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AUGUST
1978

OFFICIAL JOURNAL
OF THE
COMMUNITY ANTENNA
TELEVISION ASSOCIATION

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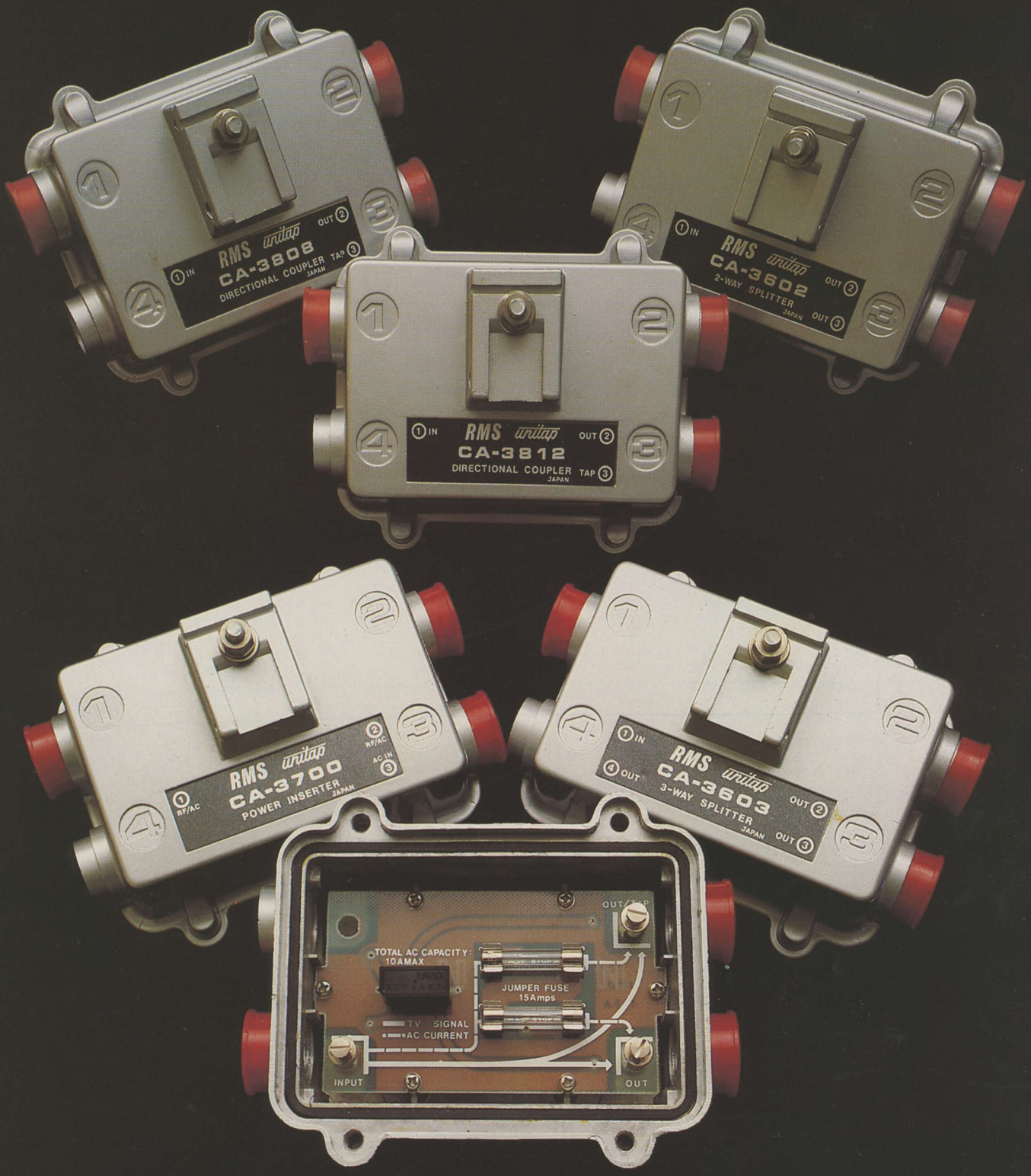

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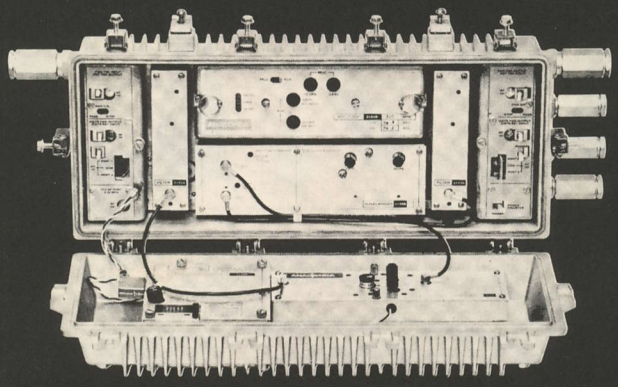

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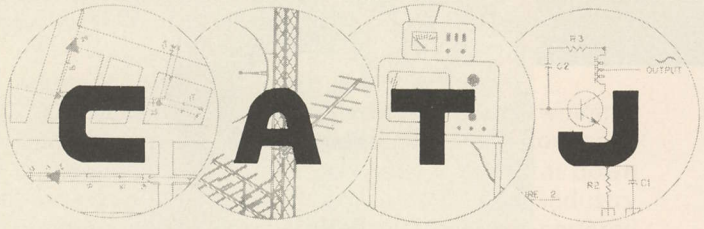

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1978

VOLUME 5 NUMBER 8

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

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CATJ subscription rates $12.00 per year for non-CATA members, $8.00 per year for CATA member-systems; $9.00 per year for industry employed personnel for at-home delivery. In Canada, $13.00 per year for CATV systems, $10.00 per year for system employees. Foreign rates upon request.

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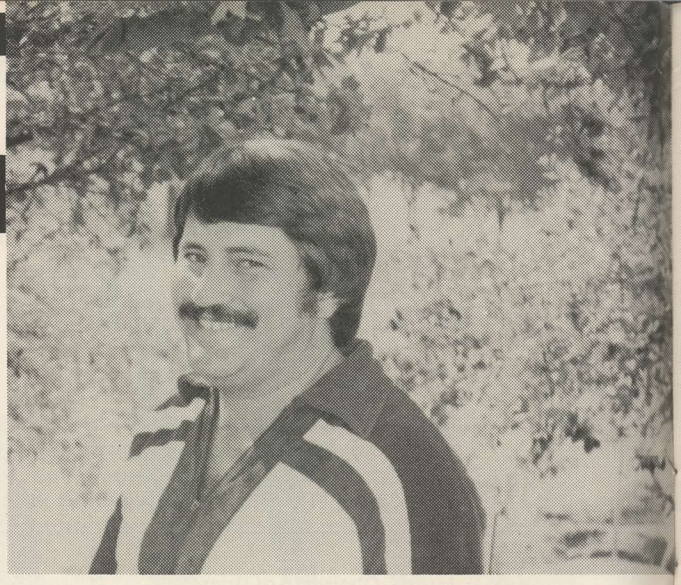
—FEATURES—

—DEPARTMENTS—

OUR COVER

100 DEGREES IN THE SHADE? After the recently completed CCOS '78 in Eastern Oklahoma, and the 100-plus temperatures, the industry needs a break from heat! Near Crested Butte, Colorado a crew working at 10,000 foot plus elevations prepares to lay in a trunk line of armored cable on top of six feet of snow pack. In August?

CATA-TORIAL



BEN CAMPBELL, President of CATA, Inc.

Gettin' While The Gettin's Good

How does an industry police itself?

That's the pressing question these days as the last-great-franchise battles of the cable industry head into their final round. Most firms that are in the open marketplace seeking yet uncommitted franchises to build and operate CATV systems are of the same mind; satellites have changed the economic feasibility of what type of community will or will not fly and there is now a nationwide rush on to grab every remaining community while there are still some around to grant a franchise. It is reminiscent of the mid 1960 rush that swept across the nation just before the FCC (prodded on by the broadcasters) moved in on us.

Competition, to say the least, **is fierce.** And, as Bill Daniels notes, **"competition is good for the industry and it is good for the communities. . .as long as the competition is honest and above board".** Daniels, Bob Schmidt and many others who tend to be industry spokespeople are quietly very concerned about what may be happening in some communities however; and it behooves all of us to try to find an answer to a problem that could, if not controlled, lead us back into the dark ages of the mid 60's all over again.

A CATV franchise has some value. Without it a system never gets up to bat. Without a franchise you may never get whatever FCC permission as may be required at the federal level to operate; you may never get a license for a TVRO, and you probably will not get a joint-pole agreement. Without it you will find financing difficult if not impossible and insurance expensive; if even available.

When the FCC dropped its franchising standards a year ago this left the door open for the communities themselves to establish franchising standards; or the states in some instances. To date very little has been done by either. What has been done has been often ill-conceived and poorly administered.

About all that remains of the FCC's cable rules are the signal carriage rules and the technical standards. The signal carriage rules, if one correctly reads the vibrations in Washington, may be short lived. The technical standards are apt to be with us for a very long time; if not indeed forever. The FCC seems to feel that the passage of copyright was their green light to back out of the majority of the 1972 rules which were established to protect the over the air broadcasters; those that remain are either technical in nature or part of the poorly conceived image of what CATV should be in the public scheme of things. With the adoption by Congress of the fines and forfeiture regulations this past spring, that was another 'green light' to the Commission to again back out of an area of the rules which they would prefer to handle on a "if you do wrong—you'll pay the price" approach.

As ill conceived and broadcaster-oriented as the 1972 rules were, they did (we now perceive) provide us with a measure of protection against (1) state and local governments who have little if any of the expertise required to administer a complex technology oriented industry such as CATV, and, (2) ourselves. It is the latter which concerns us most at the moment.

How does an industry establish standards, say in the area of franchising pursuit, which effectively throttles the over-zealous members (or would be members) of our crowd? How, lacking federal rules that establish mimimum channel capacities, rate making procedures and franchise-language guidelines do you effectively create **voluntary compliance** with what might be generously termed a 'code of conduct'? For example, if in a franchise battle several companies are in the running and the city engages an outside and well respected consulting firm to review the various applications. . .and the consulting firm finds serious flaws in one or more of the applications. . .and then to the surprise and perhaps even shock of most the city awards the franchise to one of those firms **with serious flaws;** then what?

On the surface, when an applicant **promises** services which it cannot deliver (for either technical, legal or economic reasons) and an outside consulting firm **recognizes** these flaws in the application . . .and points them out to the city; and the city chooses to ignore the 'truth', one begins to lose faith in the local franchising system. Or one begins to recall some of the (as Bill Daniels terms is) 'hanky-

panky' of the mid-60's when city councilman suddenly ended up with new autos or boats or trips to Hawaii along about the time the franchise was granted.

When one company in particular starts 'winning' franchises at an unprecedented clip, and it does so in city after city where the company is rated far down the list by both hired consultants and industry people red flags start going up all over the countryside.

How does an industry police itself? If (and it is still conjecture at this point) franchises are being 'bought' rather than 'won' sooner or later some investigative reporter someplace is going to stumble into enough facts to piece together a report. A councilman, prone to bragging and drink, sooner or later will pop off about his new car or his trip to Hawaii. These things, as we have learned in the past, simply do not stay private very long.

Could not the industry create a voluntary 'Code of Franchising Conduct'? The CATA Board of Directors, at the urging of CATA founder Kyle Dean Moore studied that question at some length two years ago, and then again one year ago. At the recently completed CATA Board meeting held concurrent with CCOS '78 it was again a topic for Board discussion. CATA counsel Steve Effros repeatedly warns that any type of 'industry collusion' is frought with Department of Justice anti-trust ramafications, "Codes of Conduct", even if voluntary and handled with complete honesty and totally above board, are borderline anti-trust situations. Yet to sit back and do nothing, wringing our hands out of fear that sooner or later a series of 'franchise scandals' will sweep through the industry is no answer either. Clearly the industry must seek out an answer to this most pressing problem before somebody else does it for us.

For my part I have opened a dialogue with NCTA's Bob Schmidt. And with numerous other industry leaders who share my concern that left unchecked, or worse yet ignored, the practice of chasing franchises may turn out to be a real thorn in the side of the industry before the last franchise has been granted and the nation is franchise-full. And just in case you think this is a problem **only for** those communities **yet to franchise** or those firms now pursuing new franchises, think again. There has already been more than a dozen instances of 'franchise-jumping' in communities where franchise renewals have come up. And as the number of 'new franchise' situations deplete there can be little doubt that more and more attention will be focused on the existing system towns.

There is an urgent need for dialogue in this area; **you need to think about it,** and to offer your own comments if you have any suggestions. Sooner or later, like cancer, the ravages of unchecked and undisciplined franchise hunting will touch every one of us.

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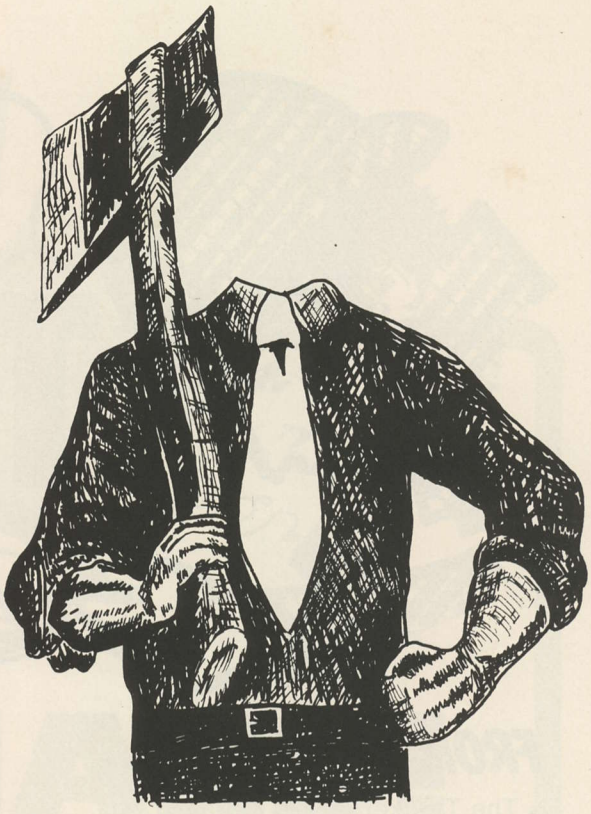

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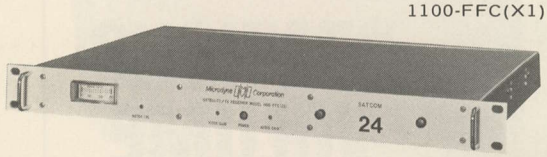

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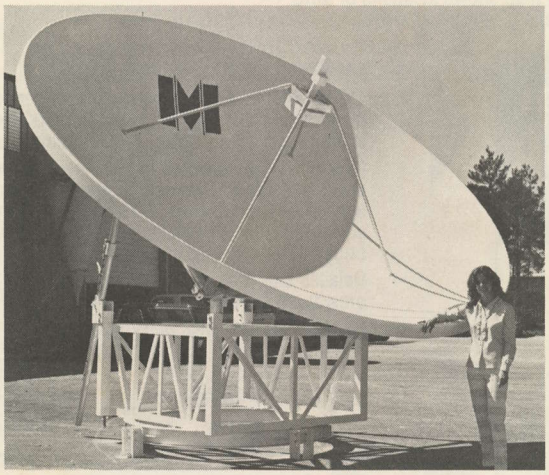

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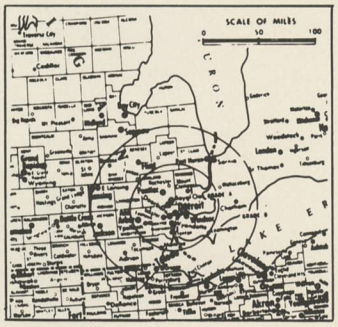

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Up The Bird!!!!

YES WE DID IT—CCOS '78 WAS LIVE COAST-TO-COAST AND BORDER TO BORDER

It Really Did Happen. . .

The odds **against** CATA pulling off the 1978 version of the CATA Cable Operators Seminar on schedule and as announced were almost incalculable. Not only had CATA set out to be the first CATV group to uplink live via satellite, or, the first group of any kind to transmit a business meeting via satellite from a "portable" uplink station. . .it set out to do all of this and much more with a "budget" that was within the four figure region.

There is no adequate way to chronicle the challenge or the feat accomplished. But it did happen, more or less on schedule and with what turned out to be the most extensive and dedicated volunteer group of cable and non-cable people ever assembled in one spot at one time in the history of the cable industry.

Here is what happened. . .for those of you who were not on hand in Oklahoma's Fountainhead Lodge or who were not able to "tune in" the "Greatest Show In Cable Television" live and in full color on transponders 10 and 24 on July 18 and 19.

CATA recognized late last year that the Association was faced with two challenges never previously faced, with the onrush of CCOS '78. Number one was a space problem. Because space commitments for "convention" proceedings must be made a year or more in advance, and the 1978 arrangements had been made at a time when the growth rate of CCOS indicated a setting with accommodations for perhaps 800 would be adequate. . .a crowd larger than that (evident by late December in 1977) suggested severe overcrowding for this summer's meeting. The second "problem" was more theoretical than real; how would CATA continue the CCOS tradition and create a "Seminar Theme" which would push the very limits of technology to new heights?

It turned out there was a single answer to both problems. The best use of the limited space at the Fountainhead Lodge complex was to not even attempt to hold meetings in the traditional way. . .with rooms dedicated to scheduled speakers and live audiences. With the single large room turned over to the exhibit hall functions (there were 62 industry suppliers on hand sharing table top display space and not an inch of space to spare), that left only two meeting rooms for seminar sessions. Neither room would hold more than 125 people. So one of these two rooms was set aside as a dedicated television production studio in which all but three of the convention's scheduled meetings were held. The televised proceedings were then transported throughout the Fountainhead complex on cable to every room in the complex equipped with a television receiver. So far no really new technology had been created; closed-circuit proceedings are done someplace every day.

Enter the new technology problem. If the meetings were going to be televised throughout the facility, why not send those televised proceedings out of the Fountainhead complex **via satellite** to cable television system personnel who did not make the trip to Oklahoma?

It all sounded very neat and quite exciting; **simply** a matter of pulling together the following elements:

1) **A television production** company capable of creating between 15 and 20 hours of live, back to back, television from a temporary location not designed to be a television production studio.
2) **A television production van,** such as is utilized for remote broadcasts of sporting or news events, plus the personnel to run such a van.
3) **A microwave relay system** to transport the studio created and production van processed proceedings approximately 1/3rd of a mile across the Fountainhead grounds.
4) **An uplink station** to send the locally generated proceedings from the ground to RCA Americom's F1 satellite at 135.0 degrees, including not only an 11 meter transmit antenna but also complete with all of the necessary electronics to insure to RCA that the uplink signal would meet RCA standards.
5) **A temporary renovation** of the Fountainhead Lodge MATV system to allow seven additional CCOS-related channels of program-

THE BRASS—Taping a session dealing with the explosive growth of satellite channels and terminals, CATA founder Kyle Moore (left), CATA President Ben Campbell (second from left), journalist Brian Lamb (center), Southern Satellite's Ed Taylor (second from right) and NCTA President Bob Schmidt (far right) discuss where the industry is headed for the satellite and lodge audience.

ming to be distributed throughout the system (making a total of 11 signals for the CCOS period).

6) **Backup systems** for the microwave should it fail and backup systems for the uplink station should it fail (even if the uplink did fail the event would be carried via the Fountainhead MATV system 'on schedule' to the hundreds of television receivers on site).
7) And, approximately 80 people who would during the course of the 15-20 hours of televised proceedings participate in panels, group discussions, demonstrations and interviews.

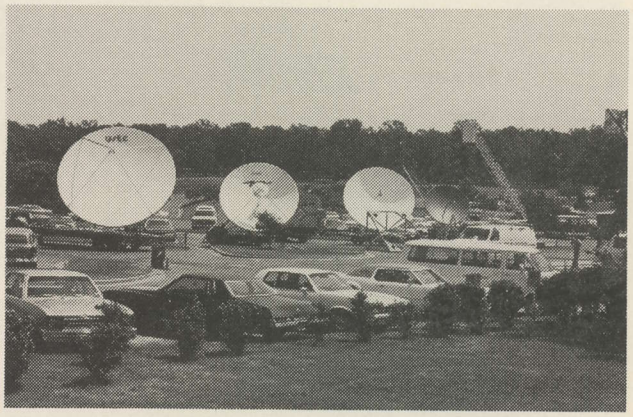
And all of this had to be done for less than $10,000. Because that was, at the outside, all of the money that could be put into the project. And it happened, more or less on schedule just that way. But not without tremendous personal effort by the largest volunteer 'army' ever assembled in one place at one time by the cable industry.

Murphy was everywhere (the mythical Murphy has a law he carries around which states simply **"Whatever can go wrong will go wrong. . .usually at the least opportune time").** Murphy first did his thing late in June. The 11 meter uplink station, scheduled to be transported from Detroit to Fountainhead Lodge prior to June 20th was still far from Oklahoma on June 30th. In fact the two-part-uplink station (one each trailer hauling the 11 meter antenna and a second trailer hauling the 8 by 8 by 16 foot portable building with the electronics) did not finally arrive, totally, on site until Sunday the 9th; barely one week ahead of the scheduled testing of the full station. The uplink terminal, loaned to CCOS '78 by the good folks at **Maclean-Hunter Cable TV Limited,** was last 'on the air' back in the summer of 1973. The terminal had originally been designed for Intelsat tests, although it had been utilized for Canadian Telesat temporary uplink purposes as late as June of 1973. Long after it arrived a volunteer worker would unpack a crate of crusty manuals and spare electronic parts and discover a "log book" in which the **last** operator had carefully noted:

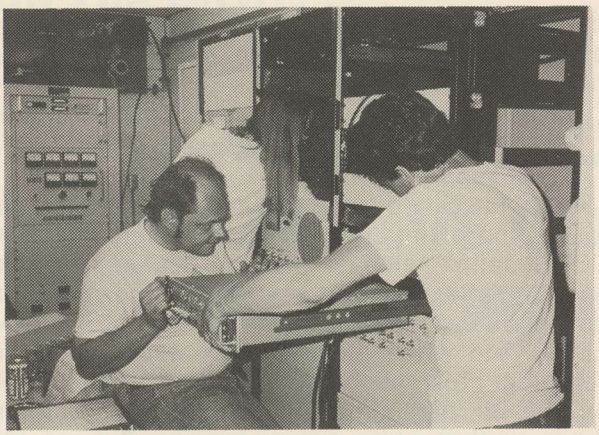
> **"Tests could not be completed. . .the IPA** (intermediate power amplifier) **appears to have lost a power supply. . ."**

With Murphy's help this log book would be found approximately two hours **before** the first CCOS uplink telecast was scheduled to begin and long **after** the problem could be corrected in time to make the first day's telecast at 9:30 AM EDST. And when the log book **was** found, the volunteer crew responsible for getting the uplink on the air had **already** narrowed the problem down to that same power supply. But we are getting ahead of our story.

"The uplink terminal antenna proved to be a three to four hundred man-hour task; to take it from the neat trailer-stack arrival condition to an operating terminal. The manual suggested that **"six men in eight hours"** should be able to assemble the antenna and put it into operating condition. One of the key volunteers on the project, **Don Pidgeon** of RCA Americom's Atlanta uplink site, would later quip in defense of the antenna manual **"You must realize that the manual is probably correct. . .because it assumes that the six people working on the antenna are experienced with both portable uplink antennas and this particular uplink antenna. But the manual has to be the figment of some tech writer's imagination because there is no such thing as** an experienced crew **with this antenna.** Once **a crew puts** one **of these together, there is no way you could ever convince them to do it again!".** Tony Bickel, charged with making the uplink go together and operate would also later note **"The manual with the antenna turned out to be the** wrong **manual. Along about page 82 we realized that the manual was for a 9 meter uplink antenna!".** The antenna had nearly 900 large bolts holding it together when it was completely assembled. It weighed over 12,000 pounds and it went together piece by piece (more than 1,000 pieces in all) over a period of seven days in blistering Oklahoma July sun-



FOUR IN A ROW—From the USTC six meter (left) to the Andrew/4.5 meter (next right), the Microdyne/AFC 5 meter (second from right) and the CATJ Lab 3 meter (far right) they stood like sentinels in a row bringing in satellite reception to the more than a dozen TVRO receivers at CCOS '78.



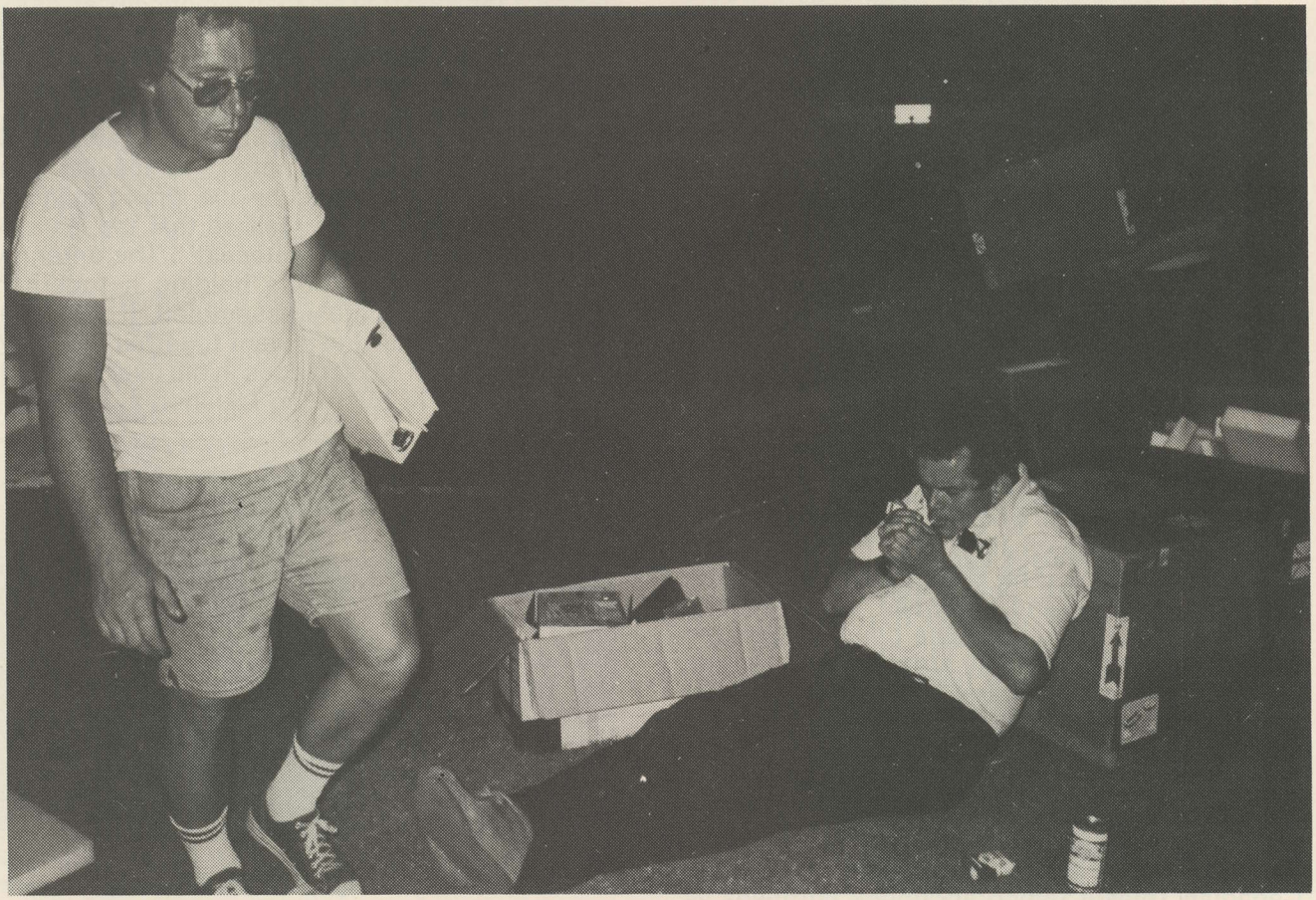
3 AM AND HARD AT IT—ICT's Pete Warren, assisted by Yukon's Rod Wheeler slide the NTSC generator into the rack while England's Steve Birkill (rear) stretches for a cable.

shine that topped 100 degrees F every single day of the project. Another volunteer, Rod Wheeler from Whitehorse in the Canadian Yukon would spend approximately 40 minutes precariously balanced at the focal point of the giant antenna adjusting the polarization of the uplink feed and came away with singed eyebrows and a blistering red face that bordered on permanent damage.

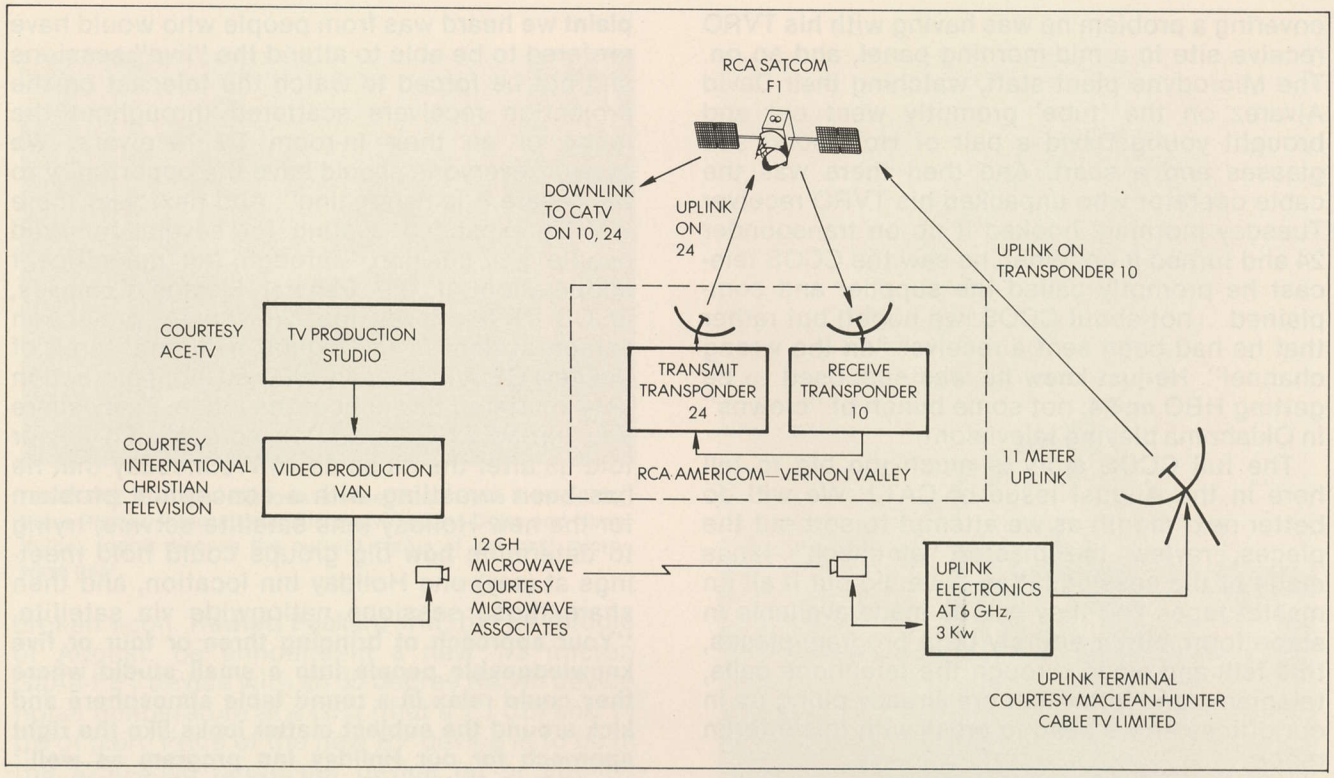
At one time or another, between the first efforts on July 10th to start assembly of the giant array and 8:05 CDST on Tuesday the 19th of July when the array actually began televising live CCOS '78 coverage the original crew of two people assigned to the project swelled to 100 plus people. At any given instant, day **and** night (Tony Bickel logged 5 hours of sleep in a 100 hour period) for four solid days there were between 5 and 20 people on site doing volunteer work. Some, like Canada's Rod Wheeler or English TVRO experimenter Steve Birkill, pitched in and helped because there was a job to be done and they had the skills needed to make it fly. Others like Don Pidgeon from RCA were there because somebody had told them to be there. . .**but** nobody at RCA ever told Pidgeon to go essentially without sleep for three days or nights or to pitch in with a crescent wrench to tighten bolts and nuts and spend all night Sunday and Monday in the equipment shack chasing and tracing uplink electronics malfunctions.

Others, such as CATA's District Four Director Ralph Haimowitz, had some direct interest in seeing the project fly. "Big Ralph", like all CATA people, wanted the project to "fly". He happened to have the brain and brawn and stamina to assist, in a major way, to pull it off.

The whole uplink project boiled down to time. The talent on hand was obviously capable of resolving any and all problems **if** there was the time to do so. To make a last minute fix on the uplink



GAWD IT'S LATE—4 AM Monday morning and Tony Bickel (left) hauls into the uplink electronics shack another stack of equipment manuals while RCA Americom's most capable terminal manager, Don Pidgeon, tries to keep from lighting his index finger with his lighter.

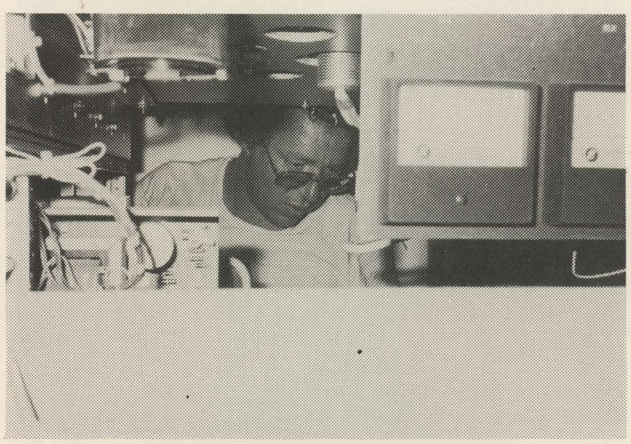


transmitter, around 5 AM Tuesday morning for example, a Microdyne receiver suddenly "lost" several of its key component parts. Big Ralph Haimowitz summed up the extraordinary cooperation of the suppliers at hand when he told them "**You guys were great. . .it was just like Christmas. We knew we could pop our head out of the electronics shack at anytime. . .even 3 AM in the morning. . .and ask for virtually anything we needed, and within minutes there would be a left handed widget or a 6 GHz mixer or a 24 volt supply back at our door. . .**". Truly, everyone pitched in and it took that kind of cooperation to make it function.

When the uplink was finally operational around 7 AM CDST on the 18th, the CCOS signal left the lodge ground on transponder 10. Yeh, we know, we were **supposed** to be on transponder 24. The Maclean-Hunter terminal was equipped with 24 crystals (one for each transponder) **but** none of those 24 were on transponder 24! **That was another one of Murphy's tricks.** So some frantic re-arrangements by RCA's Don Pidgeon and RCA Vernon Valley allowed us to get **out** on 10. Then with the cooperation of RCA Americom we were cross-strapped at Vernon Valley and re-transmitted out via F1 again on transponder 24 (where as you all know we were supposed to be all along). That created another couple of firsts for CCOS; the first double-hop (up and down on 10, back up and subsequently down on 24) and the first two-transponder use for (almost) simultaneous satellite transmission of an event carried solely within the U.S.A.

We cannot say enough good things about the cooperation, the bending of rules and corporate policy or the super assistance that the CCOS uplink telecast experienced from RCA. They came through when the chips were down, and their Don Pidgeon has got to be the greatest practical satellite uplink engineer walking around loose in the world today.

Getting up, against tremendous odds, was the big story coming out of CCOS '78 but it was hardly the full story. When we finally got onto the bird Tuesday morning the telephone calls started rolling into Fountainhead Lodge from all across the North American continent. A chap in Oregon called to ask us about some solar panels he had seen Oliver Swan discuss on the 8 AM Coop's Corner telecast; a lady in the Yukon called to ask us why her husband had a red face (that was Rod Wheeler's wife watching on their private terminal); a Florida operator wanted to thank us for

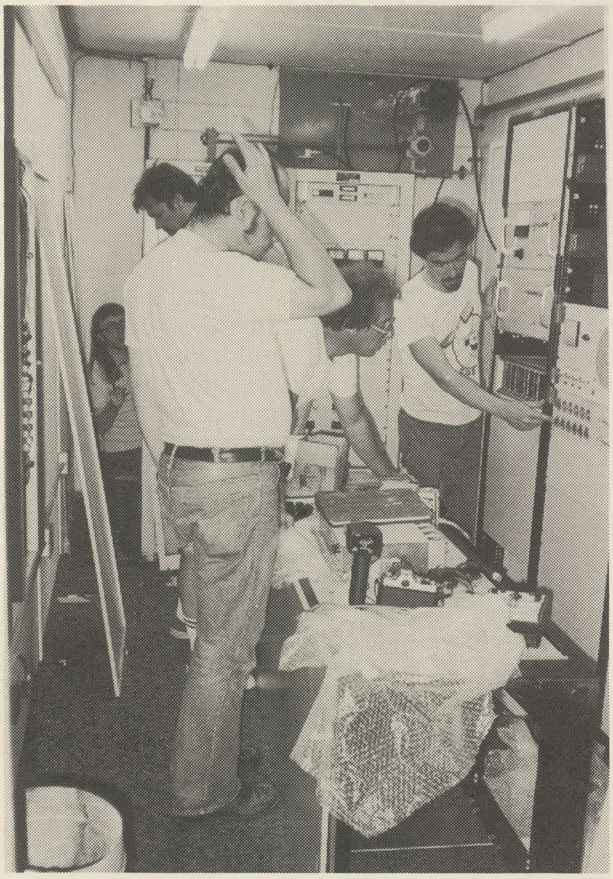


WOULD YOU BELIEVE A BIRD NEST!!! Tony Bickel, buried inside the transmitter rack, discovers a nest of straw in the klystron cavity. At 5 AM in the morning nobody was surprised about anything.

covering a problem he was having with his TVRO receive site in a mid-morning panel, and so on. The Microdyne plant staff, watching **their** David Alvarez on the 'tube' promptly went out and brought young David a pair of Hollywood sun glasses and a scarf. And then there was the cable operator who unpacked his TVRO receiver Tuesday morning, hooked it up on transponder 24 and turned it on. When he saw the CCOS telecast he promptly called the supplier and complained. . .not about CCOS (we hope!) but rather that he had been sent a receiver "on the wrong channel". **He just knew** he was supposed to be getting HBO **on 24;** not some bunch of "clowns" in Oklahoma playing television!

The full CCOS story is much too big to tell here in the August issue of CATJ. We will do better next month as we attempt to sort out the pieces, review the master "air-check" tapes made of the sessions (**Yes. . .we did** put it all on master tapes and they will be made available in some form, either entirely or in program-pieces, this fall) and wade through the telephone calls, telegrams and letter that are already piling up in our offices as we head to press with this interim report.

Technically, the sessions were superb. We were forced into the small-studio approach by the confines of the premises. **The biggest complaint** we heard was from people who would have prefered to be able to attend the "live" sessions and not be forced to watch the telecast on the projection receivers scattered throughout the lodge or on their in-room TV receivers. **We agree. . .**everyone **should** have the opportunity to be "where it is happening". And next year there will be expanded seating for several hundred people per session. Through the magnificent cooperation of the **General Electric Company,** CCOS '78 had a ten foot GE theater projection screen system in the exhibit hall, and, three of the new GE Widescreen 1000 (50 inch) projection sets scattered throughout the lodge. Everywhere you turned CCOS was "on screen". Ed Taylor told us after the close down Wednesday that he has been wrestling with a conceptual problem for the new Holiday Inns satellite service; trying to determine **how** big groups could hold meetings at (say) one Holiday Inn location, and then share those sessions nationwide via satellite. **"Your approach of bringing three or four or five knowledgeable people into a small studio where they could relax in a round table atmosphere and kick around the subject matter looks like the right approach for our Holiday Inn program as well"** noted Taylor. **"Thank you for proving it can work and work well".** You are welcome Ed.



THE CLOCK IS RUNNING—England's Birkill (far left behind transmitter rack), Big Ralph Haimowitz (behind ITC's Pete Warren in foreground), Bickel (to right of Warren) and Yukon's Rod Wheeler (far right) start the check out sequence.

Throughout the CCOS period there was considerable concern on the part of **established** suppliers who did not take kindly to the appearance, on site, of "private terminal equipment"; largely from suppliers not previously in the TVRO marketplace. Duke Brown of Microwave Associates said it best when he noted **"I am concerned that cable operators will look at a $2700 price tag twenty-four channel receiver with switchable 6.2 and 6.8 MHz sub-carrier audio and other typically home-terminal features, and figure that type of receiver is** good enough **for their tuneable needs for their systems. We all know that this new breed of home or private terminal gear is** not **capable of maintaining specs which the commercial gear is built to and that there are many shortcuts in that type of receiving equipment. I hope the CATV operator does not let the price tag get in the way of his good judgement".** Duke's concern is well taken; the Northern Satellite System receiver just described was developed jointly by RDC's Steve Richey and Rod Wheeler for a particular application in Canada where private terminals are just now starting to come on line. The project's backer, Rod Wheeler, is in fact adament that he does **not** recommend the receiver be utilized for CATV terminal use primarily because **"there are shortcuts in the receiver design which for long term use the CATV user would not find satisfactory".** But for backyard terminals? Well, that is a quite different story.

Another at-CCOS-news item that missed most people held the hope that **perhaps** the present crunch relating to NEC GaAs-FETS may be

FROM THE STUDIO—Microwave Associates' Duke Brown (left), Steve Richey, International Microwave's John Coiro and Norm Wilcox (right) discuss the current status of low cost microwave gear.

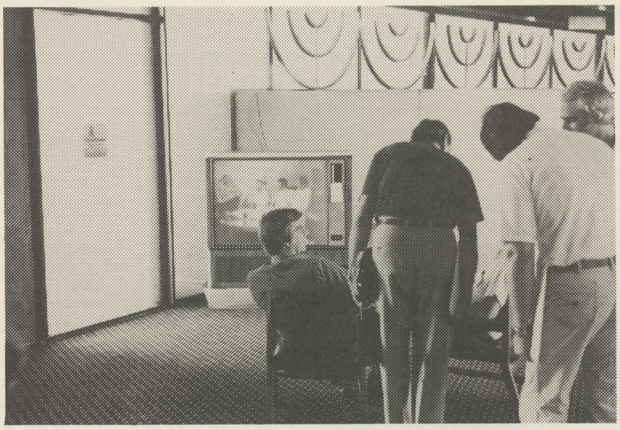
broken soon. **Hewlett Packard** will, by the middle of August, be announcing a new 1/2 micron GaAs-FET device with an 85 degree Kelvin device noise temperature at 4 GHz (that's 1.1 dB) and 14 dB of gain. Price of the new HP device is to be in the $250-$300 range per device (at or slightly lower than the present NEC devices) and they tell us the delivery will be "rapid and regular". The same device has a 3.0 dB noise figure and 9 dB of gain at 12 GHz; a set of specs which excited England's Steve Birkill because of his work with the new OTS bird now operating in Europe.

Another new receiver seen for the first time at CCOS came from **SATCO** (Lewisville, Texas). This receiver utilizes a master and slave approach where the master receiver takes a 4 GHz input signal down to baseband video and audio, **plus,** it provides a output of the broadband UHF region high IF so that one or more **additional** receivers can be fed **from** the master receiver. The slave receivers operate as UHF (high IF) input receivers that take the input signal to demodulated baseband audio and video. The concept is that there is only one master 4 GHz to high UHF IF converter stage; thereby removing the high cost of these front-end-of-receiver stages from subsequent channels to be demodulated to baseband. This brings the pricing down; the master receiver is a $3500 price range single channel receiver while the slaves that plug into it are around $1800 each. If you add up say four channels of satellite service using their master plus (three) slaves approach you come to around $2200 per channel.

In the September issue of CATJ we will have a much more extensive report on the actual sessions, what was said and who said it. The 1979 CCOS will be held at Lake Geneva, Wisconsin and because there are twin uplink terminals at Lake Geneva for both RCA and Western Union (within approximately 4 miles of the CCOS

THE UPLINK TERMINAL—with the 11 meter constructed-by-hand 12 ton transmit antenna with the 8 by 8 by 16 foot electronics enclosure sitting beneath the dish for the waveguide connection, and then to. . .

1979 site) you can be reasonably sure that uplinking of the CCOS '79 program will occur. In the interim the industry can be exceedingly proud that it did pull this one off, and that once again cable television has innovated to push just a little bit further the frontiers of technology.



THE SATELLITE where it was transmitted via transponder 10 back to RCA Americom in Vernon Valley and then re-transmitted on transponder 24 coast to coast and border to border to TVRO receive sites including the CCOS receive site where seminar attendees watched the proceedings less than 100 feet from the studio, delayed by a full half second after having traveled nearly 90,000 miles, on wide-screen projection receivers!

Feed Forward Arrives

225 MILE TRUNK RUN IS FEATURED IN NEW MANITOBA INTERCITY BROADBAND COMMUNICATIONS SYSTEM

by
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Introduction

The initial spur to the development of an intercity broadband delivery network in southern Manitoba occurred in August of 1975 when the Canadian Radio-Television and Telecommunications Commission (CRTC) issued a call requesting CATV licence applications for the three largest southern communities **outside of Metropolitan Winnipeg:** Brandon (Manitoba's second largest city), Portage la Prairie and Selkirk. In September of 1976 licences were awarded for these three communities, and several weeks later the Commission advised it would consider CATV licence applications from other rural communities in southern Manitoba.

On November 10, 1976 the Federal Minister of Communications and Manitoba's Minister responsible for Communications, announced they had jointly signed what has come to be called the Manitoba-Canada Agreement. This Agreement clarified the responsibilities of each level of government with respect to broadband services. Federal jurisdiction over broadcast programming services, including Pay Television, was clearly upheld, while provincial jurisdiction over telecommunications services and the right of the Manitoba Telephone System, a publicly owned utility, to own and maintain the broadband delivery hardware was recognized. The stage was set for MTS to provide the intra and inter-city facilities which would comprise a broadband "electronic highway" open to transmission use by CATV operators,

Wiring all of the principal communities in a Canadian province could be quite a chore. Manitoba Telephone System is working on previously uncharted ground as they set out with the latest feed-forward amplifier techniques to deliver 8 'forward' direction channels through ¾ inch trunk systems approaching 225 miles in length. Nothing quite like this has ever been attempted previously in CATV and while such techniques may ultimately prove to be very useful in rural regions, there are many applications for 'superlinear trunks' in metropolitan regions as well.

This is not a blue sky system. **A 60 mile test system has been in operation since February of 1978; connecting Selkirk, Manitoba to Winnipeg and back again via a 60 mile 'superlinear' trunk. Brandon, Portgage la Prairie and Carberry will receive service this September while Rivers, Minnedosa, Neepawa, Gladstone, Stonewall, Teulon and Beausejour are scheduled for service on December 1 of this year. The balance of 25 communities will be served by the fall of 1979.**

In selecting this particular cabled approach to wiring rural Manitoba, the system operator carefully considered several other present and 'promising' forms of technology. This included fiber optic cable, 8 GHz microwave and 15 GHz microwave. Similar studies were done to study AM transmissions systems versus various FM (wide deviation) systems. For the reasons stated in the report here, conventional 6 MHz wide NTSC transmission was chosen in conjunction with the application on ultra-modern 'superlinear' feed forward trunk systems. Writer W.E. (Bill) Evans notes 'Progress with technology in the NTSC 6 MHz wide format is not dead. . . "the new Digital Noise Reduction units from CBS Labs, Telemation and others promise the provision of 60 dB SNR using the standard 6 MHz wide channel format over distances as great as 200 miles" **of trunking.**

Another postulation offered to the Manitoba system operator was the delivery of three network signals, the Canadian (CTV) independent service, a Canadian education channel, a U.S. PBS channel and the House of Commons telecasts via ANIK satellite relay. The satellite system proposed was based upon service to not only Manitoba but throughout Canada at the base rate of 90 cents per subscriber per month for 7 channels of satellite delivered programming. Evans notes "The Manitoba Telephone System quotation is for four U.S. signals to be delivered to the rural Manitoba systems at a rate of 65 cents per subscriber per month, all inclusive. The Telesat (ANIK) proposal really amounts to around $1.70 per month per subscriber when ground station 'civil works costs' are included. Moreover of the three 'extra channels' proposed via Telesat, CTV is already available off-air in all communities, ETV is a provincial responsibility (and Manitoba has yet to add it in that province); leaving just the Parliamentary telecasts from Ottawa as an added service".

government agencies, educators, medical interests and business entrepreneurs.

The broadcast television signals available in southern Manitoba at present, or in the foreseeable future, which will require intercity transmission either to all CATV communities or on a regional basis to some communities, are summarized as follows:

(1) The **three U.S.** commercial networks (ABC, CBS, NBC).
(2) The **U.S.** Public Broadcasting Services (PBS).
(3) The **Winnipeg** English independent station.
(4) The **CBC French** service.
(5) Regional **community** programming.
(6) Regional **educational** programming.
(7) Provincial **educational** television.
(8) Possible services delivered via satellite to regional earth stations such as
    —Parliamentary telecasts
    —Second CBC service (TV-2)
    —Independent French service (TVA).

In addition to broadcast television signal carriage, market projections indicate a considerable potential for inter-city transmission of new broadband telecommunications services such as high-speed data and facsimile, teleconferencing, and closed-circuit medical and educational television services.

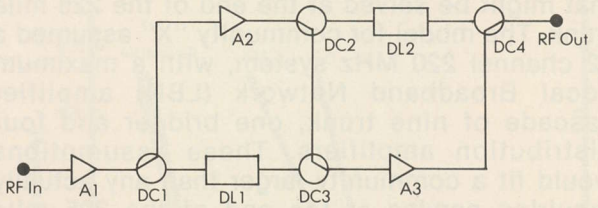
The substantial bandwidth requirements of these existing and potential services, coupled with the need to provide CATV service to all major communities in southern Manitoba no later than September 1979, stimulated serious MTS interest in development of a coaxial cable inter-city trunk system, using superlinear amplifiers. Installation of the cable, using the ploughing technique, was known to be highly attractive from an economic viewpoint by virtue of southern Manitoba's ideal terrain and soil conditions.

Key to the entire concept was the development of a broadband amplifier with internal noise and distortion generation low enough to permit cascaded amplifier system lengths substantially in excess of the permissible standard CATV trunk length of some 30 miles. The feed-forward amplifier technique seemed to offer the potential required.

Feed-Forward Concept

The principle of feed-forward is not really new and actually predates the more common negative feedback technique by over a decade. Because of the extensive development of negative feedback, the use of feed-forward for error control in CATV amplifiers has until recently been largely overlooked.

The basic block diagram (**figure 1**) of a feed-forward amplifier shows that it consists of a pre-amplifier (A1), two amplifiers or gain blocks (A2 and A3), two delay lines (DL 1 and DL 2), and four directional couplers (DC 1 to 4). To significantly reduce the distortion inherent in the signal output of the main amplifier (A2), a small portion of the distortion is first extracted by subtracting



BASIC BLOCK OF FEED FORWARD AMPLIFIER

Figure 1

the input signal, after an appropriate delay through DL 1, from the output of the main amplifier. The extracted error signal, now appearing at the output of DC 3, is then amplified by the error amplifier (A3) to an appropriate level, and is subsequently combined through DC 4 in opposite phase with the main amplifier output signal. This results in the cancellation of the majority of the distortion signals produced in the main amplifier. This ability to cancel the distortion products of the amplifier allows the implementation of relatively long coaxial cable systems while still maintaining a quality signal at the far end.

The key to the feed-forward concept is the recognition that the amplitudes and phases of the signals on the upper and lower paths of each stage be **perfectly** matched. To take advantage of the full benefits available with the feed-forward output stage, one must consider utilizing feed-forward design in the preamplifier itself, since otherwise it may become the limiting stage for distortion production. In fact, both preamplifier and output stages may be virtually identical sharing the gain requirements of the overall Superlinear Amplifier.

Investigations into feed-forward developments by Manitoba Telephone System design engineers gave optimism for up to **20-30 dB improvements in distortion performance** over the conventional broadband CATV amplifiers.[1,2,3,4]

System Characterization Development

Awareness of the developments in feed-forward design prompted Manitoba Telephone System engineers to initiate a preliminary system study in May 1976. The purpose of the study was to investigate the feasibility of constructing a coaxial cable trunk facility utilizing superlinear amplifiers.

The origination point of the system was assumed to be the City of Winnipeg, the major cultural and economic centre of the province. **A distance limit of 225 miles was selected as the maximum trunk length** thereby covering most of southern Manitoba. The three major communities to be potentially served by the system would be Selkirk, Portage la Prairie and Brandon, 26 miles, 52 miles and 132 miles respectively from Winnipeg.

Prior to determining the transmission performance requirements of the trunk, it was

necessary to model a hypothetical community that might be served at the end of the 225 mile trunk. The model for community "X" assumed a 12 channel 220 MHz system, with a maximum Local Broadband Network (LBN) amplifier cascade of nine trunk, one bridger and four distribution amplifiers. These assumptions would fit a community larger than any actually requiring service at the end of the 225 mile system. The calculated transmission performance parameters of community "X", when combined with the Intercity Broadband Network trunk values, must equal or better the Canadian Department of Communications Broadcast Procedure #23 minimum requirements at the worst case subscriber's television receiver location. It was considered to be advantageous to consider the BP-23 requirements as "bare minimum" and in turn select more stringent objectives for a higher quality signal to the subscriber.[5]

TABLE 1

OVERALL MTS TRANSMISSION PERFORMANCE OBJECTIVES FOR A 225 MILE ICBN

	Community "X" Parameters	+ ICBN Supertrunk Parameters	= MTS Overall Preferred Minimums	BP-23 Minimum
Signal-to-noise Ratio	53 dB	45 dB	44 dB	40 dB
Crossmodulation Distortion	– 59	– 57	– 52	– 48
Second Order Distortion	– 63	– 65	– 61	– 57
Hum Modulation	– 43	– 40	– 35	– 34

The Manitoba Telephone System overall Preferred Transmission Minimum parameters were based on providing the subscriber with a picture that 90% of the viewers would consider to be fine or better (60% of viewers consider excellent).[6] Through a process of interpolation, the Intercity Broadband Network trunk minimum transmission objectives were developed, from the community "X" contribution, to meet the MTS overall Preferred Transmission levels.

The technical feasibility of constructing a coaxial cable system to meet the Intercity Broadband Network minimum transmission levels was confirmed by applying anticipated feed-forward amplifier distortion product performance improvement values. Optimizing amplifier input and output levels to various low loss large diameter coaxial cables provided the proposed spacing of the amplifiers and expected signal-to-noise ratio. This resulted in the development of a System Specification, as well as a Superlinear Amplifier Specification which were made available to North American and European broadband equipment manufacturers in the fall of 1976.

System Specification Highlights

The System Specification basically calls for a 75 ohm system, utilizing **conventional** 6 MHz **AM** vestigial side band transmission with amplifiers employing feed-forward linearization techniques. The system performance objectives must be met or exceeded through the ultimate maximum length of 225 miles for **eight "forward" channels** in the **50 to 106** MHz band, and for **four "reverse" channels** in the band of **5 to 30** MHz through duplex operation over a single coaxial cable. The majority of any route is expected to traverse terrain suitable for direct ploughing of the cable, taking advantage of the economics of this mode of construction.

Superlinear Amplifier Specification Highlights

The Superlinear Amplifier specification now in its second issue calls for an amplifier meeting the system requirements when cascaded for 225 miles. The amplifier is modular in design containing the forward and reverse amplifier modules, diplexing filters, status monitoring modules, redundant power supply module and the necessary AC, RF and DC test points. The power modules operate from a 100 volt (rms) 60 Hertz quasi square wave source, allowing as many as nine amplifiers to be powered from one supply. The main power supplies are field mounted uninterruptable units equipped with batteries to provide power in the event of commercial A.C. failure. The forward amplifier module operates within the band of 50 to 106 MHz with a nominal gain of 30 dB at 106 MHz. The normal operating **input level** to the amplifier will be **17 dBmV** and the **output level + 47 dBmV** at 106 MHz. The noise figure of the amplifier does not exceed 8 dB across the operating bandwidth. The performance requirements are detailed in **Table 2**, with the corresponding typical ICBN transmission performance graphed in **figure 2.**

TABLE 2

SUPERLINEAR AMPLIFIER SPECIFICATION FEED-FORWARD AMPLIFIER PERFORMANCE OBJECTIVES

Crossmodulation	– 106 dB (8 channel synchronous loading at + 47 dBmV)
Second Order Distortion	– 88 dB (at + 47 dBmV output)
Triple Beat Products	– 115 dB (at + 47 dBmV output)
Hum Modulation	– 66 dB (rms video during synchronizing pulse interval to peak-to-peak hum)

The reverse amplifier module operates within the band of 5 to 30 MHz with a nominal gain of 16 dB at 30 MHz. The normal operating input level to the amplifier will be 19 dBmV and the output level + 35 dBmV. The noise figure of the amplifier does not exceed 11 dB across its operating bandwidth.

TABLE 3

SUPERLINEAR AMPLIFIER SPECIFICATION REVERSE AMPLIFIER PERFORMANCE OBJECTIVES

Crossmodulation	– 103 dB (4 channel synchronous loading at + 35 dBmV)
Second Order Distortion	– 86 dB (at + 35 dBmV output)
Triple Beat Products	– 106 dB (at + 35 dBmV output)
Hum Modulation	– 58 dB (rms video during synchronizing pulse interval to peak-to-peak hum)

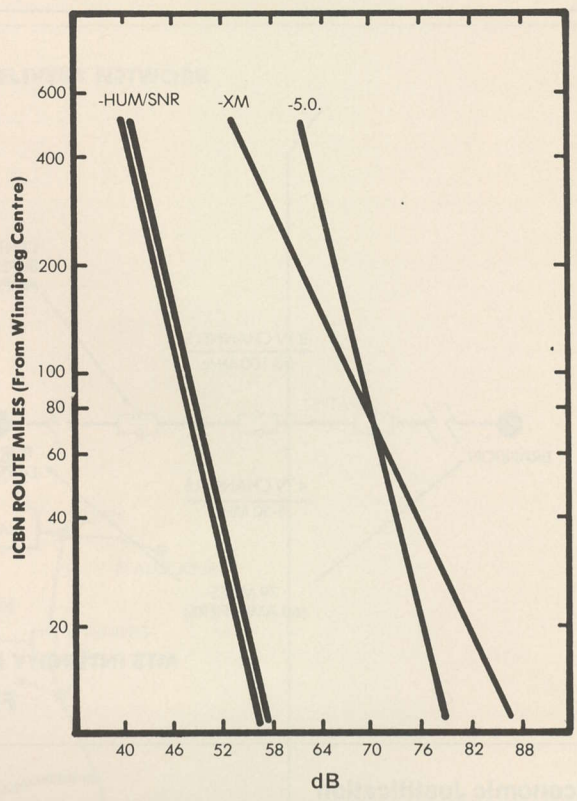
Each amplifier is equipped with a microprocessor based status monitoring and fault locate transponder which can be interrogated from the head end origination point via the downstream path (50 to 106 MHz) and the

transponder status information is returned via the upstream path (5 to 30 MHz). The status monitor transponder is equipped to provide two analog measurement channels, six on-off control functions, four on-off limit functions, and a distortion analyzer function, to indicate failure or degradation of a feed-forward amplifier stage. The head end terminal for the status monitoring system is capable of interrogating and analyzing up to 256 amplifier stations and consists of a microprocessor based video display terminal with hard copy output and keyboard instruction entry. A telephone touch-tone interface is also provided for remote command insertion.

Manufacturer Selection

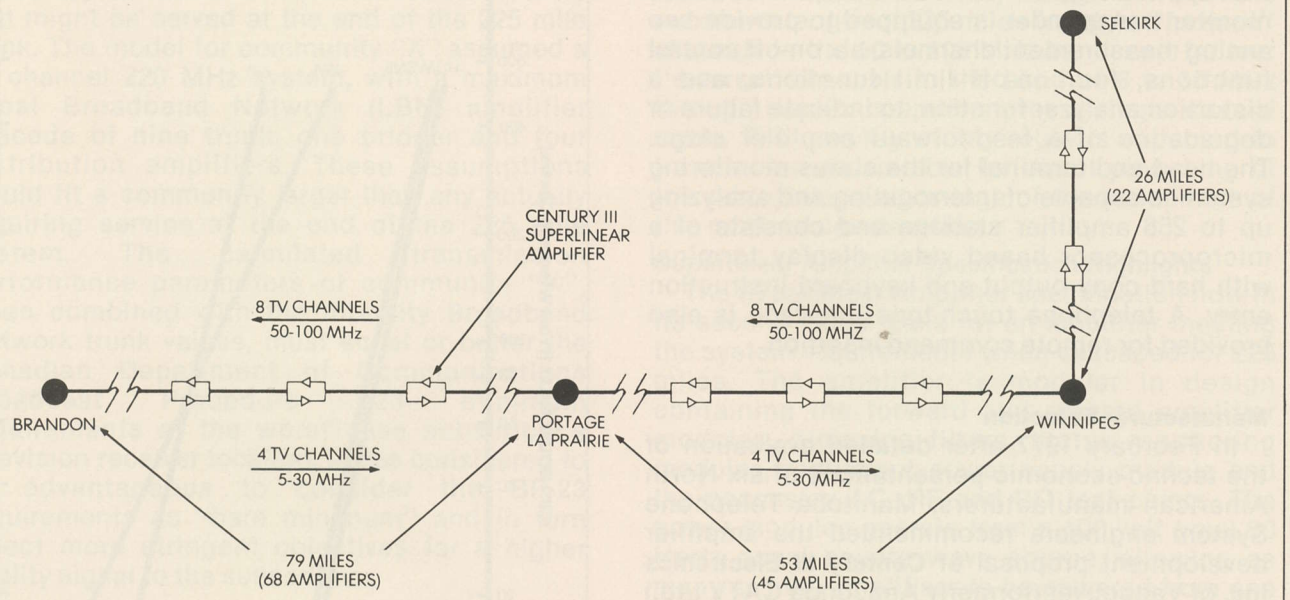
In February 1977 after detailed evaluation of the techno-economic persentations of six North American manufacturers, Manitoba Telephone System engineers recommended the amplifier development proposal of **Century III Electronics Inc.** of Vancouver (formerly Anaconda CATV Ltd.) as best meeting the requirements of performance, product availability and cost.

Also important to the economic and technical viability of the system is the selection of a suitable coaxial cable. **General Cable** 0.750 inch Fused Disc Coaxial Cable was selected for the initial ICBN systems. This cable offered the advantage of low loss, thereby reducing electronic costs which, for this system, are higher than conventional broadband amplifiers.



TYPICAL ICBN TRANSMISSION PERFORMANCE (Forward Amplifier—8 Channel Loading)

Figure 2



MTS INTERCITY BROADBAND NETWORK

Figure 3

Economic Justification

In November 1976 a cost/benefit comparison of the proposed Intercity Broadband coaxial system was made with currently available 8 GHz microwave radio on an overbuild basis for delivery of television channels from Winnipeg to the communities of Selkirk, Portage la Prairie and Brandon. Though initial capital costs for constructing the ICBN systems were similar to microwave for a basic requirement of three channels, it was obvious that the coaxial cable system offered significant savings in cost per channel for five or more channels. There was also the added bonus of the reverse channels on the coaxial system. With this economic advantage defined, the Manitoba Telephone System proceeded with the design and development of all phases of the Intercity Broadband Network project.

Performance Testing

In October 1977, extensive performance tests were completed at the National Research Council Vancouver environmental test chamber on 20 Century III superlinear amplifiers; a cascade equivalent to a 24 mile working system. These tests conducted in temperatures ranging from -32°C to +55°C, confirmed Century III's compliance with the specification, as well as the operational capabilities of the status monitoring system. Based upon the success of these tests, Manitoba Telephone System signed a contract with Century III for the provision of amplifiers for the two routes serving Selkirk, Portage la Prairie and Brandon. Since that time, the Winnipeg to Selkirk system (**figure 3**) has been completed and is now under evaluation. Test results (**table 4**) indicate that the ICBN system meets all requirements imposed by the applicable specifications. Construction has now commenced on the Winnipeg to Portage la Prairie and Brandon route, with turn-up anticipated in the fall of 1978.

TABLE 4

INTERCITY BROADBAND NETWORK
WINNIPEG-SELKIRK
MEASURED TRANSMISSION PERFORMANCE
(26 MILES, 23 AMPLIFIER CASCADE, 8 CHANNEL LOADING)

Signal-to-noise	57 dB
Crossmodulation	−88 dB
Intermodulation Products	−85 dB
Hum	−55 dB

Overall Network Technology Definition

In order to define the optimum technology, from a cost/capability viewpoint, for the overall network extending beyond Brandon, Portage la Prairie and Selkirk to the other 26 rural communities, intensive studies were made in late 1977 and early 1978 to compare the ICBN technology with both conventional 8 GHz microwave and new 12/15 GHz Very High Capacity Microwave (VHCM), developed in the United States for multi-channel CATV delivery.

The cost studies compared ICBN system construction generally with overbuilt microwave or VHCM since MTS has existing towers, buildings and land in most of the rural communities. Three fundamental selection criteria were used to compare the technologies:

(1) **Network configurations** would include both communities now licensed for CATV and those likely to be licensed in the near future.
(2) **A minimum channel capacity** of five was required in the western part of the province —four in the east.
(3) **The technology selected** should allow minimization of total capital costs—MTS costs,

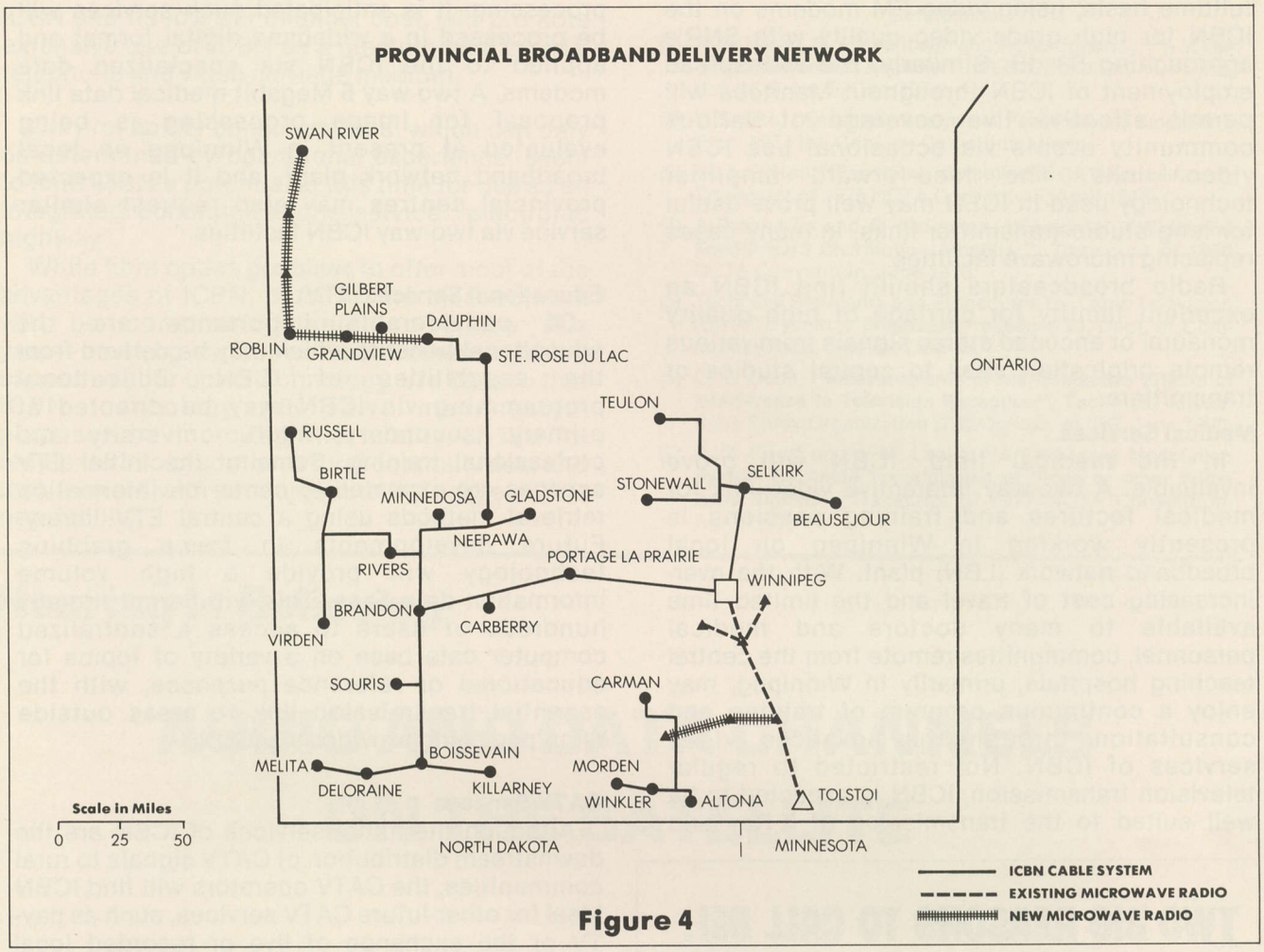


Figure 4

plus those of the CATV operator. Tradeoffs exist between CATV operator head end requirements and MTS terminal equipment costs. VHCM and ICBN can, in fact, eliminate the need for local head ends in all communities, whereas conventional microwave cannot at reasonable cost.

In spite of the obvious cost economics realized in overbuilding VHCM and conventional microwave, ICBN technology was generally favoured for most parts of the proposed broadband network. **Conventional 8 GHz microwave radio will be employed** in the northern communities **beyond the 225 mile system** limitation and for three and four channel trunks in the area south of Winnipeg. VHCM did **not** prove advantageous in **any** part of the network, although it was very close where the configuration of communities was star-shaped.

In general, ICBN proves more favourable than microwave whenever the required number of television channels exceeds four or five. ICBN lends itself to a grid configuration, allowing relatively easy and inexpensive CATV service addition of communities either on or off the trunk routes. Future addition of service communities is much easier with ICBN than with either VHCM or conventional microwave.

Future Transmission Improvements

The development of a feed-forward superlinear amplifier offering a 106 MHz upper band is only the first step in the possible transmission performance enhancement process considered to be attainable. The use of modulation techniques differing from the NTSC standard AM vestigial sideband (VSB) format, such as suppressed carrier VSB or FM transmission, can produce further improvements to received signal picture quality. The employment of FM transmission is reported to offer improvements in SNR ranging from 10 to 15 dB, **but at the cost of greater channel bandwidth.**[7] Suppressed carrier VSB would result in reduction of crossmodulation and intermodulation products of 12 and 6 dB respectively.

Future Services

Although primarily intended for CATV signal delivery, a host of other broadband services are expected to be readily accommodated with the advent of ICBN. These services encompass many fields, but may be broadly categorized into the Broadcast, Medical, Educational, CATV, Data and Telephony technologies.

Broadcast Services

Planned future television broadcast uses include intra-provincial transportation of

network video to remote transmitter sites on a fulltime basis, using video FM modems on the ICBN for high grade video quality with SNR's approaching 60 dB. Similarly, the widespread employment of ICBN throughout Manitoba will permit effective live coverage of various community events via occasional use ICBN video links. The feed-forward amplifier technology used in ICBN may well prove useful for long studio transmitter links, in many cases replacing microwave facilities.

Radio broadcasters should find ICBN an excellent facility for carriage of high quality monaural or encoded stereo signals from various remote origination sites to central studios or transmitters.

Medical Services

In the medical field, ICBN will prove invaluable. A two-way interactive video link for medical lectures and training sessions is presently working in Winnipeg on local broadband network (LBN) plant. With the ever-increasing cost of travel and the limited time available to many doctors and medical personnel, communities remote from the central teaching hospitals, primarily in Winnipeg, may enjoy a continuous program of training and consultation through the advanced video services of ICBN. Not restricted to regular television transmission, ICBN is expected to be well suited to the transmission of X-Ray and other medical scan operations through image processing. It is anticipated such services will be processed in a wideband digital format and applied to the ICBN via specialized data modems. A two-way 5 Megabit medical data link proposal for image processing is being evaluated at present in Winnipeg on local broadband network plant, and it is expected provincial centres may also request similar service via two-way ICBN facilities.

Educational Services (ETV)

Of considerable importance are the educational benefits which may be derived from the capabilities of ICBN. Educational programming via ICBN may be directed at primary, secondary, adult, university and professional training. Some of the initial ETV services are expected to center on information retrieval methods using a central ETV library. Future developments in frame grabbing technology will provide a high volume information data base. This will permit literally hundreds of users to access a centralized computer data base on a variety of topics for educational or reference purposes, with the essential transmission link to areas outside Winnipeg being provided via ICBN.

CATV Services

Although the initial services of ICBN are the downstream distribution of CATV signals to rural communities, the CATV operators will find ICBN ideal for other future CATV services, such as pay-TV or the exchange of live or recorded local programming material via the two-way intercity capability of ICBN.

Data Services

Data transmission on ICBN is in general, usually limited only by the capability of the data modems. As previously mentioned, the ICBN is ideally suited to high speed transmission of data at rates currently unachievable by normal telephone facilities. The flexibility of ICBN permits the mixing of both slow and high speed services as required by the user, with only data modem changes necessary. No line conditioning is required on ICBN as is on conventional paired wire facilities. The variety of data services that could be provided ranges from low speed teletype services to medium speed FAX services, to very high speed data services such as image processing.

Telephony Services

Conventional ICBN is expected to also play a useful role in the carriage of voice circuit transmission. Experimentation is underway to evaluate the provision of telephone voice circuits using PCM digital modulation, as well as analog multiplex techniques. Up to five T1 streams may be carried on one television channel or analog techniques may permit carriage of 300-600 voice channels with existing technology. Indeed the wideband capability of

ICBN and its low per channel cost, will promote extensive use of ICBN as a medium haul coaxial telephone and video carriage medium.

Only reliability considerations, which can only be determined by operational experience, seem to limit ICBN's potential at this time for use as an integrated communications service "electronic highway".

While fibre optics **promises** to offer most of the advantages of ICBN, much of the MTS network will be constructed and in service **this year**—meeting customer requirements which cannot **wait** for optic technology. We believe that ICBN technology will serve many useful purposes in improving the quality of life for residents of our southern rural communities, and look forward with excitement to the usage of this new facility.

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Hearing Is Believing

AUDIO AND DATA CHANNELS ON THE SATELLITE

You Don't Hear It

Perhaps you have run your tuneable 24 channel TVRO receiver through the transponders and noticed that whenever you switch through transponders 2 or 10 (on SATCOM II; 10 only **prior to** the start up of SHOWTIME service on March 7th) that there is a modulation pattern present. **It doesn't look like video,** and the audio either hisses or growls at you, so you move on not quite sure what to make of it. But certain that unless you can see a picture there, nothing of much interest is happening.

You are probably right. What's happening there is not of much direct interest to CATV types, at least not right now. Not unless you are one of those visionaries who sees your terminal as a 'gateway to the world'; a device through which many different forms of communications will one day be routed to your town.

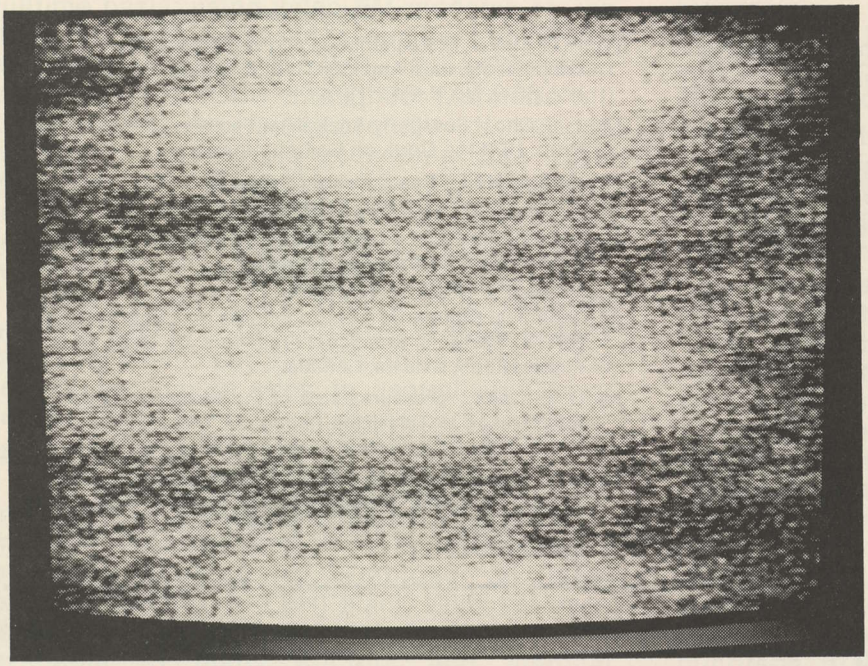
Transponders 2 and (until now) 10 have been in use on SATCOM II for quite some time for voice and data transmission. When satellite communication types talk about transponders they speak in terms of data-capacity-per-transponder. When we speak of television, we think in terms of a single high quality television signal (with accompanying aural sub carrier) per transponder; or for Alaska, two video carrier per transponder (the so-called 'half-transponder' format). With 24 transponders available, that works out to 24 high quality video (plus) audio channels per bird, or 48 lesser quality half transponder video (plus audio) channels per bird.

But the same 40 MHz wide transponder that can accomodate a **single** television signal can alternately accomodate **as many as 900** (one-way) voice channels using something called **frequency division multiplex** (FDM-fm), or, **500 single channel per carrier** (SCPC signals (fm-FDMA), **or** 60 Mb per second of digital data. In other words, television transmission is with satellites as with all spectrum uses and users a rather inefficient transmission system and for the same equivilent 'bird-space' a great deal more 'intelligence' can be accomodated.

As with all things in communi-

This report, detailing audio and data transmission services via satellite, was prepared last February. In it we make frequent reference to SATCOM II and specific transponders (on which audio data was at the time being transmitted in the SCPC format). **Subsequently the SCPC-in-use transponders were moved off of F2 to F1 and there they now occupy vertical transponders.**

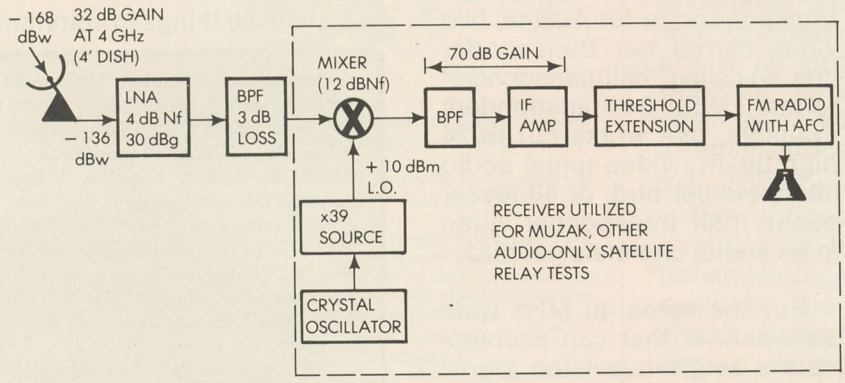
Anyone looking for SCPC signals these days will find them either on the vertical transponders on F1 or on some of the prior-video (horizontal) **transponders of F2.**



NO VIDEO HERE—typical appearance of transponder channel on TVRO video monitor when the transponder is carrying multiple audio services. Light and gray areas constantly move about as modulation parameters of received transponder bandwidth change.

cations, it sort of boils down to money. **For example,** if a full time TV carriage transponder user is paying $100,000 per month for 24 hour use of a bird channel (that's about $2.31[5] per minute), the people who lease out the satellite could realize the same gross income **if** they leased out **900** voice-grade channels **for $111.11 each** per month. In theory, then, a company could rent **fulltime** interconnection between say a Los Angeles office and a New York City office for just a tad over $100 a month for the satellite portion of the interconnection. It will be this type of economy which will appear when the SBS satellite system is put into operation early in the 1980's. Even today satellite rates are far less costly than standard terrestrial microwave or bell circuits. For example, Hewlett-Packard leases a satellite circuit from Rolling Meadows, Illinois to its Palo Alto (California) headquarters for $1,050 per month; some 40% lower than the AT&T terrestrial circuit. PPG Industries looked at leasing a circuit from Pittsburgh (Pennsylvania) to San Francisco. Bell bid $1,388 a month while a private carrier (SP Communications) offered a terrestrial link for $990. RCA came along with a satellite link bid of $705 per month.

The system, how it works, and what is being done with it today is the subject of our interest here this month.



TYPICAL DEDICATED-AUDIO RECEIVE SITE (SIMILAR TO THAT TO BE UTILIZED BY MUTUAL)

Smaller Everything

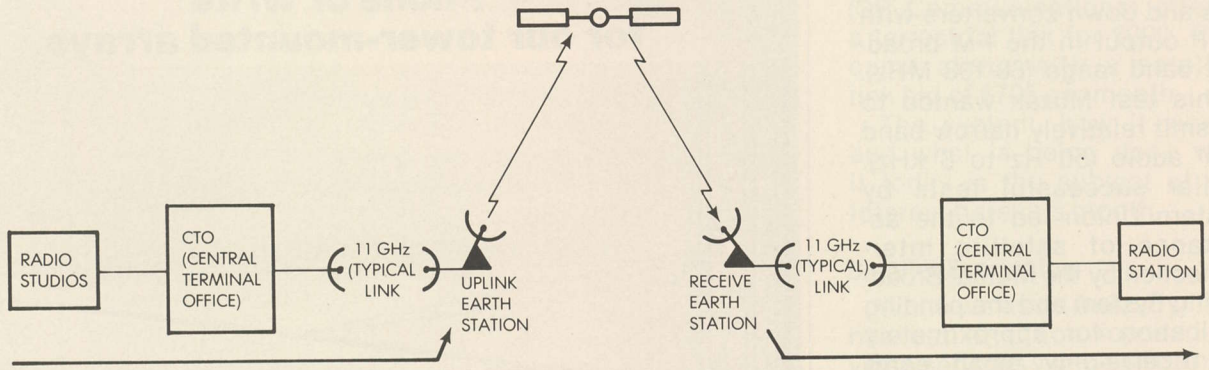
While we as an industry have had our attention focused on video services via the bird, there has been a fair amount of activity with the audio people as well. On the SATCOM birds the major voice activity is over on the Alaskan bird (presently F2) where RCA provides the majority of the intra and inter state voice grade communications to the 49th state. RCA installed a dozen terminals (from the 98 foot or 30 meter antenna at Bartlett/Anchorage to the 4.5 meter terminal at Dillingham) to provide **two-way voice grade** communications both within (intra) and outside of (inter) the state of Alaska. FDM-fm is utilized between Juneau and terminals throughout the state in communities such as Nome, Cordova and Bethel. Between Juneau and Anchorage there is fm-FDMA (SCPC) service while Alaska communicates with the balance of the country through another FDM-fm circuit that terminates in the big 48 at Point Reyes (California) via the Anchorage terminal. This Alaskan system is currently preparing for another large expansion and bid awards are expected shortly to construct additional terminals.

Over on SATCOM I, or 'our bird' (for now) voice communication circuits have been slower to catch on. **One of the earliest demonstrations** of potential mass use of satellite interconnection was conducted during the summer of 1975 when the Muzak Corporation used Westar I and the RCA uplink facilities at Valley Forge, Pennsylvania to link six different sites (border to border, coast to coast) with background music service. This test **(see diagram here)** utilized 4 foot parabolic antennas, 30 dB gain rather modest noise

specification (4 dB NF) amplifiers and down converters with an IF output in the FM broadcast band range (88-108 MHz). In this test Muzak wanted to transmit relatively narrow-band 'hi-fi' audio (50 Hz to 8 kHz). Similar successful tests by Western Union led to the acceptance of satellite interconnection by the Mutual Broadcasting System and the pending application for approximately 500 receive-only small earth terminals now before the Commission (see CATJ for January, page 42).

The basic operational difference between SCPC and FDM-fm warrants some discussion. With an SCPC system it is fairly simple for the uplink transmitter to be located anyplace where it is needed. After making sure the uplink frequency is clear (i.e. it will not interfere with any other uplink signals coming to the bird), one merely turns on the uplink transmitter, zeroes the transmit antenna in on the appropriate bird and 'starts talking'. The satellite does not 'know' your uplink signal is not coming from a central uplink station, it simply accepts your uplink signal and frequency translates it to the appropriate downlink output channel and sends it back down to earth. There is nothing however to prevent one or more SCPC signals from originating at a single uplink site including those sites that are also being utilized for frequency division multiplex (FDM-fm) uplinking. The primary advantage of SCPC (or fm-FDMA) is that it is flexible and requires far less ground terminal equipment (on either end). But coming back through the bird it will sound like a normal FDM-fm signal if everything is operated properly. The SCPC approach is the approach planned by the SBS satellites in the early 1980's; each business user will have his own transmit and receive terminal, using one or more on-site generated uplink carriers each with its own modulation information.

The FDM-fm uplinking is more suited to those up and down link sites where many-

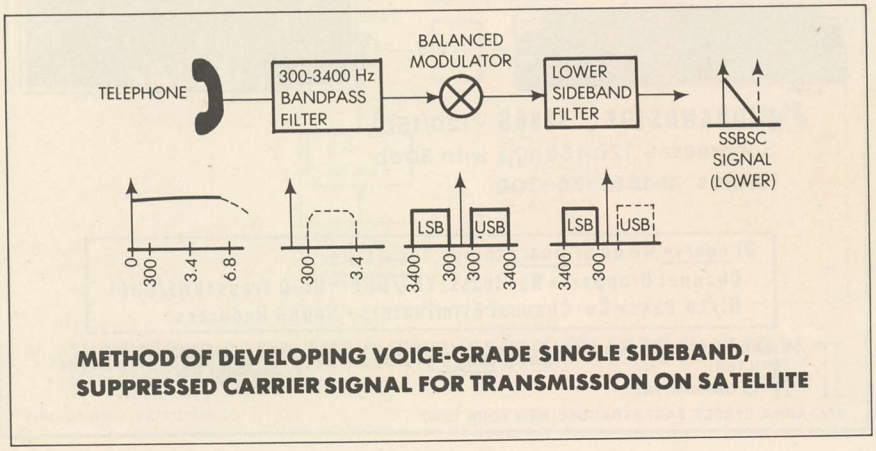


TYPICAL LINK EMPLOYED BY RCA TO DISTRIBUTE UPI, AP (RADIO) NEWS FEEDS TO AFFILIATED RADIO STATIONS VIA SATELLITE

many voice grade channels are originating and where the economies of scale can be employed to reduce the quantity and complexity of RF uplink equipment required to get into the bird.

In the FDM-fm format RCA or another carrier operates much like a terrestrial telephone company. Using radio links, landline links or microwave links voice grade data is fed to the uplink site from many different sources. One example of this now found on SATCOM is the UPI Radio, AP Radio and CBS Radio network feeds originating primarily in the New York City area. These 'radio-broadcast' grade circuits are sent via SATCOM to one or more RCA receiving sites where again using radio links, terrestrial microwave and landlines they are distributed to broadcast radio station customers **(see diagram here).** In most cases the various voice grade circuit sources do not converge on the uplink site **singly** but rather they are collected at something called a **CTO** (Central Terminal Office), operated by RCA, where they are processed and combined into the FDM-fm format. From the CTO they are then transmitted via terrestrial microwave (typically 11 GHz) to the uplink site.

In the RCA scheme of things, then, the CTO is a **regional message receipt and transmission distribution center;** for one-way circuits (such as AP audio feeds to radio stations) the **incoming circuit** from AP is added with other incoming circuits from other RCA customers and sent onto the appropriate satellite via the nearest RCA uplink site. For two-way communication circuits (such as the open circuit maintained by Hewlett Packard between Illinois and San Francisco) the local CTO combines the outward bound voice or data channel with others for transmission to the bird, and in the receive mode takes the downlink signals and separates out the specific inward bound H-P data channel for terrestrial delivery to the regional H-P office.



METHOD OF DEVELOPING VOICE-GRADE SINGLE SIDEBAND, SUPPRESSED CARRIER SIGNAL FOR TRANSMISSION ON SATELLITE

Getting It All Together

The terrestrial links (typically leased lines) to the CTO points are typically bandwidth limited by the limitations of the circuits. For voice and slow speed data the common (more or less) 3 kHz bandwidth telco circuits suffice. For higher quality 'broadcast' audio special telco links are utilized which pass the 100 to 8500 Hz range essentially flat and extend down to 50 Hz and up to 15000 Hz with electronic emphasis on both the low and high end materials.

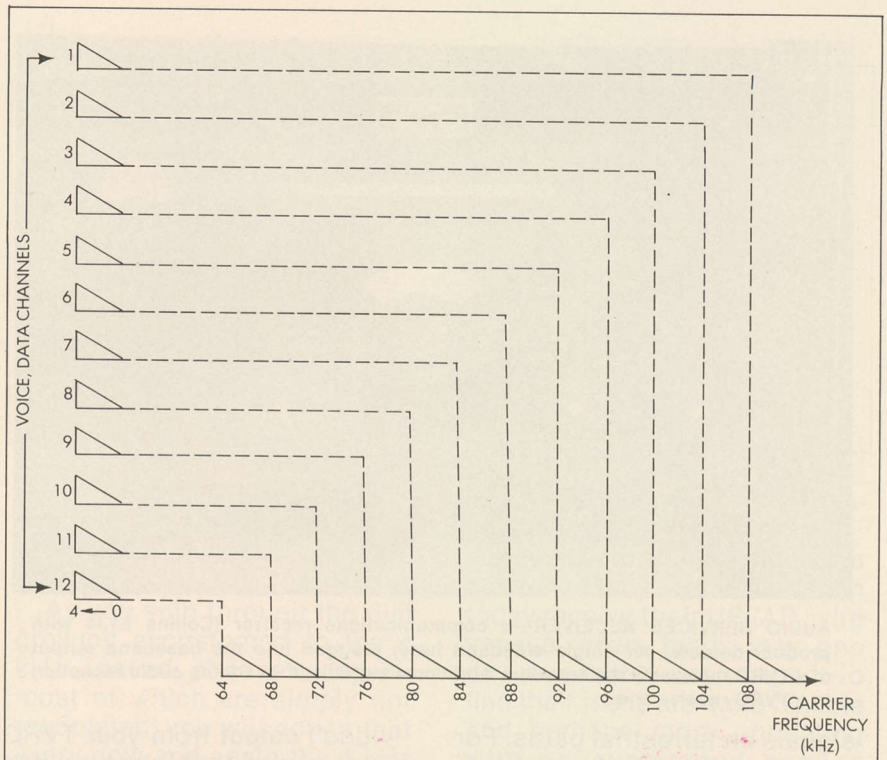
Taking a typical voice grade circuit, **as shown in the diagram here,** the incoming audio signal is fed through a 300-3400 Hz bandpass filter for 'shaping' and then to a balanced modulator. This device cancels the carrier present leaving two equal 'sideband' signals; one each upper and lower. Then the two sideband signals are fed through a lower sideband bandpass filter in which the upper sideband created in the balanced modulator is removed. This produces a **single sideband suppressed carrier** signal ready to be introduced into the satellite uplink equipment.

This works fine as long as you are only after a single voice circuit; but the name of the game is volume so some technique must be employed to combine a fairly large quantity of these 'treated' voice circuits

into a single uplink transmitter. RCA (and others) borrow a page from the Western Electric data engineering handbook to accomplish this multiple-channel system.

In the diagram here we see a total of 12 separate voice grade circuits (left hand side of diagram) each of which is fed or modulated by its own assigned customer audio source. In this system there are 12 carriers generated, starting at 64 kHz and working upwards in **4 kHz steps** to 108 kHz. Each of the 12 input audio sideband signals ends up being assigned (through a frequency translation or mixing process) to its own 'carrier frequency'. This particular format is called a 'Group B' approach and it is very similar to something called the Western Electric Type 'J' system originally developed for the Bell system for use in medium and low density terrestrial circuits. The important thing to remember here is that 12 separate audio grade channels are combined at 4 kHz spacings to form a 'group' or 'block' of data. Each of the individual 'channels' retains its own message characteristics but for transportation purposes this group of 12 channels 'travels together' from the outward bound CTO to the uplink station, through the satellite, back to the downlink terminal and back to the second CTO. There it is separated into its 12 component parts so that each 'customer' ends up getting his own audio grade channel delivered to his office via the final terrestrial inter-connection.

As neat as this system is, it is hardly adequate for the volume of traffic you might expect to find on a transponder. With the FDM-fm system you will recall that RCA talks in terms of 900 voice grade channels per transponder. Twelve channel 'groups' are along way from the 900 channel capacity. The answer is that these 12 channel groups are further mixed or combined in blocks of five **groups** into something called **'super groups'.** This sixty voice grade channel 'block' is created when five separate 12 channel groups are futher mixed with a new set of

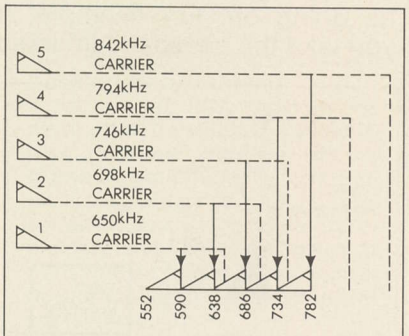


TYPE B GROUP OF CHANNELS BUILDS ON 12 VOICE-CHANNEL FORMAT TO CREATE FREQUENCY DIVISION MULTIPLEXING

'carriers' to create a new larger block **(see diagram here).** As shown here in our example 12-channel-groups 1 through 5 (left hand side of diagram) are mixed together to create a 240 kHz wide 'super group'. The **individual carriers** assigned to each 12 channel group is actually 60 kHz above the top frequency limit of the 1st (top in this case or highest frequency) channel in the 12 channel group. This is done so that when the 'super group' is downconverted to the original 240 kHz wide bandwidth spot on which it left the uplink site, the low sideband signals come out 'erect', or as lower sideband (as opposed to upper sideband) signals.

As you might suspect this can go on and on a few more steps. Super groups can be combined in assemblies of **five** super groups into something called a **master group** and then **three** master groups can be combined into something called **super master groups.** However for most satellite applications the series ends at super groups since we are able to modulate an uplink transmitter just as conveniently with separate (as opposed to combined) super groups as with higher order groups such as master and super master.

All of this mixing and combining is done primarily for two reasons: to make the least amount of (RF) equipment do the most work practical, and, to allow various customer groupings to be put together at uplink and downlink CTO's to facilitate the processing of the



BASIC 12 VOICE (DATA) CHANNEL GROUPS ARE COMBINED INTO 'SUPER GROUPS' THROUGH FREQUENCY TRANSLATION (MIXING) WITH CARRIER FREQUENCIES POSITIVE-OFFSET 60 KHz ABOVE THE BASIC GROUP HIGH-END CARRIER FREQUENCY

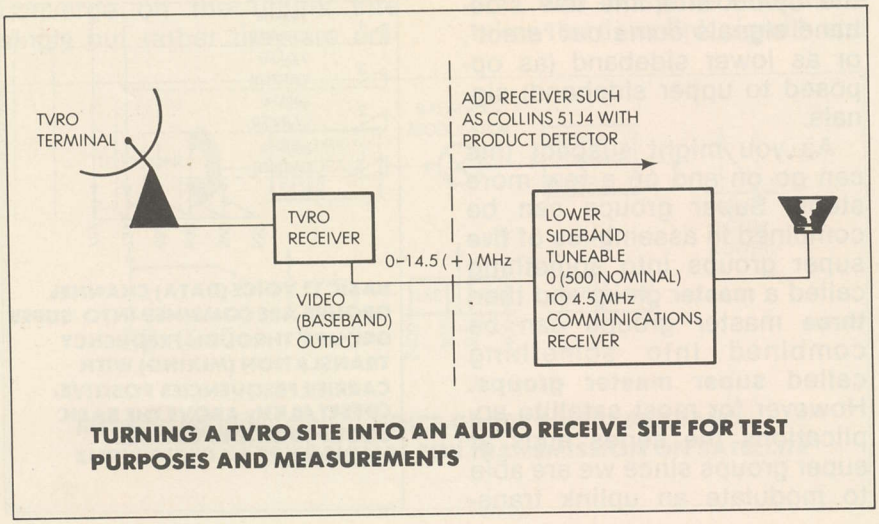
AUDIO SERVICES RECEIVER—a communications receiver (Collins 51J4 with product detector for single sideband here) plugged into the baseband output of a TVRO receiver is the essential 'additional ingredient' to adding audio reception to a TVRO receive site.

signals on terrestrial paths. For example, if say ten customers are located in one area of Chicago, they could be combined into one 12 channel basic group so that for terrestrial distribution they could stay as one 'group' until the last economical (perhaps microwave) hop had been made. It is far easier to distribute terrestrial signals in groups of multiple signals than to have to deal at each repeater and sub station along the way with individual audio channel signals present.

Tuning The Band

If you have followed us to this point, you probably have already figured out what may be going on. For example, if you take the baseband (marked 'video') **output** from **your** TVRO receiver and **feed it** into a video monitor, and tune up a transponder such as six with video on it, **you see WTCG.** But if you take the baseband output of your TVRO receiver and connect it to a single sideband communications receiver, **and then tune** the receiver to the basic 0-4.5 MHz frequency range while placing the TVRO receiver on say transponder 2, you will hear the FDM-fm traffic there. **See diagram here.**

The communications receiver is designed to receive signals in the (typically) 500 kHz to some higher (such as 30 MHz) frequency range. What you have coming out of the baseband (marked video) output spigot of your TVRO receiver is the range from just above DC (0 kHz) to someplace around the upper bandwidth limit of your TVRO receiver baseband amplifier (4.25 MHz is a fairly common upper frequency 'video pass band' limit for most TVRO receivers). By placing the communications receiver in the lower sideband reception mode you are compatible with the lower sideband transmission/reception format of the satellite service.



TURNING A TVRO SITE INTO AN AUDIO RECEIVE SITE FOR TEST PURPOSES AND MEASUREMENTS

What do you hear? Well first of all, most if not all of what you hear you are not supposed to be listening to. **This is private communications** intended for specific users who are paying money to the carrier (RCA) for the transportation of their communications. The privacy of this message traffic is protected by something called **Section 605 of the Communications Act of 1934;** it is against the law to **(1)** intercept these transmission, **(2)** or if you 'inadvertently intercept' such traffic to **(3)** reveal its presence (i.e. existence) or **(4)** content to any other person. **Any** use of **anything** which you 'inadvertently intercept' for private purposes or financial gain is also a no-no. In other words, if in the course of pursuing your own technical evaluation of your site you should happen to stumble across a choice bit of 'gossip' on an FDF-fm (or SCPC as far as that goes) circuit, **forget you heard it and repeat it to no one.**

Obviously not all of the message traffic on the bird is of a **private** nature. Some of it is actually broadcast type material being relayed from one (network/origination) point to another (network/transmission) point. Ultimately it ends up being played through AM or FM broadcast transmitters all across the country. With some degree of safety we feel we can pass along to you where to tune to find **these** signals should you happen to want to investigate this type of message traffic.

At the time of this preparation (in mid-February), **before** SHOW-

TIME begins regular service on transponders 4 and 10, and before the big May switch to F1 of all CATV traffic, it appears that the two most utilized transponders for message type traffic are 2 and 10. Transponder 2 is principally utilized for west to east (such as Los Angeles to New York, etc.) traffic while transponder 10 is for the opposite direction (east to west). The logic of this should be obvious from an uplink and downlink point of view, although there is nothing special about the arrangement.

The first thing you notice when tuning through the more populated (by use) regions of 500 kHz to 2.100 MHz **(on transponder 2)** or 500 kHz to around 3.75 MHz **(on transponder 10)** is that every few kHz or so there is a carrier. **Actually there is a carrier every 4 kHz** or so through most of the 'spectrum'; reference the explanation of how individual signals are combined into groups and super groups. Most of the carriers (you will note) are unmodulated (i.e. AO) although every now and again you'll run across one that is modulated with a tone, or a clicking noise or a buzz or some other strange sound. The spectrum also includes some radio teletype, facsimile and various forms of modest speed digital data.

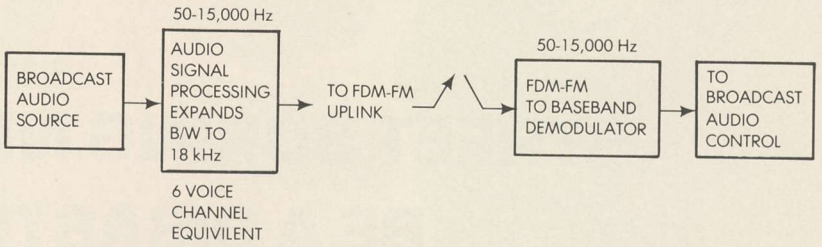
If you have a way to calibrate your receiver you should be able to dial up three closely spaced 'channels' on transponder 10 (which will probably be **some other** transponder by the time you read this because of the SHOWTIME start) and find:

1) **CBS news feeds** plus things such as the CBS Radio Mystery Theater **on 1512 kHz;**
2) **AP Radio feeds** (audio reports of news events plus some special for radio news and feature programs) **on 1528 kHz;**
3) **UPI Radio feeds** (similar to AP Radio) **on 1544 kHz.**

Over on **transponder 2** you can find another or a parallel set of CBS news feeds (which switches to relay of Los Angeles KNX News Radio in the after midnight period) **on 766 kHz.**

As you spin through the dial growing accustomed to the 4 kHz spaced channels (again, most of which are simply not modulated) you will notice that every now and again the 4 kHz spacing is interrupted by a 'mid-channel' spacing of a carrier (usually modulated with a low modulation level 800-1 kHz tone) 2 kHz above (and 2 kHz below) the normal 4 kHz assignments. This is a 'pilot tone' or carrier established by the system for reference purposes.

Another interesting use for the baseband audio receiver is to use it for a signal peaking device for your TVRO. If you take the TVRO receiver off of the AGC position (i.e. switch to manual gain control), take the AGC off of the baseband audio receiver and tune in a stable unmodulated baseband carrier, you can utilize the 'S' meter on your communications receiver as a highly accurate indicator of TVRO antenna peaking on the intended bird (this is more difficult to do with the FM modulation format of TV signals in this service).



INCREASING AUDIO BANDWIDTH TO ACCOMODATE NETWORK RADIO AUDIO FEEDS VIA SATELLITE

The Future Of Audio

Audio services in CATV have never sold particularily well. Yet there remains the possibility that one day, perhaps soon, someone will develop a unique audio grade circuit (whether voice or data) that will catch the interest of both CATV system operators and more importantly CATV system customers.

Several are on the immediate horizon. Many systems which today receive their UPI/AP 'wire service' news feeds may one day reasonably soon expect to find their feeds are more flexible and perhaps more appealing with an augmented service provided via either an FM subcarrier transported along with a standard TV transponder signal, or via one of the many (available) '4 kHz' audio channels which are now available on the bird. The technology is present, and the hardware for the most part is reasonably priced (provided you have a TVRO to begin with). Now it remains for an enterprising chap to create someway to make money with the system that is already in place!

Audio/Data Moved

Shortly after this report was buttoned up, RCA elected to move its audio and data message traffic from SATCOM II's transponders 2 and 10 (see report here).

Sources at RCA indicate the move off of transponders 2 and 10 was required because of the March (7th) start-up of SHOWTIME on transponders 4 and 10. Because of the east-west (one transponder) and west-east (another transponder) format of the domestic traffic, a pair of transponders are required.

Users will find heavy data and audio traffic on vertical polarization transponders 1,9 (this antenna pattern favors continental USA) and 7,11 (this is the vertical pattern antenna that favors Alaska). While you are over on vertical you might want to check out transponder 23 where video is sent up to Alaska.

STREET BORING NEED NOT BE A DISASTER

When You've Seen One. . .

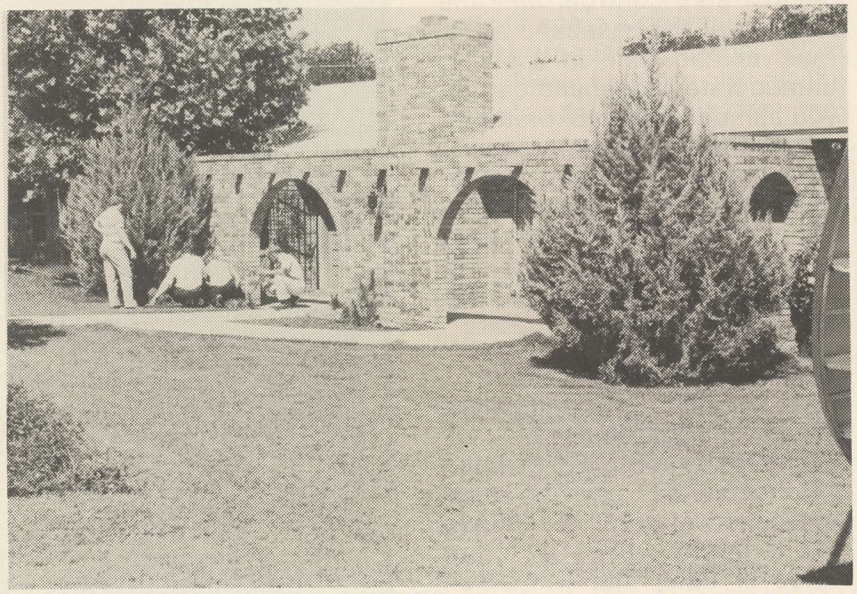
Seemingly there is not much new to be said about holes; the kind you dig in or through the ground from one side of something to the opposite side of the same something. It would be nice when you 'shoot' a hole to get through to where you intended to go in the first place and it would also be nice if when you got there you hadn't 'sunk' your company in the process.

The 'whole story' on holes has never been told properly; possibly because many of the holes we dig, bore, push-through or grunt-out have a way of turning out to be financial disasters and time consumers before they are completed. The kind of holes we are concerned with here are the type you create to push either a piece of jacketed coaxial cable through, or alternately a piece of PVC or conduit through which you will later 'thread' a piece or two of coaxial cable. Anyone who has had any experience with underground construction knows well the type of problem involved. If you are into direct burial of coaxial cable you already have a small fortune tied up in specialized equipment that digs, trenches, bores and punches. You also probably know your insurance man exceedingly well and most of the city utility people better than you wish.

Perhaps you never got into direct burial yourself; you simply 'farm' it out to some unsuspecting sub-contractor who makes his 'living' tearing up streets and people's front lawns and driveways. You may do the trenching yourself but leave the tough street and sidewalk and wall bores to an outside contracting firm.

Anyway you 'hack' it, if you have to cross under something you can't trench through you have big bucks involved. Years ago the normal procedure for crossing a street was to barricade the traffic, get out the jack hammer and rip your way across to the other side; hoping that in the process you didn't run into some utility line or pipe that was already snugly sitting beneath the pavement. After that came slit trenches; narrow trenches just wide enough to drop a cable into but narrow enough to keep patching up the street, sidewalk or driveway within the $3 to $5 a foot range.

Then along came the trenching equipment people with 'attachments' that turned their trenching/digging machines into street/driveway/sidewalk boring machines. Such equipment was a definite step forward in terms of convenience and time involved per 'bore' but those $3,000 attachments were not always easy to justify. Besides, they had a habit of chewing up expensive bits and a fellow who is used to trenching along at a pretty fair clip per hour is not anxious to tie up perhaps $10,000 in trenching plus attachments equipment or spend a half hour setting up for and boring under a thirty foot street.



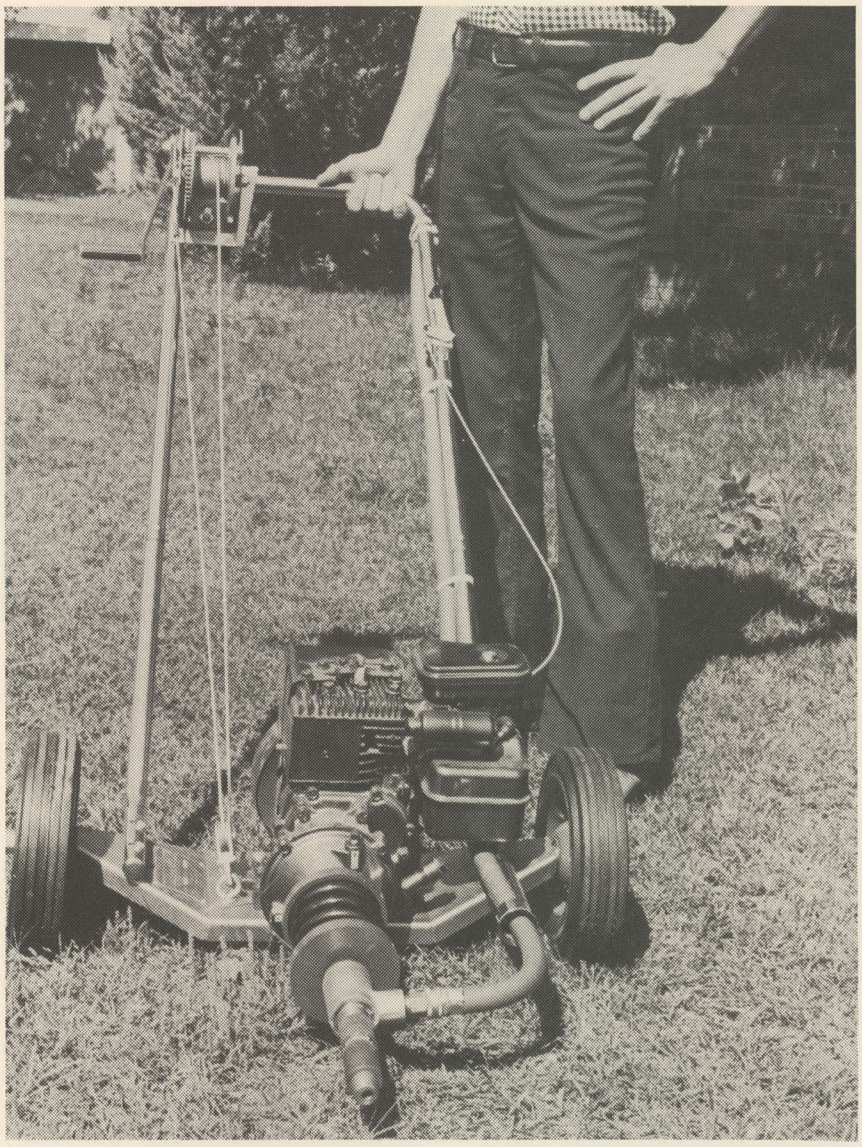
THE BORING JOB—from the entrance hole location where 'crew' is assembled to just beyond Spruce tree on right side of photo.

When you talk to a sub-contractor about popping a hole under a street/driveway or sidewalk you are in the $1.50 to $3.00 a foot region pretty fast. If you have difficult 'digging' or a maize of under-street-impediments it might hit $5.00 a foot; and even go higher in major metropolitan areas. If you have a thirty foot street to cross with an underground cable or cables that works out to $90 or so for the crossing; going down a residential area with 75 foot lots broken up with 18 foot driveways is a good way to go into the financial hole in a big hurry. That can add up to several thousand dollars per mile just to go under driveways.

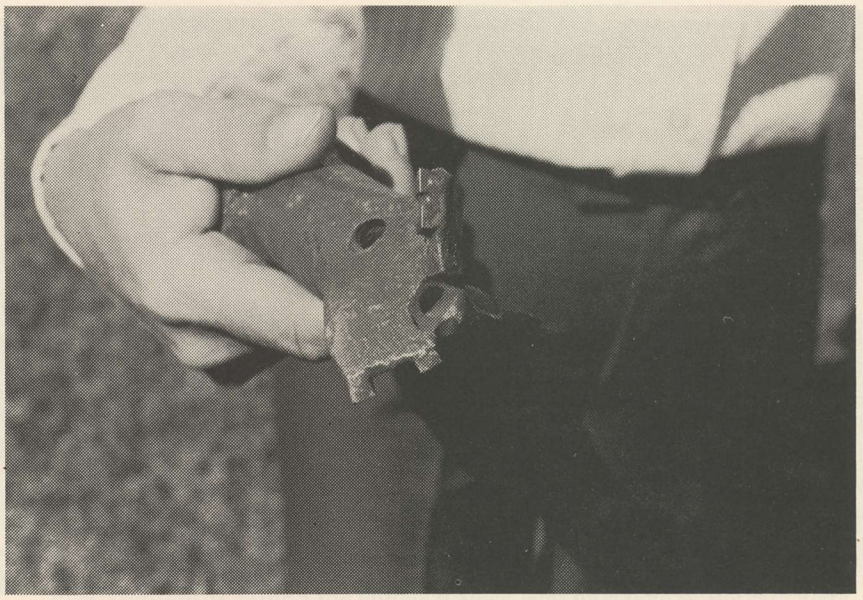
Semingly there should be a bettery way to marry the reasonably satisfactory straight-line work of a trencher that direct-buries the cable(s) with a separate, low cost machine that **specializes** in punching holes under paved areas. That's what this is all about; a company that has developed just such a machine that may result in drastic per-mile-installed costs for underground cable systems.

The machine is called the 'Under-Wunder' (model M-1) and we'll give you the price first; **$723.00.** At even $2.00 a foot boring charges you could pay for this type of machine in just a mile or two of residential streets.

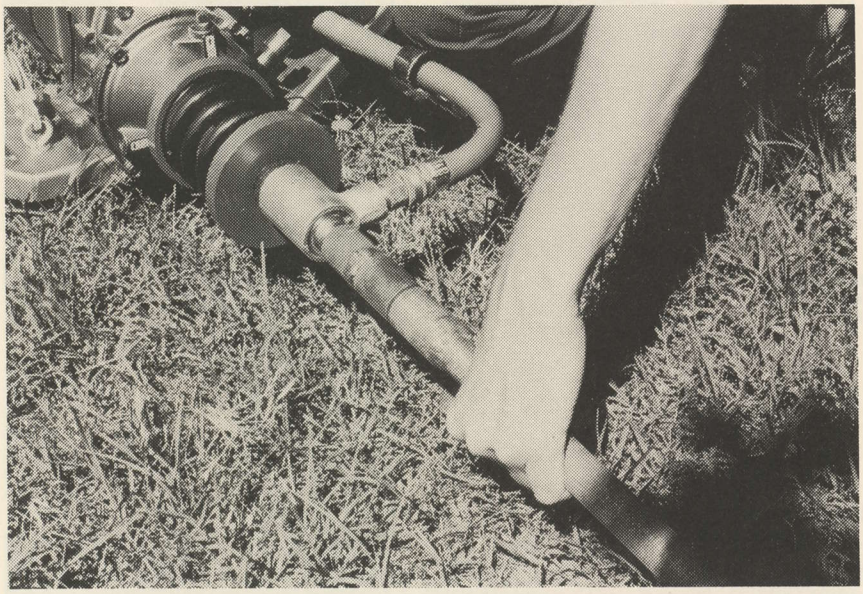
Here is what it does; as we found out by having the people who distribute the Under-Wunder nationwide bring a model out to the CATJ Lab where we punched a 38 foot hole about as fast as you can sit down and read this report. The machine is a self contained package that weighs in under 100 pounds. It looks like a lawn mower but rather than cutting grass it 'cuts a hole' in the ground in front of it. This is accomplished by attaching a section of drill stem pipe to a rotating coupling on the output end of the 3 HP gasoline operated Briggs and Stratton engine mounted on the frame (shown here). The drill stem pipe (in multiples of ten or twenty foot lengths) carries water to the



THE UNDER-WUNDER was conceived by Dave Lamb of The Lamb Corporation, Addison, Texas; is completely self-contained with a 3 HP gasoline engine.



2.25 INCH BIT—three 'hungry teeth' and an exit hole that allows the lubicating water to exit the boring bit and force dirt back out of the hole to the rear.



DRILL STEM attaches directly to the coupling on the front of the Under-Wunder.

front end where a specially designed boring bit is attached. The water (from a small container you carry with you or from a local and convenient outdoor faucet) provides a lubricant for the boring bit. It also forces the dirt, rock and what have you back out of the hole as the bit chews its way forward.

We first heard about the Under-Wunder from a gent we met locally. He described the machine as a 'Godsend to lawn sprinkler installation companies'. We had wondered aloud why if this machine could bore holes under 30 foot streets in 6 minutes time, up to 6 inches in diameter, why the same hole that they were now shoving PVC pipe through for lawn sprinkler systems could not also be used to shove coaxial cable through.

You would, in the normal course of using the Under-Wunder, trench up to a curb or driveway or whatever and then pull the trencher off the job and send it to the opposite side of the barrier where it would take off on its own again. Then you'd come along with the Under-Wunder (which can be easily toted in the back of a pick-up truck and handled by one man) and set it up over the trench facing towards the pavement barrier. It takes about 5 to ten minutes time to set the machine up; attaching the appropriate lengths of drill stem (usually the nominal 2.25 inch diameter bit is in place on the end of one of the stems), connecting up a water supply and pulling on the rope starter like you would start a small lawnmower.

LUBRICATING WATER has a machine-mounted handle-valve to turn the water on as you start up the machine and begin the bore.

At the CATJ Lab, where the accompanying photos were taken and the tests run, we presented them with a different problem. We wanted to go under some 38 feet of twin sidewalks and beneath a well rooted Spruce tree. So we had to dig an entrance hole on one side, aligning the Under-Wunder with that hole and the exit hole, and then an exit hole on the opposite end of the bore.

We determined that a 30 foot hole should, with the typical cable and trenching approach to the street on both sides, take not more than 15 minutes time from the point where your man pulls up to the pre-trenched location, unloads the Under-Wunder, sets it up, makes his bore and then wraps the whole thing up and packs off on the pick-up truck. We measured around 15 gallons of water utilized in our 38 foot bore through reasonably tough Oklahoma red clay. You could carry a water tank with you on the truck if you wished (a 50 gallon drum would handle ten such bores) or you could 'borrow' water from a nearby house with a hose you carried with you.

The bits are 2.25 inches diameter standard and they are available for a variety of ground materials. Some of the bits include carbide tips which will drill through most anything you run across; including concrete walls. After you get through with the basic 2-plus inch hole if you need something larger, you outfit the drill stem end with a 'reamer' which will take you up to 6 inches in hole diameter in three different steps (although in most soils you can jump from 2.25 inches directly to the largest size hole available).

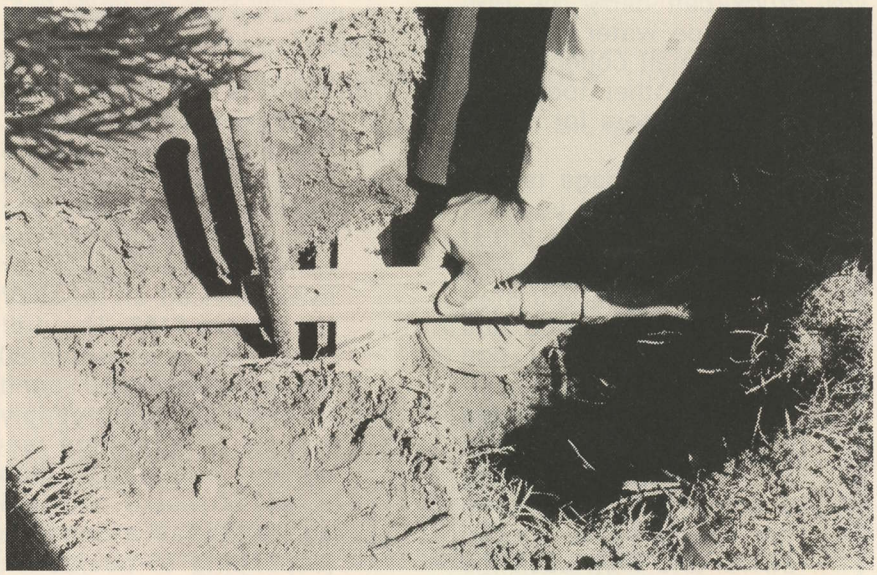
What is particularily interesting about the Under-Wunder is that it has been around for more than seven years putting in thousands upon thousands of feet of underground sprinkler systems daily and apparently nobody in the CATV business has ever stumbled across it's trail. Or at best, if they have, they've kept pretty quiet about it! Because it is basically a frame plus a tried and true Briggs and Stratton engine plus some deceptively simple mechanical coupling parts that turn the 3 HP engine's output into a bunch of torque to rotate the drill stem shaft and bit, there is very little here to put you in the poor house should something fail. If you have ever had a $10,000 trencher 'down sick' for a week or two while you wait on an expensive or hard to locate part, being able to quickly service this simple machine should appeal to you.

How much can you do with the Under-Wunder? The people who manufacture it talk in terms of maximum-bores of 150 feet and with the reamer hole sizes to 6 inches. There are two ways to use it; the quick and dirty 'line it up and turn it on' method which gets you to the other side in a big hurry with perhaps a foot accuracy on the exit point, and then the 'take an extra two or three minutes' approach and use some special alignment tools (all available for just a few bucks extra) with which we've witnessed hitting to within two inches of the intended exit point from 40 feet away. The guys who work with this machine everyday sit around drinking beer at night swapping stories about hitting 6 inch diameter circles drawn on the exit hole wall at distances of 150 feet through tough Texas shale rock.

There are a few observations we made while witnessing our 'test bore' at the CATJ Lab:

1) **If you are using the Under-Wunder in conjunction with a trenching machine,** there is a minimum of hand digging required. The trencher goes up as close to the paved area as possi-

READY TO GO—the drill stem pipe is attached to the front coupling and the pipe aligned with hand driven rods that align with the exit hole intended.



FOR PRECISION BORES the entrance angle (and direction) of the drill stem pipe is 'carefully' adjusted with a carpenter's level; accuracy to within 6 inches at 150 feet is claimed.

UNDER—WUNDER FACTS & FIGURES

Product—**Under-Wunder Model M-1**
Price—$723.00

Bits—

2.25" boring bit	$17.60
3.5" reamer	34.48
5.0" reamer (*)	69.68
6.0" reamer (*)	93.50

*-carbide cutters, for dirt. Special fishtail bits with carbide inserts for extra-hard conditions also available.

Stem—

20' with heavy duty couplings	$49.00
10' with heavy duty couplings	41.00

Source—

Custom Building Products
5508 N. Rockwell
(P.O. Box 32231)
Oklahoma City, OK 73132
(405) 495-1935

ble, lifts up the digging chain and heads to the opposite side where it sets back down and continues to trench.

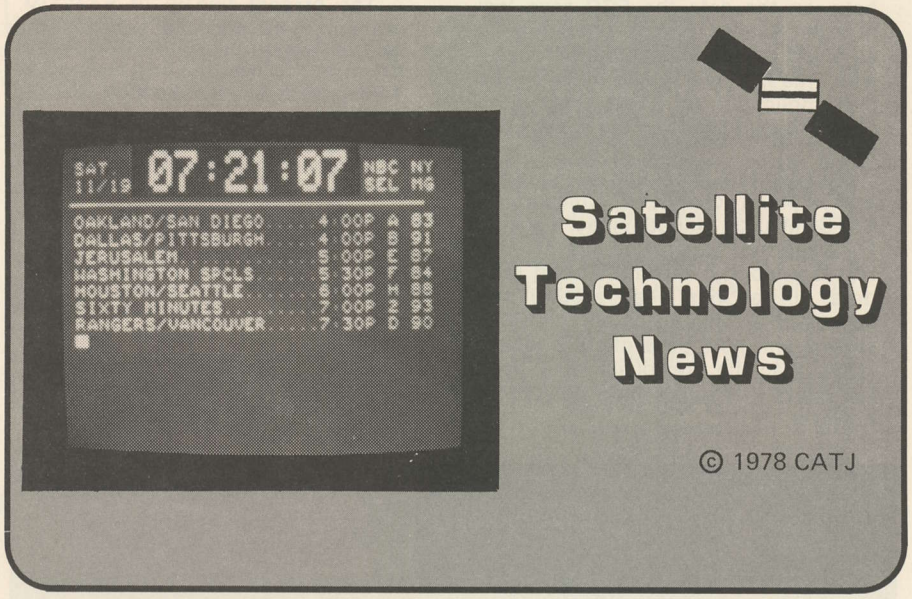
2) **The Under-Wunder stays at ground level,** back from the entrance point hole, and then works forward towards the entrance point hole as the bit chews its way towards the opposite side.
3) **The machine is very lightweight;** one man can pick it up and toss it in the back of a 1/2 ton pick up truck with ease; and the same truck can carry the drill stem pipe, water and hose and a small collection of bits and other tools and still have room for a load of cable.
4) **The water useage rate is low** enough that you can carry water with you if that is required. You valve-on the water when you start the gasoline engine and valve-off when you pop through.
5) **Once on the far side of the hole** (the exit point) you can tie your cable or a pull line or some PVC conduit onto the bit using a special swivel and then back the Under-Wunder out of the hole, pulling the cable (etc.) back through as you go.

AT THE ENTRANCE HOLE the driven guide stakes keep the drill stem headed in the correct direction while water forced back out of the hole with the dirt begins to collect.

6) **There is not much to go wrong with the machine.** The Briggs and Stratton 3 HP gasoline engine can be repaired by virtually any jack-legged mechanic who works on lawnmowers or even replaced off-the-shelf for around $150. The drill stem pipe is schedule 80 3/4 inch black pipe found in most plumbing supply houses. The bits are reasonably priced (2.25 inch is $17.60 each) and will apparently last a long time (depending of course on how tough your ground is).

The Under-Wunder people say they have yet to find something that they couldn't bore through. Perhaps the best part is the price. As noted previously, the basic machine is $723.00 (FOB Oklahoma City) and for another couple of hundred dollars you've got all of the drill stem pipe, bits, guides and reamers you probably will ever need.

We were impressed with the machine and could spot no weaknesses in the product or approach that bothered us. If you are having problems with undergrounding, we suggest you look into the Under-Wunder. It may save you big bucks, lots of time and a mess of public relation problems in the years ahead.



Towards Expanded PBS Satellite Use

Although PBS satellite linking began early in January on WESTAR I, and the use of **a transponder** for **regularly scheduled service** began early in February, the PBS use of their full set of four transponders for ETV/CPB programming will be gradually phased in over an extended period of time. The current thinking is that full use of the **second transponder** will begin **around** May 1, the **third transponder** will come into regular use **around** August 1, and the **fourth** and last of the PBS transponders will go into service with the start of the fall programming schedule this year (**around** 1 October).

Beyond the transmission of PBS (ETV) television and NPR (National Public Radio) programming, the educational folks are eyeing other uses and users for their transponders. CPB has recently established a $42,485 'grant' to the Public Service Satellite Consortium (PSSC) to allow PSSC to 'examine the future of non-profit public service sharing of satellite (delivery) systems'. Plainly the educational folks are looking for ways to 'spread' their satellite system investment, and to justify further its operation and expansion. Additionally, making full-time (24 hour per day) use of the four transponders simply makes good 'cents'. The $42K plus grant will look at such uses at delivery of rural health care and the creation of a 'satellite-based public service information network'. The study will investigate not only who might use the transponders (along with PBS), but when the transponders might have time available and the costs involved.

August Stats

FCC activity for the month of June topped all previous months by a wide margin; for both TVRO stations applied for and for new licenses granted. A total of 68 TVRO applications arrived at the Commission and 57 applicants received Commission approval in June. In fact, our running 'data chart' had to be increased in the vertical scale to handle the influx of June activity!

Also, contrary to logical reason applicants are back specifying multiple satellite program sources on their applications once again; even though the Commission only requires a single service per application. This month the average applicant requested service on 3.19 satellite delivered channels; a new record in that department. The significance of this listing ('Average Channels' per application) is the crunch this indicates on receiver manufacturers.

For example, if one assumed **all** 68 applicants filing in June **wait until** they receive their license (typically 110 to 130 days), some 3-4 months after June the industry will 'eat up' the following number of pieces of hardware:

1) **Antennas**—68 (of which 2 will be ten meter, 20 will be six meter, 22 will be 5 meter and 24 will be 4.2-4.5 meters in size).
2) **LNAs**—68 plus whatever number of 'spares' 68 new terminals will also purchase (we feel half of the terminals buy a spare LNA, which translates to 68 + 34 or 102 LNAs).
3) **Receivers**—217 (that's 68 terminals and 3.19 receivers per terminal).

This amounts to $2,313,632 in equipment sales in the TVRO area for the single month (not inclusive of any replacement equipment or new receivers for existing systems adding new services); an annualized TVRO business activity base of $27,763,584.

In the services-requested area new services began to show up in June filings; **FANFARE** had 2 requests, **UPI's** new news service 1, **PTL** had 3 requests, San Francisco's **KTVU** 1 request, Chicago's **WGN** 3 requests and **ASN** had its first formal filing.

Potpourri Update

During the month of June FANFARE began regular service via RCA SATCOM I on transponder 16; providing first run (for pay TV) movies and sporting events with a southwestern flavor to cable systems in five southwestern states. The next scheduled launch date for a new service is the Home Theater Network, now scheduled to begin limited operation on transponder 18 around the last week of July.

The scheduled August 1 launch date for San Francisco's KTVU, on SATCOM I transponder 18 (shared with HTN) now appears certain to 'slip'. The FCC has yet to approve the now nearly one year old Southern Satellite Systems application for satellite carriage of KTVU and Ed Taylor advises us that there will be approximately 90 days

CATV TVRO STATISTICS—JULY, 1978

Applications Filed/FCC	**April 1978**	**May 1978**	**JUNE 1978**
1) 11 meter	0	0	0
2) 10 meter	2	4	2
3) 6 meter	10	18	20
4) 5 meter	17	12	22
5) 4.5 meter	17	19	24
Total Apps	**46**	**53**	**68**
Cost Max.	$145,000	$106,412	$96,412
Cost Min.	20,250	5,000	$22,500
Avg. Cost	**37,942**	**$37,120**	**$34,024**
Channels Requested	132	124	217
Average Channels	2.93	2.3	3.19
Requesting WTCG	29	36	38
Requesting CBN	37	31	40
Requesting HBO	33	36	32
Requesting MSGE	19	10	15
Requesting SHOWTIME	5	6	13
Avg. Cost Per Channel	**$12,949**	**$16,139**	**$10,666**
TVRO's Licensed/FCC	**39**	**38**	**57**

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

between the date the FCC says 'go' and the service begins operation. In as much as it is impossible to 'guess' when the FCC will in fact move on the SSS application for KTVU, there is no solid forecast for when the service will begin.

A similar fate is holding up inauguration of WGN (channel 9, Chicago) on SATCOM I; by United Video. Lacking FCC approval to provide the service, UVI is unable to provide a solid start date. United **has** been around and about with an announcement that WGN service will now be **8 cents a month** rather than the previously announced ten cents (per subscriber) per month however.

The **present** line-up of SATCOM I transponders and the services they provide **today** follows:

Transponder	Service
2	PTL
4	(broken - no service)
6	WTCG **(*)**
8	CBN
10	SHOWTIME/mountain, west
12	SHOWTIME/east, central
14	KTBN/Trinity
16	FANFARE
18	HTN **(**)**
20	MSGE/HBO reserve **(***)**
22	HBO/mountain, west
24	HBO/east, central

And the asterisks. * - WTCG has decided that because the present call letters are so well known that their plans to change the call letters to WTBN ('Turner Broadcasting Network') will be dropped. WTCG forever. ** - Home Theater Network scheduled to begin service last week in July (see CATJ for February, 1978). *** - Madison Square Garden Events has a much diminished schedule during the summer, will switch to vertical transponder 9 when they start the heavier fall schedule in September. HBO's use of this transponder beyond that date is up in the air as to how it will be used; HBO has dropped plans to provide a news service.

More On Westar

It is probably inevitable that as the industry becomes more closely interested in the Western Union WESTAR II bird that we begin to uncover more facts about its operations. We went through a similar 'discovery period' with SATCOM II and probably still have that ahead of us for SATCOM I.

The WESTAR II bird is a Hughes HS-333. Western Union took the delivery of the bird with only a 'partial set' of antenna range tests. Antenna range tests are important because from those tests the calculations are made as to the expected footprints for the bird once it is put into space. It is not practical to run about the countryside with transportable dishes making hundreds (or thousands) of descrete measurements **after** the bird is launched, so paper projections of the 'anticipated EIRP levels' are made from antenna range tests of the bird. When the tests are not thorough enough, there are gaps in the information and the paper contours resulting are at best very loosely refined.

That is kind of the spot everyone is in with WESTAR II. The footprints one sees predicted are at best un-verified and in some instances they may be fanciful bits of imaginative engineering or press agentry. WESTAR **engineers** are a careful bunch and they as a group do not **ever** accept the **37 dBw contour** as a planning tool. So inspite of the general forecasts that WESTAR II has a 37 dBw contour in some portions of the continental 48 on some transponders, Western Union engineers prefer to start from a 36 dBw contour base. Western Union engineers prefer to simply specify the **'minimum dBw contours'** that will be found (at any point within the **continental 48**) rather than actual levels. That is far safer for them, and this number for WESTAR I is 34 dBw and for WESTAR II it is 33 dBw.

In the May issue we published a set of two purported-to-be WESTAR II footprint maps for transponders 1 and 12. These maps have been checked against on-file maps done by computer by Western Union, based upon the Western Union's 'best guesses' of what the transmitting antennas aboard WESTAR II are probably capable of handling. However, be advised that

regardless of what set of WESTAR II maps you may see, all maps are based upon some generous amounts of 'computer averaging' prepared after the incomplete antenna test range tests were fed into the computer. There is a word for this type of situation; it is 'beware'. Until the CATV industry has made a few dozen (or few hundred) installations on WESTAR II and has real world C/N measurements with which to back into probable EIRP contours, the maps we see in print are at best **estimates** of the real world.

The WESTAR II loading problem is apt to be a large factor in the final transponder assignments for ASN and other possible CATV users of WESTAR II. AMSAT, a company that buys bulk transponder time and re-leases it to smaller companies on a common carrier basis, is now moving onto its **fourth** WESTAR II **transponder.** AMSAT SCPC, FDM (etc.) customers seem to be growing at a rapid rate. There is considerable speculation that in the next year or two AMSAT may even require a fifth transponder. Between the heavy AMSAT use of the bird, the occasional network use of the bird, and the Western Union common carrier requirements for the bird, there are very few (if any) openings for additional full time services; and that may well include some restrictions on ASN (AmeriCom Satellite Network) as well.

One school of thought within Western Union suggests that while the company would like to wait until 1980-1981 to launch another satellite (the **Advanced WESTAR** bird which will have both 4/6 GHz **and** 11-12/14 GHz transponders on board), it may not be able to wait that long to gain additional transponder capacity. There is in fact another Hughes HS-333 bird ('WESTAR III') sitting on the ground ready to fire into orbit on relatively short notice. However, if Western Union launches a third HS-333 (4/6 GHz **only**), there are concerns that the FCC may take another look at the total number of WESTAR birds in orbit and perhaps require that **when** the first 'advanced WESTAR' goes up that Western Union use it to replace a (rather than to augment the existing) bird(s). Western Union can ill afford to launch an HS-333 as a WESTAR III if they have to pull down one of the first three birds to make room for the advanced WESTAR in 1980-81. By the same token the rapidly diminishing number of orbital slots available dictates that Western Union probably cannot have five (and perhaps not four) of 'their own' in the 1980-81 era. It's a tough question, and one that is upper most on the minds of Western Union management these days.

Is FI "III"???

The July Coop's Cable Column raised the question as to whether the present RCA satellite in use by CATV systems in North America (F1 located at 135.0 degrees west) is operating properly. The subject came to the surface because of a high percentage of systems reporting to CATJ and suppliers that their signal levels were 'erratic' or marginal on F1, having been most satisfactory back on F2 at 119 degrees west.

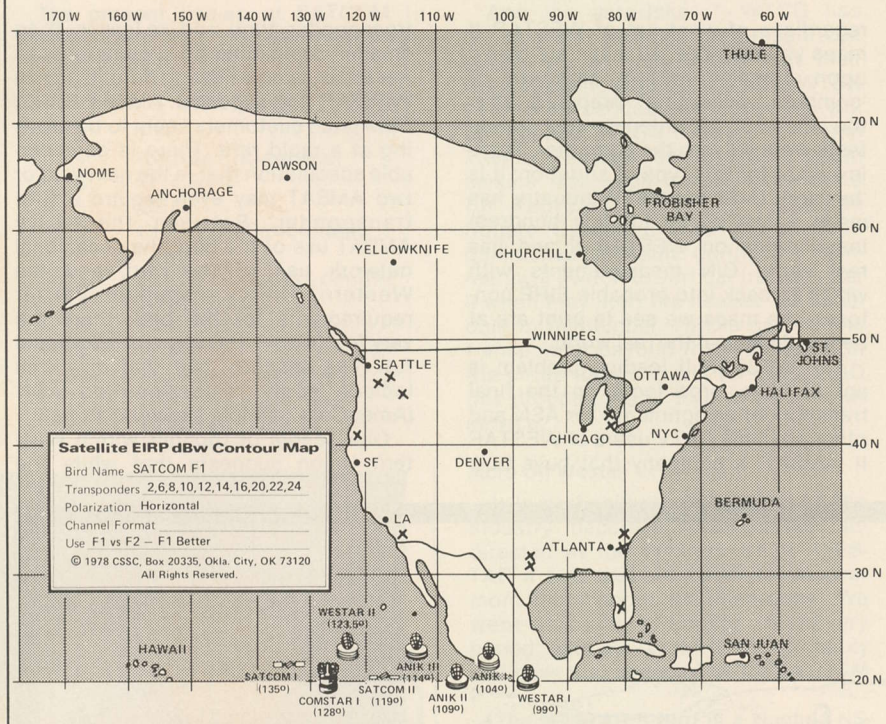


ILLUSTRATION ONE—locations where F1 service is rated 'superior' to F2 service

The subject received some considerable time and discussion during the recently completed CATA CCOS '78 and on July 19th an hour was devoted to the subject with much conjecture and a few hard facts offered. Late in June CATJ sent a TVRO questionnaire form out to approximately 450 TVRO terminal licensees. As of July 6th we had 55 responses and a clear set of patterns were emerging.

We don't expect this will be the last word on this subject; in fact we are going through our data and that gathered from other sources for a more extensive report to appear in our September issue. However the early data does suggest a 'pattern' to the problem and we want to share that with you now.

We plotted all of the locations where **F1 service was superior to F2** (see **illustration one**), all of the locations where **F2 and F1 service was essentially "the same"** (see **illustration two**), all of the locations where **F2 service was superior to F1** (see **illustration three**) and finally we did a **composite** based upon the data plotted (see **illustration four**). In illustration four, we cannot claim that

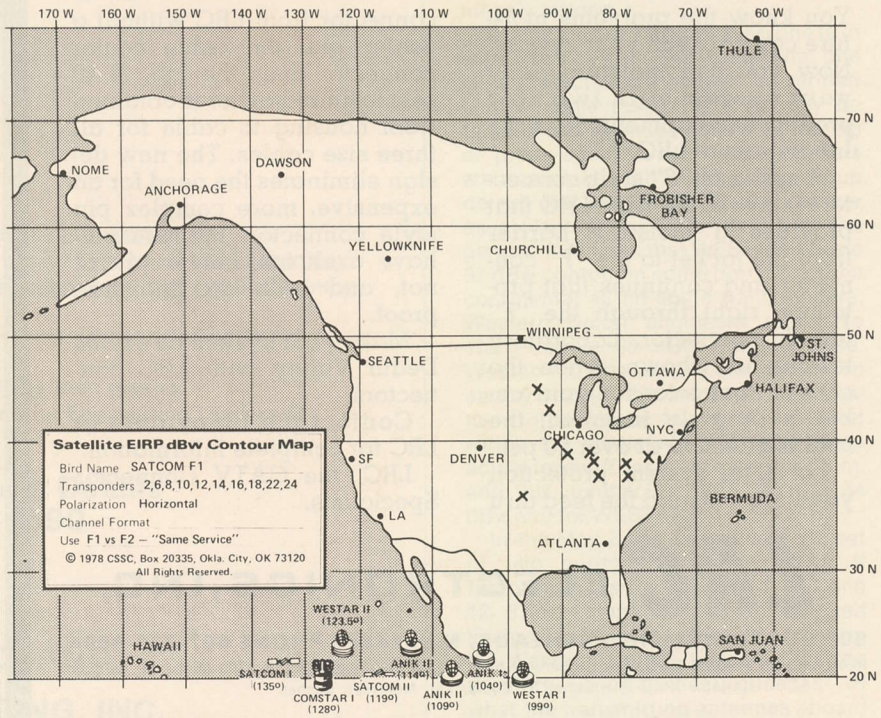


ILLUSTRATION TWO—locations where F2 service and F1 service are rated 'essentially the same'

we have a clear picture of the 'limits' of the F1-is-superior service primarily because there was a sizeable area throughout the Rocky mountain states where insufficient data was available to indicate just what may be happening in say the states of Montana, the western portion of the Dakotas, Wyoming, and portions of Utah. The south Texas data is also inadequate to clearly define where F1 service is superior to F2; it may well be that F2 is superior (with two isolated examples in north Texas) all the way to the Rio Grande.

What impressed us most was the 'neat fit' of most of the data. We did end up with an area in Michigan where approximately half of the responses indicated F2 was suprerior and the other half said F1 was superior; and a similar area in Flordia. Otherwise the reports were falling into a pattern with great regularity.

What is most disturbing about the fourth illustration is the following:

1) **With the published and RCA sanctioned F1 footprints, the western USA was clearly expecting to** lose signal level **in the switch. It gained signal level, especially in southern California and the Pacific Northwest.**
2) **The same published footprints led us to expect considerably** improved signal contours **in New England. All of the evidence suggests the F1 levels are below F2 levels in New England.**

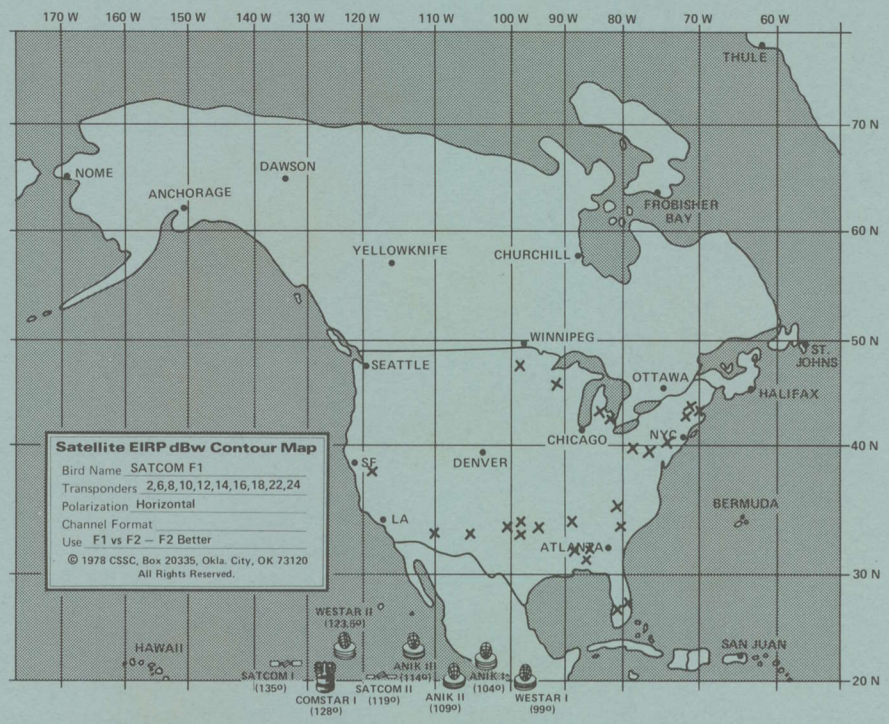


ILLUSTRATION THREE—locations where F2 service is rated as superior to F1 service

Several readers have suggested that the apparent real-world footprints we now have on F1 are in truth closer to those January CATJ published footprints (which after we published them RCA told us they were 'old' and no longer in use) than the so-called current footprints. The January footprints, we submit, **may be** closer to what we now have than the footprints we are supposed to have; **but in our opinion they are not correct either.**

The cooperation of those completing our survey forms was excellent. In

fact we acquired much more data than space here will allow us to compile and we will deal with it in greater detail in September. Not all operators had the equipment to make on-going C/N (or S/N) readings. However most receivers are equipped with front panel 'relative signal level' indicating meters and they were able, therefore, to note whether the F1 signal was equal to, better than or worse than F2 signal levels. Others had made IF measurements with 727 (etc.) meters (hopefully these were done with the receivers in the manual gain mode!) and still others rated their F1 vs F2 service on the basis of subjective picture quality, the frequency of 'erratic service' and signal outages and so on. William J. Mobbs of Midsouth Cablevision, Pearl, Mississippi sums up the comments of dozens of others when he reports **"Quality of pictures on F1 does not look as good as F2; and we have sparklies on an irregular basis"**. Many systems were so far above their respective receiver thresholds that they had never seen 'sparklies' before. Troy L. Price of Century Huntington Company (Huntington, West Virginia) put his finger on another apparent problem with F1; the considerable transponder to transponder signal quality differences. **"There are greater random variations in signal levels on F1..."**. And Michael T. Brommer of Sammons Communications in Turlock, California reflected the frustration of many when he noted **"We practically wore out the dish adjustment mechanisms trying to get F1 to look as good as F2..."**. Malcolm Fussell of Seemore TV Company in Bastrop, Louisiana noted a problem mentioned by many others surveyed. "(with F2) **we had trees in front of our dish; when we changed to F1 we had to remove the trees to get a signal. The service probably would have been better on F2 had we removed the trees in the first case!"**. Several others indicated that they had to do some Paul Bunyan work before they could switch over to F1. And finally others such as Jim Merriam of Gulf Coast Cablevision in Naples, Florida can 'measure' the difference in signal levels between F1 and F2, but they are still far enough above their respective receiver thresholds that they have not been able to detect any 'apparent' change in signal quality. **"The Terracom receiver signal level meters register 10 to 14 divisions lower on F1 than on F2 but the pictures look the same"**.

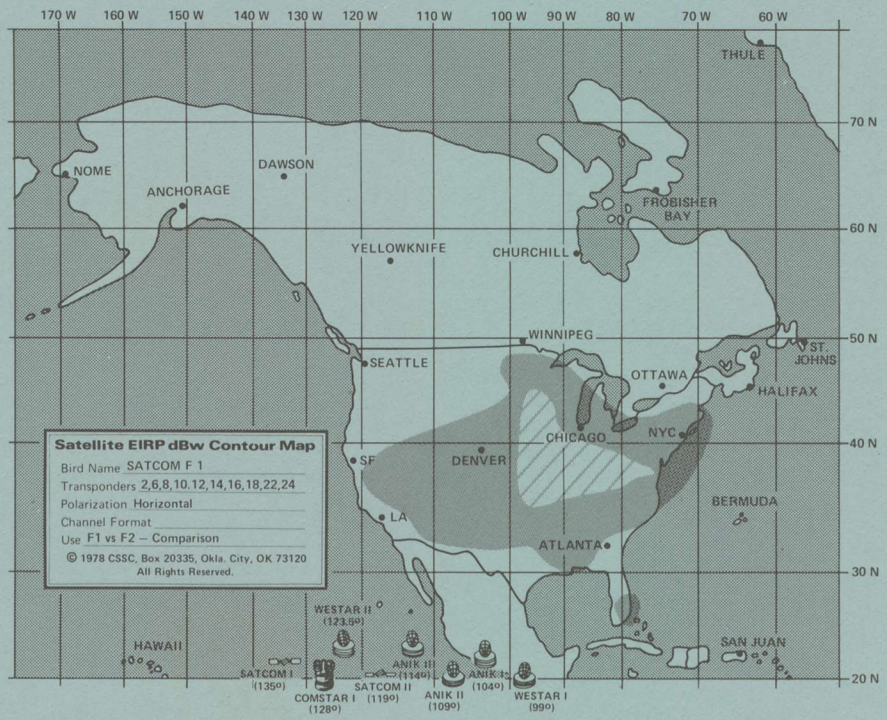
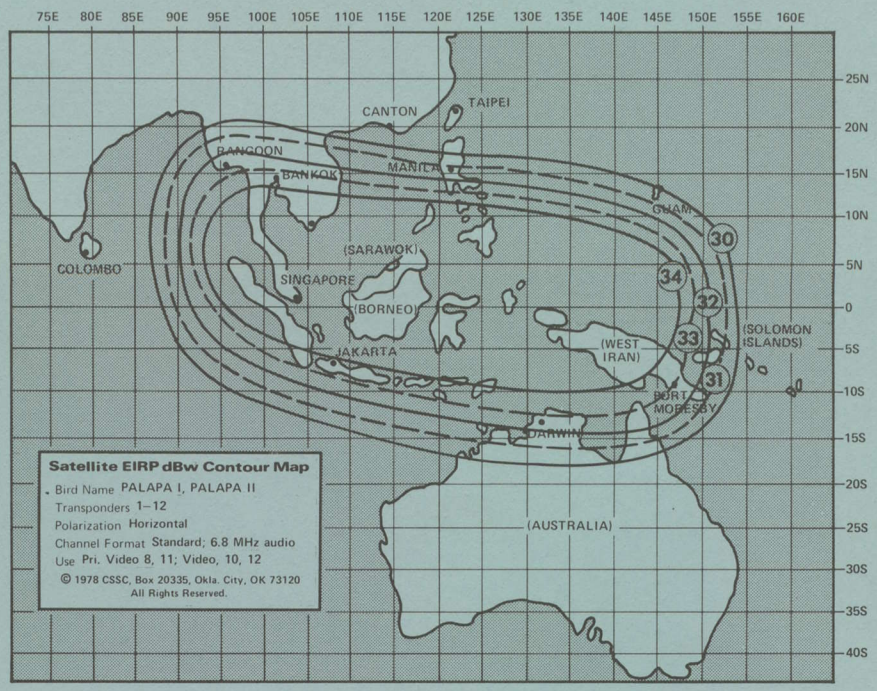


ILLUSTRATION FOUR—composite look at the pattern created by locating points where service on F1 is superior (not shaded or diagonal areas), service is the same (diagonal line areas) or F2 was superior (shaded area)

PALAPA I and II

Domestic satellites (such as ANIK, WESTAR and SATCOM) are a relatively new phenomina in the world; most satellite systems being of the Intelsat approach where through either commercial ties, cultural ties or geographic ties several nations share the satellite and its sub-systems. Indonesia is an



exception to this present day rule with a pair of Hughes HS-333 series satellite in orbit (Palapa I at 277 east and Palapa II at 283 east).

The Indonesians have approached the satellite business with two objectives in mind; to create an intra-nation communications system (telephone, data and other narrow band modulation schemes) for within Indonesia, and, as a means of providing leased transponder service to other neighboring nations in the Malaysian Peninsulan equatorial region.

With a pair of 12 channel birds in orbit there is the capacity for 24 full time television channels (with some sub-carrier narrow band modulation) or some combination of narrow band dedicated transponders and television dedicated transponders. Palapa II at 283 degrees east is the primary bird while Palapa I at 277 degrees is the backup or 'expansion' satellite.

Transponders 1-8 and 11 are set aside at the present time for Indonesian intra-country use while transponders 9, 10, and 12 are reserved for lease use by other nearby nations. Present activity has Indonesian television relay on transponder 8. Phillipines television and Singapore television (relayed to Brunei) are presently occupying two of the three 'lease-available' transponders. Other transponder assignments are: **1** SCPC telephony, **3** FDM telephony, **4** FDM telephony, **5** FDM telephony, **6** FDM telephony and **7** FDM telephony. Transponder **2** is assigned as a backup for SCPC telephony growth or expansion.

There are presently forty 10 meter terminals located at 26 province capitals and 14 district capitals in Indonesia; there are 18 'main traffic stations' and 21 'light traffic stations'. The light traffic stations have TVRO (television receive) capabilities plus a pair of SCPC channels.

Expansion of the ground terminals has a priority at the present time; PERUMTEL (the agency operating the satellites) has been continuing to shop in the United States for additional ground terminals, plus, through a technology trade agreement Indonesia has acquired design data from one U.S. supplier for Indonesian construction of 4.5 meter terminals.

Perhaps the most ambitious near-term expansion is planned in neighboring West Iran/New Guinea. A total of 5,000 'small' receive-only terminals (4.5 to 6 meters in size) are planned for television delivery to this nation with 1980-81 an indicated start-up time frame. Up to four television channels for the nation will be leased from PERUMTEL.

The EIRP contour map shown here for Palapa has been created from raw data resulting from both predicted contour coverage and field measurements. Although there are slight differences between Palapa I and II, and for difference transponders on board each, the contour map shown here is accurate to within 0.5 to 1.0 dB in most instances.

The Changing Face of Satellite Video Production Techniques

SHOWTIME's Front Row

CATV systems accustomed to having a single video feed out of their TVRO receivers will have to adjust to a new form of technology by early fall as SHOWTIME adds a new service on their existing transponders (12 and 10); it's called Front Row and it is SHOWTIME Entertainment's offering in the mini-pay field.

Front Row represents more than the first dual programming source through one transponder; it brings to CATV some quite clever engineering in the alpha-numeric and sub-carrier FM transmission fields. Here is how it will work.

A Front Row customer will see one movie each day Monday through Friday and two movies (or SHOWTIME **features**) on Saturday and Sunday. That works out to nine 'events' per week and they will be **P and PG features only** plus SHOWTIME specials such as the recently shown 'Jamboree In The Hills'. Saturday and Sunday's "double-bill" will include one 'biggie' and one lesser rated feature. The Monday through Friday single features will be primarily 'encore' or repeat films originally shown on the full scheduled SHOWTIME channel perhaps 4-6 months previously.

At the same time SHOWTIME is introducing the new Front Row mini-pay package they will also be adding a second sub-carrier (probably on 6.2 MHz although 7.2 MHz is still actively in the running) which will be utilized to transmit alpha-numeric data to both SHOWTIME and Front Row CATV affiliates. With the addition of a new piece of SHOWTIME hardware called the **'Program Separator'** either existing SHOWTIME satellite affiliates or new Front Row affiliates will pick up 24 hour per day video capability for the purpose of providing either a dynamic (i.e. moving) or static (non-moving) alpha numeric display promoting the upcoming events on respective service.

We'll see how all of this is possible shortly. Front Row customers will see three different features per week and during a month they will see a total of seven features. A premiere showing will appear each week and then the feature will continue to be shown for three additional weeks, typically 1 or 2 nights per week.

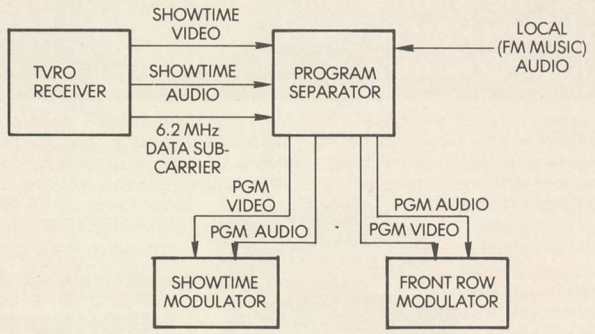
Back to the engineering, which is the exceedingly clever product of SHOWTIME VP John Sie's fertile mind. Sie, you probably are aware, came to SHOWTIME from Jerrold where his 'bag' was engineering. At SHOWTIME John's duties have been largely in the non-engineering areas. But you can't keep a good engineer locked up with program guides and affiliate relations 24 hours a day and John's Front Row began to hatch more than a year ago. After some field trials on video tape fed affiliates (a Orange County, California CATV affiliate and a San Antonio, Texas MDS affiliate) the system was formally unveiled at the NCTA meet in April. Now it is scheduled to begin satellite service this September.

The program separator connects into the 'line' between your existing TVRO receiver tuned to a SHOWTIME transponder and your existing RF modulator. Into the Program Separator goes the normal SHOWTIME video (and audio), plus a sub-carrier demodulated data channel. Most TVRO receiver manufacturers offer as a $300 to $600 option a second sub-carrier output. The sub-carrier feed from SHOWTIME will contain data to drive an RF modulator with either dynamic (moving) or static (non-moving) promotional alpha numeric displays. The Program Separator is an under $2,000 box being produced under contract for SHOWTIME. It has an alternate audio input as well, into which you can connect a local audio source such as (FM) background music.

Out of the Program Separator comes a single video line routed to the SHOWTIME modulator (if the system has an affiliation for the SHOWTIME service), an accompanying audio line; and, through a second video line a connection (with accompanying audio) to the Front Row modulator.

The full 24 hour day is broken down into segments which Sie labels T-Zero, T-One and T-Two time periods. During the T-Zero period alpha-numeric static display data has been transmitted via the sub-carrier to the Program Separator where it is stored in a memory. The memory is 'protected' with a two-hour internal battery supply that is trickle charged. Thus when the SHOWTIME program channel is replaced on the bird by color bars the last **message** sent to the Program Separator is a **command** telling it to switch off the regular video channel and to replace that with the static (memory stored) video display. The multiple line static display promotes upcoming program features and this keeps video on the SHOWTIME **or** Front Row RF channel at all times to facilitate converter and descrambler installs.

T1 is the dynamic display mode; a moving multiple page alpha numeric display that includes not only promotional material for the upcoming events but also includes something Sie



SHOWTIME'S FRONT ROW SEPARATOR

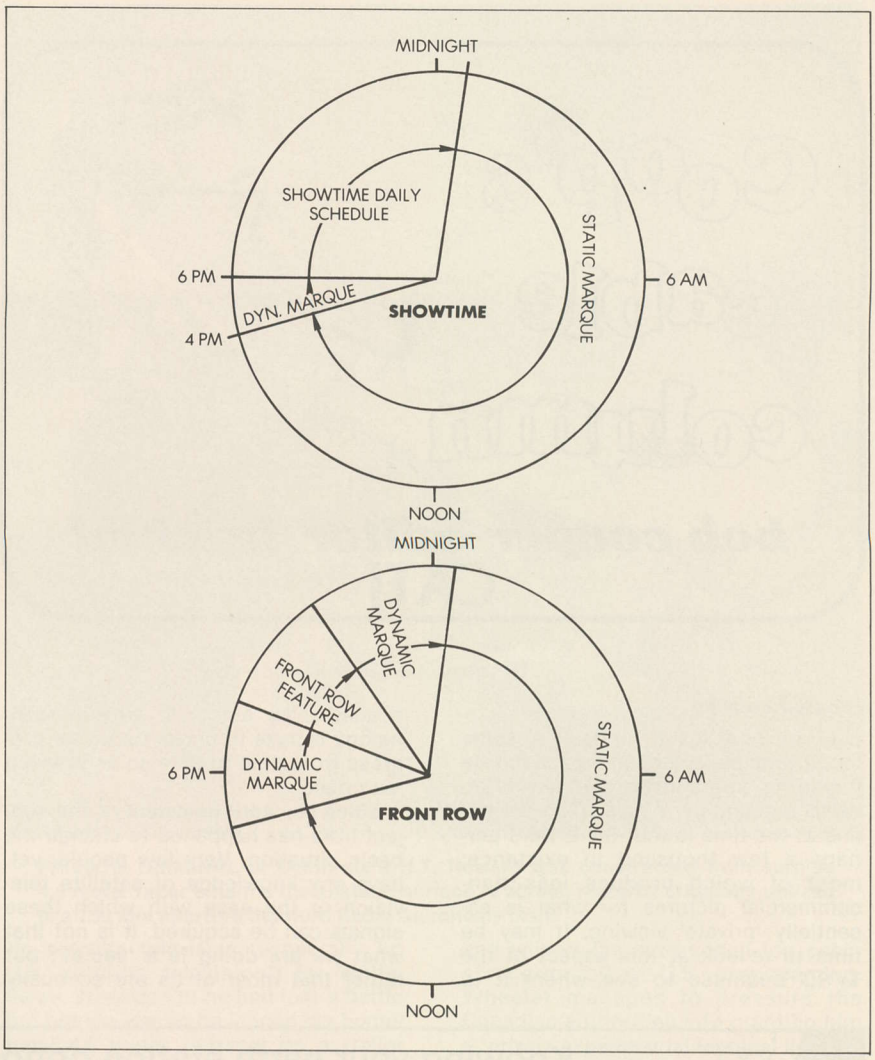
calls "an entertainment industry gossip column"; essentially news briefs involving movie land celebreties. The dynamic display runs ahead of the normal programming day on SHOWTIME and it runs during those portions of the SHOWTIME broadcast day when Front Row is still not programming, through the Front Row RF modulator.

During that time when one (or two in the case of weekend days) features are being 'lifted out of the SHOWTIME schedule' for the Front Row RF modulator, the dynamic marquee can be utilized by the CATV system on its own 'marquee channel' for promotion of the twin services.

There are several additional options available. In a ten line display, the top nine lines are controlled by the uplink material sent from RCA AmeriCom in Vernon Valley while the system operator can optionally take control of the bottom (10th) line for local video insertion. For an additional $100 ROM (read only memory) the operator can have automatic two page displays with one page his own and the other page via RCA from SHOWTIME/Front Row. A loop in and out system on the Program Separator allows the operator to crawl the bottom line if he wishes.

There are basically two versions to the Program Separator; version **'A'** is for affiliates with both SHOWTIME **and** Front Row. This routes the static and dynamic displays so that Front Row and SHOWTIME are both promoted during the off-programming hours and it will allow the Front Row customers to be 'promoted into full SHOWTIME service' according to John Sie. The **'B'** version is for those systems that take **only** the Front Row service; obviously these systems would not wish to have promotional materials directed at their customers for the SHOWTIME 'upgrading' if the system is not a SHOWTIME affiliate!

Sie sees the twin-services as more than simply a low cost way to step the customer up into the more expensive full SHOWTIME service. "We feel the CATV customers may in many cases want the Front Row service in their family rooms and they will want to keep the full (R features included) service for say the bedroom. With simple trapping technology this is possible and the CATV affiliate can offer the twin-services for the price of the SHOWTIME service alone."



Sie also feels that by offering two levels of pay, one totally non-offensive as to language and program content, the CATV operator will be better able to deal with his local community relations. "It is not that people won't take a full service that includes R product" notes John "but rather that when you offer them only a single service they feel they have no choice in the matter. Front Row gives them a choice, for about half the regular price, and that puts the cable operator in a better light with the city and his customers."

The Front Row service will include its own 'mini-program guide' which unlike the 15 cent per copy SHOWTIME guide will cost the cable operator approximately 5 cents a copy.

Is this the end of SHOWTIME program innovation? Hardly. Long term one might expect to see the basic interwoven service concept expanded to a full 24 hour per day format. Sie hints that the next major innovation from SHOWTIME will be out around the time of the California Western Show.

Coop's cable column

bob cooper editor in chief
CATJ

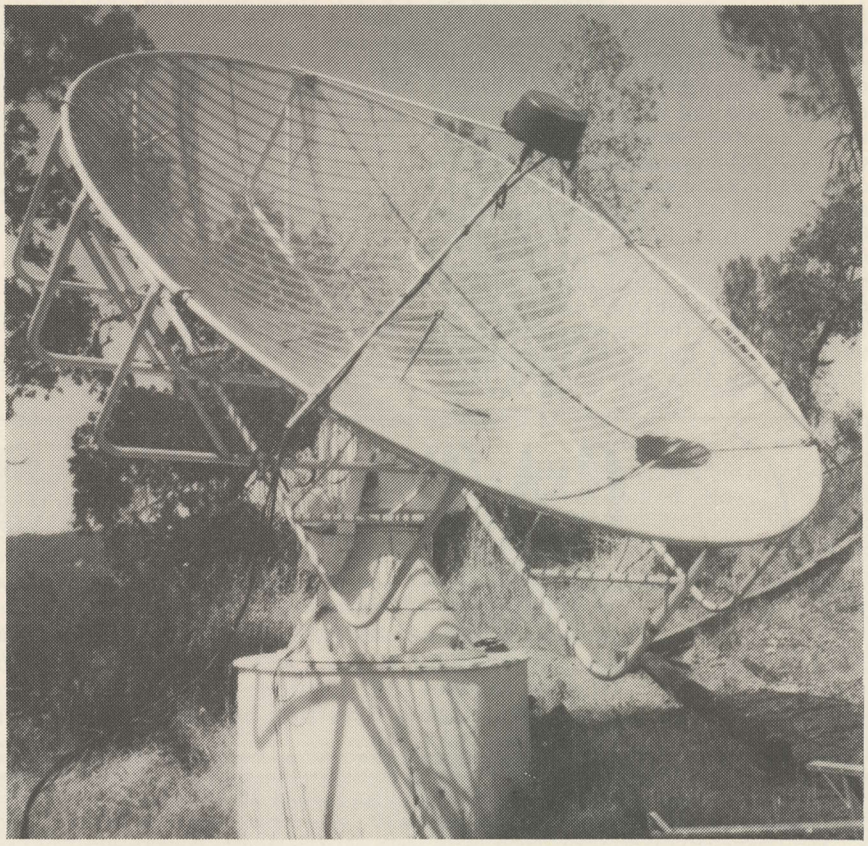
Private/Re-visited

In our April issue we dealt at some length with the emerging field of private (meaning non-commercial) earth receive satellite terminals. Our bottom line at the time is that there were perhaps a few thousand in existance; most of which produce less-than-commercial pictures for what is essentially 'private' viewing. It may be time to re-look at this aspect of the TVRO business to see where it is headed. Like any fluid area in technology it pays to check up on its progress from time to time so as to avoid 'surprises'.

Since our April treatment of the subject little has happened to change the basic situation. Very few people, yet, have any knowledge of satellite television or the ease with which these signals can be acquired. It is not that what we are doing is a 'secret'; but rather that most of us are so busily engaged in taking care of our own day to day affairs that few of us have the time to perform missionary work on the 'outside world'. However, whereas in April it seemed 'logical' that at some point in time the mass media would be discovering 'private satellite terminals' in August it is now a certainty. We are aware of **two** major, **national publications** scheduling fairly extensive 'stories' concerning 'back yard terminals' in the fall period ahead. Between the two publications there are around 25,000,000 magazine copies printed per issue which suggests that before fall is over many millions of Americans will have been introduced for the first time to the 'wonderful world of satellite technology'. Both reports make extensive mention of cable television's use of satellite terminals and we therefore 'see' the need for you, as either a cable user of satellite signals or as a 'cable person familiar with satellites' to be prepared to enter into friendly discussion with people who's curiosity will be picqued by what they read.

Our best estimate of the number of 'private' terminals now operating falls in the 3,000 region. I know, that is a quite large number (when compared to the number of 'licensed' commercial terminals) but one must keep in mind that 'operating' means simply people or groups of people who have **some form of reception** from satellites. In the real world the reception quality for most is far from the reception quality you would consider minimal for cable carriage.

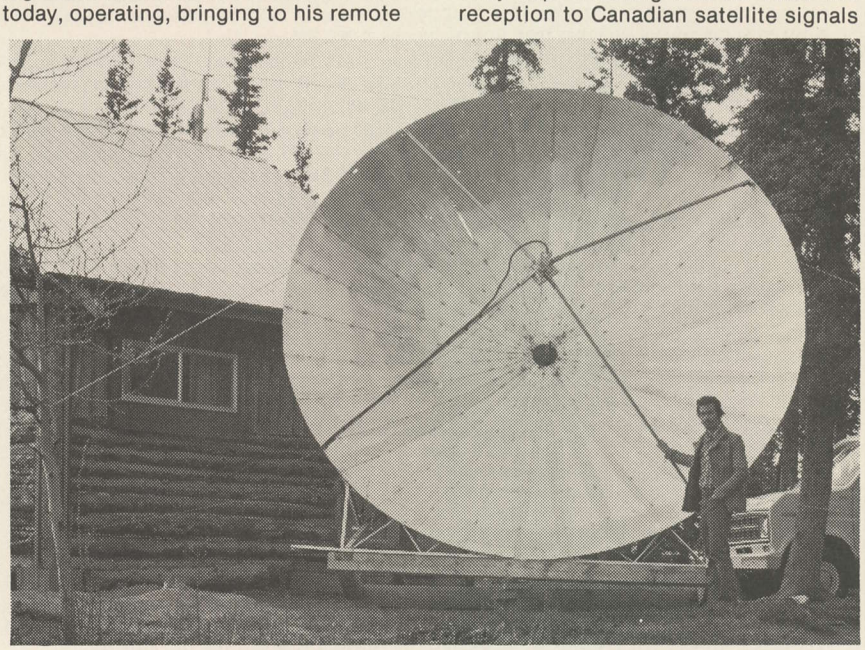
Two examples of the 'cream of the private crop' will illustrate the type of terminals being put into operation and more importantly the type of people putting them in. Out in the California foothills, east of Sacramento, a Stanford University Professor by the name of Howard has a private 4.5 meter terminal in operation. His terminal was constructed from what amounts to surplus parts; the antenna is a radar antenna stripped of its original solid surface (because when he acquired it the surface was badly damaged) and re-surfaced with a 'screen wire mesh'. I know, the books say you can't expect **adequate** performance from a screen wire mesh reflector surface at 4 GHz. The mesh has surface openings in the 0.1 inch (aperture) area and he located the mesh material by prowling around the Stanford 150 foot aperture radar astronomy dish and locating some surplus (or left over) screening material after they recently re-screened the monster Stanford antenna. He has a 300 degree Kelvin noise temperature utilizing Hewlett Packard HxTR 6102 bipolar transistor device as his LNA front end and he measures a C/N of 8 dB which he terms "marginal for CATV but fine for my own use". The receiver is a much-modified terrestrial Bell microwave video receiver originally in service in the 4 GHz band.



PRIVATE TERMINAL of California's H.T. Howard was constructed from surplus 4.5 meter radar antenna installation; surface is screen material originally utilized in a 150 foot aperture Stanford Radio Astronomy dish.

Those who attended CCOS '78 saw and perhaps talked with a Canadian experimenter in this field; Rod Wheeler of Whitehorse in the Canadian Yukon. Wheeler is a special case. He is employed by the Whitehorse cable television system and by the local Whitehorse television outlet. Both the cable system and the CBC outlet survive on week old video tapes flown in from southern Canada. To Wheeler, being forced to live on week-old-fare when there was current fare 'in the air' was something of a sin. So he set out in the early summer of 1977 to do something about it. He calculated the curve required to create a 4.5 meter solid metal surface parabolic and he designed a feed for it. Then he acquired an (SCI) LNA and a Microdyne receiver. On July 1 of 1977 he installed and turned on the system at the office of the Whitehorse CATV system. Wheeler selected that date on purpose; he knew that (Canadian) government bureaucrats were at that point on a long five-day holiday and that there was no way that they could **(1)** learn of his non-licensed terminal, and, **(2)** order him to shut it down **before the 5th of July.** So for five glorious days the Whitehorse cable customers (some 2,500) had their first live television; from (you guessed it) Atlanta's 'Super-17'. Sure enough on July 5th the government acted and Wheeler was told to shut it down. He did, but he expected a tremendous uproar from the Whitehorse residents; which he got. Some 8,000 letters, telegrams and other revengeful missives found their way to the Canadian authorities; who dutifully noted their presence but stuck by their guns.

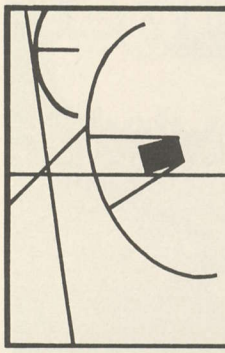
No satellite television (especially no U.S. satellite television!) **for Whitehorse.** Wheeler felt he had lost a battle but not the war so he loaded his home-brew 4.5 meter terminal on a trailer and hauled it out into the countryside to his 30 foot by 30 foot square log cabin home. Which is where it sits today, operating, bringing to his remote and wilderness surrounded log cabin a receiver-full of U.S. programming. Wheeler managed to pressure the Canadian authorities into granting him a **'private experimental terminal license'** for his home; which they even reluctantly re-newed this past spring. They kept insisting that he 'limit' his reception to Canadian satellite signals



THE WHEELER TERMINAL outside of Whitehorse in the Canadian Yukon brings together a pair of generation-separated cultures. The 4.5 meter satellite antenna with a 30 foot square log cabin for a backdrop points up how technology can jump whole generations.

(i.e. ANIK) and he kept refusing so again, quietly, he was granted 'interim permission' to utilize U.S. signals for his 'experiments'. Because of his tenacity, and the resulting publicity which covered Canadian media (including CBC coverage) Wheeler has opened the door just a crack for private terminals in Canada. He attended CCOS '78 largely to run down equipment and technology which he felt he needed to be in a position to provide others in Canada with their own private TVRO terminals. The Canadian authorities, again very quietly, have assured Wheeler that they will continue to license 'private/experimental terminals' **in those areas** where the terminal operator has **no access to any terrestrial television.** Wheeler calculates that in Yukon alone this amounts to a minimum of 200-300 terminals at 'work camps' and other small settlements where groups of people numbering from 50 to perhaps a few thousand are clustered. Most of these 'work camps' have very old, taped on cassette, television at the present time but when the weather turns foul and the Canadian bush pilots cannot fly the tapes must be run and re-run until a 'fresh' supply can be brought in. Wheeler notes that he has to work like crazy in the short Canadian summer to install terminals because after October first or so the whole of the Yukon area begins to shut down with the approach of winter. This winter perhaps 15-20 'work camps' will have their first 'live television' thanks to Wheeler and his people.

Satellite service continues to grow at a very rapid rate. Private terminals will we feel play an increasingly important part in this growth and in our September issue we'll be devoting considerable editorial space to examining how all of this may impact upon the cable industry.



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.

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AmeriCom Satellite Network, Inc., 6350 LBJ Freeway, Suite 148, Dallas, TX (**S4**) 214—341-4502
Anixter-Pruzan, Inc., P.O. Box 88758, Tukwila Branch, Seattle, WA. 98188 (**D1**) 206—251-6760
Applied Data Research, Inc., Route 206 Center CN-8, Princeton, NJ 08540 (**M9**) 609—921-8550
Avantek, Inc., 3175 Bowers Avenue, Santa Clara, CA 95051 (**M8**) 408—249-0700
Belden Corp., Electronic Division, P.O. Box 1327, Richmond, IN 47374 (**M3**) 317—966-6661
BESTON ELECTRONICS, INC., 903 South Kansas Ave., Olathe, KS 66061 (**M9 Character Generators**) 913—764-764-1900
Bestvision Home Cinema, Inc., 5540 W. Glendale Ave., Suite C-106, Glendale, Az. 85301 (**S9 Pay-TV programming and marketing**) 602—931-9157
BLONDER-TONGUE LABORATORIES, One Jake Brown Rd., Old Bridge, N.J. 08857 (**M1, M2, M4, M5, M6, M7**) 201—679-4000
BROADBAND ENGINEERING, INC., 1525 Cypress Dr., Jupiter, FL 33458 (**D9, replacement parts**) 1-800-327-6690
Budco, Incorporated, P.O. Box 4593, Tulsa, OK 74120 (**D9 Security & Identification devices**) 918—584-1115
Cable TV Supply Company, 11505 West Jefferson Blvd., Culver City, CA 90230 (**D1, D2, D3, D4, D5, D6, D7, D8, M5, M6**) 213—390-8002
CCS HATFIELD/CATV DIV., 5707 W. Buckeye Rd., Phoenix, AZ. 85063 (**M3**) 201—272-3850
C-COR ELECTRONICS, Inc., 60 Decibel Rd., State College, PA 16801 (**M1, M4, M5, S1, S2, S8**) 814—238-2461
Century III Electronics, Inc., 3880 E. Eagle Drive, Anaheim, CA 92807 (**M1, M3, M4, M5, M7, M8, S1, S2, S8**) 630-3714
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COMM/SCOPE COMPANY, Rt. 1, Box 199A, Catawba, NC 28609 (**M3**) 704—241-3142
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ComSoncis, Inc., P.O. Box 1106, Harrisonburg, VA 22801 (**M8, M9, S8, S9**) 703—434-5965
C R C ELECTRONICS, INC., P.O. Box 855, Waianae, HI 96792 (**M9 Videotape Automation Equipment**) 808—668-1227
Custom Building Products, Inc., P.O. Box 32231, Okla. City, OK 73132, (**S9, Underground Boring Equip.**) 405—495-1935
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DAVCO, INC., P.O. Box 861, Batesville, AR 72501 (**D1, S1, S2, S8**) 501—793-3816
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Durnell Engineering, Inc., Hwy. 4 So., Emmetsburg, Iowa 50536, (**M9**) 712—852-2611
EAGLE COM-TRONICS, INC., P.O. Box 93, Phoenix, NY 13135 (**M9 Pay TV Delivery Systems & Products**) 315—695-5406
EALES COMM. & ANTENNA SERV., 2904 N.W. 23rd, Oklahoma City, OK 73107 (**D1,2,3,4,5,6,7,S1,2,S7,8**) 405—946-3788
FANFARE TELEVISION, 10 Greenway Plaza, Houston, TX 77046 (**S4**) 713—960-8731
FARINON ELECTRIC, 1691 Bayport, San Carlos, CA 94070 (**M9, S9**) 415—592-4120
FERGUSON COMMUNICATIONS CORP., P.O. Drawer 871, Henderson, TX 75652 (**S1, S2, S7, S8, S9**) 214—854-2405
Gardiner Communications Corp., 2000 S. Post Oak Rd., Suite 1490, Houston, TX 77056 (**M9 TVRO Packages, S1, S2, S8**) 713—961-7348
GILBERT ENGINEERING CO., P.O. Box 14149, Phoenix, AZ 85063 (**M7**) 602—272-6871
G T E SYLVANIA, 3046 Covington Rd., Marietta, GA 30062 (**M1, D1**) 404—993-1510
Heller-Oak Communications Finance Corp., 105 W. Adams St., Chicago, IL 60603 (**S3**) 312—621-7661
HOME BOX OFFICE, INC., 7839 Churchill Way—Suite 133, Box 63, Dallas, TX 75251 (**S4**) 214—387-8557
HUGHES MICROWAVE COMMUNICATIONS PRODUCTS, 3060 W. Lomita Blvd., Torrance, CA 90505 (**M9**) 213—534-2146
Ind. Co. Cable TV Inc., P.O. Box 3799, Batesville, AR 72501 (**D1, S1, S2, S8**) 501—793-5872
International Microwave Corporation, 33 River Road, Cos Cob, CT 06807, (**M1, M4**) 203—661-6277
ITT SPACE COMMUNICATIONS, INC., 69 Spring St., Ramsey, NJ 07446 (**M9**) 201—825-1600
JERROLD Electronics Corp., P.O. Box 487, Byberry Rd. & PA. Turnpike, Hatboro, PA 19040, (**M1, M2, M4, M5, M6, M7, D3, D8, S1, S2, S3, S8**) 215—674-4800
JERRY CONN ASSOCIATES. INC., P.O. Box 444, Chambersburg, PA 17201 (**D3, D4, D5, D6, D7, D8**) 717—263-8258
Klungness Electronic Supply, P.O. Box 547, 107 Kent Street, Iron Mountain, MI 49801 (D1, D8, S2, S8) 906—774-1755
LARSON ELECTRONICS, 311 S. Locust St., Denton, TX 76201 (**M9 Standby Power**) 817—387-0002
LRC Electronics, Inc., 901 South Ave., Horseheads, N.Y. 14845 (**M7**) 607—739-3844
Magnavox CATV Division, 133 West Seneca St., Manlius, N.Y. 13104 (**M1**) 315—682-9105
MICROWAVE ASSOCIATES, INC., 10920 Ambassador Drive, Suite 119, Kansas City, MO 64153 (**M9 Microwave Radio Systems**) 816—891-8895

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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
R F SYSTEMS, INC., P.O. Box 428, St. Cloud, FL 32769, (**M2, M6**) 305—892-6111
RICHEY DEVELOPMENT CORP., 6920 Melrose, Oklahoma City, OK 73127 (**M1, M4, M8, S8**) 405—495-3953
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
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
Systems Wire and Cable, Inc., P.O. Box 21007, Phoenix, AZ 85036 (**M3**) 602—268-8744
TERRACOM, 9020 Balboa Ave., San Diego, CA 92123 (**M9 Microwave Earth Stations**) 714—278-4100
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 (**S4**) 303—825-6046
Theta-Com., P.O. Box 9728, Phoenix, AZ 85068 (**M1, M4, M5, M7, M8, S1, S2, S3, S8, AML MICROWAVE**) 602—944-4411
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), P.O. Box 4064, Atlanta Stadium, Atlanta, GA (**S9**) 404—522-7250
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
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., 200 Wood Ave., Middlesex, NJ 201—469-9400
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

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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:
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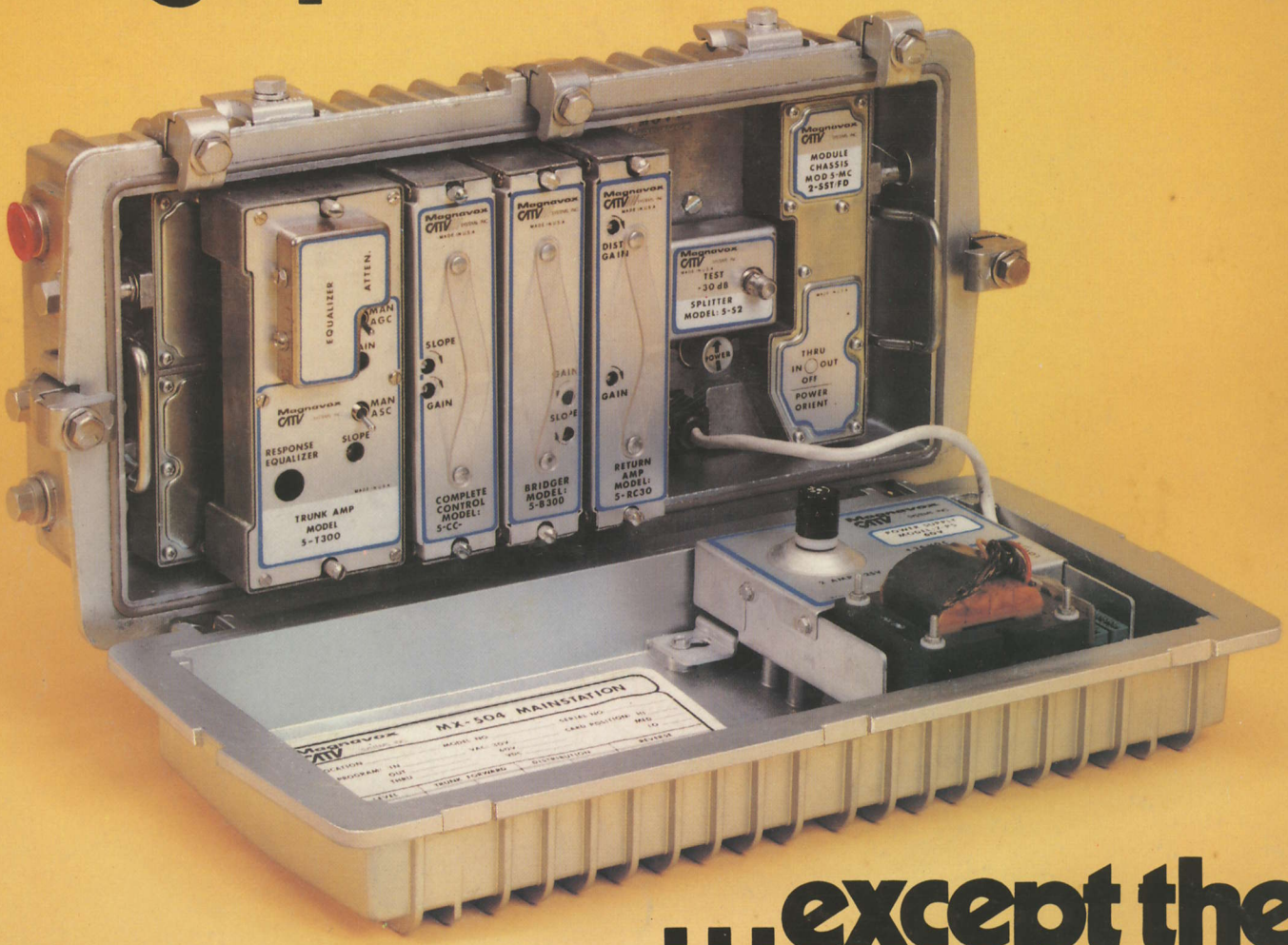

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