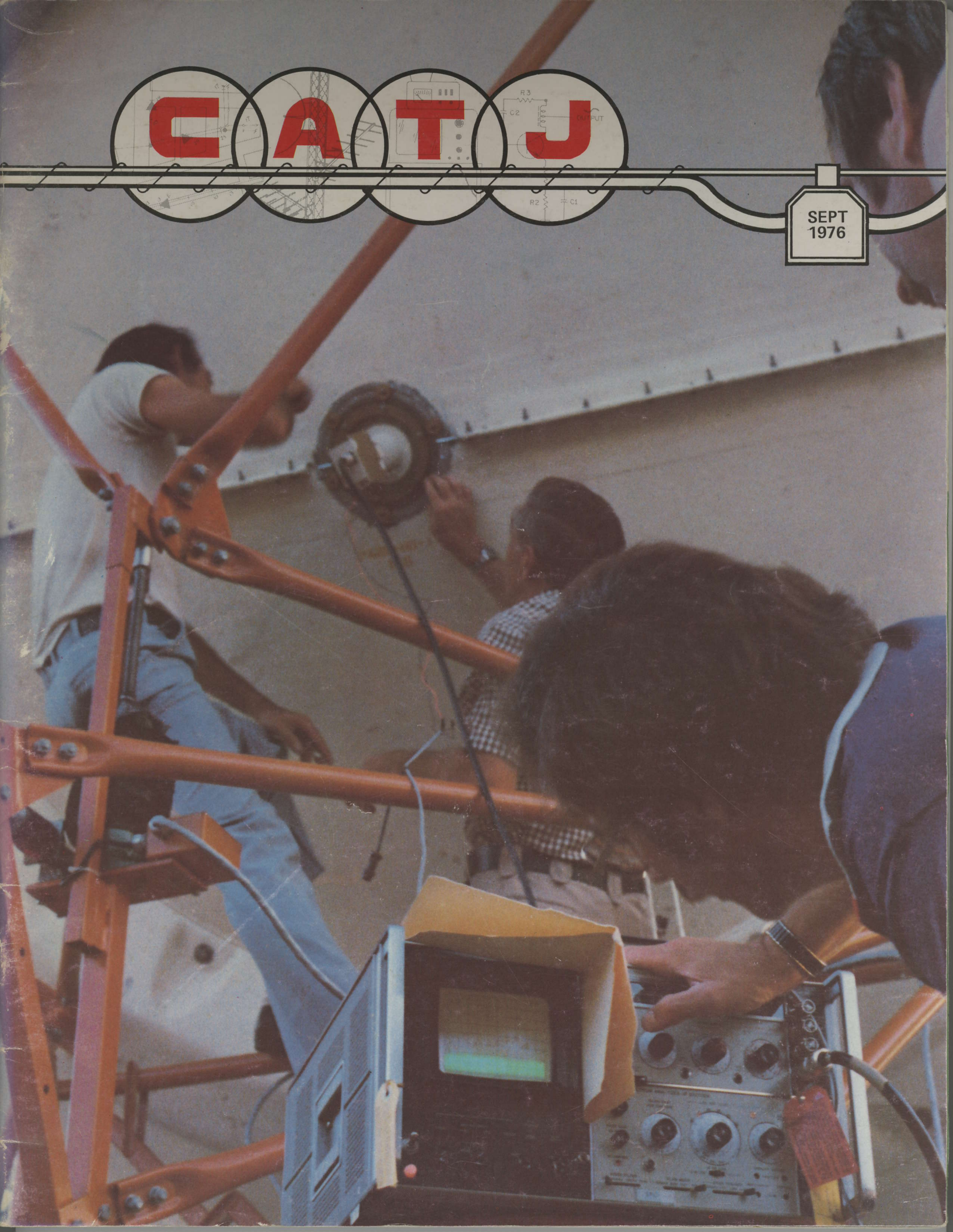
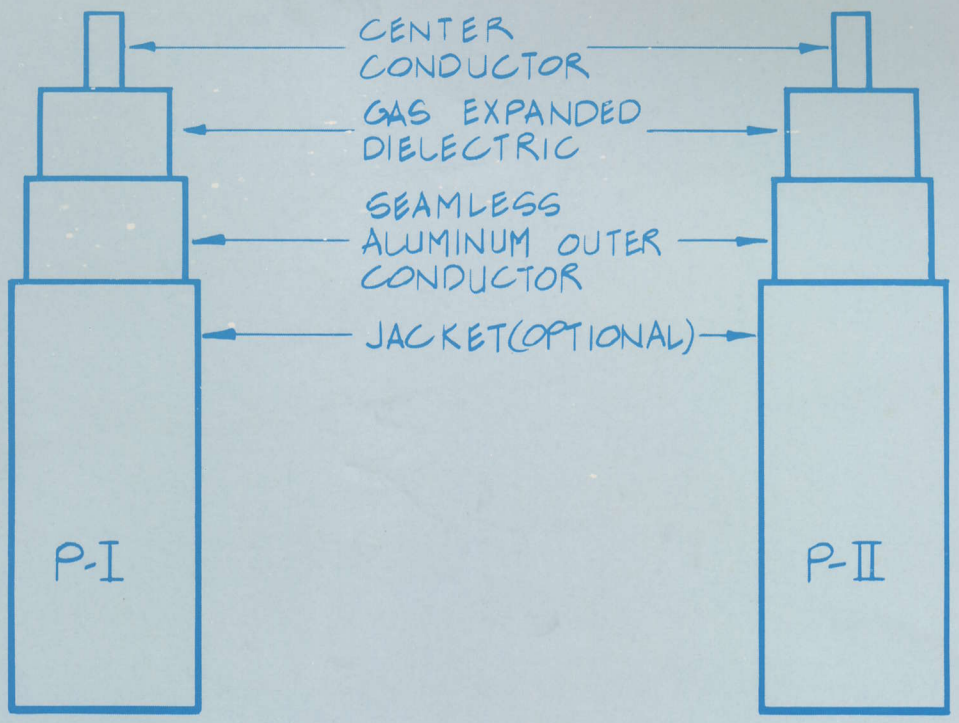
CATJ

SEPT
1976



US vs US



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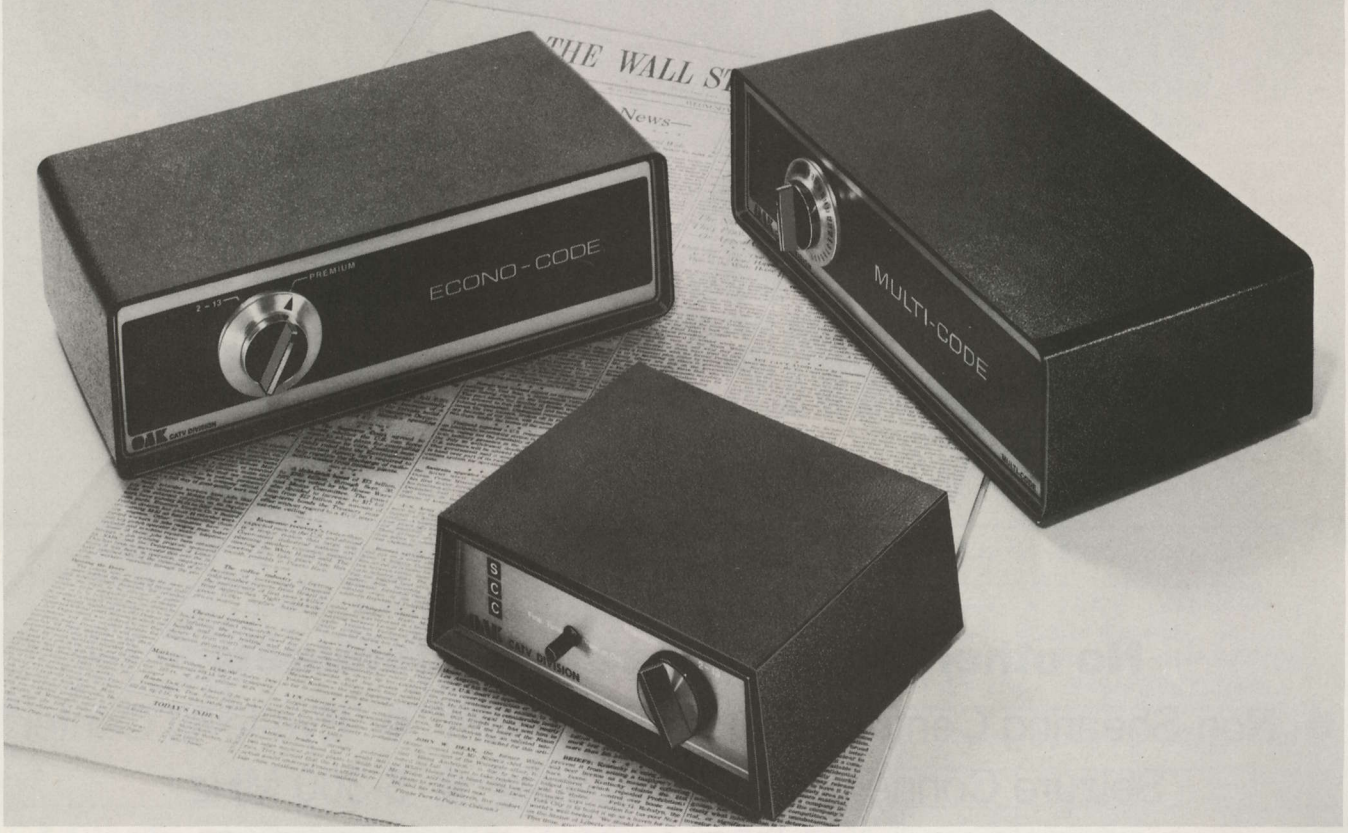

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Increases revenue in 12-channel or other non-converter systems. Oak provides scrambler and modulator for headend control of video scrambling. Two-position switch allows selection of standard or premium channel.

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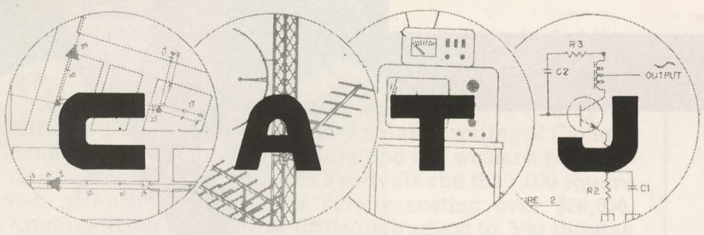

SEPT
1976
VOLUME 3 – NUMBER 9

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OFFICES
CATA/CATJ
4209 NW 23rd, Suite 106
Oklahoma City, Oklahoma 73107
(405) 947-7664

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

– CONTENTS –

CCOS-76 WAS AN EXPERIENCE! – CATV system operators, system personnel, and the industry's suppliers all joined hands to create a totally new type of 'learning-experience'.....10

EVERYMAN'S ANALYZER RE-VISITED – Want to build your own analyzer? Twenty-four operators did at CCOS-76 and now it looks like hundreds of units will be in operation before the year ends 16

SMALL TVRO EARTH TERMINALS REPORT – The 4.5 meter dishes work. And based upon CCOS-76 data, it appears they meet all existing FCC engineering criteria. Now it's up to the FCC.....28

THIN MARGIN IV – What happens when you 'series' pre-amps, bandpass filters and processors? And . . . how do you 'spot' a CATV-likely situation for a new system?.....40

BUILD YOUR OWN TEST EQUIPMENT? – Steve Richey claims for a few hundred dollars and some time you can construct test gear to make **all** 1977 required FCC tests.....46

THE WAY WE WERE-II – Remember this was **originally** published in the **1960's!** This month, the 'True Confessions Of A UHF Antenna Man'.....53

DEPARTMENTS

CATA-torial (Kyle Moore on international data exchange)..... 4
TECHNICAL TOPICS (Correspondence, Briefs)..... 49
- Klystron Shortage?
- Innovative Converter R and D
- CARS Band Changes (on schedule!)
- Earth Terminal Sharing
- A New Must Carry?
- 10-4 Old Buddy
- FCC Hams In CATV
- Circular Is Coming

CATA ASSOCIATES ROSTER.....56

OUR COVER

4.5 METER TERMINAL TURN-ON. At CCOS-76 Jerry Pell of Prodelin (left), assisted by Don Buscher of ITT Space Communications, Inc. makes final adjustments to 4.57 meter dish feed polarization while Vince Borelli of TOMCO (foreground) eyeballs the HP spectrum analyzer for signs of transponder signals.

CATA-TORIAL

KYLE D. MOORE, President of CATA, Inc.

FROM CCOS TO FRANCE

Late this past spring CATJ received an invitation to "appear as an exhibitor" at a world-wide television trade show to be held this September 23-28 in the Palais des Festivals in Cannes, France. What the promoters of this show had in mind was what is commonly known in the publishing trade as a "barter" or "trade-out". We would supply the international trade show (called **VIDCOM** / International Market for Videocommunication) with several pages of CATJ advertising space, while they in turn would supply us with no-charge exhibit space and accommodations in Cannes.

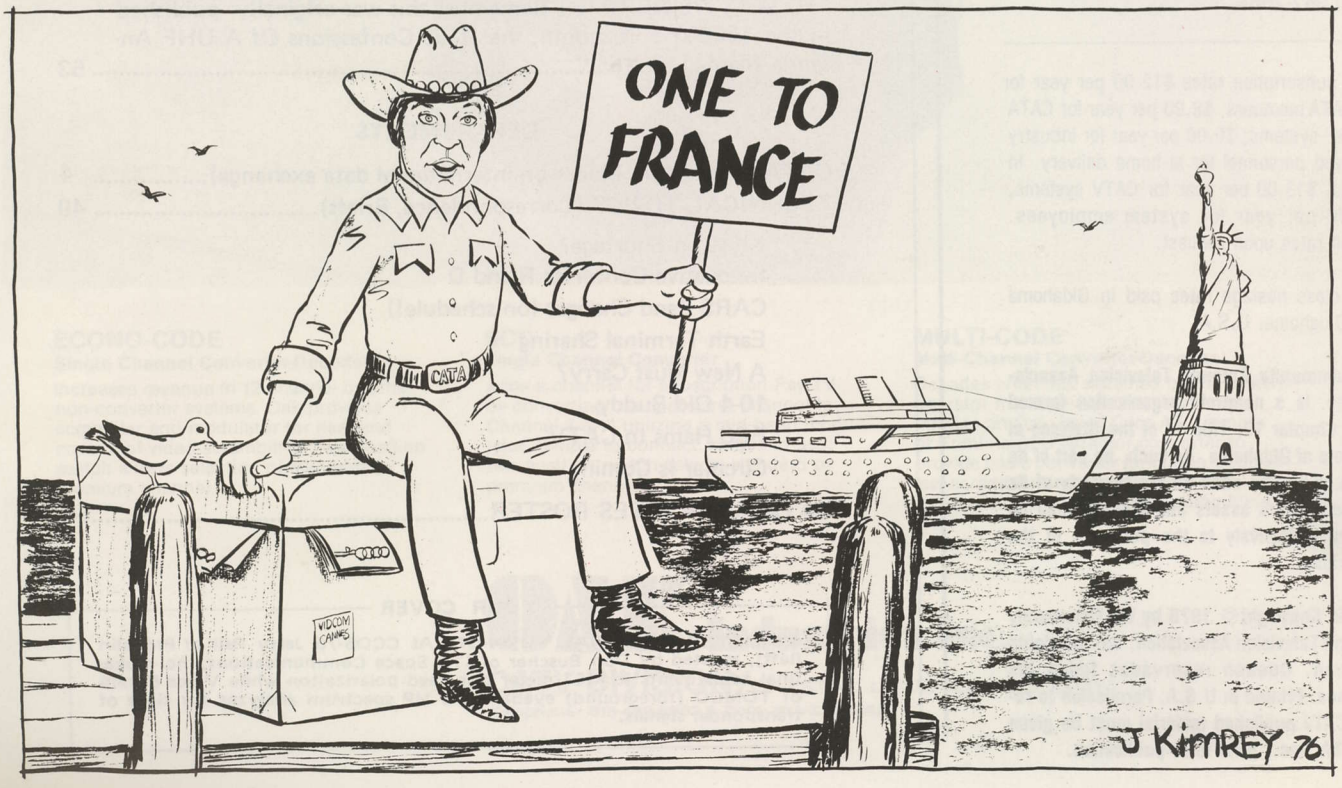
Our first reaction was to toss this bit of mail into the round file, along with other offers we had the same day for a new Popular Mechanix set of automobile maintenance manuals and an invitation to appear before a group of Wall Street investment brokers. Frankly, such things are not in keeping with the original CATA concepts.

But we thought about it awhile, and then talked it over with a few CATA people. **"Why not?"** we mused, "accept the kind invitation from France **and use this as an opportunity to talk with other cable operators from Belgium, Switzerland, Japan and so on."**

The Belgians, we have been told and have read, are locked in a copyright battle not unlike our own, although complicated by the fact that Belgium CATV systems carry signals from several countries, each with different internal copyright laws. The Swiss, we have read, are the masters of rural CATV distribution, with more small 50 and 100 subscriber systems per square kilometer than any other area of the world. The Japanese have been experimenting with small (very small) satellite terminals. All in all, it looked like an excellent opportunity to share some experiences, and to learn more about our own business here.

And so it was done. As President and a founder of the Community Antenna Television Association (CATA), I am this month attending this international gathering of CATV operators, and a 15 minute segment of the **VIDCOM** program has been designated for me to address the gathering on a topic pretty much of my choice.

Obtaining the permission and approval of our own CATA Board of Directors was hardly automatic. One Director feared that our acceptance of this invitation would be misconstrued by our own small system members as either (1) a junket at their expense, or (2) an attempt to take CATA "international". For the record, neither is the case. All expenses are being paid; not one penny of CATA money is being spent on the trip. And as for "going international", the



day may come where that is the timely thing to do, but that day is **not** yet here and Cannes, France is certainly not the spot.

Coming off of our own three day CCOS-76, it may be difficult to come down to the mere palatial setting of Cannes. From our 8 foot table top displays and our western hospitality, the elegance of Palais des Festivals and the 1,000 square foot self-contained exhibits (many costing over $50,000. American to create) will be difficult to adjust to. Yet through all of this glitter and tinsel, I suspect I will find that Swiss and English and Italian cable operators have many of the same technology problems we have here. I suspect I will find co-channel interference is a problem in Italy and plant AGC is a problem in Switzerland. I suspect illegal line taps are troubling Belgium operators, and the failure of local origination programming to attract support is a problem in England. The only problem we have here that I don't expect to find at Cannes is our difficulty in locating (or even identifying) exact replacement parts, for our Japanese operator cohorts!

Our CATA appearance in France at VIDCOM will be primarily aimed at a learning exercise. We view this as an opportunity to explore where international exchange of ideas, concepts and practices might be beneficial to all concerned. We have an excellent international "vehicle" preceding us: **CATJ**. Our "Journal" is now read in 28 countries, and it is in a unique position to bring all of the technology of the world, as relates to off-air television signal reception and distribution, together into one coherent forum. Through our **CATJ** distribution at **VIDCOM**, we anticipate introducing American cable technology to upwards of 500 new CATJ operators.

At **VIDCOM** we will be speaking privately and publicly inviting all community (or communal as they are known in much of Europe) antenna system operators to join with us in a sharing and exchange of technical and legal problems and solutions. We will suggest that through the facilities of our CATA offices in Oklahoma City, we will be pleased to act as a "collector and coordinator" of data, and to re-distribute that material to all international participants.

For longer than most of us care to remember, this nation's cable operators have been locked in a battle with the copyright interests over "fair compensation" for cable distribution of public television programming. We suspect, and in fact we know in advance, that our problems are hardly unique in this area. The broadcasters and the copyright people have for years spread the "myth" that "**...the United States is out of step with the balance of the world when it comes to copyright law**" and "**we must**" they say "**correct this injustice and join the rest of the modern world.**" This is of course major-network hogwash, spread repeatedly as "gospel" by those who want us to pay this viewing taxation so as to further cripple the attractiveness of what it is we offer to our customers. **VIDCOM** will, hopefully, offer us the opportunity to collect sufficient data to set this myth to rest once and for all.

So to those 500 plus international system operators gathering with me in Cannes, allow me to extend this formal invitation on behalf of the Community Antenna Television Association of the United States:

> CATA invites you to join with us in the creation of international dialogues about CATV. We invite you to share with us your technical problems and your technical successes. We invite you to share with us and our legal counsel your operational problems and their solutions. We invite you to do this in the spirit of creating a free-flow of data amongst all practitioners of the community or communal antenna art. We invite this participation on an individual system basis, and on a trade association to trade association basis in those countries where there are such groups.

CATA is in Cannes to learn and to share experiences. The copy of CATJ you are now reading is our American CATV industry's medium of technological and operating data exchange. We invite you to join us in this exchange, for a better CATV world where ever it may be in this ever shrinking world of expanding telecommunications.

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2903

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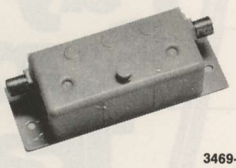

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Reduces sound 10 dB (minimum) with self-locking screwdriver adjustment.
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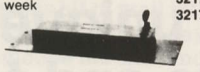

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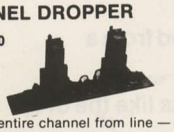

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Removes entire channel from line — for mandatory blackout or for closed-circuit use of channel frequency. (Channels 2-13)
NOTE: Disables midband.

CHANNEL NOTCHER

$550.00
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Notches out video, color & sound carriers 50 dB.
Channels 2-13

Minor impact on other channels — including midband.

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3355

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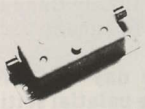

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Suppresses hi-band 40 dB.

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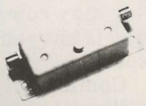

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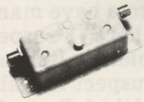

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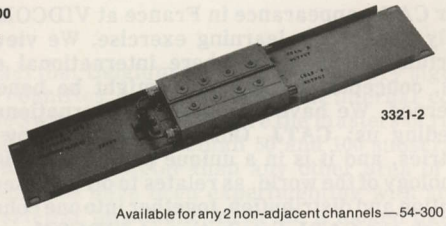

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M (A-I)
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20 dB loss at 6 PIX.

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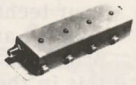

3328

Cut to your frequency anywhere 54-300 MHz.
Has > 50 dB ± 6 MHz.

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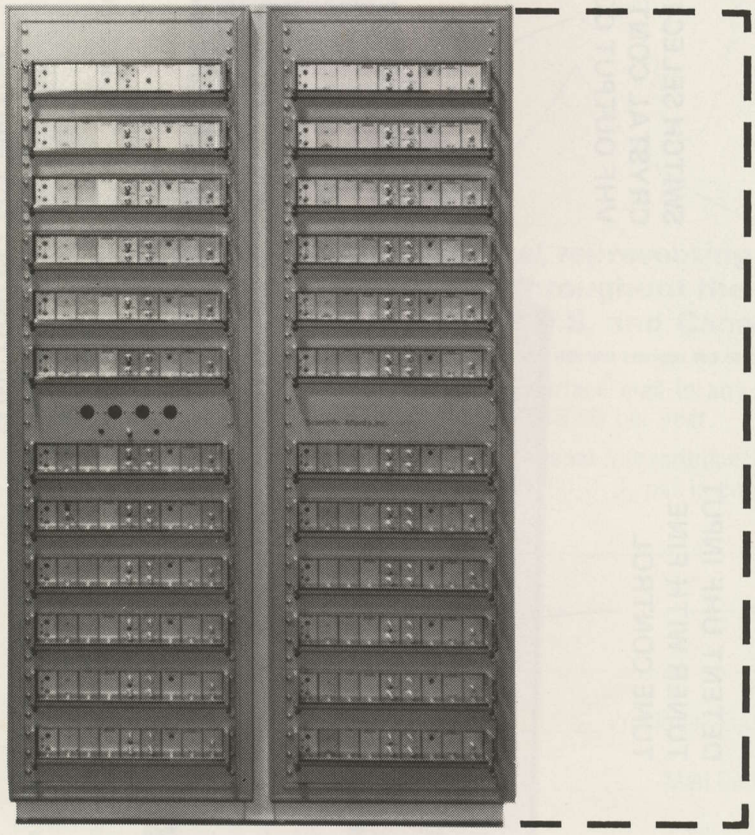

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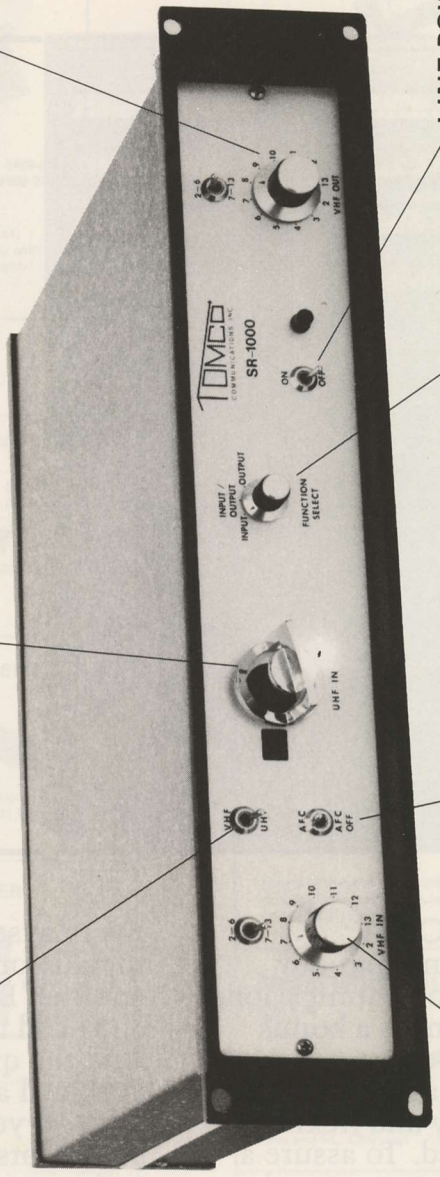
Canada: 678 Belmont Avenue West, Suite 103, Kitchener, Ontario, Canada N2M-1N6, Telephone 519-745-9445

Tomco total Standby Receiver

...the SR-1000



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AVAILABLE IN CANADA FROM COMM-PLEX ELECTRONICS LTD.

You won't have to face this

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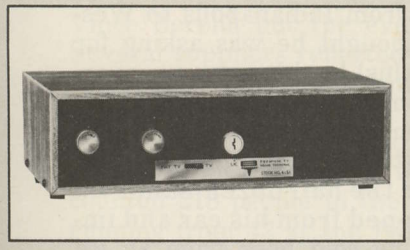
Other decoders on the market today, scramble *only* video. With audio in the clear, adult programming sound can come through loud and clear, even if the children can't see what's going on. This can cause problems. Further, non-subscribers can listen in and enjoy important sports events, even if they can't see them. It's also easier for subscribers to cheat when "video only" is scrambled.

And Blonder-Tongue assures complete parental control. A special key lock built-into the terminal provides, the parent with complete control over programming. When the parent leaves the house, he or she simply locks the set and there is no way for the babysitter or child to see or hear the pay-TV channel.

There's more to recommend this new decoder. A "barker" channel is available for operators who originate their own programming. On the other hand, the operator can use the "barker" channel for music.

The Blonder-Tongue Home TV Terminal. It's totally secure. It protects the family's privacy. For details write: Blonder-Tongue Laboratories, Inc., One Jake Brown Road, Old Bridge, N. J. 08857.

New Blonder-Tongue Total Security Pay Cable Terminal



BLONDER TONGUE

CCOS-76 REPORT
". . . there was no wasted time . . ."
Ralph Duff, General Electric Corporation
Decatur, Illinois

"Let's Do It Again"

Well, we did it. We started out in mid-April with a concept. Stage a trade show that was not a trade show. Get people involved in the meetings. Get the suppliers off the display floor and into the classrooms to 'teach' their technology. Get the operators into meetings where they exchange ideas, learn from others what does and does not work, and more important, *why* something does not work.

Approximately 450 people, made up of CATV system operators (from Oregon to Maine, Canada to the Mexican border), their families, dozens of system employees and industry supply personnel, gathered August 9th through 11th at Western Hills Lodge in Sequoyah State Park, near Wagoner (northeastern), Oklahoma.

Every room at Western Hills Lodge was filled. Several dozen rooms in nearby motels were filled. Approximately a dozen operators came and lodged themselves in portable camping facilities such as tents, campers, and mobile homes. Bob Welsh of Wavetek hauled a 24 foot boat behind his car from Indianapolis and he slept on the water at dockside. The full facilities of the state park were available for the cable people and their families and from the comments we solicited towards the end of CCOS-76, the meeting was ever-so-slightly short of a smashing success.

The first CCOS-76 "learning sessions" got underway promptly at 9 AM on Monday the 9th. Some suppliers, especially those associated with the small earth terminal displays, arrived on Friday the 7th (*"Anybody who thinks a 4.5 meter dish is small has just never put one of these things together. . . "* Jerry Pell, Prodelin, Inc.). As noted here separately, the two 4.5 meter terminals produced super-quality pictures that were in the 49/50 dB signal to noise ratio range. But several cases of Oklahoma 3.2 beer and tens of hot-hot hours in the 95 degree plus Oklahoma sunshine went into the project before magic lantern pictures spewed forth from the CMI and ITT receivers connected to the aft-end of the heliax down lines.

The CATA staff pulled in around noon on Saturday the 8th to find the following problems before us:

(1) The early arriving suppliers had checked into *and out of* their motel accommodations (most suppliers were housed *not* at the lodge but at nearby motels) all in one motion ("I couldn't believe my room when I found it had no telephone and the sink was smaller than you find on a 707 restroom!"), and they needed some alternate places to sleep;

(2) The AC power wiring in the area designated to be the display area was on the fritz and we had a single 20 amp circuit to power 42 display booths!

(3) The room divider that separated the designated display area turned out to be anything but soundproof; meaning that the display area noise would innundate the adjacent rooms, and vice-versa.

On the plus-side, CATA-member Gayland Bockhahn of Wisconsin Rapids, Wisconsin, had arrived early on Saturday to single-handedly take care of (1) converting the lodge's MATV system to our needs, (2) put in a channel 3 reverse feed line to carry scrambled HBO programming from the display area back to the headend for distribution throughout the lodge, and, (3) provide "CATV" multiple channel service from the lodge system to whichever of the 42 display booths that wished the service. Bockhahn earned the praise of dozens of suppliers when he provided RF service and AC outlet service within minutes of their requests, and he pitched in and assisted the Andrew antenna crew with assembling their 4.5 meter dish and then turned around and spent all afternoon assisting the Prodelin people with their 4.5 meter dish (*"Now when our system gets a terminal, I will be ready to install it myself"*; Gayland Bockhahn).

When Wavetek's Bob Welsh said he wanted to haul a good sized boat from Indianapolis to Western Hills Lodge, we thought he was asking for trouble. The 750 mile (plus) haul is not your average "Let's go skiing on Sunday" trip. When he pulled up mid-afternoon Saturday with the boat (loaded to the rails with test equipment which Wavetek provided for the half dozen hands-on learning courses), popped from his car and immediately started tossing cold beer from an ice chest in the stern of the craft, we knew he had suffered no pain during the long haul. Within minutes he had the boat launched and from Saturday afternoon through the following Wednesday evening, literally hundreds of CCOS-goers enjoyed his hospitality and water-skiing-boat rides on the lake. The CCOS-76 record, incidentally, is four skiiers up *simultaneously*; *"Next year we go for five"* according to Welsh.

Sunday morning brought one of those mid-western thunder-busters. "Foreigners" worried the day was ruined but the local suggested "stick around a few minutes (there was no alternative to this . . .) and it will change back to clear skies again." After around two inches of downpour and plenty of sheet lightning it cleared off and the two earth terminal crews got back to work. A summit meeting of everyone on hand around 11 in the morning produced a spur of the moment decision that the display room be *moved* to one-half of the large Sequoyah Hall. Supplier coordinator Vince Borelli of TOMCO, Larry Dolan of Mid State, the afore-mentioned every-place-at-once Welsh from Wavetek, CATA's Associate General Counsel Effros and about a dozen others converged on the Sequoyah Hall to pull out several hundred chairs, a speakers platform and the debris of a just-leaving Airforce gathering to turn the room into an empty shell; from which by 1 PM the display hall had been created. This was one of those *all-too-rare* everybody pitches in and *helps* situations and it did our heart good to see CATA's Iowa Director Ben Willie hauling one end of a 75 pound display table while at the opposite end Don Buscher of ITT was lugging his share of the load.

Throughout the afternoon people arrived by car, private airplane, and by ground transporation arranged by CATA to haul those arriving via Tulsa's airport the 60 miles to the lodge. One chartered bus load of 45-plus set out from the Tulsa airport around 4:30. CATA member (and new Board of Directors nominee) Dick Rondeau of California had used the international powers of a five-dollar-bill to persuade the bus driver to "stop at the first package store he passed." Several cases of Bud later, the happy group arrived at Western Hills Lodge. *"That was one enjoyable ride"* recalled Rondeau. *"When we started out everyone was sitting in their own seats just thinking their own private thoughts. By the time we got to the lodge it was one big* (almost) *happy family."*

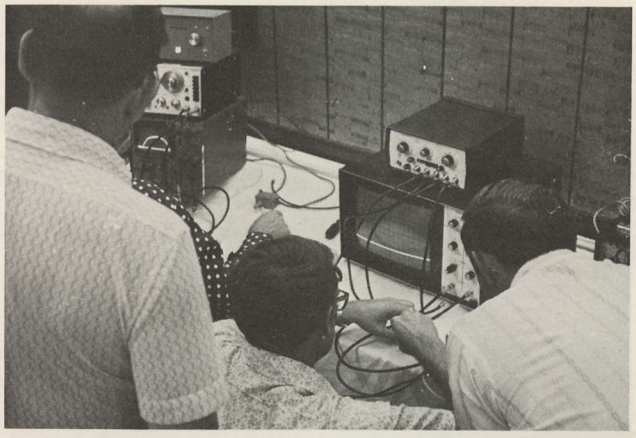
By the eight o'clock opening of the display area "preview" most of the displayers were on hand and the table-top displays were humming. *"We didn't expect much traffic the first night,"* noted Vince Borelli, but the events proved otherwise. Several suppliers reported that sales to CCOS-76 "delegates" paid their entire CCOS-76 expenses the first night alone.

Monday morning's trio of sessions began on time, which is a small wonder by itself. We counted 218 people in the Monday AM sessions, running from 42 at the Bank Loans and Rate Increases session to just over 100 at the Headend Practices #1 session. Monday afternoon's three sessions drew equally well, with over 100 at the Headend Practices #2 session, followed by 55 at the Low Cost Plant Construction Techniques and 43 at the Wave Propagation course. Glenn Hauser of the University of Tennessee and John Barth, Chief Engineer of Tulsa's KTEW (channel 2) conducted the latter course and touched on everything from 1,500 mile sporadic E skip reception

PACKED LAB ROOM — two test stations in the Monday and Tuesday evening "Lab Room" sessions were busy well past midnight as Steve Richey (standing, center) and Hansel Mead (back to camera just right of Richey) repaired and aligned dozens of pieces of gear brought by participants.

(*"Does Hauser* really *sit there in front of his TV set waiting for bursts of reception from distant stations"* we heard one fellow wonder out loud) to the changes we can expect when TV stations begin to utilize circular polarization; from John Barth.

Monday evening Steve Richey of Richey Development Corporation and Hansel Mead of Q-Bit Corporation opened up their CCOS Lab Room just off the lobby. This too-small room (we thought a room that would hold 20 people should prove adequate; we were wrong!) proved to be a real popular spot. One fellow from Kansas brought a whole car full of pre-amplifiers, and a bunch of "ill" Channel Commanders. The concept behind the Lab Room was that Richey and Mead would do gain, sweep and match tests for processing equipment, and provide noise figure checks of pre-amplifiers. Richey and Mead checked out, re-aligned and even repaired dozens of sick or just plain poorly aligned units in the two evenings the Lab Room was open. (*"Next year, we need at least three separate work bench positions"* noted Mead.) On the second evening the Lab Room was open, cable operator Dean Peterson of Missouri sat himself down at one of



THANKS WAVETEK — with the kind loan of test gear by Bob Welsh of Wavetek, the CCOS Lab Room proved a very popular and innovative feature of CCOS. Small box atop stack at left is Richey's July 1974 CATJ Mark-A-Channel construction project; here in use to mark video and audio carriers positions on bandpass filter being aligned on test station to left.

the two Lab operating positions and proceeded to hold class for several hours on Channel Commander alignment, repairing a fellow operator's Commander-I in the process. (*"I learned more about the Commander-I in those two hours than I have learned in several years in CATV"* remarked one observer.) Lab room help or assistance was of course "on the house" and the repaired equipment went out by the wheel barrow load (*"... there are dozens of better looking CATV channels out there now thanks to the Lab room"* noted one Lab Room devotee).

Monday evening's open display room period (8 to 11 PM) was the first big opportunity for everyone to see the two earth terminal HBO signals. There were three HBO transponders operating during much of CCOS-76; including the transponder that serves most of the USA. A second "West Coast" HBO feed was running a second set of HBO programming for new west coast affiliates; and a third transponder channel was leased to the Christian Broadcasting Network (the "Club 700 people") for a special telethon. Because the antenna patrns for all three transponders in use was different, the difference a couple of dB makes at the 4 GHz downlink range was very evident as the two terminal receivers (CMI- California Microwave, Inc. and ITT-Space Division) switched for display purposes from the primary HBO feed to the two other transponders in use (see separate report in this issue CATJ).

Thanks to the on-site loan of a Blonder Tongue Labs Encoder, and the Toner Cable Equipment Company booth loaning of Blonder Tongue decoders, some of the CCOS-76 participants had the opportunity to sign-out a decoder, go to their room or Lodge cabin, and in the quiet and comfort of that location view both the HBO programming and the operation of the decoder. For the rest of us, it was "watch the HBO programming on the display floor" or "scramble city."

Tuesday morning sessions included four separate choices for participants:

(1) *Spectrum Analyzer Construction* — (see separate report here);

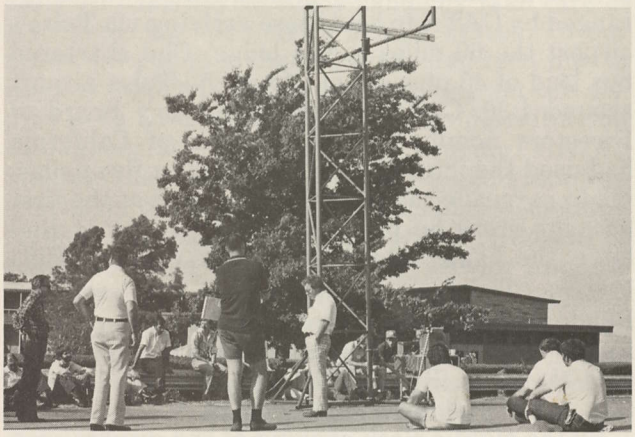
EVERYMAN ANALYZER KITS were individually packed with circuit board layouts identical to those appearing here this month. First order of business was checking the parts list against the bagged parts to insure everything was on hand.

(2) *Headend Alignment Practices #3* — Tom Olson and company set up hands-on alignment positions (using the always available Wavetek gear plus some last minute additions from Tektronix rushed to the show from the Dallas office) and operators had the opportunity to go through alignment on units as varied as B-T strip amps to complex demodulators and video processing units;

(3) *Antenna Designs/Test Range* — Tony Bickel of U.S. Tower Company, Afton, Oklahoma, set up an antenna test range on the north parking lot. When we checked around 10 AM, there were 41 brave souls standing or sitting in the hot morning sun soaking up vitamin "C" and Bickel-on-Logs. We sent out a push-cart of folding chairs followed by a second push-cart of 3.2 beer and soft drinks, feeling certain that by 11 o'clock the group would collapse in the 90 degree temperatures and bright sun from two forms of exhaustion.

(4) *Small Earth Terminals* — This was the biggest crowd for Tuesday morning, and as a separate report notes, the long and short of small terminals was that they do work, and they work very well.

By the noon break-point, Jerry Laufer's spectrum analyzer construction crew had approximately 15 of the 24 analyzers under construction not only complete but checked out and operational.



BRAVE SOULS — antenna seminar crowd braved 90 plus Oklahoma heat to sit through outdoor session that ran better part of day. Shortly after photo was taken, we sent folding chairs and cold-stuff-to-drink to the group.

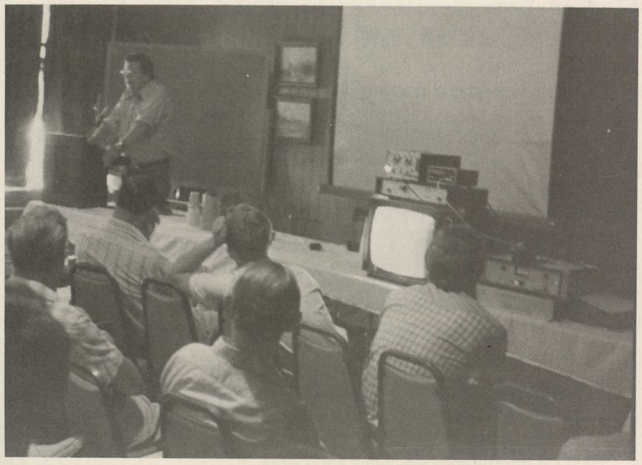
The afternoon sessions got back underway at 1:30; with the last remnants of the Laufer analyzer class taking but a few minutes to complete the last of the analyzer kit check outs. A couple of hours after the last unit had been checked out we found several fellows in the classroom staging "Mark-II" and "Mark-III" adaptations to the units. It seems once you have the basic analyzer going, your thoughts just naturally turn to turning it into a VSM-1 work-alike! We felt certain the 95 degree temperature would keep the Bickel antenna course attendance light in the after-lunch period. Wonder of wonders, many who had completed the basic analyzer were on hand and at 2 PM we counted 43 people sitting and standing in the hot sun listening intently as Bickel explained a co-channel phasing solution (*"I'm going home and be-*

ANTENNA SEMINAR — Tony Bickel of U.S. Tower Company (left, back to us) brought 40 inch face 22' tower section that self supported to hold test antennas, set up response measurements and match measurements system at base of demo tower.

fore I even unpack my bags I'm going up the 400 foot stick to change some phasing lines, based upon what I learned here," we heard one Florida operator say). One afternoon session was a bust. We thought the exhibitors should have the opportunity to have a crack at the attendees in the daytime, and we had scheduled an "Exhibitor's Show and Tell" from 1:30 to 3:30. The concept was to allow exhibitors to tell operators "what is new" and to give some short sales pitches. We were wrong. Even most of the exhibitors did not show up! Another afternoon session, "CATV and CB Interference," was a big hit. A packed room heard Lou McCoy of the American Radio Relay League explain how transmitters can generate harmonics and how mixing products can create signals where no signals previously were; and they heard CATA's General Counsel Rick Brown put into perspective how the CB "boom" is going and where it may be headed. Bob Geissler of VITEK explained how traps and filters can help out at the headend and in the plant. But the star of the afternoon session was 14 year-old design "engineer" Daniel Bostick of Microwave Filter Company. Daniel, the son of Glyn Bostick of MFC, explained how a new inside-of-the-car antenna (the "Intenna") he had designed utilizes a "slot-antenna" design concept to "load the car body via a form of skin effect" with a small bat-wing launcher placed inside of the car's windshield glass. While his dad ran the projector and moved the pointer-arrow around to match his son's instructions, Daniel showed why MFC is likely to be a dynasty-operation in the years ahead. He received a well earned standing ovation from the crowded room at the end of his short presentation.

The Tuesday evening CCOS-76 Bar-B-Que moved to the point on the lake just south of the lodge proper. CATA Director Pete Athanas from Wisconsin, assisted by the everywheres-at-once Gayland Bockhahn provided bar-service until the western style food was ready for serving at 7:30. Rows of picnic tables across the point seated more than 300 people during the dinner and Bob Welsh of Wavetek took out skiiers and sight seers in his by-now-(in)famous craft during the full course of the evening.

Most suppliers figured after the big outdoor feast the display floor would be quiet that evening. *They were wrong.* The display floor was so crowded for about two hours that it was hard to move across the allotted space. A Freddie Prinze and Mort Sahl pair of HBO specials kept the crowd congregated around the two side-by-side earth terminal displays. After it was all over, the hundreds of empty 3.2-stuff cans piled all around the earth terminal display areas was testimony that the



CB TVI AND McCOY — The ARRL's Lou McCoy covered transmitter generation of harmonics and parasitics; McCoy and Bob Geissler of VITEK set up TVI situation at varying interference levels using equipment on front table.

FAMILY AFFAIR — because of the unique facility offered by Western Hills Lodge, a high percentage of the CCOS registrants brought their families along for the 3 day affair.

HBO show was good fun (*"Now I know I can sell that in my town; and that $25,000. price tag is something I can handle"* we heard over and over again.).

The Lab Room was open Tuesday evening as well, and probably too crowded for its size. Steve Richey reported he shoved the last guy out of the room "at 3 AM or so" although he admits that not much got done in the way of practical equipment repair after 1 AM. One of the things Lab participants repeatedly asked about was the Hansel Mead "bridge," which appeared on pages 38-40 of the March 1976 CATJ. *"Dozens of people wanted to buy this bridge from me,"* lamented Mead, *"and of course we built it up just for our own use; it is not a Q-Bit product."* Hansel Mead has agreed to package up some parts-kits of the now-famous "Mead Bridge" ala the March 1976 CATJ, and if you are interested in building up this fine little necessary test instrument, you can write directly to Hansel (not CATJ) at Q-Bit Corporation, P.O. Box 2208, Melbourne, Fl. 32901. Not to be outdone by a fellow Lab-Instructor, Steve Richey of Richey Development Corporation (1436 SW 44th, Oklahoma City, Ok. 73119) says he will produce a wired and tested bridge ala the Mead design "very soon" at about $30.00 each.

"It just keeps getting better every day" commented one CCOS displayer. *"Anybody who left early* (virtually nobody did, except for a handful of trade press people who blew in one day and out the next) *really missed the every-day-was-better-than-the-preceeding flavor of CCOS,"* commented another participant. Wednesday, day three, dawned bright, clear and hot. Bob Welsh of Wavetek got out of his by-now-famous uniform (a plaid bathing suit and seldom anything else) and combed his afro-locks long enough to join Larry Dolan of Mid State for their day-long FCC Proof Testing seminar. This one ranked very high (see "CCOS-76 Survey" elsewhere here), and the amount of time and effort put into the carefully planned discussions merit extra attention. Dolan, freshly back from operator-sitting some CATA FCC Tests in Ohio and elsewhere knew from recent observations where the trouble spots were in FCC testing. Welsh, who had also spent a stint at a CATA FCC Test Package system in Ohio, had perused his extensive "library" to locate some "meaningful artwork" to accentuate their combination equipment hands-on slide show. Using a mixture of CATJ cartoons, Playboy cartoons and other "class-literature artwork" they demonstrated the pitfalls of aural (although not spelled that way) measurements and a host of other "troublesome" FCC tests.

Another high-ranker in the CCOS-76 survey was the "Preparing For March 77" seminar conducted by CATA's Associate General Counsel Steve Effros. One MSO operator was so impressed with the CATA "Course Studybook" he saw on Tuesday (the day before the session) he arranged hurriedly for his home-office "franchise renewal expert" to hop an airplane and hotfoot it to Western Hills Lodge to take in this full day session. Working from audio tapes made during this popular session, CATJ is preparing an extensive report for our *October issue* on this timely topic. It should be noted that our CCOS-76 course study guide (Filing Compliance) is available to any CATJ reader for $7.00 each, for as long as the relatively limited supply lasts. A special order card is found between pages 48 and 49 here this month.

Although not as well attended as the other two Wednesday sessions, the "Plant Amplifier Updating" course conducted by Steve Richey of Richey Development Corporation and Carl Hensley of ComSonics proved very popular with the 25 or so who did attend. Richey and Hensley got right into the design shortfalls of just about every plant amplifier *ever* produced in this industry (*"We were even designing equalizer circuits on the blackboard for old low-band only tube gear,"* reports Richey. *"Data on how this stuff works has just dried up and the poor fellow still using it was just flying by the seat of his pants!"*).

A Canadian contingent cornered us during the last day to ask if there might not be some way that CCOS-77 (Yes, Virginia, there will be a 77!) could be expanded to include some program participation from Canada. *"One thing you people seem able to do down here is to make a living from much smaller systems that we can do in Canada,"* noted one of the Canadian registrants. *"We think you can teach us a few things, and we think you might learn something from us as well."*

CCOS-76 SURVEY RESULTS

On the last page of the CCOS-76 "Program" we asked attendees to tell us their impressions of CATA's initial "trade show." We had a 32% response from attendees, meaning 1 in 3 of those attending took the time to fill out the survey form and to deposit same at the CATA Command Post in the lobby of Western Hills Lodge.

Of the surveyed:
87% were cable system personnel/owners/etc.
9% were vendor personnel
4% were "other"

(1) **Overall Impressions of CCOS-76**
- Fantastic, best show ever attended 52%
- Good - better than I had expected 48%
- OK - but I'm not sure I would come again 0%
- A bust 0%

(2) **Most-Appreciated Seminar Sessions**
- (1) Spectrum Analyzer Basics and Construction 18%
- (2) Small Earth Terminals 16%
- (3) Preparing For March '77 ..... 15%
- (4) Antenna Designs/Test Range 12%
- (5) FCC Proof Performance Testing 12%
- (6) Low Cost Plant Construction 10%
- (7) Headend Design Practices 7%
- (8) Plant Amplifier Updating 6%
- (9) Bank Loans and Rate Increases 4%
- (10) CB Interference Problems and Cures 3%
- (11) Wave Propagation 2%

(3) **Least-Appreciated Meetings Were**
- (1) Headend Designs and Practices 9%
- (2) Low Cost Plant Construction 3%
- (3) CB Interference Problems and Cures 2%
- (4) Exhibitor's Show N Tell 2%
- (5) Wave Propagation 1%
- (6) FCC Proof of Performance Testing 1%

(4) **How Attendees Felt About Display Area Arrangement**
Liked It 100%
Did Not Like It 0%

(5) **How Attendees Like Display Hours**
Liked Them 96%
Did Not Like Them 4%

(6) **How Attendees Felt About CCOS Lab Room Concept**
Liked It 98%
Did Not Like It 2%

(7) **At Future CCOS Meetings, Charges Should Be**
Less to Attend 3%
About The Same 89%
More To Attend 11%

(8) **Future CCOS Meetings Should Be Held**
In A Spot Similar To Western Hills Lodge 89%
In A Large Population Center 11%

(9) **Soapbox** (random comments on survey forms)
"**Let's do it again!**"; "More of the same...please!"; "**Stay small, stay independent**"; "Repeat next year"; "**Let's have shorter classes, such as two hours per class, so we can attend more of the simultaneous sessions**"; "Next year, **insist** on more publicity from trade journals" (**comment:** In fairness to the trade journals, we did not **seek** publicity this year. CED, TVC, Cablevision et al consider CATJ a 'competitor' for advertising dollars and are reluctant to give us **any** publicity.); "**Give more encouragement for suppliers to display**" (**comment:** They had every encouragement including no charges for display space. Frankly, we were sold out and CCOS-77 will also be limited to not over 40 displays, simply because that is the balance point between a manageable group and an out of control situaion.); "A good show...you did not let me down"; "**Expand the Lab Room concept...please!**" (**comment:** CCOS-77 will have a much expanded Lab Room concept including day-long alignment classes broken into subject/equipment categories.); "Not enough time to attend all of the meetings I would have liked to attend" (**comment:** CCOS-77 will repeat some of the more popular sessions at **two** different times.); "**Let's get a location with skiing facilities**" (**comment:** anyone who missed an opportunity to ski with Bob Welsh must have spent too long in the Lab Room!); "Can we have round table discussions for operators to share their experiences?" (**comment:** Yes - an excellent idea); "**Fun meeting - liked entire low-key operation, and no P.A. systems blaring in the exhibit area**"; "It will be difficult to make another CCOS better"; "**Would like to have a question and answer period with an FCC person present so we can express to him exactly how we feel**" (**comment:** Read 'Lynch Party?').

CCOS-77?

Will there be a CATA Cable Operators Seminar in 1977? A fair question.

The question was discussed at length throughout the CATA Board of Directors' sessions held concurrent with CCOS-76. And the unanimous decision was (surprise) "Yes, we will do it again." Will we do anything differently? Of course.

Many suppliers and even a few operators told us that the "vendors" should be lodged in the same facility as the operators. We agree...that *would be* nice. Our reason for not doing it this year was simple enough; Western Hills Lodge sleeps around 400 people, provided every bed is used to maximum capacity (i.e. one person in a twin bed, two in double beds). With around 80 vendor-types on hand, we saw up to 80 *fewer* cable people on hand *if* we assigned Lodge beds to vendors. So we made arrangements with two nearby motels to house the vendors. Some vendors had a hard time adjusting *down* to typically rural type motel rooms and 707-size wash basins. But most of all, those who complained felt naked with no in-room telephones. Being a businessman and being cut-off from one's home office telephone link was a bit of a shock, and we can understand this. *We'll find a solution to this one.*

At the close of CCOS-76, we asked those on hand to fill out a CCOS-76 survey to give us some hard, fast (and current) impressions of what was good and bad about the gathering.

In that survey 89% of those filling out the survey felt "future CCOS-76 meetings should be held in a spot similar to Western Hills Lodge." Only one fellow surveyed said *"Don't Hold It At Western Hills Lodge,"* while others took the time to add to their survey form comments such as *"This was a real good area to hold a meeting; no distractions,"* and, *"Holding it in this type of facility was the BEST feature,"* and *"Next year I am going to bring my family; this is a great spot!"*.

We also asked attendees what they thought about the "size" of the CCOS-76 group. And 98% said, "We think the size was just about right," while the remaining 2% felt "the group size was too small." Nobody thought CCOS-76 was too big.

All of this data is being analyzed, and CATA expects to announce in our October CATA Newsletter and in the same month's CATJ just where and when CCOS-77 will be held. Remember that CCOS-76 was "born" in mid-April of this year, and that we had barely 90 days to get this one pulled together. With nearly a full year to plan CCOS-77, we should be able to iron out the few wrinkles we ran head-long into this year.

An Iowa operator said it. *"It will be difficult to make another CCOS better."* Probably. But just as good...that we can do.

ELEMENTARY ANALYZER — II
Updating The Most Popular CATJ Construction Project Ever Offered The Industry

Power To The People

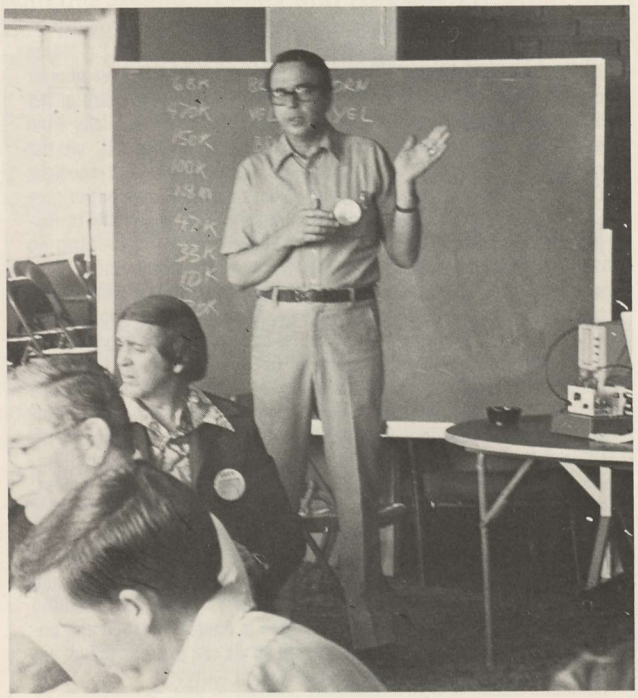
In the July 1975 CATJ, CATV engineer Jerry Laufer of Gill Cable, San Jose, California, described for readers an "Everyman's Analzyer" a device which, with the assistance of a Jerrold RSC series set-top converter, a field strength meter and a suitable DC (coupled) scope brought the user into the wonderful world of spectrum analyzers.

In the following months we heard from several dozen CATJ readers who had constructed this do-it-yourself *basic* analyzer, and from a couple of readers who had already done the same thing themselves at apparently about the same time as Laufer and crew at Gill Cable. In the year that has followed, we have seen the original CATJ material reprinted in a Canadian journal, a European journal and, most recently, in an Australian journal. It is not often that something corners the fancy of so many people in so many parts of the world.

At the recently held CCOS-76 (see separate reports in this issue of CATJ), one of the most popular of all sessions was a 1-1/2 day set of seminars devoted to the spectrum analyzer concept for CATV. Leading off the series on analyzers was a half day session conducted by well-known analyzer teacher Raleigh B. Stelle (III) of Texscan Corporation (Indianapolis). Texscan's VSM series of analyzers (VSM-1, 2 and 5) are well known in CATV circles and Stelle has contributed material to CATJ in recent months on the basics of analyzer operation.

On Tuesday August 10th CCOS-76 attempted something never before offered at a CATV gathering, and to the best of our knowledge, at no broadcast(er) or similar gatherings either. We sat 24 people down in a room lined with work benches and placed a kit of parts before each of 24 registrants. Then with Everyman Analyzer creator Laufer conducting the class, twenty four soldering irons were raised to the ready and twenty four do-it-themselves analyzers were under construction.

STELLE ON ANALYZERS — half day Raleigh Stelle session preceded construction course for Everyman's Analyzers and played to a packed house.



INSTRUCTOR LAUFER — a number of the builders were CATV management types so Laufer listed the resistors in the project with color codes on the board to help everyone locate the proper parts in their kits.

CCOS-76 packaged, with the assistance of Laufer and others, complete parts kits for the Everyman's Analzyer. The circuit boards were pre-drilled, the parts were bagged into individual kits, and special cases were prepared with holes in place and silk screen labeling intact. One each Jerrold RSC-3 converter rounded out the package, and the total cost per participant was just a few pennies over $90.00 each.

The class, which got underway at 9 AM, was nearly wrapped up by 12:30. The analyzers were completed, and checked out solder bridges were corrected and by 1 PM twenty four new basic analyzer units were operational and safely tucked away in the CCOS lodge rooms of each of the participants. Several of the participants, including

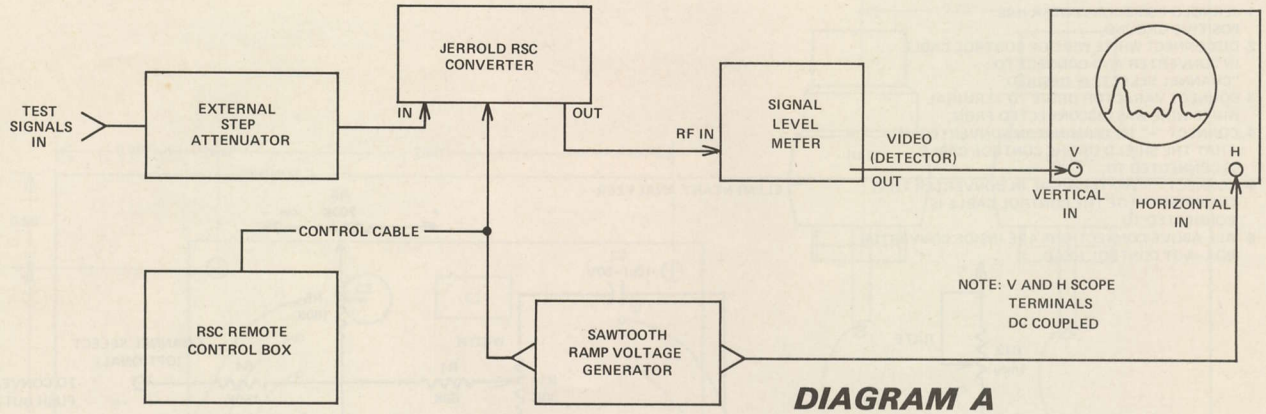


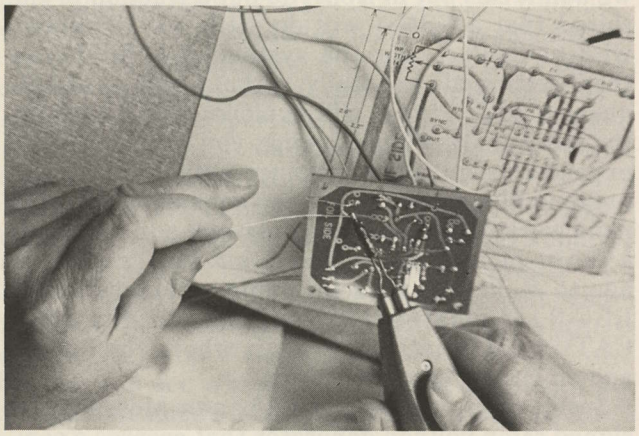
DIAGRAM A

CATA Director Peter Athanas of Lake Geneva, Wisconsin, were anything but skilled practitioners of the soldering iron art. Some, as the photos here indicate, were exceedingly well prepared, others had forgotten (inspite of advance warnings) to bring hand tools or soldering irons (but fortunately others had brought spares so it all worked out).

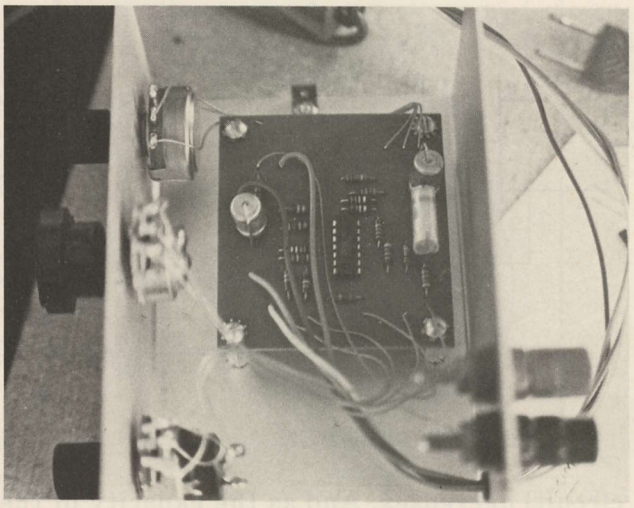
A list of those who participated in this CCOS-76 Analyzer Construction Course appears separately here, and for good reason. We are about to *re-visit* the Everyman's Analyzer and to offer a way for other interested readers to also construct this handy basic analyzer system. And the listing of those CCOS-76 participants who have already been through the construction of this unit is our way of telling you who there is in your portion of the country who has this unit already working. We *warned* those attending the construction class at CCOS-76 that we were going to do this, and they should be ready *to give a helping hand* to anyone who subsequently decides to build the basic analyzer. We don't *think* you *will* need any help . . . but *if* you do, the list appearing with this report is where you should start.

What It Is

Reference is made to diagram A here. At whatever test point you wish to look at signals, an input signal is derived for analyzer display. This can be the single channel input/output to or from a processor, low band only or high band only, mid band only, super band only, or any contiguous segments such as low band through mid band and so on. And, you can also look at the *whole* cable carriage band from channel 2 through channel R if that is what you have on hand.



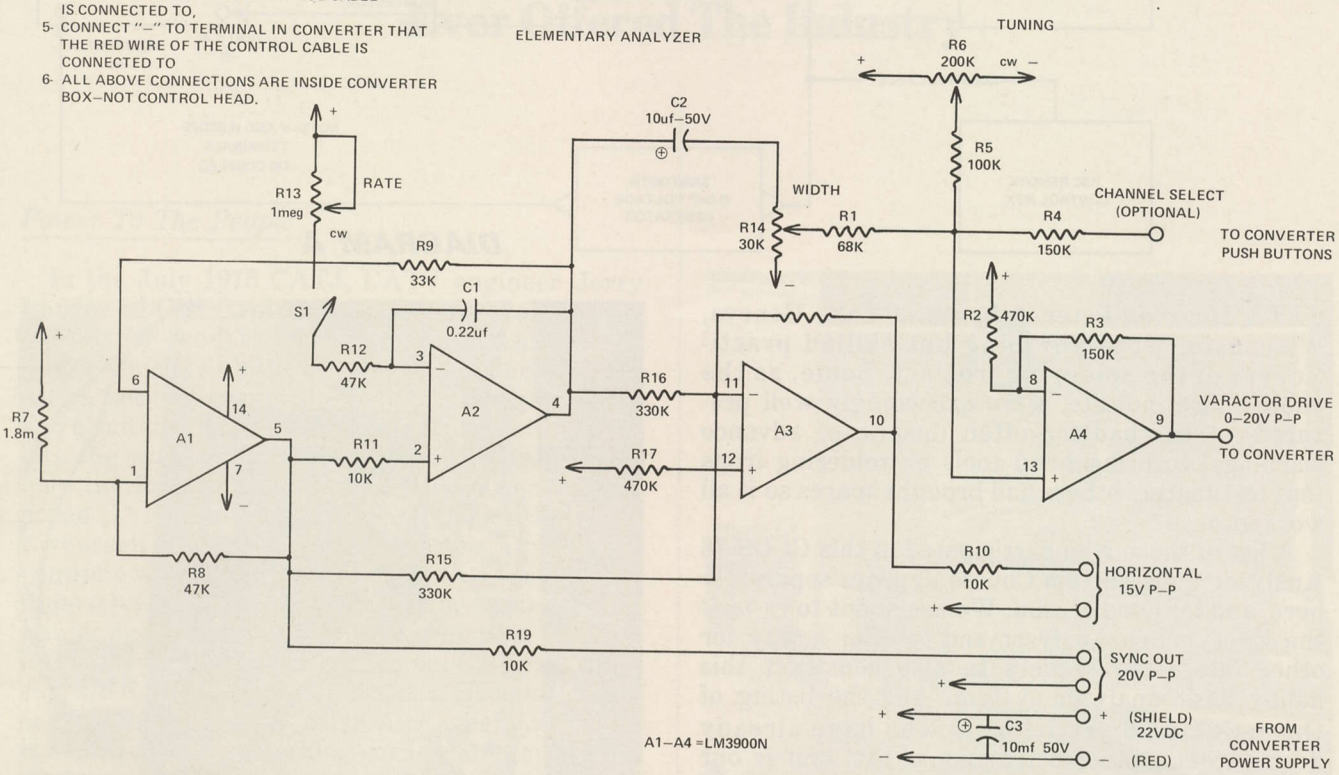
AFTER STUFFING PARTS — everyone broke out their soldering tools and went to work on the foil side of the board.



FINISHED ANALYZER RAMP GENERATOR — mounted in the TenTec predrilled and silk screened case provided as part of the kit was ready for checkout.

The input signal goes through an external switchable attenuator, which is necessary to keep the input levels to the RSC-(3) converter in the manageable (i.e. non overload level) range. Any good 1 dB step switchable attenuator (available from numerous sources including Jerrold, Blonder Tongue, Texscan, Wavetek, DBC and others) will do here. A 3 dB step attenuator will also work, but you lose the 1 dB accuracy ability in actual measurements if you do not have the 1 dB range selection. Then the input signal goes into the RSC-(3) converter. For the uninitiated, the "3" portion of the RSC-3 nomenclature indicates the output channel of the Jerrold set top converter, an RSC-2 will work just fine also, as will most other varactor tuned set top converters. All this determines is the *output* channel for which we develop an eventual "video" (i.e. demodulated) signal to drive the scope display.

The set top converter is varactor tuned, that is, the varactor diode is biased in such a way that as you *increase* the bias voltage the capacity (which is the tuning element in the frequency selective



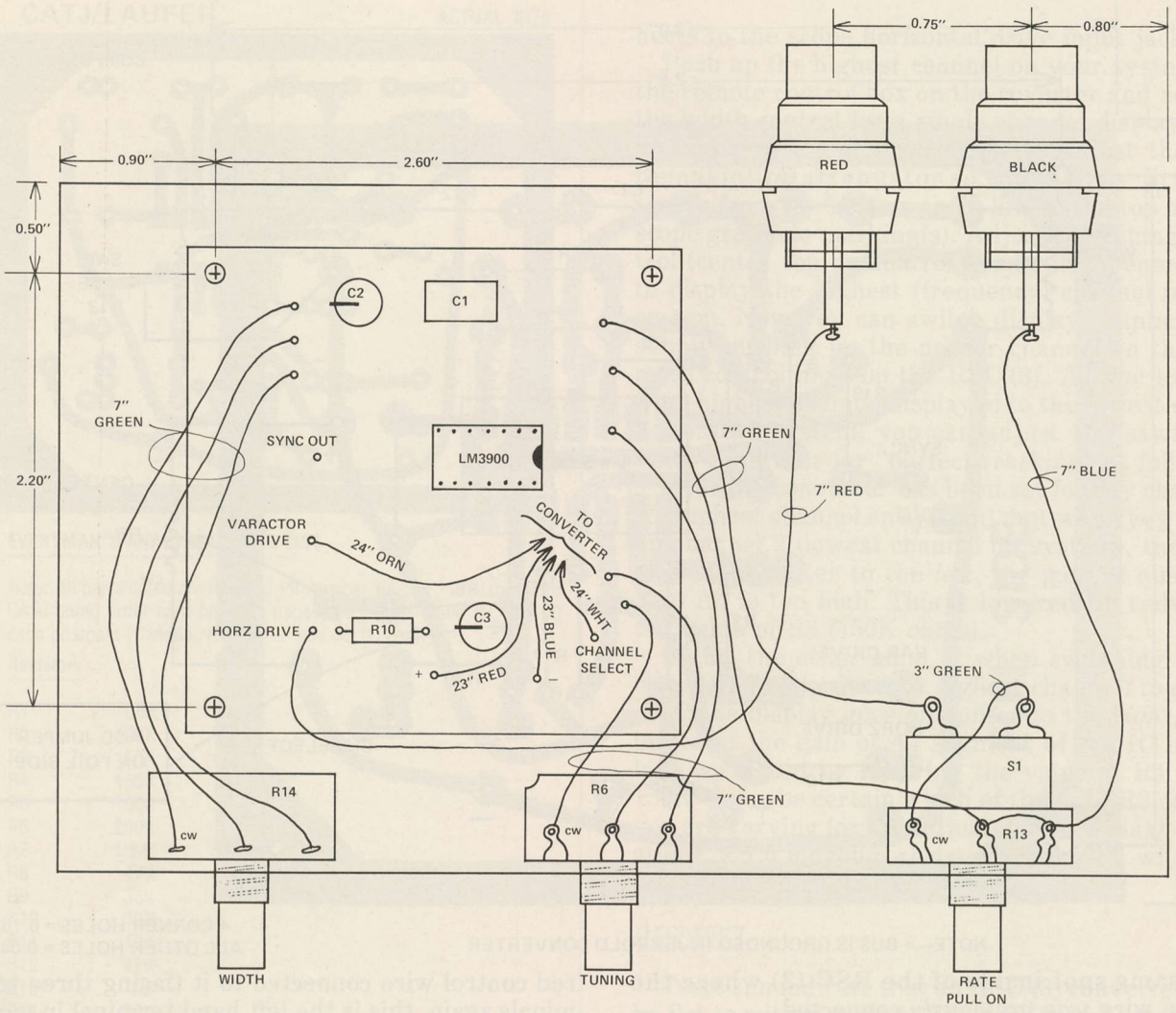
circuit) *decreases*. And as the capacity of the diode(s) goes down, the tuning mechanism in the set top converter tunes upward in frequency, to higher and higher channels. So by creating a special tuning-voltage, external to the set top converter, we can voltage-tune the frequency tuning of the set top converter. That is basically what the Everyman's Analyzer circuit does; create a tuning voltage for the RSC-3 (or whatever) converter.

The basic set top converter utilizes push button (or tuning dial selectable) tuning, and when you push the channel 5 button for example, what you are really doing is applying a factory-adjusted voltage to the varactor tuning element in the converter which puts the varactor diode in the proper "biasing state" to create the capacity required to tune the converter to channel 5 (input). When you push the channel 13 button, for example, a new (different) tuning voltage goes to the reverse-biasing network for the varactor and the capacity of the varactor diode now equals the tuned-to-channel 13 frequency.

Now, if you connected a field strength meter to the output of the set top converter, and tuned the field strength meter to the output channel of the set top converter, you would have a way to read the signal level on *all* cable channels without adjusting the signal level meter *itself*, simply tune the RSC-3 or whatever converter. In diagram "A," the field strength meter is nothing more nor less than (a) an i.f. strip to develop voltage gain between the tuning mechanism (the converter) and the display scope, and, (b) a demodulator. The demodulator function means that through the detector built into the field strength/signal level meter, via the "video-output" jack on the FSM/SLM, we have an output signal (demodulated, or at video) adequate to drive the vertical deflection circuits in our display scope.

Back for a moment to the tuning function. The set top converter is our RF head, our swept-mixer and our i.f. output circuit, just like you find in modern day spectrum analzyers. Yes — it does lack many of the refinements of a serious analyzer, such as adjustable or selectable i.f. bandwidths, markers and so on, but its basic performance is not unlike say the VSM-1 unit, although it will not (and we admit this out in front) do but a fraction of the things that a VSM-1 will do. Still, for somebody with *no analyzer* for the system, it is far better than getting along totally with*out* and as subsequent CATJ articles will explore, once you have the basic analyzer functioning, you can proceed to expand the unit's performance with some add-on building blocks. So the set top converter does the main work for you, and the only real add-on to it is a clever means of providing a known tuning voltage to make the varactor tuning element in the RSC-3 (or whatever) sweep up and down the CATV band of interest. This is where the special add-on circuit board comes in.

Inside of the add-on box is a Laufer-Messmer designed ramp voltage generator that creates a saw-tooth voltage. This saw tooth "tuning voltage" is



TOP VIEW

applied to the RSC-3 innards through a connecting wire, and to the horizontal drive circuit on your display scope, through another external wire.

The tuning-voltage-box houses a single circuit board (see photos here and the board layouts) and it has a single IC unit (a quad op-amp or four segment operational amplifier) to perform all of the magic required for our purposes. This IC (available from National Semiconductor Corporation, 2900 Semiconductor Drive, Santa Clara, Ca. 95051 as the LM3900M, or from Motorola as the MC 3401P and as the MC 3301P) is a 14 pin dual inline package (or DIP) containing about 40 transistors, 8 diodes, 12 resistors and 4 capacitors (ain't electronics wonderful!). This IC plus a handful of other descrete parts (see parts list here plus parts designators on schematic diagram) are what you need to be in the analyzer game.

Powering for the unit is easily handled by "borrowing" from the RSC-(3) converter power supply segment. CATJ has heard from a couple of builders of the original July 1975 CATJ unit who have built the entire unit *inside of their own RSC series converters*. We have seen no photographs of this, but can see where this could be done with a minimum of noodle scratching to make all of the parts fit. This would, of course, eliminate having the separate box to haul around.

The hard-language "how the ramp voltage generator circuit works" will not be repeated here, but reference is made to pages 7 through 14 of the July 1975 CATJ for those who wish to go back to the original Laufer-Messmer manuscript on this unit.

Controls and Operation

There are three front panel controls, and the scope (horizontal) drive on the rear panel. Connecting wires to the RSC-(3) converter include powering to the ramp voltage generator, and varactor drive to the converter.

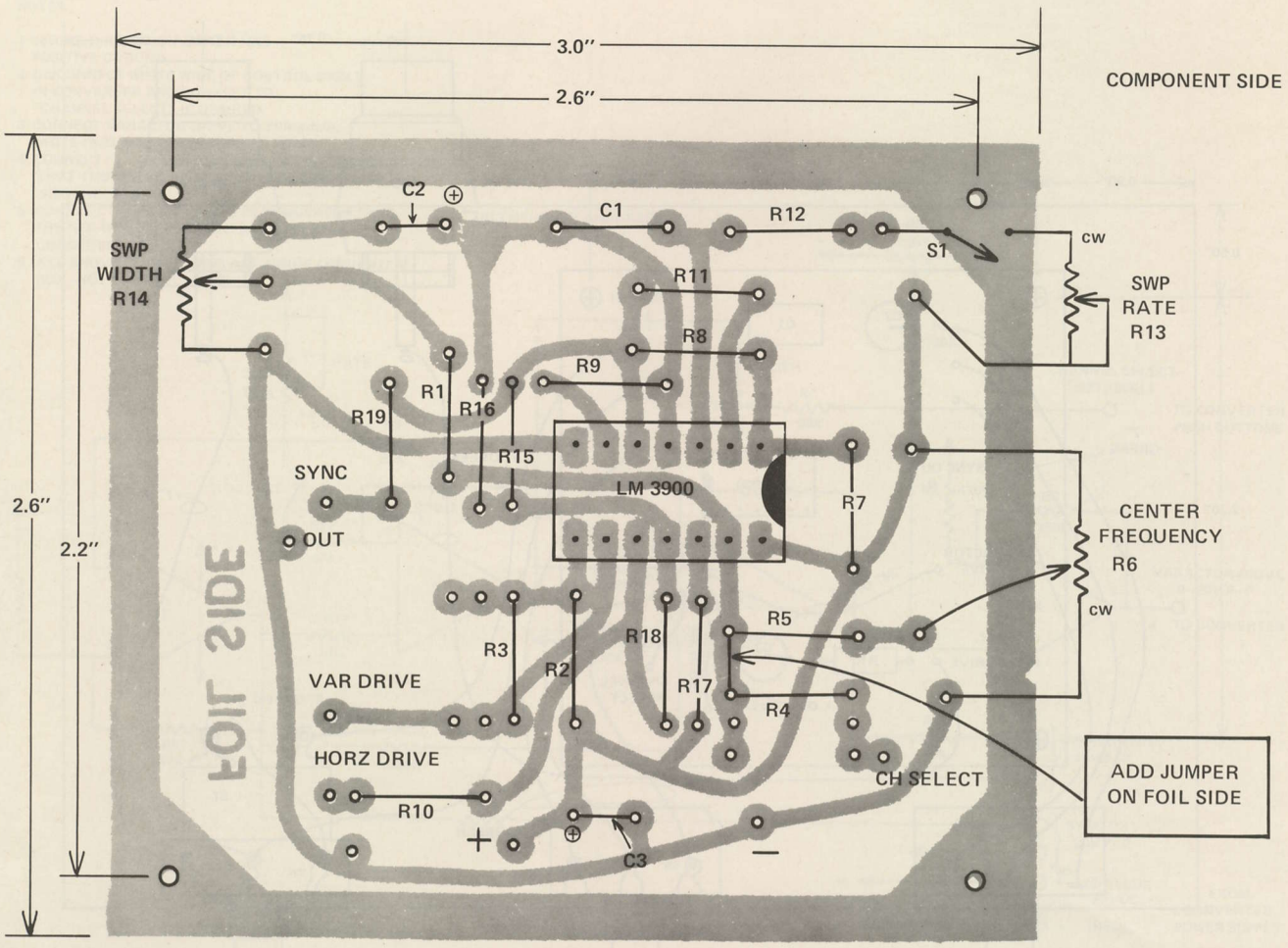
The ramp generator control box has (a) sweep width control, (b) sweep rate control, and (c) a center frequency control.

To connect the control package to the RSC-(3) converter, proceed as follows:

(1) Remove the RSC-(3) converter (this is the portion with*out* the push-buttons) from the case and drill a 13/64 inch hole .7 inches up and .8 inches in from the bottom case rear left corner (see diagram "Rear View");

(2) *Disconnect* control cable *white* wire (i.e. leaving converter from RSC-(3) control head) and connect to R4 for optional channel select function;

(3) Connect varactor drive (from pin 9 of IC) to



NOTE– + BUS IS GROUNDED IN JERROLD CONVERTER

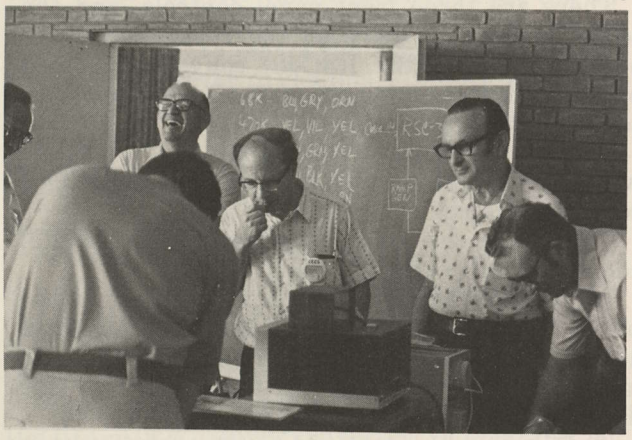
4 CORNER HOLES = 0.152"
ALL OTHER HOLES = 0.042"

the same spot inside of the RSC-(3) where the white wire *was previously* connected.

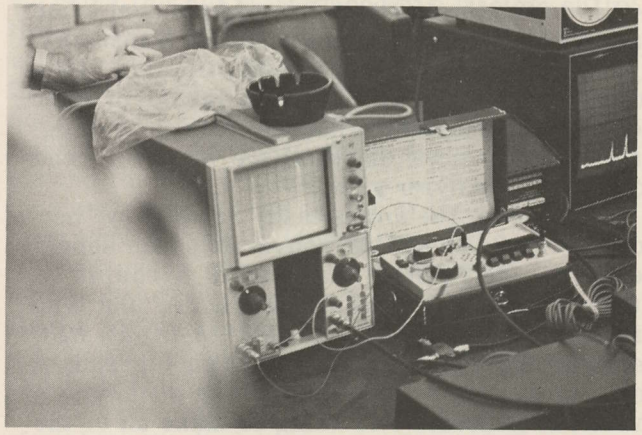
(4) For reference, the RSC-(3) converter has a *positive* ground. Connect the "+" common point on the circuit board (see "top view" diagram, on front of board just left of C3) to the terminal inside of the converter that has the *shield* of the control cable connected to it (facing three terminals, this is the right hand terminal on most units);

(5) Connect the "—" common point on the circuit board (see "top view" diagram, directly behind pot R6) to the terminal in the converter that has the red control wire connected to it (facing three terminals again, this is the left hand terminal in most converter units);

Now connect the lash up as shown in diagram "A", input signal through an external 1 dB (or whatever) step attenuator, then to the RF input jack on the RSC-(3) converter. The output of the converter goes to the input of the SLM/FSM, tuned to the output channel of the converter (typically 2 or 3), and the detector output on the SLM/FSM provides your scope vertical drive. The horizontal drive (sync) from the Laufer-Messmer control head (varactor ramp voltage generator) con-

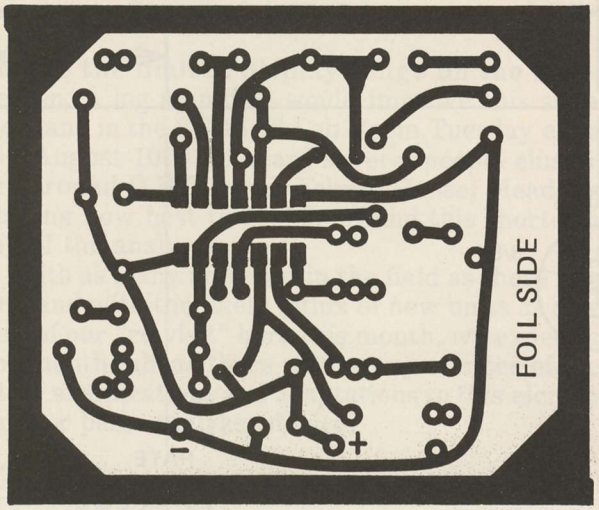


MOMENT OF TRUTH — The fellow in the center seems to be sweating out operation of a unit on the test and check out bench set up by Laufer. Actually, he is Harry Sadel of SADELCO and his meter got a good work out on the test bench.



IT WORKS! — Using Lodge MATV system, each unit was checked out before the constructor left with his completed unit.

CATJ/LAUFER ACTUAL SIZE



EVERYMAN'S ANALYZER PARTS LIST

Note: All parts listed are in CATJ kit number EA-001, available from CATJ using order card between pages 8-9 in this issue for $45.00 each postpaid (Canada, foreign — add $3.00 each).

Resistors

R1	68K
R2	470K
R3	150K
R4	150K
R5	100K
R6	200K
R7	1.8M
R8	47K
R9	33K
R10	10K
R11	10K
R12	47K
R13	1M
R14	30K
R15	330K
R16	330K
R17	470K
R18	330K
R19	10K

Capacitors

C1	.22uF
C2	10uF
C3	10uF

Other

1	Red terminal
1	Black terminal
1	Tuning knob (large)
2	Tuning knobs (small)
4	Tapped PC board spacers
8	Star washers
8	6-32 x 1/4 screws
2	Rubber grommets
3	3/8'' nuts/washers
1	PC board
1	LM 3900M (National) IC (or equivalent)
1	TenTec TW-36 case
1	3'' blue hookup wire
8	7'' green hookup wires
2	7'' red hookup wires
1	7'' blue hookup wire
1	24'' orange hookup wire
1	23'' red hookup wire
1	24'' blue hookup wire
1	24'' white hookup wire

nects to the scope horizontal drive input jack.

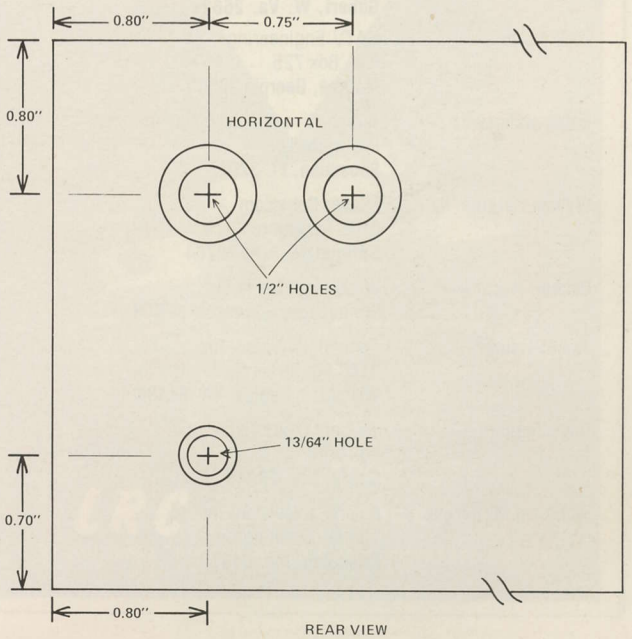
Push up the highest channel on your system on the remote control box on the coverter and adjust the width control for a single channel display (i.e. visual carrier, and aural carrier). Adjust the external inline attenuator so the display fits the screen from the bottom trace line to the top of the scope graticule marking(s). Adjust the tuning control (center top on control head/ramp generator) to display the highest (frequency) channel in the system. Now you can switch display channels by simply pushing up the proper channel on the remote control head on the RSC-(3). As you switch from highest channel displayed to the lowest channel on the system, you can adjust the sawtooth ramp generator for "perfect tracking" as follows:

(1) If the converter has been set for say channel 13 (highest channel on system), but when you push up channel 2 (lowest channel on system), the display is off-center to the *left*, the gain of quad op amp A4 is too high. This is lowered by reducing the value of R3 (150K ohms).

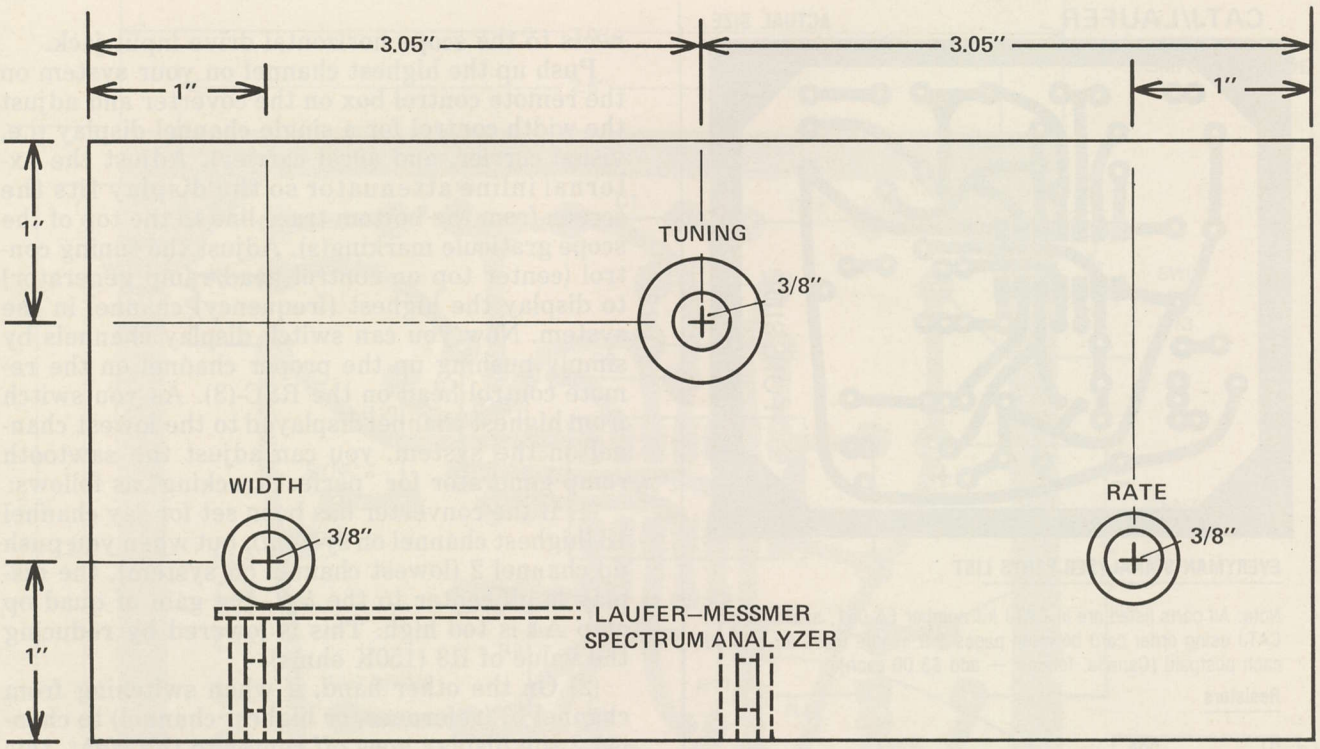
(2) On the other hand, if when switching from channel 13 (reference, or highest channel) to channel 2 the display goes off center to the *right*, this indicates the gain of A4 segment of the IC is too low; corrected by lowering the value of R4 (also 150K ohms; be certain which of the two [R3 or R4] you are varying for fine adjustment). In many situations, a 1.5 megohm resistor in parallel with R3 will set the push button tracking.

Accuracy

Tests run indicate that an RSC-(3) converter can be flat to within +/— 1 dB across the channel 2-13 range, and presumably up through channel R as well. If you have a known input level from a signal generator, you can check out your own RSC-(3) or other converter and prepare a calibration chart for accuracy for critical measurements such as head-end level setting.



REAR VIEW



FRONT VIEW

EVERYMAN ANALYZER ASSISTANCE?

The following CCOS-76 registrants participated in the construction class and built their own working analzyers as described here. If you need help, find the fellow closest to you and ask!

Peter Anthanas — Southern Wisconsin Cable
719 Williams
Lake Geneva, Wi. 53147

Jim Daniels — Auxier Cablevision
Box 217
Auxier, Kentucky 41602

Clarence Dow — Van Buren TV Cable Co.
28 Bradley Street
Caribou, Maine 04736

David Fox — Fox TV Cable Co.
P.O. Box F
Gilbert, W. Va. 25621

Nick Geehr — CATV Engineering
P.O. Box 725
Monroe, Georgia 30655

Ralph Haimowitz — Indian River Cablevision, Inc.
P.O. Box 327
Sebastian, Fl. 32958

William Harkins — Beaver Cablecom
2108 Sycamore Place
Springdale, Ark. 72764

Delmer Heck — Winnebago Cable TV
Winnebago, Minnesota 56098

James Heino — Community Video, Inc.
2140 8th Street S.
Wisconsin Rapids, Wi. 54494

Dave Jaggers — Jaggers Ozark Cable, Inc.
Box 306
Ozark, Ark. 72949

Woodrow McHargue — Milan Cablevision, Inc.
103 N. Washington
Princeton, Mo. 64673

Robert Polkinghorne — International TV Cable Corp.
Box 93, 410 3rd Avenue
International Falls, Mn. 56649

Haskell Starbuck — Television Cable Co.
P.O. Box 226
Shattuck, Oklahoma 73858

Steve Streeter — Storm Antenna and Tackle Shop
P.O. Box 226
Siletz, Oregon 97830

Neil Webster — Guttenberg TV Cable System
314 S. River Park Drive
Guttenberg, Iowa 52052

Kenneth Charles — TV Distribution Systems
59 Le May Street
West Hartford, Ct. 06107

Richard Core — Westover TV Cable Co., Inc.
234 Barret Street
Grafton, West Va. 26354

Donald Jackson — West Lafayette TV Cable, Inc.
Box 173
West Lafayette, Ohio 43845

Joe Latimer — TV Cable Corp.
501 Main Street
Van Buren, Ark. 72956

A.R. Olson — Elbow Lake Cable TV
Box 2024
Elbow Lake, Mn. 56531

Ed Smith — Steuben Video, Inc.
166 Main Street
Hornell, N.Y. 14843

Updates and Mods

Experience at CCOS-76 and from prior constructors indicates that there are probably a half dozen or more modifications to the basic analyzer which will improve the versatility of the unit. One of the major shortcomings of the basic analyzer box is of

course the limited display range on the scope screen. A log amplifier would improve this situation, and in the CCOS-76 Lab Room Tuesday evening August 10th we heard several people clustering around Q-BIT's ever-helpful Hansel Mead discussing how best to design around this shortcoming of the analyzer.

With as many units out in the field as there now are, and with the likely influx of new units as a result of our "re-visit" here this month, we expect in the months ahead there will be any number of creative modifications and adaptations to this elementary or basic analyzer device.

Kits Available

CATA/CATJ resisted to the very last minute getting into the potential can of worms called "kit supplying." Even under the extreme pressures of the early CCOS gathering (*"I didn't get into the spectrum analzyer course because it was filled up...but I sure would like to build the analyzer, can I get a parts kit?"*) we said "no...we will tell you where to get the parts, but that is it."

Well, we have re-considered.

Between pages 8 and 9 here this month, we have an order form for ordering the *same* parts kits utilized at CCOS-76. This will include the same TenTec box (i.e. housing), pre-drilled and silk screened just as the CCOS-76 kits were, the same Jerry Laufer supplied circuit boards, the same LM3900M IC devices and all of the parts including all of the hook up wire required to build the analyzer as it was built at CCOS-76.

There is one thing we will *not* supply you, and that is the Jerrold RSC-(3) converter, on the theory that everyone knows at least one friendly Jerrold salesman.

Now we have no idea how many parts kits to stock up on, and frankly, *until* we do know, we are *not* going to order one single part. So here is how we are gong to handle this project:

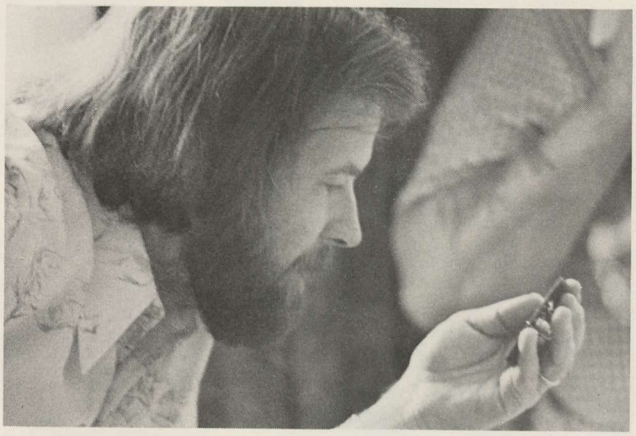
(1) We will accept orders placed *only using the order card* between pages 8 and 9 here this month. You may order one or a dozen units, as you wish. There are no quantity discounts (one fellow at CCOS-76 said he was going to order 9 units, one for each of his technical employees and then he was going to sit them down in mini-CCOS fashion and have a construction party!).

(2) On October 15 (1976) we will count all of the orders on hand, and then we will go out and order the required IC's, boards, TenTec housings and so on. We expect that between the day we order all of these parts and we start shipping out kits to those who order will be 30-40 days.

(3) Therefore, between November 15 and 25, we will ship all orders in our hands by October 15th. We do not anticipate stocking *any* extra kits; anybody who has not gotten their order in to us by Octber 15th will just have to wait until next summer or find the parts, board, etc. on their own.

(4) So, be advised that there *will be* a wait, until late in November, before you receive your kit. It will make a nice three hour project for the Thanksgiving holidays anyhow.

Will CCOS-77 have more construction projects? Will there be a Mark-II version of the Everyman's Analyzer by next summer? We suspect the answer to both questions is a resounding yes!



I CAN'T BELIEVE IT — you mean this little board and a Jerrold converter is a serious threat to our VSM-1!''...seems to be the thoughts of TEXSCAN's Raleigh B. Stelle, who made it a point to sit through the full construction course for Everyman's Analzyers and help out some of the less experienced builders.

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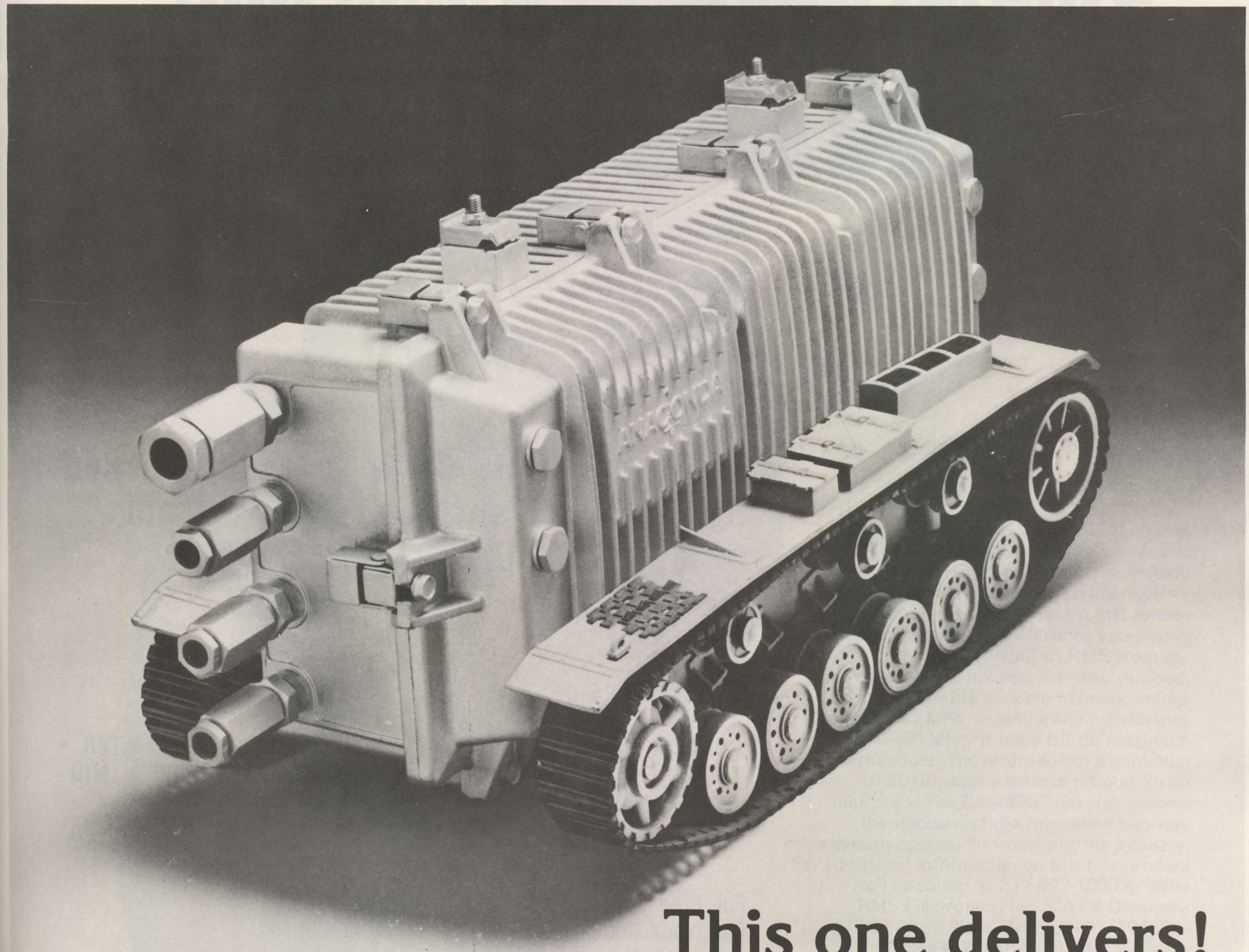

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RMS CATV DIVISION

SMALL EARTH TERMINAL UPDATE
All The Arguments Pro And Con Came Out During CCOS-76

11 Months Ago

On Tuesday September 30, 1975, at 9 PM EDST, Home Box Office inaugurated delivery of pay-cable-channel programming to a pair of earth terminals in the southeastern USA. The *October* 1975 issue of *CATJ* carried an extensive seventeen page report outlining how the earth terminals worked, what the major problems were in their installation and operation, and where the industry was likely to be headed with this then-new form of signal delivery.

Early in August this year, according to HBO sources appearing at CCOS-76, there were 56 operating CATV earth terminals, serving 70 CATV systems with HBO satellite service. By the time this new TVRO service (television-receive-only) is a full 12 months old, it is likely that 65 such terminals will be operating, virtually from coast to coast and border to border. In anybody's book, that is more than 1 new terminal turn-on per week, and there is no sign that year-two will be markedly different from year one.

Still, there are changes in the industry, changes which most hope will add up to even greater proliferation of earth terminals for CATV in the months and years ahead. One of the most dramatic, and potentially most influential changes in the wind is the now out-in-the-open push for smaller TVRO terminals. As *CATJ* has reported throughout the past year, the present FCC standardized 9 meter or larger terminals are producing such good pictures that many CATV system operators feel we have a classic case of engineering overkill at work. We may have such good pictures that we are paying more money than we need to pay to deliver adequate pictures to our customers. We are experiencing video signal-to-noise ratios in the 54-56 dB range, and there are those who argue that 48-49 dB signal to noise at video is more than adequate for our purposes. And we lay the blame for the overkill squarely on the doorstep of the Federal Communications Commission, because it is they who have enforced the so-called 9 meter (or larger) standard that presently restricts TVRO terminal antennas to installations that fit the 9 meter and up criteria.

For some months now there have been rumors and rumblings of many separate parties individually pushing at the FCC, and in Congress, for authority to install smaller-than-9 meter antennas for the receive only applications of TVRO service. In Dallas, Texas, at the industry's annual trade show, *CATJ* ran down not one but two individuals who had already constructed as sort - of - backyard - projects their own experimental TVRO facilities, utilizing in one case a 12 foot antenna and in another case a 15 foot antenna. Both antennas were unearthed on the "surplus market" (meaning military disposal system that rids the military inventory of obsolete or no longer required "surplus" electronics equipment), and neither cost the purchaser over $250.00. One had constructed his own low noise LNA and his own receiver, from scratch. The second had purchased a 2.7 dB noise figure LNA and using the same surplus channels, come up with an "obsolete" 4 GHz common carrier microwave video receiver.

Shortly after the Dallas show, an old-line antenna manufacturer in California (Prodelin, Inc.) installed, using experimental authorization from the FCC, their own 4.57 meter fiberglass antenna, and using LNA's and a receiver borrowed from nearby California Microwave, Inc., created what was probably the first permanent (although experimental) typically-CATV-TVRO using the smaller antenna size. And so the die was cast. By producing 49-50 dB video signal to noise ratios at their Santa Clara, California plant, Prodelin seemed to be pointing the way towards the future of TVRO facilities in this country.

If there was a turning point for 4.5 meter dish technology in this industry and country, it would have to be said that the *CATJ* report in our *May* (1976) issue was *that* point (pages 27-32). In that issue we revealed that smaller terminals were under construction, and that a serious challenge of the FCC's "9 meter standard" was coming *. . .soon.* Soon turned out to be late June of this summer when *CATA* (the Community Antenna Television Association) filed a formal request at the FCC seeking either a "rule-making" or alternately an expedited "Declaratory Ruling" on the issue. This *CATA* filing with the FCC (unacted upon as this is written in mid-August) provided a focal or rallying point for all of those who would like to see the 9 meter standard "relaxed" or eliminated, and the filing came on the heels of *CATA/CATJ* testimony on May 20th offered by Bob Cooper to Congressman Lionel Van Deerlin's House Subcommittee on Communications. In that testimony, Cooper pointed out the problem small CATV system operators were having with the present "price tag" of 9 meter and larger terminals, *"the net effect is that because of the pricing structure, smaller and typically more rural American communities will never have TVRO facilities, nor the programming they offer."*

Surprisingly, perhaps, there were and remain those who would prefer to see that smaller communities never do have TVRO facilities, at least of their

own. As the FCC muddles through the complex legal questions of earth terminal sharing, it has become apparent that there will one day emerge a mini-industry composed of people or firms who exist solely for the purpose of providing TVRO signals, for a fee, to *any* customers they can find. Sort of "un-common carriers" as it were.

So there has been some quiet, not overt resistance to the 4.5 meter concept. Which brought us to the doorstep of CCOS-76 in Oklahoma August 9 to 11. When CCOS-76 was announced, it was evident from the very beginning that the focal point of the "show" would be the "below 9 meter TVRO terminal" question. To create the proper atmosphere for such discussions, CCOS-76 arranged initially for a single TVRO facility utilizing the 4.57 meter dish of Prodelin. There were still people out there who believed, until shown otherwise, that a "small terminal" such as this was not capable of providing adequate (i.e. saleable to cable customers) pictures. CCOS-76, we felt, would allow an opportunity to dispell that notion once and for all. And as it turned out, there were two separate terminals on hand, one provided by Prodelin, with a receiver from the Space Communications Division of ITT, and a second provided by Andrew with a receiver from California Microwave, Inc. And as it further turned out, towards the end of July three more terminals were "offered" to CCOS-76, from three more suppliers, but were turned down on the theory that *five operating* small terminals *would be* a classic case of overkill.

BIG AND LITTLE OF IT — Actually both terminals are about the same (4.5 meter) size. The closer terminal is the Prodelin fiberglass structure on its show mount. Behind it, on a trailer mount, is the Andrew solid metal terminal. Both looked South/southwest over Fort Gibson Lake.

The Set Up

Fortunately for everyone involved, the CCOS-76 facility was virtually ideal for the two terminals. Easy access to the installation spot, paved hard-surface "pads" for the terminals and relatively short 100 foot or less downline runs to the display floor all helped the erection, installation and tweeking procedures run quite smoothly. The Prodelin 4.57 meter terminal arrived in a large wooden open packing crate, and the Prodelin crew appeared Friday August 6th to begin the uncrating and setting up procedure. The Andrew terminal was installed on the back of a trailer, and the trailer has been utilized for other demonstrations recently and is equipped to pull up to a site, set up and be delivering terminal signals in not much more than a half days time.

There were problems of the "first-nighter" variety, of course. Andrew's antenna erection man was done and gone before the receiver people showed up, primarily because of the clever use of a truck erection crane which is part of their special display package. Prodelin, working from the innards of a giant erector set taken piece by piece out of the huge wooden packing crate had to move more slowly. By Saturday afternoon the 7th it was evident the Prodelin installation was having a handful of minor

mechanical problems; primarily with their motor driven jack screws (which are in essence a fancy azimuth and elevation "antenna rotation system" that allows the TVRO terminal operator to put the focus of the 4.57 meter dish dead on the satellite). It turned out that somebody had gotten carried away with electro-painting and had coated elevation support drive rods with generous amounts of orange paint, which naturally caused the moving rods to bind. A half-inch drill chuck and lots of Jerry Pell and crew manual cranking solved the problem by mid-evening on the 7th. We all learned a great deal in that exercise:

(1) Murphy (who created Murphy's Law) was alive and well;

(2) Anybody who thinks a 4.57 meter dish is a small one has another "think" coming;

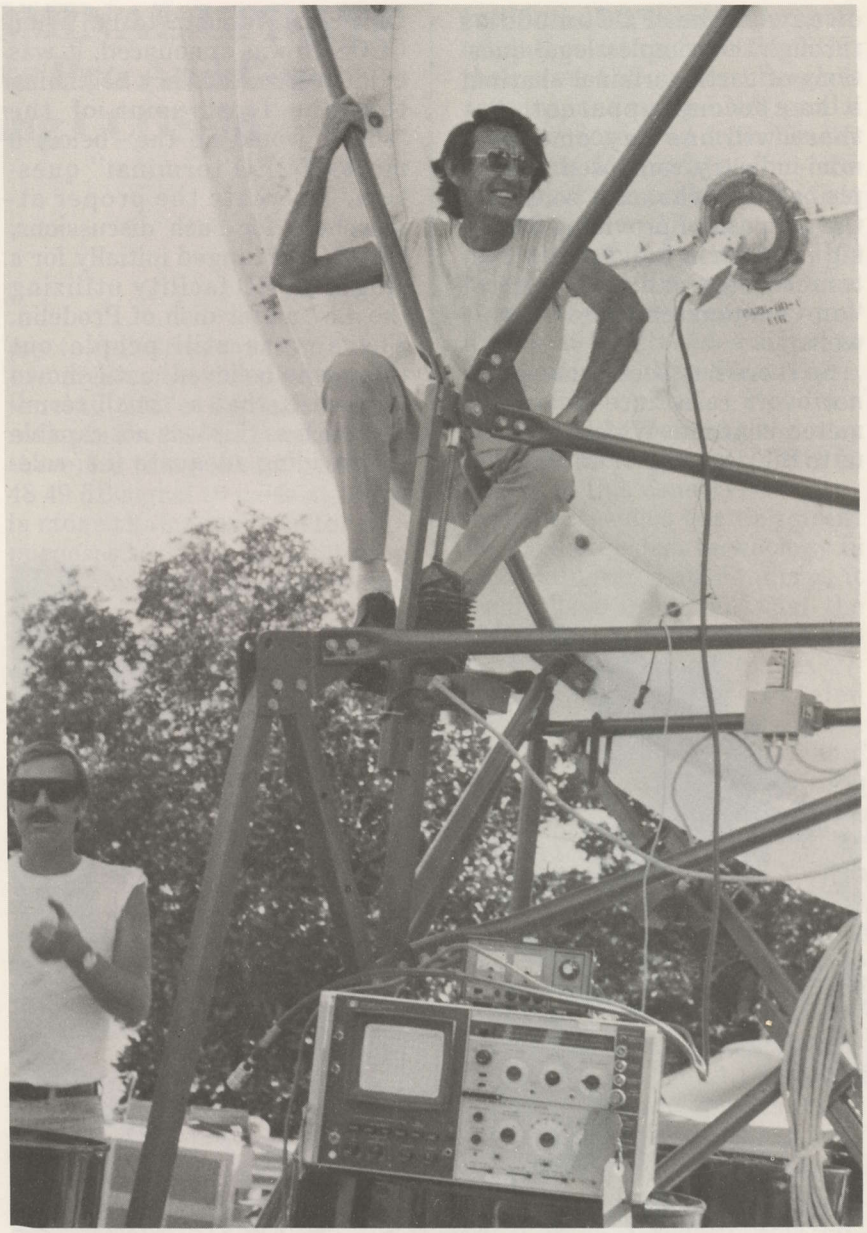
(3) Even this "relatively small" terminal and its resultant "relatively wide" front beamwidth demands precise aiming to get into the satellite beam (just one healthy crank on the jack screw took us from no signal to an almost full quieting signal).

Perhaps one of the most memorable singular events in personal cable involvement for the dozen or so people clustered around the Prodelin terminal occured around 10 PM Saturday night, when the terminal suddenly sprang to life and Connie Fioretti (Manager, Systems Engineering for ITT Space Communications, Inc.) switched from the in-use-for-alignment purposes HP spectrum analyzer to the ITT receiver, and an HBO movie appeared on the 19 inch screen. The television receiver, propped on the top of a ballest drum, was the hands down winner of all attention. It could have been elected King at that point, and Connie Fioretti would have been Vice-King. And the dozen excited watchers and project helpers, clad in bathing suits and sipping Coors, would have been grateful subjects of the court.

The center of the 4.5 meter terminal controversy shifted to the CCOS display floor Sunday evening as several hundred cable operators saw their first glimpses of small terminal signals. *"I can sell that...no sweat"* was heard again and again. *"And how much did you say this terminal will cost me?"* asked many in somewhat disbelieving tones.

By the time Tuesday morning's Small Earth Terminal Seminar rolled around, a spirit of victory had spread throughout the gathering. The terminals *obviously* worked. They were obviously small enough to fit most small system headend sites and a large portion of the budgets. *"Now"* the system operators wondered, *"when will the FCC get off its stance and let us install these things?"*

The participants in the satellite session included Peter Fechhiemer of Optical Systems (Channel 100), Bill Hooks of HBO, Buzz Van Hecke of Andrew, Jerry Pell of Prodelin, Drew Lance of California Microwave, and Cliff Schrock of Beaverton, Oregon. Moderating the group was CATA's General Counsel Rick Brown of Brown and Effros, Washington.

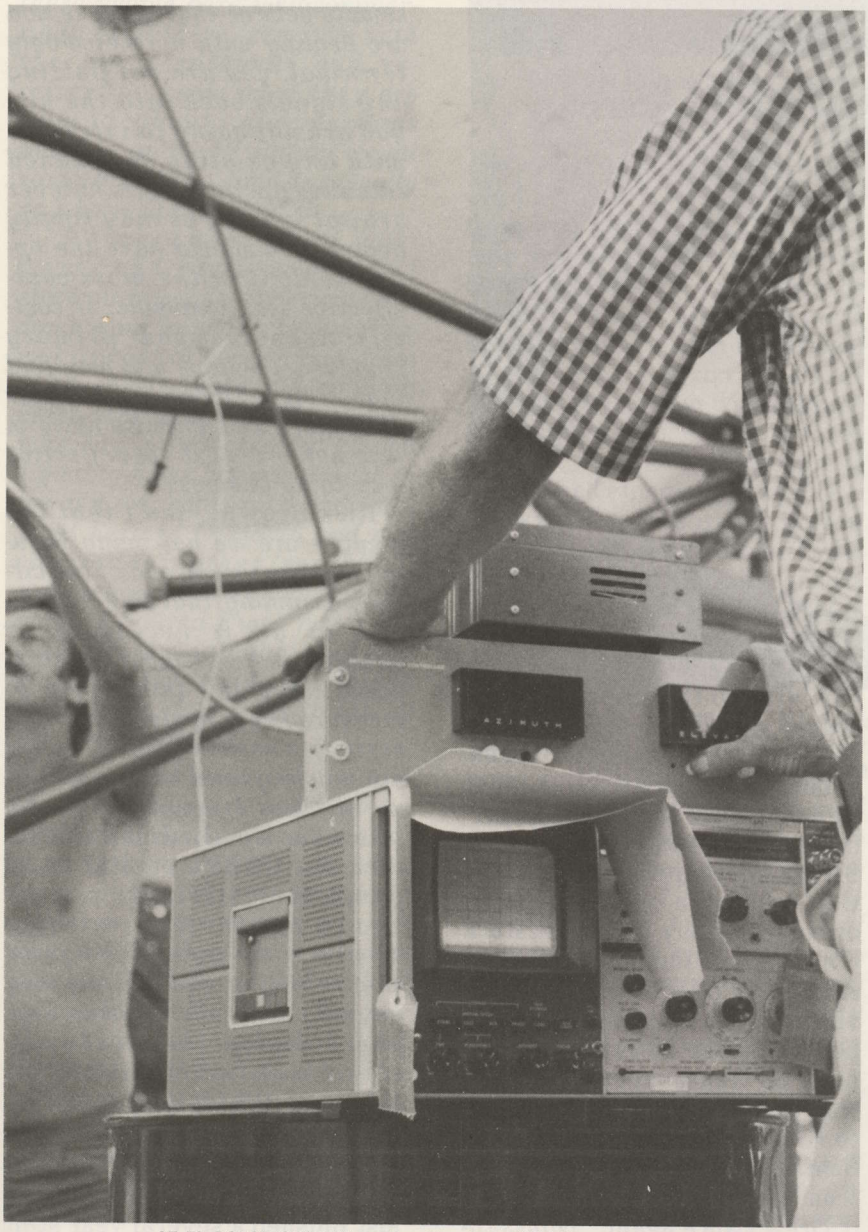


PELL AND LNA — Low noise amplifier (mounted on flange feed above Jerry Pell's left elbow) had temporary operating voltage from portable supply atop HP analyzer. At this point Prodelin/ITT were ready for first signal-search. Prodelin's Randy Renner looks on (left).

The divergent approaches of HBO and Optical was evident in the two presentations offered by Hooks and Fechhiemer. *"We program fewer films, but repeat them more often so viewers have a greater opportunity to sit down and watch as their own schedules permit. We believe people want movies first of all, good movies, at sufficiently varied schedule times, so the viewer can set his own leisure time schedule"* said Fechhiemer.

"We have always operated from an affiliation contract" said Hooks. *"The operator provides the receiving hardware, the equipment, and the distribution system, we provide the programs."*

Fechhiemer: *"We believe the operator should have the option of taking whatever level of service or mix of movies he feels will sell in his market. There have been some ugly experiences with R rated movies in some markets. Our recent turn-on of Midland, Texas, with a G and GP movie format, has been extremely successful and we believe the operator needs the ability to make his pay channel program the way his community will respond most favorably."*



AZ-EL ROTOR SYSTEM — Don Buscher of ITT Space Communications, Inc. adjusts 4.5 meter dish elevation using motor driven jack screws actuated by Prodelin control system. Azimuth and elevation controls are read-out to nearest 1/100th of a degree on control box head.

Hooks: *"Program mix is our key ingredient. We try to show a balanced movie package, but we back that up with HBO specials such as live sporting events, our recently introduced nightclub performances of entertainers such as Freddie Prinze and other material designed to have broad appeal."*

Fechhiemer: *"We come in and lease the channel from the operator, and then we program that channel. That has been our format from the beginning."*

Hooks: *"Our management made a decision four years ago to not get involved in leased channels."*

So it was evident to the new potential entrants to pay-channel-cable that they had *at least two* viable alternatives in getting into pay.

The 9 Meter Standard Problem

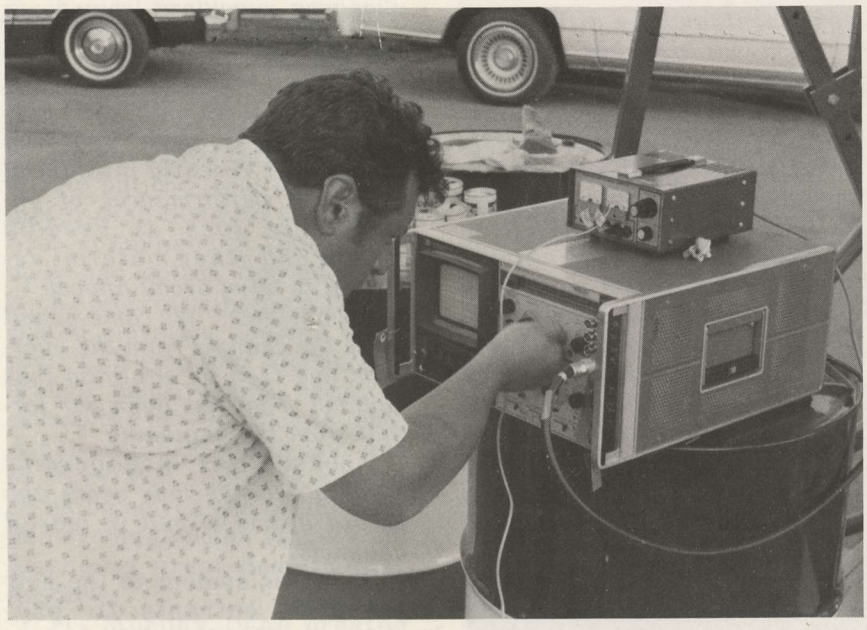
The technical portion of the panel was exceedingly well balanced, and what really came across well was the down-to-earth approach utilized by the participants. The 4.5 meter versus 9 meter (or larger) arguments boiled down to a handful of *key* issues, each of which was separatly dealt with during the course of the session:

1) Can you get sufficient signal with a smaller terminal to produce saleable pictures on your system (the signal to noise problem)?

2) Can you get sufficient margin (i.e. reserve system gain) to handle signal anomalies (i.e. rain attenuation, faraday rotation, etc.)?

3) Can a 4.57 or such sized dish produce interference free pictures when and if all of the equatorial parking spots are occupied (i.e will such an antenna produce sufficiently narrow beamwidths to insure that other transponders on other birds do not interfere with the desired transponder signal)?

4) Can a "small" 4.57 or such sized dish provide adequate protection against terrestial interference, from common carrier point-to-point users of the same 3.7 to 4.2 GHz frequency



LOOKING FOR SIGNAL — TVRO style. Conrad (Connie) Fiorreti of ITT Space Communications, Inc. tweeks upon the HP analyzer looking for the signs of SATCOM transponders.

range?

Drew Lance (CMI) on noise: *"In actual practice, there are two types of noise to be concerned about. There is the standard signal to noise, such as you have with a normal TV receiver or CATV distribution system, and then there is impulse noise, a function of the FM technique utilized for satellite transmission.*

"There exists in a system of this type a threshold situation, wherein if your carrier to noise signal is above the threshold point, you have a 1 to 1 relationship between the carrier to noise ratio and the signal to noise ratio. A 1 dB change in carrier to noise produces a 1 dB change in signal to noise. But when the carrier to noise ratio drops to the threshold point, which is typically at a measurement point of 12.5/12.8 dB ratio of carrier to noise in most basic receivers, then you enter a region of signal to noise where a 1 dB drop in the carrier to noise ratio produces a 4 or 5 dB drop in signal to noise. This is the area where impulse noise begins to show up on the screen. You don't have to be too smart to figure out that when you design a receiving system you don't want to be operating below the threshold point."

"Now there are some things that receiver manufacturers can do, and are doing, to extend the threshold point. By utilizing threshold extension, we are able to lower the threshold point from typically 12.5 to 12.8 dB (carrier to noise) *to perhaps 9.5 to 10 dB carrier to noise. A couple of dB may not sound like much... but in this ballgame it is a great deal."*

CCOS participants had the opportunity to see just exactly what it did mean by viewing transponders 17 and 23 from the SATCOM bird in the display area. The clean signal on HBO transponder 17 was markedly superior to the impulse-noise laden signal on HBO transponder 23. The channel 23 transponder had a 5.5 dB lower input signal level to the CCOS receiving site, primarily because this SATCOM channel transponder was utilizing a special antenna directed largely at the western USA and on further north into Alaska. In effect, with 48-49 dB video signal to noise on transponder 17, the 43-44 dB signal to noise on transponder channel 23 was just not quite good enough to remove the last of what Cliff Schrock later called "sparklies" from the picture.

Drew Lance again: *"Now suppose your customers will accept impulse noise. Maybe you can sell pictures with impulse noise in them. I believe, as a matter of personal opinion, that if your customers will accept a picture with impulse noise, you ought to be able to sell it without FCC objections. But there is a lesson to be learned here. Let's assume you get what you want from the FCC, that is, you are allowed to install any type of receiving antenna system you wish. There is a strong argument for self-regulation. If you don't set your own high standards of performance, somebody is going to step in and do it for you...and that somebody may be the FCC all over again.*

"Still, inspite of that, I personally believe that because you are dealing with a receive-only terminal, you are not putting any signals back into the air, you are not going to interfere with any existing or planned satellites operating at whatever orbital spacing as may finally evolve, you should have the option to do it in the most cost-effective way available. If cost-effectiveness is your primary standard, I believe you may find that a signal delivered to your customers with impulse noise in it is not the most cost-effective way to do business.

Rick Brown: *"Isn't that the point — are we not being regulated at the wrong end of the circuit, assuming that any regulation at all is necessary or needed? If there must be standards, shouldn't they apply to measurements made at the subscriber's set terminals, as we are now required to do with off-air or Class I signals? If this is where the standards were fixed, then the CATV operator could go into the marketplace with his known parameters including amplifier cascade, EIRP from the satellite and so on, and working with the various suppliers design the most cost-effective system for his particular and often unique receiving and cable distribution needs?"*

Because panelist Cliff Schrock of Beaverton, Oregon (Cliff has just finished a several year stint with *Tektronix*, the well known test equipment manufacturer; he is now constructing a cable

system of his own in Oregon and also serving as Technical Editor for Titsch Publications, Inc. in Denver...to which we say welcome aboard Cliff!) has spent the last half year designing and building his own "backyard" terminal, and because he has been fighting the impulse noise and signal-to-noise ratio problem on his own, his panel comments are worth dropping in at this time.

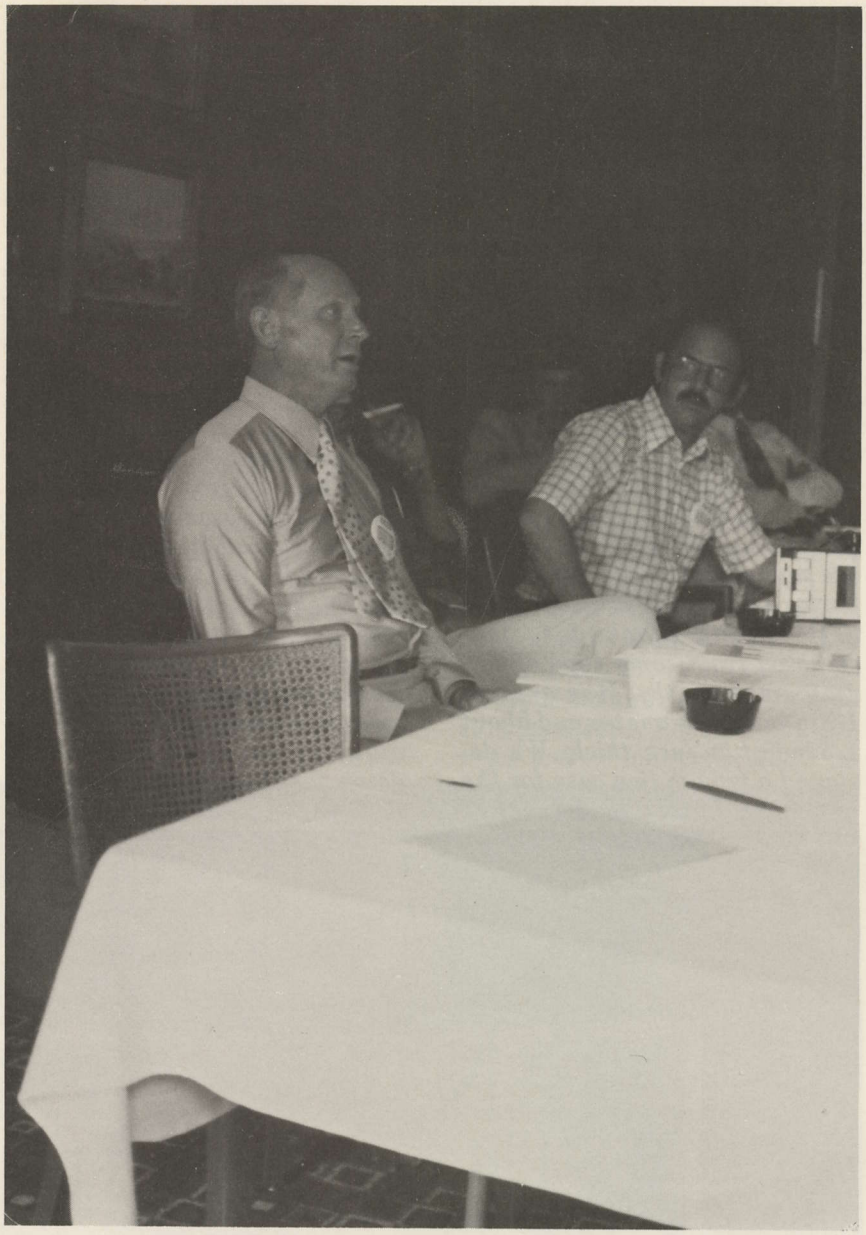
Cliff Schrock: *"I decided, being the wise guy that I am, that I would just go out and build my own earth terminal, which I did. But now that I have done it, I am of the opinion that perhaps these people here who commercially build these terminals with the fancy antennas and receivers do know what they are talking about, and perhaps building an earth station is not something to be done as casually as I have approached it.*

"I have a number of comments and cautions before I start on my own experiences. I don't want anybody to jump up and run out of here saying 'I am going to run home and build an earth station for $2,000,' *which was my number. My 43 dB signal-to-noise ratio was real as far as I was concerned and until I got here to CCOS-76 and discovered this other 'sparklie' I was seeing was called impulse noise, I figured I was just a tad away from a saleable picture. Now I understand that this is definitely a detriment to sale of the video product.*

"To begin with, there are three main components to an earth terminal. The antenna, the low noise amplifier, and the receiver. Now the antenna is the portion I consider to be the largest stumbling block because you just don't go out and build it up out of chicken wire. To give you an idea as to why you don't do this, the dish must be a rather perfect parabola and the tolerances along the surface at any point must be somewhere around 1/10th of a wavelength at 4 GHz, or better. That translates to plus or minus 1/20th of an inch. And that means that if you build an antenna up out of chicken wire, it won't work, even if you could hold that kind of tolerance, because the holes in the mesh must also be no larger than 1/10th of a wavelength. It is a general rule of thumb that at 4 GHz dishes are no longer constructed out of any mesh product, but rather they are solid, as the two dishes here are.

"Building panels up out of aluminum a section at a time, even if you can stamp it out on a jig and then mount it to a perfect parabola section backframe, is an awful lot of work. Here again, I am not saying that these things can't be done, I am saying that you have to weigh how much time you have to build something like this versus how much it would cost you to buy it.

"So I threw out the idea of building my own antenna and my partner and I set out to find a ready-built antenna. We found a surplus Andrew 12 foot antenna laying on the ground in a Portland (Oregon) playground, the kids were using it as a slide. And that is what we started with. We fabricated a feed horn for it for 4 GHz...and we learned a lot about feed horns in the process. Then we built up the mount for the antenna, which in our case was quite simple because the transponder is



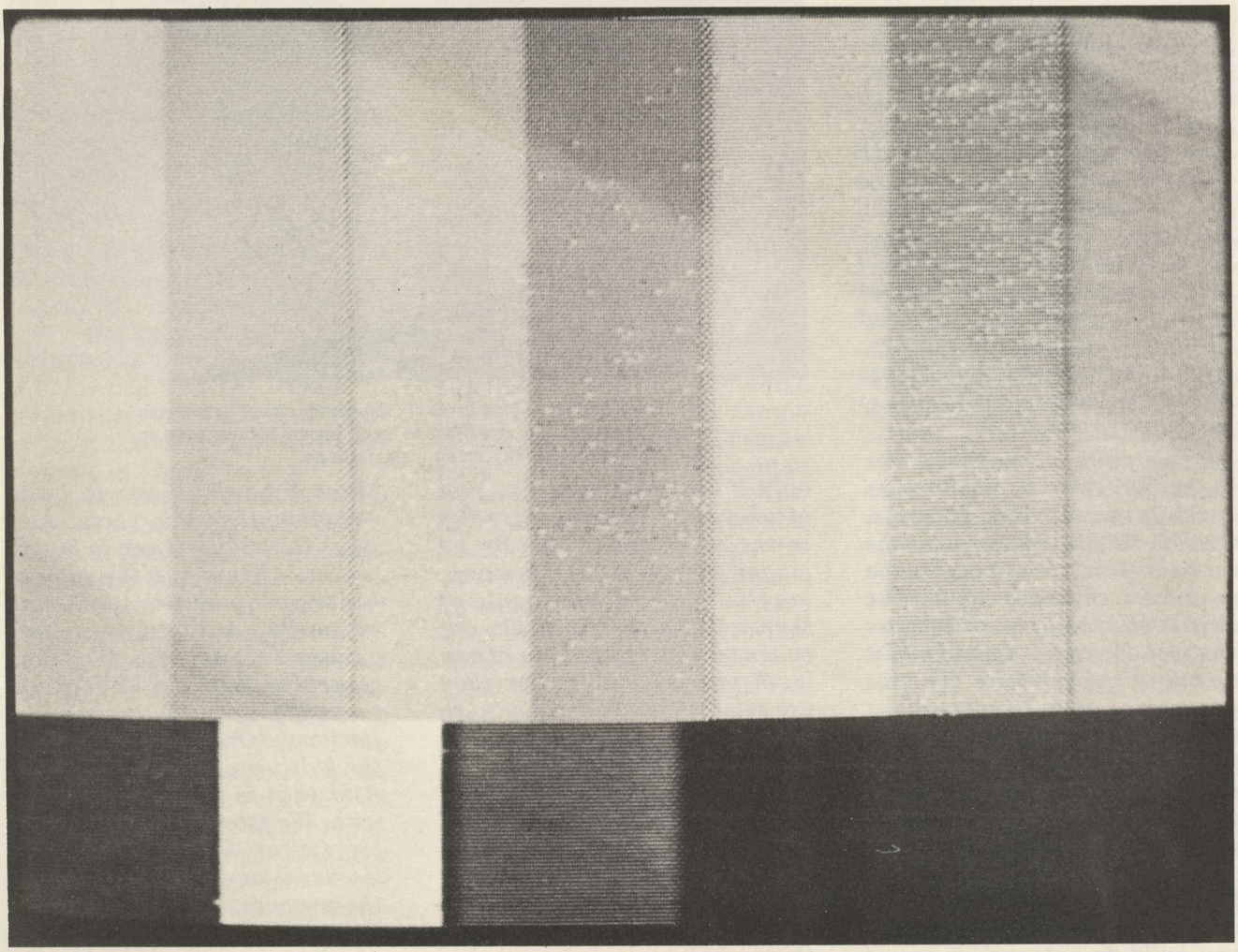
LANCE AND BROWN — Drew Lance of California Microwave (left) makes a point on signal to noise parameters on Small Terminal Seminar panel as CATA General Counsel Rick Brown (right) looks on.

due south of us and only had to be elevated to the proper elevation after getting azimuth bore sighting completed.

"The LNA is the area where I now consider there to be the largest doses of electronic black magic involved. We decided to build up a GaAs FET low noise preamplifier and working for Tektronix as I did at the time I had a lot of resources available and a lot of very bright people around to help out. We found we could buy a GaAs FET with suitable characteristics from a number of sources and we bought ours from NEC. I would caution you about GaAs FETS... they are not your typical component parts. The actual transistor is a little round black dot, constructed from some type of ceramic apparently. It is around 1/8th inch in diameter and about 1/32nd of an inch thick. We designed a trough line case for the unit with a box about 6 inches long and 1-1/2 inches wide, inside of which we mounted a special piece of glass circuit board. We used a grinder to grind away the portion of the board coating we did not want, leaving behind a strip line type of bandpass filter covering 3.7 to 4.2 GHz. At the appropriate spot we glued or bonded the small GaAs FET transistor to the strip line. I am going to get photographs and circuit information to Bob Cooper at CATJ *one of these days so he can show you how this was done.*

"When we fired the unit up first, we had a noise figure of 4 to 5 dB; not adequate by TVRO standards. We tweeked on it, and finally got it down to 2.9 dB, which is still not good enough for a 4.5 meter terminal. Then we started playing with thermoelectric cooling, which is a technique to cool the GaAs FET down in physical temperature. It turns out when the GaAs FET is cooled down, the noise figure of the device drops and you get better performance. That experiment was a total failure, so I installed a liquid hydrogren cooling system and pumped liquid hydrogen through the whole LNA. We got the noise figure down to 1.9 dB quite easily and by really pouring the hydrogen to the unit we could get the noise figure down to 1.5 dB, although the unit was very unstable at that temperature.

"As you might suspect, there are problems with all of this. First of all, keeping liquid hydrogen flowing through the LNA is no easy chore. When you turn it off and the LNA physically regains ambient temperature ranges, the metal in the unit expands and contracts; this causes the welds to burst and the GaAs FET to fall off the circuit board or even crack in two. At a few hundred dollars a pop for the GaAs FET this is not a



SPARKLIES HERE — Impulse noise appears on transponder 23 at CCOS-76. Effect is randomly placed white-noise "speckles" as often as not stationary on screen for long periods of time.

good situation.

"My conclusions on the LNA are that you can build an LNA . . . an LNA that has a reasonable noise figure for the ten meter dish crowd. Or, reasonable if you wanted to sit in your own backyard with a receiver or two connected to the terminal and you didn't mind impulse noise 'sparklies' flitting through the picture. I believe, however, that some type of dramatic breakthrough is going to have to happen with GaAs FET technology, where you can get 1.9 dB or lower real world noise figures with uncooled LNA's, using typical or not so typical backyard construction techniques, before this part of the package gets down to the do-it-yourself level of operator.

"Now to the receiver. I decided early on that I would put my receiver at the antenna, near the focal point. I didn't like the idea of a long downline or hardly any downline at all and the attendant signal losses. So the receiver was constructed on a very long piece of PC board, actually about six feet long, and we mounted it at the dish. My receiver is a single conversion job, using 300 MHz as my i.f.. I had started out with a 70 MHz i.f. but we had all sorts of spurious signal problems so I moved up to 300. I would have liked to have gone higher such as the 700 MHz which California Microwave uses, but the devices I had on hand for i.f. gain limited me to about 300 MHz. The full receiver design is not complex, but I will save that for CATJ to explore in detail later on. We ended up with about 1 volt of video peak-to-peak and we used the sound portion of a standard TV receiver for audio recovery.

"The first time we fired up the system we had pictures. They were in a snow storm, but we could see something. Then we backed up and looked at the system and said 'we have got to find a bigger antenna.' *At this point we had the 12 foot surplus dish in service, complete with a big dent. We found a 15 footer in* (town name deleted for obvious reasons); *and there is a caveat here. The surplus equipment people are pretty cagey. For example, just before we located this 15 footer, somebody else had called them long distance looking for surplus dishes. This was more action on this line of gear than they had seen in years, and they were already beginning to wonder* 'why'. *So if there are a lot of people suddenly looking for 15 or 18 foot surplus dishes, I assure you the price will no longer be $250. an*

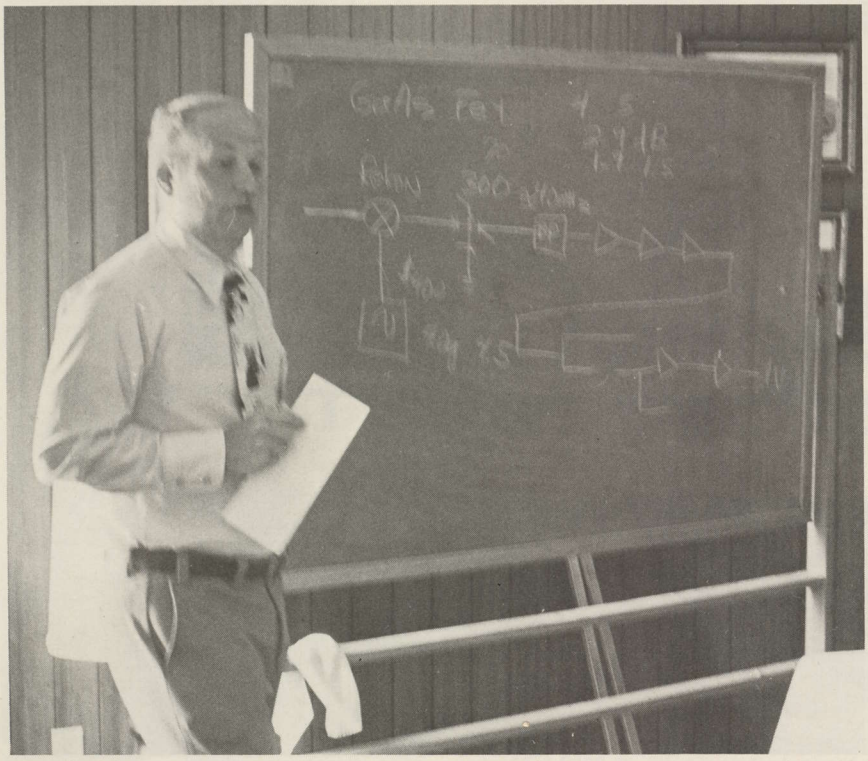
NO SPARKLIES HERE — HBO program break as photographed on a Tektronix color monitor on the CCOS-76 display floor. This is transponder 17, which covers most of (80% estimated) of the U.S.A. with sufficient EIRP to make a 4.5 meter terminal play.

antenna, it will get to $2500. an antenna in a hurry.

"Then we went into the receiver and started to play some games. We narrowed up the i.f. and that got us a couple of dB of signal-to-noise ratio. Yes, it cost us some hi-fi video response, but we feel it was worth the effort, and the commercial people do the same thing, too. And when we got all done, with a non-cooled 2.9 dB noise figure LNA, we measured signal to noise ratios of 43 dB. With impulse 'sparklies' in there.

"In summary, it is possible to build your own backyard type of terminal. You can bring down a picture on a single optimized channel and you can watch it on your own TV receiver. But I had a lot of advantages through my relationship at Tektronix which others may not have, and many of the parts I used are not found in the average junk box. And as for building a completely homebrew earth terminal for a cable system...and this was my concern going in...I don't think today it is a real possibility. I could build a pre-amp that is adequate for a 10 meter dish, but not for a 4.5 meter dish. I can probably build a final-form receiver that works, but not if I need a few extra dB of margin to protect me for those weeks on end in Oregon when the sun does not shine. Threshold extension is more than a catchy phrase used by the receiver manufacturers...they really do know something that I don't know. So for my own system I am going to probably invest in a commercial antenna, and I will build my own mount. I may buy an LNA, but I will probably stick with my own homebrew receiver. When I get all done, I will have perhaps $10,000. invested, and a couple of dB of margin to protect me for low signal level conditions."

As reported in CATJ in recent months, there are ongoing advances in GaAs FET technology which ultimately *will* bear on the type of system capability which a Cliff Schrock or others of similar persuasion might put together. NEC has recently announced the NE463, a 1.5 dB noise figure uncooled GaAs FET device with 19 dB of gain at 4 GHz. Of course building an amplifier that *realizes* that kind of noise figure, cooled or not, with the NE463 or any other GaAs FET is where the back-room black magic enters the picture. A few comments from CMI's Drew Lance illustrates the parameters the system designer is up against:



AND THEN I GOT HIT BY SPARKLIES! Cliff Schrock explains how his homebrew TVRO receiver was designed for back yard experimentation in Beaverton, Oregon.

"I think you people are going to have to stop thinking in terms of noise figure and start thinking in terms of LNA performance in degrees Kelvin. For example, as we go lower and lower in noise figure/degrees Kelvin, a 1 dB change in so-called noise figure may actually be a 3 dB change or improvement in signal to noise ratios. If you have an LNA that specs at 220-240 degrees Kelvin, and there is another LNA that has a spec of 120 degrees Kelvin, the 100 degree Kelvin noise temperature drop equates to a 3 dB improvement in signal to noise ratio at the detected video. So going from say 2.9 dB noise figure to say 1.5 or even 1.9 dB noise figure is really a very dramatic improvement in system performance. For reference, the line up looks like this:

A) *20 degrees Kelvin* — these are liquid helium cooled parametric LNA's which represent a 10 dB signal to noise *improvement* over a 200 degree Kelvin LNA. But the price is in the $50,000. to $100,000. range for *just* the LNA.

B) *The next level is the 55 degree Kelvin LNA's*, which are typically thermo-electric cooled GaAs FETS; and they are priced in the $10,000. to $20,000. range for the LNA.

C) *Third up the ladder is the 70-120 degree uncooled LNA's*, again using GaAs FET devices, and they price in the $8 to $10,000. range.

D) *Fourth up the line are the 150 to 180 degree Kelvin LNA's*, which are also uncooled. This level of performance translates to noise figures of 1.9 to 2.2 dB.

"At what level of LNA performance are you safe with an adequate signal margin for say a 4.5 meter terminal? In approximately 80 percent of the country served by SATCOM-I, the answer is the 150 to 180 degree Kelvin or 1.9 to 2.2 dB noise figure region. There are areas of the country where the trans-

ponder 17 HBO programming is far enough down that even a ten meter dish may be marginal. This typically includes areas such as southern Florida, Maine and so on.

4.5 Meters vs. Interference

It established that in 80% of the country, at least, 4.5 meter terminals can and will produce adequate signal-to-noise ratios and adequate "fade" margins for most systems, using 1.9 to 2.2 dB noise figure (150-180 degree Kelvin) LNA's, the panel moved on to the interference question. It is on the "32 minus 25 log theta" curve which so much of the future of small earth terminals for TVRO purposes hangs at the FCC.

Buzz Van Hecke of Andrew: *"You can go through long, drawn our calculations of interference by assuming the worst case situations, and then place those calculations along side or over the known antenna pattern plots for virtually any antenna known. In short order, you will know whether your proposed antenna meets the 32 minus 25 log theta curve or not. When you do this, you assume the very worst possible future conditions. You assume that all orbital spaces* (19 in all) *are occupied by active birds, and that at any given moment each of the 19 birds is operating on your desired receive transponder channel with maximum EIRP* (power), *using the same polarization you are using, and using the same video modulation format you are using. If you do this with a 4.5 meter dish antenna, you find that your worst case interference levels are going to be in the region of 20 dB ratios between the desired carrier you are pointing at and the non-desired interfering carrier(s).*

Jerry Pell: *"Buzz is right... if you look at the center satellite of all 19 in orbit when the belt is loaded, you have a worst-case situation. But there are differences in receive antenna patterns, and in* our *case we found that by doing this exercise we have a 28 to 29 dB number with our 4.57 meter dish. That is, the desired carrier is 28 to 29 dB stronger than the non-desired carrier at that point.*

Connie Fioretti of ITT: (from the floor) *"At ITT we have created some subjective eyeball kind of tests because we found ourselves wondering at just what point does the C to I become objectionable. We are dealing with some new technology here, especially with the relatively high modulation index of 40 MHz wide FM video. And frankly, much of the existing data is so related to the AM video transmission mode such as we have with regular television that we felt that new subjective tests, similar to the TASO tests of the late 50's, should be run.*

"We set up a test situation with two identically modulated FM carriers, and we used two video sources; a color bar pattern, or static scene, and a moving video scene such as you more commonly encounter. We arranged for approximately twenty people, a mixture of engineers, secretaries and others with no technical background, to parade before the static and moving displays, and we varied the C to I between the desired video and the non-desired video levels. Here is what we found:

A) We asked all observers to rate the point where they *first*

TEARING DOWN a pair of TVRO facilities is not nearly as much fun as setting them up. The Prodelin dish (top photo) is off the mount and on the ground ready for dis-assembly; the Andrew dish (bottom photo) is stowed on the vehicular display truck and ready to hit the road.

saw interference. The median fell around 18 dB C to I, with engineers seeing it around 20 dB C to I and non-technical people seeing it around 17 dB C to I;

B) We asked observers where they first found the interference *to be objectionable.* This number was 14 dB C to I, with engineers finding it objectionable at 16 dB C to I and normal people finding it objectionable at levels of C to I as low as 12 dB.

"Then we calculated the worst case C to I using the worst orbital loading situations, the worst transponder use situations, and the worst 32 minus 25 log theta 4.5 meter antenna patterns (i.e. a pattern that just meets 32 minus 25 log theta) *and we found that by our calculations we have the 20 dB ratio range. So if 20 dB C to I is the worst case expected, and the subjective tests indicate that even highly critical engineers only start to see interference at a C to I of 20 dB, then it appears to us that the 4.5 meter terminal is more than adequate for small system TVRO usage."*

Drew Lance: *"There is additional data to back up this approach. The new RCA satellite will be using something called frequency re-use; which means they will use the same down-link channel for two simultaneous video modulated carriers. One downlink signal will be horizontally polarized and the other will be vertically polarized. So the difference at the receive antenna of the TVRO will be only the polarization separation. This, RCA has already found, is typically 25 to 26 dB; although they had hoped for more than this. So we are facing the real world of not more than 25-26 dB separation in C to I between signals coming out of the same bird on the same channel at the same time. I believe the initial CCIR report talked about 32 dB C to I as minimum; yet it appears that through the frequency re-use technique, RCA itself will be closer to 25-26 dB maximum rejection between carriers. And this will be the case no matter what type of receiving antenna is in use, that is a 4.5 meter dish, a 10 meter dish or a 100 meter dish.*

"There is another observation worth mentioning. The C to I problem is inversely proportional to the signal to noise present at video at the receive terminal. When you have a very strong, sharp, clear picture, such as in the 54-55 dB signal to noise region, you can start to see video stuff walk through the picture much sooner (i.e. with lower C to I ratios) *than you can when you have a lower S to N ratio. Therefore, it appears to us there is an inverse and desirable situation with lower S to N's, where C to I ratio works to your advantage as a result of having lower S to N's to start with."* *with."*

Jim Hurd of Farinon (from the floor): *"I think we need to be looking at the terrestial problem just as well. The 3.7 to 4.2 GHz band was once considered to be the private preserve of Bell; but now we are seeing the MCI's and others point to point users getting into that band and as a result terrestial usage of the band is growing monthly, at a new rapid-rise rate."*

Buzz Van Hecke: *"That is an excellent point. And this is one of the reasons I believe the FCC has held the line on the 32 minus 25 log theta curve. This is their* 'protection curve.' *They tell you that if your projected receive antenna meets the 32 minus 25 log theta curve, you will be protected by their assignments policy from terrestial interference. But if it does not meet that standard, they cannot protect you against all comers.*

"What that means is that if five years from now Bell or MCI or some other common carrier comes next door to you and wishes to file an application for common carrier usage of this band with a transmitter that looks right through you, you would not be protected from this encroachment of your antenna pattern unless you met the standard."

Drew Lance: *"I believe one of the important things being overlooked with the small terminals is the relative ease with which you can pick that TVRO antenna up and move it if interference from a terrestial source comes your way. This is not true with a ten meter dish. A dish this small can be set behind a natural shield, such as a building or a mound of dirt. It can even be placed in a swimming-pool-sized hole and with the dish below ground you will have all of the shielding you would ever need for virtually any type of terrestial problem."*

Jerry Pell: *"This whole discussion boils down to the practical side of real world situations. What type of numbers can the cable operator live with? Here we are being protected by the FCC against ourselves. OK — what degree of protection do we need to be safe from doing ourselves in? It appears to us that 20 dB is a very safe number for C to I situations, and that number is totally realizable with virtually any form of 4.5 meter dish even when you assume the very worst case paper models of identical transponders, all operating at maximum power, all video modulated, all simultaneously on your one desired receive channel, and you are looking at the 'bird in the middle.'*

Steve Effros, CATA Associate Counsel (from the floor): *"How many years do we have before we see this worst case, fully orbit-loaded situation? Two years? Five years? Ten years?"*

Drew Lance: *"You don't even have to ask that question. Because we know, whether the FCC accepts it or not, that even when we do have that worst case situation, that the present 4.5 meter dishes are already adequate.*

Steve Effros: *"I was trying to establish that perhaps if we have a number of years to work with 4.5 meter dishes before the orbit belt is loaded, that there might be adequate time between now and then for a cable operator to install a small terminal, amortize his purchase, make a profit and then if and when the interference does come along, then take steps to either upgrade to a larger antenna or simply tolerate the in-*

terference."

Drew Lance: *"Even that is not necessary. If we had worst case today, which we do not, we would still be OK. But since you brought up several years down the road, it is worth discussing. The chances are excellent that before there are satellites operating every 3 to 4 degrees, in a fully loaded orbital belt, that all TVRO facilities will shift off of the 3.7-4.2 GHz downlink range up to the X or Ku bands (i.e. 11-14 GHz). It turns out that these higher frequency bands are excellent for receive-only applications; better in fact than are for transmit and receive applications. And within the next five to eight years, we just may see all TVRO applications moved to the new band(s). If that happens, you will find the 4.5 meter dish is ideal for receive only in that portion of the range. The operator would change his feed from a 4 GHz feed to a X or Ku band feed and change his LNA and receiver, and be in business on the new band. The present 4.5 meter dishes are very adequate for that range, and would be considerably better I believe than the present larger 9-11 meter dishes. By the time we get into the X and/or Ku band ranges, the beamwidth of the larger dishes becomes very small. So small that you may have to install some type of step-tracking to follow the 'bird' in its minor walking around in space... the birds do move around a little. And finally, just for the record, the whole 19 parking spaces are not reserved just for USA or Canadian birds. Brazil, which will be the next domestic system to come on-line, within the next 18 months, will have two orbit spaces of its own. And its antenna beams will be essentially south from the equatorial belt and therefore away from us here in North America. So we will never really have the worst-case orbital interference sources we hypothecate on paper, because many of the transponders will not even be directed towards this part of the world."*

Richard Brown: *"After this discussion, is there anyone in the audience who would feel he was not taking a cost-effective approach to a planned earth terminal receive facility by specifying in his application a 4.5 meter terminal?"*

From the floor: *"I represent Multiple Channels of Alabama, and we are prepared, based upon our Compucon study, an SRI study and what we have heard here to file our own TVRO application with a 4.5 meter terminal specified. It is our intention to return home to Alabama and to proceed in that direction."*

And so it went. Subsequent to the CCOS-76 Satellite Seminar, there were a number of other systems who voiced similar in tentions. One of these, represented by Louis Bone of Edna, Texas, is in process as this is written.

Where To From Here

And so here we are, 11 months and a few days after *CATJ* first visited the CATV earth terminal subject. As this is read, more than 60 earth terminals are in operation in the United States; all 10 meters or larger in size. Several "experimental" terminals using smaller antennas are operating, and we suspect or know of others coming on line all across the country.

The Federal Communications Commission has in their *"in-basket"* a June application requesting amendment of the present 9 meter standard; from *CATA* and *CATJ*. Based upon the CCOS-76 program, and the results, the time would appear to be proper for the FCC to act upon this request.

Cliff Schrock has shown that a person with access to some laboratory equipment and smarts can put together a home terminal that will produce pictures (although noisy) using dishes as small as 12 feet. It is our intention, with the assistance and continued cooperation fo Cliff and his employers at Titsch Publishing Corp. to provide you with construction details of Cliff's terminal, as it now is and as it evolves over the coming months. We hope you will stay with us as we head into Year-Two of CATV TVRO facilities. The first year has been a humdinger!

THIN MARGIN IV
Locating Areas That Need CATV Service

Up And At 'Em

When last we left the "Thin Margin" of CATV, we had laboriously worked through the sequence of getting a weak channel 3 signal into the input of its processor, while the off-air signals on channels 2 and 4 were substantially more potent than our desired channel 3. In that exercise we covered bandpass filtering versus trapping, upstairs pre-amplification versus downstairs pre-amps, and the mysterious world of "match."

The long and short of it all was that pre-amplifiers should go downstairs whenever possible (go back to August CATJ and run your own numbers), and bandpass filters are to be avoided *ahead of* a pre-amplifier (use traps instead), but are usually acceptable between the pre-amplifier and the input to the processor, provided you have a way to "force" a 75 ohm match at the *usually poor* processor *input* match point.

A lot of this is contrary to general practice, but then times have changed and technology marches on, waiting for no man. Some of this *is* controversial, as we suspect letters to our Technical Topics section will point out in months ahead. But when all is said and done, if suggested techniques provide superior signals and better "CATV margins:", then who is to quibble over some theory that fails to deliver in actual practice!

This year for the first time, a fairly substantial number of CATV systems performed their first swept headend tests, looking at the in-channel response integrity in particular. While performing some of the CATA Test Program tests recently, we had the opportunity to study some of the response conditions for a headend that has the pre-amplifiers down in the headend. The equipment brands are not important, we were satisfied that the results were typical enough to want to pass them along as a further example of the type of problems associated with meeting FCC specifications for in-channel flatness (section 76.605 [a] [8] required that you have a system flatness, from the antenna to the subscriber's drop of +/— 2.0 dB from a point 0.75 MHz *below* the visual carrier frequency to a point 4.0 MHz *above* the visual carrier frequency). And while we are not concerned here with the ramifications of 76.605 [a] (8), we would like to point out how difficult (if not impossible) this specification *may be* when you have *any* type of trapping, filtering or even a pre-amplifier ahead of your single channel processor.

Photo 1 here shows the swept response of the processor alone, it meets the spec for the 4.75 MHz bandwidth. Photo 2 shows the response of the pre-amplifier, all by itself. Photo 3 shows the bandpass filter, again alone. This system is connected as shown in diagram 1.

Now look at photo 4. This is the total system, with the sweep signal introduced into the pre-amplifier input, where it travels through the pre-amp and then through the bandpass filter and then through the processor.

In this situation we checked the input and output match of the pre-amplifier, 18 dB and 22 dB respectively. Then we checked the input and output match on the bandpass filter, 20 dB on both ends. Finally we checked the match on the input to the signal processor, it was 15 dB.

Finally we added a 3 dB pad between the output of the pre-amplifier and the input of the bandpass filter, and between the output of the bandpass filter and the input to the processor. Photo 5 is the result.

In this situation, the off-air signal is channel 3 and the *two adjacent* signals (on 2 and 4) *are* potent, but not so potent as to overload the pre-amplifier. So the pre-amplifier *can be* installed without any external trapping *ahead* of it. However, the pre-amplifier is sufficiently broad (although it is a so-called single channel unit) that before we can dump the pre-amplified signal(s) into the processor, bandpass filtering is necessary. This particular bandpass filter has built-in traps on the input and output; one to catch channel 2 sound and one for channel 4 video.

Based upon CATJ analysis of CATA FCC Tests run to date, we do not believe this type of "sine-wave response" is at all unusual in *actual* practice. Yet the system has difficulty making "FCC spec," but without this type of real-world lash-up, the cable customers would never even see the channel 3 signal on the cable plant, channels 2 and 4 would bury it at the processor input.

Thus in actual real-world practice, there are probably *twin* problems with the +/— 2 dB spec. The first problem is the minus 0.75 MHz part of the 4.75 MHz spread. This is a little *too tight* for systems that have *lower adjacent channel* potent signals, if the spec is main-

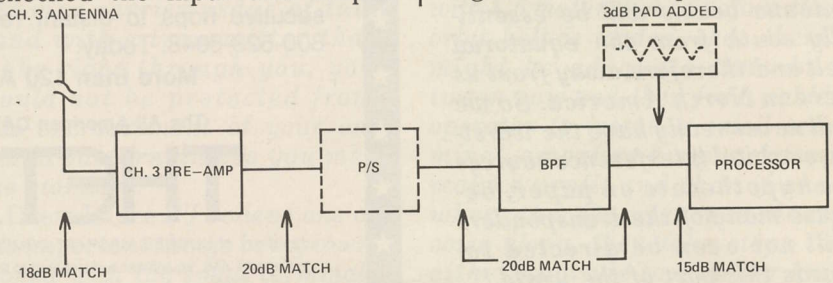
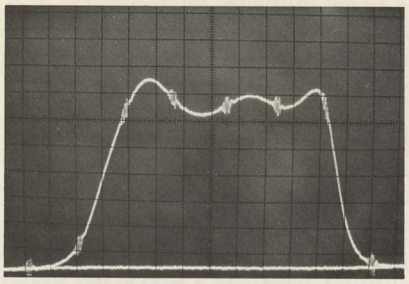
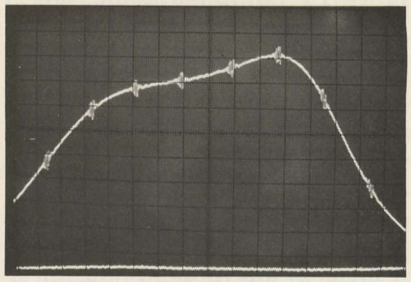


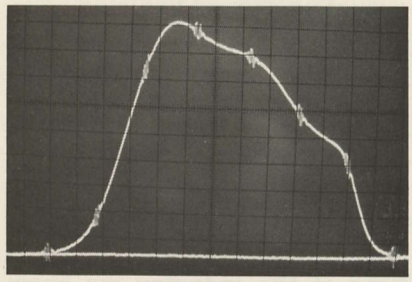
DIAGRAM 1



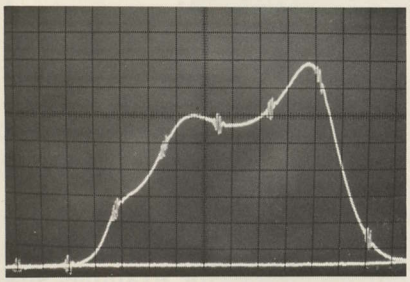
PROCESSOR ALONE — mis-matched (i.e. reactive) input network often creates non-flat response pattern shown here.



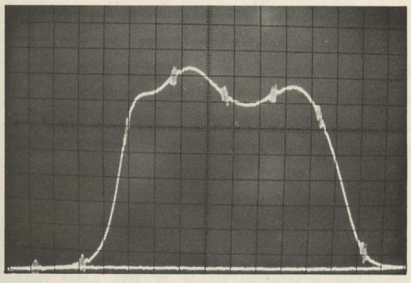
PRE AMPLIFIER ALONE — so-called single channel pre-amplifiers (without input network LC filtering) typically display slightly peaked response.



BPF ALONE — mis-matched (to source and load impedances) filter displays slightly out of flat response curve.



FROM PRE-AMP INPUT TO PROCESSOR OUTPUT — mis-matches added to mis-matches creates virtually unpredictable cumulative affect.



PAD ADDED — 'BY INSERTING PAD BETWEEN BPF and processor, match is forced at critical point and response pattern returns to more acceptable levels.

tained, the lower adjacent aural carrier is not trapped sufficiently to rid the desired video of the herringbone interference. The second problem is in the in-passband response, when you cascade (i.e. series) the required combination of pre-amplifier, traps and/or filters, and the processor input circuit. This is inherently a very "reactive" lash-up, and the "ideal" pretty smooth or flat-topped response patterns when swept, are simply not possible. Whether you can maintain the +/— 2 dB flatness region even from the video carrier upwards to 4.0 MHz is questionable, and often subject to the whims of the connecting cables and the standing waves set up by the various degrees of mis-match present.

But alas, fortunately for most systems, customers cannot *see* moderate in-channel response incongruities and *they* wouldn't recognize a proper response pattern with a sweep set up if it were pointed out to them. So in the final analysis, we are back once again to a *margin* of signal improvement, the margin which a properly engineered and properly maintained CATV system is able to achieve using the best techniques available to it *within* the price range of *its* financial ability to produce improved quality signal(s).

So Far

To this point in this series we have dealt with the following headend design considerations:

(1) Signal fingering, layering and general propagation characteristics; (May CATJ);

(2) The ability to find signal, virtually anyplace on earth, if you really set your mind to it (June CATJ);

(3) The inter-relations between the pre-amplifier, the downline, the traps/filters and processor (August CATJ).

(4) And the difficulty with delivering customer-acceptable pictures versus FCC-acceptable engineering measurements of *your* system's headend.

Readers are referred to the June 1974 and September 1975 issues of CATJ for detailed discussions of antenna and phasing solutions to co-channel and adjacent channel problems. The June, July and September 1975 issues also contained extensive basic antenna theory data covering the characteristics of yagi and log antenna designs, while the October 1975 and the March 1976 issues contained practical multi-mode antenna data. These reference works are invaluable aids to anyone planning their own antenna system for new channels or a new system.

Early on in this series we talked about *locating CATV situations* where no present CATV service exists. This is still an area of challenge to the real pioneering spirit of died-in-the-wool cable people and there still exists the opportunity for hundreds of new, small systems in areas where service remains poor with off-air antennas, for whatever the reason. Learning to spot such situations is part of the orientation you need to go through to take advantage of such situations.

What does it take to make a cable system fly? Basically, the ability to deliver good quality, reliable reception to people who presently receive only degraded reception on some or all of the basic three network service channels. In the very earliest days of CATV, systems were installed only where there was *no off-air service* at all. As CATV matured, service expanded into new communities where there was acceptable reception on a single channel, then acceptable service on two channels, and much later on during CATV's evolvement, good service on three or more channels.

Bascially, people have come to expect reliable service on *no less than* the three major networks. If there also happens to be an ETV station and one or more non-network signals available on the cable, so much the better. But as dozens (if not hundreds) of new systems in suburban and major markets have discovered, the mere cable-addition of PBS and ITV is simply not enough to bring people

to your cable in sufficient quantities to pay the rent and retire the debt. Let's explore what types of situations are attractive to the would-be cable person:

(1) *Lacks three basic service signals* — This remains the classic CATV situation. With thanks to the wide distribution of *TV Guide* and other television program promotion publications, people *know* when they are being short changed in their reception service. There are any number of combinations of local conditions which can create such a situation, and we'll explore some of them here.

In a mixed market, where there are VHF and UHF network assignments (Jacksonville, Florida is an example with CBS on channel 4, NBC on channel 12 and ABC on channel 17), the UHF station just naturally comes up on the shorter end of the coverage stick. In Jacksonville, the two VHF stations average 451,500 TV households reached while channel 17 reaches 366,500 TV households. So there are 85,000 TV households somewhere out there within the umbrella of the channel 4/12 coverage patterns which do not presently receive channel 17, *or ABC network programming*. There are presently approximately 30,000 CATV homes within the "Jacksonville market", so 85,000 minus 30,000, or 55,000 homes are outside of channel 17 (ABC) reach, but within CBS (4) and NBC (12) reach. Those 55,000 homes, in whatever population groupings they offer for CATV signal distribution, are an obvious CATV opportunity. And there are 139 U.S. markets (including San Juan) with three or more network signals available plus an additional 72 "markets" with two or one network affiliates operating. And while most of the obvious CATV *communities* have been franchised, there still remain (according to a recent CATA study) more than 900 communities or areas with missing basic network service and no franchise granted, in the 1,000 and up population category (i.e. 300 homes potential upward). Granted, the big communities have just about been wrapped up. But there is still plenty of room for the owner/operator entrepreneur who is willing to build several "smallish" type systems in an area where he can combine manpower and resources to serve multiple communities at reduced operating expenses.

(2) *Split Markets* — Many markets have three network service, but the FCC designated market encompasses two or more communities. Often the tower sites are located in or adjacent to the *licensed* community, and there is considerable airline distance from one of the communities to the other. This creates a "market umbrella" that is often not matched by respective "signal umbrellas."

Market number 58, for example, is Shreveport (La.) / Texarkana (Tx., Ark.). The designated market cities are approximately 65 airline miles apart. The market has ABC service on channel 3, NBC service on channel 6 and CBS service on channel 12. One would expect to find the towers *concentrated* between the two cities, so as to provide coverage over both city-extremes in the market. But channel 3 is located closer to the Shreveport end of the market (thereby not placing a Grade A signal over the Texarkana portion). So the location of the towers, within a split market or hyphenated market, has a major bearing on who does and does not receive adequate roof-top or rabbit ear antenna service. Why would the channel 3 ABC affiliate locate its transmitting tower further south and thereby purposefully degrade its signal in the northern portion of the hyphenated market. *Set count.* It covers 570,500 TV equipped homes while the more northern located channel 6 covers 551,100 TV equipped homes. There are more TV equipped homes *south* of the *center* of the market than north of the center, and channel 3 picks up an important 4.6% more homes covered with the ploy.

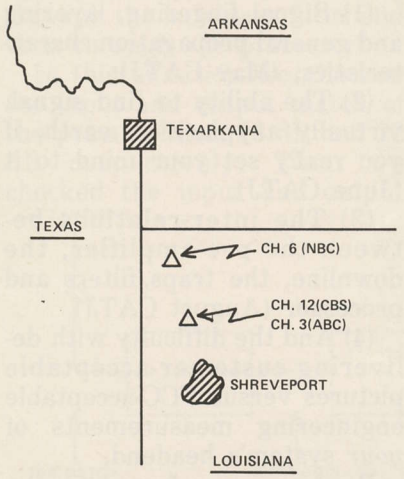


DIAGRAM 2

Of course that is the broadcaster's game, ours is to find locations where *their* clever use of marketing statistics has left homes uncovered; sufficient homes to warrant our CATV installation.

(3) *Localized Terrain Factors* — As CATV grew in the 50's, CATV "scouts" fanned out across the country searching for valleys where people lived, and where TV reception was poor or non-existent. The franchise boom of the late 50's and early 60's was largely a result of these "scouting forays," and the backbone of the industry we know today has its roots in such communities or population pockets. Anyone with a keen eye and time to drive around can spot this type of situation, the hills and mountains surrounding a collection of dwellings is a dead giveaway to a poor TV reception situation.

Often only a *portion* of a town has reception problems. Boulder, Colorado, for example, sits right on the edge of the rising Rockies. The western portion of the community is tucked back into the gullies and valleys that lead into the Rockies while the bulk of the University community rests far enough east out on the plains immediately preceding the slopes that the Denver signals boil in with local quality.

The primary problem *here* is to *separate* the poor TV portion of the community from the balance, for operational purposes and franchise purposes. Under the guiding hand of the FCC,

one is *supposed* to cable *all* of a franchised community, whether all of the community needs the service or not. This is not unlike having an egg roll franchise for *all* of San Francisco, you would sell your product well in Chinatown but probably have few takers on Knob Hill! If the city of San Francisco (or the Federal Eggroll Commission) *demanded* that you field *as many* egg roll delivery trucks on Knob Hill as you did in Chinatown, you would quickly go out of business by having to absorb the overhead of the low or no sales volume trucks on Knob Hill. And so it is with a federal or city mandate that you cable all of a community and provide equal service to everyone, whether they need what you have to sell or want it or not.

On occasion, an area isolated by terrain from the primary city may be a self-governing municipality. For example, Nichols Hills, Oklahoma is *surrounded by* Oklahoma City, but is a self-incorporated and self-governing community of 4,500 people. Nichols Hills, *if* it was so geographically located that it had poor television reception (it is not) while the surrounding Oklahoma City area did not, could easily be approached for a cable franchise individually, while the 375,000 people in Oklahoma City could be left to their present off-air service. *Some* would call this *skimming*. The egg roll franchisee in Chinatown would call this *good business*.

In other situations, it is possible that you can talk the city itself (if it, like Boulder, includes *areas* of adequate reception and areas of inferior reception) into granting you a franchise for only that area you really feel will buy cable. There is nothing to prevent a city from creating its own "cable television districts" and you can often get citizen support for this approach by simply working door to door in the area which you would cable. Several dozen citizens demanding action for a cable franchise for *their portion* of town, backed up by the city council(man) from that portion of town (if they are elected by districts or if one lives in the region) is an approach that will work.

All of this presumes that you can start off your campaign of "here is a segment of your town that needs cable service" by avoiding the blue-sky pitfalls of those who have probably come before you, promising 36 channels of inter-active two-way inter-digital color for "all" of the community.

(4) *Localized Noise Factors* — Where you can spot areas of a town or small communities with inadequate off-air reception by simply knowing the signs to look for (i.e. tall hills, valleys, big roof-top antennas, etc.), the signs of high ambient noise are more difficult to spot. Yet they often create regions within an otherwise adequately served town or segment of town where CATV is the obvious answer for quality broadcast service reception.

This is not unlike a detective game. If you equip your vehicle with a TV-audio-only receiver (see June CATJ, page 41), you will eventually learn what type of *noise* to listen for in the low

band TV region, as a sign of high ambient background noise in an area. There are obvious noise sources, which after some small field practice even a neophyte will learn to spot visually. For example, a large refinery or steel working production facility (etc.) is bound to generate several tens of dB's of background noise for an area up to several miles around it. If the industrial noise source is located so that a pocket of the community must look through that noise source with their roof-top antennas to pick up Grade B (or even A sometimes) signals, you can assume the rooftop antennas may well be getting nearly as much noise as they get signal. If the region has one or more network signals on low band (remember that low band channels are most adversely affected by noise sources), you may have a candidate worth investigation.

One of the first places to start the investigation is the local TV service shops in the area. Questions posed such as "Are there some spots around here where channel 4 (or whatever) is received badly?" should evoke informative responses based upon the TV serviceman's intimate in-house experience throughout the area. A restaurant or bar or club with a large antenna array in the area will also be a first-stop source of information. Once the information starts to fit into a pattern, try to define on a map the extremes of the affected area. Then perform a house count, and determine whether the affected region stretches over a single political entity or into several. Finally, arrange to view the in-home TV at several of these locations to verify your information.

Armed with this data, you can then draw up your own franchising plans and present a well documented map to the franchising authority(ies) with the explanation that *this* is the area you seek franchising for, based upon your study of off-air television reception conditions.

(5) *RF Interference Corridors* — The typical home television receiver is extremely responsive to signals in the air which it is not designed to receive (see July 1976 CATJ; CB Interference). Local FM stations, AM stations, police transmitters and the current scourge CB transmitters can create a zone of poor reception for several miles around themselves.

This is another job for the sleuth. Again, the local TV receiver sales and service people should be one of your first stops. If the problem is transitory in nature (i.e. CB'ers, or a problem with *mobile* police transmitters, etc.), it may not be worth the effort of a cable installation. A 50,000 kW AM broadcast transmitter "getting into all TV channels" may not be a problem cable can solve inexpensively. The problem may well be *audio rectification* in the receiver's audio circuits (see July CATJ, page 17), and cable is no answer to this one. On the other hand, if you have a channel 7, 8, 9, 10, 11, 12 or 13 that is desired, and a local FM transmitter (i.e. between 88 and 108 MHz) is getting into a bunch of home receivers via its *second* harmonic (which will fall into TV channels between 7 and 13), a CATV sys-

tem might well cure the problem if you can locate your headend far enough away from the FC transmitter that the second harmonic of the FM transmitter is not troublesome to you. In other situations, a high-powered educational band FM station (educational FM stations are generally assigned on the *low* end of the FM band between 88 and 92 MHz) may be tearing up grade B (or lower level) channel 6 station. The TV receiver has great difficulty separating the *strong/local* 88-92 MHz FM signal from the weaker (distant) channel 6 TV signal, and herringbone lines on the channel 6 video and/or buzzing in the channel 6 audio typically results. The region affected may be up to give to ten miles from the FM transmitter, and if the TV antennas for channel 6 must point "through" or close to the FM station's transmitter site, the problem is made even worse. This may even get more intersting soon if the FCC acts on a *pending* rule making that would allow "low power" education FM stations to operate *down inside of the channel 6 band.* It is *proposed* that ten watt FM educational stations be allowed to operate on 87.8 MHz, or a bare 50 kHz *above* the channel 6 aural carrier frequency. In the past such educational 10 watters have been licensed primarily to small, often rural, or suburban school district. Even with ten watt transmitter power, their zone of interference could extend for ten miles or so when someome is trying to receive a distant or Grade B channel 6 station.

(6) *Weirdo Effects* — Our favorite story here comes from the San Francisco Bay area. It seems an oil company had a large installation of those "inflatable" metallic tanks for holding crude oil. When the oil tanks were filled to capacity, the outer shell was nearly seventy feet in *height.* When the oil was drained for refining the container "shell" got shorter and shorter so that at no-load they were but ten feet high.

For months people in the area noticed that at times their San Francisco TV was perfect, at other times the pictures were splattered all over the screen with multiple images (ghosts). Yup, you guessed it, when the tanks were full and the line of six huge tanks were all seventy feet high (and several hundred feet wide as a line), the TV went bananas. When the tanks were low, everything was fine. Somebody has cabled this area already, but there are probably others like it.

New high rise buildings are notorious causes of inferior reception. Stories abound in Chicago and New York of the disappearance of quality reception as recent new buildings such as the Sears Tower and the World Trade Mart steadily rose higher and higher. Buildings don't have to be *that* high to create problems, the further back from the transmitter you get, the shorter the new building needs to be to be disruptive.

New freeways can be disastrous. If you run a major interstate highway through an area with marginal off-air reception, the increase in automotive background noise from vehicle ignition systems can really wipe out TV reception, especially on low band channels. The area affected may not be great, in terms of size, but the people

who live there would welcome cable with open arms.

(7) *New Population Centers* — Man is always looking for new opportunities to turn a barren piece of ground into a home for a few thousand people. Some of the most "ideal" settings are often buried in canyons, behind hills, or along lake shores. Man made lakes are just naturally built where the land is *low*, and the water usually stops well below the top of the hills that make up the potential lake bed. *People naturally build homes along the shoreline.*

Several enterprising cable people in Texas have nice, 200 to 700 subscriber cable systems started along these lake-shore areas. Often you deal initially with not a county or city governing board, but rather with a land developer. The "franchise" you acquire may be more in the nature of a business license or contract, and you may never cross *public* rights of way or have need for a normal franchise. But as long as the present FCC rules stand, if your area has or will have more than 50 subscribers, you will need to investigate the FCC Certificate of Compliance problems.

All of this goes without mentioning the usual arrangements with trailer courts, resort areas and even camp grounds such as KOA. A number of very nice small systems have been built in KOA campgrounds along the Florida coast and down into the Keys, by working out an arrangement with the camp ground owner. Campers that spend as much time on the road as off seldom have much more than a "camper-special" antenna there, and once the camper sits down for a night or week at a point where these ten foot high 2-3 dB gain affairs are well out into the B service regions, TV service is anything but satisfactory.

The story here is that poor TV reception does not have to extend over a *full* community to make a CATV situation viable. If the impaired region is only a *portion* of a community, and the service you will offer *can* improve reception, there is no reason for you to treat the isolated "CATV opportunity" any differently than you would if a whole community was involved. As long as you seek a franchise *only* for the *portion* of the community suffering degraded reception, and the franchise you receive spells it out in terms of franchise area, even the FCC won't give you difficulty with a CAC, as long as you treat that proportional area in the same manner as you would otherwise treat the *whole* community, if *that* was the franchise region.

BUILD YOUR OWN TEST EQUIPMENT
A Modulation 'Stripper' For Counter Freq Measurements

Bite the Bullet

After four years of FCC tests and harrassments 1976 is here and it looks like it is not going to go away. 1977 follows, as sure as the sun continues to rise. And up until now the small CATV system operator has had but four choices regarding FCC testing:

(1) Pay an "independent" outside "expert" from $175. to $2,000. to come in and perform the tests for you;

(2) Spend upwards of $2,000. for the test equipment required to make the annualized tests;

(3) Sign up for the CATA test program at $500. or $600. per shot;

(4) Ignore the tests altogether and hope that either the sun quit coming up, or the FCC goes away (not necessarily in that order!).

Facing facts (a fact being something we have to live with, like it or not), it appears *likely* that *some* form of testing *is* going to be with us. This is my *personal* opinion, one not universally shared, and probably shared by few small system operators. *If* indeed this *is* fact, then perhaps the time has come to approach the testing requirements with some degree of professionalism.

Testing takes test equipment. That is one of those facts we have to face. Yes, you can do quite a bit with the CATJ FCC test Compliance Wallchart, but can you go back and make repeat comparison tests time after time by using the wallchart and calibrated eyeballs? Of course you can't.

Testing takes test equipment, and test equipment takes money. That seems to be the point where most people stop this "scrabble" game and go back to more interesting pursuits. Now money comes from subscribers and subscribers stand in line for our service only when the service is worth money. So it follows that if testing makes for better service and better service makes for more money, at some point there is an economical and viable trade off between spending *some* money for testing and getting *some* of that money back, ultimately, with more subscribers and happier subscribers.

You possibly are not yet convinced testing is a good idea.

How much money should testing cost? Inversely, what kind of testing are you going to do, and to what degree of accuracy should your test results be read?

I have approached CATV FCC testing as (1) a way to achieve better pictures a higher percentage of the time, and (2) a lesser evil than being the recipient of a nasty (and possibly expensive) visit from an FCC field van. At some point the cost of the test equipment washes out with the better pictures achieved, and at some other point the cost of the testing equipment exceeds the cost of the potential FCC hassle.

Suppose you could do *all* of your FCC required tests for say $300-$400 in test equipment that you do not now have on hand. Is that a good number? Now suppose that same equipment could be put to additional use every week of every month in your system, to achieve better pictures. If you still charge $5.00 per subscriber per month, how many new subscribers would you have to pick up to justify a new expenditure of say $400.? The answer is fewer than ten.

That is what this "series" of articles is all about; test equipment. Test equipment you can build, on your own in your own shop, at your leisure pace so that your system can maintain better quality pictures, and so that you can also have the tools on hand to make FCC tests on your own, to prove compliance should the need ever arise. This will be a series of articles describing five separate but related pieces of simple test equipment. We budget the cost of the parts at between $300. and $400. for all five units. If you are not a builder but like the concept, we have excellent reason to believe there may well end up being commercial units available that perform the same functions as the units to be described, for possibly $700. for the *complete* package.

The first piece of equipment to be described is a low-cost video stripper, a box that allows you to feed a single TV channel into it, and then strip away or remove all of the video modulation so that what remains is a single (CW) carrier. Then, with a suitable frequency counter, you can proceed to measure the frequency of the video carrier for compliance with the +/— 25 kHz tolerance permitted by the rules. We will, in the series, provide instructions for constructing your own 250 MHz frequency counter, but not this month.

In the second installment of this series we will construct a wideband noise generator source, which with a suitable (you already have this) signal level meter will allow you to check the flatness of the channel passbands in your system. In another installment we will describe construction on a wide band adjustable signal generator (CW) which, in conjunction with the counter, will allow you to accurately measure and mark the channel edges. Finally, we will show how to construct a calibrated dipole for radiation level measurements, along with a

flat, broadband amplifier to be used in conjunction with the dipole to give signal level readings which you can measure on your SLM.

This series will not appeal to everyone. It is not intended to do so. There will be segments of the series which will appeal to you, and whether you construct the equipment on your own, or select a unit or two to construct, or simply read and learn how such devices work, you will, we promise, be better informed for the few months you spend with us as we wind our way towards the March 1977 FCC test deadlines.

Stripper

This month's project is a simple device that will remove the modulation from the video carrier. You can make it as simple or as complex as you choose; what we will deal with here is the basic approach, and a set of instructions with the schematic to make the unit fly.

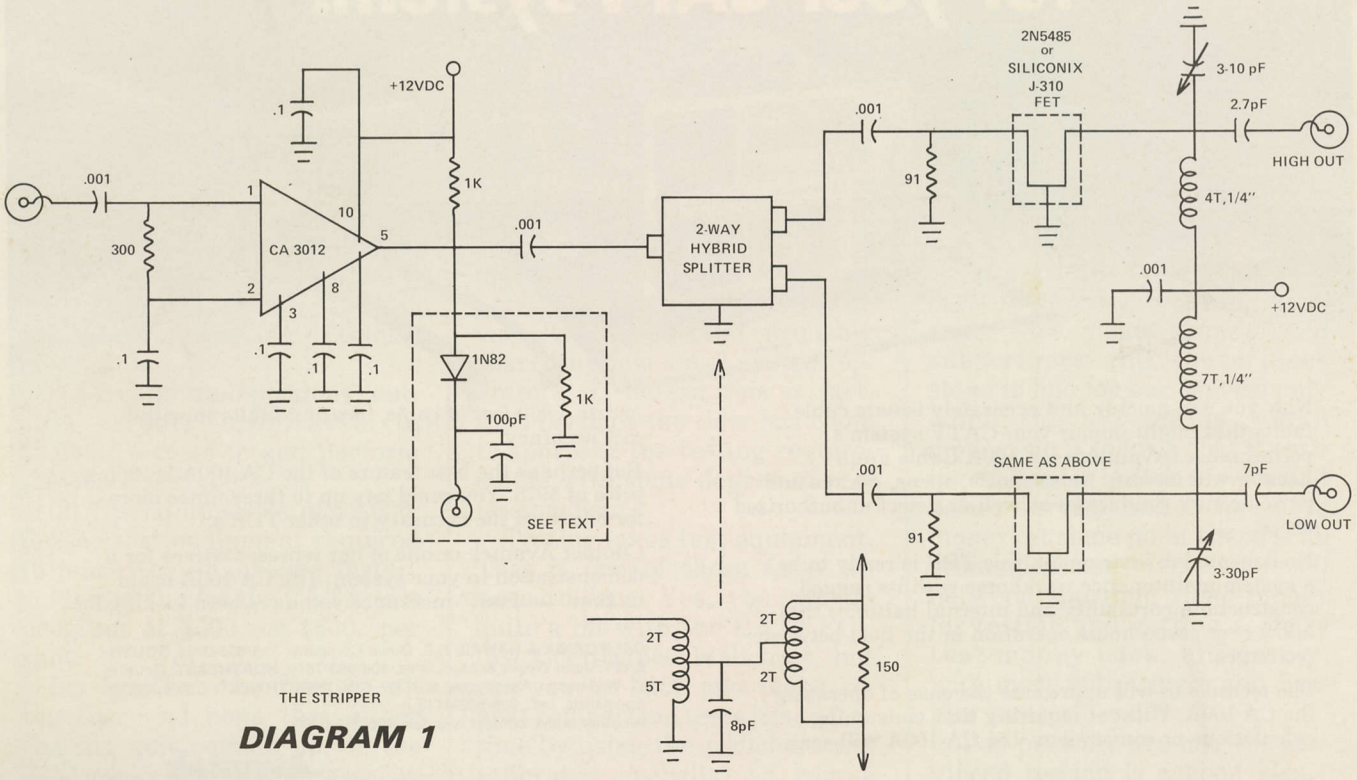
The heart of the unit is the RCA CA3012 IC; and IC package that was intended initially to function to only 10 MHz, but which function fine up to 220 MHz (and beyond) with a loss of gain.

To use the stripper, you insert the output of your processor (with the audio level control turned way down, or with an adjustable trap after the processor/strip amp to trap the audio out) into the input of the stripper, and connect the field strength meter you already have to the output of the stripper. If you are plugging a low band channel into the stripper, plug your SLM into the "low output" of the stripper; if you have chosen a high band channel, plug the SLM into the "high output" of the stripper. Now adjust the 3-10 pF or 10-20 pF output tuning capacitor for maximum indicated carrier output on the SLM. Then replace the SLM at the output with the counter you have or will have, and measure your frequency.

You will recall that you do *not* need to measure the audio 4.5 MHz sub carrier on your system *unless* you are generating within your system the 4.5 MHz sub carrier. That is, for heterodyne and strip processing, there is no FCC mandate that you check or test the 4.5 MHz sub carrier(s). However, if you have a modulator that does generate video and audio carriers for any Class I (i.e. off-air or broadcast) TV channel, you are required to measure not only the video carrier frequency but the audio (sub) carrier as well. Look again at diagram 1. Note that there is a portion of the parts layout appearing in a dotted-line box. This portion stays as shown in diagram 1 as long as you have no locally generated 4.5 MHz sub carriers. As soon as you have to check *both* visual *and* aural carriers, you will need to add the parts in the dotted box with those shown in diagram 2.

To measure the frequency of the audio carrier, turn the audio carrier level control back up (or alternately remove the external trap added, for the processor with no separate audio level control), and connect the frequency counter to the 4.5 MHz output shown in diagram 2. The counter *will jump about* under TV audio modulation, so *wait* until there is a totally quiet period on the audio (by monitoring a TV receiver) and then read the counter for the proper 4.499 to 4.501 MHz region which passes FCC spec.

Parts are called out on dia-



THE STRIPPER

DIAGRAM 1

grams 1 and 2; the IC layout for the CA 3012 appears here as diagram 3. The CA 3012 is available at most RCA distributors (i.e. parts supply houses handling RCA line parts), and there is an exact replacement in the Sylvania ECG line (#726). This series will continue in the October CATJ.

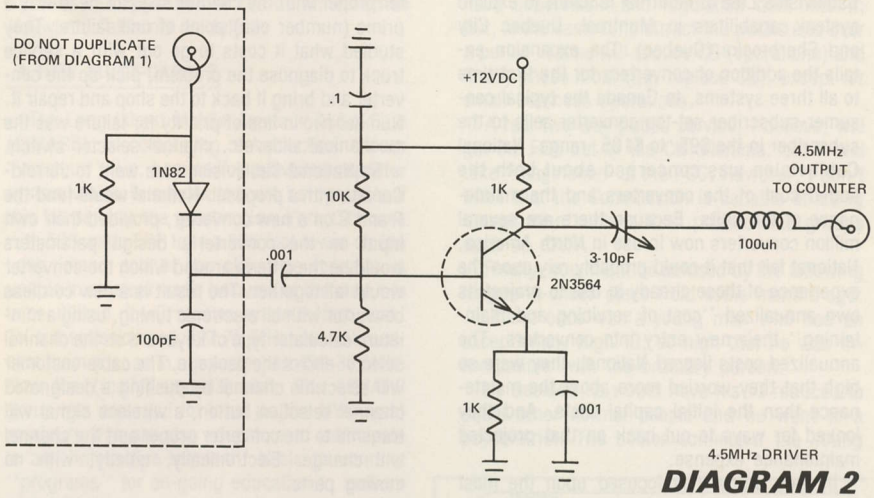


DIAGRAM 2

TECHNICAL TOPICS

KLYSTRON SHORTAGE

Users of Raytheon KTR-2 microwave and some Collins microwave of the 1965-1971 or thereabouts era have a problem. It seems that the transmitting klystrons (**QKK1237**) are suddenly in short supply and new deliveries are not likely until January 1977.

Originally the QKK1237 units were to be cycled every 6 months or so and one could expect 12-24 months of service from them. They cost around $850.00 when new. Then the prices jumped to around $1,000., after 1972 or thereabouts. Lately, the prices have gone to $1,600.00 each, **if you can find them**. At the present time Raytheon and Collins are out of the QKK1237 and are quoting 'next availability' as **after** January (1977). Obviously in a time of short supply (or no supply) people who have a few hoarded away are not about to admit it. But there is the chance that a CATJ reader may: (1) have an abundant supply, or (2) know of some firm somplace that still rebuilds the transmitting kylstrons, or (3) know of some obscure source for the unit.

CATJ has several system operators filed away in a ''Help Us'' file folder who either need a replacement or two today or yesterday. Can anyone help? Contact CATJ's Editor In Chief Bob Cooper if you can help.

INNOVATIVE CONVERTER R & D

During the past several years, the fortunes of the major equipment suppliers to the U.S. CATV industry have fallen into tough times. The closing of the Theta-Com line equipment production facility announced in late June is but the tip of an iceberg that extends in varying degrees throughout virtually all areas of CATV equipment production.

A number of people, some who know of what they speak, have lamented of late that the larger suppliers have cut way back (or even eliminated) new, innovative, research and development. And if you are a far-sighted person it does not take you long to figure out that if R and D of new generation equipment comes to a standstill, sooner or later (and probably sooner) the appearance of such new equipment on the marketplace also comes to a halt.

In CATV as in virtually all phases of electronics, component R and D goes on constantly. New and better IC's, new and better transistors, new and better thin film filters (etc.) are being developed daily. But the **adaptation** of these new descrete parts into working CATV ''appliances'' is the responsibility of the CATV industry's suppliers. Alas, without R and D money, there are not the talented people available to develop new circuits and new innovative ways of making equipment smaller, less costly and less demanding on the operating voltage/current supplies.

So where are we today in innovation? At this time, we have probably lost no less than 12-18 months in the past three years. In other words like it or not, during the past 36 months while component technology and system technology in **other** areas of electronics has continued to grow, CATV has at best managed to keep up with no more than 1/3rd to 1/2 of the R and D it should have been doing parallel to the emergence of new components and systems.

Such are the consequences of cut backs in CATV plant gear sales, and the inevitable cut backs in operating capital for R and D. So what is likely to happen in CATV in the years ahead?

With the exception of areas such as test equipment and some headend or pay cable ''appliances'', CATV technology is likely to begin to run counter to the trend we have seen during the first twenty-five ''serious'' years of CATV development. Rather than leading in the development of broadband communications technology, we are apt to ''follow''. Whole generations of new components, IC's, transistors et al will be developed and passed over without as much as a look-see from CATV R and D facilities. This will hurt us tomorrow, it is already hurting us today. For without constant adaptations of our circuits and designs to the latest state-of-the-art technology, we will find equipment that was once being outmoded every five to seven years now being outmoded in three to five year periods. Replacement parts, and replacement technology will be harder to come by, because we will be generations behind in component useage, rather than current.

Can the emphasis shift back towards innovation? Perhaps, **if** there is re-newed growth in CATV plant construction and our primary suppliers once again become healthy enough to re-staff their curtailed R and D facilities.

Or, perhaps there is another answer. System funding of R and D. The August CATJ contained a system designed scheme for producing an at-video microwave alarm system (see CATJ August, Page 26). This type of innovation would at one time have come from a supplier. Telesis had an operational problem which demanded a technology answer. Bill Ellis searched for a product to solve this problem, and finding none dipped into his own ''special projects budget'' to create the answer.

But, there is a fly in that ointment we well. The people who logically have the greatest need for new products and new innovations are the larger system operators, in particular those going into major market situations. And if one studies the annualized financial reports of these system operators closely, one finds that they too are in a period of very tight money. The systems who have money available are the medium to smaller systems, where **traditional** services largely do not require new, innovative equipment. They, the best candidates for innovative R and D **funding**, have the smallest need for such R and D. It is a vicious circle and the dog chases the tail, but never quite catches it.

Perhaps there is yet another answer. Any system or MSO passing large volumes of cash **through** its books (regardless of whether there is a profit at the bottom line) should be receptive to ways to cut operating expenses. You may **not** be making money, or you may be breaking even. But if someone can show you how the money you are now spending can be trimmed, while the job being done continues at the present level or even a more efficient level, **you should listen.** An example to point. National

Cablevision Ltee of Montreal is about to expand system capabilities in Montreal, Quebec City and Sherbrooke (Quebec). The expansion entails the addition of converters for the first time to all three systems. In Canada the typical consumer-subscriber set-top converter sells to the subscriber in the $95. to $105. range. National Cablevision was concerned about both the added cost of the converters and the maintenance of the units. Because there are several million converters now in use in North America, National felt that it could probably rely upon the experience of those already in use to **project** its own annualized "cost of servicing and maintaining" their new entry into converters. The annualized costs floored National, they were so high that they worried more about the maintenance than the initial capital costs. And they looked for ways to cut back on that projected maintenance expense.

In their study they focused upon the most frequent cause of converter failure in the hands of the cable subscriber, and they found that the remote control head cord, that links the converter proper with the channel selector head was a prime (number one) point of unit failure. They studied what it costs to go out with a service truck to diagnose the problem, pick up the converter and bring it back to the shop and repair it. Number two in line of priority for failure was the mechanical slide/etc. channel selector switch.

So National Cablevision Ltee went to Jerrold-Canada with a proposal. **National would fund** the R and D on a **new** converter, provided their own input on the converter's design parameters would be the criteria around which the converter would fall together. The result is a new cordless converter with all electronic tuning, using a miniature calculator type of keyboard on the channel selector end of the package. The cable customer will select his channel by pushing a designated channel selection button, a wireless signal will transmit to the converter proper and the channel will change. Electronically, quietly, with no moving parts.

National Cablevision Ltee is reported to have spent upwards of one million dollars in funding this R and D. The converters to be manufactured in Canada by Jerrold-Canada will be available in the spring of 1977. They will have a customer price tag of $150. (that is the price a cable customer will pay for the unit if bought outright), and they will be marketed in Quebec by National, as an adjunct to their own internal use of the converter in their own three large systems.

Will this National/Jerrold converter be available in the United States? The bets are that sooner or later it will find its way across the border and into the United States. The Canadian's can take real pride in their own innovative approach to a problem which should have attracted the attention of suppliers here in the United States. In all fairness to those suppliers, however, the problem probably **has** attracted their attention, but finding a loose "million dollars" to fund it was quite another matter. It is important to note that National Cablevision Ltee assumed this somewhat unorthodox stance of being an R and D "funder" because it looked carefully at the bottom line of its projected P and L's, and set out those items where the cost of business seemed too high. From that simple, straight forward "good business judgement" approach came ultimately the decision to fund a converter. Perhaps other systems would do equally well to take a hard look at their own "bottom lines", and at the cost-items that go into their operating overhead. Cost cutting through innovation is hardly new in business, but it is a fresh approach for the cable industry. **There may be hope for renewed R and D efforts yet!**

CARS BAND CHANGES

As reported in the June **CATJ** (pages 30-34), the FCC has been considering some "editorial changes" in the Part 78 rules governing operation of CARS band (relay) stations for CATV.

In mid-July, the Commission released an announcement codifying the expected changes, as follows:

(1) **Section 78.69** previously required CARS band operators to log the date and time of the beginning and end of each period of transmission of each CARS band transmitter. This rule has now been amended so that unattended (i.e. remote control) CARS band stations are no longer required to keep "logs" of station transmitter operations.

(2) **Section 78.109** has required that a CARS band licensee who sought to change out one brand or model of type accepted transmitter with another brand or model must **first** obtain Commission approval for the change. Under the amendment, you may change out your CARS band transmitter without prior Commission approval **provided**: (A) there is no change in the power delivered to the antenna, (B) there is no change in the type of modulation, and (C) there is no change in the form of emission which results in the new transmitter occupying more bandwidth than was initially authorized. A licensee may now make such changes with**out** Commission approval, **but**, you are still required to notify the Commission under 78.109 (b) that such a change will be made (i.e. you notify the Commission so that they may in turn up-date their own records, but you do not need to file any **formal** applications **before** change-out nor do you need to wait for Commission response, provided the equipment you change-out to is approved under the requirements of 78.107 (b).

(3) **Section 78.109** formerly required that prior to a change in the CARS band transmitter's

control system, that a formal application to the Commission for approval to make the change was required. Under the new rule change, all that is required is that you give the Commission ten day advance notice if you plan to modify the (remote) control system. Any such ten-day notice must include a full description of the control system including a showing as to how the new (remote) control system will comply with the requirements of 78.51 and 78.53 (78.51 covers remote control operation and 78.53 covers unattended operation). The Commission is "retaining" the right to notify you, after study of your ten-day notice, not to make the change or to suspend the change when in their view your proposed system will "not be in the public interest, convenience or necessity."

(4) **Section 78.113** has required CARS band licensees to make frequency measurements on CARS band transmitters no less frequently than once per month. By change, these measurements are now required when a transmitter is initially installed (i.e. such as when a replacement unit is installed, or for a new installation), when any maintenance to the transmitter may result in a change of frequency of the transmitter, and annually. The "and annually" part is a replacement of the prior "monthly" requirement.

Using the vehicle of the notice of the rule changes, the Commission also addressed itself to two other questions. By editorial addition, the rules governing towers, painting, lighting et al are now incorporated into Part 78 (they were previously cross-referenced to Part 17). This means that when you obtain a **new** copy of the **new** Part 78, everything you need including tower information should be there in one spot. Additionally, the Commission addressed itself to the matter of changing polarization of the CARS band transmissions. Apparently a number of systems had asked if they could rotate the polarization (i.e. from as-licensed horizontal to new-polarization vertical) **without** Commission approval. **The answer is no**. The rationale behind this is that a change in polarization is in effect a change in the geographically related assignments in the CARS service from a real or potential "interference" standpoint, and that if you are going to make a change that may upset "their allocations" formula, it needs their approval first. So keep your hands off the feed on your dish unless you have Commission approval to "rotate."

EARTH TERMINAL SHARING

The Commission has ruled that bona-fide non-profit, cost-sharing arrangements for CATV earth terminals **will be allowed.**

The criteria under which applications for "shared facilities" will be studied are identical to those found in the CARS Band rules, section 78.11. Section 78.11 allows joint-use of (CARS Band) facilities when there is a written contract between the parties, and when said contract spells out that any capital contributions to the project by second (third, etc.) companies are on a "cost-sharing, non-profit basis, prorated on an equitable basis among all cable television systems being supplied with television programming."

Anyone interested in going into a joint-earth terminal program should first familiarize themselves with the requirements of 78.11, and then proceed to draw up their joint-use earth terminal program so that the capital contributions for the terminal satisfy these requirements. The first such formal approval for such a cost-shared system was approved by the Commission at Hayward, California on July 2.

A NEW MUST-CARRY?

The Long Island Mobile Amateur Radio Club (LIMARC) is completing construction on an "amateur" (i.e. ham-radio) **television repeater** system which it is expected will be operational this fall serving the greater New York City area with 500 watts ERP from a 300 foot tower on the Long Island end of the city. The repeater is unique in amateur-radio because of the **way** it is to be utilized. It will receive amateur 'fast-scan' TV transmissions on 427.75 MHz and rebroadcast them (i.e. as in a repeater) on 439.72 MHz. Now the (really) unusual part. The LIMARC group has arranged for local (to the NYC area) amateurs who are **also** educators to participate in an "interactive-terminal" basis to conduct "programs" for on-going education in matters pertaining to amateur radio and communications in general. For example, through an inter-active (that means two-way in the sense that people "watching" can ask questions of the "course-conductor" at any point) terminal being installed at the Hall of Science at Flushing Meadow viewers will be able to communicate with the instructor conducting a course on CB TVI problems. Other course-uses planned involve amateur-radio license preparation courses, on-going education courses in rapidly advancing technology such as micro-computers and so on. Some of the inter-active terminal locations scheduled include the Industrial Arts Department of the Syosset School District, Bishop McCormack High School at Oyster Bay, Pace College in Manhatten, City University of New York, High School of Automotive Trades in Brooklyn and so on.

The inter-active terminal concept is being followed primarily to insure that there are readily available (public) "viewing points" for the system, which will be programmed in the inter-active mode largely in the evening hours starting this fall. During other periods of the day, the repeater will be utilized for ham-to-ham ATV (amateur TV) "contacts".

Tuning in the 439.75 MHz signal is very simple; take a Blonder Tongue (or other consumer-tuneable UHF to VHF converter) and pad down the three "cavities" in the tuner to allow it to tune down an extra 40 MHz from where it normally tunes-in channel 14. After you decide the signal is usable and perhaps even useful for your CATV system, we feel certain you could order a standard BT, Jerrold (etc.) U to V converter (crystal controlled) to place the ATV station on your system on an available channel.

Because the station is **not** a broadcast signal, it would **not be** a must-carry or even a Class I signal. But its unique "programming" might provide a very interesting "alternate choice form" to subscribers nonetheless. Those operating CATV in the New York City area can obtain additional data on the new **LIMARC** service by contacting **E. Edwin Piller** (W2KPQ), **80 Birchwood Park Drive, Syosset, New York 11791.**

10-4 OLD BUDDY

"I just finished reading your 10-4 (et al) in the July CATJ and noticed CATA is interested in the CB problem and is participating in the PURAC program with the FCC.

What PURAC needs to do to reduce interference (spectrum pollution) is to come up with a two-way radio service for the public, that will have supervision and regulation built into it; but, at the same time attract the public and over a period of time will reduce CB (operations) and finally phase it out (i.e. replace CB), except for small business operations.

A real two-way public service, I believe, will get the FCC out of the CB dilemma; but it will take 'imagination' at the FCC. However, I don't think that the Commission is capable of using 'imagination' unless it is pushed like groups such as CATA.

Finally, you might be amused by the following tongue-in-cheek piece I did some months ago:

'There once was a young man who had an exceptionally high IQ; so high that he was incompatible with the ordinary person.

He decided he would have his IQ reduced to equal other normal people and he went to a psychiatrist. The doctor connected the young

man to a machine.

Presently the doctor was distracted by a telephone call, and the call turned out to be a long one, during the course of which the young man was left connected to the machine.

Suddenly the doctor remembered the young man, threw down the telephone and ran to the young man jerking him loose from the machine. '**Can you hear me?**' the doctor shouted.

'**10-4 old-buddy**' responded the young man.

G.M. Howard, Esq.
Communications Counsel
Dallas, Texas 75209

GM —

CATA/CATJ's Bob Cooper is **deeply involved in the FCC's PURAC group regarding CB TVI, presently serves on two committees within the PURAC operation. A Cooper 'White Paper', being prepared at Committee Request, will define all of the known CB-to-the-world interference problems as CB relates to electromagnetic spectrum compatibility.**

In the CB area, on July 27th the FCC adopted a new rule making expanding CB channels from 23 to 40. The 17 new channels begin near 27.235 MHz and work upwards to 27.405 MHz. This means that the second harmonic region will now move up to 54.810 MHz (remember channel 2's visual carrier is centered at 55.25 MHz) **and the third harmonic region will move from its present 81.705 MHz upper-frequency-end** (for CB channel 23 times 3) **to 82.215 MHz. With channel 6 assigned from 82-88 MHz, this means that when the new channels become effective** (the effective legal date is January 1, 1977), **there will be** new **CB TVI problems affecting channels 2, 5** and now 6.

At the same time, at a late July PURAC gathering, Cooper and an E.F. Johnson company representative discussed CB TVI problems with TV channels 9 and 13. Channel 9 TV is the recipient of 27 MHz 7th harmonics and channel 13 gets zapped with CB's 8th harmonic. Under the terms of the new **FCC CB channel expansion,** a CB'er who causes TVI **is going to be** required **to install on his CB transceiver (i.e. transmitter) an** external **TVI filter. We'll have a full report in the October CATJ.**

FCC HAMS IN CATV

''This is relative to your June 1976 CATJ report 'Hams in CATV-II'. You indicate there ''apparently there are no FCC types who are also amateurs''.

Pardon us for bursting the bubble. In the FCC there are several amateurs engaged in a 'first-line' of CATV enforcement. Plus, there are several dozen amateurs in various other staff positions (including one Bureau Chief and one Chief Engineer!).

Specifically, Cecil Ellington (K4RZO) is the supervisor of the Eastern FM-TV-Cable Enforcement unit, and he is active on VHF amateur bands. Tom Toenjes (WØTVI) is the supervisor of the Central FM-TV-Cable Enforcement Unit and he is active on numerous bands. I am the former supervisor of the Western FM-TV-Cable Enforcement unit, and am now Assistant Engineer in Charge of the San Francisco FCC office. I am active on VHF.

In addition, the majority of the District Office and Monitoring Station Engineers in Charge are licensed amateurs of many years standing. Not to mention the staff engineers, technicians, and clerks who are amateur operators. In fact, there is still a 40-meter CW 'FCC Net' for present and retired FCC personnel.

As for why they were not listed in the original article. . . I guess they were just to modest to write!

Philip M. Kane (W6VQM/K2ASP)
San Francisco, Ca. 94111

CIRCULAR IS COMING

Although it has been almost one year ago that CATJ first looked at the circular or multi-mode polarization question for beyond-the-horizon off-air signals, and reported on tests then underway in Chicago (Illinois) and Modesto (California), it is apparent that broadcasters are just now gearing up for massive entry into the circular polarized antenna game.

In recent months JAMPRO antennas in California has been advertising ''circular polarized UHF and high band TV transmitting arrays'' noting that when the FCC approves them, **JAMPRO** will have them ready for delivery. But a single company does not a trend make. However, it is of interest that the August issues of the various broadcast oriented engineering magazines have burst forth with circular polarized transmitting antenna advertisements from two large well known antenna manufacturers; **RCA** and **Harris**. RCA sports a trio of circular transmitting antennas, one each design for low band V, high band V and UHF.

Harris, in a marketing technique reminiscent of the ''buy our one-way amplifier now and you have plug-in capability for two-way later when you need it'' ploy is advertising a CP antenna that radiates a horizontal wave front **today** but ''with minor field modifications you are ready for circular polarization when approval comes from the FCC.''

In the meantime, we have yet to hear any further rumblings from CATV antenna manufacturers who are proceeding on their own with CP receiving antennas. Could it be that when CP transmission comes that there will be no off-the-shelf CATV circular antennas to take advantage of this new technology?

THE WAY WE WERE — II
More Early 60's CATV History For Nostalgia Buffs

TRUE CONFESSIONS OF A UHF ANTENNA MAN

Lee Thomas
M.H. Thomas Antenna Manufacturing Co.
Salem, Oregon

The installation of UHF antennas, especially in the Translator band (i.e., channels 70-83) has been a touchy subject for years. This is in part because it's a touchy job!

Many theories have been put forth on the subject and we all have uttered an unsavory remark or two. Some of us have even suspected the presence of gremlins.

But why not face the subject with a little reality? To begin with, it doesn't take a mathematician or a genius of any kind to be a good UHF installation man. You don't even need to be a good technician (although it helps). You do need a good set of eyes and an excellent memory. You don't even need expensive test equipment! You do need a fairly reliable inexpensive field strength meter and a well aligned properly operating test set.

Always remember that in this work a field strength meter is only a relative signal device. It won't take you long to learn what type of reading you need *on your meter* to register an acceptable picture at the set. Keep in mind you are not testing the receiving antenna for resonance and reactance, the famous dB gain, lobe patterns or whatever.

YOU ARE MERELY LOOK-

TVH was not "strictly" a cable magazine; in fact, when it first began its "weak (TV) signal industry" **coverage, a very large portion of the publication was devoted to** (of all things) **translators and their then VHF counterpart: VHF boosters. Not all cable people could stomach having part of TVH devoted to cable and part devoted to translators; one CATV pioneer remarked years later "I never did subscribe to TVH simply because it also contained that $%*& translator material!"**

The May 1961 issue contained a "still humorous" story prepared by a fellow named Lee Thomas of Salem, Oregon; who manufactured UHF translator (band) home receiving antennas. All things considered, the UHF-mentality has not changed that much in the ensuing 15 years. (The cartoons for this story were drawn by none other than Stan Searle of Communications Publishing Corp; then "Promotion Director" of TVH.)

ING FOR A GOOD PICTURE!

A few examples to follow will give you some insight into the problems you can make for yourself by trying to be too technical or a "Johnny-know-it-all."

Since the advent of the first UHF channel in the United States (channel 27 in Portland) I have visited with many installation men in many-many different areas. Each community seems to present a different set of problems. Obviously, if you are working within one area, the first thing to do is "get to know your own back yard." If you remember what you observe, and apply it in future installations, all of the outside "geniuses" in the world won't be able to compete with you.

Many problems will confront you, as well I know. Atmospheric density (a changing "female" if ever there was one), foilage types and density, antenna salting conditions, saturating water condition (rain-rain go away, come again another day!), ice and snow, electrolytic conditions caused by various chemical conditions in the local atmosphere and terrain problems are but a few of the "local conditions" you will soon grow to *"love!"* As they vary and each will vary independent of the others, you will soon find *good judgment* is the very finest piece of "equipment" you have.

"Get to know your own backyard."

Let's talk about foilage density. We know it affects UHF. *The TASO report told us so.* Not that we needed to be told. . . any UHF antenna man could have saved them the trouble and expense of finding out for themselves! Learn what kind of foilage grows in your neighborhood. With your field strength meter in hand do a little "back yard probing." And if a customer's dog bites you on your first visit, you certainly know to watch more than the trees the next time you return!

What about salting conditions? You are placing installations near the Ocean and a continued fog builds up the saline compound on your feedline and antennas. Many commercial antenna manufacturers have devised "de-icers" but no one has a "de-salter" yet! *What to do?* The antenna should be as rugged as possible, and the transmission line should be double insulated to protect your pictures. It may take you two return service calls, but you will soon learn that it takes "extra-precautions" in such areas.

A UHF signal is tested about 30 feet above ground for intensity. All conditions being right, you may have a good picture. But did you ever see a community with *all of their UHF antennas thirty feet above ground?* You learn after a while "the general heights" for signal in your area. But you also soon learn there are exceptions. . . sometimes more exceptions than general heights!

Maybe you leave an open end on a hollow lead and water collects inside. You may not know *why* it shorts out the line and you lose the picture, but one thing is sure. *After a couple of free calls you will make different arrangements!*

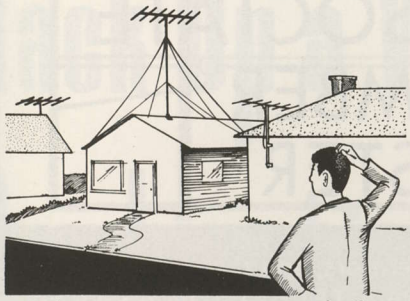
If your lead-in line shorts out from resting on the damp ground or roof, and you gingerly pick it up to find the meter reading suddenly return to normal, you don't have to know why it does this. But you certainly learn soon it can't happen again and you make different arrangements in future installations.

When you fail to put a drip loop in the lead before entering a home and the water ruins "my ladyship's rug or floor" I hardly think you will repeat this procedure!

And you soon learn that switches, clothespins, poor splices, wrong wallthrus, the "long way around the room to the set," metal in contact with the transmission line, taping the lead-in line to the antenna mast, antenna or boom, ALL may be very convenient, *BUT certainly not good for the picture!*

Must you be a genius to learn these things?

I can hear the catcalls at this point! OK, so I have seen a customer's picture bad on channel 72 and good on channel 77. Against all of the textbooks' advice and even my better judgment I changed the 6AF4. Out came a better picture on channel 72 and no change on 77! Let's let



"Did you ever see a community with all its antennas 30 feet above the ground?"

the tube manufacturers worry about these things, I won't.

I have seen pictures on UHF only six feet above ground and 100 feet away, the set owners had to go to 40 feet to get any signal. But why worry about it? It only happens once in (you name it) times.

I have seen a picture at a point where the signal comes directly across water all the way (the textbooks tell us this is an "ideal situation"). Along the edge of the water I have measured signal levels that fluctuated from 100 uV to 700 uV at the very same antenna terminals. 200 feet away and still at the edge of the water, the signal was rock solid at 500 uV. They tell me over water signal transmission is perfect and very stable. *I agree!* And I'm sure not going to tear my hair out trying to re-write the textbooks.

In erecting Translator transmitting antennas I have seen a 200 foot wide strip develop where the *line-of-sight signal level* is considerably down from the surrounding areas. Using a two-way communications system I tried raising and lowering the transmitting antenna hoping to eliminate the dead spot. I tried three different models of transmitting antennas. And I tried skewing the polarization of all of the antennas. Vertical... horizontal...even in between! *Nothing worked.* I know it can't happen, so I walk down the street talking to myself.

"He couldn't get any channel 6."

One time I decided to get away from it all. I started on a fishing trip, going across one of the passes to Eastern Oregon. While crossing the pass I noticed a ranch house a short distance from the road on the "far side of the summit" from channel 27 in Portland. The ranch house was in a small opening surrounded by tall pines stretching up 75 to 100 feet. *But behold!* On a 15 foot mast leaning against the ranch house I spied a 24-element channel 27 colinear! At this time channel 6 was also operating out of Portland. No channel 6 antennas was in evidence. After ten minutes of driving my curiosity got the better of me and I simply knew this man couldn't be getting channel 27! I turned the car around and returned where the rancher showed me his channel 27 picture. Admittedly it wasn't much, but the rancher quickly informed me *he couldn't get ANY channel 6!*

Knowing this couldn't be true I left in haste believing more than ever in "TV gremlins." To this day I haven't returned although I pass the ranch house often. Now I just look the other way and don't even slow down!

One day while calling on a good friend in the TV business he suggested that I go with him on a replacement job. It was an easy reception area and we knew we would have an opportunity to visit. The old weather-beaten installation displayed a fairly good picture. And try as we might we had nothing but trouble with the new installation. We fought with the installation for two hours to finally discover that the manufacturer of the hollow tubular line had forgotten to copper coat six feet of the steel core transmission line.

So I must confess that while I use good sound technical information, charts and formulas upon formulas in following my work, I have found it necessary to modify the use of this data to varying degrees to meet the idiocyncricies of each community and each installation.

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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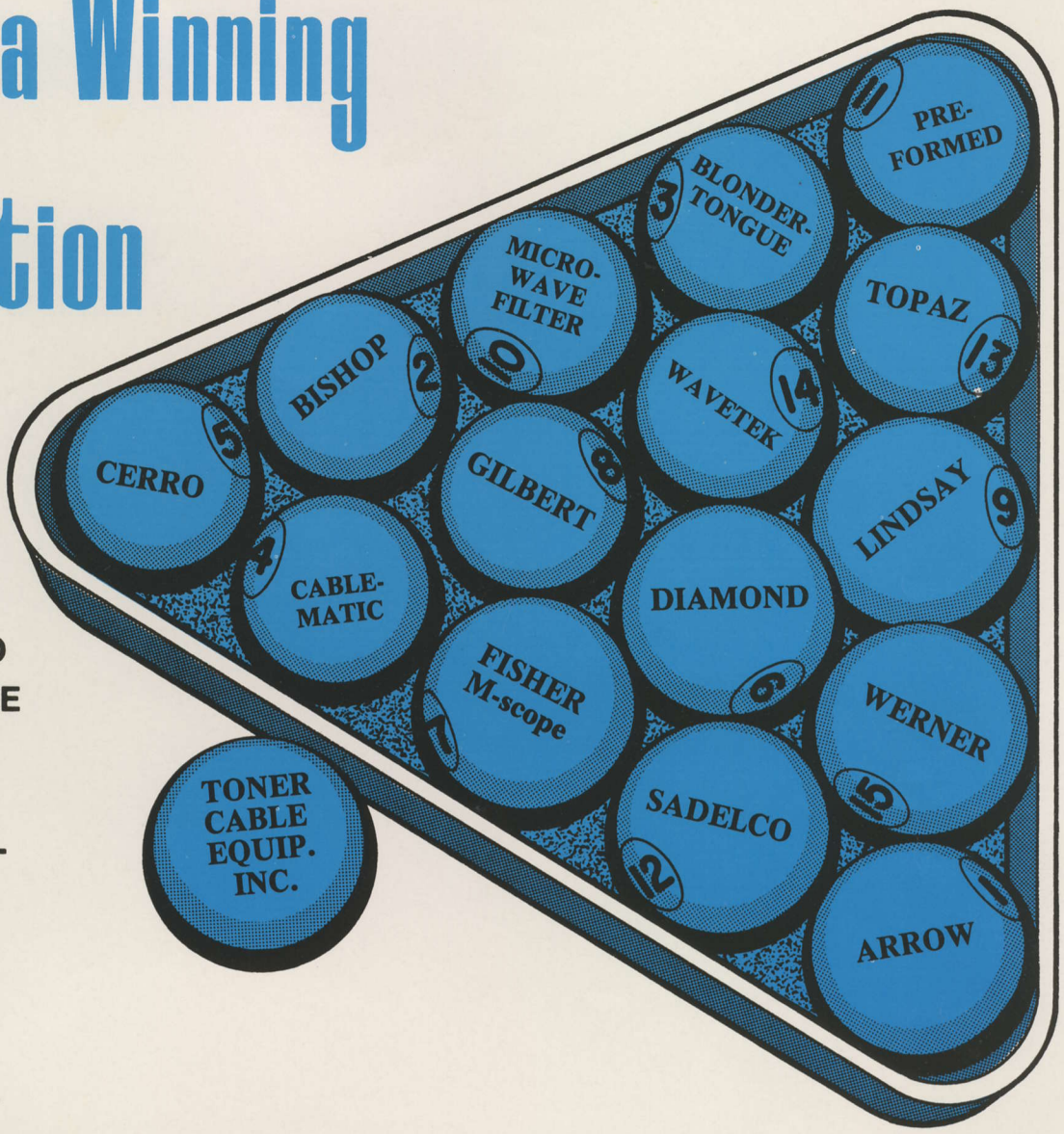

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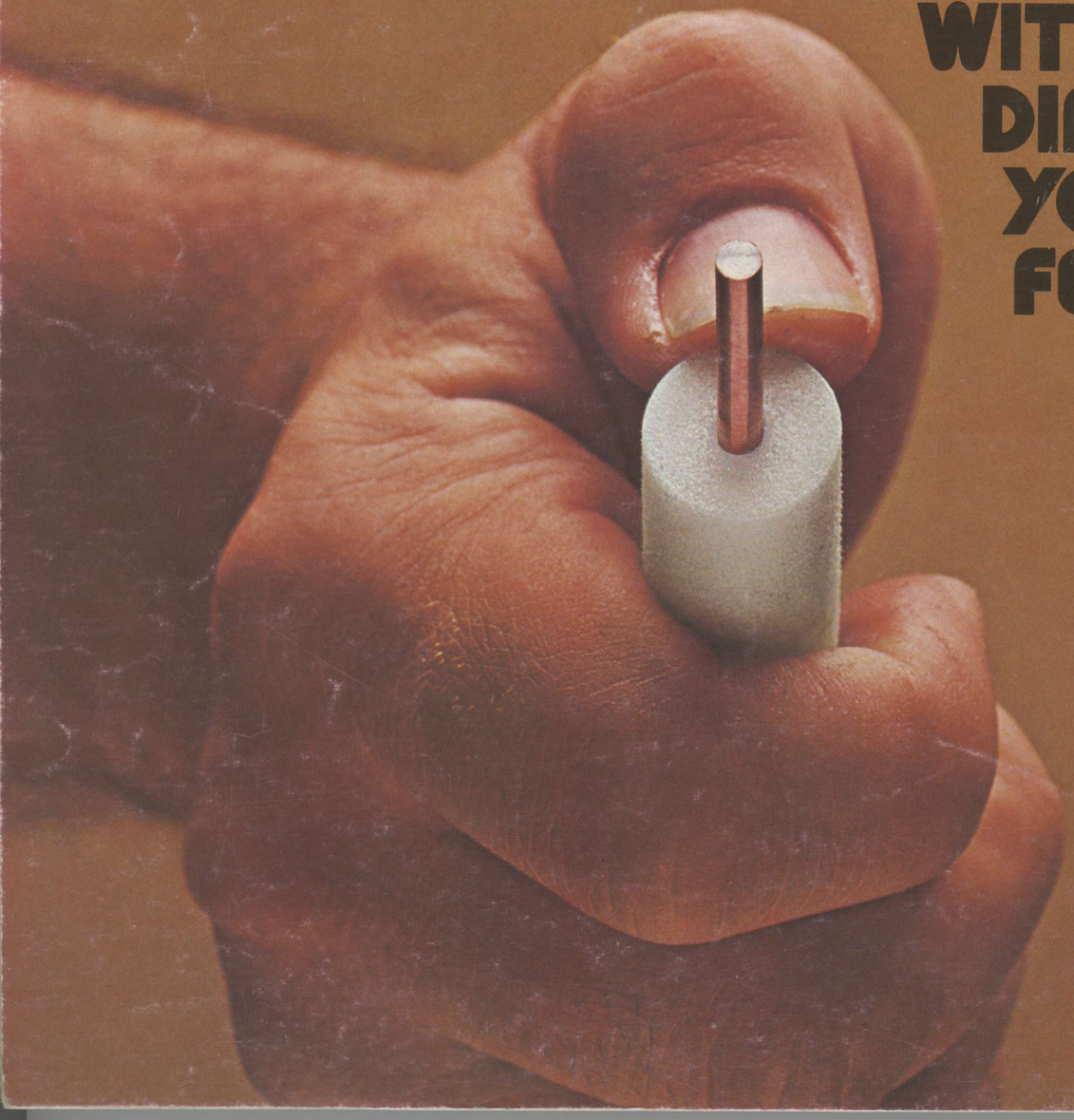

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