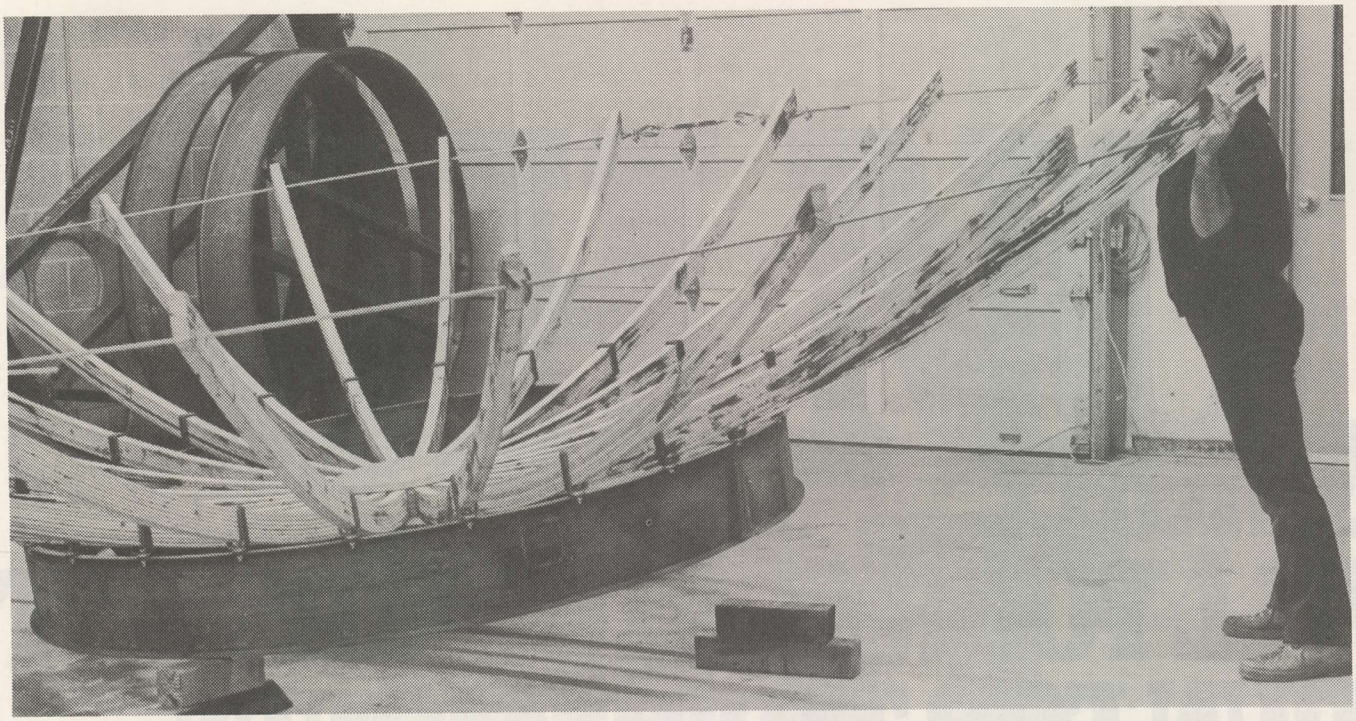
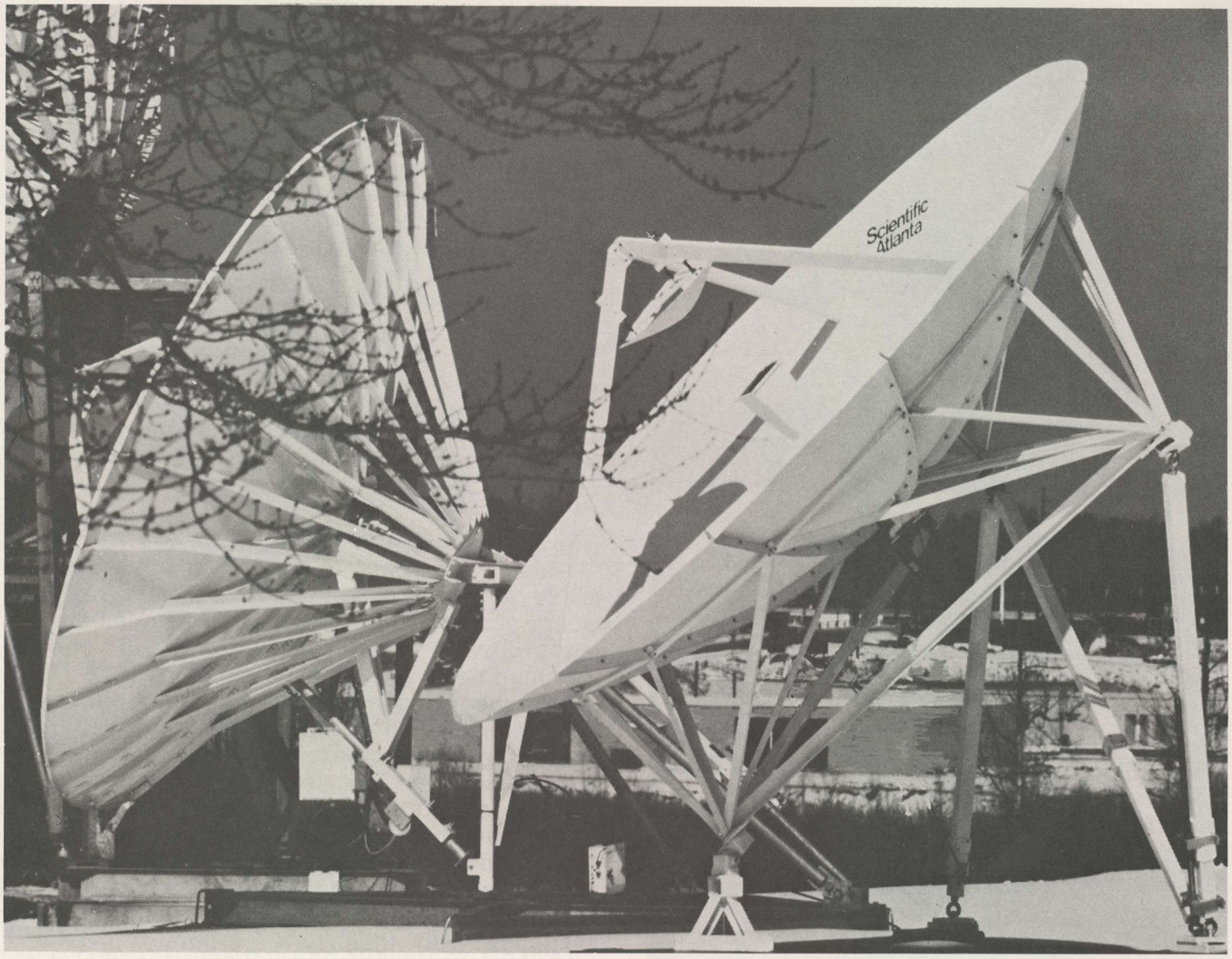


PARAFRAME'S JIM VINES - the master of the high performance, low cost do-it-yourself parabolic antenna will teach at SPTS '79 the precision approach to homebrew TVRO antennas.

Other Topic Areas

We promised to have some non-TVRO microwave technology on hand to get your interest. There are two areas of interest. The MDS technology issue (April 1979) showed that you can put together good quality MDS downconverters and antennas for not very many bucks. Using some local-to-Oklahoma City area talent we'll have a session that describes building your own 2.15 GHz converters and antennas. Yes, there will be sets of plans,



Announcing volume pricing and 30-day delivery.

That's right, 30 days for our new 4.6 meter cassegrain high efficiency antenna, our Series 6600 satellite receivers, LNA and system components.

You also enjoy the kind of economy only volume production makes possible. And when you buy a complete Terminal, you get a price only a package purchase makes possible—whether you order it with the 4.6 meter, 5 meter or 10 meter antenna.

We've increased our production facilities, added new machinery and are producing satellite terminal equipment on a volume basis.

Check us out. We're making everything faster. We're making it better. And we're passing along the savings in costs and time to you. For our new prices and current delivery schedules, call Mike Smith at (404) 449-2000. Or write us.

Scientific Atlanta

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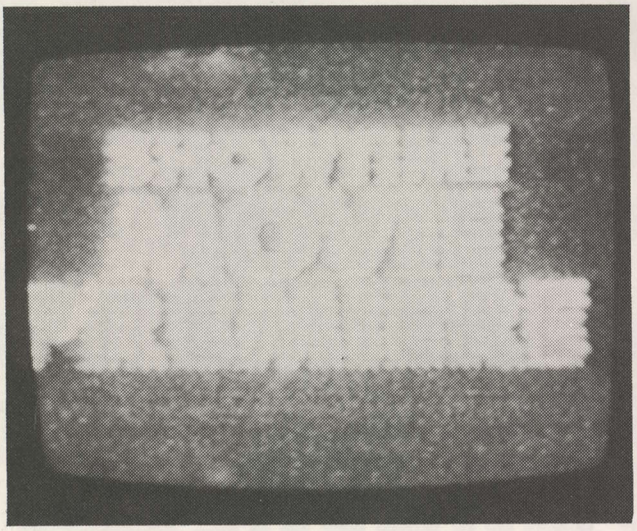
Canada: 1640 Bonhill Road, Unit 6, Mississauga, Ontario, L5T 1C8, Canada, Telephone 416-677-6555, Telex 06-983600
Europe: 1-7 Sunbury Cross Centre, Staines Road West, Sunbury on Thames, Middlesex TW16 7BB, England,
Telephone Sunbury on Thames 89751, Telex 896015



COLEMAN's pictures in the Carolinas using ten foot dish, converted TD-2 receiver, Birkill Hybrid-mode feed and a single **stage of HFET LNA. Transponder 12, SHOWTIME.**

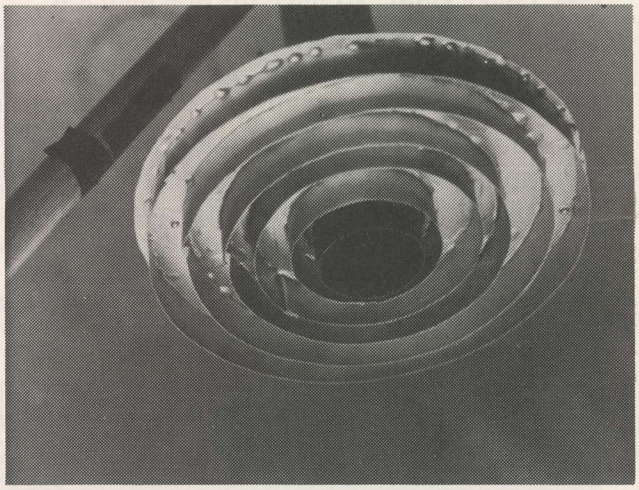
schematics and board layouts available.

There is likely to be some very big news in the 10 GHz (Gunnplexer) video/audio microwave area. We say **likely** because while we've **seen** a very dramatic new super-simple circuit work and work very well, we are not sure the developer of the circuit will be ready to allow us to make it public at SPTS '79. Basically, the circuit lets you throw away virtually the total Mini-Wave FM receiver system (see **CATJ** for **June** 1978, page **32**) and plug a standard TV receiver (almost) directly into the Gunnplexer. The transmitter is still frequency modulated however. If you are figuring that the normal TV receiver is AM video and it cannot be compatible with an FM video signal . . . well, there **are** some surprises left in this world!

Viewers of **Satellite Magazine** or readers of the May issue (see **CATJ** for May, page **67**, Coop's Cable Column) already know that the Canadian One Man TV Network, **David Brough** will be on hand with his 'suitcase TV station'. David has agreed to put on a seminar session that explains how he brings television to remote villages and towns throughout Canada employing Betamax format tape machines and 1 watt transmitters (see **CATJ** for March, page **16**). You probably don't live where **you** could get away with the same 'technology' (without landing in the pokey) but we assure you that David is very inspirational when he talks about his trials and tribulations in the far north of Canada. We hope he tells the story about the 'station manager' who got caught on-camera "in the buff." David will also show how he utilizes the semi-TV-game device called VIDEOBRAIN as a low cost information channel alpha-numeric system and he hopes by SPTS '79 time to have his own ten foot TVRO antenna mounted on a trailer, with a portable TVRO receiving terminal stowed in the back of his van.

The Commercial Aspects

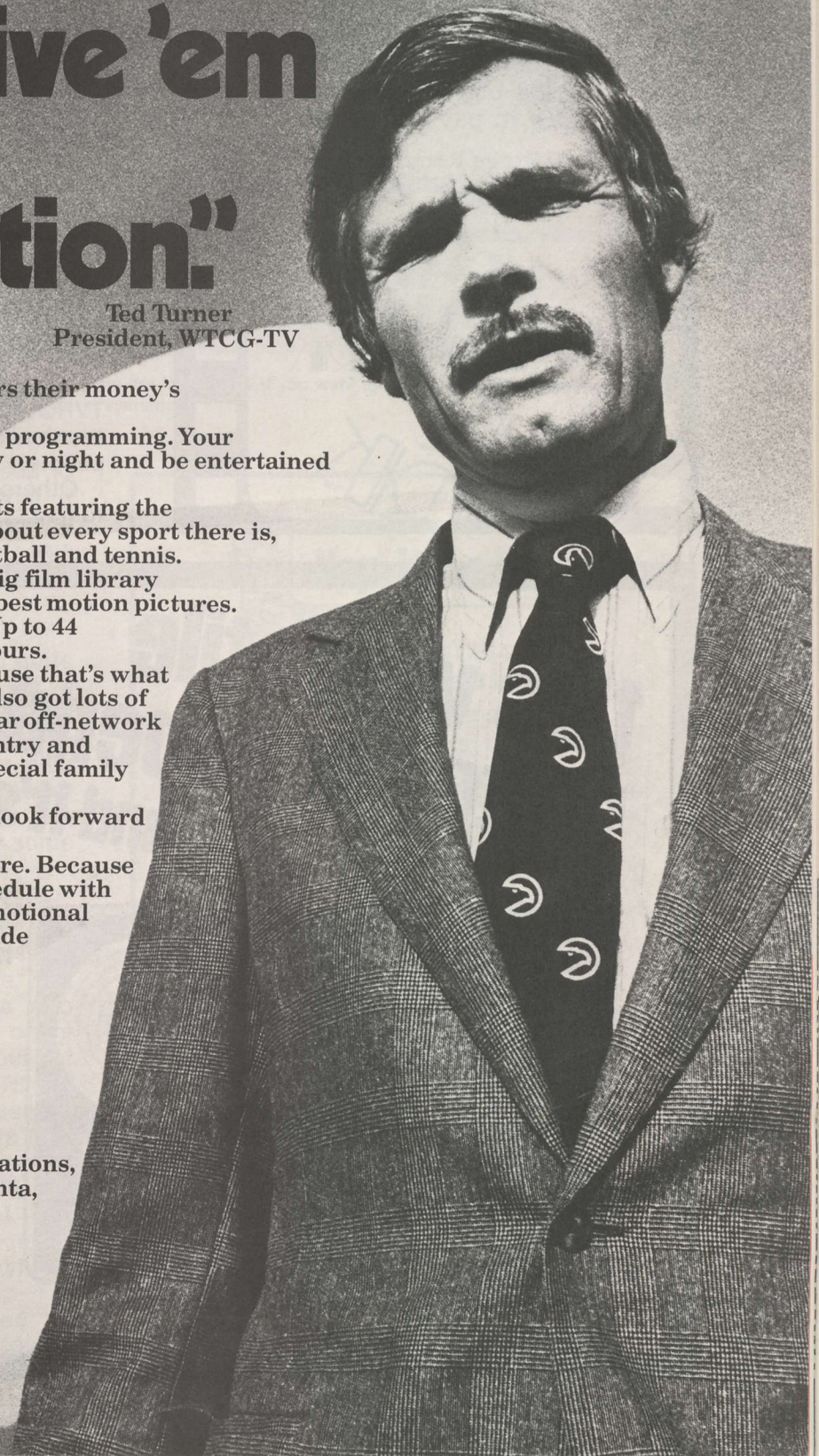
This all sounds pretty much like an advanced class in amateur experimentation. There are some surprises here also. A large number of people who have businesses in their communities have been turned-onto SPTS '79. They expect to come to SPTS and find out how **they** can get into the distributing, selling, installing and maintaining (private) TVRO terminals in their area. Many of these interested people are operating rural-area cable TV systems. Others do everything from building houses to selling farm implement equipment. As reported on **Satellite Magazine** May 3rd and 10th, **Scientific Atlanta** is now in this end of the business with their new corporate division **HOMESAT** (as in **home**-satellite-TV-terminals) and they have already been out attending rural-folk shows like Cattleman conventions and the like. **Richard Campbell** from S-A will be on the program to explain how a person with some smarts, technical savvy and ambition can get started in being a local outlet for private terminal packages.



THE BIRKILL Hybrid-mode feed as built by Robert Coleman for his ten foot experimental terminal. Can you imagine getting pictures with NO low noise amplifier at all!

"Listen. If you want to give your subscribers a super return for their money, give 'em the SuperStation."

Ted Turner
President, WTCG-TV



Super 17. Talk about giving your subscribers their money's worth, we've got it all!

A non-stop super schedule of 24 hour programming. Your subscribers can tune in any hour of the day or night and be entertained and informed by Super 17.

We've got over 200 live sporting events featuring the best of college and the pros, covering just about every sport there is, including baseball, basketball, hockey, football and tennis.

Movies, all the great ones, from our big film library which contains nearly 3000 of Hollywood's best motion pictures. Drama, comedy, romance and adventure. Up to 44 movies each week, and that's movies not hours.

We're mostly sports and movies, because that's what you want for your subscribers. But we've also got lots of other family entertainment, the most popular off-network shows, talk shows, situation comedies, country and western music shows and loads of other special family programs.

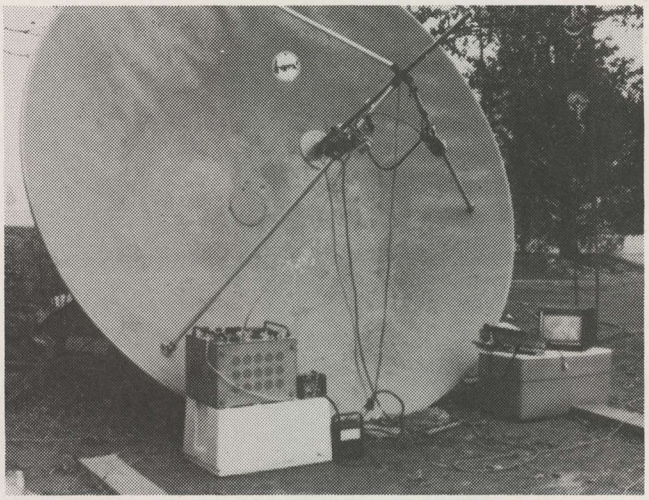
This is what your subscribers have to look forward to from Super 17.

And you can look forward to even more. Because we back this sensational programming schedule with hard hitting, effective advertising and promotional support. And we're the only station to provide continuing support of this kind.

(17) THE SUPER STATION™

For additional information, write Cable Relations, WTCG-TV, 1018 West Peachtree Street, Atlanta, Georgia 30309, or call (404) 875-7317.

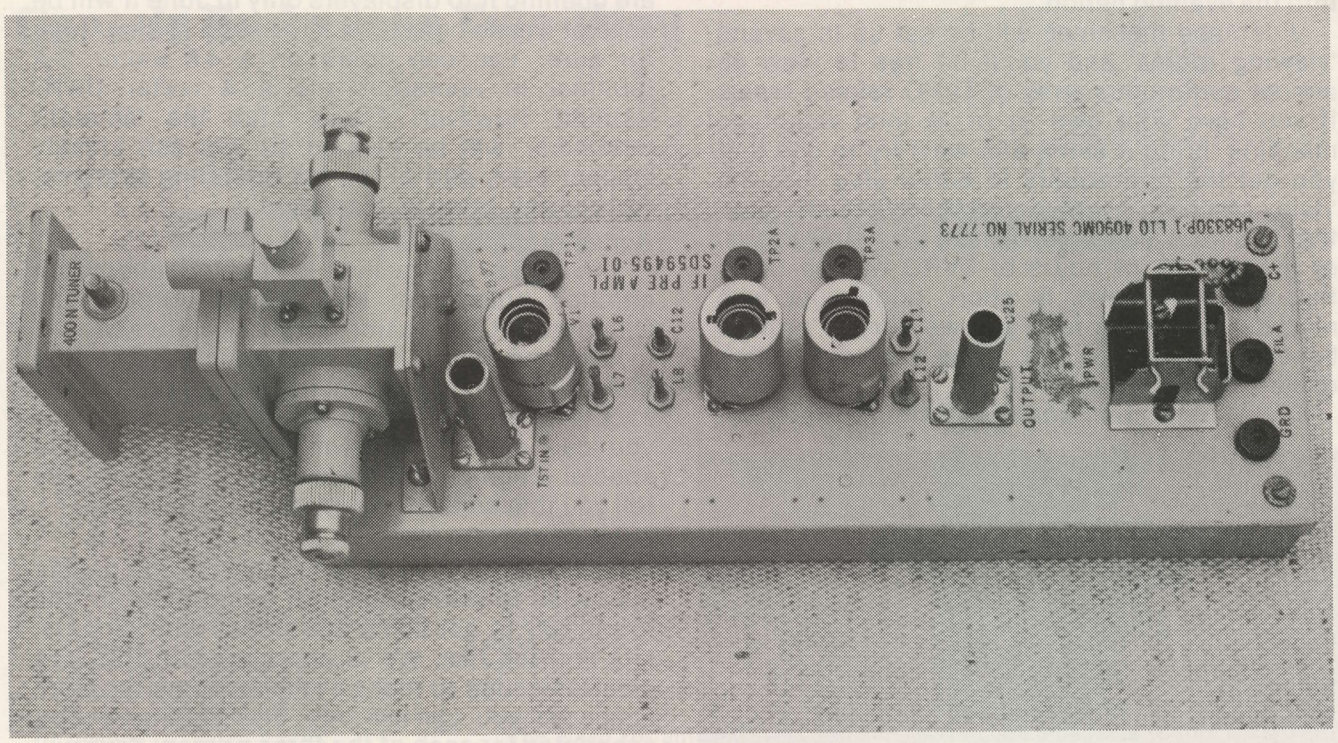
That's why they call us The SuperStation.



COLEMAN's ten foot dish with the Birkill Hybrid-mode feed (February 1979 CATJ), **surplus HP signal generator** (left of center) **used as early LO source and the TD-2 plus IF and discriminator boxes spread out for system test. Yes, if you look closely you can see a picture** (CBN) **on the monitor right of center.**

By the time we wrap up the program for SPTS early in July we will be surprised if S-A doesn't have some on-the-spot competition from other TVRO hardware suppliers looking for private terminal distributors, installers and maintenance people.

Others already signed up are coming in to try to find some clever circuits which they can either



WESTERN ELECTRIC TD-2 receiver is the basic building block you are looking for if you want to go the 'Robert Coleman' route to convert a surplus piece of equipment to a low cost TVRO receiver system.

buy manufacturing rights for or be licensed to produce. Many people seem to think that if sufficient hardware gets into the marketplace this whole new industry will really take off in a big hurry.

Publicity and The Media

The whole concept of SPTS has created quite a bit of controversy in some quarters. We've already heard from one of the major national TV networks that wants to send a film crew in to see what this technology explosion is all about, plus several major national magazines. Even without our own journalistic endeavors, chances are you'll be reading and hearing about this for some time to come in the future.

The Facility

The facility where SPTS '79 is being held is an almost brand new Junior College campus. The main building was designed by a genius who knew how to get the best use out of open-learning areas. The school will be 'out of session' during this period of time and SPTS will have the full campus essentially to ourselves. The JC (which is located in the Oklahoma City area) is very progressive and they have a complete TV program origination facility on campus. We'll be making good use of that facility to tape the full proceedings (or as much of it as we can) and some selected tapes will be available after SPTS for a nominal type fee.

We will have the on-site cafeteria open for lunch the 14th, 15th and 16th and we are toying with having it open for dinner on the 15th so that

we can extend the seminar sessions that day into the evening period.

Videotape machines will be set up in several 'viewing rooms' and you'll be free to view an almost continuous array of TVRO related tapes. If you have your own ½ or ¾ inch videotape machine, bring it along and we'll try to see that you get the opportunity to either plug into the 'daisy chain' that will record the proceedings or that you have a chance to make a dub from some of the dozens of hours of TVRO related tapes that will be shown. In short, bring your own recorder and blank tape and we'll try to provide baseband inputs to you. **Bring your own patch cables however!**

Will there be commercial displays of equipment? The answer is yes although since we are opening it to displayers only in June it will be several weeks before we know who will be there for sure. You can count on a 4.6 meter S-A terminal in operation and a 4 meter USTC terminal however. These, plus the 'amateur terminals,' will be located so you can closely inspect every part of the full operating systems. As they say, bring your camera!

Accommodations

The SPTS '79 facility is located about ten minutes drive from Will Rogers Airport; the Oklahoma City major airport. Between the facility and the JC are numerous brand name motels and when you register we supply a list of each with addresses and telephone numbers so you can make your own reservations. Where special lodging rates have been worked out, we tell you this on the lodging information sheet.

Extra Day

Friday the 17th is an 'extra day'. Some people may wish to stay around for some time on this fourth day to get some assistance with circuits, kits and the like. We've arranged with the JC's electronics lab to make available some lab work space so you can do this. The start and stop schedules for each of the three primary days will be found in the boxed material accompanying this report.

SRO

Because no national (or international) conference of this type has ever been held before it is very difficult to accurately pre-guess the total turn out. We anticipate perhaps 300 registrants but will be able to handle perhaps another 100. At some point around the 400 mark we will be cutting off registration to keep the facility uncluttered and large enough to handle the crowd. We want everyone to have an adequate opportunity to see everything they want to see, talk to everyone they want to talk with, and learn as much as they can absorb. Therefore we suggest that while August 14th may seem like some ways away yet that you would do well to **get your pre-registration application into SPTS very soon.** Sign up forms are found between pages 48 and 49 here this month.

Canada Embraces Two-Way

CATV MONITORING SERVICES

R.C. SHORT, P.Eng.
EXECUTIVE VICE-PRESIDENT, TOCOM CANADA LIMITED

IT WAS FORECAST

—**TV abundance** with 36-channel capacity
—**Satellite interconnection** for special programming
—**Residential security** and meter reading
—**Information** retrieval

This was a 1971 forecast for cable communications for the decade of the 70's in the Sloan Commission Report "On The Cable". These cable capabilities are a reality **today.** The Sloan Commission also implied that "user-pay" services might **replace** retransmission of over-the-air programs as the major subscriber perceived benefit and the major cable company source of revenue. This is a likely development in the decade of the 80's, and one which will clearly justify 2-way interactive utilization of the cable distribution system.

Electronic Display Generators such as the Canadian "Teledon", the French "Antiope" and the British "Prestel", present **potential prospects** to provide a broad-band cable alternative to customers presently using facsimile services over the wire. Generally speaking, these are commercial clients who therefore represent a new market area for cable companies.

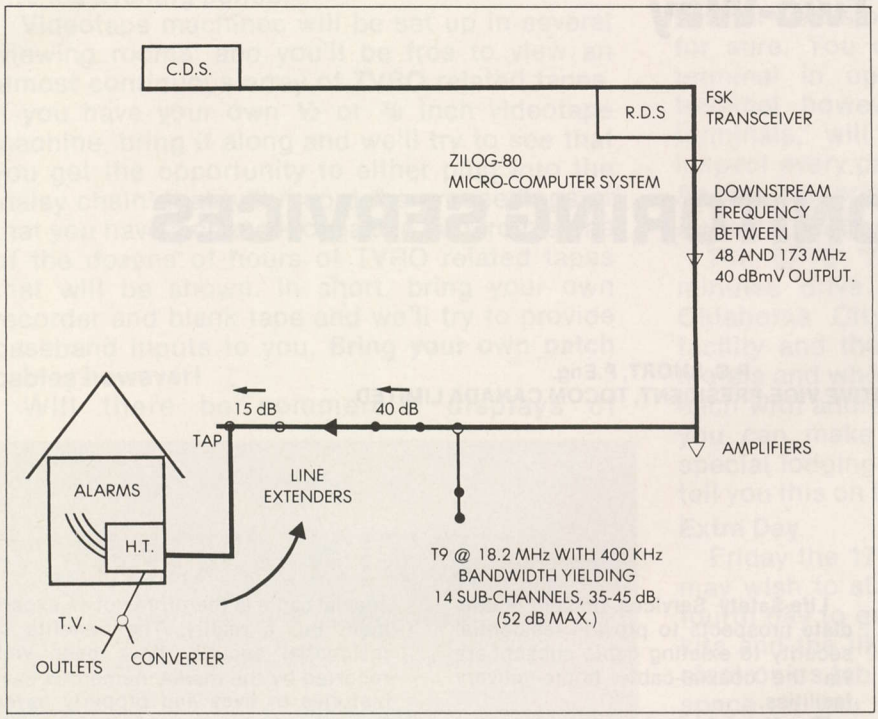
Life-Safety Services present **immediate** prospects to provide residential security to existing cable subscribers via the coaxial-cable home-delivery facilities.

The Need for automatic residential remote alarm services (ARRAS) is clearly recognized by the U.S. Department of Commerce. Responding to public expectations for authorities to act to reduce residential losses from fire for both life and property, the Department of Commerce has established a well-funded project for its National Fire-Safety and Research group. Governments and life-safety authorities in Canada should note that the final report of this impressive group will be made public this summer. The CRTC's March 26, 1979, favorable decision approving cable company applications for residential security, suggests cable company executives may also wish to become familiar with the latest work of this group of leaders in residential security.

The Hardware and Software for broad-band monitoring of premises for abnormal conditions, such as fires, burglary or medical emergencies, has been operational in the U.S. for over three years. Residential security over coaxial cable is therefore not an experiment but a reality. The benefits of residential security have been well reported by the media; numerous case histories of lives and property saved through monitored residential security over cable are illustrated in part through articles in the Miami Herald, the Fort Lauderdale News, the Houston Post, TV Guide and Videography. These actual cases show subscriber appreciation for the cable security service as great or greater than the entertainment service.

The Minnesota Cities, a civic government publication, quotes Woodlands, Texas, Fire Chief W. Neill as saying "he must schedule extra fire drills to keep his department's group sharp". He states elsewhere that he is able to use smaller fire vehicles because the equipment is arriving 25 minutes earlier in this community where 80% of the 2,000 homes subscribe to monitored home fires, burglar and medical alert over cable.

Western Fire Journal quotes Director Shaw of the U.S. Department of Commerce on this same point of early detection via CATV monitoring. Shaw states that the recent 2 year study of the Applied Physics Lab at Johns



Hopkins University confirms automatic residential remote alarm services reporting abnormal conditions 30 minutes ahead of similar non-protected situations. **The NBFAA Signal** notes not a single successful burglary against cable alarm protected Woodlands, Texas homes. **San Francisco Chronicle** quotes developer Richard Martin stating "50-60% of our buyers were motivated to select Gateview Development because of the security offered by cable."

Less than 2% of residential dwellings have monitored security systems in spite of four decades of serious marketing attempts by sophisticated alarm companies such as Edwards, Dictagraph and ADT to penetrate the market. Lack of economical means for positive response to an alarm has precluded residential security sales to 98% of the market. **Cable is the key** to this untapped market and to the U.S. Department of Commerce objective of reducing residential fire losses by 50%.

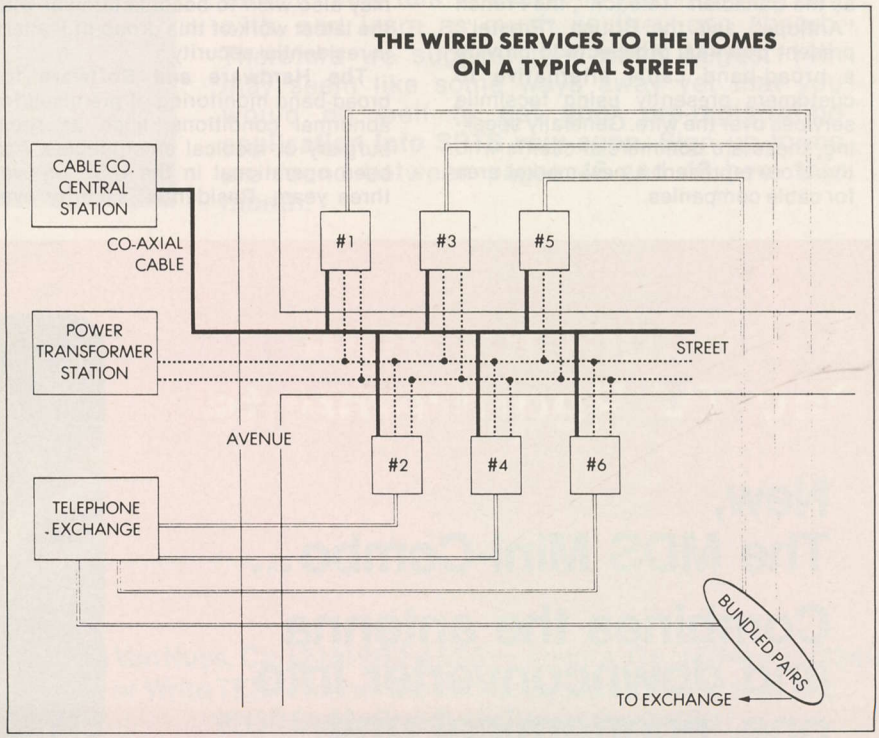
This would be a worthy objective for Canadian governmental authorities as well. Encouragement should be considered by the DOC and CRTC to the provisions of life-safety services over cable. Now is the time for the Federal Government to add broad-band life-safety services to the attention it is giving to market development for broad-band display generators.

Today there are three wired-services in most residential communities—electrical, telephone and coaxial cable. The electrical power and cable television companies use a similar tree configuration to distribute the same product to all residences on demand. There is no switching between customers. The telephone system requires a matrix of separate pairs of wires from each house to an exchange to accomplish unlimited switching between subscribers. The coaxial cable configuration provides a less expensive alternative to the dedicated, or multiplexed, or digital dialing lines of the switched paired wire network for monitored residential security. Although central station broad-band monitoring systems can be made to work over the telephone system, it is the wrong way to push the technology. Fibre optic transmission won't change this fact. Though the cable television distribution network, a transmitter at the central station can provide continuous monitoring of cable subscribers' premises by transmitting individual codes recognizable by a home terminal in each subscriber's dwelling. Such a configuration is capable of monitoring many status points and three such points will provide fire, medical alert and burglar alarm identification. The same equipment will also accommodate on/off switching of the cable service itself, pay-per-view channels through a converter, tiers of pay-TV, meter reading, electrical load-management and TV polling. Perhaps the financially independent social benefit of cable residential security will therefore assist subsequent provision of other 2-way services such as pay-TV in Canada.

From the cable subscriber's point of view it is interesting to note that one-half of a comprehensive residential continuously monitored security system is already in the home with the presence of the cable. By adding the home terminal the cable company can provide subscriber peace of mind in the face of the following facts:

- **1 out of 5 Canadians** is a victim of crime (Weekend Magazine January 20, 1979).
- **70,000 residential fires** in Canada in 1977 resulted in 830 deaths and losses of $504 million in property. **From the cable company's point of view,** there is a genuine need for residential security and the existing cable plant is the key to provided a genuinely new service with true value to 98% of the dwellings on cable.

It is interesting to note that this new "non-broadcast" service is now a **requirement** in the majority of the **new** U.S. franchises for cable television licenses. Support for residential security over cable is also in evidence

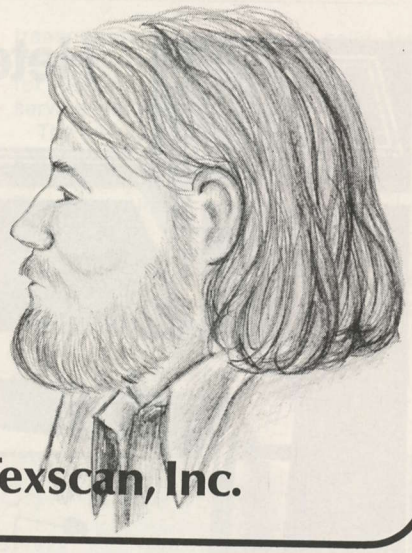


now from the insurance companies. One company in Texas is offering 25% reduction to properties protected with cable monitoring services. The Royal Insurance Company in Canada gave each of its policy holders a free smoke detector last year. Smoke detector production in North America has moved from 500,000 to 16 million units **per year** in the last five years. **The next logical step is to monitor these units.** No one is in a better position to do this than the cable television companies. **Life-safety services** therefore, represent a pragmatic, practical opportunity for cable companies to profitably move now from subscriber interconnection to interaction. **Residential security,** a new dimension for cable companies traditionally delivering entertainment, can provide an important new meaning to the role and place of the cable television industry in Canadian society.

We will have 5 million homes cabled **in Canada** by the early 1980's. The preoccupations of homeowners, police, insurance companies and power companies with burglary, fire, electrical load control is wide-spread and rising. Canadian investment and employment parameters for these new services, with genuine value to customers, approximate $100 million per year and several thousand new jobs in manufacturing, installation and maintenance. Canadian companies have proven the technology by exporting it to other countries where it is well received. The time has come to do it as well at home.

The CRTC March 26th decision approving applications from cable companies to provide residential security is therefore most encouraging. In addition to the approval, the Commission also stated that it does not intend to regulate non-programming services as such. The Commission will, however, require cable companies to obtain authorization to provide security services on the assurance that programming services will not be compromised and that there will be **no financial cross subsidization.** The cable industry, therefore, is now free to offer security services proven to be technically and financially viable in Canada.

R. Stelle's Technology Corner



Raleigh B. Stelle - Texscan, Inc.

First let me thank those readers who have written to me about **Technology Corner.** I have attempted to answer each of you and hope I have been successful in answering your questions. Speaking of questions, Technology Corner welcomes questions, comments, and suggestions regarding this column. I would like to know what you, the READER, want! Drop me a line in care of CATJ and I'll try to include your favorite subject in a future column.

"The Bench"—almost every system has one, and they range from (cl)utter simplicity to semi-automated precision. The complexity of "The Bench" is a direct function of your system needs. If you do no repair work, the bench may contain only voltmeter, oscilloscope and a few miscellaneous items. If your system does complete maintenance on all equipment as well as product evaluation, the complexity of the bench can be very great. It may include an automated cross mod test set, Spectrum Analyzer, Video Monitor, wide band oscilloscope, sweep setup through UHF, Frequency Counter, cable sets, pilot generators, power supplies and on and on and on.

The next few Technology Corners will deal with "The Bench". We will attempt to discuss typical system requirements and the type of bench your system may have. Along the way we will examine various classes of measuring devices and try to point out some key parameters and applications.

Perhaps the one item which will be found on all benches is the **voltmeter.** It is usually a combination of AC, DC, ohms and current meter. It may be old as the hills or as modern as tomorrow with neat-o flashing digital display. In either case, it's purpose is to supply information on the circuit connected between the test leads.

The heart of the VOM is the meter movement itself. There are many methods by which an electric current can generate a magnetic field and cause a pointer to deflect. The most common types of movement are the D'Arsonval movement, and the iron vane movement. The D'Arsonval is the most common movement, consisting of a permanent magnet and a coil of wire connected to a pivoted pointer. To determine whether your meter is D'Arsonval or iron vane, examine the current (mA or A) scales. If the current divisions are **equally** separated on the meter face the movement is **D'Arsonval** type. If the current readings are **compressed** on the **low** current side of the scale and expanded at higher current side then the movement is **iron vane** type. Another meter, the thermocouple, also has a compressed scale and like the iron vane movement responds to the **square** of the current flow instead of linearly like the moving coil types.

Two parameters are of vital interest when examining the VOM; it's accuracy, and it's sensitivity. Insofar as accuracy is concerned, the tolerance of resistive elements for DC measurements and the total meter accuracy will combine to provide the overall accuracy. For instance, the multiplier and shunt resistance may be +/−1% and the meter movement may be +/−2% or worse. So the **best** accuracy to be expected from such a (garden variety) VOM is about 3%. Perhaps a word here about the movement itself is in order. A 2% accuracy specification on a 100 microamp movement means the meter will be in error by 2% at **full scale,** or +/− 2 microamps. This applies at full scale only. If the low end of the scale is 20 microamps (rather than 100 as at the high end) and the error is 2 miroamps, you now have a 10% reading error. See why you should always use meters near the full scale end of the movement?

Sensitivity of the meter is specified in terms of the full scale current. For instance meters may be supplied with a movement of 5 microamp **full** scale, a very sensitive meter indeed. On the other hand, a movement of 1 to 10 milliamp (mA) is not considered sensitive.

Another important parameter is the impedance of the VOM. How much will it "load" a circuit. In general this parameter is specified in terms of ohms per

volt. An instrument which uses a 1 mA movement will have a sensitivity of 1000 ohms per volt. ($E = 1 \times R$ and $E = 1$, $I = 10^{-3}A$ and $R = ? = 1 \div 10^{-3}A = 10^{3}$ ohm). By a similar exercise a 50 microamp movement has a sensitivity of 20,000 ohms per volt. Also the total impedance of the meter, probe to probe is equal to the ohms per volt rating multiplied by the full scale voltage of the range selected.

Figure 1 depicts a loading problem created because of VOM with low ohm/v rating.

Meter loading can cause considerable errors in circuit analysis, particularly if you are using the less expensive and less sensitive variety VOM's. A quick rule of thumb: Always be sure the VOM **total** resistance (sensitivity, ohm/v x highest volts on scale selected) is at least 10 times the value of the resistance across which voltage readings are to be taken. This will keep measurement error below about 5% due to loading effects.

If you have an old meter movement laying around, you can create your own multiple range VOM. The equations are fairly straightforward and are presented for those of you who like to tinker and do nifty home projects.

Let's tackle the current meter first and because the meter movement we will use is sensitive (100 microamp full scale) we have to do something to direct the current around the meter, or it will be destroyed.

The device to direct the current we call a shunt. As you can see in **figure 2,** the shunt connects **in parallel with** the movement.

Since we know that voltage across parallel resistances is equal, and we can define that voltage in terms of I and R; ie: $I_m \times R_m = I_s \times R_s = I_m \times R_m / I_s$. Now let R_m equal 100 ohms. If you wish your 100 microamp movement to indicate 100 mA full scale;

$$R_s = \frac{100 \times 10^{-6}A \times 100 \text{ ohm}}{9.99 \times 10^{-3}A}$$

$$= \frac{100 \times 100^{-3}}{9.99}$$

$$= \frac{10}{9.99}$$

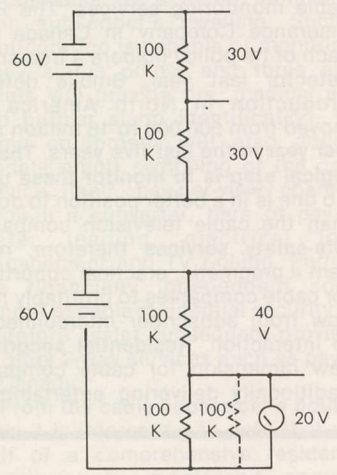
The shunt, approximately 1 ohm, carries 9.90 mA and the meter movement carries 100 microamps.

When connecting a current meter into a circuit, always connect the meter in **series** with the source and load. **Never parallel** the power source with a current meter.

Also, you should adjust the meter to a full scale range which is larger than the maximum expected current. Polarity is also important to current meters, unless it is of a type having a "0" center scale. In most meters, a reverse polarity connection will not cause **electrical** damage, but the pointer may be (physically) bent around the restraining pin.

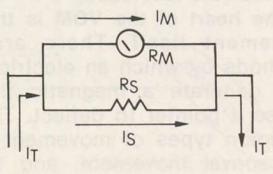
Next column will address the volts, ohms and AC measurements of your VOM.

FIGURE ONE



THE METER IS A 100K LOAD, SO THE FIRST RESISTOR DROPS THE SOURCE 40 VOLTS. METER NOW READS 20 VOLTS; A 33% ERROR!

FIGURE TWO



Remember The AMA?

In the February CATJ, in Coop's Cable Column (page 50), we pondered the impact of private groups (such as the American Medical Association) "discovering" the satellite inter-connection medium as a means of constantly updating their members.

On May first a nationwide television network, via satellite, began preliminary operation on SPN's transponder 21 for one hour per day, to link together patients in hospitals. The new service, coordinated by a group known as the Public Service Satellite Consortium, is uplinked from the Douglasville, Georgia site maintained by Ed Taylor and his multiple satellite companies.

The new service is free to the cable systems, starting with an hour per day (2-3 PM eastern) in May it builds on July 1st to 2 hours per day (1-3 PM eastern), expands to three hours per day on October 1st and then to four hours per day on January 1st.

Hospitals will 'subscribe' to the service by agreeing to pay one cent per hour per hospital patient on a daily count basis. A 150 bed hospital, full throughout the year, would pay around $1500 per annum for the service.

Cable system operators will obviously have new reason to talk with their local hospitals about taking the cable service, with the addition of the new health education programs for patients. Program guides will be distributed through the hospitals. If this interests you, contact Public Service Satellite Consortium at (714) 452-1140.

Australian Satellite Decision

After several years of internal debate a federal government task force has reached an 'initial decision' concerning the development of a national satellite communications system for the island-continent-nation. The initial decision is many years from implementation however and the chances are good that before the final form is selected the present plan will see several modifications.

Basically the Australians plan **two operational 14 GHz** (up)/11 GHz (down) **domestic satellites** each with 15 transponders on board operating at the 20 watt (TWT) power level. A second generation satellite system would have 100 watt TWT's on board.

The project as now drawn envisions use of the satellite for the following multiplicity of services:

1) A national communications system for emergency and government messages;
2) A direct (to the home) television and radio service to provide communications of a 'broadcast nature' to rural homes and communities
3) Military and tactical communication services
4) A rural telephone and data communications service.

The plan proposes 8 multi-purpose earth terminals (8 meter diameter) at Sydney, Melbourne, Brisbane, Adelaide, Perth, Canberra, Hobart and Darwin. These will be the primary input (uplink) stations for the service. An additional 62 terminals utilizing 4.5 meter antennas would be installed throughout New South Wales, Queensland, and Western Australia for reception of television (broadcast) services. These 62 terminals will be tied directly to terrestrial TV transmitters. Another 72 terminals (4.5 meters in size) would receive radio broadcasts and interconnect to terrestrial radio broadcast transmitters. The plan also calls for three transportable 4.5 meter terminals for use in 'mobile' and emergency service restoration situations.

The task force also suggests that the program will have no fewer than 3,000 'private terminals' 2.5 meters in size. These terminals are to be primarily intended for telephone communications although the 165 page report notes "these private terminals can be modified for television or radio reception as well".

Four of the transponders will be set aside for 'homestead' telephone and data services; they would provide ser-

CATV TVRO STATISTICS — June 1979

Applications Filed/FCC	Feb. 1979	Mar. 1979	April 1979
1) 11 meter	0	0	0
2) 10 meter	2	1	0
3) 7 meter	0	0	0
4) 6 meter	4	8	7
5) 5 meter	64	88	77
6) 4.5 meter	12	20	16
Total Apps.	**82**	**117**	**100**
Cost Max.	$103,000	$89,112	$71,700
Cost Min.	11,200	$12,600	12,600
Avg. Cost	**31,323**	**$38,564**	**30,018**
Channels Requested*	181	286	270
Average Channels	2.2	2.4	2.7
Requesting WTCG	40	63	59
Requesting CBN	35	57	48
Requesting HBO	39	79	67
Requesting MSGE	13	24	34
Requesting SHOWTIME	9	16	8
Requesting WGN	13	17	19
Requesting KTVU	5	3	9
Requesting Warner's Nickleodeon	9	5	11
Avg. Cost Per Channel	**$14,237***	**$17,371***	**$11,488**
TVRO's Licensed/FCC	**75**	**104**	**114**

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.

vice to an estimated 40,000 Australians currently cut off from the outside world except through often-unreliable HF (high frequency) radio links. Several voice grade channels in this package of transponders would be utilized for the Australian 'school-of-the-air' program which presently utilizes HF circuits to provide instructional information to isolated families with school age children.

Television services via the Australian domestic satellite system will include both programmed-for-direct reception channels and satellite relays of presently-carried-on-terrestrial-microwave networking feeds. Most of the Australian television stations do not currently have a direct terrestrial connection to a network headquarters and rely on tape and film for interconnection.

When might all of this come about?

The task force has recommended that some initial **trials** should be investigated utilizing INTELSAT facilities (using 4 GHz downlinks). However the timetable for the new 11 GHz downlink birds (as of yet unnamed) is envisioned as follows:

1) **1979** - decision made to proceed with the project
2) **1981** - orders to be placed for the satellites
3) **1984** - two satellites launched
4) **1985** - operation of the initial two satellite system with terrestrial terminals in operation
5) **1987** - third satellite launched
6) **1989** - second generation satellites ordered
7) **1992** - launch of second generation satellites to replace first generation birds (7 year life forecast).

Off-Air Sat Feeds

With the approach of the warm weather season, abnormal propagation conditions affecting the VHF and UHF spectrum are upon us. Virtually every cable system operator is familiar with the affects of summer time Sporadic E Skip (or E_S) on low band signals (especially channels 2-4); co-channel interference that shows up suddenly, often becomes quite intense, and then disappears just as abruptly. Other propagation abnormalities, such as ducting and enhanced signal levels from 200-500 mile distant VHF and UHF signals are more apt to be seen at high band VHF and UHF.

As noted in the February **CATJ** (see **Battle of The Super Stations,** page 24), all of the indie 'super' stations now being fed via satellite are picked up directly off the air at some distance from their transmitters. These distances vary from the approximately 1/2 mile path for WGN to a 108 mile path for KTVU (San Francisco to Point Arena).

The combination of a long path plus the low operating frequency for San Francisco/Oakland's KTVU make this particular off-air feed particularly vulnerable to interference from a number of abnormal propagation conditions. For example, while RCA typically strives to maintain an off-air feed RF level of at least +14 dBmV (5,000 microvolts) to their demodulator(s) the actual antenna level signal may be as low as -9 dBmV before it is fed into a single channel preamplifier. With **antenna level signals in this range,** co-channel interference from other channel 2 stations need only reach levels in the -40 dBmV (10 microvolt) region before you begin to notice the telltale horizontal lines indicating a co-channel beat.

Other forms of interference commonly encountered at this frequency and with this type of antenna level signal include 'precipitation static' (see photo here) which results when static electricity builds up on the antenna during rainstorms or thunder showers.

Knowing what to anticipate with the four off-air indie signals fed to your systems via satellite is simply a way of being prepared to diagnose 'unusual looking' satellite delivered signals during the months ahead. In a nutshell:

1) **Anticipate** co-channel interference on **KTVU,** often severe and most often during the 4 PM to 9 PM pacific time frame, plus, occassional precipitation static (again, see photo). Co-channel from E_S will typically vary in level abruptly with strong peaks and nulls over just seconds of time.
2) **Anticipate** occasional steady-level co-channel on **WOR** (channel 9, New York now carried on transponder 17) especially during June, July, August and September; peaking between 6 and 9 AM and 8 and 11 PM eastern time.
3) While **WCBS** is being carried for late night movies only on transponder 17, it is possible that occasional E_S may occur during the satellite feed period, especially during late June and into July. WCBS is also a channel 2 station.
4) On very rare occasions tropospheric conditions may create visible co-channel on Chicago's **WGN.** Most likely times for this fairly steady level co-channel will be during late May, June, late July, August and September with the most probable times will be 6-9 AM and 4 to 10 PM Chicago area time.
5) To date no verified co-channel has ever been noted on **WTCG.**

Steve J. Birkill On Experimental Earth Terminals

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No Birkill Column This Month - Popular columnist Steve Birkill was unable to provide his column this month to CATJ due to the press of a family matter in Sheffield, England. Birkill's column has been one of the most popular sections of CATJ since it began last November and in the interest of providing copies of his material to the hundreds of new CATJ readers who have subscribed to CATJ subsequent to last November we are **repeating** his **December 1978 column** at this time.

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 baseband 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

$B_N = \int_{\infty} |H(j\omega)|^2 \, df$, 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

(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

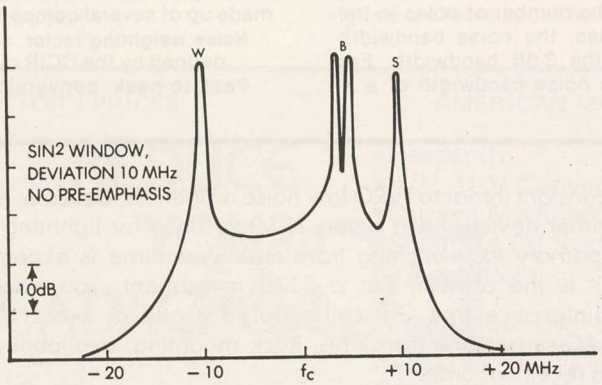


DIAGRAM ONE

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.

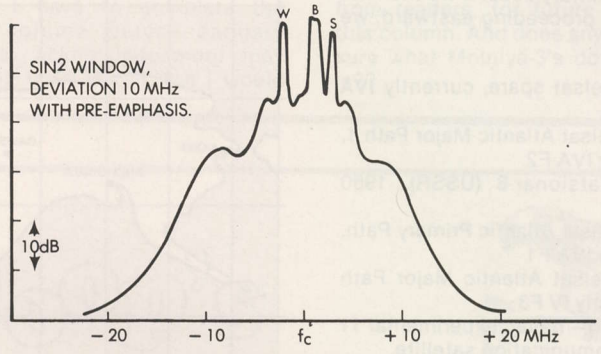


DIAGRAM TWO

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. . .

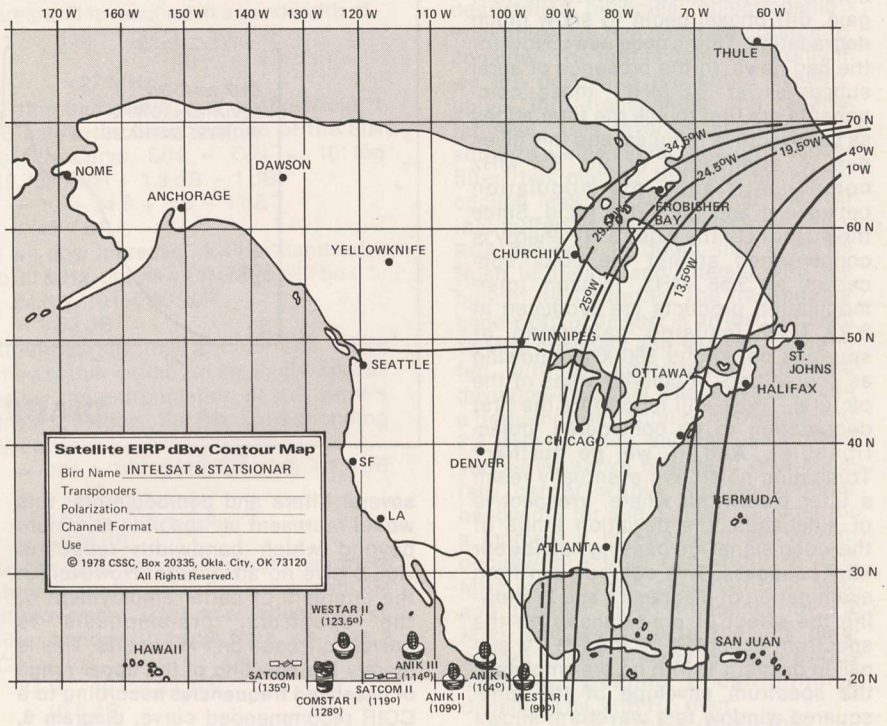
To conclude this month's offering I shall introduce what to some will be an altogether new and untried area: reception of TV signals from non-domestic satellites. To the east of the US/Canadian Domsat arc lies the 'Atlantic' portion of the geostationary orbit. Comstar 'C' is parked at 89.7° west, then 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

TRANSFER CHARACTERISTIC FOR PRE-EMPHASIS NETWORK

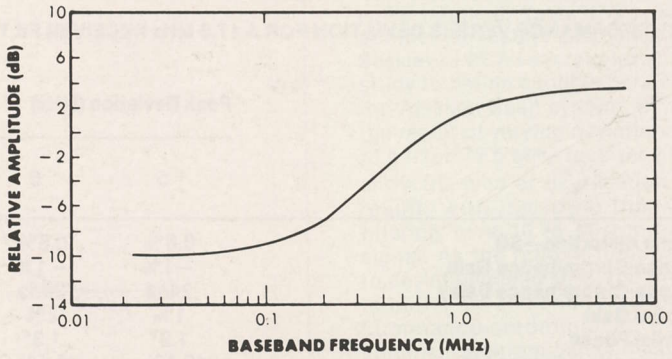


DIAGRAM THREE

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??

Coop's cable column

bob cooper editor in chief
CATJ

SPTS '79

Elsewhere in this issue of **CATJ** is a round-up on the progress of the world's first **'Satellite Private Terminal Seminar'.** Basically, it says that those attending SPTS '79 will witness real, honest-to-gosh, do-it-yourself TVRO hardware. Low cost (even downright cheap) gear. Many people never figured this would all happen so soon. I, however, had the faith.

Every registrant at SPTS '79 will go home with two complete sets of plans to build his very own LOW COST earth terminal. An experimenter from the southeastern USA (sorry - until SPTS '79 is over I'm not **about** to tell you **who** he is or **where** he is **!!!**) has successfully managed to convert a Western Electric TD-2 terrestrial (surplus) microwave receiver to 4 GHz TVRO reception. If you are not into 'surplus', you can find these 'gems' for around $5 to $25 in excellent shape gathering dust in out of the way surplus sales outlets all across the countrty. I doubt the price will stay low long now that somebody's figured out what they can be used for. When this particular fellow called me back in February to tell me about his achievement I spent an hour on the phone deciding he was for real. When I hung on the telephone I got out the Oklahoma City Yellow pages and called around at surplus outlets. I found several TD-2 units for **$5.00 each** in about 15 minutes time. **Now that's cheap!** There is an inkling as to what this fellow has done in the afore mentioned special report in this issue.

Another experimenter in California came along in early April with a complete set of plans to build a brand spanking **new** home TVRO system. On the 23rd of April he and I reached an agreement whereby **we will be producing** a complete handbook of **his plans.** This is the 'Howard Terminal' and a block diagram of it also appears in the special report in this issue. I flew out to California in early May to spend a day going over the terminal, shooting lots of black and white pictures of the modules, and doing a color videotape on the complete system.

Again, every registrant at SPTS '79 will receive **as a part of his registration package both sets of plans.** This includes **all** schematics, parts list, sources for parts and some building instructions. Board layouts, where required are to be included. Everything you need to either convert a TD-2 **or** build a complete homebrew terminal in one place. And **now** I hope my telephone stops ringing with people asking me where they can get "plans".

Back last December and January, about three out of five callers wanted to know where they could go to **buy** a terminal. We sent hundreds, no - thousands, of lists (alphabetical so as to show no favoritism) of the suppliers to the CATV industry. David Alvarez of Microdyne even called to ask us to take him **off** the list; he said he couldn't find his desk anymore. It was buried under hundreds of letters of inquiry.

Along about February the scales tipped the other way. Where we were getting 5 calls now we were getting 50; only the ratio stayed the same. Except now 3 out of 5 (or 30 out of 50) wanted to know where they could get "complete **plans** to build a low cost TVRO". We sent most of them to Paul Shuch at Microcomm for his modules but several dozen got very indignant. **"I know YOU have plans . . . I was TOLD you do!"** they would say. I'd like to find the guy that started **that** story. By the time it got back to us somebody had us publishing a three part series that was purported to describe everything you need to know to build a terminal!

OK - in mid August anyone who thinks they can't live a moment longer without their very own "complete set of plans to build a TVRO" can have them. **Nobody** is going to get them **before** they check in at the registration desk at SPTS '79 however. So don't call with some story about your sister running off with the village idiot and you can't make SPTS '79 because you have to join the possee. It won't work. I've heard every story you can think of and a few more you won't think up.

Are these complete plans? Totally complete. Well thought out, carefully prepared, well documented. Can you build directly from the plans? You can. Can you arrange to get a set, by mail, **after** SPTS '79?

Good question. You figure by then the possee will have rounded up the village idiot, rescued your sister and you'll have time to devote to the project. Let's put it this way.

Logic suggests that **we will** release the plans in this fashion. **But . . .** if you come to SPTS '79 you'll see the TD-2 conversion in "the flesh" (so to speak), and have the opportunity to view the videotapes showing the intricate details of the 'Howard Terminal'. Naturally we think you would be better off coming to good ole' Oklahoma August 14th through 16th. But we understand . . . . **she's your only sister.**

So the **August magazine** will have an order form for **both sets** of plans. No inkling yet as to what the price will be; we may even bundle them together in some once-in-a-lifetime package offer. If you call us up between now and SPTS '79 and try to talk us out of a set early, we'll have to politely refuse you. **So don't waste your nickle.**

Oh yes, good luck on finding your sister. If you should find her before SPTS '79, we'll see you there. **Your plans will be waiting for you!**

After The Plans ...

If the development of the low cost TVRO terminals follow the same pattern that virtually every other major electronic technology breakthrough has followed through the years, somebody will pounce on the **'TD-2 Conversion Plans'** and the **'Howard Terminal Plans'** and start cranking out circuit boards and parts kits.

If you are standing outside the ice cream parlor looking in, and the door is shut and locked, you think to yourself over and over **"Gee . . . if I could** just **get inside".** The plans get you inside. Now you need to get behind the counter where the goodies are located.

The 'TD-2 Conversion' plans tell you how to scrounge and convert and mess around with really inexpensive stuff and get a satellite TV picture (and sound of course too). I figure a fellow can be operational with a TD-2 conversion about 20 working hours after he collects the raw parts and pieces. I suspect somebody will shortly start offering 'kits of parts' to first convert the TD-2, and later on I see a dozen or more modifications to 'soup up the TD-2'. Magazines (not this one) will be filled with articles on 'this' modification and 'that' trick circuit.

The 'Howard Terminal' is for the guy who has $1,000 or so to spend, he has a reflector skin of suitable size spotted or in his backyard, and he wants studio quality signals out of the spigot. It is beautifully engineered and it will stand the test of both time and thousands of duplications. And I feel certain that before long, **possibly even by SPTS '79,** we'll see somebody offering to sell you circuit boards and parts kits for some or all of the 'Howard Terminal' system. It is a total natural. I'm aware of one outfit (not small, incidentially) now burning the midnight oil to get a 'Howard-like-terminal-kit' ready in time to show at SPTS '79. I hope they make it because for every guy that can build from 'plans' ten can build from kits.

Are you now sitting at the counter filling your face with the goodies? Yes, but the banana splits are still to come. If the people working on the 'splits' (there's more to that word than the relationship to the ice cream parlor) continue to make good progress, we'll tell you about it in the next month or two.

The Video Boom

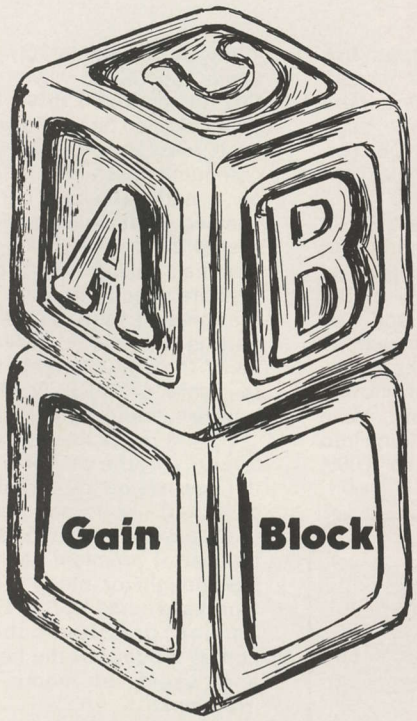
Unlike most people in the CATV industry, I got intrigued by the thought of having my own personal video taping system late in life. Actually that is not totally correct; **back in 1966** when I was building my own cable systems in California I had one of the very first Ampex 3/4" decks which we used extensively to tape local ballgames, school council meetings and the like. But having one in my own home came only a year ago. Which is probably contrary to what certain FCC people think; they being suspicious that my WF92 terminal has been (and is being) used for all sorts of clandestine activities.

Once into videotaping I discovered how many other people are into it. For example, when cable came to south-of-Oklahoma City suburb Norman (an ATC system), and HBO was added, I'm told VTR (or VCR) sales quadrupled in days. And stayed up. When it came to other Oklahoma City suburbs (El Reno, Yukon, and Edmond) my informant at the local RCA (VHS) distributor for this part of Oklahoma said sales went up so rapidly that they had to put dealers on an allotment program. By the first part of May the pinch became severe; between the non-cable public and the cable-served public VHS machines were actually on back order! The retail dealer that boasts they are the largest RCA dealer in the state was down to as few as three VHS machines a week and resorted to dealing with distributors in less cable-impacted areas to back up his own state-wide distributor/supplier.

You can find HBO or SHOWTIME or FANFARE movies "on the street" for the price of a blank tape cassette plus a $20 bill **the day after** the movie first appears on the local premium service. Retail dealers openly display stacks of "demo" tapes that look like the current HBO program schedule. Oh yes, MDS (programmed with HBO) arrived in our city in November and of course that's another source for the movie tapes.

I truly doubt Oklahoma City is unique. I subscribe to a number of video-enthusiast publications that cater to people with VTR/VCR machines and they are filled with page after page of classified ads listing HBO/SHOWTIME/FANFARE taped movies for swap, exchange or outright sale. I've watched these classified pages grow from a page each issue to perhaps ten pages an issue in less than a year.

There are several messages here to the perceptive mind. First of all, there is

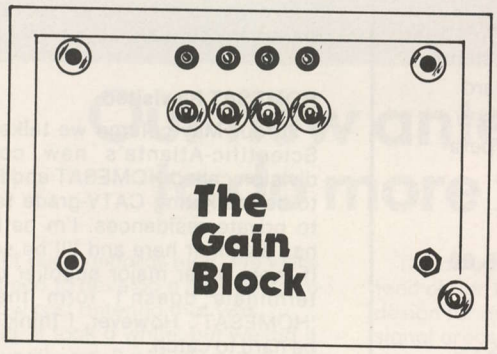


THE GAIN BLOCK

. . .building on a firm foundation. . .

EXPERIENCE IS KNOWLEDGE. The more you do, the more you learn. The latest CATJ 'KIT KORNER' project is just the ticket for the CATV owner/operator, technician or engineer who needs and wants to learn more about the basic "gain-building-blocks" of our industry; hybrid amplifiers.

THE CATJ 'GAIN BLOCK' is both a learning exercise and a valuable bench tool for your CATV system. We selected a very high quality Hewlett Packard gold IC/hybrid device manufactured on a saphire substrate. This 'block' provides 30 dB of gain from below 30 MHz to over 300 MHz (typically 350 + !!). We designed this 'block' into a bench-handy package with a built-in regulated power supply (with external output jacks to power other bench projects), and added a few extra features to make it the most valuable instrument on your CATV test bench!



* - Once you have the basic GAIN BLOCK build and operating (approximately a two hour kit project) we'll be showing you how you can plug in **external** circuits to change gain and passband parameters, build single channel pre-amps, use it as an MDS converter IF 'block' or even as a TVRO low-IF 'block'!

* - the basic GAIN BLOCK has built-in gain controls in three steps using front panel switching of the operating voltage. Outputs of + 53.5 dBmV for 12 channels with cross mod at — 57, second order at -59 and triple beat at -70.5. A very high quality amplifier for bench or system use! (see CATJ for May 1979, page 38).

* - The combination of the basic self-contained GAIN BLOCK, our very extensive construction and operational manuals, and add-on (external!) circuits allow you to work with broadband hybrid circuits, see how they perform, and learn all about the CATV industry's basic tool of "gain".

ENGINEERED TO GROW WITH YOU. More than a construction project kit. More than a super-high gain, high output capability amplifier. GAIN BLOCK is an engineering tool for teaching system technicians what "gain" is all about, how it works and how the amplifiers you work with every day of the week are designed to operate.

PLAY WITH IT YOURSELF. If you have a sweep signal generator, a detector and a display scope, you'll quickly see how very small changes in input and output circuits can affect the operation of a 'block gain' hybrid device. In working with this super learning tool, you will develop a new appreciation for the trunk and extender amplifiers which you utilize daily in your system.

ALAS — AT THIS PRICE. . .the quantity is limited. We made an especially good buy on these Hewlett Packard gold-plated hybrid devices. When they are gone we'll have to substitute a TRW hybrid chip that costs many times more and the price of the 'GAIN BLOCK KIT' will go up by $40. So act fast. . .like now. . .while our good buy is still available!

the obvious business opportunity if you have a cable system in a town where nobody is bothering to stock and sell VTR/VCR machines plus blank tapes. Since **your cable** is, (or will be), one way or the other, **the reason** why video tape machine sales boom, you might as well be in on it! Even if your franchise prohibits you selling or servicing TV "sets" I believe you could add VCR/VTR units without any local stink. If you might be worried about servicing the beasts, my own experience may be helpful. Here at TPI, because of the Lab work and the TAPE TIME project (through which we provide dubs of our own instructional and Satellite Magazine programs) we've had two minor problems with five separate machines (two Beta format, one VHS, and two 3/4"). I'm sure there are problems, but most of the bugs seem to be well worked out. Our two problems were both mechanical, not electronic.

Another more important message is that people who think a few thousand private or home satellite terminals may endanger the relationship between the premium service suppliers and the movie companies ought to re-think their concerns. I'd venture the guess that tape dubbing of premium movies off of local-to-Oklahoma City cable systems and the MDS service runs into thousands (perhaps more than 5,000) 'dubs' per month; largely going to non-cable, non-MDS viewers. Oklahoma City has around 0.15% of the nation's population so do your own math to see what cable and MDS relaying of premium movies may be amounting to on a national scale per month. **The number is staggering.** So huge that even if there **were** 50,000 private TVRO terminals taking the signal off of the satellite **directly,** and not paying for it, the present day number of people getting the same services 'second hand' through a neighbor with access to cable or MDS would dwarf the private satellite number.

So why all of the concern about the 'security' of the satellite? I'll be darned if I can figure out what the fuss is about. I'd like to see somebody do a real honest to gosh study of the number of premium cable homes that have bought (or intend to buy within six months) a home VCR/VTR machine. I'm betting premium-cable-equipped homes are **(by-far)** the heaviest buyers and users of home video tape machines.

My message to the premium service operators and their movies suppliers is very simple. Quit worrying about private earth terminals as a 'hole in your dike'. You've got one alright, but that's not where it is. All of this talk about scrambling the uplink signal sounds impressive, but it will be closing the barndoor after the horse is gone. If you want to approach this 'problem' logically, figure out a way to encode the premium service so it looks normal (i.e. is not degraded) for **live** viewing, but will not 'take' on a home VTR unit. That's the only kind of security that makes any sense.

HOMESAT Re-visited

In our May column we talked about Scientific-Atlanta's new corporate division called HOMESAT and its plans to be marketing CATV-grade terminals to private residences. I'm betting S-A has a winner here and I'll be surprised if every other major supplier of TVRO terminals doesn't form their own 'HOMESAT'. However, I think S-A will be hard to catch.

Within days of the preliminary announcement on April 19th (in such organs as the **Wall Street Journal**) HOMESAT VP Dick Campbell was buried under an avalanche of telephone messages and letters. Naturally it was S-A stockholders who read the message with special interest. One living in downtown Atlanta called Dick and said "I want one". The price didn't bother him (we are talking at least $20,000 an installation typically). He just wanted one. A self-made millionaire in South Carolina bought one so he could watch baseball games. He's a baseball nut and Dick Campbell sealed the deal with him by taking him, his wife and daughter to a Brave's game in town. Dick has been worried about the 'beauty' of the hardware, knowing that the **average** American family probably is not going to be

Our new antenna was designed to do more than just survive.

We set our standards high. We were determined to develop a high performance, low cost antenna that was versatile. It took a while, but we did it. It's a sweetheart. But that's not enough. Because Mother Nature can be very destructive at times. So we designed in strength to withstand winds of 100 knots without signal degradation. And *survive* winds of 140 knots.

The fiberglass composite reflector achieves maximum stiffness with minimum weight. We had our computer help us design it as well as a new kind of mount. It uses torsionally stable tubular members instead of the usual angle iron. We also included anti-friction roller bearings for azimuth and elevation so that they are not frozen when you need to orient or reorient the antenna quickly and easily. You don't need the state surveyor to align the foundation on this one.

The antenna provides two antenna feed options—a high gain Cassegrain design for maximum gain in weak signal areas or a focal point feed for strong signal areas. The 5 meter antenna is easily convertible to 6 meters should additional gain be required at a future date. That's built-in versatility.

The new Hughes Satellite Video Receiving Antenna now makes it possible to have a complete Hughes-built earth terminal. Our antenna stands up to hurricanes and all our receivers have built-in 24 channel agility and threshold extension.

With Hughes, you'll be ready for anything, including satellite or transponder changes and EIRP degradation.

For more information, write Hughes Microwave Communication Products, P.O. Box 2999, Torrance, CA 90509.

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Call our service number any time, day or night: (213) 534-2170.

overjoyed with having a 5 meter steel skin in their yard. So when he took the trio out to show them the S-A antenna 'parking lot' (a ten meter, and so on down to a small job for voice grade satellite circuits) he was anticipating some negative feelings.

"Oh Daddy" exclaimed the little girl as they rounded the building and the dishes came into view **"I hope that BIG one is ours!!!"**. The wife, who Dick always fears as being against this sillyness chuckled and remarked **"My-my, we certainly will be the hit of our neighborhood!"**. Dick had to talk them OUT of buying a ten meter antenna. It is probably a good thing S-A didn't have a twenty meter on display in the yard.

A fellow who bought a restricted homesite in the Missouri Ozarks had a problem; his deed restrictions wouldn't allow him to put ANY size dish in his yard. **But he wanted a satellite terminal.** So he bought a piece of land immediately outside of the restricted area and he'll bury his cables from the off-restricted-land terminal on into his home.

A farmer near San Angelo, Texas receives one off-air channel. He simply wanted his family to have access to a wider variety of television than his one local channel brings him. So he bought a terminal.

A chap building a house in rural Connecticut (it was news to me that any part of Connecticut could be called "rural") has a crippled mother and an aging father. He's equipping the home with multiple home VTR's, multiple projection TV screens and the whole 9 yards of entertainment. He put in the best MATV system he could buy and he's stuck with constant co-channel from the Boston and New York channels. So his terminal will satisfy his desire to give his parents an opportunity to enjoy life a little more as shut-ins.

I could go on and on with more case histories but I think you get the messages here. Private terminals, even at $20,000 plus each are a very viable business. Campbell won't share his total sales volume with me nor his predictions. **I see him averaging** one complete private terminal per day, five days a week, 52 weeks a year. And not even denting the surface.

I do know this. Our forthcoming SPTS '79 in Oklahoma this August will probably bring out one hundred or two hundred people who are looking at the private terminal business as a way to get in on the ground floor of a very exciting new business opportunity. People like the plumbing shop owner from rural Idaho who feels he could, if he was a sales agent for somebody's terminals, sell several dozen in the first month. Or the farm equipment dealer in Kansas who says he's got 15 sold already if he can just figure out who he can buy them from.

HOMESAT, INC. It is a nifty company name that says it all.

TECHNICAL TOPICS

MDS Revisited

"As a new subscriber to CATJ I must say thank you because I feel there is enough information to make CATJ worth ten times the subscription cost. You provide me with a most interesting two nights a month of reading.

"The MDS technology article appearing in the April issue was very informative. Using the MDS mixer (twin diodes) that operates at 1/2 the LO injection frequency, I have found that you can make a 3/4" inductive coupling loop into the oscillator of a standard UHF TV tuner and pick off the second harmonic of the LO very neatly. Use this to drive the twin diodes and you have a picture on 2150 or 2156 very neatly. You may have to increase the tuner voltage to 31 volts or so to get enough drive but the tuner will handle it easily.

"If people are having trouble locating the NE64535 (NEC) transistor for the RF stage the April issue detailed, they should try Gateway Electronics, 8123 Page, St. Louis, Missouri 63130 (314/427-6116). This source also has a good supply of UHF TV tuners and NEC diodes (in lieu of the sometimes difficult to locate MA 4882 diodes)."

A.C. Hoffsterrer
St. Louis, Missouri
63131

Response to the April MDS Technology issue was very high. It varied from an MDS operator who couldn't believe somebody actually published converter schematics to words of praise from government and industry officials. The April report was not a construction project. For those who want a front to back 'how to build' and MDS converter construction guide, we suggest you watch for the June/July/August (we aren't sure of the exact scheduling) **73 Magazine which has a fine article by a chap in Minnesota that tells exactly how to do it in steps anyone can follow.**

MDS 'bounty'

"We have been advised locally that there has been a ruling approved by the Arizona Attorney General that intercepting the local Phoenix MDS transmitter and watching 'HBO' without an agreement to have the service as a customer is now prosecutable. The rumor is that there is now a 'bounty' offered of $1,000 when somebody turns in someone else who is 'stealing' the MDS signal; the 'bounty' being paid by the MDS operator!"

Gordon K. Woods
Phoenix, Arizona
85013

Shades of Steve McQueen!

Upside Down MDS

"Reference the April 1979 issue of CATJ and the report on MDS technology; I agree that a TV signal is structured 'upright' and an MDS channel is 'upside down'. But in the interest of being technically correct, a TV set is designed to accept either configuration. Except for minor differences in the upper and lower IF bandpass skirts, the video will detect around DC and the audio sub-carrer will be 4.5 MHz regardless of which side of the passband is called 'up'. This has been the case ever since the intercarrier sound (i.e. 4.5 MHz IF) system was placed into use in the TV set.

"What that means is that one can use a low side local oscillator for an MDS downconverter without worry. And generally a lower LO means cheaper. I think that everyone went to the high side LO because it sounded like it might (en)code a little; one audio scrambler inverts the audio spectrum and codes very well. However one can operate the LO on either side. If one is beating towards channel 7 from the low side, for example, use 1976 MHz or 988 MHz for the twin diode mixer configuration detailed in the April CATJ. To get channel 7 with a high side LO requires a 2330 MHz LO or a half frequency of 1165 MHz into the dual diode mixer. Additionally, one can gain a little in the way of stability by being on the low

side to begin with. It works. . .give it a whirl!"

Travis Brackeen
St. Louis, Mo. 63112

The SUPER Battle

"A note in appreciation for your most informative and comprehensive article entitled 'The Super Station Battle'. Many cable operators have been looking for just such comparative information.

"It is obvious that you did your homework well. We feel the results were well worth the time it must have taken and we feel confident (from the number of inquiries we have already received) that many others share this opinion. Enclosed you will find a few pieces of comparative information which shows that WTCG is number four in a market of four stations, while WGN is number two in a market of nine stations based upon market share. WGN is 'special' because very often it beats out the local CBS and NBC affiliates; this is unique in a major market.

"Also enclosed you will find a comparison done by Nielson of independent stations by market shares. Obviously one share in a market of nine stations is considerably more difficult to realize than in a market of four stations.

"Your article was analytic, fair, very comprehensive and your comments most insightful. Congratulations on a most impressive job!"

David M. Schroeder
Marketing Director
United Video, Inc.
Tulsa, Oklahoma 74135

Reader Schroeder is charged with the responsibility of promoting the carriage of WGN at cable systems nationwide. WGN has, based upon Nielsen Station Index measurements data, a 19% share of all Chicago-land households from 7 AM to 1 AM. KTVU (transponder 1) **commands a 14% share** (second best of indies). **Other highly rated indies** (in shares) **include Boston's WSBK** (13% and a UHF outlet —there are no VHF indies in Boston), **WPIX New York** (12%), **KTTV Los Angeles** (12%), **WTCG** (12% and an indie U) **and WOR New York** (9%). **Alas, how well do they** play **in Dubuque?**

Training Aids

"I noted with great interest your 'Tape Time' announcement in the January issue of CATJ. The list of tapes available, while interesting, do not meet my specific immediate requirements.

"I am looking for material that can be of assistance to our radio inspectors in their day to day dealings with CATV systems and subscriber complaints of same. Material dealing with the make up of a complete cable system, from 'headend to subscriber drop' would be of great benefit. Also, information on taking measurements, recognizing common interference and faults would also be useful.

"If CATJ has video tapes in this area, or films or written material, I would like to hear about it. Thank you."

A.S. Cobham
Training & Manpower
Department of Communications
Moncton, N.B.

During 1975, 1976 and 1977 CATJ did prepare annual FCC Test Study Handbooks which hundreds of systems utilized to perform their annual measurement tests. These test booklets, now out of print, satisfy U.S. testing procedures but would not satisfy Canadian BP-23 procedures which is your specific interest area. We are not aware of any 'headend to drop' recognition/fault finding video tape or film and frankly now that you bring it up, we wonder why someone has not done

this. Sounds like a good project for us. The last thorough testing issue we did was January of 1977 where we outlined the current FCC testing procedures in a step by step format. Anyone who needs testing information may contact CATJ Librarian Janet Stone for a xerox copy of this 1977 epic (enclose $4.00 and ask for '1977 Testing Article'). **As far as determining what is causing interference, we have two excellent study aids available. The CATJ** 'Head-end Wall Chart' **contains more than 90 off-screen photos which show various types of interference. The CATJ** FCC Tests Wallchart **has more than 60 off-screen photos depicting hum mod, co-channel, frequency offset stability, and signal to noise ratios. With this chart you can look at a TV screen and locate the precise type and level of interference you are observing. Either chart is $10 per copy or you can order** both for $15 postpaid in the U.S. or Canada.

Telesat Re-Replies

"Re: Telesat letter and editorial comment in the **March 1979 CATJ.**

"OK, let's call it even.

"There are a number of nitpicks I might scratch with you, such as the design life of the HS-333 (Anik-type) satellites which Hughes **itself** set at seven years. Operational experience indicates to us that that was a fairly accurate estimate, and six years a prudent service life.

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.

AmeriCom Satellite Network, Inc., (A.S.N.), 310-14th Ave. South, St. Petersburg, FL 33701 (S4) 813—895-4201
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
B.E.I. (BESTON ELECTRONICS, INC.), P.O. Box 106A, Olathe, KS 66061 **(M9 Character Generators)** 913—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
Comtech Data Corporation, 15207 N. 75th, Scottsdale, AZ 85260, (M2, M6) 602—991-9580
CRC ELECTRONICS, INC., 2669 Kilihau St., Honolulu, HI 96819 **(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
General Cable Corp., 1 Woodbridge Center. P.O. Box 700, Woodbridge, N.J. 07095 (M3) 201—636-5500
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
IBM Corp., P.O. Box 2150, Atlanta, GA 30301 404—231-6005
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
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

"However, it's obvious that we had best agree to disagree on a number of basic issues, like the laws of the land governing satellite communications in Canada. There's not too much either of us can do about them.

"I would like, however, to touch on your editorial comment that my allocation of satellite channels to guarantee "active" channels was like counting empty pop bottles returned to the supermarket as full bottles.

"Fair enough. Just keep that in mind when you find a fly in your freshly purchased bottle of pop and are handed a sticky, returned empty in exchange as full compliance with the supermarket's guarantee to replace unsatisfactory merchandise."

F.M. Steers
Director
Information Services
Telesat Canada

Subsequent to the March issue's release Canadian cable systems were given official permission to begin utilizing ANIK satellites for programming relay and to own and operate their own TVRO terminals. A feature appearing in the July CATJ by Sruki Switzer details what the Canadian CATV TVRO scene is likely to look like in the years ahead.

Blonder Tongue Clarification

"Many systems recently received a letter from Blonder-Tongue Labs, Inc. announcing that commencing February 1, 1979 BT would no longer sell direct to MSO and cable operators at the CATV Distributing/Non Stocking Distributor pricing; although you could get the same fine B-T CATV products through a local distributor.

"We would like to take this point to note that we, a CATV distributor since 1949, are stocking and warehousing a complete line of Blonder-Tongue CATV products. Anyone having any questions about this is advised to contact us."

Harold B. Wilson
Sales Manager
DAVCO Electronics, Inc.
Box 861, Batesville, Ark. 72501

New Sadelco Facility

Continued expansion within the cable industry is catching many firms with their production capabilities lagging behind the times. Harry Sadel of Sadelco has reacted by acquiring a new facility at Englewood, N.J. which provides the firm with a five-fold increase in production capacity.

Sadelco is also installing new automatic production equipment and expanding its engineering department by a factor of three to keep up with the expansion-minded cable industry.

MID STATE Communication, Inc., P.O. Box 203, Beech Grove, IN 46107 (**M8**) 317—787-9426
Modern Cable Programs Division of Modern Talking Picture Service, Inc., 2323 New Hyde Park Road, New Hyde Park, NY 11042 (**S4**) (516) 437-6300
MSI TELEVISION, 4788 South State St., Salt Lake City, UT 84107 (**M9 Digital Video Equip.**) 801—262-8475
NORTHERN CATV DISTRIBUTORS, INC., 8016 Chatham Dr., Manlius, NY 13104 (**D1**) 315—682-2670
OAK INDUSTRIES INC./CATV DIV., Crystal Lake, IL 60014 (**M1, M9 Converters, S3**) 815—459-5000
PRODELIN, INC., 1350 Duane Avenue, Santa Clara, CA 95050 (**M2, M3, M7, S2**) 408—244-4720
Q-BIT Corporation, P.O. Box 2208, Melbourne, FL 32901 (**M4**) 305—727-1838
RADIO MECHANICAL STRUCTURES, INC., P.O. Box 1277, Kilgore, TX 75662 (**M2, M9, S2**) 214—984-0555
RMS CATV Division, 50 Antin Place, Bronx, NY 10462 (**M5, M7**) 212—892-1000
Sadelco, Inc., 299 Park Avenue, Weehawken, NJ 07087 (**M8**) 201—866-0912
SATCO, P.O. Box 1260, Lewisville, TX 75067 (M4) 214-436-9509
Scientific Atlanta Inc., 3845 Pleasantdale Rd., Atlanta, GA 30340 (**M1, M2, M4, M8, S1, S2, S3, S8**) 404—449-2000
SCIENTIFIC COMMUNICATIONS, INC., 3425 Kingsley Rd., Garland, TX 75041. (**M4 Low Noise & Parametric**) 214—271-3685
Showtime Entertainment, Inc., 1211 Ave. of the Americas, New York, NY 10036 (**S4**) 212—575-5175
Southern Satellite Systems, Inc., P.O. Box 45684, Tulsa, OK 74145 (**S9**) 918—664-4812
Systems Wire and Cable, Inc., P.O. Box 21007, Phoenix, AZ 85036 (**M3**) 602—268-8744
T.E.S.T., Inc., 16130 Stagg St., Van Nuys, CA 91409 (**M9 Encoders & Decoders**) 213—989-4535
TEXSCAN Corp., 2446 N. Shadeland Ave., Indianapolis, IN 46219 (**M8 Bandpass Filters**) 317—357-8781
The Associated Press, 50 Rockefeller Plaza, New York, NY 10020 (**S9 Automated News SVC**) 212—262-4014
Theta-Com CATV, Division of Texscan Corporation, 2960 Grand Avenue, Phoenix, AZ. 85061, (M1, M4, M5, M7, M8) 602—252-5021
TIMES WIRE & CABLE CO., 358 Hall Avenue, Wallingford, CT 06492 (**M3**) 203—265-2361
Tocom, Inc., P.O. Box 47066, Dallas, TX 75247 (**M1, M4, M5, Converters**) 214—438-7691
TOMCO COMMUNICATIONS, INC., 1077 Independence Ave., Mtn. View, CA 94043 (**M4, M5, M9**) 415—969-3042
Toner Cable Equipment, Inc., 418 Caredean Drive, Horsham, PA 19044 (**D2, D3, D4, D5, D6, D7**) 215—675-2053
Trenco Inc., P.O. Box N, 385 South 300 West, Salem, UT 84653 (**S1, S2, S7, S8, S9 Consulting**) 801—798-8633
Triple Crown Electronics Inc., 42 Racine Rd., Rexdale, Ontario, Canada M9W2Z3 (**M4, M8**) 416—743-1481
TURNER COMMUNICATIONS CORP., (WTCG-TV), 1018 West Peachtree St., Atlanta, GA 30309 (**S9**) 404—875-7317
UNITED PRESS INTERNATIONAL, 220 East 42nd St., New York, NY 10017, (**S9 Automated News Svc.**) 212—682-0400
UNITED STATES TOWER & FAB. CO., P.O. Drawer "S", Afton, OK 74331 (**M2, M9**) 918—257-4257
United Video, Inc., 5200 S. Harvard, Suite 4-D, Tulsa, OK 74135 (**S9**) 918—749-8811
Van Ladder, Inc., P.O. Box 709, Spencer, Iowa 51301 (**M9, Automated Ladder Equipment**) 712—262-5810
VIDEO DATA SYSTEMS, 40 Oser Avenue, Hauppauge, NY 11787 (**M9**) 516—231-4400
VITEK ELECTRONICS, INC., **4 Gladys Court, Edison, NJ 08817, 201-287-3200**
WAVETEK Indiana, 66 N. First Ave., Beech Grove, IN 46107 (**M8**) 317—783-3221
WEATHERSCAN, Loop 132, Throckmorton Hwy., Olney, TX 76374 (**D9, Sony Equip. Dist., M9 Weather Channel Displays**) 817—564-5688
Western Communication Service, Box 347, San Angelo, TX 76901 (**M2, Towers**) 915—655-6262/653-3363
Winegard Company, 3000 Kirkwood Street, Burlington, Iowa 52601 (**M2, M3, M4, M5, M7**) 319—753-0121

NOTE: Associates listed in bold face are Charter Members

Distributors:
D1—Full CATV equipment line
D2—CATV antennas
D3—CATV cable
D4—CATV amplifiers
D5—CATV passives
D6—CATV hardware
D7—CATV connectors
D8—CATV test equipment

Manufacturers:
M1—Full CATV equipment line
M2—CATV antennas
M3—CATV cable
M4—CATV amplifiers
M5—CATV passives
M6—CATV hardware
M7—CATV connectors
M8—CATV test equipment
M9—Other

Service Firms:
S1—CATV contracting
S2—CATV construction
S3—CATV financing
S4—CATV software
S5—CATV billing service
S6—CATV publishing
S7—CATV drop installation
S8—CATV engineering

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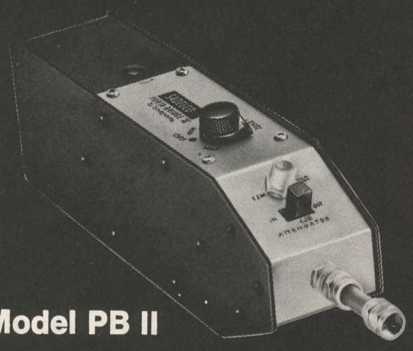

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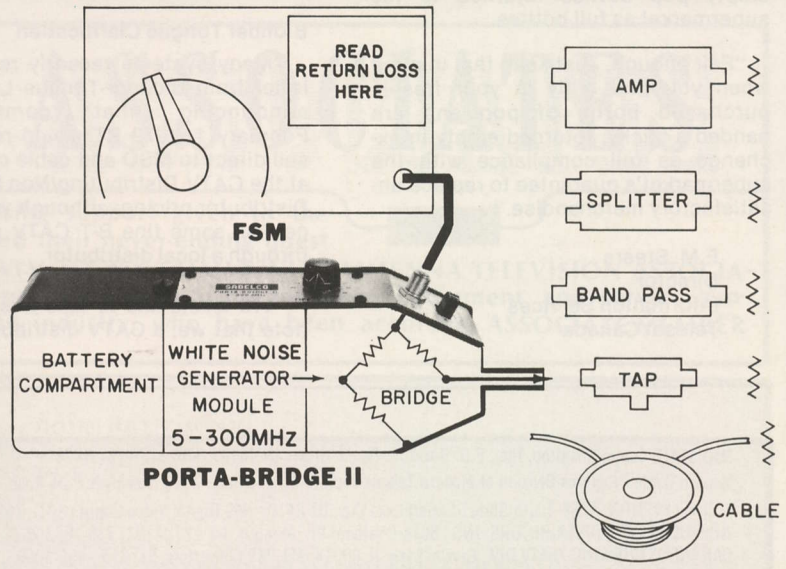

FUNCTIONAL BLOCK DIAGRAM

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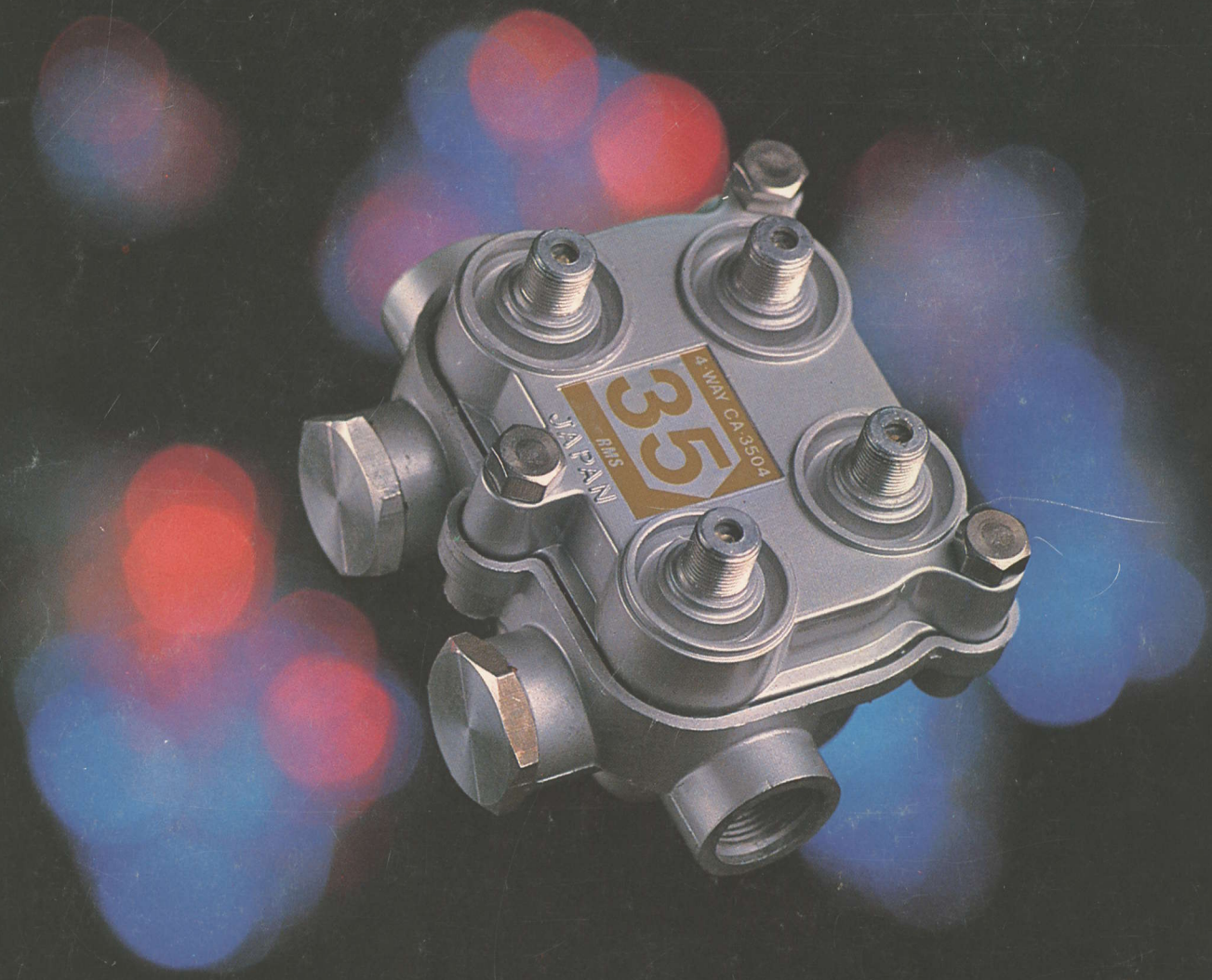

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