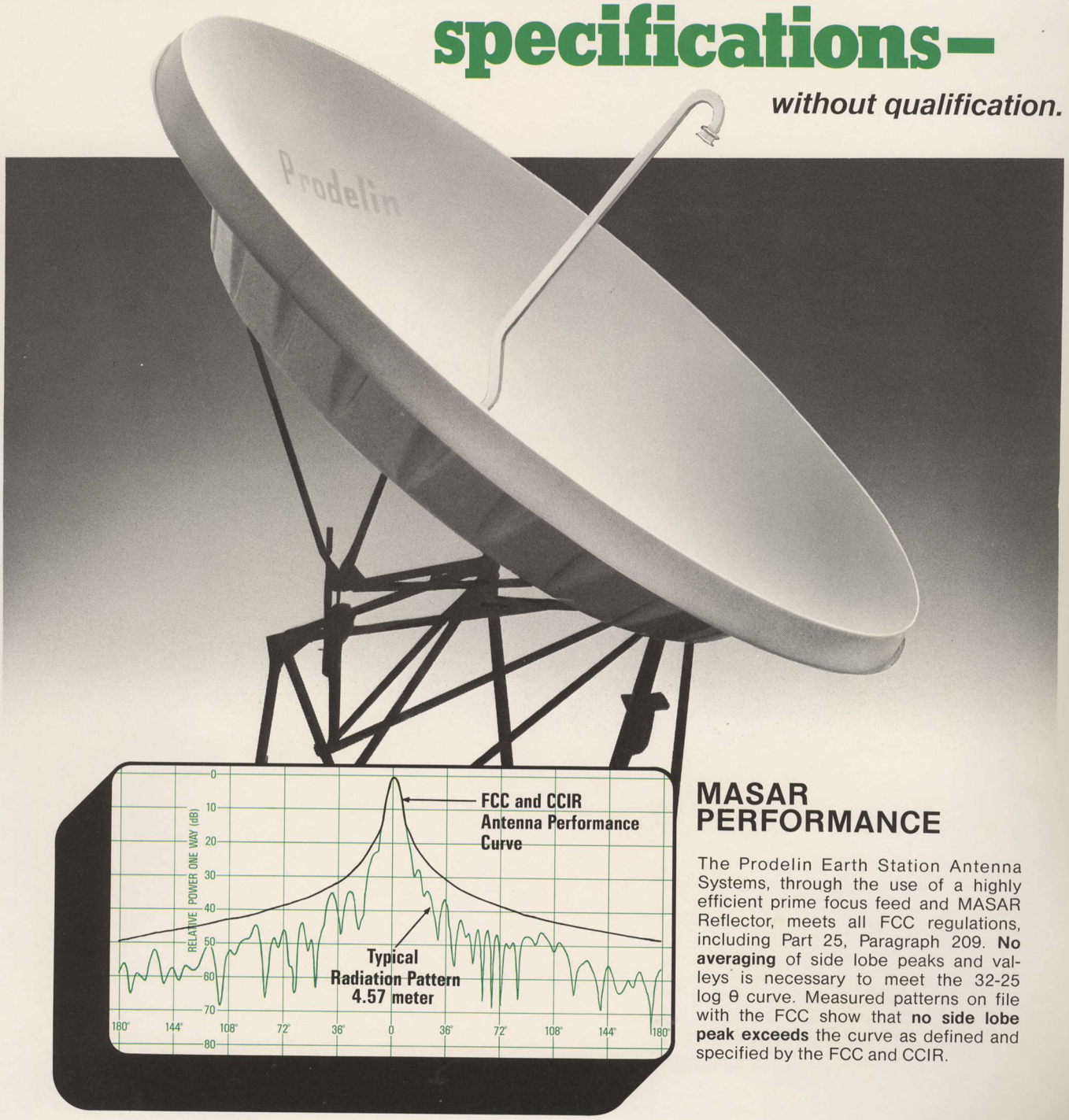
JULY CATJ 1977

MASAR 4.57 meter earth station antenna system

meets FCC and CCIR specifications—

without qualification.



MASAR PERFORMANCE

The Prodelin Earth Station Antenna Systems, through the use of a highly efficient prime focus feed and MASAR Reflector, meets all FCC regulations, including Part 25, Paragraph 209. **No averaging** of side lobe peaks and valleys is necessary to meet the 32-25 log θ curve. Measured patterns on file with the FCC show that **no side lobe peak exceeds** the curve as defined and specified by the FCC and CCIR.

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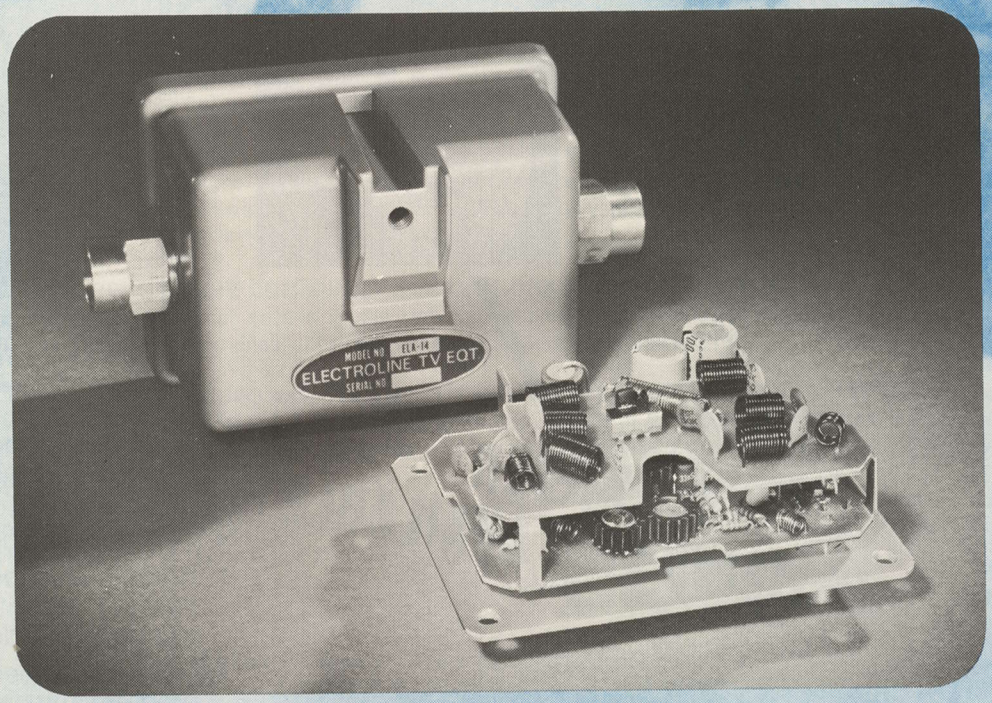
Odds are 30 to 1 in your favor



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CATJ

JULY 1977

VOLUME 4 — NUMBER 7

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

OFFICES

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—FEATURES—

—DEPARTMENTS—

OUR COVER

CCOS-77. . .an overflow crowd from 40 + states, Canada and Mexico converge on Oklahoma's Fountainhead Lodge July 17-20 to soak up the "leading edge" of new CATV technology as the CATA Cable Operator's Seminar moves into its second big year. **See you there!**

CATA-torial

KYLE D. MOORE, President of CATA, Inc.

1,000 Inspections Per Day

A very large share of the rules and regulations adopted by the FCC in 1972, for CATV, had their origins in the broadcast regulations which the Commission has codified through several decades of use and re-use. The adoption of technical standards for broadcasting was not a trivial matter when the **1927 Radio Act** was first put into play. Old timers may recall from personal experience the chaos that existed in the (AM) "broadcast band" in the early and mid-20's. Radio "licenses" were simple to come by; the requirements were minimal and if you had the money to put a transmitter on the air, you were in business. In that era everything was new; the broadcasting "art", the broadcasters and the listeners. Nobody had any prior experience and everyday was a new experience. The **story** is told of **Amy "Simple" McPherson,** the stylish evangelical religious prophet and her radio station of the 20's. Amy recognized early that radio was a powerful tool through which she could reach tens of thousands of potential "supporters" to her "cause" nightly. Her radio station, in southern California, was one of the biggest and most powerful built to that time. She decided to set up "camp"-on 1,000 kHz, a "popular" frequency in those days because it happened to fall in the middle of the "dial"; and it was easy to remember. It was also the "300 meter" spot on the dial, and that was desirable because 300 meters was "easy to remember" for the listeners. In those days both "kilocycles" and "meters" were used interchangeably; it was a number of years thereafter that "kilocycles/megacycles" won the tug of war for terminology in North America.

Only when Amy "Simple" McPherson decided to **move to** 1,000 she had no particular regard for others who were there ahead of her. She just directed her transmitter engineer to "move to 1,000" and in her mind "that was God's will". Only the people who had figured out the 1,000/300 ploy ahead of her, including one just up the street from her transmitter, didn't quite see it that way.

And so the battle of the kilocycles/meters began. People (meaning early broadcasters) figured if Amy "Simple" McPherson could get away with **poaching** on **any** frequency she wanted (with God's backing of course), they also could do the same. Stations that operated on 950 one night would move to 1160 the next night because they found a "hole" there in local reception conditions. That meant somebody else in the same community or up the highway a piece could then move down on 950 the third night. And so it went.

If you get the picture of chaos. . .you've got it right.

The 1927 Radio Act was an emergency measure in Congress. It attempted to create federal power for one central agency which would have the considerable task of establishing licensing criteria, and licensing standards for broadcasters. There can be little doubt that without such singular authority the public was not going to be properly nor adequately served by the rapid growth of broadcasting.

It seems unlikely, from the safety of an armchair 50 years removed from the actual event, that had Amy "Simple" McPherson **not** been so brazen with her 1000/300 poaching that the regulations governing broadcasting might well have grown up in a different mold. Until frequency/meter poaching became a serious problem, there was not nearly the concern of Washington that something needed to be done, **in a hurry.**

The simple adoption of rules and regulations, even if on an emergency basis, did not totally solve the Amy "Simple" McPherson "problem". Even with a formal licensing structure, the lady evangelist felt she had as much (she would say more) "right" to her self-chosen frequency than anyone else. She refused to give it up, and there followed a series of legal and over-the-air battles. The government used the new law to chase Amy and others like her off the airwaves; while Amy used the airwaves to "preach" her case to the tens of thousands of listeners. The government won of course, but not until it had known it was in a real "fire" fight.

From the regulation of operating frequencies and **power** (another area of early abuse; if you couldn't be heard above the din of heterodynes, the answer was obvious enough. . .**build a more powerful transmitter!)** virtually everything else the FCC regulates has sprung. The regulations have grown with the times (EEO, equal time, etc.) but seldom have they changed. There are subtle re-wordings of key and not so key phrases from time to time, but in the 50 plus years of regulated useage of the airwaves the basis regulatory principles adopted in 1927 have not changed.

So when CATV regulations were written in 1971-72, it was with no particular surprise that the "Amy Simple McPherson" foundation of 1927 was once again repeated. That founding principle was simply this:

"Bad apples must be identified, isolated, and eliminated".

You **identify** a bad apple by either experiencing it yourself or establishing a network of "spies" to report to you when one comes along. The FCC has such a network at work in cable right now; the public, when it becomes unhappy with the cable product delivered, is encouraged to communicate (i.e. report) the "bad apple" to Washington.

You **isolate** a bad apple by singling it out. If the Commission brings "charges" against a cable system operator, alleging mis-use of the public confidence by way of the deliverance of poor quality signals or service, the cable operator is brought out of the safety of his peer-crowd into a courtroom where he must answer to the charges.

And if the charges made hold up in a competent court of law, the **elimination** is quick and sure. The operator pays, one way or the other, for his poor operation. All of this **pre-supposes** that:

". . .the government, through the espertise of its dedicated specialized agency personnel is the best equipped to handle the nature, and volume of complaints created by the business activity being subjected to regulatory overview. . ."

By the very inter-state nature of radio broadcasting, the federal regulation approach undoubtedly makes the most sense for people using the "public" ether. Cable stands a considerable distance away from

broadcasting in this regard. Our interstate activities are no more nor less involved than say the local garbage collection company. Without our interstate transported signals, we'd be out of business. Without the interstate transported gasoline, oil, vehicles and vehicle parts, the garbage collection company would **also** be out of business.

There is no Federal Garbage Bureau to which unsatisfied customers take their complaints of poor pick-up service. Rather, it is handled on the **local** level, where the **local** conditions can be fairly and honestly determined by other **local** citizens. The same sound principle of local regulation for local businesses dealing with the public prevailed in the CATV industry until the 1972 FCC coup. It worked very well, and **in-spite of** the FCC's **unproven statements** to the contrary, the number of "bad apple reports" filtering out of the local level to the FCC never amounted to more than a mere trickle.

The FCC, since 1972, has stated time and time again that it was faced (with cable) with a wild prairie fire; that cable operators, apparently like Amy "Simple" McPherson, were running amuck in the streets and alleyways of the nation scattering microvolts to the masses in a most hap-hazard style. **These statements have never been proven,** and each time a request has been filed with the Commission requesting the opportunity to conduct a full and unrestricted audit of their "cable subscriber complaints file" we have been rebuffed. One time the file room was locked; on another occasion the files were being moved; on yet another occasion the files were being transfered to computers, and so on. Former employees who have **actually seen** these files tell us they **primarily deal** with letters to the Commission complaining not about cable service per se, but rather with subscriber's who are unhappy because parts of programs get clipped or stations come and go on the dial. . .all because of FCC mandated "Non-Duplication Protection" rules. In other words, the majority, we are told, of the FCC's cable complaints are complaints concerning **not our service,** but the **lack of our service** in those situations where we are forced to turn channels on and off **to comply with FCC rules!**

It is no wonder, if these are truthful statements, we have never been accorded the opportunity to inspect, read, and document (with categorical totals) the complaints. We have been charged with a "blind bill of goods" and the evidence against us has been withheld from our inspection.

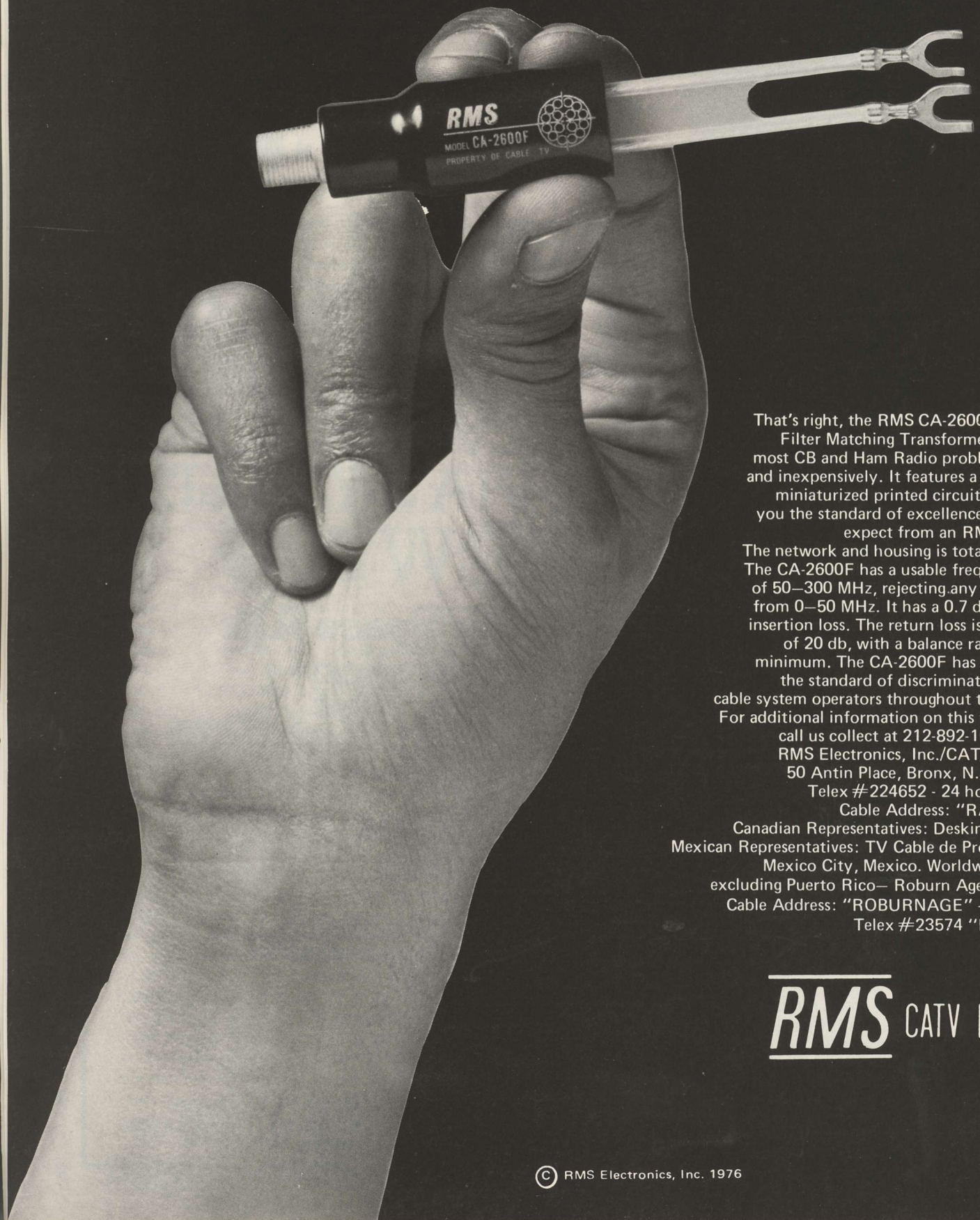
If I have 1,000 subscribers on my system, I have no fewer than 1,000 "inspections" each and every day. Each time a subscriber turns on his television set **he "inspects"** the quality of my product. If I am not doing the best job possible, **he tells me about it.** And if after complaining to me, I don't clean up his picture and my act, he then proceeds to tell my city about it. After more than twenty years in the cable business I am the first to tell you that **even one** honest complaint brought up at a city council meeting is one too many. No operator needs, wants or can afford that kind of grief.

All of which says that as long as we aren't poaching on somebody else's airwaves, and as long as our customers are as numerous as they are and as critical as only cable subscribers can be, we have about as much need for federal standards of service and practice (with the hand in hand bureaucracy that must oversee such standards of service) as our local garbage collection firm.

The public is **not** better served by having a federal agency sitting in Washington telling us we must keep our pictures sharp and clear. Quite the contrary, if the presence of such a federal agency in our business adds even one penny of cost to our customers per year, **that is an extravagence.** We are not Amy "Simple" McPhersons and we are not runing amuck in the public streets and alleyways. We are responsible, locally authorized and locally answerable business people whom left alone will do the best job we know how.

Every system operator should re-think the rationale for our regulation. There is a new, growing tendency in Washington to "listen" to the voices from the hinterlands. Let's all give Washington something sensible to listen to.

The proven way to eliminate CB and ham radio interference



That's right, the RMS CA-2600F High Pass Filter Matching Transformer eliminates most CB and Ham Radio problems quickly and inexpensively. It features a high quality miniaturized printed circuit that assures you the standard of excellence you always expect from an RMS product.
The network and housing is totally shielded. The CA-2600F has a usable frequency range of 50–300 MHz, rejecting any interference from 0–50 MHz. It has a 0.7 db maximum insertion loss. The return loss is a minimum of 20 db, with a balance ratio of 25 db minimum. The CA-2600F has also become the standard of discriminating two-way cable system operators throughout the industry.
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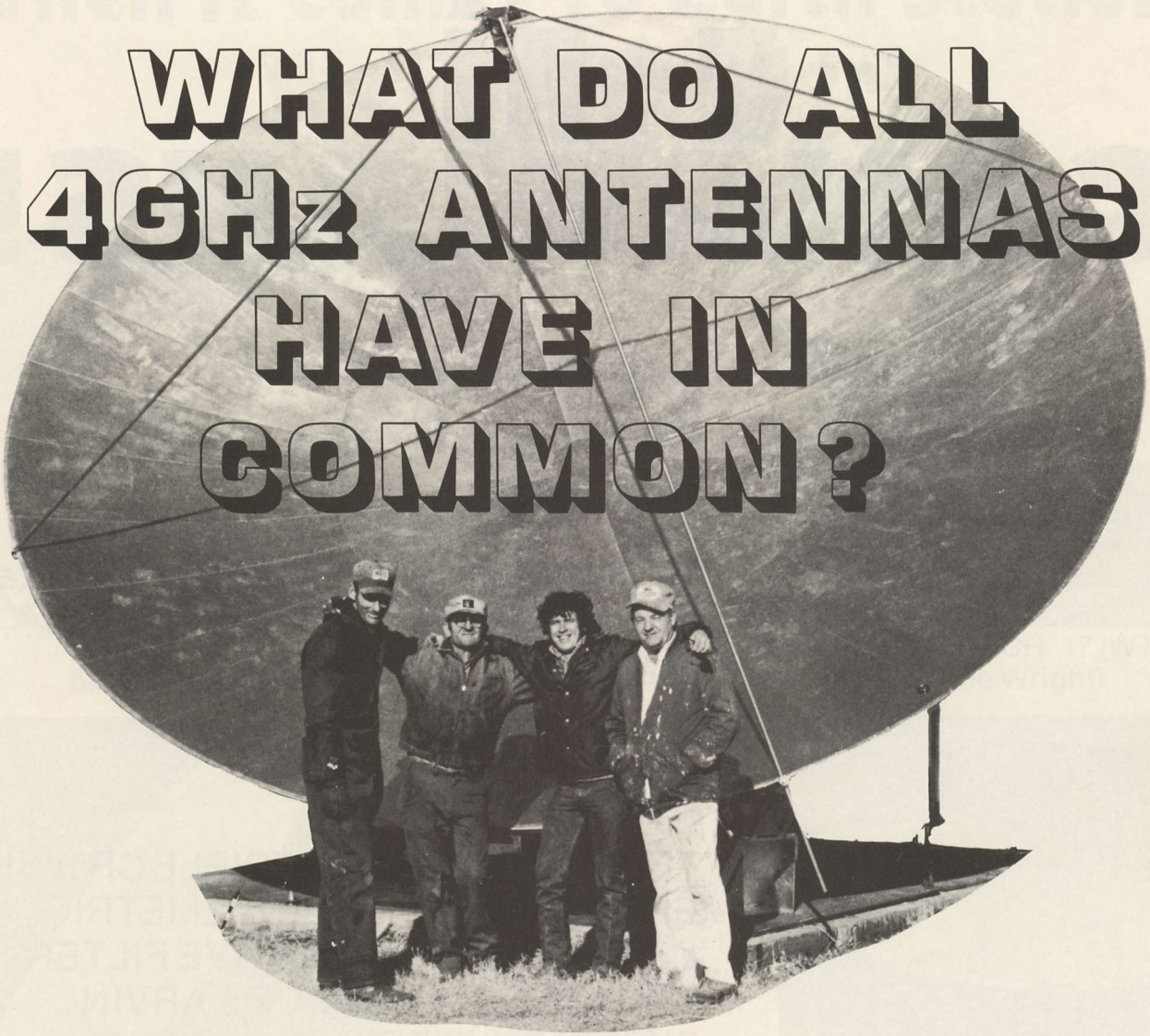
Mexican Representatives: TV Cable de Provincia S.A., Mexico City, Mexico. Worldwide exports, excluding Puerto Rico– Roburn Agencies, Inc.– Cable Address: "ROBURNAGE" – New York. Telex #23574 "ROBR-UR".

RMS CATV DIVISION

WHAT DO ALL 4GHz ANTENNAS HAVE IN COMMON?



Same 3.7 to 4.2 GHz freqency range? . . . . . yes

FCC dictated effective sidelobe reduction requirements? . . . . . yes

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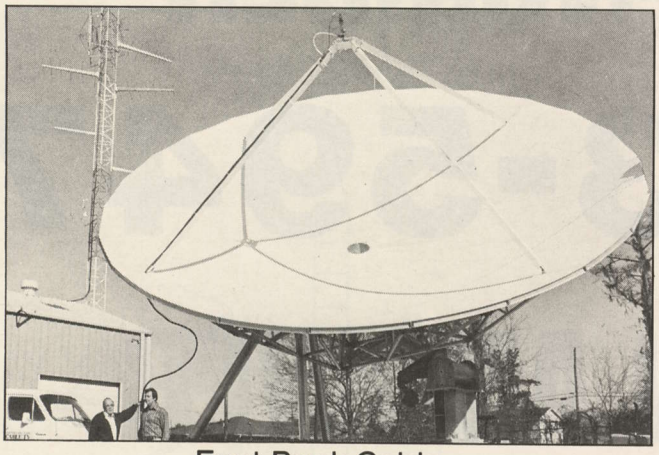

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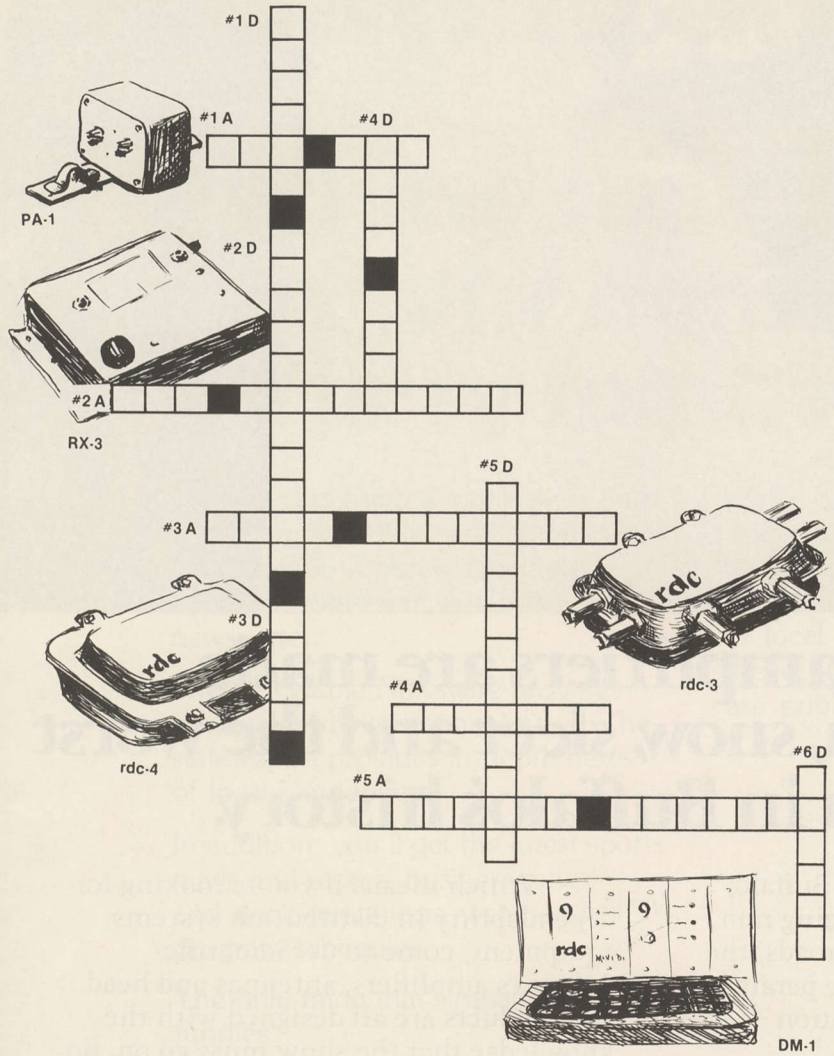
THE rdc CROSSWORD PUZZLE

Here it is crossword puzzle fans in CATV land; a test of your mental skills and familiarity with CATV lingo.



DOWN

#1 down—Surname of a popular writer and well known engineer in the CATV world (hint - it starts with an 'R').

#2 down — The act, process or result of developing (hint - middle word of a three part CATV corporate name).

#3 down—Four letter abbreviation for corporation.

#4 down—Registered trade name for the world's only $380 solid state heterodyne CATV signal processor (hint - two words, first starts with an 'M').

#5 down—Descriptive term for location of a line amplifier that is placed along trunk line between two ideally located trunk/bridger units.

#6 down—A point, person, area or thing that is most important or pivotal in relation to an indicated activity, interest or condition.

ACROSS

#1 across—A two word set that describes the first electronic unit the typical CATV signal sees after the antenna (hint - The **rdc** product unit here has 28 dB of gain, a noise figure of under 2 dB and costs $125. with power supply!)

#2 across—A two word set that describes a unit designed to transfer an ultra high frequency signal to a VHF channel (hint - the **rdc** product unit here has 5-10 dB of gain, +/- 15 kHz conversion stability and costs only $100. with power supply!)

#3 across—The single most widely used CATV amplifier family, a two word set (hint - the **rdc** product has 25 dB of gain, cast aluminum weather-tite housing and the 10-up price is just $75!)

#4 across—The amplifier family utilized to take trunk line signal out of the trunk and into the feeder lines (hint - the **rdc-3** unit is designed to operate from 5 to 20 dB from the trunk amp, has four feeder outputs, and sells for $150. in 5-up quantities!)

#5 across—A two word set which with #6 down is the registered trade mark name for the CATV industry's lowest cost ($750) state of the art local message origination service.

If you are having "cross" words with your present supplier of small system CATV equipment, perhaps you need to write for the **rdc** catalog. We have the most complete line of custom-designed-for-small-systems CATV equipment in the world; priced to make really small systems economically feasible while still delivering BIG-system performance!

rdc

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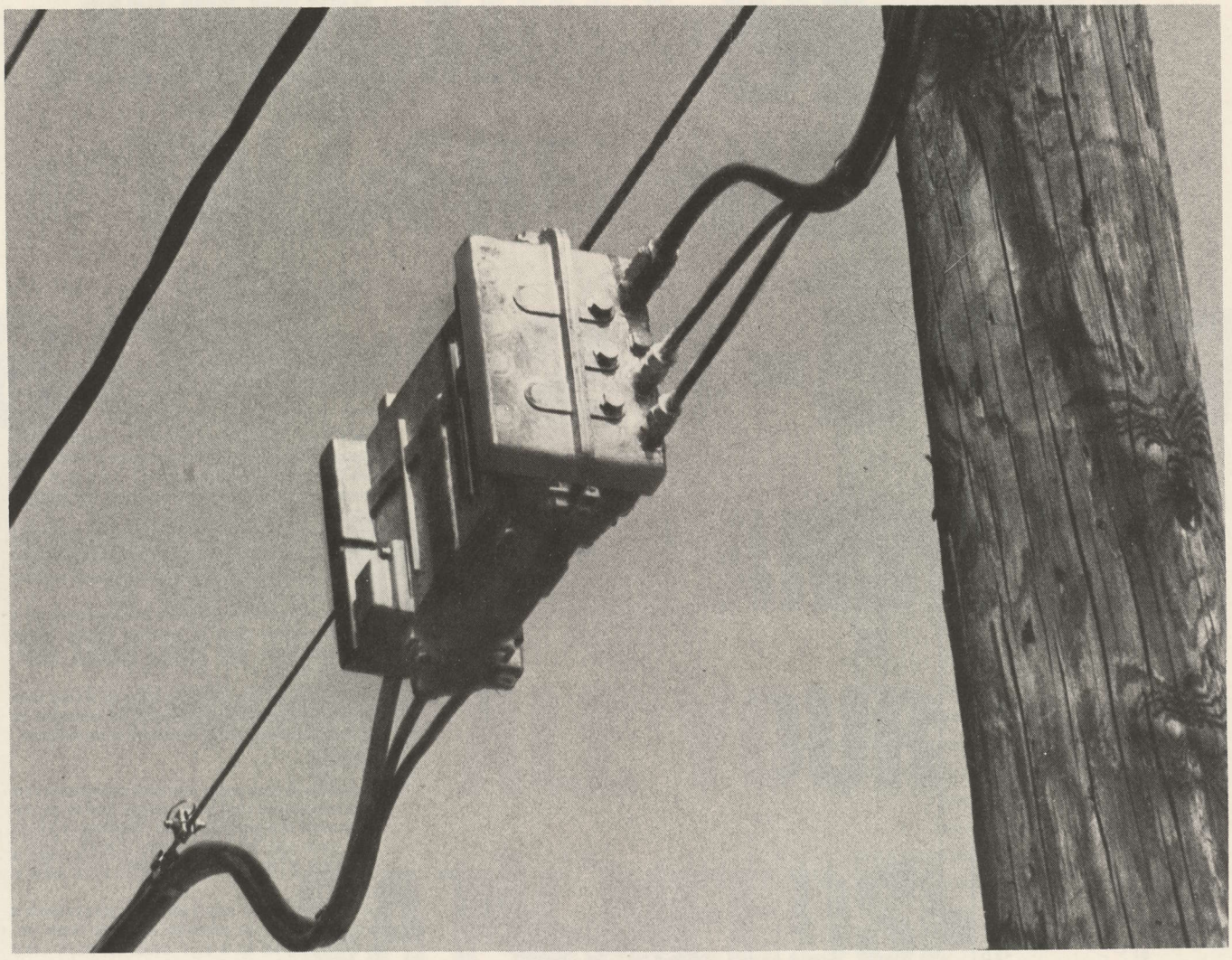

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For complete information about Scientific-Atlanta distribution systems, please call Jay Levergood, (404) 449-2000. Or write us.

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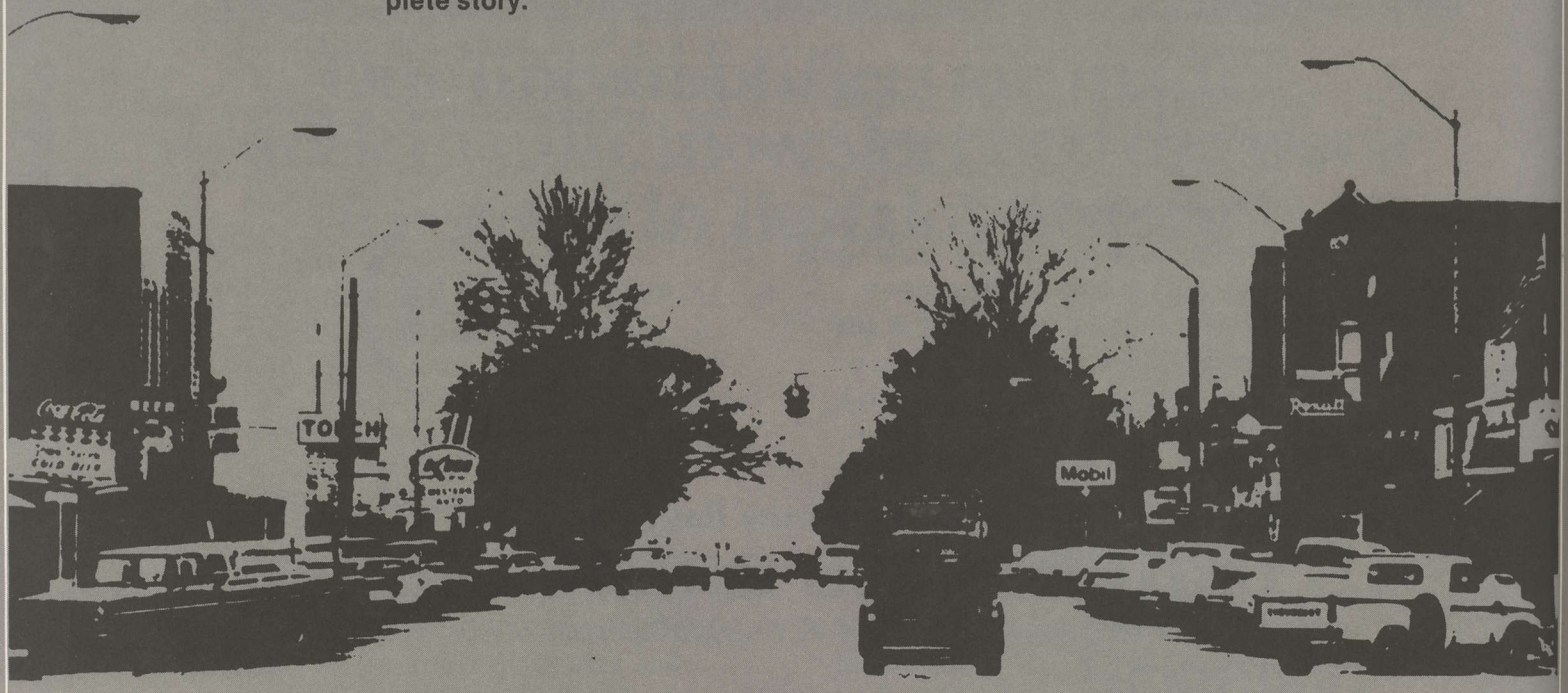
TOCOM 240 series solid state amplifiers and the companion TOCOM solid state headends are in use in hundreds of small, American towns. This is the equipment line that makes small town CATV economical, and profitable. 240 series amplifiers are highly reliable, very serviceable single ended "profit centers" for rural American CATV. They are designed to work under extremes of stress and temperature and they are competitively priced to insure the return of your rural American system in the shortest possible period of time. From our central location in Dallas, Texas you have the assurance of fast service when you require it. So if you are planning a rebuild, a line extension or a new rural American CATV system. . .you need to talk to the small town specialists. TOCOM. We have everything you will need for your small system, including twenty-five years of practical design and construction know how. We can even assist you with your financing. Call Tom Campbell today for the complete story.



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Молния/ Радуга/ Экран

Are Russian Television Relay Satellites Planning An 'Invasion' by 1980?

Filtered Information. . .

With the rapid development of communication satellites in the western world one might reasonably expect that there has been some form of parallel growth in the eastern block nations. The Soviet Union, for example, encompasses an exceedingly large land area (more than 8.6 million square miles) and stretches across 11 of the world's 24 time zones. Not unexpectedly the population spread throughout the USSR is uneven, varying from the extreme density of the western area (the Ukraine, Moldavia, Cacuasia and Central Asia) to the almost total lack of population in Central Siberia.

Very little non-classified information concerning the Soviet satellite communications technology era is available to the "general" press; but with some persistence it is possible to piece together sufficient data to create a picture of the general **trends** in Soviet satellite work to date.

Development of Soviet television has been not unlike similar development in the western world. Typifying the early efforts, the Soviets designed and constructed a tower reported to be 1,914 feet above ground (dubbed the TV Ostankino Tower) to serve the Moscow area in 1967. This tower replaced earlier installations of lower height, and it was designed to provide primary service to an area which the Soviets characterize as 74 miles in radius. Out of the Moscow program center four separate TV programs channels originate, and with varying degrees of "penetration" these channels are carried throughout some or many portions of the huge nation. At the end of 1976 it was reported that:

(a) **80%** of the Soviet population was within range of a transmitter carrying **program one;**
(b) **55%** of the population is within range of **program two;**
(c) **less than 20%** of the population is within range of **programs three and four.**

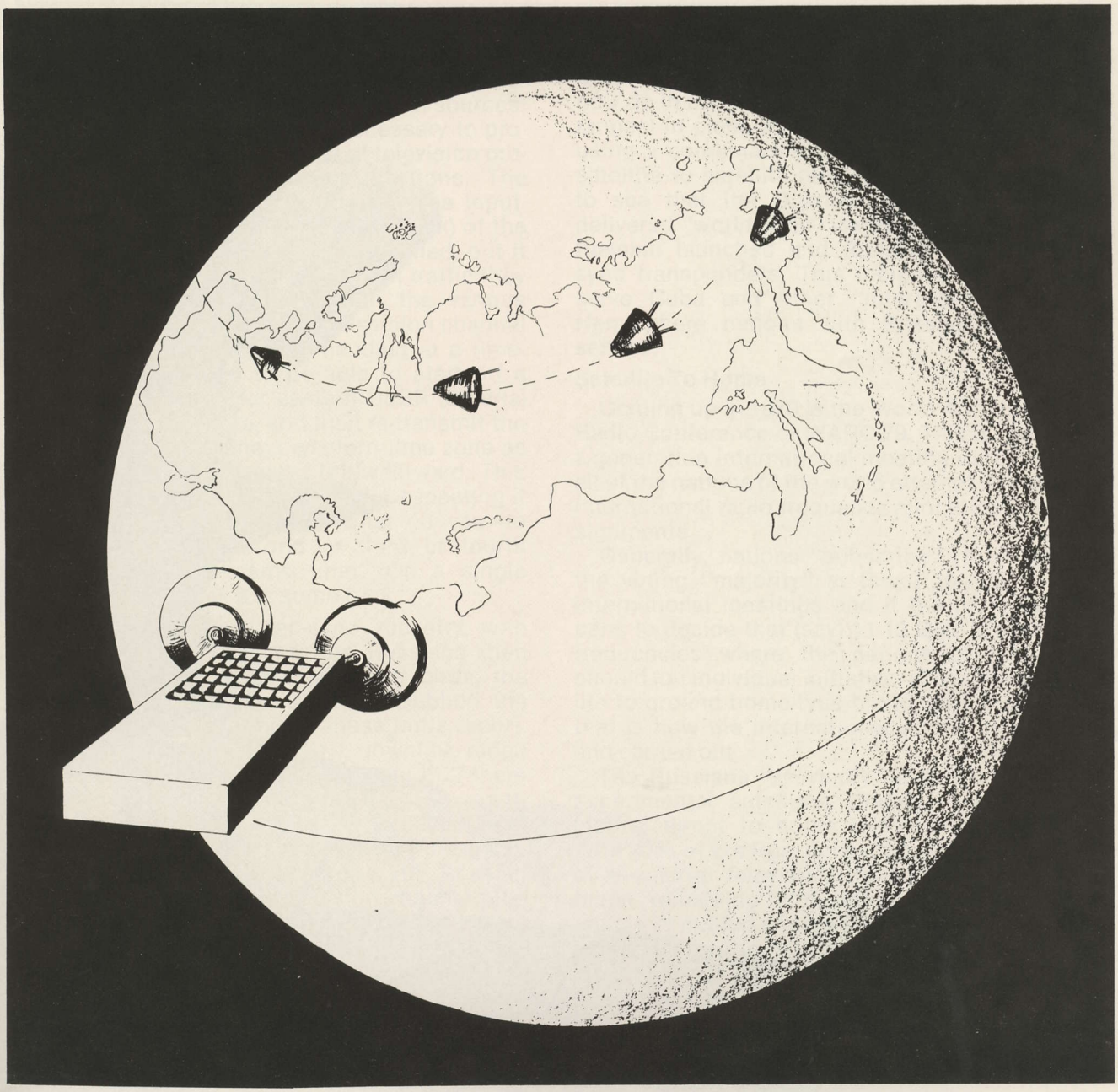
In a land area more than four times the land area of the United States (but with a only slightly larger population base) establishing a nationwide grid of interconnected television broadcasting stations (even if only essentially relays or satellites of the Moscow programming) is no simple undertaking. The Russians went into the 50's almost totally devoid of a national communications grid, and while it has improved measureably in the interim, there are still only a handful of microwave routes in operation covering only a portion of the country.

The initial curiosity of Sputnik soon developed into the framework for an attempt to leap into a national communications grid via satellite. The Russians have never lacked for the ability to launch large, heavy satellite packages, frequently. So in April of 1965 the Russians announced the successful launching of **Molniya** (that means "lightning" in Russian); a satellite transponder that **circles the earth** at approximately 65 degrees above the equator. The orbit was elliptical, and the satellite was a "slow mover" taking a full 12 hours to circle the earth. Consequently, it remains "in view" for extended periods of time for any earth bound station that is within line of sight along the mid-country 65 degree north parallel. The orbit takes the device

over a rather strange succession of heights above the earth, from 339 miles up at its lowest point to more than 25,000 miles at its highest orbit point. Molniya (I) reported it has 40 watts of transponder output power (this may have included the **antenna gain,** although that seems unlikely). It receives uplink signals in the 3.4 GHz region and was initially designed to re-broadcast in the 800-1000 MHz region **as well as** the 4.1 GHz region.

Because of the moving-orbit (i.e. it is not geo-sync or stationary above the equator as modern communication satellites are) the Soviets eventually launched **a series of** Molniya (I) devices. At the orbit height and speed it takes 9 hours to pass over the full width of the USSR; individual ground stations have to be equipped to "track" the moving or orbiting bird in their passes. By the time the Molniya was largely terminated, 35 such satellites had been launched into the same general orbit. There was limited channel capacity on board the units however and only **one** television channel was operational at a time (along with some undetermined number of telephone and other narrow band message channels). The 3.4/4.1 GHz range was devoted to message channel (narrow band) service plus some inter-linking of remotely situated television relay transmitters. The 800-1000 MHz region apparently saw **some** amount of experimental operation for **direct** broadcasting **to home-type receivers.** A couple of photographs purported to show Siberian and other locale home receiving terminals indicate from close inspection the use of helical or cross-polarized yagi multi-stack yagi antenna systems.

To complement the Molniya (I) satellite series the Russians constructed (they say) 70 ORBITA receiving terminals throughout the USSR. The ORBITA stations employ 12 meter dish antennas



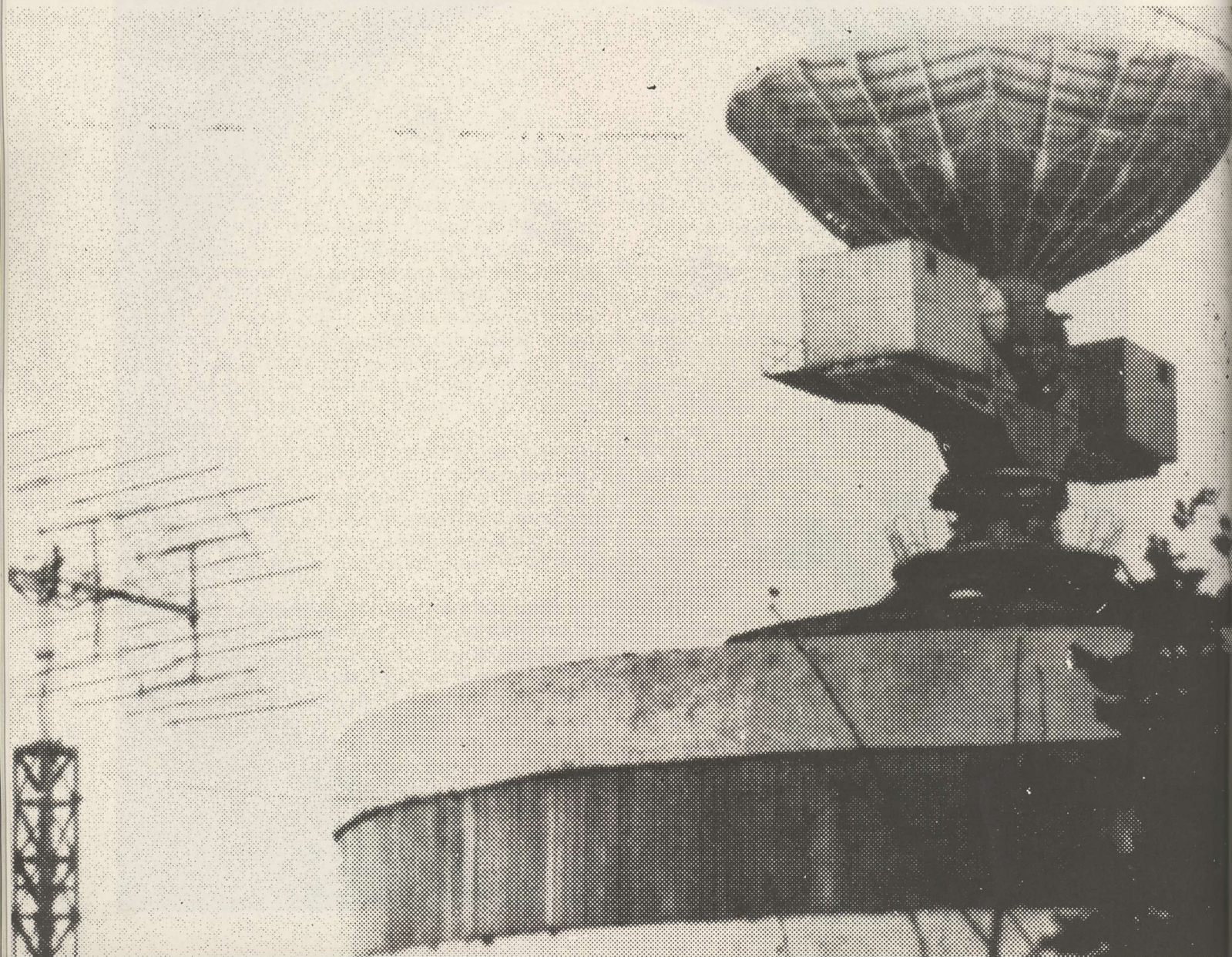
and the antennas track the satellite(s) in the azimuth and elevation mode. The large antenna size was probably due to the generally high noise figure front ends on the receivers (at 4.1 GHz) and the relatively large diameter dish antenna size required for an effective-gain array at the lower 800-1000 MHz region. Eventually, after 35 satellites were launched in the series (apparently not all of them lasted through the end of the program and the unusually large number of satellites launched indicates that replacements were launched for failures) a later generation of satellites was pressed into service.

Molniya (II) began with an initial launch in November of 1971; subsequently followed by **16 addition** similar satellites. This series of birds utilized 6 GHz as the uplink and 2 GHz as the downlink. They were equipped with directional antennas and some amount of satellite to satellite linking was possible (sort of a microwave-relay system above earth). The Russians **claimed** they could interconnect Molniya II series birds to inter-connect Cuba (a specific example cited) with Moscow. Earth receiving terminals were installed at Habana, Prague and Oulan Bator specifically for the Molniya II series birds. The Russians called the link up system **INTERSPOUTNIK.** The birds however continued in the Molniya I format of circling the earth at roughly 65 degrees north latitude in a slow moving (12 hour circling) orbit.

By July of 1974 the Soviets were into geo-synchronous orbiting birds and using the same electronics package of Molniya II (the 6 GHz up, 2 GHz down link transponder packages) a series of **six** Molniya **III** birds were launched. The geo-sync orbit point (the Russians like to explain that the geo-sync birds really have 24 hour orbit periods which they indeed do, rotating about the earth at the same speed as the earth itself rotates on its axis) is located over the Indian Ocean.

This series of six birds allowed the Russians to get the "bugs" out of the rocketry that was

REPORTED TO BE an Orbita station; the Soviets claim over 70 were installed, largely for the Molniya series projects. Note az-el mount dish (right), apparently 12 meters in size and helix array in .8 to 1 GHz range on az-el tracking tower lower left.



SOVIET SATELLITES FOR 'CIVILIAN' TELECOMMUNICATIONS

Group Name	Characteristics	Quantity	Frequencies	Today's Useage
Molniya I	slow moving, 12 hour orbit, 65 degrees north of equator, 40 watts	35	.8 to 1 GHz 3.4 and 4.1 GHz	obsolete limited use
Molniya II	same, 8-10 watts	16	6 GHz and 2 GHz	still in use, especially for Artic areas
Molniya III	Geo-sync orbit, over Indian Ocean; 8-10 watts	6	6 GHz and 2 GHz	television and telephone relay
Radouga I	Geo-sync orbit, over Indian Ocean; 8-10 watts	2	3.4-3.8 GHz downlink; 6 GHz uplink	expansion of television and telephone system
Radouga II	Geo-sync orbit, over Indian Ocean, 8-10 watts	0	4 GHz down link, 6 GHz up link	seven planned by 1980, world-wide inter-connection network
Ekran	Geo-sync orbit, over Indian Ocean; 300 watt transmitter power reported	1	11-12 GHz	experimental satellite to home
		1	23 GHz	same

needed to establish a geo-sync orbit but the electronics package proved to be less than satisfactory. Primarily, according to Russian sources, it lacked the channel capacity necessary to provide **more than a single channel** of television programming to remote Russian locations. The actual operating bandwidth of either the input-link (up link) or the output-link (down link) of the Russian transponders is not declassified, but it appears from studying the amoung of traffic they claim to be able to handle with the various vintages of birds that a single television channel was about all that could be handled at a time. The Russians **wanted** to be able to start off a televison program in far eastern USSR (Siberia) when evening fell there, and then re-transmit the same program to the next western time zone as the sun advanced and night fell westward. This worked fine for a single program (i.e. repeating it for different time zones) but what do you do when you need a second or third or fourth program all at the same time? On a single transponder channel, it is some trick.

Having proven the geo-sync rocketry with Molniya series electronics, the Russians then moved onto a whole new series of birds; the **Radouga** geo-synchronous family. Dubbed the "Statsionar I" and "II" birds, these units reportedly operate in the 3.4-3.8 GHz downlink range and in the 6 GHz uplink range. By early 1977 there were two such birds operating from an orbit-stationary point above the Indian Ocean, with 8-10 watts (they say) of transmitter output power. The channel capacity, according to Russian sources, is **still** a single television channel plus ten dedicated widths of 1,000 telephone (voice) channels.

The next phase in the Radouga series is the planned or scheduled launching of seven additional satellites over the period 1977 through 1980. The Russians are scheduled to have the Olympic games in Moscow in 1980, and they also plan to have a network of Radouga series satellites (operating as most western world satellites now do in the 4 GHz down link and 6 GHz up link ranges) in place and operating by that time. By using a combination of ground to satellite and satellite to satellite relays, the Russians intend to see that the Olympic games in 1980 are delivered "world wide" via **Russian** constructed, **Russian** launched and **Russian** operated geo-sync transponders. This includes the plans to serve Cuba and other "interested" Northern Hemisphere nations with **Russian down link service.**

Satellite To Home

Coming up in 1979 is the World Administrative Radio Conference or WARC-79. This is the once-a-generation international meeting during which all of the nations of the world attempt to work out international radio frequency allocations and assignments.

Generally, nations "subscribe" to the will of the voting "majority" at these 20-year spaced international meetings and if the majority happens to decide that (say) 11-12 GHz is a band of frequencies where the nations of the world should (on individual initiative) allow direct satellite to ground home-type broadcasting systems, that is how the international accord is reached and carried out.

The Russians reportedly have two operating experimental satellites already in service exploring direct to home television technology. With 20% of the Russian people still out of range of terrestrial television transmitters, and with those remaining 20% largely spread over a couple of million square miles of desolate Asian wasteland, the future of direct-to-home technology is of far greater importance to the Russians than say it might be here in the North American region. One of the operating systems is **reported** to be in the 11-12 GHz region; a bird that **reportedly** has 300 watts output power on a

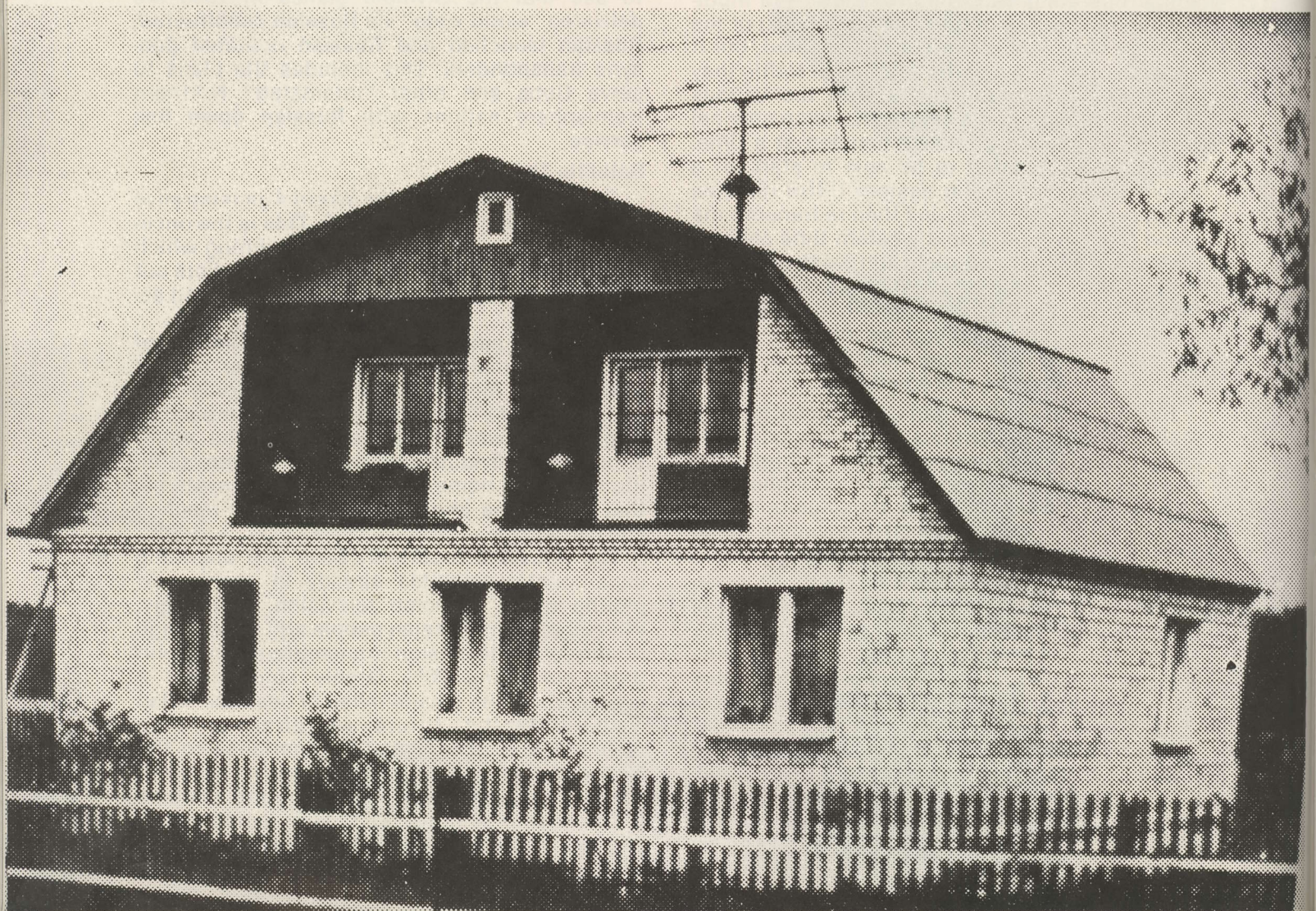
single television channel **(the power level seems** far beyond **the capacity of the Russians at this frequency in as much as the best free world technology seems to be in the 200 watt range; this may well be an ERP value, although it would seem low if that is the case).** This 11-12 GHz range package, if in truth operating, is never detailed in Russian literature. It is a geo-sync orbit bird however.

This has been dubbed the EKRAN or "Statsionar T" project, and it **reportedly** also has a companion project operating (again we are told) at or in the 23 GHz region. The Russians do place, it appears, high priority on the international family reaching accord for a set of frequencies for satellite-to-home transmissions. At a preliminary meeting in 1977, a WARC working group of Russians made it very plain they intended to push for international assignments in both the 11-12 GHz **and** 23 GHz region for this purpose.

Synopsis

Over the years the Russians have launched a very large number of "birds". In sheer quanity, they out number western launches by a wide margin. And as a rule, the Russian birds tend to be larger (i.e. heavier payloads). It is wise to keep in mind that all early rocketry work was designed around the "needs" of international powers to "deliver" nuclear warheads over great distances. The United States was the first to develop a relatively speaking small, or lightweight hydrogen bomb and consequently the rocket power required for American launches was by a scale of magnitude much lower than the same time frame Russian rocketry requirements. With smaller rockets available, because of hydrogen bomb load requirements, American and western world technology has concentrated on **reducing** the attendant peacetime payload size and weight requirements. American electronic packages are by nature small and lightweight; and very versatile. Russian electronics has always tended to be big, bulky, and heavy. This never bothered the Russians too much for they had the rocket power to spare anyhow. But when the American (and western world) electronics became highly sophisticated **as well** as small **and** lightweight, this left the Russians launching big, heavy traveling wave tube **single channel** TV transponder satel-

REPORTED TO BE a Siberian house with a non-tracking antenna system. Frequency range of antenna system is obviously in UHF region yet no Soviet geo-sync birds are reported or acknowledged to be operating in this region. Whole photo is of questionable validity.



lites while the U.S. was launching solid state **24 channel** transponders in packages a third the weight and a quarter the size.

One example should point out the problems encountered. With 11 time zones and 4 separate Moscow originated TV programs, **theoretically** the Russians need the capacity for 4 x 11 or 44 TV transponder channels to concurrently feed **all** four Moscow program channels to **all** 11 of the time zones (properly delayed for each time zone). At the present time, with one and no more than two TV channels per bird, this means either 22 or 44 **separate birds** in geo-sync orbit. Even given the larger quantity of birds the Soviets have launched, this is a formidable task. It also makes for 22 or 44 possible bird failures and a very crowded geo-sync orbit!

The Russians seem intent on achieving some type of "international victory" in 1979 at WARC-79, and again in 1980 during the Moscow Olympic games. If it turns out that part of this "game plan" ultimately includes a geo-sync bird to deliver Moscow created programming **to a Cuban based earth receiving terminal,** in the 4 GHz down link band, it could provide for some mighty interesting years ahead for those CATV systems equipped for reception in that frequency range!

'DUPLEXING' ON MICROWAVE. . .

When HBO Is Off The Air— Descramble And Run Something Else Down The Circuit!

by
William H. Ellis
Telesis Corporation
Evansville, Indiana
47714

Cable operators are always striving to obtain full value for their capital dollars. One way to achieve that goal, for microwave expenditures, is to **completely utilize** the channels once they are installed. Total utilization of microwave channels takes imagination and, in some cases, special equipment.

A case in point is a microwave system which was installed by Telesis Corporation from a terminal point in Lafayette, Indiana to cable systems in Lebanon, Carmel, Elwood, Alexandria, Martinsville, Franklin and Bloomington, Indiana (**See diagram 1**). A 10 meter earth station was installed at Lafayette for the initial purpose of receiving Home Box Office (HBO) pay cable programming and relaying it to the network cable systems. Because HBO supplied programming only from approximately 5:30 P.M. until 1:00 A.M., the microwave channel was available for alternate programming for about 17 hours per day. However, since pay programming was involved, certain roadblocks existed which made it difficult to fully utilize the available channel. These roadblocks included the security problems associated with pay cable. For example, could additional non-pay programming be made available to non-pay subscribers? The answer was yes, but with the **addition of** certain pieces

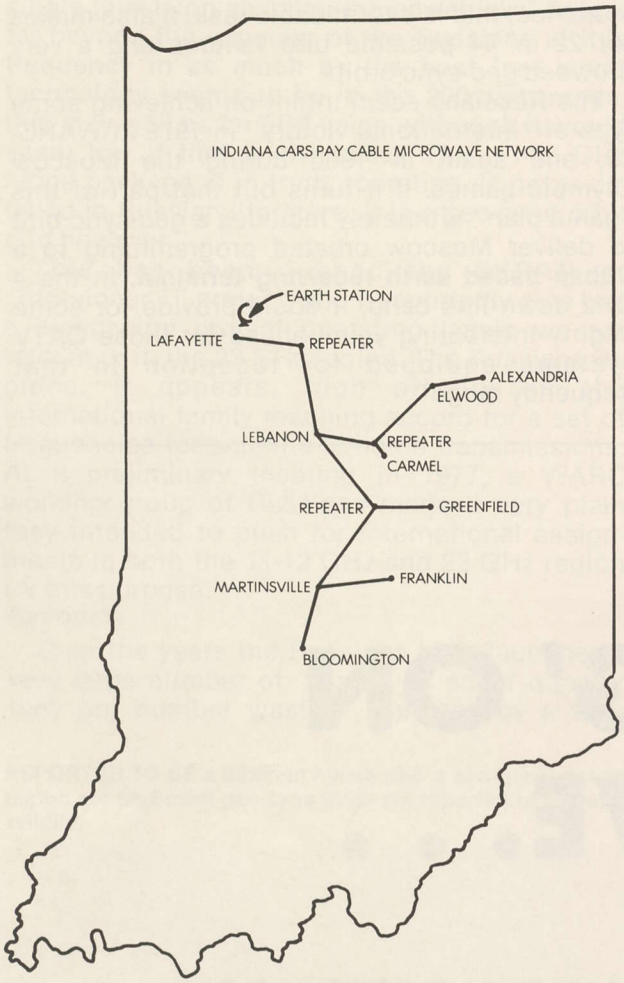
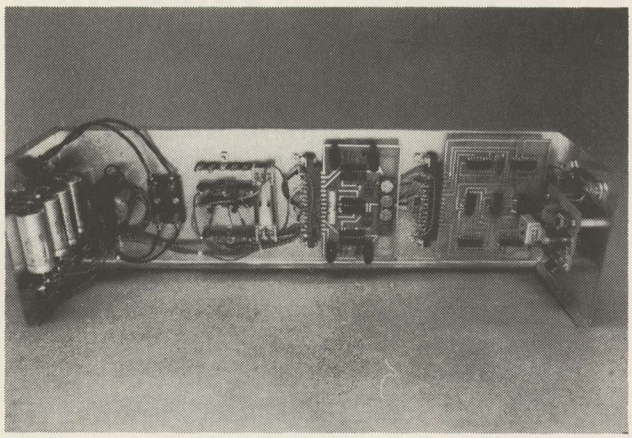


DIAGRAM 1



6 MHz RECEIVER/decoder for security and switching system described in text.

of equipment to effect **descrambling** of the signal at the user system headends.

Scramblers were chosen, rather than traps, for pay cable security because they permitted use of the channel for **other** purposes **when** security was **not** needed. With the possibility of removing scrambling **at will,** pay cable promotional material could be carried unscrambled with the intent of enticing additional pay cable subscribers.

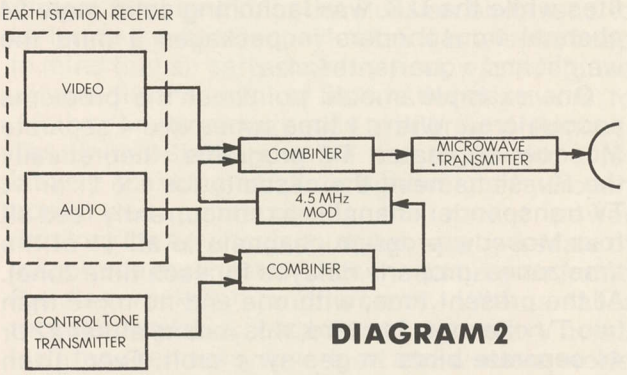


DIAGRAM 2

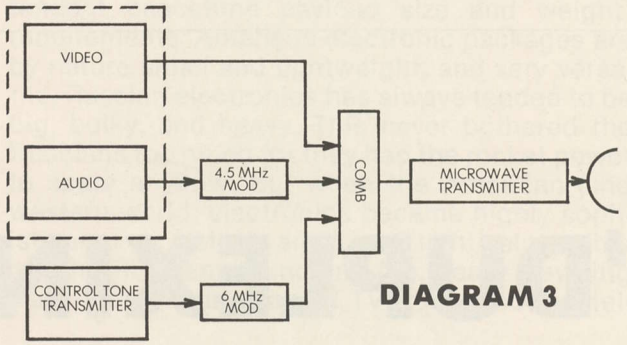


DIAGRAM 3

Besides pay promotions, approximately three hours each day was allocated for college level educational programs. With the addition of the Christian Broadcasting Network (CBN) and WTCG Atlanta on the satellite, it will be possible to program the channel unscrambled from early morning until HBO sign on with CBN with appropriate breaks for educational and promotional programming. When HBO signs on, the microwave signal will then be scrambled at each cable headend. At HBO sign off until the following morning, WTCG can be carried unscrambled. The result is **full utilization** of the microwave channel and a significant additional variety of programming to all segments of the subscriber base.

Accomplishing the required switching required a coded tone **transmitter** at the earth station location and tone controlled **switchers** at **each** cable system headend. The remainder of this article describes the equipment that was developed to accomplish the switching.

Initially the problem "sounded" reasonably straightforward and it was decided that touch-tone switching over the existing microwave audio channel should be a reasonable solution (**See diagram 2**). However, after the equipment was designed and tested, it was determined that random switching occured at the receive location even though certain reset safeguards were built into the tone receivers. Apparently program audio **randomly** generated tones **similar to** the two-tone touch-tone system. Thus the simple initial approach was abandoned for a more complicated sub-carrier approach. **Diagram 3** shows a block diagram of the sub-carrier scheme. A 6 MHz oscillator with automatic

frequency control (AFC) was designed for use as the sub-carrier generator. The oscillator was frequency modulated with the amplified touch-tone signals from a standard telephone touch-tone pad. The sub-carrier signal was then combined with the program composite video and aural signal and fed into the microwave transmitter. No special sub-carrier filtering was needed to separate the control sub-carrier from the program composite signal, i.e., no interference was observed in the video picture at the receivers due to the 6 MHz sub-carrier.

The tone receiver uses a 6 MHz FM receiver/demodulator followed by a phase-lock-loop touch-tone decoder, and two sequential decoders which recognize two separate codes. The sequential decoders activate relays which enable or disable the scramblers. The system operates as follows: each tone receiver is set up to recognize two four-digit codes. The receivers can all be set to activate upon receipt of the same scramble and unscramble codes, or can be set up to recognize separate codes. In the system under discussion, all receivers except one were set to operate from the same codes. The remaining receiver was set up to recognize a separate code for independent switching.

For added security, the control tone transmitter at the earth station location was activated by a **key lock.** Once the transmitter is turned on, the controller can "punch-up" the scramble or unscramble codes. As soons as the last digit is pushed, the receivers turn on or off the video scrambler, (any scrambler **with** a remote control feature can be used). Selection of an incorrect sequence by the operator causes the sequential decoders to reset.

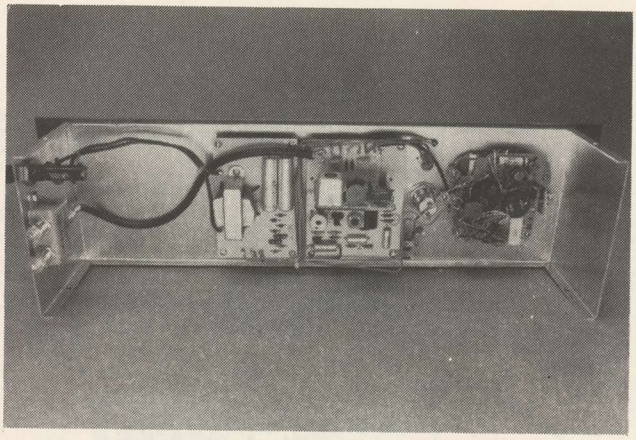
Manual switching is possible with the transmitter **shown**, however, development of a tone generator that could be clock controlled would permit automatic switching on a pre-programmed basis.

The switchers have been operating successfully for approximately four months. Some false triggering occured when the equipment was first installed, as power was applied or removed from the receivers. The difficulty was a power problem. Addition of an "and" gate in the relay drive circuits corrected the problem. Use of the switchers is **not limited to** scrambler type pay systems. The switchers can also be used to automatically transfer microwave signals from one cable channel for pay video using trap security to an entirely different cable channel for non-secure type programming. Remote control of other functions via the microwave system are similarly possible using this equipment.

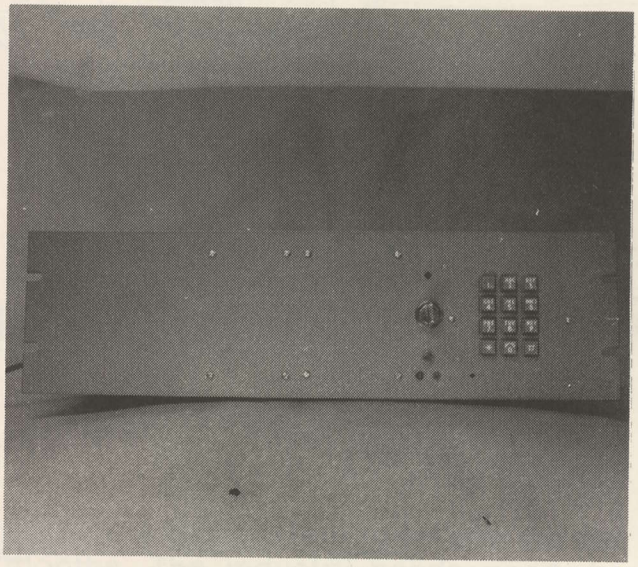
CIRCUIT DESCRIPTIONS

Tone Transmitter

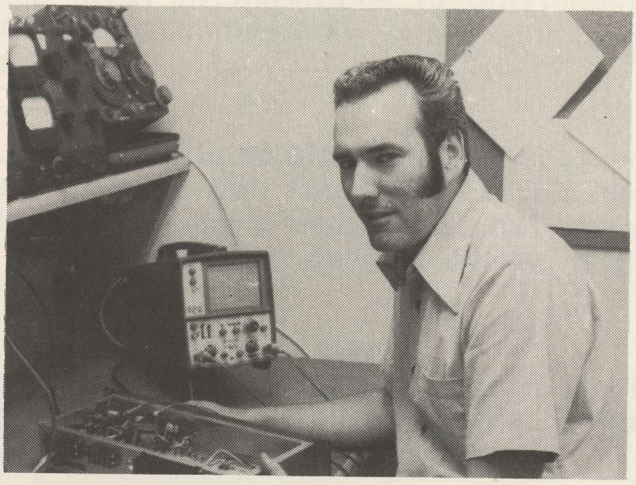
Diagram 4 shows the circuit diagram of the 6 MHz transmitter. The 2N4400 transistor operates as a 6 MHz free running sinusodial oscillator with back to back varicap diodes as part of the



6 MHz TRANSMITTER for security and switching system described in text.



6 MHz TRANSMITTER with key-lock for security, touch-tone® encoder system rack mounts at TVRO receive site where microwave feed for additional systems originates.



DESIGN ENGINEER EARL VOSS (heading up special projects department at TELESIS) working on 6 MHz receiver described in report here.

6 MHz TRANSMITTER

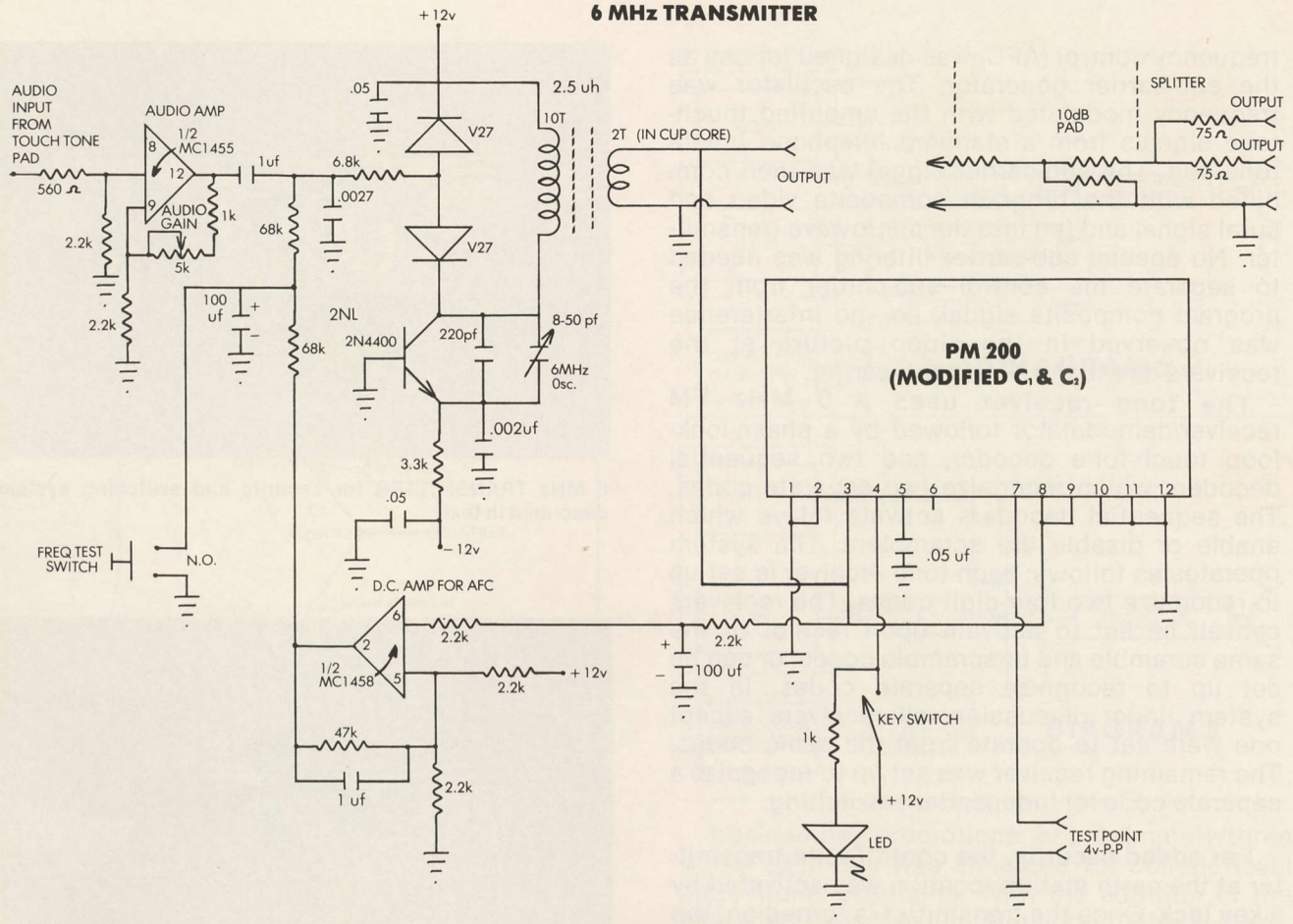


DIAGRAM 4

TONE RECEIVER

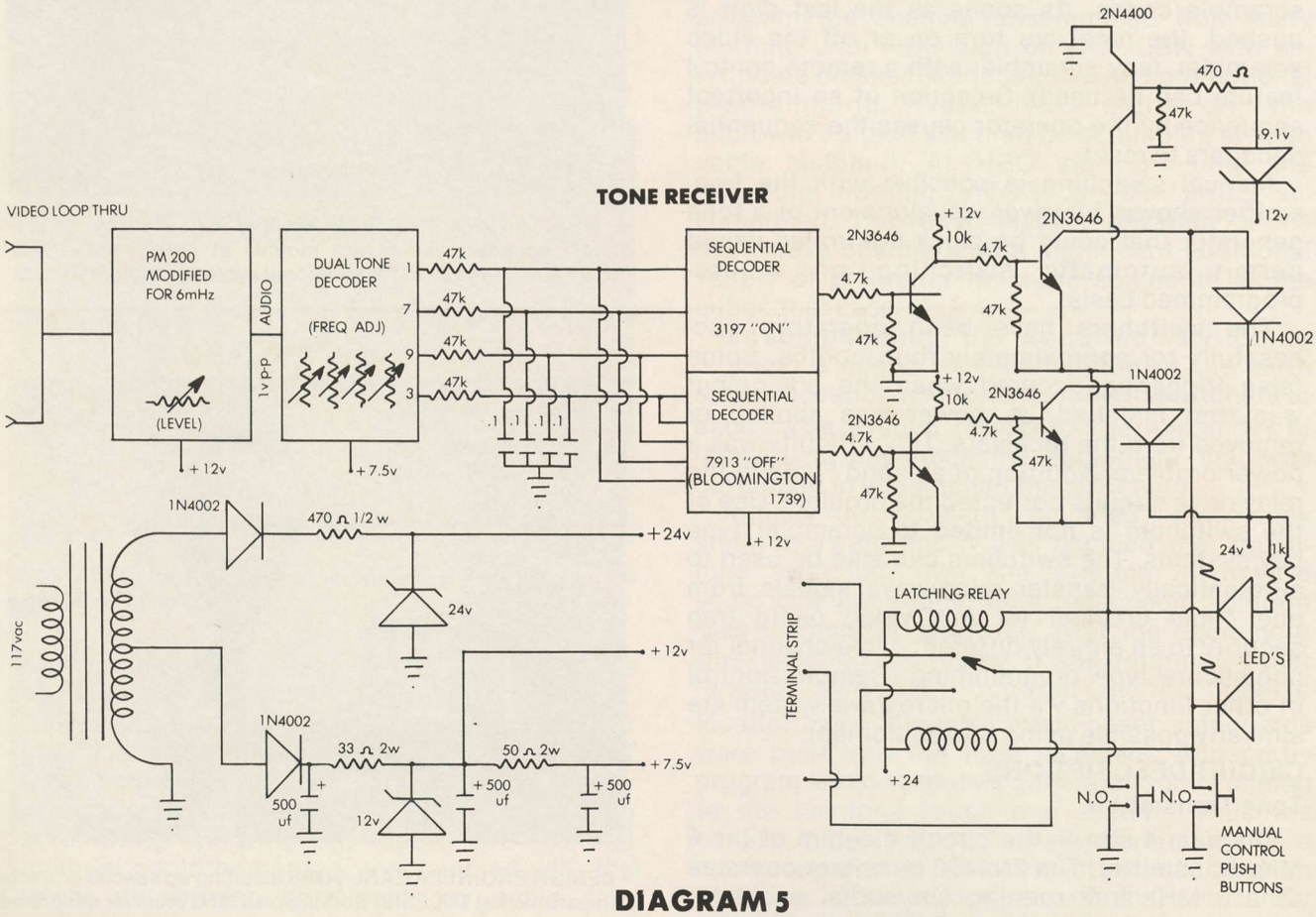


DIAGRAM 5

DUAL TONE DECODER

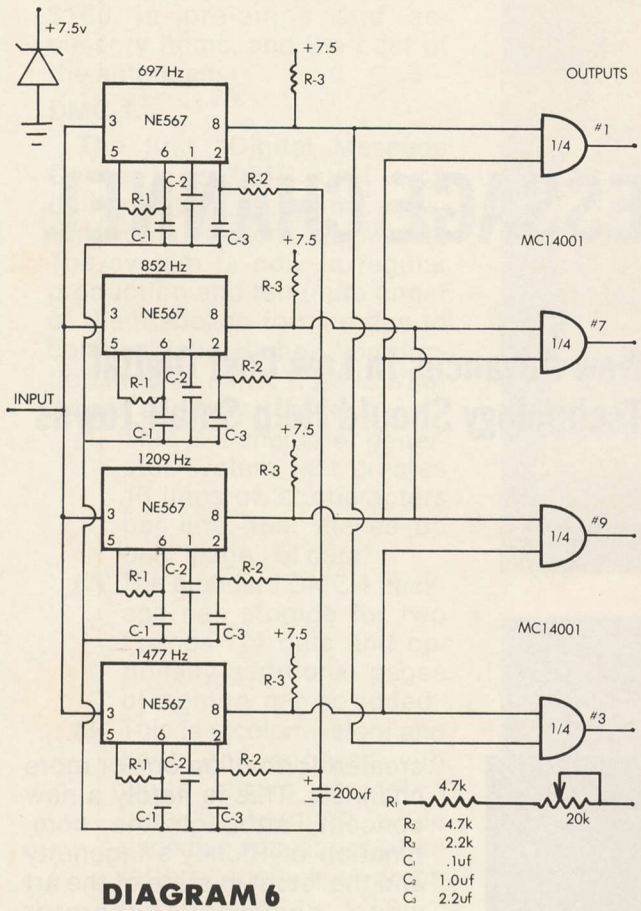


DIAGRAM 6

DUAL SEQUENTIAL DECODER

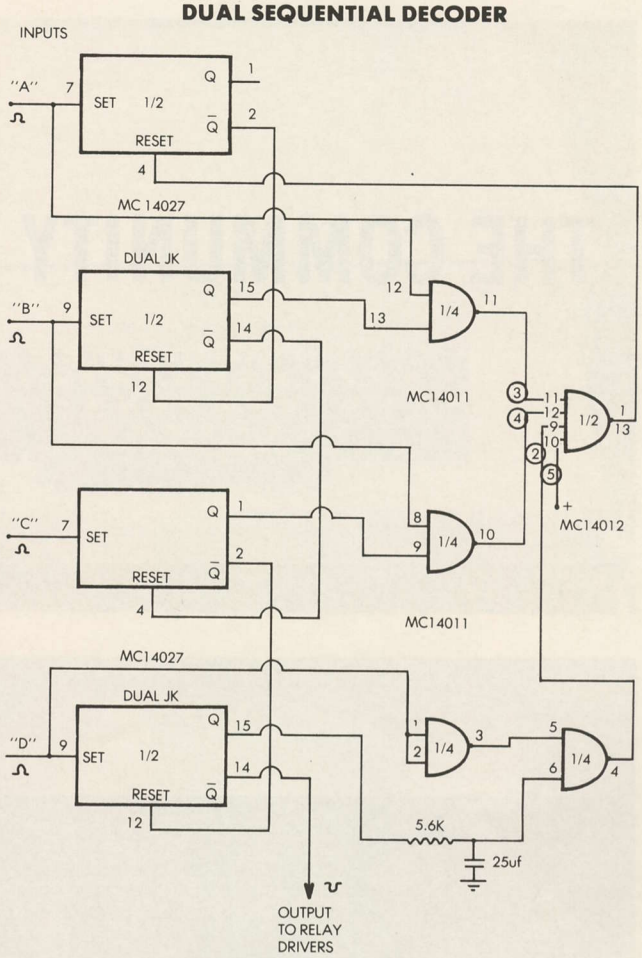


DIAGRAM 7

tank circuit. The DC voltage across the varicaps is controlled by an AFC loop which consists of a **modified** RCA PM 200 FM receiver/demodulator. The PM 200 is **normally** used in RCA TV sets as the audio detector at 4.5 MHz. However, by **returning** the frequency controlling network of the PM 200 **to 6 MHz,** it is used as the AFC detector in the transmitter. The DC control voltage out of the PM 200 is fed into one half of a dual operational amplifier connected as a DC amplifier. The amplified control voltage is filtered by an R-C network and connected to the voltage variable capacitors in the 6 MHz oscillator. A frequency test button disables the AFC to permit adjustment of the oscillator free running frequency.

The audio output from the standard touch-tone pad is fed into the other half of the dual operational amplifier integrated circuit connected as an audio amplifier. The amplified tones than frequency modulate the 6 MHz oscillator via the varicap diodes. Output from the oscillator is taken from a secondary winding on the oscillator tank inductor. A 75 ohm attentuator is included to permit adjustment of the output level.

Tone Receiver

Another PM 200 is used in the receiver as a 6 MHz FM receiver/demodulator, (**diagram 5**). A 1 volt P/P demodulated audio signal is coupled into a dual tone decoder, (**diagram 6**), which recognizes four of the 12 available touch-tone codes. These four tone combinations are then fed into two sequential decoders which generate an output only after the required four touch-tone numbers are depressed at the transmitter in the proper sequence (**diagram 7**). An output from either the "on" or "off" sequential decoder drives a buffer amplifier, which in turn drives a latching relay driver transistor. Once the latching relay is switched to either the "on" or "off" position it will remain in that position until the opposite sequential decoder is activated.

The 2N4400 transistor connected in series with the emitters of the relay drivers is used as an "and" gate to prevent false triggering of the relays as power is turned "off" or "on", i.e., as the power is turned "off" or "on", the sequential decoders can have undesired outputs under certain voltage conditions. The series transistor will not permit the relay to switch until the supply voltage reaches a pre-determined voltage level.

Manual switching of the relays may be acomplished via the override control buttons on the receiver. Three supply voltages are needed by the tone receiver. They are supplied by simple half wave rectifiers and zener diode regulators.

THE COMMUNITY MESSAGE CHANNEL

New Advances In Low Cost Digital Technology Should Help Small Towns

Basically Richey. . .

Readers of **CATJ** for some time are familiar with the efforts of Steve Richey, of Richey Development Corporation located in Oklahoma City. Steve has served as a contributing editor to **CATJ** since the first issue, and he has developed numerous gadgets, boxes and test instruments for readers and his projects have been in more than a dozen issues.

Here in Oklahoma and the surrounding states, Richey is known for his line of (really) small system CATV equipment; a line that extends from preamplifiers to heterodyne signal processors to line amplifiers and much in between.

Now Richey Development has gone into the wonderful world of digital electronics, and the result is a rather interesting approach to small town information channels. The newest Richey product is a **"Digital Message Center";** a package which allows the cable system operator to put local news information, in the character generator keyboard created format, on one or more channels. This is hardly a new concept, although the combination of Richey's ingenuity and the latest in state of the art video character generator technology has certainly shaved the price on such a package.

Richey approached the "Digital Message Center" much in the same way he approaches other equipment projects for small town CATV systems; he wanted it to be cost effective, as a channel of information or data, with any other channel placed on the system. To do this he weighed the typical costs of putting a channel on the system; adding up and then averaging the cost of antennas, processing equipment and the additional equipment normally required.

"I wanted to produce a versatile package which the small system operator could utilize for either straight community information, or in combination with local advertising sponsorship at a going in cost that was comparable with what it would cost to simply add another off-air channel". This was no easy assignment since a typical Richey supplied system has around $400 tied up in a Richey

heterodyne processor, another $100 in pre-amps and accessory items, and the cost of the antennas.

DMC-1. . .

The first "Digital Message Center" or DMC unit was delivered to a small, new-Oklahoma system in March. The system is now in regular production and ten units (most of them spoken for) are due to come off the Richey "production line" in June. Here is what it does and how it works:

(1) This is a character generator system that creates 16 lines of 32 characters per line; that makes up one "page" of data.

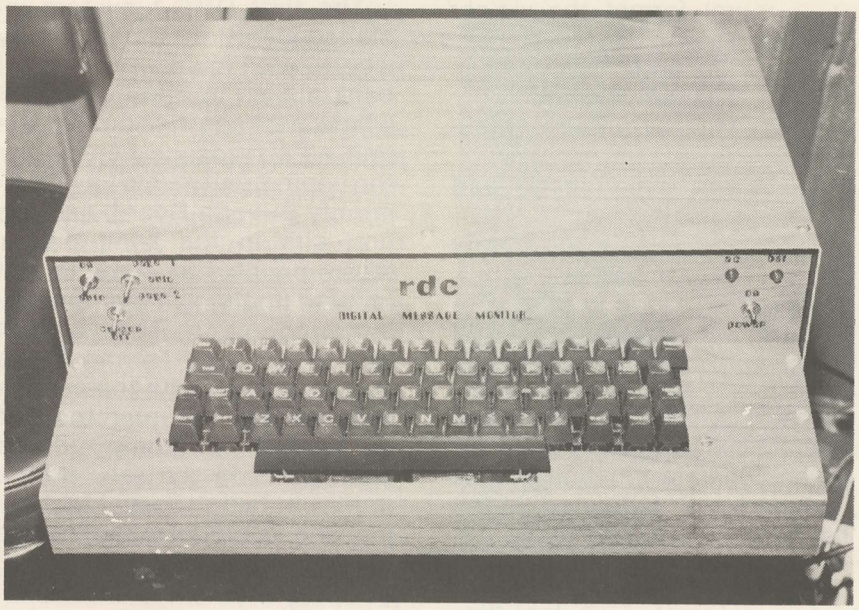
(2) The standard DMC-1 package has storage for two "pages" of data and optionally additional pages of memory can be added.

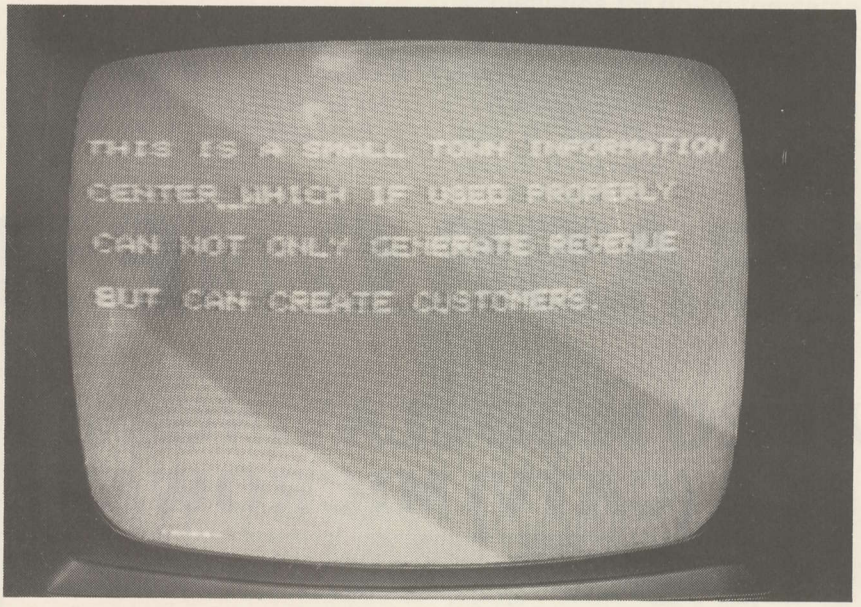
(3) This is a color system and page one appears with white letters against a blue background while page two appears as white letters against a green background.

The machine alternates between pages 1 and 2 and there is an adjustable hold or dwell time of from 7 to 37 seconds per "page". The DMC-1 has a self-contained keyboard, or optionally the keyboard can be separated from the balance of the electronics and located at a remote location. If you locate it at a bank or in your cable office, then a leased telephone line (or other alternate return line connection) carries the information back to the headend where the balance of the package is located.

(4) The DMC-1 generates its own vertical and horizontal sync signal(s), and both are brought out through external jacks so you can "slave" other video apparatus (such as a camera) to the same source.

(5) The package operates from 110 VAC but it also has a built-in trickle charge ni-cad battery supply. If the voltage shuts off for any reason, the ni-cad supply keeps the memory (both pages or more) "hot" until the regular power returns. In this way you don't lose any material during a power outage.





(6) There is a switch on the unit that allows you to switch in the battery supply should you need to pick the unit up and move it from one location to another. In this way, again, the unit travels with its memory "hot" even though the power is disconnected.

The DMC-1 is priced at $750.00 complete; and at $850.00 with a video/RF modulator (the Richey RDC-II modulator). This suggests that Richey came very close to meeting his original cost-effective design objective.

Expansion To Weather. . .

The next generation of the DMC-1 package is well underway and while the pricing is not yet firm, here is what it will do in addition to the basic functions just outlined:

(7) The top 20% of the screen will be dedicated to local weather/time information. The "page copy" will continue to occupy the bottom 80% of the screen.

(8) Across the top, in a one-line (16 character maxi-

mum) format the viewer will see:

a) **The time**
b) **The temperature**
c) **The barometric pressure**
d) **The wind speed and velocity**
e) **The cable company identification.**

These will appear a line at a time, sequencing down the list to the end and then starting all over again. This portion of the package will function through the DMC-1 and it has room for seven separate function boards (only five are 'dedicated' in the list here).

The first DMC-1 system installed went into a community where the town's one local bank picked up the tab for the whole package. They offer the unit as a message service for the community (ala a Community Bulletin Board) and the unit sits in the bank proper where people can come in and prepare their own community announcement. The system operator reports he was making money with the service from the day he turned the unit on because not only did the bank pick up the tab for the unit's installed cost, but they pay the cable company a fee per month for the on-going use of the "channel" which carries the message material plus a line of their own advertising.

With this type of technology break through in digital channel displays, one would reasonably expect many more small system communities to soon be enjoying the benefits of a local message center. Richey Development Corporation is a CATA Associate Member and their listing can be found in the Associate's roster listing starting on page 46 here this month.

PHASE ONE REPORT

VIDEO MODULATING THE GUNNPLEXER (CATV) MICROWAVE SYSTEM

A BUSY MONTH

Progress with the new Microwave Associates Gunnplexer (Gunn diode) microwave package during the past thirty days has been hectic, and on several fronts. First of all CATA President Kyle D. Moore appeared before an "en banc" session of the FCC (five of the seven Commissioners attended the session) on May 31st. The FCC first heard about the CATA plan to petition the Commission "sometime late this summer" at that meeting, and Kyle Moore passed around for all to inspect and hold the 9.5 ounce 20 milliwatt transceiver package. The "show and tell" exercise received excellent press, including an AP wire story that appeared in numerous newspapers all across the nation. By the end of a week after Moore's presentation the FCC "Public Information Office" had tired of trying to answer telephone calls and letters from people intriqued by the concept and began sending them on to CATA directly.

The Mayor of Toco, Texas (37 homes, population under 200) was typical. He told the story of being unable to enjoy the quality TV the nearby bigger community had. **"We asked them to extend the line out here but they wanted $XX,XXX. to do the job"** (we thought the price quoted was fair considering the distance; but for the 37 homes involved it just didn't make economic sense) **". . .so we have been struggling along with a 100 foot tower I put up years ago. Every home**

in town is plugged into my tower and I don't charge for the service." He wanted to know if the new low cost microwave could bridge the gap over the five mile span and make the larger community cable reception available to **his** "head end" from whence he would simply plug into the already connected 37 homes.

Reaction from cable operators was generally favorable. A few were concerned that in their particular situations (mostly in the hills of New England and in Appalachia) that the cost of the $2400 per channel commercial microwave was going to be more than they could install a new head end for. Most of these fellows admitted they would be using strip amps ("with around $500 a channel wrapped up when we are done...") in their new small town systems. A system operator in a South American country (that's South...**not** Central) wanted to know if **we** would buy a **set of six** units for him, mark them "amateur radio equipment" and ship them to him via Braniff! (Amateur radio equipment...**you see**... has a special **low** import duty tarriffs while commercial electronic equipment carries a **much higher** price tag.)

Then on June 14th CATA Directors Ralph Haimowitz (Florida), Justin Mueller (Vermont), David Fox (West Virginia) and CATJ Editor In Chief Bob Cooper traveled to Washington where they testified before Congressman Lionel Van Deerlin's House Subcommittee on Communications concerning "Rural Television Problems". Cooper explained how the unit works, what it could cost, and how important it was that the low cost equipment be approved for CATV use.

Under questioning by Congressman Van Deerlin and his Chief Counsel Chip Shooshan a representative of the FCC admitted that it might take **"...as long as two years** (or as little as nine months) **for the FCC to act on the forthcoming CATA petition."** Cooper noted that this is part of the problem with Washington; they take so long to get new technology into the main stream of American life. Congressman Van Deerlin noted **"...nine months** or **two years... that is the difference between the gestation period for a human being or the elephant".** As with the good Congressman's support for the rapid approval of small earth terminals in 1976, it was plainly evident that **he** would be **more pleased** with a six-nine month turn around for the new low cost microwave concept and the FCC also quite plainly got the message.

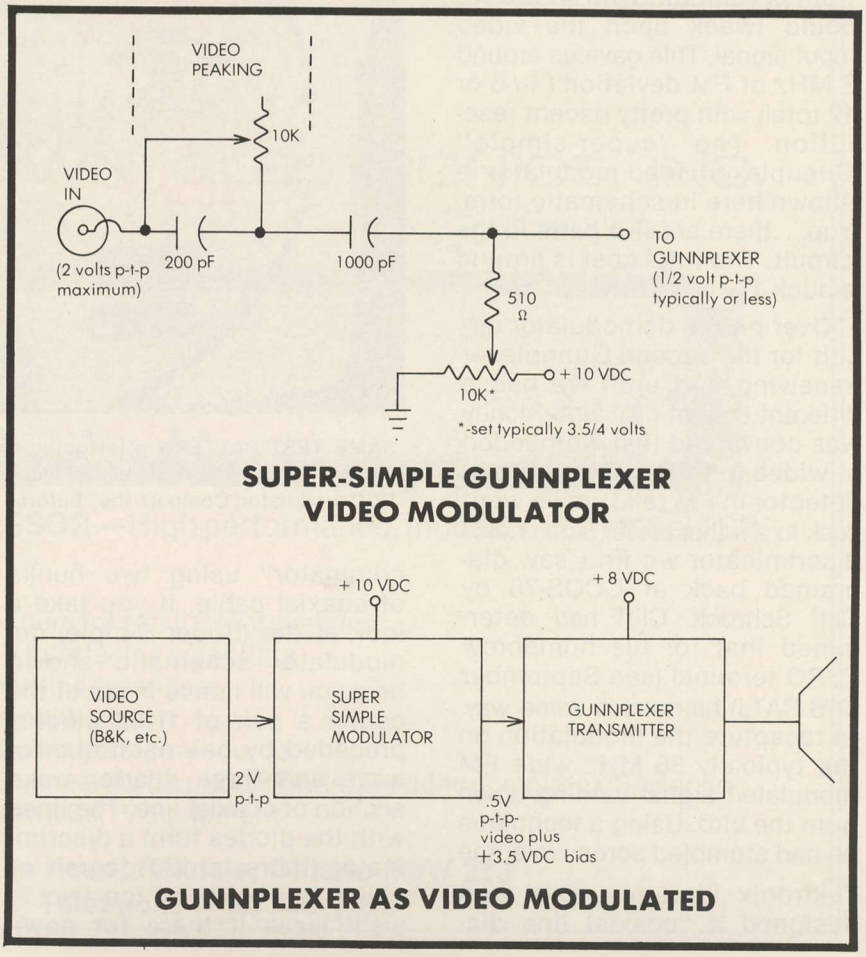
While all of these fun and games were being played in Washington, the CATJ Lab with a giant assist from Steve Richey and some of his crew at Richey Development Corporation were very busy trying to get video modulation through the first pair of 10.38 GHz transceivers we had ordered out as "hams" from the Microwave Associates offices. The balance of this report will concentrate on these early attempts at making the Gunn-diode video modulate and

THE FIVE PART MODULATOR "thrown together" to get video into the Gunnplexer transmitter.

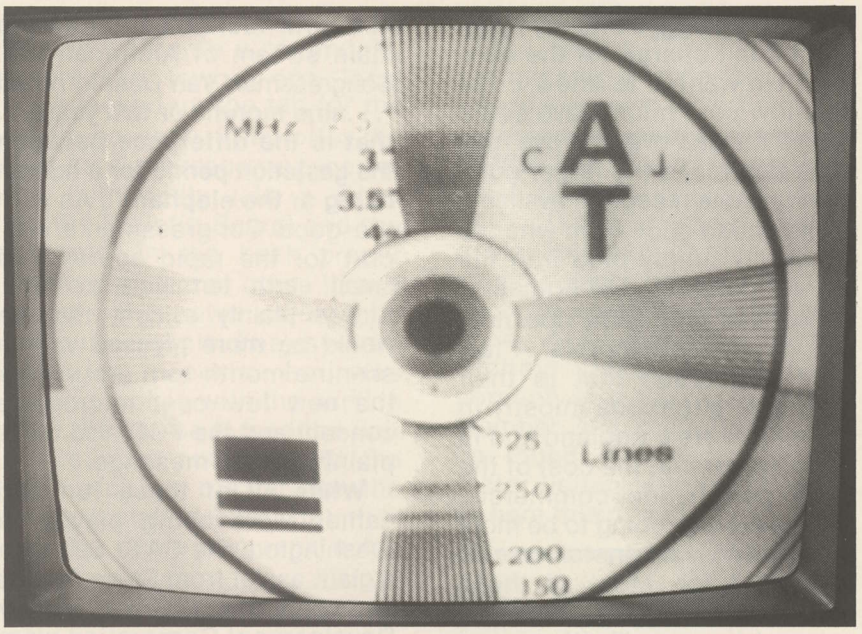
will include a complete set of schematics for doing the same on your own.

Nothing To It...

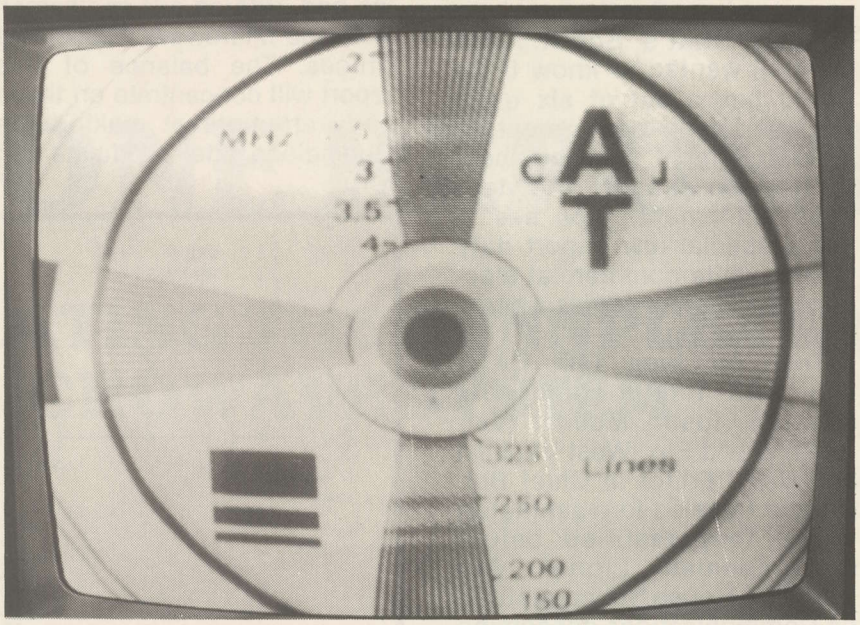
It seemed like a good idea to see if the Gunnplexer units would modulate with **any** form of intelligence, to begin with. So following some general data sheet instructions from Micro-



wave Associates we duplicated the audio modulation scheme approach shown in diagram 6 of page 16 for the May CATJ. This involves putting an audio signal into the transmit Gunnplexer and using an FM receiver tuned to around 30 MHz to take the IF out of the IF spigot of the second Gunnplexer (see pages 10 - 17 in the June CATJ). It worked almost first crack out of the barrel so we proceeded to get into the video business. Being CATV oriented we decided we would set up to use a pair of typical CATV video sources; we took the color bar and flying spot scanner test pattern video outputs out of a B and K Analyst and fed them to the biasing point on the transmit Gunnplexer unit. We found we had around 1 MHz video information present; obviously something was limiting in the video circuit and we were losing most of the highs. Any color or sound that should have been there was not. From this we progressed to a video peaking circuit for the modulator (see diagram here) which was far from perfect but with which we could tweek upon the video input signal. This gave us around 6 MHz of FM deviation (+/-6 or 12 total) with pretty decent resolution. The "super-simple" Gunnplexer video modulator is shown here in schematic form. Yup. . .there are **five parts** in the circuit. The total cost is around a buck 17.



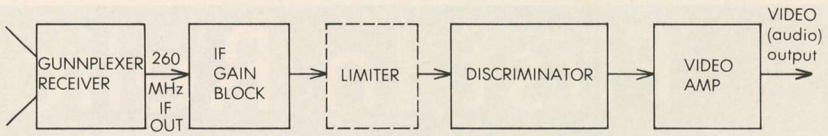
CATJ TEST PATTERN as fed out of the B and K flying spot scanner (at video) before going through the Gunnplexer system.



SAME TEST PATTERN after going through the 10.38 GHz microwave system, being demodulated to video and then being re-modulated to TV channel two in an RDC modulator. Compare the "before" and "after" shots!

Over on the demodulator circuit for the second Gunnplexer (receiving end unit) we had a different type of problem. Richey was convinced that we needed a **wideband discriminator** (or detector in FM talk) so we went back to a rather clever (and cheap) discriminator we first saw diagramed back at CCOS-76 by Cliff Schrock. Cliff had determined that for his homebrew TVRO terminal (see September 1976 CATJ) he needed some way to recapture the modulation on the typically 36 MHz wide FM modulated signal coming down from the bird. Using a technique he had stumbled across in some Tektronix literature, Cliff had designed a "coaxial line discriminator" using two hunks of coaxial cable. If you take a look at the (Super Simple) demodulator schematic shown here you will notice in about the center a pair of 1N82 diodes, preceded by one each quarter wave and three quarter wave section of coaxial line. The lines with the diodes form a discriminator (there is 180 degree of phase lag between the two. . . **we'll leave it there for now**). Steve felt this was a good wide band approach and since one of our objectives was to deviate the transmitter quite widely (that helps all sorts of things including signal to noise) we did surely need the wide band technique. Only there are trade offs with this approach to a discriminator. One is that unless you are both careful **and** lucky, you probably need to employ this technique at a pretty **high** IF

range. Steve chose 260 MHz, which means we offset the LO in the receive Gunnplexer by 260 MHz from the transmitter output frequency. We knew going into this that if you really want to get good **range** with these simple Gunnplexer units you must follow the IF output of the receiver unit with a low noise figure IF. However, for close range work (under a mile) we were more concerned with making the package work than we were with long haul work, so we rummaged around in Richey's junk box and came up with a **simple** gain block to act as our first IF amplifier. This turned out to be a TRW chip amp (30 dB of gain) which at 260 MHz checked out with a total package noise figure of **in excess of** 20 dB. It really needs to be down **under** 3 dB (which is not impossible, but still skillful at 260 MHz) to get maximum performance out of the system. Our ultimate goal would be to either make the coaxial line discriminator function at a low IF (such as 30-50 MHz) where we could easily and simply get good low noise (under 3 dB NF) high gain, or, work extra hard at getting a decent low noise figure amplifier string running with descrete transistors (such as J-FETs) at a higher IF (such as 260 MHz); where the coaxial line discriminator (we found) worked very well.



GUNNPLEXER DEMODULATED

But all of that was ahead. The first trick was to get the package working. Then we'd proceed with the knit-picking improvement problems.

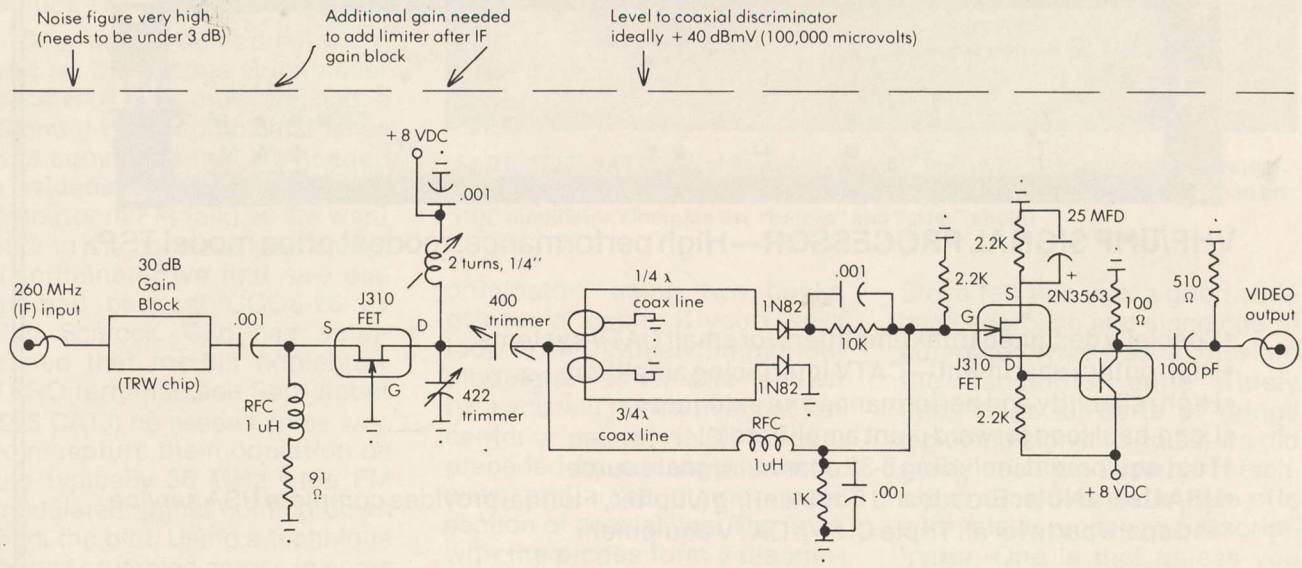
By the start of the second week in June we had such good color video going through the test system that we got real brave and took the demodulated video (**plus** 4.5 MHz audio) out of a CATV demod and ran it into the Gunnplexer transmitter. It worked very well and pointed out that perhaps before we got done we'd have to do something "a little more sophisticated" with the five part modulator unit to insure a flat modulation response passband. We found very little critical to adjust in the system as shown here in schematic form, but there was just a trace of herringbone in the color. **Part** of this was traced to the video coming out of the demodulator itself, and some **more** was traced to a local FM station that was getting into the clip-lead-lashed-together system.

But it worked, as the photo here shows. Merv Griffin was never one of our favorites but he sure looked awfully good going through the 10.38 GHz microwave system and coming out of the Gunnplexer receiver. The photo shown here (of Merv), incidentially, is after taking the demodulated video/audio from the Gunnplexer receiver and then driving an RDC channel two CATV modulator. This is not pure video on a video monitor; it is as you would put it on your own CATV system.

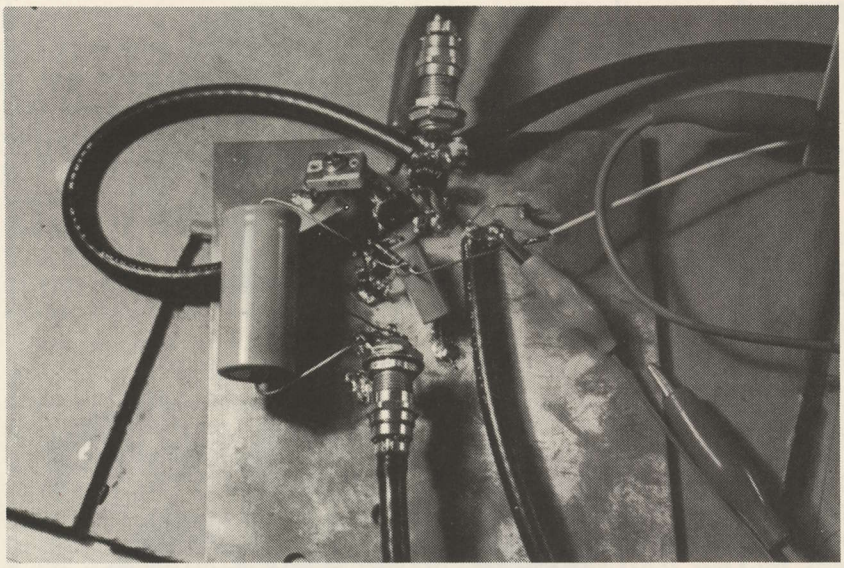
So to the five part modulator add a 27 part demodulator. That comes to around $10.00 in parts if you overlook the junk-box TRW chip amp.

What's Ahead?

The Gunnplexer CATV technology is moving so fast that long before this is in print in early July there will be a couple of additional generations of proto-type work done. **The schematics shown here**, with a pair



(ALMOST) SUPER-SIMPLE DEMODULATOR FOR GUNNPLEXER RECEIVER



OPERATING DEMODULATOR lacks many of the social graces of a commercial unit but it performs none the less!

MERV VIA 10.38 GHz experimental Gunnplexer microwave; video and audio taken from a CATV demodulator, fed through the Gunnplexer system, and then demodulated and fed back into CATV channel 2 modulator and displayed on a normal home receiver. Could you sell it?

of the Microwave Associates Gunnplexer transceivers, **will put a person into the do-it-yourself video microwave business.** For very few bucks and perhaps a couple hours of a person's time.

The then-current proto-type phase of the package will be demonstrated at CCOS-77; possibly in several forms. Microwave Associates will **also be** demonstrating **their commercial version** of the CARS band Gunnplexer units at CCOS-77. To date we've done all of our own low-cost development work with**out** doing much talking with Microwave Associates about **their** design. We wanted to see just how simply the job could be done; and as we advance from our very simple system shown here this month to more sophisticated systems throughout the summer, we'll keep you updated on how it is done and what the pitfalls are along the way.

One of the summertime projects we have in mind is a completely solar-panel-powered solid state camera **and** Gunnplexer transmitter, mounted on a tripod. This will make a very portable (pick up the estimated seven pounds and haul it with you; setting it down where you want the video feed to originate) "un-attended package for which we can see dozens (if not hundreds) of applications, both in and out of CATV.

If you haven't gotten bitten by the "Gunnplexer Video Microwave" bug yet, time is awasting. We haven't had this much fun in years!

OFF-AIR PROCESSING. . .

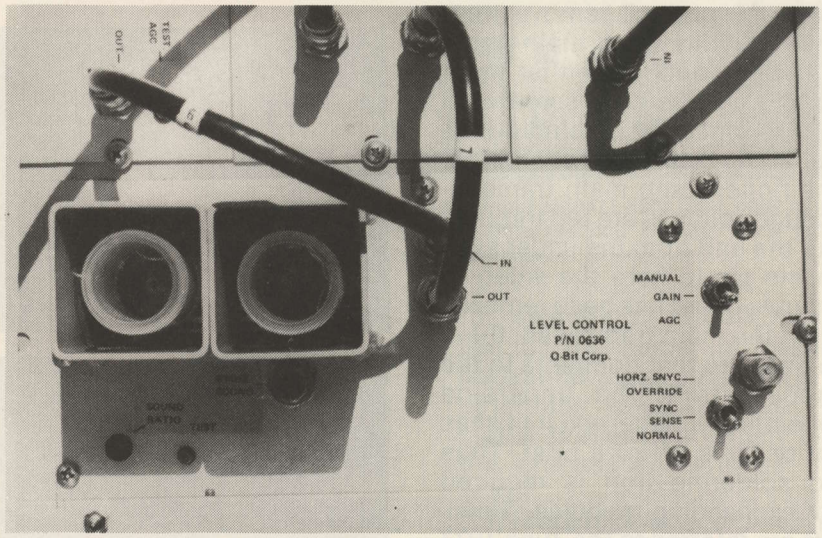
Part Two Looks at Operational Characteristics For *Triple Crown TSP Processor* and *Q-BIT QB-650 Processor*

The 'Everyman's Processor'

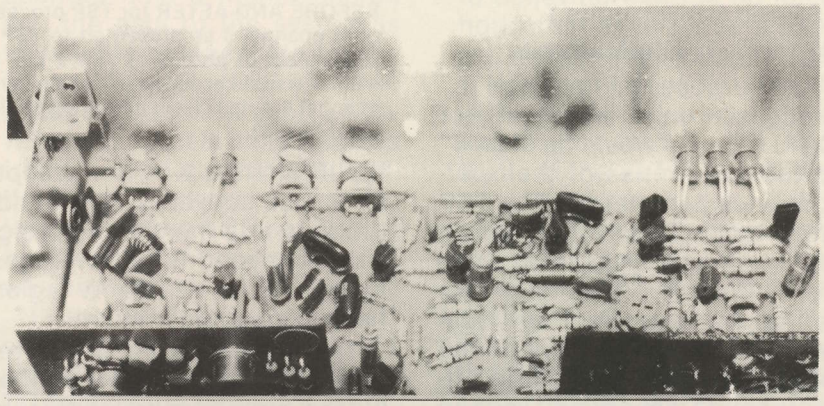
Triple Crown's model TSP processor would, as suggested in the June part one of this series, be 'homey' to anyone who has ever poked their fingers into the innards of a television receiver. The design is a very straight forward although there are servicing innovations which might escape the casual observer.

For example, the IF segment of the TSP processor is universal for any TSP processor. If you wanted to or needed to exchange an IF module (that's the front snap-out segment of the unit) you could do so safely whether the unit was operating on channel 2 or W. And because the units go into and out of the main frame by simply releasing a pair of snap-locks, there are no cables to change or other time-consuming service slow downs.

In addition to this approach to serviceability, the TSP also has rather unique interchangeability between RF sections and RF filters (when the processor handles the same in and out channels). The RF front end (which provides RF gain) is directly swappable with the RF output stage; although for **optimum** performance you **should** take a few seconds to change



LEVEL CONTROL MODULE of QB-650 has audio tracking-AGC system and AGC control switches.



CLEAN LAYOUT and point to point construction (LO and portion of IF shown) makes TSP unit relatively simple to service.

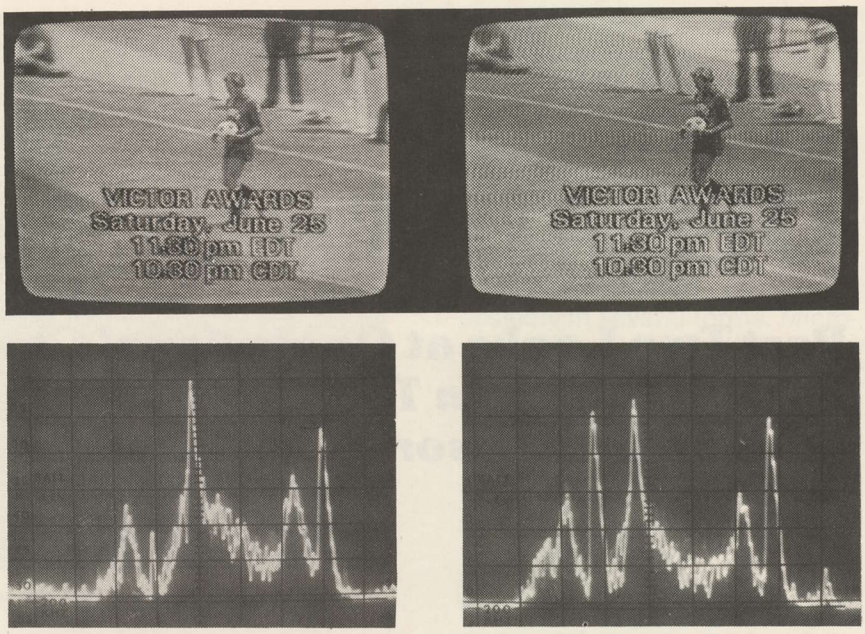
out **a resistor** (the resistor value in the bias network for the RF front end stage is chosen for **best noise figure** while the same resistor in the output stage is chosen for **maximum output** capability).

In a very real sense the TSP processor is "almost" a "two-way" processor; with same channel in and out operation the **output** stages will double in a pinch **as input stages.** When you couple this inter-changeability **with** the no-jig-required test bench servicing (remember that the RF and IF modules snap out of the main frame, plugging **back together** on the test bench) you may have the most serviceable head end processor in CATV today.

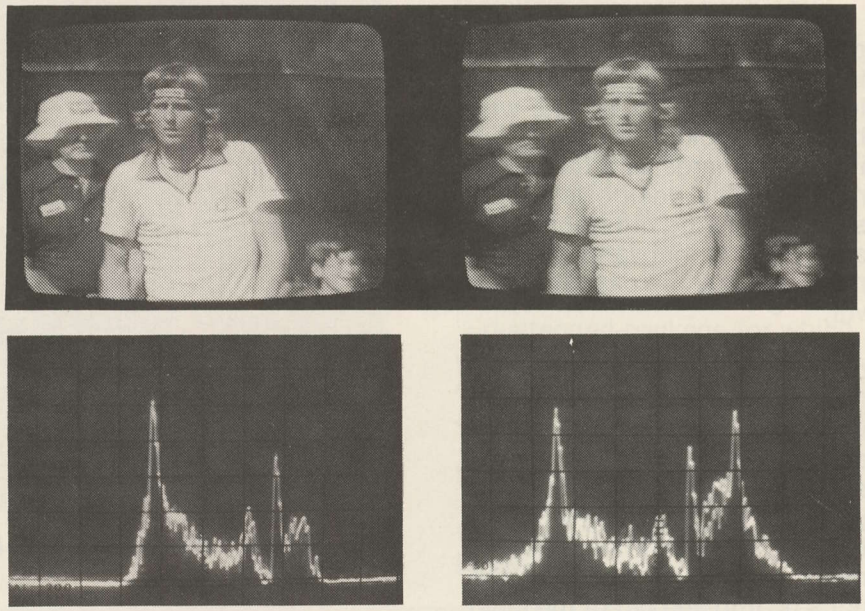
The Q-BIT QB-650 processor has a different approach, but the emphasis is on getting into the unit for service none the less. As shown here, the individual module "plates" remove from the cast aluminum main-frame "well" by undoing either three or four phillips head screws. All RF connections (including IF, oscillator, etc.) are "on top" of the honeycomb main frame although voltages are fed throughout the unit from the under side. In the photo here the video IF module-board has been removed from the main frame well; there is **one wire** that connects to the module from the underside (operating voltage) and it pushes on or pulls off of a post. Thus no soldering iron is required for exchanging modules. (Readers are referred to the June 1977 **CATJ,** pages 18-26 for part one of this two part series, covering the modular design of both the TSP and QB-650 units.)

Performance Judgements

On purpose, we "ordered in" processor units which at our CATJ Lab site would be "taxed" to the extremities of their performance parameters. The TSP from Triple Crown receives on channel **8** and releases on channel 3. The significance of this is that we have an off-air local on channel **9** (+30 dBmV on the channel 8 antenna) and an off-air local on channel 4. Thus in converting 8 to 3 we would, if the IF filtering was not acceptable, also convert 9 to 4. In addition to this the channel 8 signal is "beyond B", or averages in the −18 to −22 dBmV region before pre-amplification.



BEFORE AND AFTER for QB-650 processor; top set of off-screen photos shows on right channel 6 as presented to QB-650 and on left channel 6 as released by QB-650. Bottom set of photos of VSM-2 Lab analyzer depicts on right channel 6 input (with 5 color and 5 aural left of 6 visual and local FM band signal above channel 6 aural) while left hand photo shows channel 6 output (5A severely notched 5 color still evident).



BEFORE AND AFTER for TSP processor; top set of off-screen photos shows on right channel 8 as presented to TSP and on left channel 3 as released by TSP. Bottom set of photos of VSM-2 Lab analyzer display depicts on right channel 8 (with 9 visual carrier nearly same level to far right) while left hand photo shows channel 3 output (very slight lower sideband from 9 is evident just to right of 8/3 aural carrier).

The QB-650 from Q-BIT receives and releases on channel 6. The significance of this is that we have a strong local 5 (+21 dBmV off of six antenna), and three "local" FM stations below 92 MHz. Additionally, there is the age-old problem of keeping twice the IF frequency (2 x 41.25 aural is 82.50 and 2 x 45.75 visual is 91.50) out of the output channel 6. Add to this a −15 to −18 dBmV input signal on 6 (before pre-amplification)

and you begin to see the operating conditions.

When you strip away all of the rhetoric concerning noise figure, gain, AGC, filtering and so on, the final proof is how well the pictures appear on the trunk line. Our approach with both processors was as follows:

(1) **Measure and verify** the manufacturer's ratings;

(2) **Observe the performance** of the processors over an extended period of time, watching for "glitches" and other faults which would prove troublesome to systems and their customers;

(3) **Compare** the performance before and after the processor.

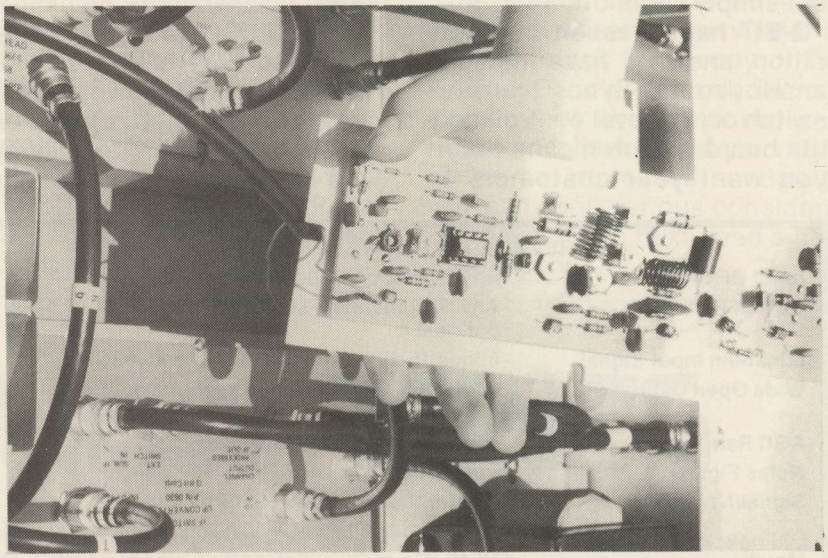
The abbreviated specifications for both units appears here in tabular form. We found no serious deviations in either unit.

The TSP unit has been functioning for several months. It has proven to be reliable with no problems of any kind to date. The QB-650 processor received by the CATJ Lab was one of the very first units released. One month of operating time has been run up as this report is completed.

There are a couple of areas where we believe the QB-650 might well be improved. For example:

(1) **A lack of an input test point** on the exterior of the housing is we believe a shortcoming. The output test point (−30 dB) on the front panel is adequate.

(2) **The AGC system** (see page 25, June CATJ) is a keyed system operating from a sampling of the horizontal sync pulse. This is a dandy AGC system and we found that we could not fool it with man-made noise spikes (we coupled all sorts of man-made noise into the input via a hybrid combiner purposefully trying to fool it into over-reacting). However, there is one not too uncommon signal type that will disrupt an AGC "related" system; co-channel.



QB-650 VIDEO IF MODULE (like all other modules) removes from honeycomb main frame well; only under-board connection is B+ line (single wire on push-on post).

FRONT PANEL SEGMENT of TSP processor; input signal LED's glow right to left (red) indicating range of input signal. Trim pots reached through front panel recesses allow adjustment of operating parameters.

In a conventional AGC system a peak clamping detector charges one or more capacitors to provide a reference "voltage". As long as the reference voltage stays at or above some pre-set level, the AGC circuit holds the gain of the system constant. When the voltage increases beyond some "window" limit, the capacitors hold a higher charge and the gain of the system is lowered to compensate for the larger AGC detected/reference voltage present. In such a conventional system noise spikes from passing automobile (ignitions), power lines and so on (can) cause the AGC capacitors to charge as if the signal itself was higher.

In the QB-650 the horizontal sync pulses are sampled and phase locked, the peak of the DC level is the reference point. This works fine for AGC, but **within** the QB-650 the **internal** "IF switching" circuit makes use of the **same** (processed) **horizontal sync pulse** form to determine whether there is a signal present (in which case the processor 'switches on'), or not.

If there happens to be severe co-channel interference on the incoming signal, the IF switching "interrogator" is fooled into believing there is no (clean) horizontal sync pulse present; and it shuts the processor down.

You might think that through with your own system as an example. For example, we found that as long as the non-desired co-channel source was 15-17dB **below** the desired signal source, the processor went ahead and operated. But with the non-desired carrier was a 10 KHz beat the processor **"decided"** that there was no longer a (clean) signal present, **and it shut down.** In other words, when the co-channel gets bad, the proces-

sor simply shuts off.

Q-BIT had foreseen this condition, and they have installed a "Horizontal Sync Override" switch on the level control module board. Which means that if **you** want **your** customers to "see" co-channel laced pictures (at 15-17 dB down the co-channel is so severe that only the truly dedicated viewers would stay with the picture) you can switch to the "override position" and let the customers tough it out. On the other hand, if to your mind co-channel laced pictures are worse than no pictures then leave the switch in the "Sync Sense Normal" position and the processor will shut off when the co-channel gets bad.

None of this gives us much difficulty; only the location of the switch does. Having grown up in "co-channel alley" where co-channel conditions come and go with great regularity (or irregularity perhaps) we'd like the ability to switch from one mode to another with**out** having to pull the housing **out** of the rack, **lift** off the top and **throw** a switch (repeating the process in reverse having thrown the switch). We mentioned moving the switch (to a more accessible spot) to Hansel Mead at Q-BIT.

Both the TSP and the QB-650 employ front panel, recessed pots for trimming things such as the "threshold level point" (QB-650 for setting point at which the input signal will trigger the on-off switching) and "sound control" (TSP for setting ratio between the visual and aural carrier). The adjusting tools required for both unit's front-panel adjustments are at best non-standard. The TSP in fact requires two separate plastic-tipped types of tools to make the full range of adjustments. As long as manufacturers are selecting recessed pots with less-than-standard adjustment-slot-heads, we believe that it would be an excellent idea if they also included in their shipping bags the appropriate tools to do the job! If you have ever been on top of a mountain with a new processor to install and no tools to fit the processor adjusting screws, you know the feeling. A fellow can waste an hour's time trying to whittle a hunk of plastic into a tool that fits an "unusual" pot and he'll remember how wasteful that hour was for a very long time thereafter.

ABBREVIATED SPECS - TSP PROCESSOR

Input RF Signal	- Any TV channel, sub-band thru 83
Output RF Signal	- Any TV channel, sub-band thru W plus 14-35 optional
Minimum Input Signal	- minus 15 dBmV (for full output and AGC)
Wide Open Gain	- 60 dB (55 dB UHF input) with maximum output of +45 dBmV.
AGC Range	- 40 dB window VHF, 35 dB UHF
Noise Figure	- 8 dB VHF, 12 dB UHF
Signal/Noise Ratio	- greater than 50 dB at +3 dBmV input greater than 60 dB at +10 dBmV input
Match	- 16 dB RTL at RF and IF ports
Spurious Outputs	- 62 dB below **maximum** picture carrier level
In-Band IM Products	- 60 dB below picture carrier level
Output Level Stability	- +/- 0.5 dB for +/- 10 dB input change
Processor Delay	- +/- 25 nanoseconds for picture information between picture and chroma carriers, sound attenuated 10 dB (plus off-air value)
Frequency Response	- minus 0.5 MHz to chroma (sub) carrier, +/- 0.5 dB (FCC spec is +/- 2.0 dB)
Operating Power	- 0.15 amp at 115 VAC, 0.5 amp at 28 VDC
Size	- rack width x 3.5 inches high x 9 inches deep
Price Range	- $895.00 range
Source	- Triple Crown Electronics, Inc., 42 Racine Rd., Rexdale, Ontario M9W 2Z3 (416) 743-1481. Also available in United States from Broadband Engineering, Inc. (Jupiter, Fl. which also serves as U.S. service depot) and Jerry Conn Associates Inc. (Chambersburg, Pa.).

ABBREVIATED SPECS - QB-650 PROCESSOR

Input RF Signal	- channels 2-6, 7-13, 14-83
Output RF Signal	- channels 2-6, 7-13; optional mid-band channels
Minimum Input Level	- minus 20 dBmV (for full output and AGC)
Wide Open Gain	- 60 dB (at +40 dBmV output) to optional 80 dB (at +60 dBmV output)
AGC Range	- 50 dB window (minus 20 to + 30 dBmV)
Noise Figure	- 6 dB max VHF, 9 dB max UHF
Match	- 16 dB or better all ports
Spurious Outputs	- greater than 60 dB below video carrier
Image Rejection	- greater than 60 dB
Output Level Stability	-+/- 0.5 dB max for input between -20 dBmV and +30 dBmV
Processor Delay	- +/- 25 nanoseconds for picture information between video and chroma carriers
Frequency Response	- minus 0.75 MHz to chroma (sub) carrier, +/- 0.5 dB (FCC spec is +/- 2.0 dB)
Adjacent Channel Rejection	- lower channel chroma greater than 20 dB; lower channel aural greater than 42 dB; lower channel video greater than 60 dB; upper channel video greater than 50 dB; upper channel aural greater than 60 dB (all with optional helical filter)
Conversion Accuracy	- less than +/- 10 kHz VHF, +/- 20 kHz UHF
Operating Power	- 45 watts at 115 VAC, 0.6 to 1 amp at +24/30 VDC
Size	- rack width x 5.25 inches high x 15 inches deep
Price Range	- $950. up with options
Source	- Q-BIT Corporation, P.O. Box 2208, Melbourne, Fl. 32901 (305) 727-1838.

Manuals

Both the TSP and the QB-650 manuals are pretty decent, but the QB-650 takes the edge because of its extremely complete description of **(1)** how each and

every circuit functions (including the circuit path for each module and the part played by each major component), and, **(2)** its straight forward approach to "making FCC proof tests" with the QB-650. The manual tells you what equipment you need, where to plug into the modularized processor, what to expect and where to adjust if you don't get what you should have. Because of the considerable new technology involved with the QB-650, the thorough manual is probably well advised. Q-BIT's heavy involvement in the 50 ohm (military) world has taught them to document everything with great care; you are the winner here because we suspect that if you wrote to Q-BIT to ask for a copy of the manual you'd not only learn a great deal about modern processor technology but you might even be impressed enough to give the unit serious consideration when you next need a new processor.

TECHNICAL TOPICS

True Fiber

"I would like to compliment **CATJ** on the April article "Now or When" dealing with fiber optics for analog broadband communications. This was an excellent article covering all of the questions that I had regarding fiber optics and their potential uses in CATV.

"I also read the article by Irving Kahn on fiber optics in the same April issue and I would like to again congratulate you for having the foresight to include both of these articles into the same issue. There is nothing wrong with Mr. Kahn's statements other than he might be getting a little carried away! However, the thought comes to mind after reading his report that generally missing are specific details of what he proposes. Can we not get someone connected with Mr. Kahn to provide some real world numbers on factors such as distortion, number of channels per fiber and so on? Certainly the generalizations made in Mr. Kahn's article could not be used to design a real fiber optic system. Since Mr. Kahn makes the statement that fiber optic equipment is available for sale and installation at the present time I believe that they should have some system design parameters which they would be willing to publish in **CATJ.** In that way those who might seriously have need for a fiber optic installation could begin the task of intelligently designing such a system."

Jack D. Cauldwell
General Manager/CATV Division
Arvin Systems, Inc.
Lancaster, Ohio

Jack—

At the present time a very large amount of what is actually possible in the way of fiber optic installations seems to be either proprietary (i.e. private company secret) **or developmental. In the latter category the 12 channels through the fiber demonstrated in Chicago in April would at best have to be categorized as 'interesting but not saleable'. We've put the proper bug under the proper hats and we are told that when information is generally available, as you request, we will have sufficient data to make a full technical report to the industry. In the interim. . .keep on selling those taps for that solid sheathed cable!**

Supports Low Cost Microwave

"I have just finished reading your report regarding the 20 milliwatt transmitter and receiver from Microwave Associates and to say the least I was very impressed with what I read.

I am the Coordinator of Broadcast Services for the Dodge City Community College (Dodge City, Kansas) and handle the Communications Technology curriculum here at our community college. We have a radio-TV curriculum that will soon include a 10 watt FM station and does now include a fully equipped television studio with two color cameras that is hooked into the Dodge City CATV system. We send out almost a full day and evening of

programs via the Dodge City system, and this includes our covering city commission meetings. We hope to be taping some of the smaller communities sporting events this fall for playback on the system. This may not sound like a big project, but we are real proud or our set-up for a two-year community college with around 1,000 full-time students.

I live some 35 miles from Dodge City between a couple of small towns; one has around 300 population and the other around 1,100. I was wondering if it would do any good for me and others to write to the FCC pushing for this type of small and low-cost microwave system approval? I would be happy to try and to do all that I could do to get it approved."

John Ewy, Coordinator
Broadcast Services
Dodge City Community College
Dodge City, Kansas

John -

Your letter is one of dozens (if not hundreds) **received of late; many from the CATJ series starting back in May and others generated by an AP wire service story which appeared throughout the nation following CATA President Kyle Moore's presentation to the FCC on May 31st.** YES—**there is plenty that folks like you can do to get the FCC moving on this project. Letters to the Commission** (FCC Chairman Richard E. Wiley **[as this is written]**, Federal Communications Commission, 1919 'M' Street NW, Washington, D.C. 20554) **and to Congressman Lionel Van Deerlin** (Chairman, Subcommittee on Communications, U.S. House of Representatives, Room B-331, Rayburn House Office Building, Washington, D.C. 20515) **will be very helpful. The utility of the new low cost equipment does and will extend far beyond the CATV uses; here at last is a low-cost, simple to set up and operate, replacement for coaxial cable for everything from remote telecasts of high school football games** (linking a camera back to the recorder some distance away) **to private and personal video communication system links. The Gunnplexer technology holds great promise for creating a very exciting new revolution in video communications. We all stand on the threshold of a very exciting era in video communication techniques!**

Missing Market?

"Could it be that we are missing another market with out service? I noticed the enclosed cartoon in a local newspaper.

I believe CATJ should turn the boys at the "Lab" loose working out the proper installation procedures for this type of receiver. Do we hit it with 0 dBmV? What about the sound? Down 17 dB? Will there be radiation problems? And what do you charge for the installation. Come on guys. . .we need some guideance and help!"

I get better pictures since I hooked to the cable.

Dick Rondeau
Idyllwild Cable TV
Idyllwild, California
92349

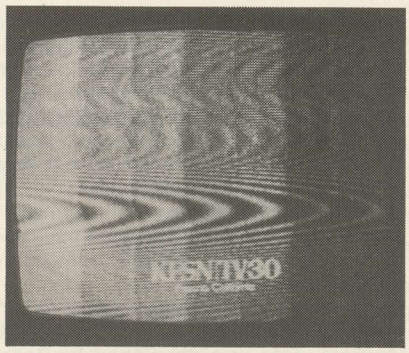
First "Legal" 4.5 Meter Terminal (!)

As reported in the April, 1977 issue of CATJ, the first "legal" installation of a duly licensed 4.5 meter TVRO terminal was completed on April 1st in Kalispell, Montana by TelePrompTer Corporation. The new terminal has a Prodelin 4.5 meter (fiberglass) parabolic antenna.

Installation of additional 4.5 meter terminals at 18 TelePrompTer locations is currently underway. The installation shown here is the Kalispell site.

Crud VS Crud

"I wonder if there might be some help out there in the vast **CATJ** readership, with a problem I have been having here in the Contra Costa county area in California? The best shot from here for the blacked out SF 49'er



football games is channel 30 in Fresno, KFSN-TV. Unfortunately there appears in the channel 30 passband, almost dead on the KFSN antenna heading from Pleasanton, a carrier that seems to be there virtually all the time (see photo). I've scouted for it, and decided that it must be well down the path itself because the heading changes only ever so slightly as you move around the Livermore Valley area and through Contra Costa county. It is strong enough that unless there is propagation enhancement of the KFSN signal, the beat is so close in level to the desired signal that decent reception is impossible.

While I have your attention, if anyone **REALLY** wonders **why** cable has made such a high impact in the eastern portion of the San Francisco Bay region, please see second photo. This is **high band** channel 10 (KXTV) from Sacramento. Now this photo was taken inside of KXTV's Grade A contour, on a good quality off-air antenna. The crud? That is appliance noise. Noise from the rapid expansion of mankind into these lovely acres. **On high band yet you say?** Ha. . .I can show you the same type of stuff clear through channel 60 out here. And on a regular basis. The message here is clear enough—as long as cable headend sites can stay away from the rapid expansion of 'civilization' they'll continue to feed prosperous systems in this part of California."

John Phillips
Pleasanton, California

John -

Appliance, power line, one-lunger gasoline engines and the like are without question ruining off-air reception for not only home-antenna viewers but also for cable sites throughout the United States. We recently tried to run a radiation check on a system in a relatively small town. We set up the dipole, the amplifier and the SLM and started down the street. We kept running into -20 and 15 dBmV "signal" levels every pole or two. Each time when we broke down to check for the source (i.e. modulation) **we found nothing more than intense** 'buzz-buzz-buzz' **from some electrical appliance. The FCC has been extremely negligent through the years in enforcing their rules concerning permissible radiation levels. CATV systems, with rare exceptions, radiate far less 'crud' than man made contrivances that are not supposed to even have RF energy present. What do members of the industry think? Could we all get together and individually** (in each town) **document the extent of such crud? If we could do this in every cable town in America, and then compile that data for formal presentation to the FCC, and Congress. . .we might get some long overdue action! Comments are invited.**

MDS Via The Bird

Microband National System, Inc. (176 Broadway, New York, New York 10038) is in the process of putting a number of the nation's 25 MDS systems into "interconnection" with a new operational entity known as Satellite Networks, Inc. The new TVRO connected installation format is installing earth receiving terminals at locations to serve existing MDS operations in San Francisco, Sacramento, Palo Alto and Milwaukee. Additionally, earth terminals in the Minneapolis and Indianapolis areas currently interconnect MDS stations which now deliver HBO programming. Additional expansion of the MDS satellite interconnected network in 8 additional locations including Tampa/St. Petersburg is underway.

Hughes TVRO Seminar

Coming too late for the June issue of **CATJ,** Hughes is holding a very innovative satellite earth station

technology seminar at the new Hughes facility in Torrance, California during the period July 11 through 15th (just ahead of CCOS-77).

Hughes is bringing in well known and experienced hands at all phases of TVRO system design, installation and operation to lead the seminar group discussions. Included are Carl (Buzz) Van Hecke of Andrew, Dan Yost of Compucon plus Abe Sonnenschein and Norm Weinhouse of Hughes microwave communications products. The seminar includes detailed presentations on the design and operational facets of TVRO installations, as well as what promises to be a most interesting series of tours of the Hughes facility. Hughes has a number of satellites under construction for various domestic and foreign agencies (Hughes originated the geo-sync bird concept) and the attendees will be treated to a first-hand inspection of these next generation satellites. Hughes is making no charge for the seminar course, and while you will **not** have adequate notice in this issue of **CATJ** to attend, you might want to contact Ms. Marcia Dynklau at Hughes (213/534-2146, extension 2376) **if** you would be interested in attending a **later** (repeat) session.

More Than 12 Channels?

"I notice in the June CATJ some interest in running more than 12 channels through single ended equipment. This is now being done very routinely in Canada by putting in a new headend. One of the approaches is to utilize harmonically related carriers **(HRC)** (see my many technical papers on the subject). By using this approach, the system typically provides the customers with converters for all channels in as much as by harmonically relating the full set of operating carriers all 'normal' channels (i.e. the original 12) are shifted by 1.25 MHz or so; and many receivers cannot tune up or down as the case may be that extra amount with the set's built-in fine tuning control. If the system does not mind having to provide converters to all subscribers, **this** is the **best way** to go since it virtually eliminates all second and third order IM (intermodulation products) and harmonic problems; and actually reduces cross modulation.

The next best approach is called **'MCP'** or **'SOS'**; which is multi-pivoted coherent carriers. This was developed by John Cappon and Ted Finlay in Toronto (note: readers should see **CATJ** for **April**, 1976 for an article by Finlay and Cappon) from my own work on coherent carrier systems. This approach allows the addition of from 7 to 9 channels in mid-band on any old single ended system (as long as the amplifiers are not going to be overloaded by the new carrier levels present). This has the advantage of maintaining the so-called 'normal carriers' on their proper (FCC or DOT) assigned frequencies. The MPC approach is now being utilized by at least a dozen Canadian systems including the Vancouver system (possibly the world's largest CATV system), New Westminster (40,000 subs), London, Guelph, Montreal and Peterborough to name a few. The MPC system works fine but it does need a new headend at a cost of from $1500 to $3000 per channel.

Smaller systems might find it less expensive to rework their present amplifiers, as suggested by Broadband Engineering (see **CATJ** for **May** 1977); larger ones should find the HRC or MPC approaches attractive."

I. Switzer
Switzer Engineering Services Ltd.
Mississauga, Ontario
Canada L4V 1G2

Sruki

There are, as you suggest, many alternatives to adding channels in mid-band; certainly replacing a full scale, operating single-ended plant is one of the more expensive approaches. We anticipate there will be considerable in-print discussion of the various features of all three systems (HRC, MPC, and amplifier re-build) in the coming months.

Training For Personnel?

Condon TV System, Inc. is a small (280 subscriber) struggling cable television system located in Condon, Oregon. The system has been in operation since early 1953. In July of last year, Condon TV was purchased by Telephone and Data Systems, Inc. (TDS). TDS is a small **independent** telephone holding company that owns and operates 44 independent companies in 19 different states, including Oregon. It is through TDS's ownership of Home Telephone Company, Condon, Oregon that the System became aware of the television company and its planned sale in 1976. After receiving a waiver from the FCC regarding cross-ownership of

telephone and cable television systems, TDS acquired Condon TV. It now operates the company by purchasing on an arms-length basis management and maintenance services from Home Telephone. I say all this so that you will have some idea of how a cable television system located in Oregon happens to have a Madison, Wisconsin mailing address. TDS coordinates the operation of its various subsidiaries through its Madison, Wisconsin operating headquarters.

Now, to the purpose of my letter. A few weeks back, I had an opportunity to visit the Wisconsin Indianhead Technical Institute located in Rice Lake, Wisconsin. The tech school developed with the assistance of the Wisconsin Independent Telephone Association a one-year telephone service repair program for individuals who are interested in seeking a career in independent telephony. The programs have been developed in a building block fashion so as to allow independent telephone companies to send employees to the school for a two or three-week stay for concentrated study on a specific area of telephony such as Station Installations, Outside Plant Construction, etc. In talking with John W. Graf, Supervisor of the Technical Institute's Telephone Repair Program, our discussion led to the cable television industry and what potential educational needs employees of that industry might have here in Wisconsin, as well as outside the state. I indicated to Mr. Graf that I was unfamiliar with the cable television industry here in Wisconsin but felt from what experience I had obtained in Oregon, the needs of the CATV industry somewhat paralled those of the independent telephone industry with respect to employee education. I suggested to Mr. Graf that there most likely existed a Wisconsin Cable Television Association which might be interested in exploring with the Technical Institute the possible formation of some type of CATV education program. In view of your affiliation with many state associations, I am writing to you in the hope that you may be able to contact appropriate individuals in the Wisconsin Cable Television Association and advise them of the interest that has been expressed by Mr. Graf. Should there be any interest on the part of Wisconsin TV operators to talk with Mr. Graf, I would suggest they contact him by calling (715) 234-7082 or writing to the Wisconsin Indianhead Technical Institute, 1900 College Drive, Rice Lake, Wisconsin 54868.

In closing, let me add that any information on the cable television industry that you would provide Mr. Graf I am sure would be appreciated. I would hope you could also do everything possible to insure that the Wisconsin Cable Television Association explores with the Technical Institute the possibility of developing a program for the industry. I am certain Mr. Graf would be pleased to speak with you or any other individuals.

Charles W. Ricker, V.P.
Condon TV System, Inc.
Condon, Oregon

Mr. Ricker -

We are sharing your letter with all of the industry in hopes that your concept of mutual training might spark similar thoughts in areas other than in Wisconsin.

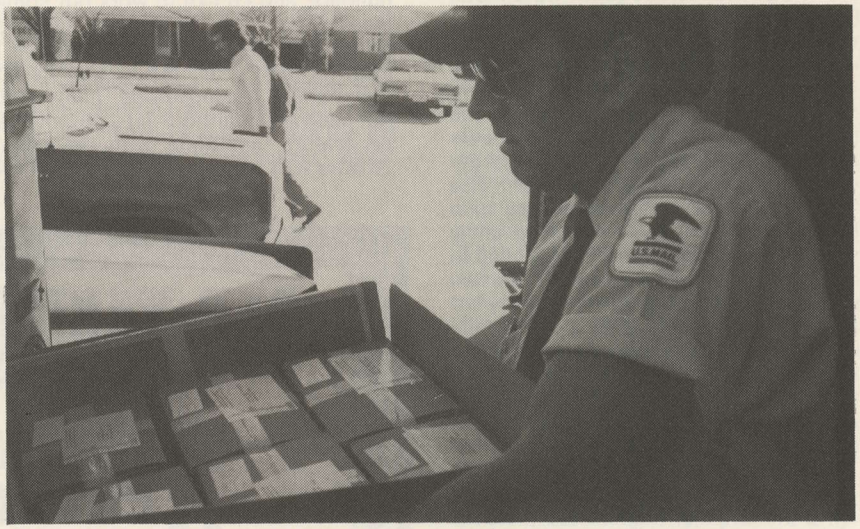
TVRO Parts

"I've got some CPR 224 hardware which might be useful to other TVRO builders, and I'd like to work out some type of exchange of needed 'surplus parts' with people who have things I might need for my own TVRO installation. Among those things I **do not** need are quantity 3 TD-2 microwave generators, complete with diagrams; 70 MHz AT&T IF's for TD-2 gear, TD-1-A 2 CYO amp; a 7 foot NARDA dish with a 3GHz feed. What I am needing includes a do-it-yourself LNA diagram that uses inexpensive transistors, coax line and I could also use an HP-342A automatic noise figure system with an Argon head."

Ted Hartson (WA8ULG)
2444 W. Haibert
Battle Creek, Mi.
(616-963/8429)

Ted -

Several people have contacted us regarding getting together an 'ad-hoc' group of backyard experimenters who can share experiences, parts and technology on do-it-yourself backyard terminals. A few already have systems "up and running" although most are utilizing 'borrowed' hardware which their work makes available to them. We'd happily serve as a national coordination point for these individual efforts if others are interested.



Shipping Out

Taking care of CATA member and CATJ subscriber requirements is a full time task for several CATA/CATJ people. The (relatively speaking) small office staff that handles all CATA member requests and problems, produces CATJ and the CATA Newsletter each month also handles such less-than-monthly special efforts such as the CATA/CATJ Wall Charts, CCOS, the spectrum analyzer kits, regional meetings, R and D at the CATJ Lab . . . and on and on.

For example, when the CBIC (EIA supported) citizens band radio interference wall charts were recently completed as a special project, there were hundreds that needed to be disbursed throughout the CB industry; and several hundred more that were supplied to all CATA member systems. That put our Janet Stone to work rolling up the heavy coated stock finished two color wall charts, inserting them into mailing tubes, getting labels and postage afixed and dropping them into the friendly hands of our friendly mail person.

Which brings us to our mail "character". Hank personifies the type of old style, cares-about-your-mail-service type of mailman that we all remember from our youth; but which is seldom found today. Hank not only trucks our mail in, but he also makes it a point to stop back by to pick up the often-times heavy shipments of things like low-cost-analyzer kits (shown here

being trucked by Hank to his mail vehicle) which our largely feminine staff would otherwise find difficult to lug out of the office and into their own vehicles for a trip to the P.O.

It takes people to make any organization run, and CATA/CATJ is especially proud of not only our own internal people, but the several dozen others who work with us every day to make certain that within the range of reasonable human responsibility, that **what** our members and readers want **is what** they get. **Hat's off to a fine bunch of people!**

Remember TVH?

"I want to thank you very much for locating for me a copy of the June 1961 issue of **Television Horizons Magazine.** Because I created the artwork on the front cover (showing the cable car headed up the hill, loaded with convention-bound CATV people) it means something special to me to have for my files."

R. Wayne Wilson
Seattle, Washington

Mr. Wilson was once on the editorial staff of Television Horizons Magazine; the predecessor to the current TVC magazine. CATJ Editor in Chief Bob Cooper, who started TVH in January of 1960 as the CATV industry's first magazine, probably has one of the few "almost complete" sets of TVH around. Anyone have any of these old "relics" kicking around gathering dust? CATJ would like to have them for our new library project!

Remember Sausalito?

"I want to thank CATA and the CATJ staff for all of the assistance we received during our recent battle with the FCC. We really don't feel triumphant because we have reached a stage of "Mexican-standoff" with the FCC and the television station involved but it did help to know that a call to CATA would give us new strength or ideas and ease some of the constant confusion our little system was in. It made us feel like 'we owned a piece of the rock' to have CATA rooting for us!"

Olive Cushman
Southside Sausalito Cable TV
Sausalito, California

Olive -

Most may not be aware that this spring the FCC decided that your system did not have to add Spanish speaking channel 60 in San Francisco; at least not for the time being. The FCC ruled that as long as Southside added 'no new signals' **they would** not **have to add channel 60; but** when **and if you add additional signals, channel 60 must be carried. The problems of this system were widely covered in CATJ for December 1976.**

Fine TVRO Job

"I believe your February 1977 issue on small TVRO installations was as complete as any such effort, private or public, as I've seen. We are getting calls regularly from clients asking for information on TVRO installations, and since the February issue appeared we simply tell people to go hunt up their office copy of **CATJ.** I have yet to run across a serious question that was not answered in that issue. Congratulations on a job well done!"

Gary A. Dent
Gary Dent & Associates
Dallas, Texas

Gary -

While congratulations are being offered, may we offer ours to you for getting a fine nuts and bolts article published in the March 1977 issue of Banking (Journal of the American Bankers Association). **Gary's article tells bankers what sort of things they need to look for when they are considering local CATV loans. If you have a banker that needs to be educated, refer him to that piece or contact Gary directly at Oak Cliff Bank Tower, Suite 510 in Dallas at zip code 75208.**

CLASS-I-CAT advertising is handled as a no-charge membership service of and by CATA. The rules are as follows:

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

NEW POWER SUPPLIES—for sale. Normal operation with standby battery power. I-TE model No. 600, $300 each. Complete except for batteries. Contact—CON-TECH CATV Services, Inc., 1600 West 38th, Suite 115, Austin, Texas 78731 (512/459-4344).

CADCO GEAR—Four year old CADCO antennas, pre-amps, power supplies, booms and hardware for channels 3, 5, 6, 7, 8, 11 and 13. Excellent condition. $2,000. Jacksboro Cable TV, Box 337, Jacksboro, Texas 75056 (817-567-2553).

STARLINE ONE AMPLIFIERS—with complete accessories. Also Commander 1's with CCV outputs $175. See TV Co., 300 N. Washington, Mexico, Mo. 65265 (314-581-6666).

VIKOA WANTED—Need Vikoa Futura 12 trunk and distribution amps. Miley Cablevision, 101 North Broadway, Tishomingo, Ok. 73460 (405-371-3350).

JERROLD GEAR—WMC-PS, 2 RPS-150, 1 ROS-300; 3 each WCON 10/2 and 13/4; Assorted 26-28 volt PS, some regulated; 100+ tap blocks for 201; 30+ assorted SKL tap boxes; 1 SKL 263 amplifier; 6 Vikoa BPF 2-6, 3, 4, 5, 8; approximately 65 assorted new tubes (6AK5, etc.) at 75 cents each. COD UPS or make offer. J. J. Mueller, Box 646, Manchester, Vt. 05254.

JERROLD TAPS—1600 Jerrold #1491 AM tap blocks, $.50 each; 129 Jerrold LPT Inserts as follows: 29 at 30 dB, 33 at 33 dB, 20 at 36 dB, 27 at 39 dB, 20 at 42 dB at $1.00 each. Consider offer for the lot. Tom Carbaugh, Jerry Conn Associates, P.O. Box 444, Chambersburg, Pa. 17201.

MAKE OFFERS—Jerrold Commander, any VHF input, channel 3 output; Winegard DS-310, DSX-310, DSX-415 panel, DSX AGC strip amplifiers for channels 4, 5, 9 and 12, DS strip amp for channels 2, 4, 5, 7, 9, 12 and FM. Cableview Company, Box 67, Harper, Texas 78631.

CATA ASSOCIATES

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

Andrew Corp., 10500 W. 153rd St., Orland Park, IL. 60462 (**M2, M3, M9** Satellite Terminals) 312—349-3300
Anixter-Pruzan, Inc., 1963 First Ave. S., Seattle, WA. 98134 (**D1**) 206—624-0505
Avantek, Inc., 3175 Bowers Avenue, Santa Clara, CA. 95051 (**M8**) 408—249-0700
Belden Corp., Electronic Division, Box 1327, Richmond, IN. 47374 (**M3**) 317—966-6661
BESTON ELECTRONICS, INC. 903 South Kansas Ave., Olathe, KS. 66061 (**M9**) Character Generators-913-764-1900
BLONDER-TONGUE LABORATORIES, One Jake Brown Rd., Old Bridge, N.J. 08857 (**M1, M2, M4, M5, M6, M7**) 201—679-4000
BROADBAND ENGINEERING, INC., 535 E. Indiantown Rd., Jupiter, FL. 33458 (**D9, replacement parts**) 305-747-5000
FRANK L. CROSS & ASSOCIATES, INC., 5134 Melboune Dr., Cypress, CA 90630, (**M9**) 714-827-0868
CALIFORNIA MICROWAVE, INC., 455 West Maude Ave., Sunnyvale, CA. 94086 (**M9 Satellite Terminals**) 408—732-4000
CATEL, 1400-D Stierlin Road, Mt. View, CA. 94043 (**M4, M9**) 415—965-9003
CCS HATFIELD/CATV DIV. 5707 W. Buckeye Rd., Phoenix, AZ. 85063 (**M3**) 201—272-3850
C-COR ELECTRONICS, Inc., 60 Decibel Rd., State College, PA. 16801 (**M1, M4, M5, S1, S2, S8**) 814—238-2461
COMMUNICATION EQUITY ASSOCIATES, 8200 Normandale Blvd., Suite 323, Bloomington, MN. 55435 (**S3**) 612—831-4522
COMM/SCOPE COMPANY, Rt. 1 Box 199A, Catawba, NC 28609, (**M3**) 704-241-3142
ComSonics, Inc., P.O. Box 1106, Harrisonburg, VA. 22801 (**M8, M9, S8, S9**) 703—434-5965
C R C ELECTRONICS, INC., P.O. Box 855, Waianae, HI 96792, (**M9** Videotape Automation Equipment) 808-668-1227
DAVCO, INC., P.O. Box 861, Batesville, AR. 72501 (**D1, S1, S2, S8**) 501—793-3816
EAGLE COM-TRONICS, INC., 8016 Chatham Dr., Manlius, N.Y. 13104 (**M9 Pay TV Delivery systems & products**) 315—682-2650
FARINON ELECTRIC, 1691 Bayport, San Carlos, CA. 94070 (**M9, S9**) 415—592-4120
FEDERAL BROADCASTING CO. 600 Fire Rd. Box 679 Pleasantville, N.J. 08232 (**D9, S9**)
FERGUSON COMMUNICATIONS CORP., P.O. Drawer 871, Henderson, TX. 75652 (**S1, S2, S7, S8, S9**) 214—854-2405
GILBERT ENGINEERING CO., P.O. Box 14149, Phoenix, AZ. 85063 (**M7**) 602—272-6871
G T E SYLVANIA, 3046 Covington Rd., Marietta, GA 30062, (**M1,D1**) 404-003-1510
HOME BOX OFFICE, INC., 7839 Churchill Way—Suite 133, Box 63, Dallas, TX 75251 (**S4**) 214—387-8557
ITT SPACE COMMUNICATIONS. INC., 69 Spring St., Ramsey, N.J. 07446 (**M9**) 201—825-1600
JERRY CONN ASSOCIATES, INC., P. O. Box 444, Chambersburg, PA 17201 (**D3, D4, D5, D6, D7, D8**) 717-263-8258
JERROLD Electronics Corp., 200 Witner Road, Horsham, PA. 19044 (**M1, M2, M4, M5, M6, M7, D3, D8, S1, S2, S3, S8**) 215—674-4800
LARSON ELECTRONICS, 311 S. Locust St., Denton, TX. 76201 (**M9 Standby Power**) 817—387-0002
LRC Electronics, Inc., 901 South Ave., Horseheads, N.Y. 14845 (**M7**) 607—739-3844
Magnavox CATV Division, 133 West Seneca St., Manlius, N.Y. 13104 (**M1**) 315—682-9105
MICROWAVE ASSOCIATES, INC. 10920 Ambassador Drive-Suite 119 Kansas City, MO. 64153 (**M9**) Microwave Radio Systems-816-891-8895
Microwave Filter Co., 6743 Kinne St., Box 103, E. Syracuse, N.Y. 13057 (**M5, bandpass filters**) 315—437-4529
MID STATE Communication, Inc. P.O. Box 203, Beech Grove, IN. 46107 (**M8**) 317-787-9426
MSI TELEVISION, 4788 South State St., Salt Lake City, UT 84107 (**M9 Digital Video Equip.**) 801—262-8475
OAK INDUSTRIES INC./CATV DIV., Crystal Lake, IL. 60014 (**M1, M9 Converters, S3**) 815—459-5000
PRODELIN, INC., 1350 Duane Avenue, Santa Clara, CA. 95050 (**M2, M3, M7, S2**) 408—244-4720
Q-BIT Corporation, P.O. Box 2208, Melbourne, FL. 32901 (**M4**) 305—727-1838
RADIO MECHANICAL STRUCTURES, INC., P.O. Box 1277, Kilgore, TX 75662 (**M2, M9, S2**) 214-984-0555
R F SYSTEMS, INC., 8720 South Orange Ave., Orlando, FL 32809, 305-857-0036
RICHEY DEVELOPMENT CORP., 1436 S.W. 44th, Oklahoma City, OK. 73119 (**M1, M4, M8, S8**) 405—681-5343
RMS CATV Division, 50 Antin Place, Bronx, N.Y. 10462 (**M5, M7**) 212—892-1000
Sadelco, Inc., 299 Park Avenue, Weehawken, N.J. 07087 (**M8**) 201—866-0912
Scientific Atlanta Inc., 3845 Pleasantdale Rd., Atlanta, GA. 30340 (**M1, M2, M4, M8, S1, S2, S3, S8**) 404—449-2000
SITCO Antennas, P.O. Box 20456, Portland, OR. 97220 (**D2, D3, D4, D5, D6, D7, D9, M2, M4, M5, M6, M9**) 503—253-2000
Systems Wire and Cable, Inc., P.O. Box 21007, Phoenix, AZ. 85036 (**M3**) 602—268-8744
TEXSCAN Corp., 2446 N. Shadeland Ave., Indianapolis, IN. 46219 (**M8, bandpass filters**) 317—357-8781
Theta-Com, P.O. Box 9728, Phoenix, AZ. 85068 (**M1, M4, M5, M7, M8, S1, S2, S3, S8, AML MICROWAVE**) 602—944-4411
TIMES WIRE & CABLE CO., 358 Hall Avenue, Wallingford, CT. 06492 (**M3**) 203—265-2361
Titsch Publishing, Inc., P.O. Box 4305, Denver, CO. 80204 (**S6**) 303--573-1433
Tocom, Inc., P.O. Box 47066, Dallas, TX. 75247 (**M1, M4, M5, Converters**) 214—438-7691
TOMCO COMMUNICATIONS, INC., 1077 Independence Ave., Mtn. View, CA 94043 (**M4, M5, M9**) 415-969-3042
Toner Cable Equipment, Inc., 418 Caredean Drive, Horsham. PA. 19044 (**D2, D3, D4, D5, D6, D7**) 215—675-2053
Triple Crown Electronics Inc., 42 Racine Rd., Rexdale, Ontario, Canada M9W2Z3 (**M4,M8**) 416 743-1481
UNITED PRESS INTERNATIONAL, 220 East 42nd St., New York, N.Y. 10017, (**S9**) (Automated News Svc.) 212-682-0400
UNITED STATES TOWER & FAB. CO. P.O. Drawer "S", Afton, OK 74331 (**M2,M9**) 918-257-4257
Van Ladder, Inc., P.O. Box 709, Spencer, Iowa 51301 (**M9, automated ladder equipment**) 712—262-5810
VIDEO DATA SYSTEMS, 40 Oser Avenue, Hauppauge, N.Y. 11787 (**M9**) 516-231-4400
VITEK ELECTRONICS, INC., 200 Wood Ave., Middlesex, N.J. 201—469-9400
WAVETEK Indiana, 66 N. First Ave., Beech Grove, IN. 46107 (**M8**) 317—783-3221
WEATHERSCAN, Loop 132 - Throckmorton Hwy., Olney, TX. 76374 (**D9, Sony Equip. Dist., M9 Weather Channel Displays**) 817—564-5688
Western Communication Service, Box 347, San Angelo, TX. 76901 (**M2, Towers**) 915—655-6262/653-3363

NOTE: Associates listed in bold face are Charter Members

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

Manufacturers:
M1—Full CATV equipment line
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M8—CATV test equipment

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

SHOWCASE

AML Guide Book

A new brochure/booklet from the Hughes Aircraft Company puts the AML "story" into context for people who have an interest in exploring how AML's multiple-channel CARS band microwave transmission and reception system might be an effective answer for their system planning.

The new package describes how AML works, what the operating parameters for several different transmitters and receivers are, and explains typical AML applications. A no-charge copy of the material (entitled "AML Brochure") is available from Hughes Microwave Communications Products, 3060 West Lomita Blvd., Torrance, California 90509 (214/534-2146).

Broadband Has Mod-Kits

Broadband Engineering, Inc. (535 E. Indiantown Road, Jupiter, Fl. 33458) has announced the availability of field modification kits for many lines of 'older" CATV distribution equipment (see CATJ for May 1977). The 'Mod-Kits' are thoroughly tested by Broadband prior to shipment, contain all component parts required to update the operating characteristics of older CATV plant gear and include complete instructions for field modifications.

Typical improvements are: noise figure improvements of 2-3 dB at 220 MHz, cross-mod improvements of 6-10 dB for 12 channels, output capability improvements of 3-5 dB for 12 channels, and increased bandwidth.

Systems To Pruzan

Systems Wire and Cable has announced that it now has a distributor stocking arrangement in effect with Anixter-Pruzan, Inc. Under the terms of the agreement trunk and distribution and drop cables are being stocked in all five of the Anixter-Pruzan warehouses across the United States.

Systems Wire and Cable will continue to provide factory direct shipments from their Phoenix, Arizona plant as well.

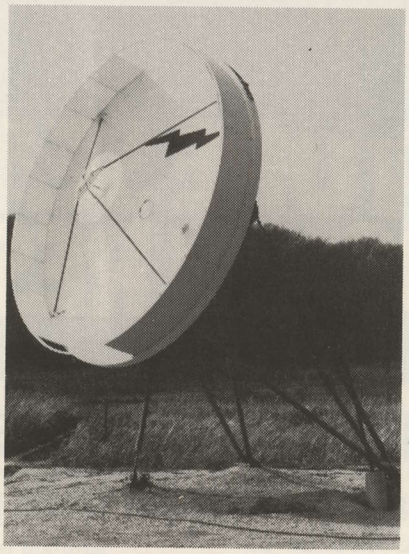
TVRO Progress

TelePrompTer Corporation has ordered eighteen (18) 4.5 meter television receive-only satellite terminals from **Hughes Aircraft Company.** Following the successful installation of their first 'small' terminal in Kalispell, Montana (see **CATJ** for April 1977; **page 52**) TPT has decided to make similar 4.5 meter installations at additional system sites. This brings the number of TVRO terminals installed or about to be installed for TelePrompTer to 48.

C-COR Has Been Busy

C-Cor Electronics, Inc. (60 Decibel Road, State College, Pa. 16801) recently completed expansion of its manufacturing facilities resulting in a 50% increase in manufacturing floor space. The expansion includes the installation of a facility for the specialized construction of PC boards. C-COR has also announced the signing of a contract to provide CATV gear and engineering supervision for a new CATV system in West Fargo, North Dakota. A similar contract was announced for the construction of expansion lines for Tele-Media's system headquartered in Key West, Florida. The Tele-Media system is re-building one of the pioneer systems in the United States and expanding the system to serve previously unserved segments of the far southern Florida Keys.

Andrew Corporation (10500 W. 153rd Street, Orland Park, Il. 60462) has released specifications on a new 'high-performance' 4.5 meter terminal antenna. The antenna has 44 dBi gain at 4 GHz, employs a three-point mount and is available with a 'shroud' for controlling side lobe rejection in situations where terrestrial interference might be or become a problem. Andrew bulletin 1166 details the new antenna.



Scientific-Atlanta (3845 Pleasantdale Road, Atlanta, Georgia 30340) has been exceedingly busy in the small terminal arena of late. S/A has announced:

(1) A new model **414** 'video' receiver covering 3.7 to 4.2 GHz, with a frequency tuning system employing a synthesizer-tuned down-converter, a threshold-extension system (optional), 15 dB maximum noise figure, input dynamic range of 40 dB and IF bandwidths of from 17.5 to 36 MHz selectable by the choice of the appropriate IF module. RF 'channel' selection is in either .25 or 2.5 MHz increments.

(2) The new 414 receiver has been ordered, S/A reports, by the State of Alaska for their new "Bush Terminal" receive sites. The "Bush Terminal" sites are providing first-time television reception to remote Alaskan villages via RCA's SATCOM 'bird'.

(3) Western Tele-Communications, Inc. (WTCI) has ordered 15 TVRO (5 meter) terminals from S/A for delivery over the next 12 months.

(4) B.C. Cable in Juneau, Alaska has ordered the S/A 10 meter terminal for delivery of cable TV via satellite programming to Alaska's first TVRO equipped CATV system.

(5) Telecom Engineering, Inc. has ordered S/A 5 meter terminals for their Ironton, Ohio and Texarkana, Texas systems. The two terminals will supply TVRO delivered programming to a total of six communities.

(6) Satellite Systems Corporation of Marquette, Michigan (they had the name long before we had the satellite!) has ordered four of the S/A 5 meter terminals for installation at Fort Campbell, Kentucky, Little Rock (AFB), Arkansas, Shaw (AFB), South Carolina and Redstone Arsenal, Alabama.

Prodelin, Inc. (1350 Duane Avenue, Santa Clara, California 95050) has announced that **JAMPRO Antenna Company** (Sacramento, California) will now be a stocking distributor for Prodelin Copper Coaxial Transmission line and accessories. The stock will include corrugated and smooth sheath cables, connectors, pressurization equipment and accessories.

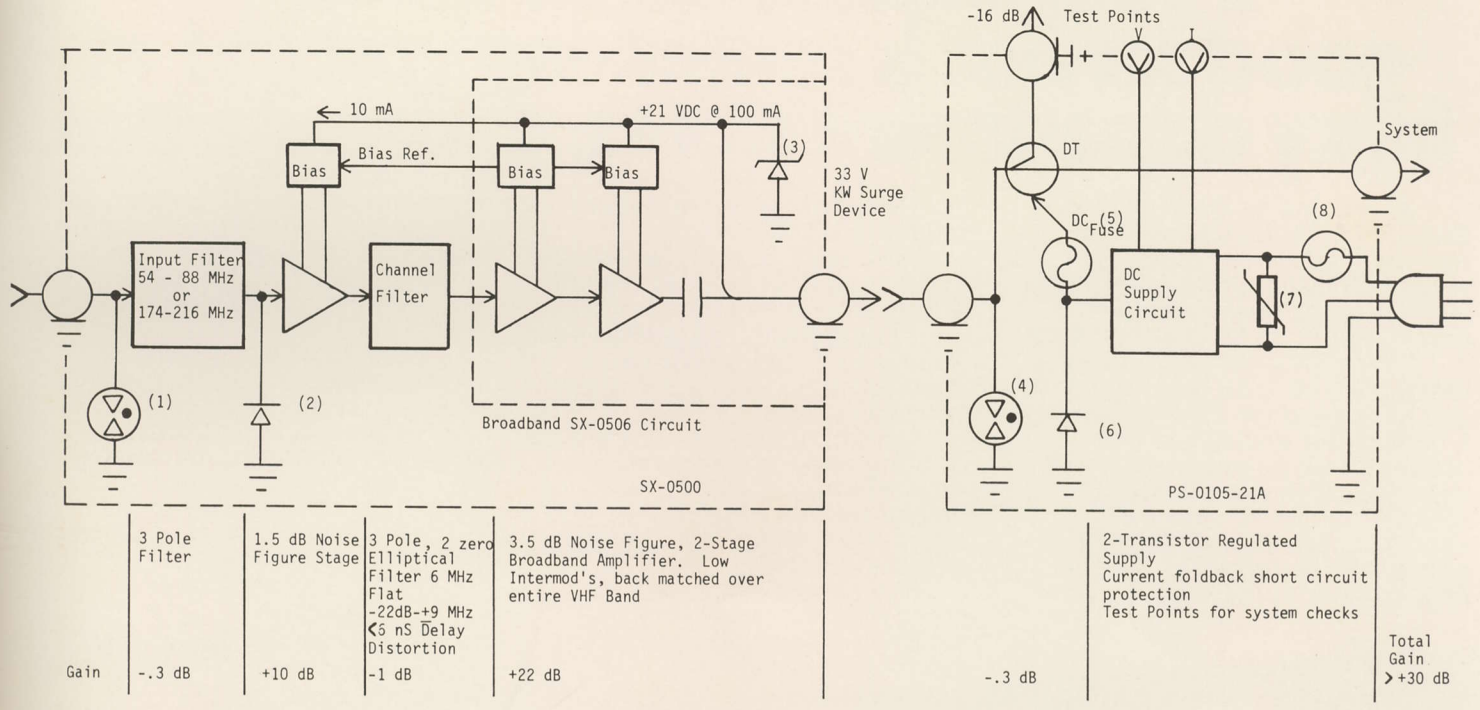
New Jerrold Products/Materials

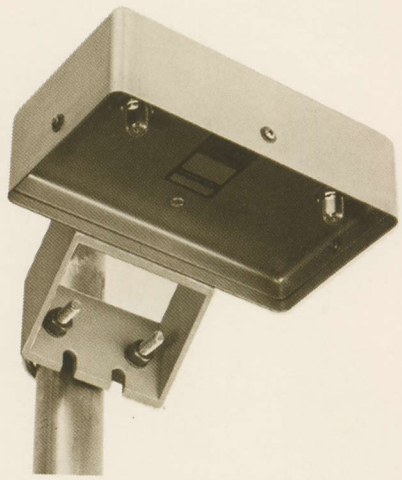
Jerrold Electronics (200 Witner Road, Horsham, Pa. 19044) has announced the availability of a host of new products many of which are designed to augment the company's product line-up in the pay-cable field.

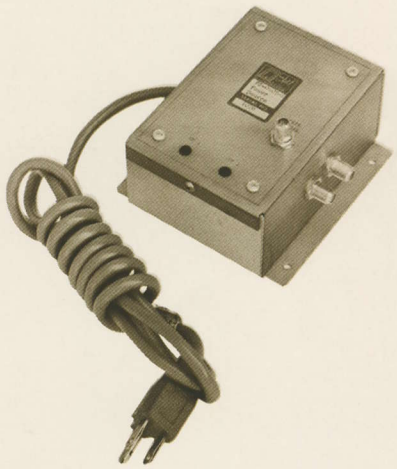
(1) The new **STARPACK** Pay-TV Security System is a scramble/descramble package involving an outdoor descrambler that can be so mounted that the CATV system subscriber is unable to gain easy access to the unit; and the CATV system can retrieve the unit should the customer dis-connect from the system. A "low cost" control unit does mount indoors.

(2) The new **STARCOM-III** Cordless Converter is a remote control system with varactor tuning and an "all electronic memory". The unit functions by sending an ultra-sonic digital control signal from the remote control box to the set-mounted converter. A digital display on the remote control box indicates the channel the package is tuned to; up to 36 channels total. The package also features fine tuning and on-off for the receiver from the remote control package.

The SX-0500 Is *Not Just* Another CATV Antenna Preamp!







Q-bit Corporation's SX-0500 VHF Preamplifier design goes far beyond delivering gain and a low noise figure.

Compare all these equally important operational features:

- **8 points of lightning and surge protection ••• Field-proven effective.**
- **Additional transistors used to bias the RF transistors results in stable and reliable operation from -50°F to +140°F. Likewise, any transistor can be changed without any realignment required.**
- **Selective channel filtering with low delay distortion and buffered from input/output interfaces.**
- **High level output stages for low intermodulation distortion.**
- **Test points in the power source for meaningful system tests without disturbing operations.**
- **Each amplifier noise figure is measured with a certified AIL noise source. This and other test data is supplied with each unit.**

We do all this (including power source and mounting hardware) for only $155.00.

30 dB UHF single channel and broadband preamplifiers also available.

For more information on all CATV products, write or call:

Q-bit
Q-BIT CORPORATION
MELBOURNE FLORIDA

Q-BIT CORPORATION
P. O. Box 2208
Melbourne, Florida 32901
Telephone: (305) 727-1838

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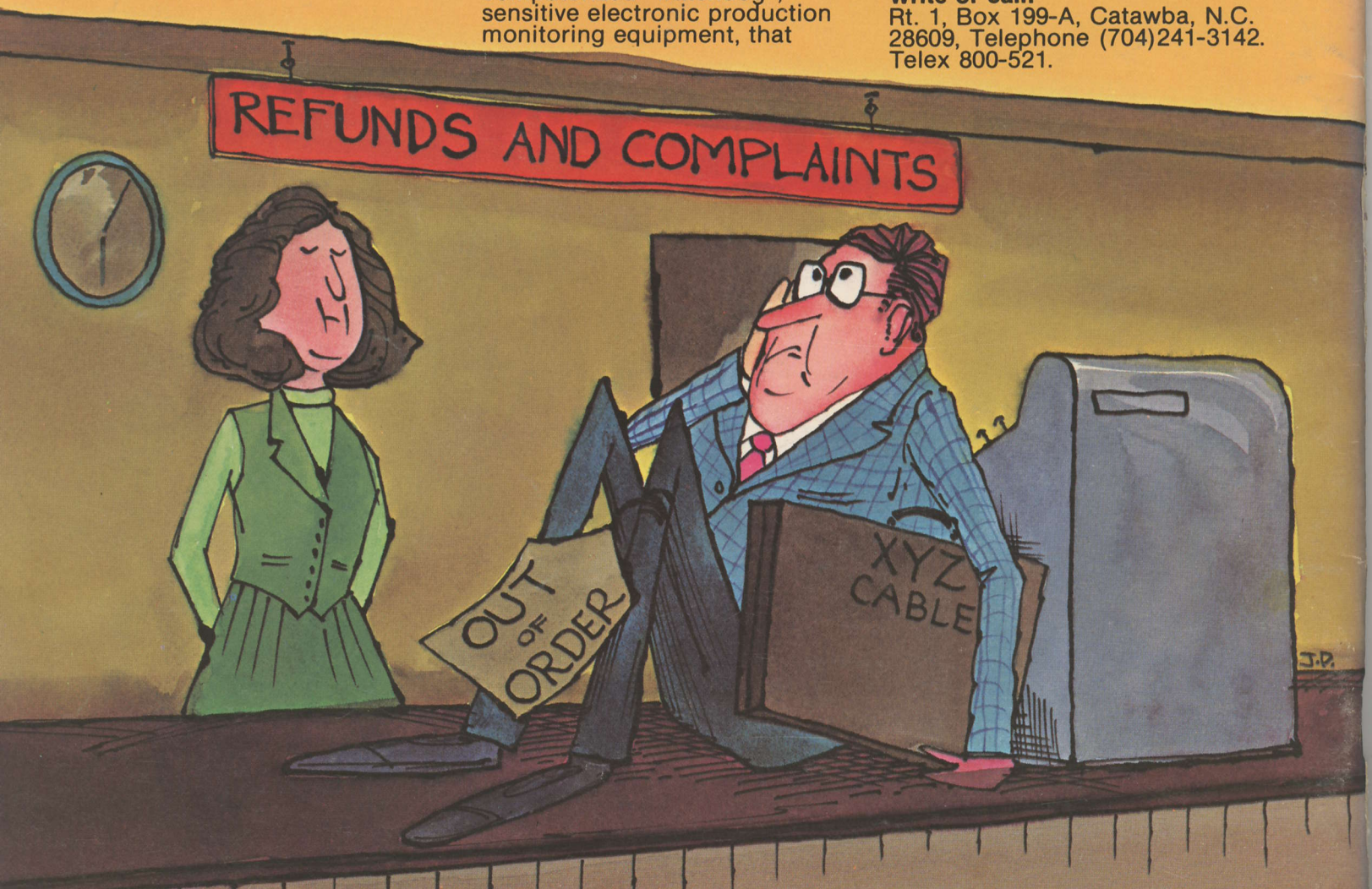

Comm/Scope Company
We give you something besides great cable. A great company.