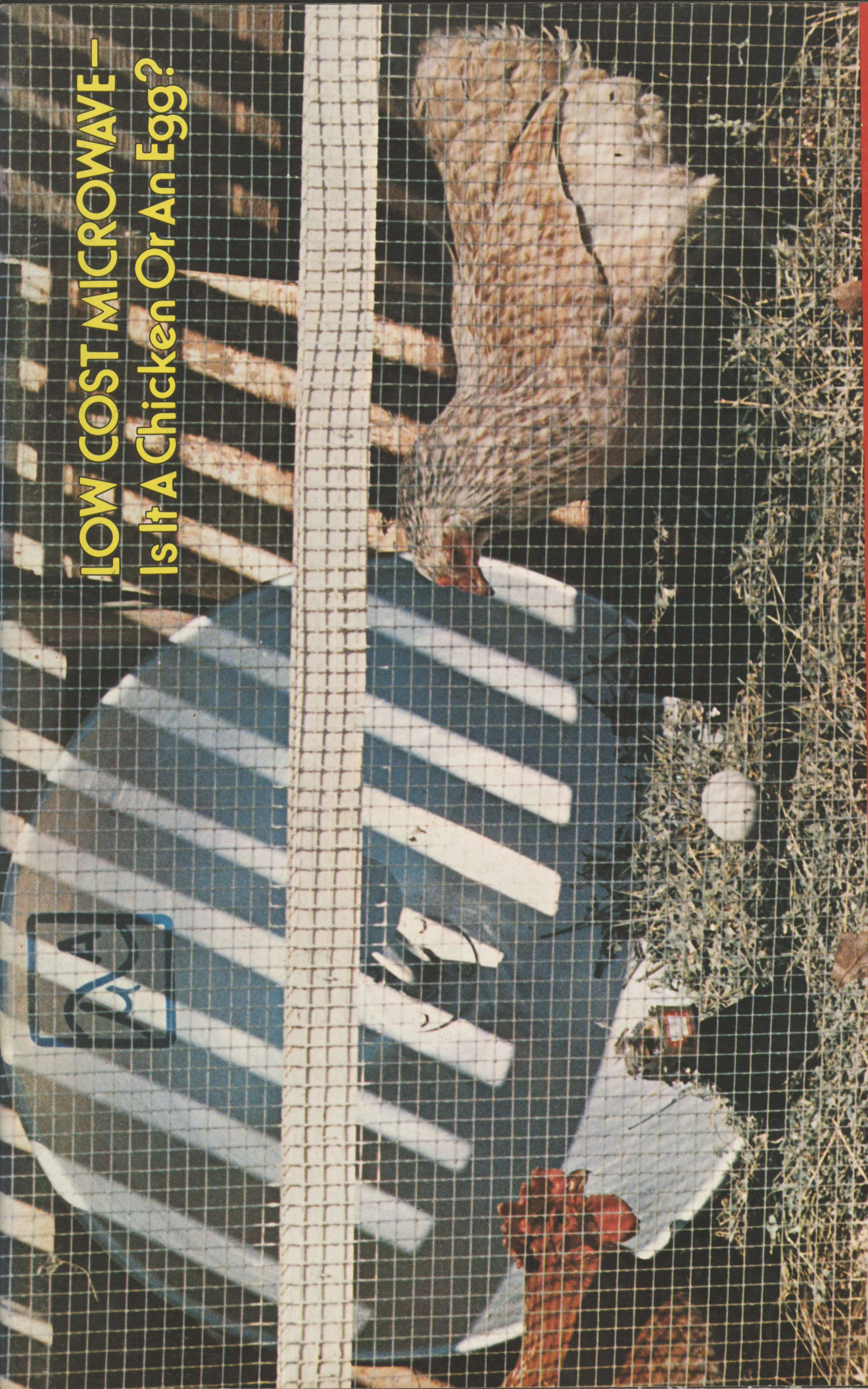


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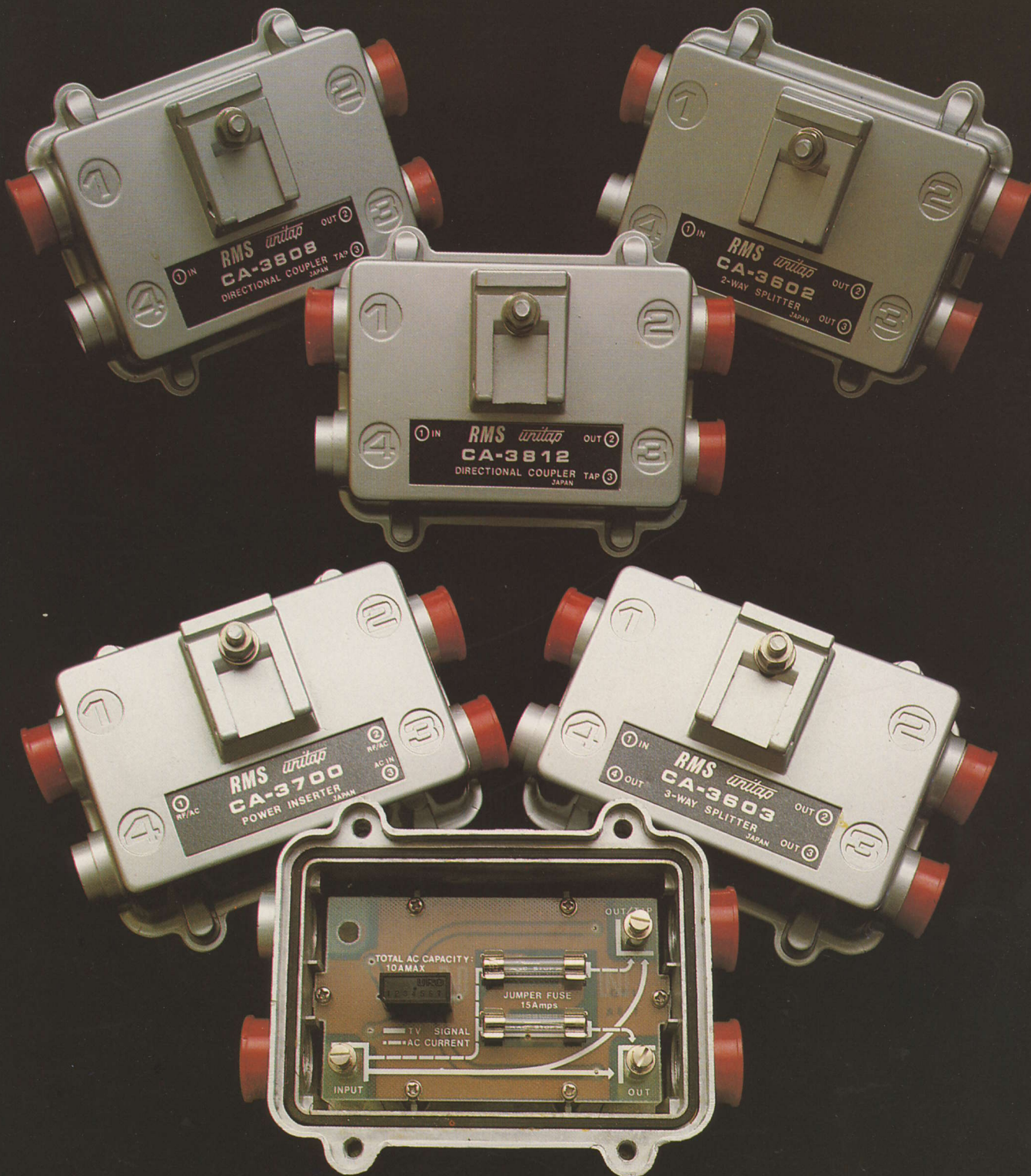


OFFICIAL JOURNAL
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JUNE
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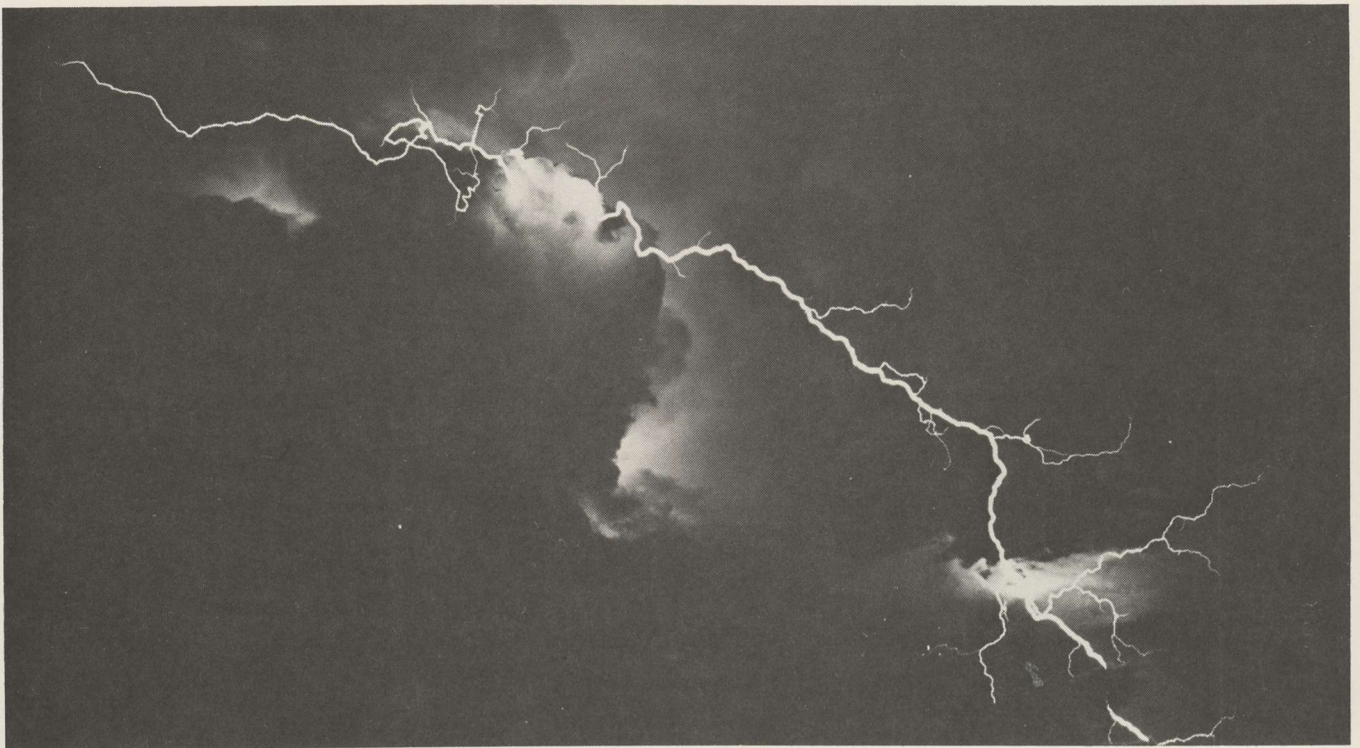
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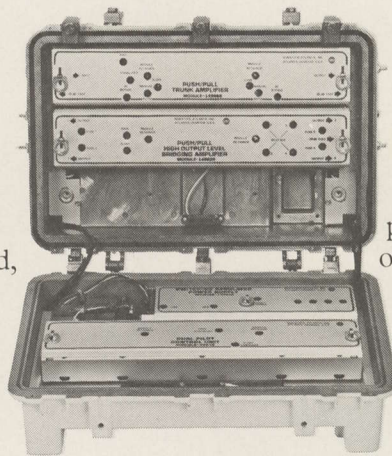


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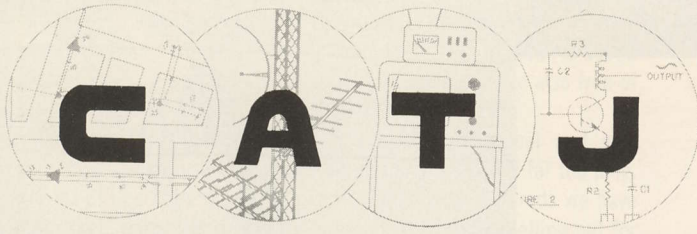


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**JUNE
1978**

VOLUME 5—NUMBER 6

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OUR COVER

Low cost microwave. Where is it? This issue features a look at the licensing problems (see page 21) and presents a do-it-yourself video (with 4.5 MHz aural sub-carrier) transmitter system developed at the CATJ Lab this past winter (see page 32). The whole issue asks the question "can a low cost microwave approach surface in an industry where hardware traditionally costs an arm and a leg"? **Which comes first.** . . the gear, or, the rules to allow the gear to be used???

CATA "TORIAL

KYLE D. MOORE, President of CATA, Inc.



The 1,000 Subscriber Exemption

By unanimous accord the Federal Communications Commission, on April 26th, changed the rules for small town, rural cable. It decided some 58 weeks after it said it saw no reason not to, that cable systems with fewer than 1,000 subscribers served from one headend are not a threat to the economic viability of television broadcasting stations. And therefore **such small cable systems are now free to carry any signals they wish**, without regard to the origin of the signals nor the delivery mode, wherever they wish. And without a CAC from the Commission.

This 'decision' follows the March 10, 1977 decision that established that systems with fewer than 500 subscribers were not an economic threat to conventional over the air telecasting.

Small town cable (or community antenna service) differs widely from big town service; few will dispute this fact. Small town cable tends to be **locally** owned and **locally** managed. That makes the system operator typically more responsive to the needs, wants and desires of the community simply because the system owner and operator must not only do business in the town, he must purchase his groceries there, bank there, send his kids to school there and attend church there. Small town cable ends up being more of a 'local service' than big town cable, although there are of course exceptions to every generalization.

Small town cable has largely **been** an off-air service. Except in those exceptional circumstances where service was impossible unless signals were brought in by common carrier microwave, the traditional small town system has been forced to make the very best possible use of distant, often long-haul-path signals. This has forced the small town operator to keep on improving his off-air antenna system, to maintain his pre-amplifiers and headend processing equipment in the best possible condition simply because he had very little (if any) margin for degradation in his receiving system. The

FCC believes that some 42% of all CATV systems in operation are in the 'under 1,000 subscriber category' and certainly this number is believable; although undoubtedly low.

However, what such numbers fail to show is that a much higher percentage of 'smaller' systems are owned and operated independent of multiple system type operations. A recently completed CATA study indicates that of approximately 1,700 'small' systems studied, there are some 840 different owners. The balance of all of the 'non-small' CATV systems in the United States are owned by just over 100 'owners' or corporations. On a one-man-owner, one-vote system clearly the small, independent operator would 'out vote' his larger corporate brethren.

That says that probably fewer than 950 'companies' actually operate in the CATV industry. And that makes us a relatively small industry. And for many years we have been getting smaller all of the time. Because it has been the nature of this business to be a good producer of 'cash flow' once debt is paid off (and often before if the debt has been carefully structured), there has been a ready market for system acquisitions by established operators in an expansion mood. For many years systems were bought and sold for cash or cash and stock or stock alone for some simplistic formula such as "five times gross earnings" or "seven times cash flow" or... (pick your own favorite). In the past year or two the traditional sellers (independent operators) have become more reluctant to sell out their holdings to the traditional buyers (the multiple system owners). CATV systems, like any business, are sold for a variety of reasons. Many are personal, and many are business related. The threat of bureaucracy (the unknown fears associated with regulation) has been a legitimate reason for sale since 1972 for small systems operated by their owners with no help or modest part time help. When the FCC decided that systems with fewer than 500 subscribers no longer warranted their bureaucratic attention in

1977 hundreds of small system operators breathed a collective sigh of relief and went back to what they **used** to do very well; running a small one man business. With the 'upping' of that number to 1,000 subscribers now another sizeable group of operators are **also free** of the 'six-year-fear' brought on by the 1972 rules.

The fear of FCC bureaucracy has been a very real and very legitimate concern in the small system marketplace for far too long. Dozens of operators we are acquainted with (and hundreds we have never met, we suspect) have teetered on the brink of selling out for as many as six years because of that 'fear'. An accurate accounting of how many actually sold out since 1972 because of the 'fear of bureaucratic entanglement' in their small businesses cannot be made. **We estimate** the number to be in the 100-150 system region, a not insignificant 12-15% of the total systems operating in this size category. In the process of 'selling out' we know of many fine, skillful and talented operators who are no longer a part of our industry. The loss of their skills is very real indeed when you remember how few 'people' are actually involved in the ownership and operation of systems nationwide. Their skills are a resource to the industry as a whole, and the loss of these skills has been an industry loss.

The immediate reaction of most who heard the latest bit of FCC good news has been jubilation and relief. A chap who has been in our business since 1955, operating first one and now a dozen small systems in very rural areas had been on the edge of selling out his systems. With the news of the FCC ruling he drew a deep breath, and tore up the contract for sale of his systems which he had been scheduled to sign the very day he heard the news.

There is not now (nor has there ever been) anyplace in the 'free marketplace' for bureaucratic pressure. Washington bureaucrats have **never** been able to perceive just **how deeply** their rules and

regulations cut, how many personal lives are affected by their morass of largely idiotic rules and regulations. In the instant case of small cable system operations there has been unmeasureable loss to both the industry and the public served by smaller systems during the 'six year fear'. It is a sad lament on the bureaucratic processes that there is virtually no way for those adversely affected by bureaucratic dumbness to go back now and sue for damages; and collect.

But all of that is now past us and the days ahead look brighter indeed; at least for those 'fortunate enough' to be below the 1,000 subscriber number. Not only are such systems now free to carry any signals they wish, but the continued erosion of TVRO pricing suggests that small systems will one day soon have access to those 'bird signals' at very reasonable capital and signal delivery costs. At the recent NCTA meet in New Orleans there was open discussion of complete basic terminals in the under \$17,000 range and some suggesting, quietly perhaps, that \$15,000 would buy a (one channel receive) terminal (see separate report starting on page 14 here). At the forthcoming CATA CCOS '78 national gathering in mid-July we have been told by several suppliers to expect even further price reductions in TVRO equipment and ASN is suggesting that their WESTAR II four channel service could be laid into a typical system (with **four channels** of video) for perhaps \$18,000; and five year lease-purchase terms.

When one adds up these technology changes, the 1,000 subscriber exemption ruling, and the greatly improved 'attitude' of small system entrepreneurs there can only be one conclusion; that small town cable is coming back, heady and strong, to rural America. And that will, we predict, reverse the trend of the past five to six years as owner operated businesses once again regain their rightful place in the marketplace of America.



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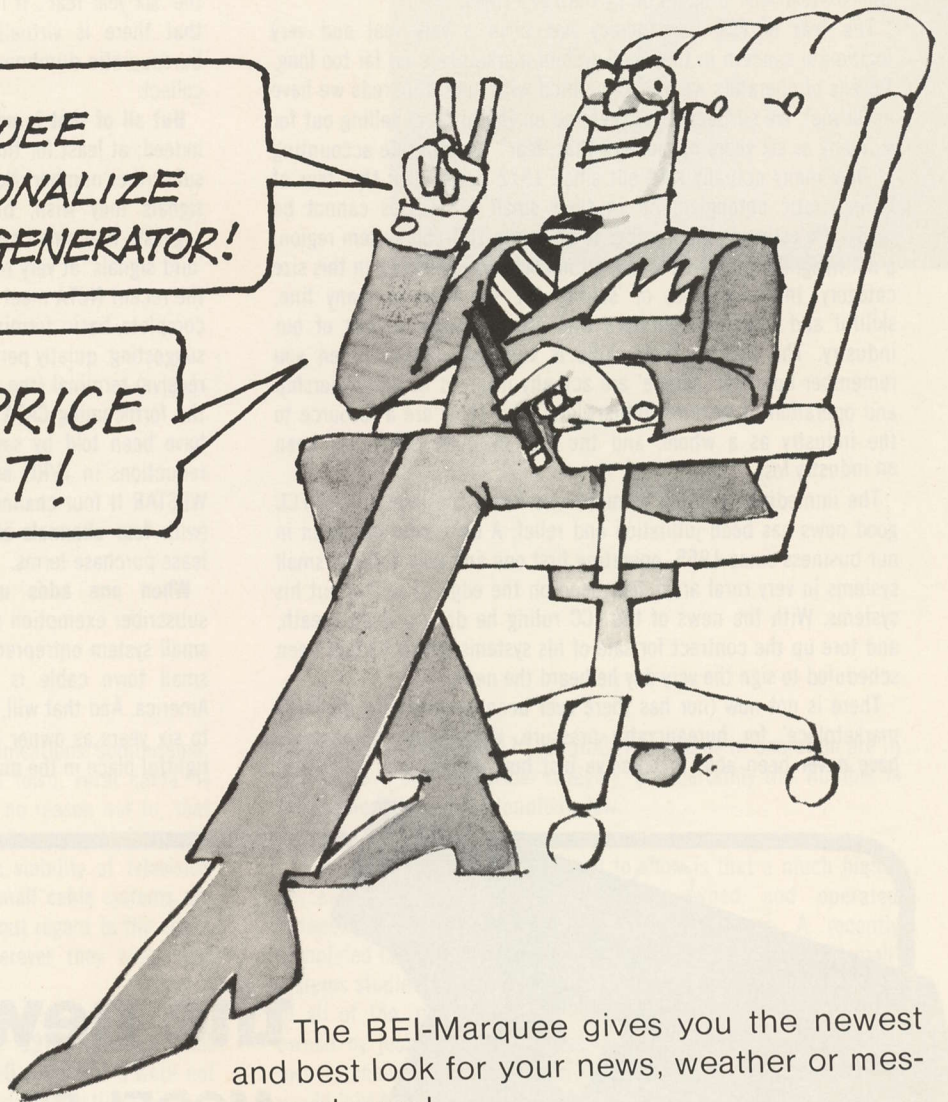
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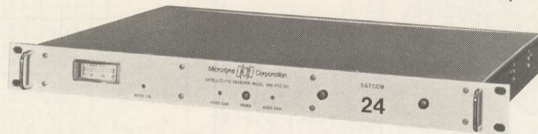
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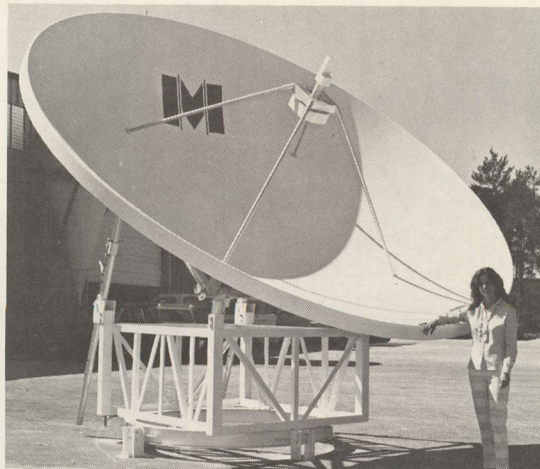
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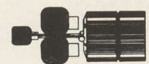
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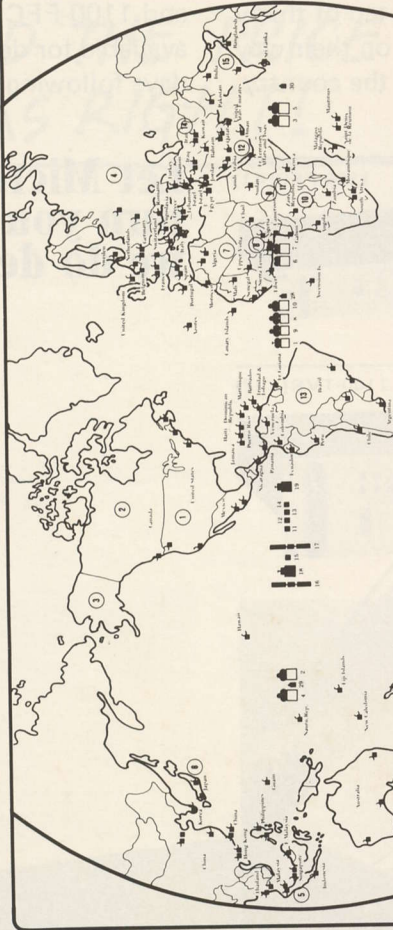
Intelsat IV-A total of three satellites in orbit. The first satellite was launched by Hughes Aircraft Company in August 1974. The second satellite was launched in October 1974. The third satellite was launched in December 1974. The satellites are in orbit at an altitude of 35,800 km. The satellites are in orbit for a period of 12 years. The satellites are in orbit for a period of 12 years. The satellites are in orbit for a period of 12 years.



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8. The satellites are in orbit for a period of 12 years.
9. The satellites are in orbit for a period of 12 years.
10. The satellites are in orbit for a period of 12 years.

WORLDWIDE COMMUNICATION SATELLITES

Satellite communications is a fast changing science. Changes in technology, that miniaturized satellites will be used to provide global coverage. This chart has been prepared by Communications Satellite Corporation, Washington, D.C. 20540. It is a preliminary chart and is subject to change without notice.



Key	System	Year	Service
1	NAVSTAR	1978	Navigation
2	NAVSTAR	1979	Navigation
3	NAVSTAR	1980	Navigation
4	NAVSTAR	1981	Navigation
5	NAVSTAR	1982	Navigation
6	NAVSTAR	1983	Navigation
7	NAVSTAR	1984	Navigation
8	NAVSTAR	1985	Navigation
9	NAVSTAR	1986	Navigation
10	NAVSTAR	1987	Navigation
11	NAVSTAR	1988	Navigation
12	NAVSTAR	1989	Navigation
13	NAVSTAR	1990	Navigation
14	NAVSTAR	1991	Navigation
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33	NAVSTAR	2010	Navigation
34	NAVSTAR	2011	Navigation
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36	NAVSTAR	2013	Navigation
37	NAVSTAR	2014	Navigation
38	NAVSTAR	2015	Navigation
39	NAVSTAR	2016	Navigation
40	NAVSTAR	2017	Navigation
41	NAVSTAR	2018	Navigation
42	NAVSTAR	2019	Navigation
43	NAVSTAR	2020	Navigation
44	NAVSTAR	2021	Navigation
45	NAVSTAR	2022	Navigation
46	NAVSTAR	2023	Navigation
47	NAVSTAR	2024	Navigation
48	NAVSTAR	2025	Navigation
49	NAVSTAR	2026	Navigation
50	NAVSTAR	2027	Navigation
51	NAVSTAR	2028	Navigation
52	NAVSTAR	2029	Navigation
53	NAVSTAR	2030	Navigation

NORTH AMERICAN DOMESTIC SATELLITES

North American domestic satellites provide services to the United States and Canada. These services include television, radio, and data transmission. The satellites are in orbit at an altitude of 35,800 km. The satellites are in orbit for a period of 12 years.



Key	System	Year	Service
1	ANIK	1972	Television
2	ANIK	1973	Television
3	ANIK	1974	Television
4	ANIK	1975	Television
5	ANIK	1976	Television
6	ANIK	1977	Television
7	ANIK	1978	Television
8	ANIK	1979	Television
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20	ANIK	1991	Television
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22	ANIK	1993	Television
23	ANIK	1994	Television
24	ANIK	1995	Television
25	ANIK	1996	Television
26	ANIK	1997	Television
27	ANIK	1998	Television
28	ANIK	1999	Television
29	ANIK	2000	Television
30	ANIK	2001	Television
31	ANIK	2002	Television
32	ANIK	2003	Television
33	ANIK	2004	Television
34	ANIK	2005	Television
35	ANIK	2006	Television
36	ANIK	2007	Television
37	ANIK	2008	Television
38	ANIK	2009	Television
39	ANIK	2010	Television
40	ANIK	2011	Television
41	ANIK	2012	Television
42	ANIK	2013	Television
43	ANIK	2014	Television
44	ANIK	2015	Television
45	ANIK	2016	Television
46	ANIK	2017	Television
47	ANIK	2018	Television
48	ANIK	2019	Television
49	ANIK	2020	Television
50	ANIK	2021	Television
51	ANIK	2022	Television
52	ANIK	2023	Television
53	ANIK	2024	Television
54	ANIK	2025	Television
55	ANIK	2026	Television
56	ANIK	2027	Television
57	ANIK	2028	Television
58	ANIK	2029	Television
59	ANIK	2030	Television

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	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
36	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5
37	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5
38	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5
39	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5
40	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5
41	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5
42	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5
43	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5
44	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5
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46	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5
47	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5
48	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5
49	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5
50	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5
51	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5
52	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5
53	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5
54	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5
55	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5
56	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5
57	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5
58	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5
59	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5
60	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5

TVRO DESIGN TRADE OFFS

Trade-off curves showing the relationship between various parameters for TVRO systems. The graph plots parameters such as EIRP, G/T, and antenna diameter against each other. The curves show that as one parameter increases, another must decrease to maintain a constant system performance. The graph is used to determine the optimal design for a given set of constraints.

SATELLITE LINK EQUATIONS

$$C/N = EIRP - L - 10 \log R - K$$

$$C/N = G/T + C - 10 \log R - K$$

$$EIRP = C/N + L + 10 \log R + K$$

$$G/T = C/N - C + 10 \log R + K$$

Where: C/N = Carrier-to-noise ratio (dB-Hz), EIRP = Effective Isotropic Radiated Power (dBW), L = Free space loss (dB), R = Range (km), K = System constant (dB-Hz).

MECHANICS OF THE DOWNLINK



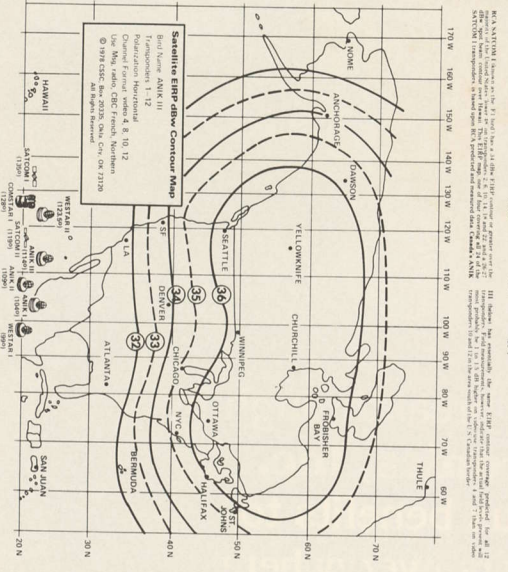
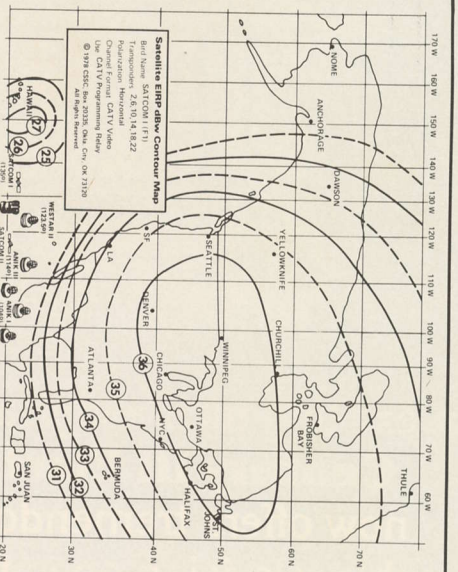
The satellite downlink is the link between the satellite and the ground station. It is the most critical part of the communication system. The downlink is subject to a variety of atmospheric effects, including rain fade, scintillation, and multipath interference. These effects can significantly degrade the signal quality and must be accounted for in the system design. The ground station must use techniques such as adaptive antennas and error correction codes to maintain a reliable link. The satellite must also have a robust transmitter and antenna system to ensure that the signal is transmitted accurately over the long distance.



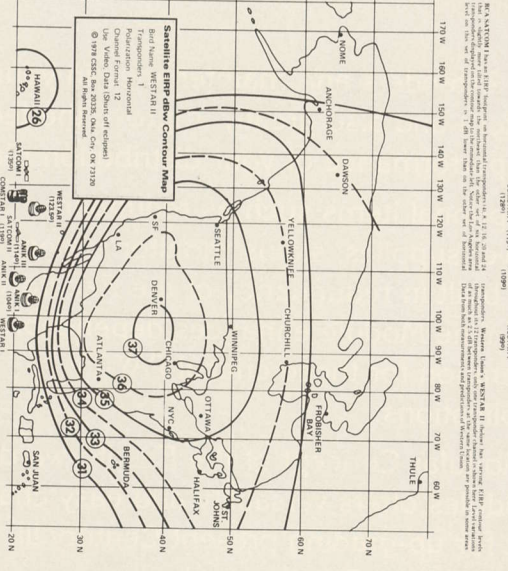
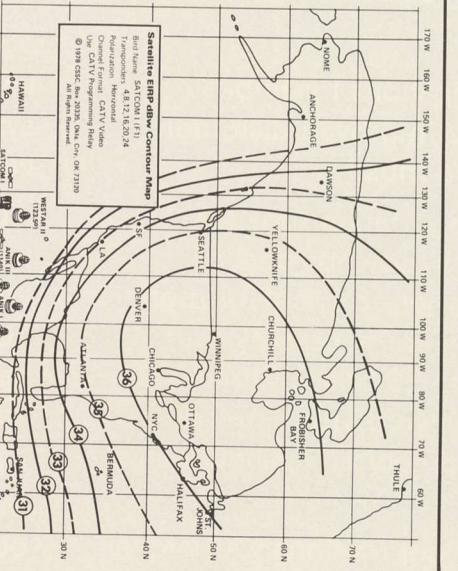
The satellite in orbit is the central component of the communication system. It receives signals from the ground station and retransmits them to the intended recipients. The satellite must maintain a precise orbit and have a stable orientation to ensure accurate signal transmission. It also carries various instruments and payloads, such as transmitters, receivers, and antennas. The satellite's power is typically provided by solar panels, and it must have a reliable power management system to ensure that it can operate for the duration of its mission. The satellite's communication system is designed to handle a wide range of frequencies and data rates, allowing it to support various types of communication services.

PATTERNS FOR PLANNING

The satellite coverage patterns shown in this section are based on the current orbital parameters of the satellites. These patterns are used to plan communication services and to determine the areas of coverage for each satellite. The patterns are shown as contour lines on a map of the United States and surrounding regions. The contours represent the signal strength and coverage area of the satellite. The patterns are used to determine the areas of coverage for each satellite and to plan communication services. The patterns are also used to determine the areas of coverage for each satellite and to plan communication services.



The ground station is the link between the satellite and the ground. It receives signals from the satellite and retransmits them to the intended recipients. The ground station must have a reliable power supply and a robust communication system to ensure that it can operate for the duration of its mission. The ground station also carries various instruments and payloads, such as transmitters, receivers, and antennas. The ground station's communication system is designed to handle a wide range of frequencies and data rates, allowing it to support various types of communication services.



SATELLITE TV PROGRAMMING

The satellite television industry is growing rapidly, offering a wide range of programming options to viewers. The industry is expected to continue to grow in the coming years, as more viewers turn to satellite television for their entertainment needs. The industry is also expected to offer a wider range of programming options, including sports, news, and educational programming. The industry is also expected to offer a wider range of programming options, including sports, news, and educational programming.

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SIN

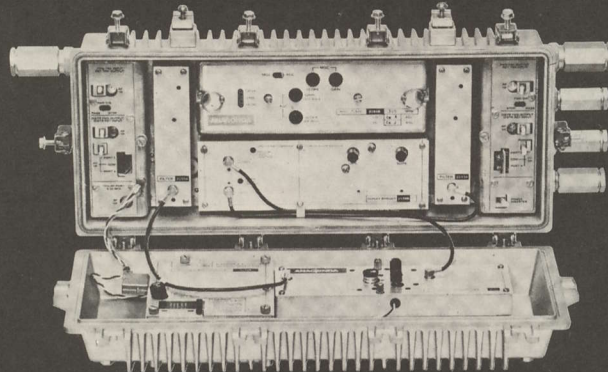
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The satellite television industry is growing rapidly, offering a wide range of programming options to viewers. The industry is expected to continue to grow in the coming years, as more viewers turn to satellite television for their entertainment needs. The industry is also expected to offer a wider range of programming options, including sports, news, and educational programming. The industry is also expected to offer a wider range of programming options, including sports, news, and educational programming.

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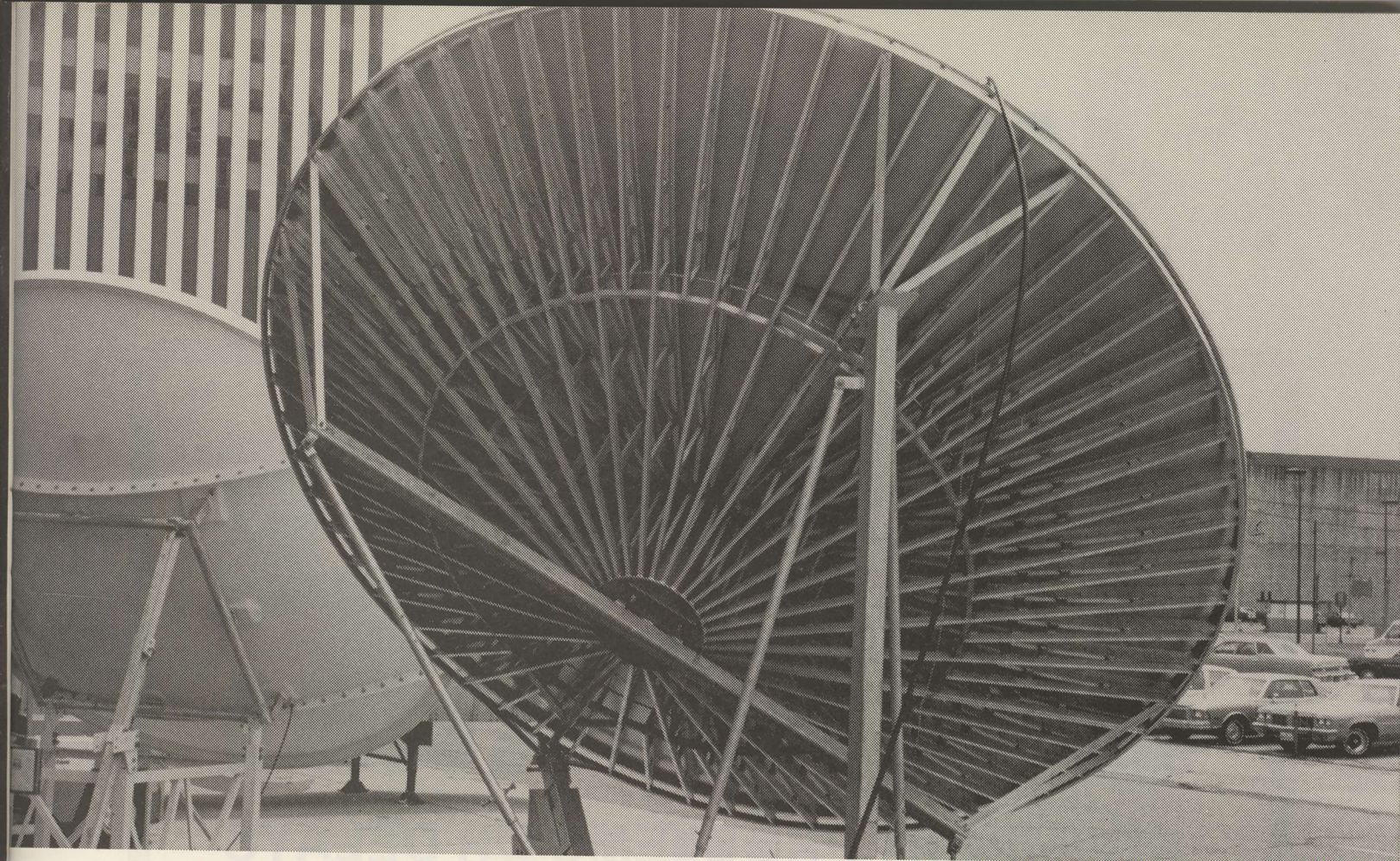
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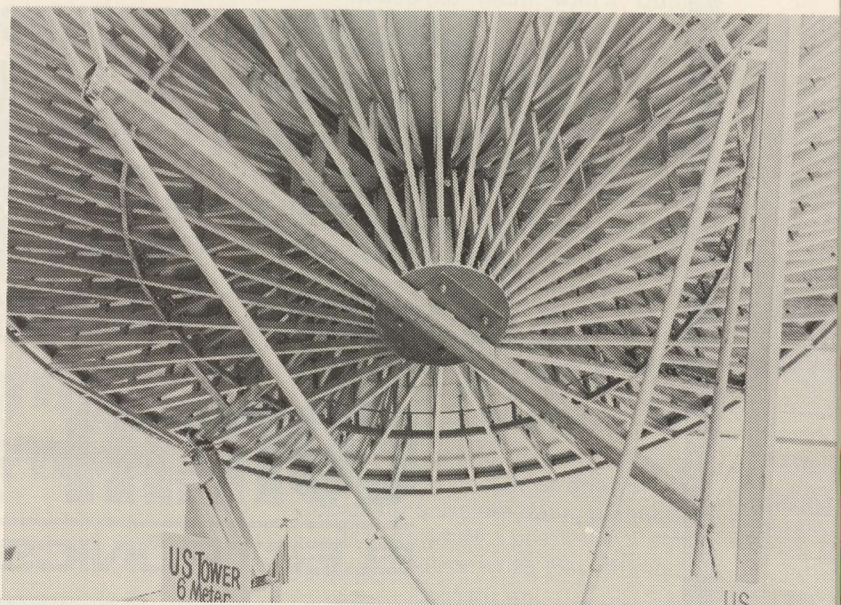
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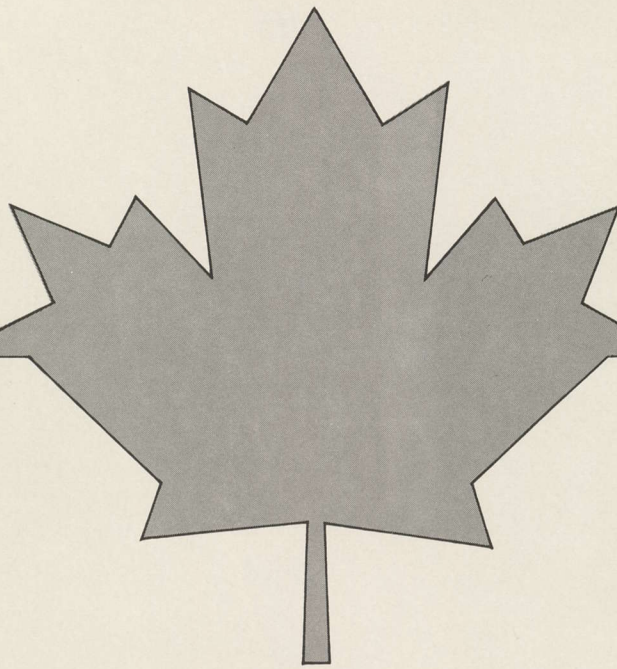
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THE NEW ORLEANS NATIONAL HAD ITS SHARE OF NEW PRODUCTS AND SERVICES ON DISPLAY

An Enthusiastic Show

The "national" convention held in New Orleans April 30th through May 3rd mixed the latest in new CATV technology with the largest CATV crowd in the thirty year history of the industry and the worst torrential rain to hit New Orleans in 50 years. For most it was an upbeat show accented with enthusiastic suppliers showing their new (and old) wares to equally enthusiastic operators and would be operators of cable systems.

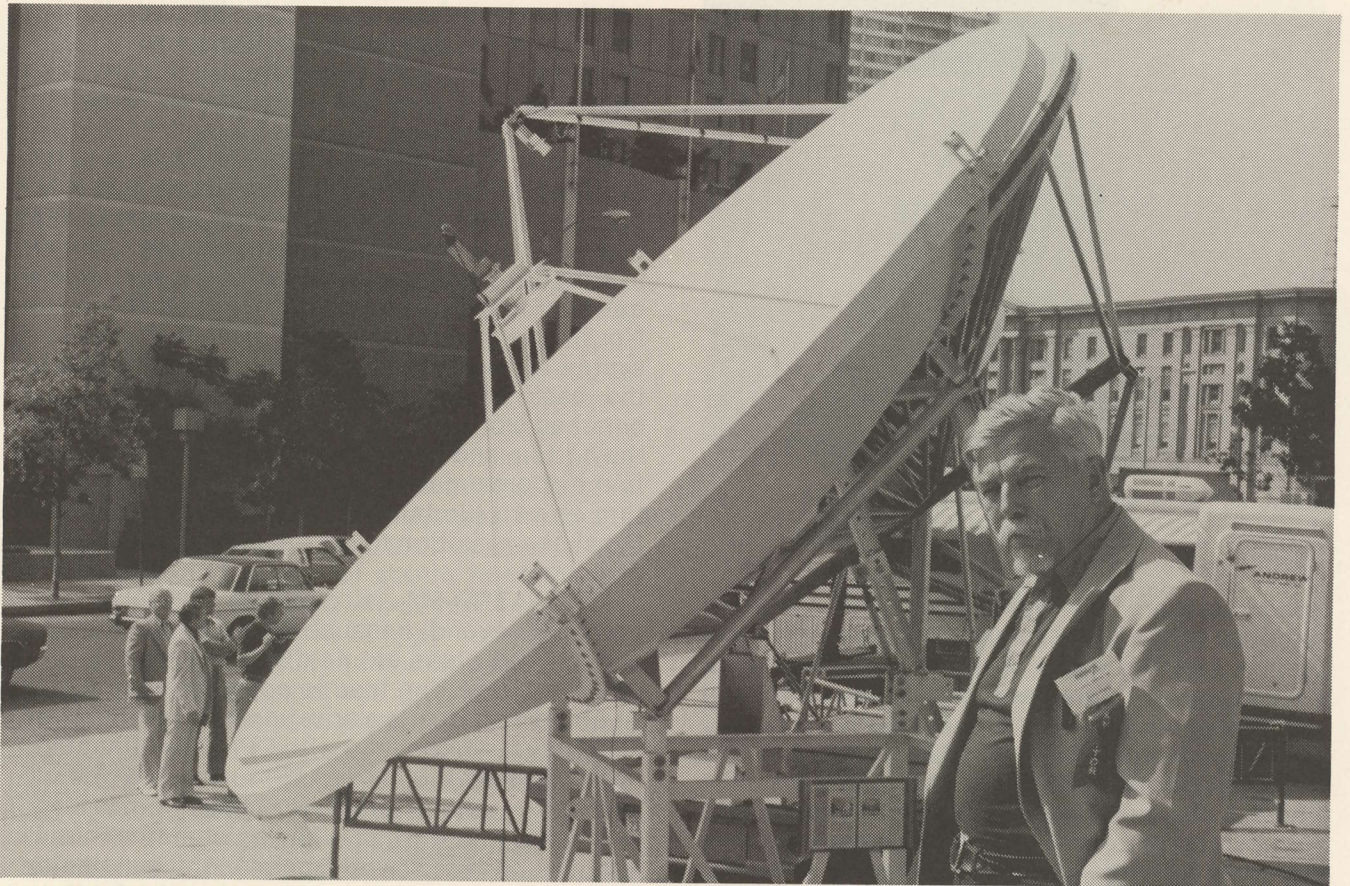
NCTA's 30th was almost too big, too gaudy and too spread out to be taken in and assimilated in less than perhaps three full days time. This worked to the detriment of those traditional 'in and outers' who are accustomed to popping into the national for a day and a night and then heading home again. With a reported 176 different suppliers on hand hawking everything from computer equipment to hand tools, transistors to satellite terminals a man could walk the aisles in a long 8 hour day and see all of the booths but if he wanted to grasp the meaning of each product and service on hand he probably needed two full days. . .and then some.

The FCC did its usual number of digging around in their files to search out one or two 'big items' to rule on just prior to the show and came through for small and large operators alike when they changed the definition of small systems, sent a motion picture group packing with a petition that would have stopped the spread of super independent stations via satellite and announced a major administrative change in the way CAC procedures will work.

If there was supposed to be one or two blockbuster new products or services on display that were going to change the way we do business today or in the near future, it didn't quite work out that way. There were numerous significant new product announcements but in our view none of them will be impacting on the way you operate your company in the near future. The most significant new thing on display was hardly a surprise; the **AmeriCom Satellite Network** demonstration of four channels of CATV service via WESTAR II came off pretty much on schedule

(see April CATJ, page 38) with only minor technical glitches. The fact that ASN did show up, did have Los Angeles channel 11, Chicago channel 9, New York channel 9 and their pay-view channel Hollywood One on display live via WESTAR II had not a few people shaking their heads in wonderment. If there was one 'lively' topic of conversation permeating the atmosphere of the show it was probably ASN's appearance, and speculation about how ultimately the service might sustain an expected onslaught of legal challenges. The principals of ASN and several competitors over on SATCOM engaged in a lively exchange of opinions and challenges as to their respective heritages throughout the show and it made for sporty reading in the show dailies and tasty gossip in the after hour watering holes.

Most of the technical or product excitement came in spurts from a handful of companies. And a good portion of this centered around the ever decreasing 'base price' for a so-called "basic terminal". For the unwary, a "basic terminal" is one that includes a TVRO antenna, an LNA, a single channel receiver, and a modest collection of hardware required to lash the whole system together into a working system that delivers pictures to your headend from a bird. We spent three days trying to pin down "how low has it gone" and came to the conclusion that if a fellow was persistent in his pestering of the suppliers he might find he owned a "basic terminal" after shelling out someplace between \$14,500 and \$17,000. In our process of badgering the suppliers in this area we kept hearing one basic theme mentioned; a theme discussed in some detail in our **Coop's Cable Column** for last November. If you will recall, we were concerned at that time that the industry was in the midst of two separate and seemingly opposite-pulling tug-a-wars. TVRO equipment was (and remains today) in very short (or tight) supply; while at the same time the prices keep eroding bit by bit. We sensed an intense competitive nature in the TVRO field at all suppliers and came to the conclusion that most people buying TVRO's



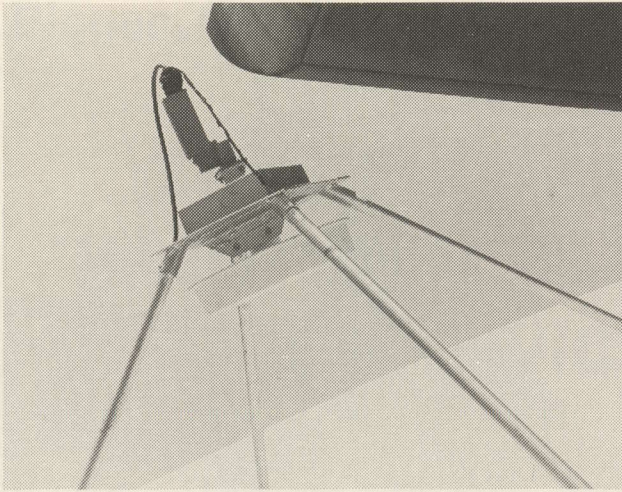
HOWARD HUBBARD AND HIS DISH—While Hubbard's Antennas For Communications (AFC) has been the prime supplier of 'horn' antenna for Bell for years, and his 4.3 meter horns for CATV have received some attention, the new 5 meter Hubbard designed fiberglass is the first for Howard in the parabolic area for CATV.

these days are shopping virtually every known source for the equipment before buying; playing the 'best bid' of one supplier against all of the others in the field. Virtually none of the TVRO suppliers had anything nice to say about any of the other suppliers in the field and not a little bit of 'sales subterfuge' was in evidence. We found one supplier telling a customer who had already signed a P.O. with a competitor that the competitor's antenna was not FCC approved, another supplier spreading the 'secret' that his competitor's receivers were subject to noisy audio and on and on. We cannot recall another era of such intense competition in the CATV arena except perhaps the late 60's/early 70's infighting between CATV plant amplifier suppliers. We came away from the show largely feeling the November **Coop's Cable Column** would make just as good (and as timely) reading today as it did six months ago.

There were two new five meter model TVRO antennas on display; one in model form and another on line operating for the show. Both are fiberglass design and there seemed to be a message here. Metal prices have gone clear out of sight in recent months, a direct result of a change in the import tariff arrangements that now restrict Japanese sheet aluminum coming into this country, and, the long winter coal strike that slowed down the production of U.S. sheet

aluminum. Most TVRO antenna designers believe that aluminum as a base material for the 4.5 to 6 or so meter sized antennas will shortly become obsolete simply because at roughly a dollar a pound raw material cost nobody is going to be able to afford it anymore. When a 6 meter antenna requires 2,500 to 3,000 pounds of 'skin' plus super structure aluminum the antenna supplier has about the same number of dollars invested as pounds in his antenna **before** he starts the delicate process of fabrication, construction, delivery and set up. Fiberglass is not cheap, especially when very high grade resins are utilized, but on a comparison to aluminum it comes off quite a bit ahead in today's market. You'll be hearing a great deal of discussion from the antenna suppliers going to fiberglass concerning 'resins' in the months and years ahead. One of the things you'll hear about is the fire retardent properties of various resin 'mixes'. Fiberglass, unless properly resin-prepared, will burn quite easily. And as some suppliers and operators have already found out, a grass fire on a headend site can be a disaster.

Perhaps the most impressive and exciting new TVRO antenna package in operation in New Orleans was the **Microdyne/AFC** new five meter fiberglass antenna. This statement can't get us in much hot water with the competition in as much as this was the **only new** antenna in



FEED on MICRODYNE/AFC SATRO-5M antenna is suspended at four points, employs 1/4 wave concentric (slot) circles.

operation there. Microdyne has been a leading supplier of TVRO receivers since this craziness began. And like many of the receiver suppliers, they have been riding around on the coattails of the antenna suppliers principally because **system buyers** seem to gravitate to the **antenna suppliers** for the **package** of equipment. The obvious way out of this marketing dilemma was for Microdyne to have their own antenna. So they got together with Howard Hubbard at Antennas For Communications (AFC) to bring out a five meter fiberglass antenna. Hubbard brings to the marriage one of the finest minds in super high frequency (SHF) antenna design and production in the world today; his AFC is the principal supplier of 'horn' antennas to the Bell system nationwide. Those who recall the CATA/CATJ inspired battle with the FCC back in 1976 to get smaller-than-9 meter antennas approved for the CATV field will remember that Howard Hubbard was a very important ingredient in the FCC battles of that era (see **Coop's Cable Column** for January 1977).

The Microdyne/AFC SATRO-5M antenna is a two-piece design that sells for around \$9,500 as a stand alone antenna product. However Microdyne, which brought their sales expertise plus the design experience of George Bell to the marriage, really is not all that interested in selling the antenna as a 'stand alone' product. Rather, as is wise from a marketing point of view, they are interested in complete TVRO terminal packages; one each antenna, LNA and one or more of their receivers. We'll have more to say about a couple of new Microdyne receivers shortly.

One of the clever things about the SATRO-5M is the azimuth adjustment system. You dig a hole in the ground adequate to hold from 2-4 yards of concrete and into that hole you place a prepared metal framework. When the concrete hardens you have a set of tie down studs around the outer edge of the square pad and in the center you have a 2 inch diameter round ball (i.e. trailer hitch

ball). When the SATRO-5M antenna arrives you set the square framework onto the pad aligning the center of the frame on top of the 2 inch diameter ball. The studs tie down the circumference of the framework circle to the concrete pad.

There is no aligning to north and south with the system because the whole antenna rotates (over the trailer ball as a center) in a complete 360 degree circle. This means you have the ultimate in azimuth coverage possible (if we ever figure out how to put a geo-stationary bird above the North pole you could in fact look at it with this system!). For elevation, there are two struts to the back of the dish. The struts have holes punched along the length of the strut and you set the bottom end into an anchor bolt to correspond to the approximate elevation you need. Then you turn on two turnbuckle like contrivances to fine tweek the elevation to the nearest 1/10th (or less) of a degree.

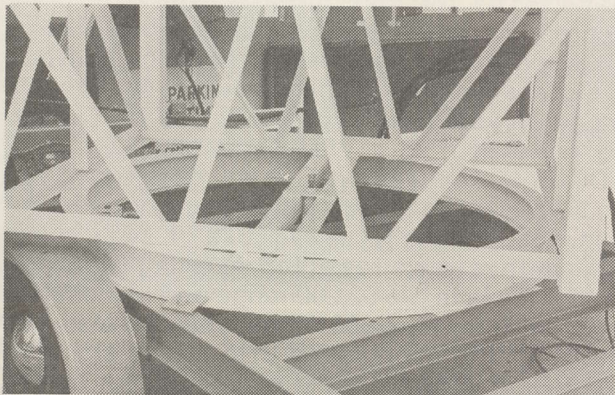
The SATRO-5M is good to 12 GHz (and probably beyond) because of the high tolerance surface and gains are 44 dBi at 4 GHz and 53.5 dBi at 12 GHz. The feed is apparently unique to Hubbard and dual polarization is available. The LNA mounts at the feed with CPR-229G flanging.

Hubbard tells of stepping out of the vehicle with his pull trailer (for their portable / demonstration unit) and having signal within 45 minutes. In a real world permanent installation Microdyne / AFC suggest that after the footings are in place the job requires two men for four hours each. The world certainly is speeding up from the 10 meter dish days!

A one quarter model scale sized fiberglass antenna was on display at the **RF Systems** booth and RF people were talking about August delivery on their own 5 meter fiberglass antenna. RF has done a handy job of dominating the lions share of the 6 meter all metal antenna market in CATV, and from some of the pricing we heard kicked around for their new 5 meter fiberglass antenna they will be tough competition for the new 5 meter fiberglass field as well. They asked that we not 'print' the pricing on the new antenna, which is dramatically similar in design concept to the SATRO-5M from Microdyne/AFC, so we won't. **However**, the numbers we heard were **lower than** the announced stand alone price on the Microdyne / AFC antenna. The mounting system is virtually identical to the full 360 degree 'track mounted' azimuth system seen on the SATRO-5M. However rather than having a **pair** of elevation struts the RF antenna had a **single** strut. And RF Systems, equally aware that to be competitive these days requires that a supplier have at least two of the three major components in a TVRO (antenna, receiver and LNA) in his own manufacturing bag, was quietly talking about June/July availability of a new 24 channel tuneable receiver. Again we were asked not to disclose the pricing of the 24 channel receiver. And again we will note it was below other 24 channel receiver prices we ran across.

In the TVRO receiver area Microdyne had a pair of brand new receivers on display. Two things impressed us about them. One was their size. They are very thin line design, no bigger than typical CATV modulator rack mounting packages or thin line bandpass filters. The other thing that impressed us was the design approach to their multiple-channel capability. A new single channel model is actually a four channel job. The receiver has a door on the front of the panel and behind the door are crystal sockets. By popping a crystal out of a spare-crystal socket, substituting the crystal for the active crystal in the bay and then inserting a 29 cent screwdriver into a small opening and 'peaking' a pot for max(imum signal) you change channels. It takes about 30 seconds time if you have thick fingers or ten seconds if you are David Alvarez. Pricing is in the \$3,200 region. A bigger brother version has 12 channels and a host of subtle features you need to study carefully. Microdyne felt the 12 channel number was a 'happy' compromise between single and fully tuneable versions and part of their logic is that you probably won't be utilizing one receiver on **both** polarizations anyhow (there are 12-channels-maximum possible on each of the two signal polarizations). Pricing on this unit is in the \$5,200 region. As we understood the marketing philosophy behind the new receivers they are ready for production now but will not be actually released until the present supply of completed units and parts for the black-faced single and 24 channel models runs down abit. The new units have a white face although the sharp black/white contrast between the 'old' receivers and the new receivers is hardly necessary to tell them apart. Microdyne seems to be pushing hard on the theme that they can deliver receivers on short notice. We overheard several comments from Microdyne personnel that indicated they felt one of their stronger sales pitches was simply the fact that a fellow could walk in the door and walk out with a receiver; without having to take up long term residence.

Microwave Associates had their new 24 channel tuneable VR-4 on hand operating and perhaps the most impressive thing about the VR-4 is its



SATRO-5M mount rotates on a circular ring allowing 360 degree azimuth adjustment.



ONE QUARTER SIZE SCALE MODEL of new 5 meter fiberglass antenna from RF Systems was on display. Antenna has circular track type mount similar to new Microdyne/AFC antenna, single elevation strut. Earle Davis of RF discusses new antenna with Bill McVey from Tennessee.

flexibility and 'super-electronics' look. Whereas most the newer receivers seem to be starting to look like fancy CB sets (sorry fellows...that's the way we saw them) the VR-4 looks for the world like it belongs in an Intelsat \$500,000 terminal installation. The single channel VR-3 is now in full scale production but it will be mid-summer apparently before the 'do everything' VR-4 will be sailing off the production lines and into system terminals.

There was one more TVRO receiver on hand. At the ASN booth **Scientific Communications, Inc.** had perhaps the smallest-yet TVRO receiver on display. The electronics are such that within a single 3 inch tall panel there are **two** separate receivers. SCI had both single channel and fully tuneable 24 channel models on hand and the ones we saw had the 'ASN' logo on them. Apparently ASN is looking at having SCI 'private label' a receiver for ASN users/customers in as much as ASN was talking widely about a full lease package that consists of antenna, receiver(s), LNA and the whole ball of wax. Attempts to pry information about the receiver loose from either SCI or ASN failed miserably; except the notation that SCI was not 'planning' to be in the "onesy-twosy" receiver business. The compactness of the receiver did fascinate us and perhaps by CCOS-78 we'll have the opportunity to 'get inside' the box and see how they have managed to compress all of the electronics into a half-sized box.

After the innovations in satellite technology the next most interesting field was test equipment. People from Indiana in particular have apparently spent a long, snowbound winter pouring over many hours of R and D bench operation designing some very innovative new test equipment.

Mid State Communications had not one but two brand new and quite innovative field strength meters on hand. Larry Dolan and Doyle Haywood obviously have done their homework well and



ELEVATION STRUTS on the SATRO-5M adjust the elevation; a pair of turnbuckle type screws provide fine adjustment on elevation.

while the 'rumors' heard prior to the show suggested a digital display for the new Mid State product(s) that turned out to be only a partial truth.

The **SAM-I** is an analog display conventional tuning meter. It covers 4 through 300 MHz, reads in the -40 to +60 dBmV range and sells for \$895 list. That hardly tells the story however. SAM-I has direct reading of **hum** modulation (that ends hauling a scope around to measure hum), a manual gain control (ala the 727) and an internal meter **calibrator**. The internal calibrator is a 150 MHz closed-loop oscillator of the same design approach as one finds in \$700 range meter calibrators and with it you read accurately to the nearest 0.25 dB according to Mid State. You calibrate to the environmental temperature you are working under which means the meter should be as accurate when it is zero as when it is 120 degrees (F). The SAM-I covers the range in a five position range selection switch with low, high, mid, super and sub bands lined up in that order. The dial is calibrated to allow 1 MHz resolution accuracy.

The **SAM-II** is an analog display meter of both conventional and unconventional tuning. It has a digital tuning system and a digital display accurate to the nearest 0.1 MHz (100 kHz) and a keyboard to 'dial up' the channel you wish to

measure. In effect you have a 100 kHz accuracy digital display frequency meter that can be conventionally tuned to read both levels and frequencies of carriers tuned, and, a keyboard entry system to dial up a specific carrier. Some of us are going to have to re-learn the frequency assignments of carriers if we are going to get maximum utility out of this versatile meter. The price on this unit is \$1,395 and that too does not even begin to tell the story.

The **SAM-II** has as **standard equipment** a built in spectrum analyzer head, not unlike the CATJ/Laufer approach to an economy analyzer. With your own **external** display scope connected to two front panel jacks on the SAM-II you can 'see' on the scope screen the whole 296 MHz bandwidth of the machine, or narrow that down to a single carrier. The display has a 40 dB on-screen range, manual sweeping, variable rate and variable dispersion. Very cleverly, by using the digital frequency display on the SAM-II you can narrow up the dispersion onto a single carrier, and then read its frequency to the nearest 100 kHz on the digital display. Mid State says the meter can also function for slow scan, low level system sweeping. The spectrum analyzer is also available as an **option** for the **SAM-I** meter (\$150 extra).

While Mid State was spending the cold Indiana winter cooking up a pair of innovative new signal level meters Raleigh Stelle and the gang at **Texscan** were equally busy across town at their end of Indianapolis dreaming up at least **six** new test equipment pieces for CATV. We can't recall having been introduced to so much new CATV test equipment in one place at one time as in New Orleans.

Of the **six new pieces** at **Texscan**, four were totally new and except for limited private showings have not been shown previously. The "nobody else has one like this" box shown was the model **MDC-3** microwave converter. With this device ahead of your field strength meter or spectrum analyzer, you can read signal levels and check modulation and so on for signals operating in the (1) 1.9-2.1 GHz band; that's where **MDS** is, (2) 3.5 to 4.0 GHz band; that's 300 MHz of the **TVRO** downlink spectrum, and, (3) the 12.5 to 13.0 GHz band; that's most of the **CARS** band. The MDC-3 inserts between the appropriate antenna downline and the FSM or analyzer of your choice. It frequency converts the chosen microwave band down to an IF that is tuned on your FSM or analyzer. The MDC-3 can be powered from a VSM series analyzer (+12 VDC) or from 110/220 VAC. It will handle as much as 2 watts power **direct** without burning up or out and that means you can use it with many transmitters as well as at the receiving end of the line. Price is in the \$2,200 range and by using an external filter kit (\$800 range) you can also use the MDC-3 to upconvert a UHF sweep signal to the SHF/microwave band of interest for sweep alignment of a piece of microwave gear. **Very nifty.**

Another new Texscan unit is the **DS-5 digital storage system**. It interfaces with any oscilloscope or display device to add dual channel storage capability. With this capacity you can make detailed after-the-fact examinations of rapidly occurring phenomena that are simply too fast (rise time, decay time, or both) to be seen with the eye in real time displays. The DS-5 also should find widespread application for narrow resolution, slow scan spectrum analysis applications.

Perhaps the most innovative new gear from Texscan is their model **9557/9558 two-way test set system**. This system, for large systems with complex forward and reverse frequency schemes lets you plug into a return path amplifier anyplace in the system and align that return band amplifier in one stop. It works this way. A headend unit sends a forward direction VHF pilot signal throughout the system. In the field you dial up the forward pilot signal with the remote package and send it back to the headend on sub low VHF. By tweaking on the return band amplifier you read out a 'null' condition on the forward path signal which indicates (by some electronics black magic) the proper alignment of the reverse direction amplifier. This scheme is in operation in the extensive Columbus two-way system and field reports are all good. The system is complex but ingenious and we predict that now the technology barrier is broken in this area we will see many additional innovations in the years ahead. It is conceivable that we will be building limited-type return or reverse path systems on a regular basis in the years ahead just to allow us to do quick and accurate forward path field alignment on a one man basis. This product line may be the sleeper of the whole show.

Texscan also displayed a new (model FDM) signal leakage monitor system. Now there is currently a rhubarb going on in the signal



MICROWAVE DOWN CONVERTER—Texscan's Raleigh B. Stelle congratulates Tom Jokerst of Continental Cablevision, Inc. (Quincy, Illinois) for having selected the new MDC-3 microwave converter from Texscan. Converter covers MDS (2.1 GHz), TVRO (3.7 GHz) and CARS (12.7 GHz) bands. See text.



LOW COST HETERODYNE—Canada's Triple Crown Electronics displayed a new under \$500 (in U.S.) heterodyne headend signal processing unit that may prove serious contender to strip amplifier processing for small systems on a limited budget.

leakage detection area of this business as to which firm (if indeed any) actually has the 'right' to be building equipment in this field. A pretty broad patent, awarded not very long ago to ComSonics in Virginia, would appear on the surface to pre-empt anyone **but them** from offering leakage detection equipment systems. Be that as it may, while the patent attorneys and engineers fight it out Texscan has joined the leakage equipment market with their model **FDM** package. This employs a headend mounted 'transmitter' that puts a signal on the system in the 108-136 and 225-300 MHz regions. It transmits a pair of modulated test signals down the line at the appropriate level. The receiver, dubbed appropriately the 'Bloodhound', is a compact 5 pound battery powered device capable of reading signals down to the -77 dBmV region. It has an aural tone alert that sounds off when it detects radiation/leakage and the ability to function as a direction finder. The receiver and the transmitter are both priced in the just-under \$400 region, each.

Finally at Texscan there were two later generation versions of tried and true instruments; the 7271 field strength meter and the VSM2A spectrum analyzer. The 7271 has a newly developed (patent pending) "true-peak" detector circuit that is claimed to be accurate within 0.5 dB (+/-) regardless of video modulation levels, and an input range for full scale deflection from -40 dBmV to +70 dBmV. The **VSM2A** is a second generation of the popular 4-1,000 MHz spectrum analyzer. Texscan calls the new model a "laboratory performance device" although it is intended, as was the VSM2, for **field** use. It has a digital storage interface (for their new DS-5 digital storage system), an internal level calibrator and a battery saver circuit.

If all of this has been a bit rich for your blood to date, and you are one of the 42% of all CATV systems known to the FCC that has fewer than 1,000 subscribers, a new headend signal processor from **Triple Crown Electronics** may be more to your liking. Triple Crown has been selling their model TSP signal processor for several years and as the June/July issues of CATJ for 1977 reported, our Lab found the unit we received for test to be a very compact, easy to service, high reliability unit. TCE's Charles Evans has had his boys hard at work on a lower cost heterodyne signal processor unit and a prototype was on display in New Orleans. The Model **HE-P** will sell for \$495 in the U.S. when it is

available late this summer for shipment and at that price for a true heterodyne processor it may well be a serious contender for the capital expenditure dollars of small systems heretofore locked in on strip processing systems.

The HE-P will accept any input 6 MHz wide channels from 5 to 900 MHz and it will deliver that input channel out on either the same frequency range or any other 6 MHz wide frequency range from 5 to 300 MHz. The processor has 65 dB of gain, a 45 dB (minimum) AGC range, an output signal level from +45 to +55 dBmV, an output level stability of ± 0.5 dB for an input change of ± 15 dB. Performance specs are 48 dB signal to noise for a 0 dBmV input level signal, a frequency response flatness of ± 0.5 dB over the passband and a 5 to 12 dB sound reduction control system (which when coupled with the off-air level difference of from 3 to 10 dB should prove adequate for setting the audio down by 15-17 dB). The unit is rack mounting, 3.5 inches tall, operates from either 117 VAC (0.1 amp) or 24 VDC (0.3 amp). At the \$495 price level it should be a winner.

Triple Crown also displayed a new modulator that should be of interest not only to economy minded TVRO installers but perhaps of more immediate interest to those system operators interested in getting a good quality RF signal back on the system after having carried some distance via low (or low-low) cost microwave. The Triple Crown model HE-M modulator is set for September delivery in the \$500 price range. When you couple a \$500 modulator with a \$500 demodulator such as the TOMCO D-1000 unit (see page 50, CATJ for May) you have a viable way of handling the baseband to RF (or reverse) interfacing that can be married to under \$3,000 per channel FM microwave now available.

Speaking of the low cost microwave, the originators of the low cost FM approach, Microwave Associates, had a new version of the 12XC (Gunnplexer) system on hand in New Orleans. It is a rack mounting package that expands the versatility of how you can lash together several channels of the equipment into a single piece of waveguide for either receive or transmit functions. We talked with M/A's Chief Engineer Fred Collins about what is coming out next in this field and learned that M/A is now working out the details on an outdoor mounting version of this equipment. For those who would like to see the gear hung on the tower or a pole, this is good news indeed.

We had the opportunity to visit at length with Arie Zimmerman and his crew at Phasecom Corporation and inspect closely their newest "2000 series" headend units. Phasecom gear has for years been extensively utilized in the Canadian market by the largest and most complex metropolitan area systems on the North American continent. But the use of this innovative headend equipment in the U.S. market has never amounted to that much acceptance and we have for some time wondered why. In the

newest 2000 series gear Zimmerman and crew have put together two important ingredients which impressed us as being equal to and often ahead of what the other headend piece suppliers are offering these days. The new series has TV modulators (2100 series priced in the \$900/\$1000 range), TV demodulators (2200 series priced in the \$800/\$1000 range) and the 2300 series of heterodyne processing gear. It is the processing gear, which has been in the market the longest as a 'family of gear', that has virtually captured the big system metropolitan market in Canada. CATJ intends before the year is over to take a hard look at all three of the Phasecom entries because we believe there is some very clever engineering here which you need to know about.

There were a number of new schemes for subscriber converters on display in New Orleans. In fact a fellow almost needs to maintain a separate reference book on converters to keep up with all that is being offered. One that caught our attention will be available late this year from the people who have done such an excellent job with the passive trap market; VITEK Electronics Inc. This is the first entry into large scale (meaning mass production) active electronics, although their test equipment for CATV has been around for a number of years. The MUL-T-BLOK is a 40 channel converter featuring dual-conversion, no remote cord, an apparently new approach to switching and simple operation. It has an input range of 50-300 MHz, which it then block converts to either 2-13 or some portion thereof. For example, 2-13 ends up on 2-13 while C-1 ends up on 7-13, J-P ends up on 7-13, Q-W ends up on 7-13 and finally 90 MHz to B ends up on 7-13. Specified input levels are -5 to +15 dBmV, unit gain is from unity to 5 dB and the noise figure is 10 dB maximum. The unit has good cross mod, intermod and signal to spurious ratios and a customer fine tuning range of ± 500 kHz (0.5 MHz). The units draws 2.5 watts at 110 VAC and carries a one year warranty. Delivery is scheduled to begin in October with a 19 channel version priced in the \$20 range and a 30 channel version with LED push button indicators in the \$35 region.

Finally, no cable show would be worth a darn unless it had some blue sky on display. The fiber optics displays we saw from several exhibitors indicated to us that fiber optics is here and now and probably within another year we will be hard pressed to seriously design a new trunk run without getting a comparable bid from at least a couple of fiber optic suppliers. Any industry needs a little blue sky to kick around, and if we lose fiber optics from this podium we have to start looking for something else to take its place.

There appeared in our hands, directly after the show, a mysterious looking and highly professional appearing brochure that announced the availability of (are you ready for this... we were not!) the "Blue Sky Box".

The "Blue Sky Box" (honest injun... that's the name of the device) is an "universal addressable

data terminal for CATV" designed (the brochure says) to "provide progressive services for cable users". What the box does is make it possible, today, for your cable system to offer, in addition to normal cable TV services, some or all of the following: (1) security services, (2) energy control systems and (3) utility metering functions (water, gas and electric). It offers to handle cable service, per-view service, premium pay service, fire and intrusion alarm services, emergency alert functions, apartment controls, system monitoring, utility meter reading, energy controls, control of remote video cameras, credit card verification, check verification, and remote switching.

A publication, so inclined, could easily work up a 10 page article describing both the uses of the "Blue Sky Box" and how it works. **We won't for now.** However, you should know **who** is

behind this imaginative new package of electronics; it will probably play some part in just how serious you take the offering. Remember a gent named Clifford B. Schrock? Cliff has been associated with Tektronix in Portland, Oregon for many years and for a year or so he edited Titsch Publications CE/D magazine. Cliff has always impressed us as being one very sharp, although possibly spaced-out, engineering mind with absolutely no fear of (1) the unknown, (2) the competition, and (3) trying to do something everyone else said could not be done. The "Blue Sky Box" is a product of Cliff Schrock and if you want to spend an entertaining hour reading over what the latest inventive Schrock mind has conceived, we suggest you drop a line to **Clifford B. Schrock and Associates**, 2040 SW 187th, Aloha, Oregon 97005. If you can't wait for the mail to go both ways you should try 503-644-6285. Schrock says "the blue sky is here now". We'll see.

Low Cost Microwave Options

HOW TO GO ABOUT FILING FOR 'HASSLE-FREE' DO-IT-YOURSELF CARS BAND (non-type-accepted) MICROWAVE

by Ray Daly President Computer Cablevision, Inc. Washington, D.C. 20007

You can now get two types of FCC licenses for **low-cost** microwave stations. Since type-acceptance of the **Microwave**

Associates MA12-XC transmitter on September 30, 1977, you can apply for a conventional CARS microwave license using low-

cost equipment. **And now**, as a result of several recent changes to the Cable Television Relay Service (CARS) Rules, the permissible use of low-cost microwave gear has expanded.

Ray Daly is the President of Computer Cablevision, Inc., a microcomputer and consulting firm located in Washington, D.C. Mr. Daly was until early this year the senior engineer for the FCC's Microwave Branch of the Cable Television Bureau. In that position he was responsible for CARS proceedings at the Commission, was involved in cable television technical standards and the TVRO small earth terminal decision of December 1976. Computer Cablevision is in the development phase of a microcomputer and microprocessor line of CATV peripheral equipment including two-way subscriber to subscriber interfacing equipment.

Mr. Daly is a recent 'contributing editor' staff addition to the CATJ staff, reporting on FCC activities, proposed actions and interpretations of actions taken in the technical arena. In this month's feature report Ray Daly reports on how recent FCC rule changes begin to open the door for low-cost, almost license (hassle) free CATV microwave for certain applications. This feature report is part of the CATJ series relating to the expansion of low cost microwave in our industry.

In the **Cable Television Relay Service** the FCC authorizes microwave stations of cable operators to serve their cable television systems. For a **conventional** point-to-point CARS microwave station, FCC Rules require that the **transmitter** be **type-accepted** and the **transmit antenna** have a beamwidth of **less than 3 degrees**. With the type-acceptance of the Micro-

wave Associates gear, you can receive an FCC license to operate this equipment using a 2 foot or larger parabolic antenna. Several cable operators have already received FCC authorization for such stations.

While such a conventional CARS station with its parabolic antenna has many advantages, **these advantages have a price.** After buying antennas and feeds, going through local zoning and permit procedures, frequency interference studies, architectural permits, and environmental impact clearances, the **cost of the microwave gear** may be only 10 to 20 percent of the total system cost. And so the low-cost equipment has become part of a high-cost station. This can be the consequences of the FCC's antenna requirement. If you could use a small horn antenna, you might be able to eliminate many of these additional costs.

As a result of recent changes in the CARS Rules, mobile CARS stations can now use horn antennas. The Commission believed that the 3 degree beamwidth requirement was "an unnecessary restriction on CARS mobile stations." They went on to say: "**Since CARS mobile stations are authorized on a secondary, non-interference basis they could advantageously utilize antennas having a wider beamwidth than the maximum presently allowed and not restrict our frequency assignments. The relation of the present requirement for mobile stations would permit the utilization of antennas currently available for mobile transmission equipment**

which are less expensive and are more easily oriented towards the receiving equipment." The Commission was specifically addressing the horn antennas. So as a result of this change, which was effective on December 13, 1977, low-cost microwave stations can be licensed using the horn antenna.

MOBILE CARS STATIONS

Mobile CARS stations are authorized under some different regulations than fixed, point-to-point CARS stations. Mobile stations are licensed to an area on a secondary, non-interference basis and no FCC construction permit is required. Also, mobile stations are exempt from certain FCC requirements, yet they are subject to others that fixed stations are not. These points should be considered before filing with the FCC for a mobile CARS license.

The secondary status of mobile stations is both a blessing and a curse. The blessing is that the FCC review is minimal. Since a mobile station, according to the FCC Rules, can not **(is not allowed to)** cause any interference to any existing or future fixed station, the FCC assumes that you will obey the Rules. Therefore, the only frequency coordination at the FCC is to see that **no other mobile stations** are operating near your proposed station. In the event that another station does operate nearby the FCC will grant your application **with the condition** that your station will not cause interference to the existing mobile station. It is your responsibility to work out the

details with the other licensee. So in many ways the FCC does your frequency coordination for you.

The curse is that, first, you must keep track of any other fixed station that your neighbors might construct and you must coordinate your station's operation with theirs. This includes television broadcasters, since they share the entire CARS band with cable television. Second, any fixed station that comes along in the future might wipe out your mobile station's operation. It is because of this possibility that the FCC has included this subject as part of its recent **Notice of Inquiry and Proposed Rulemaking in Docket 21505.** So while the secondary status speeds up the application at the FCC, it puts a heavy burden on the mobile CARS station licensee.

For a **mobile CARS station,** the FCC cannot require a construction permit before licensing your station, pursuant to the Communications Act of 1934 as it now reads. However, for **fixed CARS stations** the Commission requires that you file for a construction permit before you can even begin to build your station. If you do construct before receiving the FCC construction permit and the FCC finds out then you cannot get a license to operate any part of the station built prior to the grant of a construction permit. But if you do build in accordance with the construction permit, upon completion of the construction you must file an application for a license to operate the station. Obviously, this is time consuming and involves some extra paperwork. For a mobile station no construction permit is required, just file a license application. This one-step application procedure saves you time. Later in this article, how to file such an application will be explained.

In addition CARS mobile stations are exempt from some FCC requirements that apply to fixed station. First, the FCC requires an applicant to use a

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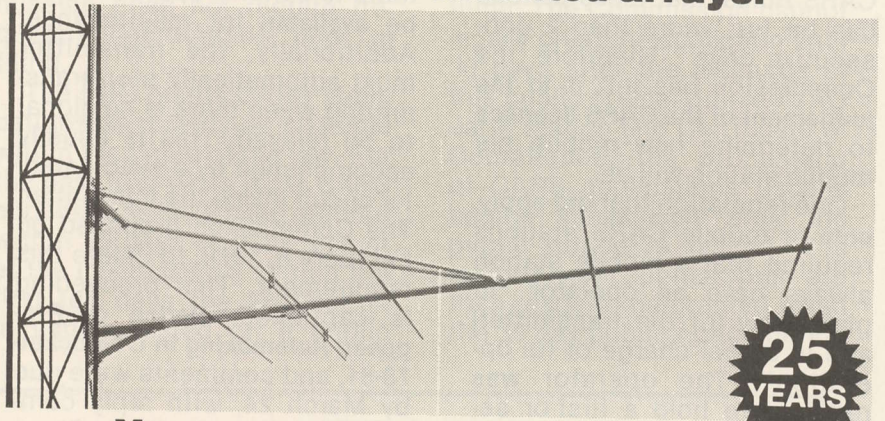
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channel of less than 12.5 MHz bandwidth if the path length of the proposed station is less than 10 miles. Since CARS mobile stations are exempt from this requirement, 25 MHz bandwidth channels can be used. However, in the **Notice of Inquiry and Notice of Proposed Rulemaking in Docket 21505**, the Commission is considering deleting all of the 25 MHz channels. This would eliminate this special treatment for CARS mobile stations. Regardless of the outcome of the FCC proceeding, it would most likely be a good idea to use 12.5 MHz bandwidth equipment. For short-haul systems, there should be no noticeable difference in the quality between the 25 MHz and the 12.5 MHz equipment, especially when using 250-350 line cameras. Also, this would conserve spectrum and if you ever decide to use the equipment as part of a fixed station the gear should meet all of the FCC requirements. Second, the antenna requirements (as discussed previously) do not apply to mobile stations. It should be noted that since this is a subject of the inquiry in the previously cited FCC matter, things may change. And finally, there are some other requirements which mobile stations are exempt from, however they have little, if any, effect at present.

And there are FCC requirements that **apply only to mobile CARS stations**. First, the rules limit any cable television operator to **three** mobile channels, except if a showing can be made that additional channels are necessary and available. This should not be a problem. Second, mobile CARS stations are authorized to transmit "program material, and related communications necessary to the accomplishment of such transmission, from the scenes of events" to cable television systems or studios. In other words, mobile stations are for local origination. However, the Commission **will allow** mobile CARS to relay other television signals on a "temporary" basis. The

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FCC has recognized, in the CARS Rules, that these periods can be for "more than 2 consecutive days". Therefore, the Commission has left it to the **judgement of the CARS licensee** to determine **how** mobile his mobile station will be.

One regulation that **did** apply **only** to mobile CARS stations required that a mobile station always have an operator "in plain view [of the transmitter] and in actual charge of its operation". The operator **was** required to hold a first-or second-class radiotelephone operator's license. However, the Commission recently amended this requirement for mobile stations in certain circumstances.

Mobile CARS stations may now be operated unattended. The same requirements for unattended operation of fixed CARS stations also apply to mobile stations. Essentially, this means that the transmitter must be located in a secure place (i.e., your office or headend) which is always easily

accessible, plus a licensed radio-telephone operator must be **available** for maintenance. Additionally, the transmitter must automatically stop transmitting when there is no signal to be relayed. This is usually accomplished by a sync detector circuit inside the transmitter. The Commission proposed on February 8, 1978, to delete this requirement. This proceeding is captioned, **Notice of Proposed Rulemaking in CT-Docket-78-51**, and comments were due by March 24, with reply comments due on April 10. Since no other microwave service at the FCC requires automatic shut-off (including the Television Auxiliary Broadcast Service) which shares the same band with CARS, it is anticipated that the Commission will quickly delete this requirement for CARS.

Also mobile CARS stations may now be operated by "any person whom the licensee shall designate." The proper operation of the station shall remain the licensee's responsibility. But

for stations "operating with nominal transmitting power in excess of 250 milliwatts" a first-or second-class radio-telephone operator must be at the **receiving end** of the circuit in order to supervise the station's operation. The FCC made these changes in recognition of significant advances in both microwave technology and in the uses of mobile microwave.

LOFT MICROWAVE

A new type of mobile CARS station can now emerge. Previously, mobile equipment would cost about \$15,000 plus you had to have a first-or second-class FCC licensed operator on your payroll. These costs are now substantially reduced. For about \$3500 you can purchase a complete mobile CARS station (video input to video output) consisting of a Microwave Associates MA-12XC equipment with antennas. The horn antennas are the least expensive, but your choice of antennas will depend on the distances between your transmit and receive sites. Furthermore, the station can be operated unattended, resulting in minimal operating costs. And when an operator is required, it can be any person you care to designate. This permits a use of **mobile** microwave stations for cable television which has not been available before.

Such a station could be a Local Outlet For Television (LOFT). For example, you could locate your character generator for your time-weather-message channel at your office or any other location in the community and microwave the signal back to the headend. Then, when an occasion arises, you could use the equipment to cover local events live! If there was a high school sporting event that you could carry on your system, you **or any person that you might designate** could take the microwave transmitter to the game for live coverage via your LOFT microwave station.

Another possible use of a LOFT microwave station is in conjunction with a TVRO earth

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station. LOFT microwave could be used to relay signals to a headend which is located at some distance away from the TVRO site. For example, if your system carried WTCG on only a late-nite basis, you could use the LOFT station to microwave the signal to the headend. Then during the day and evenings you could use the LOFT station to cover local events live or feed local video. However, remember that mobile stations are licensed on a secondary basis and as such they are not protected from interference. Therefore, it might be appropriate to also get a conventional fixed CARS station license to cover the TVRO to headend link. There is no reason why you couldn't get both licenses and use the same transmitter.

FILING FOR A MOBILE CARS LICENSE

To obtain a FCC license for a LOFT microwave station, first you must complete FCC Form 327 (An Application for Cable Television Relay Service Station Authorization). Filling out this form is really quite easy compared to filing with the Commission for either a TVRO earth station or a Certificate of Compliance. In either of those cases there is no form presently available, and you pretty much need to know the FCC Rules and the FCC inside and out (some would say like an attorney) to be able to file an acceptable application. Furthermore the final application can be almost the size of a book and the FCC requires multiple copies.

CARS application are far simpler, (the Commission only rarely returns CARS applications as unacceptable for filing). FCC Form 327 makes it quite easy to complete an acceptable application and three complete copies of the application plus two extra copies of certain pages are all that is required. For example, the sample application shown here consists of 10 individual pages totaling (only) 32 pages to be filed with the FCC. Furthermore, no copies of the application need to be sent to any

other party (i.e., local television broadcasters) and the Commission does not require frequency coordination prior to filing.

The FCC grants CARS applications as quickly as possible within the limits of the law. For the past four years most CARS applications have been granted within 45 days of their receipt at the Commission. Within the first ten days the application is usually listed on a public

notice stating that the application has been accepted for filing. The Commission cannot legally grant the application until 30 days after the issuance of this public notice. Unlike TVRO earth station and Certificate of Compliance, the processing of CARS applications usually begins **immediately after** the public notice is issued. The majority of applications are then ready to be granted when the 30 day public notice period

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1525 Cypress Dr.
Jupiter, Fla. 33458

SAMPLE

FCC Form 327
September 1975

FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D. C. 20554

Page 1 of _____
Approved by GAO
B-160227 (R0279)

APPLICATION FOR CABLE TELEVISION RELAY SERVICE STATION AUTHORIZATION
SCHEDULE A

- 1.(a) Application for: Construction Permit (CP) Modification of CP Assignment of Authorization
(Check only one box) Modification of License License Renewal Transfer of Control
 License Reinstatement Amendment of Application

(b) Does this application refer to an existing station? YES NO If "YES," give call sign.

(c) If this application is for a modification of CP or for a CP for a licensed station, check the box(es) for the appropriate description(s). Attach as Exhibit A-1 a complete explanation of the modification or proposed construction.

- Add Channel(s) Change Transmit Site Add Receive Site(s) Change Antenna System
 Delete Channel(s) Change Control System Delete Receive Site(s) Change Height of Antenna Structure
 Change Transmitter Change Operating Power Change Receive Site(s) Change Horizontal Location of Antenna
 Extension of Time Other (Specify)

2.(a) Indicate the name, mailing address, and telephone number of the applicant.

LEGAL NAME OF APPLICANT (If person, list last name first.)
COMPUTER CABLEVISION INC
CONTINUE NAME HERE IF NEEDED
ASSUMED NAME USED FOR DOING BUSINESS (If any)
MAILING STREET ADDRESS OR P.O. BOX
2617 42ND ST NW #2
CITY WASHINGTON STATE DC ZIP CODE 20007
AREA CODE TELEPHONE NO. 2623746911

(b) Indicate Internal Revenue Service Employer Identification (E.I.) Number used by the applicant. If the applicant has no E.I. Number, use Social Security Number.

E.I. NO. (OR SOC. SEC. NO.)
Applied For

(c) Indicate the name, mailing address, and telephone number of person to contact, if other than applicant.

NAME (Last name first)
RAY DIALY
CONTINUE NAME HERE IF NEEDED
FIRM OR COMPANY NAME
COMPUTER CABLEVISION INC
MAILING STREET ADDRESS OR P.O. BOX
2617 42ND ST NW #2
CITY WASHINGTON STATE DC ZIP CODE 20007
AREA CODE TELEPHONE NO. 2623746911

Attach as Exhibit A-2 the name, mailing address, and telephone number of each additional person who should be contacted, if any.

(d) Indicate the address where the station's records will be maintained.

STREET ADDRESS
2617 NW 42ND ST NW #2
CITY WASHINGTON STATE DC ZIP CODE 20007

is over. But, as with all FCC application processing, if a problem is encountered by the staff, this can delay the grant of the application.

A variety of problems can arise at the FCC in processing a CARS application. The easiest way to understand how to avoid problems is to go through an application. To illustrate this, a sample application is shown on these pages. This sample assumes that a LOFT station will be used to relay both automated weather and local organization programming to a company's cable television system. Note that no broadcast signals will be relayed and that no other cable television systems will be served.

The application consists of five (5) pieces of paper. These

pages are labeled, in the IRS tradition, Schedules A, B, C, D, and E. Schedules A and B ask mainly legal information while the technical information is specified on Schedules C, D and E. Simply, Schedule A asks your names and addresses plus your signature. Schedule B questions deal with minimum ownership information. Schedule C requests transmitter data and television programming information. Schedule D relates only to towers or antenna structures. And Schedule E asks for data on the microwave antennas and the name of the communities to be served.

Schedule A is the first page to complete. Section 1 will indicate to the FCC what type of application you are filing. Since you desire a license (remember

that there are no mobile station construction permits), check "License" in 1(c) and "No" in 1(b). 1(c) is left blank. In Section 2 the FCC simply wants your names and addresses: The name and address of your company, your name and address in case the FCC staff has a question about your application, and the address where the station's records will be kept. Also, the Company's Internal Revenue Employer Identification (E.I.) Number is required. This completes page 1.

The backside of Schedule A is rather straightforward. 3(a) asks if your station will be providing programming to other cable television owners. For the example, the answer is "No". 3(b), (c), and (d) merely ask about the control of the equipment. Three "Yes" answers. 3(e) asks if you have ever had any FCC station licenses, permits, or authorizations revoked. Another "No" (hopefully). Section 4 requires that you attach an Exhibit A-5 stating why you are eligible to be a CARS licensee. The answer is simple—you operate a cable system. So instead of using more paper, it is acceptable to simply write in "Operate cable television system in (community), (state)". Section 5 requires that a map be attached as Exhibit A-6. Since such a map will also be required as Exhibit C-1, label a sheet of paper "Exhibit A-6 and C-1". Draw a circle on the paper representing a 25 mile radius. Mark a direction as being north and say "Station will operate within 25 miles of (community), (state)." Section 6 asks about foreign interest in your company. And lastly there is a place for your signature. Do not sign yet. Section 78.16 of the CARS Rules stipulates who may sign an application (i.e., an officer, if the applicant is a corporation). But do check off the "appropriate classification" of the person who will sign the application. We are now done with Schedule A.

Schedule B. Section 1 simply requires some minimal ownership information. Fill in the

legal name of the company, the type of entity (i.e., 3 = corporation), your E.I. Number, and the state where the company is incorporated. Since the company alone will be the licensee, check number 2 as "No". Assuming that you have already filed FCC Form 325 (Annual Reporting Form) for your cable television system, simply check "Yes". Finished with Schedule B. To this point the FCC rarely has any problems with CARS applications provided all of the questions are answered. Just make sure that the copies you will send to the FCC are **signed and dated**.

Schedule C, transmitter information. As you can see in the top line of the sample, one Microwave Associates MA12-XC transmitter is to be used. In the second line is indicated the emission designator. This is the type-accepted bandwidth in kHz (i.e., 12,500 = 12.5 MHz) and a code indicating type of modulation (i.e., F9 = FM). So for 12.5 MHz channels, indicate 12500F9; for 25 MHz channels indicate 25000F9. Next indicate the class of station as mobile by putting in an "M". You have already completed the requested exhibit C-1 when you made exhibit A-6 earlier. For mode indicate unattended by putting in a "U". The exhibit C-2 is no longer required, but review Section 78.53 of the CARS Rules to make sure that you will comply with those requirements. Since this application only proposed one receive site, "1" is checked. The channel group is indicated on the right hand side of the page as "K" since a 12.5 MHz channel is proposed. If 25 MHz channels are going to be used, then it should indicate group "A". For the frequency boundaries of these channels see Section 78.18 of the CARS Rules.

Next, you have to select which channel to operate on. This can be quite involved, but assume that you know that no one else is using a channel you picked **within 50 miles**. Then you indicate that channel on Schedule C by writing in the information requested next to

SAMPLE

Page 2 of

	YES	NO
3. (a) Will the applicant provide program material to cable television systems other than those which the applicant owns or operates? If "YES", attach as Exhibit A-3 a copy of a written contract specifying that service will be provided on a non-profit, cost-sharing basis; or a copy of a written statement specifying that service will be provided without charge.		X
(b) Will the applicant control the station equipment?	X	
(c) Will the applicant have unlimited access to the equipment?	X	
(d) Will effective measures be taken to prevent use of the equipment by unauthorized persons?	X	
(e) Has the applicant or any controlling party to this application had any FCC station license, permit, or authorization revoked? If "YES", attach as Exhibit A-4 a statement identifying the license, permit, or authorization revoked and the circumstances relevant to the revocation.		X
4. Attach as Exhibit A-5 a statement showing that the applicant is eligible pursuant to Part 78 of the Rules to be a licensee. OPERATE CABLE TELEVISION SYSTEM IN WASHINGTON D.C.		
5. Attach as Exhibit A-6 a map or drawing of appropriate detail showing the complete proposed relay system including points of interconnection, if any, with other cable television relay stations, common carrier stations, and/or other stations. The map or drawing should show the following: (a) Direction of true north; (b) Location of transmitting site(s), the location of any intermediate relay station(s), passive repeater(s), and terminal receiving point(s); (c) Call sign(s) and licensee(s) of any station(s) to which applicant's proposed station will be interconnected; (d) Every path number for the station for which this application is filed.		
6. Is the applicant, or any of its partners, members, or owners: (a) a foreign government or the representative thereof; or (b) an alien or the representative of any alien; or (c) a corporation organized under the laws of any foreign government; or (d) a corporation of which any officer or director is an alien or of which more than one-fifth of the capital stock is owned of record or voted by aliens, or their representatives, or by a foreign government or representative thereof; or (e) a corporation directly or indirectly controlled by any other corporation of which any officer or more than one-fourth of the directors are aliens, or of which more than one-fourth of the capital stock is owned of record or voted by aliens, their representatives, or by a foreign government or representative thereof, or by any corporation organized under the laws of a foreign country? If "YES", attach as Exhibit A-7 a detailed statement which fully describes all alien interests, officers, and directors of the applicant and any controlling entities, including identity, address, nationality, biographical data, and extent of capital stock ownership.		X

CERTIFICATION

All the statements made in the application and attached exhibits are considered material representations, and all the exhibits are a material part hereof and are incorporated herein as if set out in full in the application. The applicant certifies that he has a current copy of the Commission's Rules governing the Cable Television Relay Service (CARS). The applicant waives any claim to the use of any particular frequency as against the regulatory power of the United States because of the previous use of the same, whether by license or otherwise, and requests an authorization in accordance with this application.

I CERTIFY that the statements in this application are true, complete, and correct to the best of my knowledge and belief and are made in good faith.

WILLFUL FALSE STATEMENTS MADE ON THIS FORM ARE PUNISHABLE BY FINE AND IMPRISONMENT. U.S. CODE, TITLE 18, SECTION 1001.

(Check appropriate classification)

 INDIVIDUAL APPLICANT MEMBER OF APPLICANT PARTNERSHIP OFFICER OF APPLICANT CORPORATION OFFICER OF APPLICANT ASSOCIATION OFFICIAL OF APPLICANT GOVERNMENT ENTITY

Raymond E. Daly II 4-1-78

SIGNATURE DATE

the appropriate channel number. Since in the sample application automated weather information and local origination will be relayed on channel K20 (12.9375-12.9500 GHz) then "AO/NO" is written next to the number 20. Since none of the codes apply about the source of the signal nor to the FCC authorization for carriage of the signal on the cable television system, then the number "6" code is filled in twice on the same line (#20) and the space for "Microwave Station Call Sign..." is left blank.

These answers require that Exhibits C-6, C-7 and C-8 be provided. This is done on one sheet of paper. The exhibits must indicate the nature, source, and the extent (hours per week) of the programming, plus a

statement about why Commission authorization is not needed for CATV carriage of the signal being relayed. This is all that is necessary for this example. If a TVRO earth station or another microwave station were involved, their call signs are required. Finished with Schedule C.

Schedule E. Only antenna information and cable system information is requested on this schedule. Since a horn antenna is being used with a two foot parabolic (Nurad) antenna at the receive site the antenna data is filled in as shown in the example. Since the station will be mobile, simply indicate the antenna heights, the path distance, and the path azimuth as variable. On the right hand side indicate the

SAMPLE

Page ____ of ____

FCC Form 327 APPLICATION FOR CABLE TELEVISION RELAY SERVICE STATION AUTHORIZATION

SCHEDULE B. Control and Ownership Information (The information submitted in this schedule should enable the Commission to identify all entities which either directly or indirectly control the applicant.)

SECTION I. Control and Ownership

1. The following information must be provided for the applicant; for each member or partner, if the applicant is an unincorporated association or partnership; and for each cable television owner or operator, if the applicant is a cooperative enterprise wholly owned by cable television owners or operators. Indicate the legal name, the type of entity (1=Individual, 2=Partnership, 3=Corporation, 4=Unincorporated Association, or 5=Governmental Entity); and the Internal Revenue Service Employer Identification (E.I.) Number used by the entity (if the entity has no E.I. Number, use Social Security Number). If the entity is a nongovernmental corporation, indicate the state under whose laws the corporation is organized.

LEGAL NAME (If person, list last name first) COMPUTER CABLEVISION INC	ENTITY CODE 3	E.I. NO. (or Soc. Sec. No.) APPLIED FOR	STATE OF INCORPORATION DE
CONTINUE NAME HERE IF NEEDED			

Indicate applicant's members; partners; or owners (if a cooperative enterprise).

LEGAL NAME (If person, list last name first)	ENTITY CODE	E.I. NO. (or Soc. Sec. No.)	STATE OF INCORPORATION
CONTINUE NAME HERE IF NEEDED			

LEGAL NAME (If person, list last name first)	ENTITY CODE	E.I. NO. (or Soc. Sec. No.)	STATE OF INCORPORATION
CONTINUE NAME HERE IF NEEDED			

LEGAL NAME (If person, list last name first)	ENTITY CODE	E.I. NO. (or Soc. Sec. No.)	STATE OF INCORPORATION
CONTINUE NAME HERE IF NEEDED			

(If additional space is needed, attach as Exhibit B-1 the requested information in the same format as above.)

2. Is the applicant a cooperative enterprise wholly owned by cable television owners or operators?	YES	NO
		X
3. Has the above-named applicant filed FCC Form 325 indicating all entities which either directly or indirectly control the applicant?	X	
If "YES", no further items in this section need be answered.		
4. If the applicant is an unincorporated association or partnership, have the applicant's controlling members or partners filed FCC Form(s) 325 indicating all entities which either directly or indirectly control such controlling members or partners?		
If "YES", attach as Exhibit B-2 a statement explaining which members or partners control the applicant; no further items in this section need be answered.		

channel number that you filled in on Schedule C. Precede it with the channel group letter. In the example, channel 20 of Group K is being used, so "K20" is filled in under channel designator. The fourth space of the channel designator usually indicates the polarization of the microwave signal, but since the station is mobile no polarization information is required. Next, on the left indicate the communities to be served with their FCC Community Unit Number (i.e. DCI) and the legal name of the franchisee.

Schedule D. Depending on how you plan to use your mobile station, you have to file none, one, or several Schedules D. A separate schedule is required for each tower (not buildings),

mounted either on the ground or on a building, which is over twenty (20) feet high. If you plan to transmit from your office window to a window in your headend building, then no Schedule D need be submitted, but you should state this in your letter to the Commission when submitting the application. Otherwise, submit a Schedule D for each tower **over twenty feet** which you might use for either transmitting or receiving from more than 48 hours. In the sample, a building in Washington, D.C. is shown which could be used for a receive site. Note that an accurate street address, geographical coordinates, building or tower height, and ground elevation must be given. Also, a vertical

profile sketch of the structure—it need not be a picture—is required.

Tower problems are the most common problems delaying grants of CARS applications. Since the FCC coordinates their tower data with the Federal Aviation Administration (FAA), most of the problems can be avoided by including with the application the latest FAA tower clearance. Make sure the FAA numbers, heights and coordinates, match Schedule D. If the FAA data is in error, write the FAA a letter, referring to their previous study number, advising them of the correct numbers. Attach a copy of this letter to your CARS application. You could still run into problems. For example, if a paging service radio licensee is mounted on the same tower you plan to use and they gave different coordinates to the FCC, the Commission **might** think that there are two different towers built right next to each other. If you have any problems, remember that the person at the FCC is working with numbers trying to insure air safety. They cannot afford to visit your tower site, so they can only try their best to do their job with numbers. We are now finished with Schedule(s) D.

Last step. After reviewing the completed application have three complete copies made and two extra copies of all Schedules D and related tower information (i.e., FAA clearances). **Sign and date all copies and the original.** Keep the **original** for your records and send the **copies** to the FCC. Notice that it is not mandatory the application be typed. Enclose a cover letter stating that you are submitting a license application for a **mobile** Cable Television Relay Service (CARS) station to serve your cable system. Mail the copies to the FCC, 1919 "M" St. NW, Washington, D.C. 20554.

THE FCC'S TURN

Upon acceptance of your application the Commission will send you a postcard stating

SAMPLE

Page ___ of ___

FCC FORM 337
APPLICATION FOR CABLE TELEVISION RELAY SERVICE STATION AUTHORIZATION
 SCHEDULE C. Transmitter and Signal Data (Each Schedule C should indicate the requested information for each model of transmitter which will transmit channels of the same channel group. See reverse side for further instructions.)

NO. 1 **MA-12XC** MAKE (MANUFACTURER) **MICROWAVE ASSOCIATES**

EMISSION DESIGNATOR **12G00F9** CLASS OF STATION: **F** = FIXED **M** = MOBILE

MODE: **U** = UNATTENDED **R** = REMOTE CONTROL **N/A** IF UNATTENDED OR REMOTE CONTROL, ATTACH AS EXHIBIT C-2, THE APPROPRIATE SHOWING AS TO THE MANNER OF COMPLIANCE WITH SECTION 78.51 OR 78.53 OF THE RULES.

Check the path numbers that this transmitter(s) feeds. **1** **2** **3** **4** **5** **6** **7** **8** **9** **10** **11** **12** **13** **14** **15** **16** **17** **18** **19** **20** INDICATE THE MICRO-WAVE CHANNEL GROUP **K**

MICRO-WAVE CHANNELS	CALL SIGN OF TELEVISION BROADCAST STATION TO BE RELAYED OR THE APPROPRIATE CODE	SOURCE OF SIGNAL Δ / MICROWAVE STATION CALL SIGN OR FILE NO. OF PENDING APPL.	AUTHORITY ORIGINATOR CODE	MICRO-WAVE CHANNELS	CALL SIGN OF TELEVISION BROADCAST STATION TO BE RELAYED OR THE APPROPRIATE CODE	SOURCE OF SIGNAL Δ / MICROWAVE STATION CALL SIGN OR FILE NO. OF PENDING APPL.	AUTHORITY ORIGINATOR CODE
1				22			
2				23			
3				24			
4				25			
5				26			
6				27			
7				28			
8				29			
9				30			
10				31			
11				32			
12				33			
13				34			
14				35			
15				36			
16				37			
17				38			
18				39			
19				40			
20	A0/NO	6	6	41			
21				42			

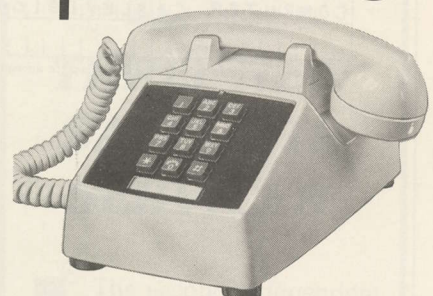
that the application was accepted for filing and giving you an application number (i.e., CARS-14356-12). Then about 45 days after filing with the Commission you should receive another postcard saying that your application has been granted. The official authorization will be mailed later, but you can begin operation immediately upon receipt of the grant-card. To insure that things go this smoothly at the FCC, call the CARS Microwave Branch about a week or two after receiving the first postcard. Telephone (202) 254-3420 or (3421, 3422). They will also be glad to help you if you have questions about how to complete the form (or about CARS Rules). This call is well worth the money because you can see if there

will be any delays. If they have not yet processed your application, ask when they will be able to work on it and when it would be a good time to call back.

BEYOND TODAY'S LOW-COST

So far this article has covered how you can receive an FCC license for a low-cost microwave station today. The future holds several possible alternatives for low-cost microwave. The most promising is competition. The Microwave Associates MA12-XC equipment is the only complete FCC type-accepted microwave system costing less than \$3000. Because this equipment is available today, it is used in the example in this article. For mobile operation the standard MA12-XC is

control by phone



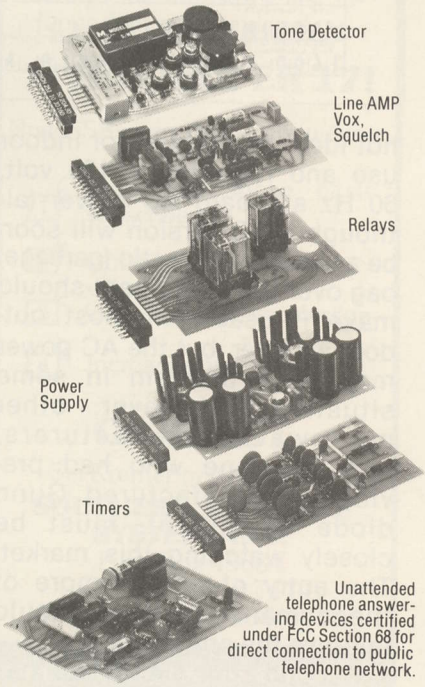
Use a regular touch button telephone to control:

- Cable TV circuits
- Pollution sampling equipment
- Microwave transmitters
- Call diverters and automatic answering devices
- Antenna systems
- Telephone equipment
- Radio/telephone interconnection equipment
- Pumps, motors, overhead doors

Use Monroe Electronics plug-in circuits to construct your own custom system with off-the-shelf ready to use circuit cards.

Accessories include power supply 12 V from 115 V AC line.

THESE CIRCUIT CARDS AVAILABLE FROM **\$49 TO \$99**



Circuit card Enclosures are offered for 1 to 12 cards

MONROE ELECTRONICS, INC.
 100 Housel Ave., Lyndonville, N.Y. 14098

JUNE 1978

SAMPLE

Page _____ of _____

FCC Form 327 APPLICATION FOR CABLE TELEVISION RELAY SERVICE STATION AUTHORIZATION

SCHEDULE D. Site Search and Data (File a separate Schedule D for each transmit, receive, and passive repeater site. See reverse side for further instructions.)

LEGAL NAME OF APPLICANT (If person list last name first) COMPUTER CABLEVISION INC	NO. 01
CONTINUE NAME HERE IF NEEDED	If a receive or passive repeater site, indicate the number of the path which feeds this site. If transmit site enter number 00.

Draw a vertical profile sketch of the complete antenna support structure in this space.

If the structure is proposed, indicate the call sign of any Standard Broadcast station transmitter located within 1.0 kilometer (0.62 mile) of the proposed structure.	CALL SIGN N/A
If the applicant proposes construction of a major communications facility as defined in Part 1, Subpart 1, of the Commission's Rules, attach as Exhibit D-1 a statement containing the information required in Subpart 1.	NOTE: 1.0 foot = 0.3048 meter 1.0 meter = 3.2808 feet
If these facilities will be mounted on an antenna support structure previously authorized by the Commission, include as Exhibit D-2 a statement identifying the licensee or permittee, call sign, service of station, and current obstruction lighting (list by reference applicable paragraphs of FCC Form 715).	HEIGHT of complete structure feet: 112 meters: 34
Construction of certain structures and alterations to structures may require notification to the Federal Aviation Administration (FAA). (See Section 17.7 of the Rules.) If such a notification was made, and the construction or alteration is proposed, attach as Exhibit D-3 a copy of such notification.	HEIGHT of building (if any) feet: 112 meters: 34
If the structure will be located on land under the jurisdiction of the U.S. Forest Service, the U.S. Department of Agriculture, or the Bureau of Land Management, the U.S. Department of Interior, certification shall be made as Exhibit D-4 that approval has been received from the appropriate agency for the use of the site, subject to the grant of this application.	HEIGHT of ground AMSL feet: 35 meters: 11
	North Latitude 38 53 50
	West Longitude 77 02 13
SITE COMMUNITY WASHINGTON	COUNTY N/A
LOCATION (STREET ADDRESS OR DISTANCE AND DIRECTION OUTSIDE THE COMMUNITY) STATE 1600 PENNSYLVANIA AVE DC	

not ideal being built for indoor use and requiring a 120 volt, 60 Hz standard AC power (although a DC version will soon be available). A plastic (garbage) bag over the equipment should make it usable in most outdoor weather, but the AC power may be a problem in some situations. However, other microwave manufacturers, including one who had previously manufactured Gunn diode equipment, must be closely watching this market. The entry of one or more of these manufacturers should improve the options.

Second, the CATJ Lab has reported in past issues about a low-cost microwave system which they have been working on. It has always been assumed,

quite correctly for most CARS stations, that the equipment must be FCC type accepted before it can be licensed. However, there is an exception in the present Rules. Section 78.107(b) reads, "Each transmitter authorized for use in the Cable Television Relay Service, other than CARS pickup station, must be a type that has been type accepted..." (emphasis added). This holds the promise for even lower cost LOFT stations. The difficulty is that the FCC has never authorized a mobile CARS station under this exemption. To date all mobile CARS stations have used type accepted equipment. This means that there is no experience at processing this type of station and therefore

such stations will not and cannot be routinely processed. It may even turn out easier to get equipment type accepted (this is being investigated). It should also be noted that this exemption may be changed as part of the FCC's Notice of Inquiry and Proposed Rulemaking in Docket 21505.

Third, when the FCC adopted the Notice of Inquiry and Proposed Rulemaking in Docket 21505 the Commission considered including a proposal to permit cable television operators access to the 2 and 7 GHz band. Yes, 2 and 7 GHz. This proposal was aimed at improving rural television service. Earlier the Commission had authorized television translator licensees access to 2, 7 and the entire 13 GHz band; four times the spectrum available to cable television (see CATJ, March 1978). However, the Commission on a 4-2 vote rejected the proposal saying that the cable television industry had not shown any interest or need for use of these frequencies. Chairman Ferris and Commissioner Brown stated at that meeting that they would write dissenting statements to that decision. More work will be done on this matter and please feel free to contact me if you have any specific suggestions on this matter.

And finally there is you. Without your participation in the FCC CARS rulemakings, low-cost microwave is just an idea. The FCC should hear from you about your experiences, your plans and even your dreams for using microwave for providing the public with television service. If the FCC can see no need for low-cost microwave, then in rewriting the CARS technical standards the FCC will not consider low-cost microwave. If the CATV industry does not express their demands the FCC cannot be criticized (too much) for not giving low-cost microwave a chance, especially when the television broadcasters will say they need all of the spectrum themselves.

LOW COST MICROWAVE TRANSMITTER WITH 4.5 MHz SUB-CARRIER AUDIO

13 Months Ago. . .

It has been thirteen months since 'word' of the development of low-cost microwave techniques, utilizing the Gunn Diode, first appeared in CATJ. And it has been eleven months since CATJ's Lab reported in print with a circuit diagram of a lab-model video modulated Gunnplexer system, and it was also last July at CCOS that hundreds of operators had the opportunity to actually see in operation both the commercial version of this gear and some CATJ Lab low-cost versions.

There is much talk in this issue of CATJ about microwave. And judging from the comments we have been hearing lately, it comes none too soon. The cable natives are, as they say, restless.

We've learned a great deal about low cost microwave in the intervening year or so. Some of what we learned is best forgotten; other should be indelibly imprinted in the mind of every would be practioner of the low cost microwave art. This month we begin a multi-part series on the **current** state of the low cost microwave art. There is much good news, and some not so good news. In the former department, be sure to read carefully the piece in this issue by Ray Daly; formerly of the Cable Television Bureau's microwave branch. Daly has some very interesting things to say about how you can file for a 'painless' CARS band license and actually use **home-brew** equipment in the CARS band service. We expect some fall out from his suggestions appearing in print and that may be where some of the bad news comes along at a later date.

In addition to now having a very simplified way to go for licensing low power (or low cost) CARS band microwave equipment, there is a building sentiment within both the industry and even at the Commission that **perhaps** in some situations where interference could be either tolerated or coped with (i.e. resolved) at the local level there might best be a way for this to be done on a regular basis without 'scooting along the edge of the law'. Daly's comments about the many factors that drive up the cost of the basic microwave package are well taken; it seems somewhat anti-productive to be able to plunk down say \$2900 for a complete commercial microwave

transmitter and receiver such as the Microwave Associates 12XC series gear and then have to spend **another** \$3000 or more per chanel to get the little boxes licensed, connected to antennas and operating. It's sort of like the 5 cents of wheat you find in a 70 cent loaf of bread.

The bottom line on the total-system cost equation is that while hardware costs may be tumbling the peripheral costs seemed to be going up constantly.

But enough of the politics of the situation. Where are we technically?

Well, this month's first part of this status reports deals with the transmitter end of the equation. Next month we'll tackle the receiver. The last time we visited the transmitter in print we had around \$3 in parts plus a Bud box to marry to the basic \$90 Gunnplexer transmitter. That got us fairly respectable video (even color no-less) **but no audio**. Since most people watch television with the sound turned up we thought it best to remedy that shortcoming. We'll show you how to go about adding a 4.5 MHz aural (FM) subcarrier shortly.

Now a number of things have happened or are happening with the basic Gunnplexer units. You will recall that as-available-from Microwave Associates the \$90 each (or \$180 for a pair) transceivers were tuned up in the amateur 10,000 to 10,500 assignment. For those of us licensed to operate there this seemed adequate although running your office-located weather channel machine back out to the headend through a 3 mile 10,250 MHz hop of Gunnplexer is at best dangerous even if (or especially if) you have a legitimate right to be operating in that band (i.e. you have a ham license). Still, several fellows have 'played around' with that approach primarily because until Ray Daly came along and showed us how to license homebrew equipment in CARS band we didn't think we should be 'playing' in CARS band, and, (and this one hurts even worse) the **12 GHz** (or CARS band) version of the basic low cost Gunnplexer transceivers are simply not available from Microwave Associates. For which we blame them not; if **you** were selling a com-



FOUR FOOT TRANSMIT dish from Microwave Associates is mated with low-cost microwave Gunnplexer transmitter which mounts directly to feed flange at rear end of dish antenna. Using this test system high quality video signals over paths as great as 20 miles proved practical under 'dry weather' conditions.

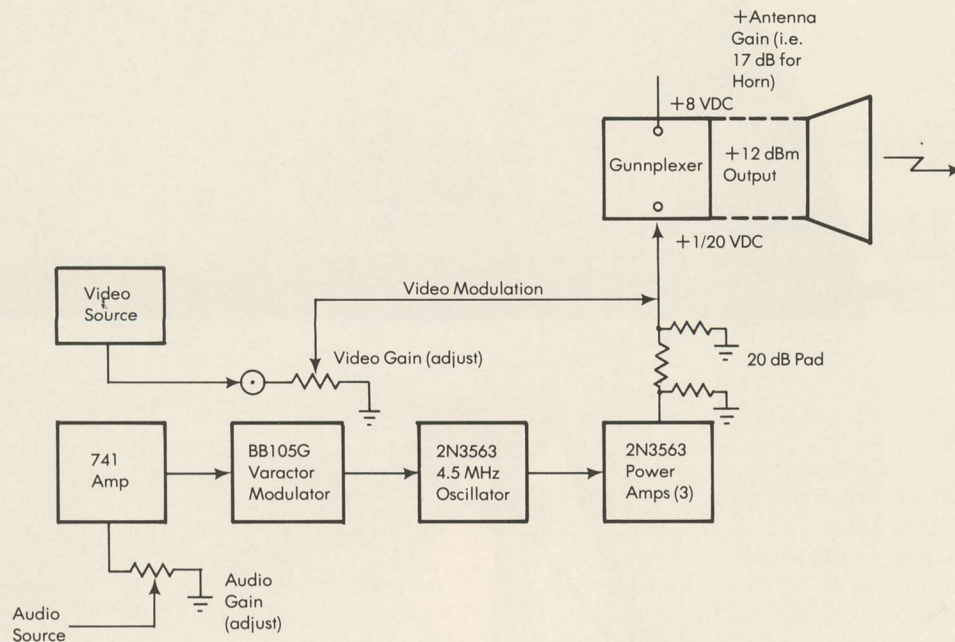
mercial version (with full FCC type acceptance) for just under \$3,000 a channel you wouldn't be foolish enough to be offering a do-it-yourself version for \$180 either!

So even inspite of brother Daly's "here's how you get your own homebrew microwave licensed for CARS band use" explanation in this issue of CATJ, there remains the **slight** problem of not being able to acquire the basic Gunnplexers in the 12 GHz range. At least not from Microwave Associates. And to save you scouring the back pages of Microwave Systems News or Microwaves (magazines) we'll advise you here that **no-body else is delivering** low priced 12-13 GHz Gunn Diode oscillators either right now.

And to further save you some grief and wasted time, no, you cannot remove the back end of the cavity on the 10 GHz version and 'shave it down' to move the operating frequency of the low cost units up a 'tad' to say 12,700 MHz. The Gunn Diodes in the cavities at 10,250 GHz simply don't like working at 12,700 GHz, even if the cavity will resonate up there. At least that has been our experience (you see, we did try that approach. . .).

So you are back to being a 'ham' on 10 GHz or 'bootlegging'; right? No, not entirely. There are, it turns out, two frequency allocations immediately above the 10,000 to 10,500 MHz band, which the basic Gunnplexer will hit with no difficulty. One of these is the 10,500-10,550 MHz 'Developmental Band' (police radars commonly employed operate

on 10,525 MHz give or take their doppler and drift) and another is the 10,550 to 10,680 MHz 'mobile' band. Our study of these two bands revealed a pair of interesting tid-bits. In the 10,500 to 10,550 MHz band there are FCC certified low power radar packages; the kind you plunk down a few hundred bucks for, take home and set on a bookshelf and turn on; to 'alarm you' if something bigger than a medium sized cat moves around in the room. It turns out that one very enterprising chap who **has had** his 'low power radar equipment' **FCC certified** for sale in this band has read the rules carefully and discovered that there is nothing in the rules to prevent him from employing a 'secondary form' of modulation with his package. That is, **in addition** to the carrier he transmits for radar detection purposes, **he also transmits a second carrier**. And that second carrier is FM modulated with...you guessed it, **video**. This chap (which has the gear on the market under the tradename 'Videobeam'; a dead give away as to his true marketing interests) sells his package to security installation firms with instructions to hook up a vidicon (surveillance) camera to the jack marked 'video input', and a video monitor to a companion receiver he sells. The idea is that when a security company has an installation where they cannot easily or economically install a coaxial cable between a surveillance camera location and a central monitoring point the 'Videobeam' re-



**LOW COST MICROWAVE TRANSMITTER WITH OPTIONAL
4.5 MHz AURAL SUB-CARRIER GENERATOR**

places the camera with 10,500-10,550 MHz microwave. If that seems ho-hum to you, be advised that **this is not commonly done in any other** frequency range with any other gear these days; unless a would be microwave user goes to the trouble and expense of putting down perhaps \$5000 to \$10,000 for a more conventional microwave system and all of the messy licensing, frequency coordination and other FCC required problems that go with 'expensive' microwave. Obviously the 'Videobeam' serves a most useful and much needed purpose; not unlike the purposes low cost CATV microwave would serve given half the chance necessary to do the job.

Then there is the 10,550-10,680 MHz band. This is, as noted, designated a 'mobile band'. Now normally when we think of 'mobile radio', we envision rolling down the highway and speaking into a microphone to communicate with somebody. But, as most are aware, this is not something one does easily (if in fact at all) at 10,550 MHz. It is the nature of the ultra-ultra short waves of this frequency range that they are simply not suitable for this type of 'mobile' operation. So what does this band do? That's the sixty-four-dollar question around since in the decade or so there has been such a band allocated there have been fewer than 30 licenses granted in the service. That works out to over 4 MHz per licensee on a nationwide basis and that clearly is a poor use of precious spectrum space. Still the word '**mobile**' does stand out since that is the word Ray Daly keys off of his separate report in this issue. Might not Mr. Daly's approach to essentially hassle free 'mobile CARS band' licens-

ing also work for someone at say 10,550-10,680 MHz? It is a question which begs an answer, and it is very relevant because of the ease with which 10,000-10,500 MHz 'amateur band' Gunnplexers will in fact tune up into this region.

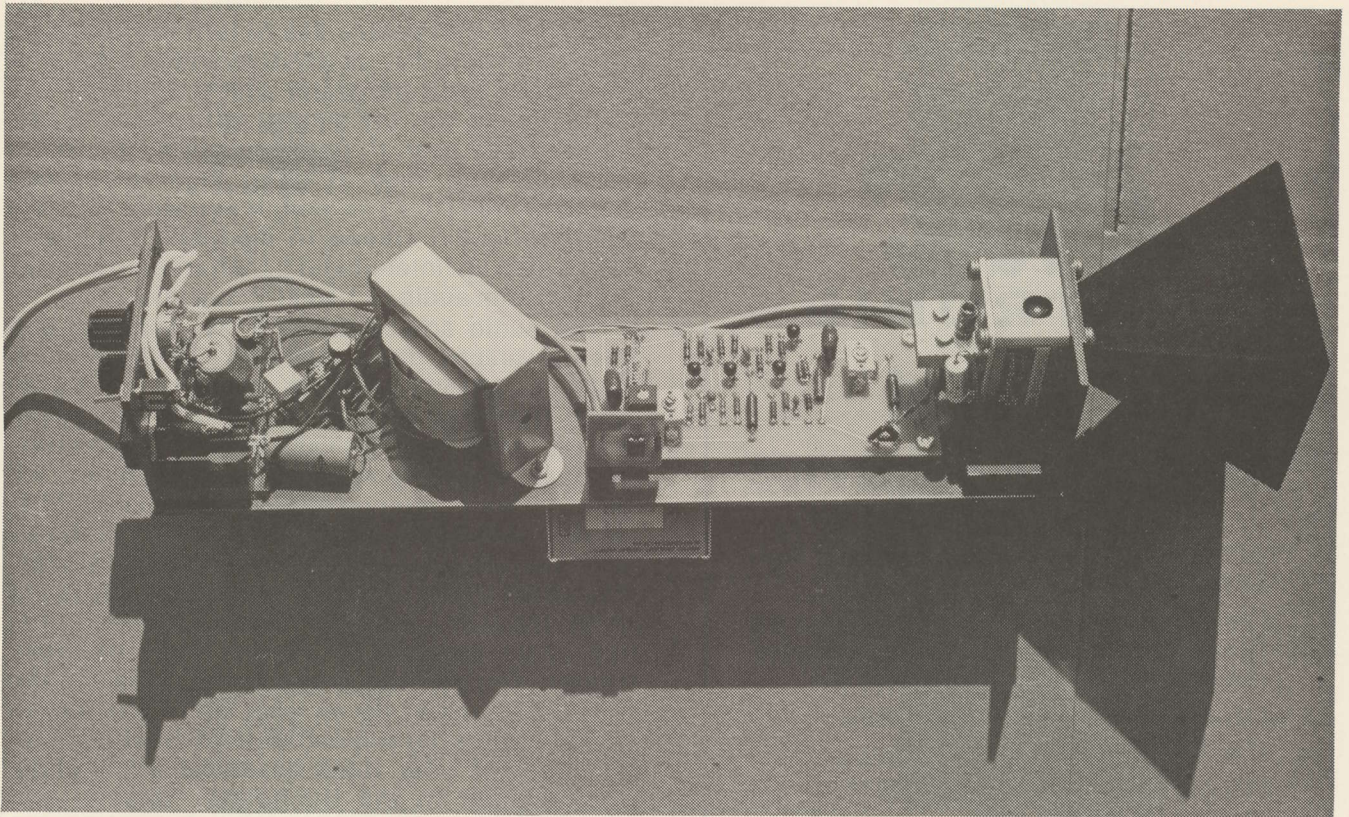
So there are two more licensing possibilities. And both fit the technical format of the readily available gear.

However, in spite of all of these 'possibilities' the individual that likes everything firmly set down in black and white is still at somewhat of a loss as to where to go. Any decision to use low cost (do it yourself) microwave is fraught with some danger. Anything you do might be bordering on being contrary to existing Commission rules, or as Ray Daly points out in this issue, preempted by rule changes at some future date.

There remains therefore **no clear cut and concise answer to the problem**; which simply stated, is, 'Where can I set up and operate, with total legality, a low cost microwave system that can be afforded for my small (often rural) CATV system?'

Margin and Distance

Much has been made of how much power you need to successfully cover some set distance between the transmitter and the receiver. For reference, see **CATJ** for **November 1977**, page 47. With the industry now very familiar with FCC required fade margins for TVRO work (typically 3 dB [minimum] above FM noise threshold) it should be understandable to state that the margin you require on (10) 12 GHz microwave is the sum of the maximum total weather losses to



COVER OFF of basic 15/20 milliwatt transmitter unit shows 4.5 MHz audio sub-carrier system board (just right of center). Power supply and video modulation control circuits are to left. Unit is shown with 17 dB gain horn antenna; this antenna comes off of the package when the transmitter is mated with a higher gain parabolic antenna.

be anticipated in your region of the country under the most abusive weather conditions likely along your path. In very dry areas of the country a 15 or 20 dB 'margin' may prove very adequate (remember that heavy rain is the principal loss factor for [10] 12 GHz microwave energy). In other very wet areas of the country a 40 dB 'margin' may prove to be inadequate. Charts and graphs abound (see page 49 CATJ for November) and considerable care should be taken anytime the total path length will exceed 5 miles. Beyond 10 miles rain becomes especially critical.

The first mile is the problem. At 10,250 MHz the path loss in the first mile is 116.8 dB. It rises to around 119 dB at 12,700 MHz. That means that your system gain (i.e. transmitter power output, transmitter antenna gain plus receiver antenna gain and receiver gain/sensitivity) must be great enough to overcome not only the loss of the path but also provide the 'fade margin' required to protect against 'rain outages'.

After the first mile, everytime you double the path length you add 6 dB to the path loss. For example, if a 1 mile path is 119 dB, two miles of path is 119 + 6 or 125 dB while 4 miles is 131 dB and 8 miles is 137 dB. Think about that for a minute or two; because that is the crux of the problem you are facing. The first mile is the killer. If you can build up a system and make it work satisfactorily at 1 mile, you are really almost home free. After that it is primarily 'tweaking' and providing the necessary margin to push the signal through infrequent heavy rains.

Now The Transmitter

The Gunnplexer oscillator operates on the transmit frequency. As detailed in the May, 1977 (page 10) and June 1977 (page 10) CATJ, the oscillator is a Gunn Diode operating inside of a resonant cavity. The cavity is sized to create a 'self resonant' condition and the Gunn Diode 'excites' that cavity. RF energy so-generated is fed out of the cavity through an 'iris opening' into either a section of waveguide or directly into a primary antenna (such as the commonly shown 17 dB gain horn antenna). Anyone that has missed the basic description of the Gunnplexer needs to go back to the two references noted and bone up on the technology involved here.

A varactor diode that shares the resonant cavity housing with the Gunn Diode is our modulating/frequency changing device. By applying a voltage to the varactor (a bias voltage in the +1 to +20 vdc range) the output frequency of the Gunn oscillator is subtly modified. If we 'sweep' the voltage back and forth the 'rate of sweep' varies the output frequency of the Gunn oscillator at the same rate as the 'sweeping bias voltage' applied to the varactor. This then frequency modulates (or FMs) the Gunn oscillator. So by applying an amplitude modulated signal, such as a video baseband signal, to the varactor port, the varactor 'FMs' the Gunn oscillator and frequency modulator of the Gunn oscillator results.

The basic layout of the Gunnplexer transmitter system is shown in diagram number one.

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Remember that people like to turn the sound up when watching TV, so we've included a 4.5 MHz sub-carrier aural generator which will allow you to modulate the transmitter with not only the video (1 volt peak to peak typical) source but a relatively low level (0 dBm) high impedance audio source (10 K) as well. If you want to use a 600 ohm audio source to modulate the audio, find a step up (inter-stage) transformer to convert the 600 ohm audio to 10,000 ohm audio.

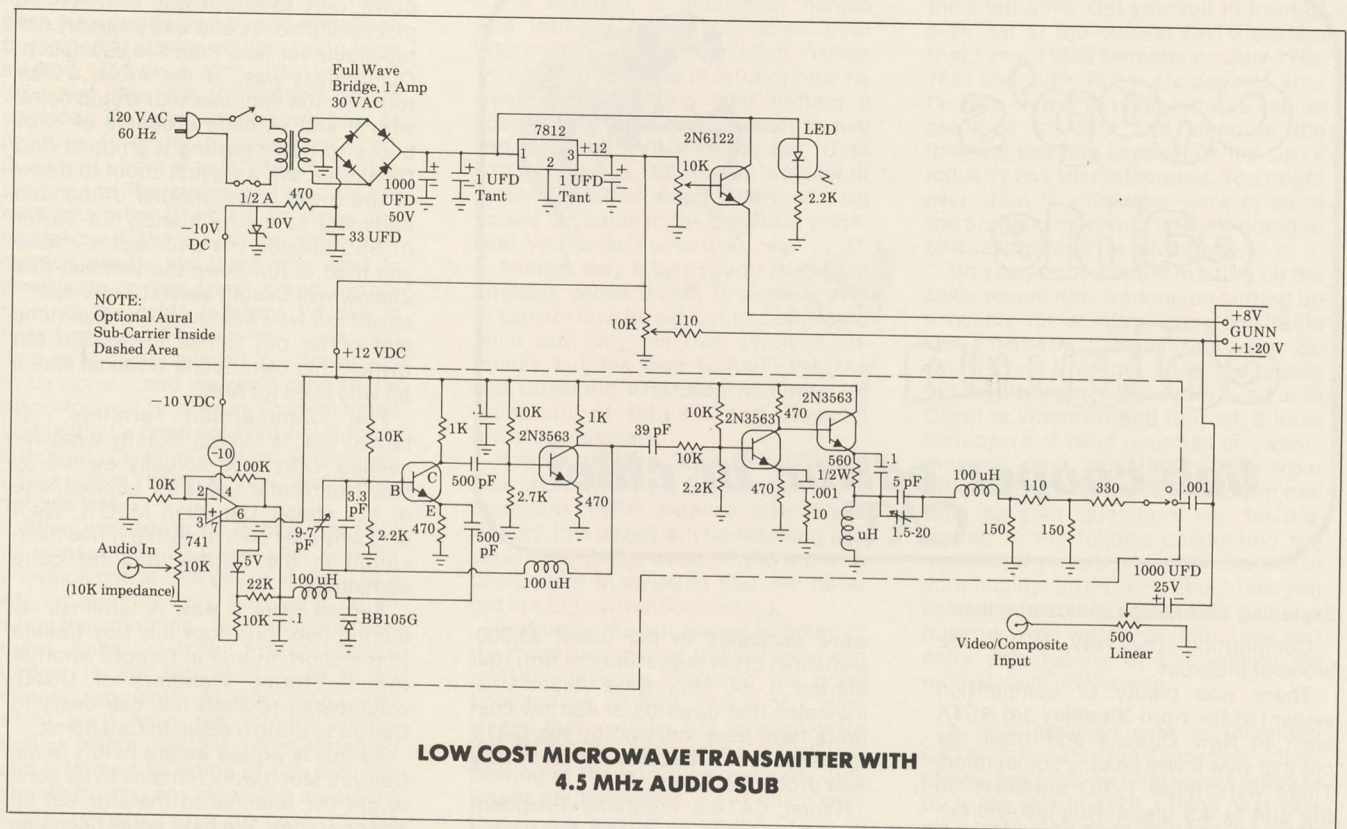
The audio source drives a **741 amplifier** and then a **varactor diode** (Amperex BB105G) which FMs the **2N3563 oscillator** operating on 4.5(00) MHz. The FMed output at 4.5 MHz is then amplified in additional 2N3563 bi-polar transistors. What we are doing here is simply creating a 4.5 MHz carrier frequency modulated. This 4.5 MHz carrier, with audio 'attached', is then combined with the video input signal (a baseband signal). The audio signal is combined with the baseband video through a resistive network to insure that the audio runs 20 dB 'down' from the video carrier. You run the 'audio down' here for the same reason you do on your CATV system; to prevent the audio sub-carrier from creating interference with your video baseband information. At the input to the Gunnplexer varactor you should have approximately 1 volt peak-to-peak baseband video and 0.1 volt RMS audio.

Also note there is a switch at the end of the audio chain to allow you to switch out the internal 4.5 MHz sub-carrier generator should you already have the 4.5 MHz available from a demodulator.

Tune up? There is virtually none. If you follow the schematic and the photos here there is very little you can do to go wrong. **There is** a .9 to 7 pF trimmer capacitor on the base of the first 2N3563. With a frequency counter connected to the output of the 4.5 MHz sub-carrier generator (and no modulation present) adjust the trimmer for 4.500 (you should maintain 1 kHz accuracy which is 4.499 to 4.501). **The only other** construction adjustment is the 1.5 to 20 pF trimmer in the output of the last 2N3563. This is a **peak for maximum level** adjustment; adjust for highest output level. And the 10K pot on the input to the 741? Simply an audio level control which if you want to get very technical impacts on the amount of audio deviation (or FMed) of the aural sub-carrier.

Over on the video modulator side we have two parts (our initial circuit in the July 1977 CATJ had five!); a 500 ohm pot and a capacitor. The pot is a video modulation level adjustment. We'll touch briefly here on what you do to adjust it properly; simply set it until the received signal looks good, and then forget it as long as the video level to the modulator stays pretty much the same.

Now yes there are many more circuits that **could** be designed into a system like this; such as automatic video level controls, and automatic aural level controls to insure that the modulation indexes on both the video and audio stay at or



below some pre-determined level. But each brings up the costs of the unit, and for applications involving simple applications such as running the weather channel back out to the headend (where the video level stays within fairly constant level ranges) such 'automation' is not required.

Frequency control. Devotees to the Gunnplexer are well aware that the Gunnplexer is not unconditionally stable as to operating frequency. In fact for each one degree of temperature change (C) the frequency moves by 0.350 MHz. If that seems like a bunch, remember we are at 10,250 MHz (or higher) and proportionally it is not all that much. Now it turns out that frequency 'drift'

will affect both a transmitter and a receiver by about the same amount (and in the same upward or downward direction) if both units are in about the same temperature environment. And if they are not? Well, that is another one of those refinements we have made since last reporting to you in July of 1977. However, the AFC (automatic frequency control) is all incorporated into the receiver portion of the design; which simply means we let the transmitter move around as it will and then the receiver runs up and down the band 'chasing' the transmitter. And that seems like as good a place as any to stop this phase of the report so that we can come back next month with the operating schematics and construction techniques required for the receiver.

Like To Tinker With Microwave?

Judging from our mail here at CATJ and comments we hear at CATV gatherings there is a considerable amount of interest in adapting low-cost (Gunnplexer) microwave to various applications involving CATV systems. Since the first public operational showing of the Gunnplexer equipment at CATA's CCOS-77 we understand that approximately 800 of the basic Gunnplexer transceivers have been produced and shipped by manufacturer Microwave Associates.

Contrary to popular mis-belief the design and operational problems presented by 10 or 12/13 GHz transmitters and receivers is no more complex nor complicated than equipment operating at 100 MHz. In fact, because the microwave transmitter and receiver are complete within the Gunnplexer unit any add-on work you do is in fact either at baseband (video and or audio) or at the selected IF range (40-50 MHz in our case). This year at CATA's CCOS-78 we will have a special 'Gunnplexer Room' where operators who wish to learn more about Gunnplexer technology may congregate, exchange practical experience and talk with people who have already 'been there'. Leading up this effort will be a fellow named Bob Richardson who is in the process of completing a several hundred page 'Gunnplexer Handbook'. This new handbook describes dozens of Gunnplexer circuits, all built and made operational by Richardson, spanning the range from simple motion detection systems (great for security at your headend) to more functional video (and audio) transmission and receiving systems.

If you are 'into Gunnplexers', now or plan to be one day soon, bring your own list of questions and equipment if you wish to CCOS-78 on July 16-19. And plan to spend some time in the 'Gunnplexer Room' with Richardson and a host of design people from Microwave Associates.

Coop's cable column



bob cooper editor in chief
CATJ

Exploding Technology and Competition

Competition, they say, is the life blood of progress.

There was plenty of competition evident at the April 30th/May 3rd NCTA bash in New Orleans and from our point of view it was healthy competition. There were three TVRO antennas on the site (a 4.5 meter Hughes/Andrew, a new to the industry 5 meter Microdyne/AFC and the latest all aluminum USTC 6 meter) providing satellite signals to perhaps a dozen different booths. There was even competition between the satellite owner/operators; SATCOM II had CATV traffic on transponders 2,4,6,8,10,14 (Trinity Broadcasting which began full time service on the 29th), 20,22 and 24. And Western Union had (ASN) CATV traffic on transponders 1,4,7 and 12.

And many of the best minds in the satellite/TVRO industry were on hand as well, competing for the attention of the convention attendees. But not all of the best minds were on hand; a subject we will return to shortly.

Back three years ago when the Community Antenna Television Association (that's CATA for the uninformed) held its first CCOS (which stands for CATA Cable Operator's Seminar) in Oklahoma, CCOS focused on a then untried and unproven subject; small earth terminals. It was at CCOS-76 that the industry and the world first saw operating 4.5 meter television terminals (a pair from Prodelin and Andrew) and it was there that the 'smaller-than-9-meter' subject was first aired and studied. In a sense, CATA's 1976 CCOS was designed to be competitive, in a friendly way, to NCTA's annual bash (held that year in Dallas). To make CCOS worth attending, CATA deliberately sought out subject or topic matters designed to establish the CATA 'show' as an important event on the annual cable calendar.

Last year's CCOS picked up where CCOS-76 left off and it was at CCOS-77 that the industry first saw operating low (and low-low) cost microwave. Now there are two firms producing micro-

wave packages in the under \$3,000-a-channel price range and the firm that started it all, Microwave Associates, indicates that upwards of 400 low cost units have been ordered by the CATV industry. Not a bad start for a totally new product concept.

When CATA's incoming President Ben Campbell first asked me what I was going to do to "top" the small earth terminal and low cost microwave successes of past years, I told him "Don't worry. . .we'll think of something". That was back in November of last fall and I felt November was way too far out in front of CCOS-78 to be thinking about upstaging ourselves (or NCTA) with "new technology" for CCOS-78.

In January the pieces began falling together. An off-hand comment made on the telephone one day during a conversation between myself and my favorite "informed RCA source" (Al Parinello) started the wheels rolling. By late in February most of the pieces were clear in my mind even if not in place. CATA's CCOS-78 would be televised, five hours per day, live from Oklahoma's Fountainhead State Park Lodge to some 400 or more CATV earth terminals from coast to coast and border to border. RCA's Parinello had promised to make it all possible at RCA (in defense of Al, he probably thought my chances of getting the other pieces together were nil and he was in little danger of having to fulfill his part!) if I could round up a transportable uplink terminal, get it to the Fountainhead Lodge site and get a signal up to SATCOM I.

Now for those who believe uplink terminals grow on trees, think again. We started chasing uplink terminals. RCA had a pair, once, but they had sold them off to a friendly Arabic group in 1976. CBS had one for awhile, nobody knew where it got to. Hughes had one that went with former Prez Nixon to China and it was 'stored' in a warehouse in one of the many Los Angeles locations of the company. Several

people at Hughes helped me run it down, only to find it was scattered in pieces and boxes and was probably not repairable for less than \$40,000. Ouch. Our budget was, at the most, a free room for the engineer that would come with it and perhaps a couple of K of bucks to cover getting it shipped into Oklahoma. We were just about to throw in the towel when another off-handed comment to me by friendly Ed Taylor of SSS opened the door again. "Have you tried to run down the terminal Arie Zimmerman bought several years ago?" asked Ed. Now we knew Arie had done a lot of far out things in his life but owning his own uplink terminal was a bit wild even for Arie.

The "Zimmerman Terminal", it turned out, is almost exactly what we needed. Only it is actually owned by Maclean-Hunter Cable TV Limited, one of our stellar Canadian MSO's. We'll skip why they own it, noting it had been stored in the Detroit area for quite sometime.

And so there it was. A terminal, requiring two forty foot low boy trailers to transport, stored in Detroit. Another friend, Stormy Weathers of USTC, volunteered to send two cab overs to Detroit to bring it down to Oklahoma.

As this is written we are hardly home free yet. Much work remains to be done to get the terminal to the site, set up and operating. We have some licensing hurdles to get over (Compucon will help us prepare the FCC material), and there is a chance that the 1 kilowatt klystron in the HPA (high power amplifier) is 'soft'. That's another word for not worth much. Sruki Switzer, who played an important part in talking Maclean-Hunter into allowing us to use the terminal for CCOS-78 uplinking, has been kind enough to provide us with plenty of advice on getting the terminal operating. And Tony Bickel, who is no longer with USTC (by the way) is going to take the two low boys of gear and turn them into an operating uplink site. Doug Rasmussen of Hughes has volunteered to be standing by with a replacement HPA if we can't get the one with the Maclean-Hunter uplink terminal to fly. It's nice to have so many talented friends out there.

Having found the uplink terminal, and seemingly now on the way to transmitting five hours per day of the CCOS seminar sessions live and direct to cable system personnel from coast to coast on July 17, 18 and 19th, the next hurdles are more mundane but just as critical. For example, while we had intended all along to videotape all of the CCOS sessions this year (on a 3/4 inch format), there is a world of difference between taping now and editing later (before anyone sees the final product), and, doing it all live. Microwave Associates Board Chairman Dana Atchley, Jr. had volunteered his son Dana (III) to do the taping. Dana (III) has a fairly efficient and very compact mobile production van which he hauls all over the United States each year doing contract video work on a one-man show scale. Dana (III) had planned to bring a couple of Colorado cable

operators with him to man the video gear. Now suddenly we need **everything** from special effects equipment to page memory storage. A slide chain wouldn't be a bad idea, not to mention having someone on hand who knows how to produce 15 hours of programming(!). Suddenly I have a much deeper understanding of the problems faced by the networks when they try to cover the olympics. **If there are any video production people out there who want to participate in this latest grand experiment of the cable industry, I'd like to hear from you.** There's no money (except your own) involved in what needs to be done. . . and we can't even find a place for you to stay at Fountainhead Lodge (that's been sold out for months although 25 minute-away Arrowhead Lodge does have a few accommodations left).

What we plan to do is this. Possibly on transponder 22 (we're still working on **which one** at this point) starting at 9 AM on Monday July 17th we'll be on with the morning technical/management session from Fountainhead Lodge. It will run until 12:30 in 50 minute segments. At 9:50, 10:50, and 11:50 we'll have ten minute breaks during which you will be entertained and informed by some of the industry suppliers who are 'donating money to CATA' to help defray the costs of this experiment; and in return for which they are getting ten minutes time to tell you about what it is they do for you. At 12:30 the 'live session' will be over and we'll run until 12:50 with interviews (both live and on tape) from CCOS. The interviews promise to be kind of different because they will be with cable operators and cable people who are on site at CCOS. The topic or theme of the interviews will be a complete surprise to everyone, myself included. From 12:50 to 1 there will be another of our ten minute 'commercial breaks' and then from 1 to 1:50 we'll run a special video tape dealing with some topic that requires **special camera work** that simply cannot be handled live by our crew. As an example of what type of format we are going to work with here, one of the taped sessions will deal with design techniques (and trouble shooting) of TVRO receivers. If you are on the receiving end of this, you'll get into the very innards of TVRO receivers on your 21 inch screen and see things you've never seen before.

And then, if the Lord is willing and the creeks don't rise, we'll be back again on Tuesday and Wednesday (the 18th and 19th) with another full five hours of brand new CCOS seminar topics.

Now way back early in this column I noted that 'many of the best minds' in the satellite/TVRO area were on hand in New Orleans. To be more precise, many were, some were not. And many that were there didn't get the chance to speak or teach their speciality to the assembled throng. We'll make the best possible use of the television (and satellite) medium to overcome that deficiency at CCOS.

For example, a gentleman named Rod Wheeler is coming down from Whitehorse in the Canadian Yukon Territory to tell (and illustrate) how he went about building (and getting a license for!!!) **the first privately owned and operated TVRO in Canada.** Until you've seen a 4.5 meter homebuilt antenna nestled along side a 30 foot square log cabin in the Canadian northland, you haven't seen it all.

Another very bright young man from England, Steve Birkill, is coming over to explain how he set out to design and build not only his own terminal antennas but his own GaAs-FET LNAs and threshold extension receivers for reception of Intelsat and Russian Stations signals.

Howard Hubbard, the man behind the new Microdyne/AFC 5 meter two piece fiberglass TVRO antenna (see 'Show Report' this issue) will be teaching and explaining things about TVRO antenna design and installation you will never get in a big convention setting.

And these are but teaser samples of the most informative 15 hours you can possibly imagine. Through the good cooperation of Bob Titsch of Cablevision, there will be full schedules for the CCOS-78 "telecasting days" appearing in the late June and early July issues of Cablevision. All of which says that if you wanted to attend CCOS-78 this year but couldn't get into the facility because we ran out of space early, or simply because Oklahoma is a long ways to go in hot July, consider

the alternative. Get yourself in front of a TV set at the closest CATV system that has a TVRO terminal on July 17th, 18th and 19th. Put a six pack of your favorite on ice, get comfortable and be prepared to learn and share in the greatest learning experience the CATV industry has ever attempted. You might even want to videotape some or all of the program (heck no, it is not going to be copyrighted!) for later study.

Oh yes, just to put the frosting on the cake, we are now working on setting up a twenty meter 'ham' (amateur) radio station at the seminar this year. So what? Well, if we get all of the pieces put together you will be able to sit in El Cajon or wherever and through a local ham operator (who operates on twenty meters) send questions from your office back to CCOS-78 live and in real time so your questions can be presented to the fellows conducting the seminar. If you are a ham or have one in your facility, be thinking about how you can plug into this nationwide two-way network. And watch the late June and early July issues of Cablevision for more details in this area.

A final personal note to incoming CATA President Ben Campbell. "**Ben, please don't ask me what we are going to do to top this in 1979. I think next year we'll just hold a quiet little family gathering in my back yard and let everyone else stay home and participate via satellite. It will probably take me until July of 1979 to recover from this one!**"

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TECHNICAL TOPICS

What MIGHT Be Done About Fines

"I got the February CATJ yesterday. I skimmed through it and was quite interested in what you had to say in your editorial. What came through to me, but was not printed there, is that NCTA is not all that good at the job that they have chosen to do for the industry. I have had this feeling for some time. At one point when I was being pressured by Bob Schmidt to join NCTA, all that came through was that they were nothing more than a big chowder and marching society. Then I did the sensible thing and joined CATA.

"I think that it is time for CATA to take the lead and make some proposed changes to insure that we get a fair shake for a change. I would suggest the following:

- 1) **Ask for a new change in procedures to accompany the implementation of the fines and forfeitures.** Evidently the fines and forfeitures are here to stay. Let the FCC have their day. Tell them, informally, that CATA will not contest the new fines and forfeitures if they will implement the changes that we ask for. There are some points which we will suggest that I am sure that they will like.
- 2) **Formally ask** to be able to review the new rules and regulations which will implement the fines and forfeitures. I do not think that we should ask for a lot of changes in this area if it is at all possible. We **should ask** for a few changes, and among them should be the requirement that any charge that is made by the FCC, or any other person, or organization, must be made in writing and sent by registered mail to the FCC and the person, or organization, that the charge is being made against.

What happens next is not too important. Possibly you might like to call out the exact procedure that will be followed. This could cover such things as interrogatories, scheduling of hearings, continuances, etc. I am sure that Effros will have some great ideas in this area. The most important item is that **all of the hearings with respect to any fine, or forfeiture, must be held in the community where the infraction occurs.** Give in on some of the other things that you will ask for, but not this one.

- 3) Ask for a complete review of the present Rules and Regulations. Here again this is a must. You can probably come up with some reason for the review, but here are the ones that I thought of.
 - A. With equitable Rules and Regulations, the amount of infractions will be minimized, and the costs involved will be kept to a minimum. The present Rules are not structured to be either equitable or economical to administer.
 - B. The Present Rules are highly biased against cable. They were the ones that the broadcasters had put up in 1972 to hinder cable TV growth. History and practice have proven that this amount of caution was not warranted. The Rules should be changed to represent a practical approach to real world conditions.
 - C. The Court has recognized that the Rules must be changed, and have mandated that the FCC make such changes. Now is the appropriate time to implement such changes.
- 4) Ask for a change to the Commission Rules and Regulations that will provide for a non-discriminatory procedure to make changes to the Rules and Regulations which will be subject to the fines and forfeitures. The present Rules were made in such a way that it either discriminated against, or insured that, the **small cable TV operator could not participate** in the formulation of the Rules. The present set of Rules represents a compromise between the large cable TV operator, MSO's, NCTA and the broadcasters. Suggest that the cable TV segment of the FCC responsibility be administered in the following way:
 - A. All systems having a Certificate of Compliance will be issued new ones. The new ones will expire with the franchise, but must have some sort of validation each year until the franchise expiration. This can be in the form of a stamp that is affixed to the certificate.
 - B. All cable TV operators will be charged a flat fee each year at the time that the form 325

or 326 is filed. This will be the mechanism that triggers the FCC to send the new validation stamp. The fee should be, I would guess, about \$40.00.

- C. All cable TV operators having a validated Certificate of compliance **will initially be sent** a up-to-date set of Rules and Regulations. For an additional charge of, say \$5.00, an operator having a valid Certificate may purchase an up-to-date replacement set of Rules and Regulations.
- D. The operator with the valid Certificate will **automatically receive** all Notices from the FCC that have to do with the administration of cable TV matters. This includes all rulemakings.
- E. For a flat fee, say \$10.00, any operator having a valid Certificate may receive, in a timely manner, **all of the comments** submitted on any given proposed rulemaking or procedure change.
- F. Change the rules so that only **one set** of comments is necessary for any submittal.
- G. For a flat fee, say \$10.00, an operator with a valid Certificate may receive a copy of all the reply comments.
- H. As part of the \$40.00 fee, all operators with a valid Certificate will receive copies of all such documents as Opinions and Orders, etc., automatically.
- I. As part of the \$40.00 fee the operator will automatically receive sheets to update his set of Rules and Regulations. The new Rules and Regulations will become effective **ten days after** the date that the update sheets **are postmarked.** It will be easy enough to print each update sheet so that it is folded with the new rule on the inside, and the address and postmark on the other, or outside.

"**There are** some other changes that might be good to have. **Now is the time to ask for them.** One that might be good is to get the FCC to adopt some sort of system that would insure that any mail that was not answered within ten calendar days would be given a file number that would be put on a acknowledgement letter and a date would be

given when the complete answer would be forthcoming.

"Now would be the time to have the 500 limitation raised to 1,000, and we should ask that the limitation area of 1,000 to 3,500 be investigated with the object of raising the limitation to that figure.

"We should ask for the sports black-out to be lifted.

"All of the testing requirements should be changed to equipment/system design requirements. All systems below 3,500, and above 1,000, would be exempted from system testing if a program of updating, or modifying installed equipment to better than original published standards is maintained so that all system components (active) are updated, or modified, at least once each, say twenty four months. Systems below 1,000 would be completely exempted from required system testing if the system design criteria and the equipment installed would, on paper, provide performance in excess of the stated design standards in the Rules and Regulations. Systems with more than 3,500 subs must effect complete system testing as shown in the Rules and Regulations, unless they have a modification/update program.

"Since it is not such a good idea to make everything on a one way basis, why not suggest that they modify the form 325, or 326 to contain a section which indicates which of the programs contained in the previous paragraph is being followed. You might even

suggest that the person filling out the form certify that the indicated program is, in fact, being followed as required.

"One last change that you might work for is to have any signal which is taken off the satellite, AND IS PAID FOR, OR IS OF A SPECIALTY STATION OR NETWORK (this would include CBN, SIN, Canadian stations from ANIK, and ones like WTCG and KTVU, etc.) be authorized without a change to a Certificate as long as there was an agreement with the broadcaster. I do not have HBO, but the guy (Mission) across the street does. They get about \$8.00 for it. I think that I would have a better package for my customers with something like HTN and KTVU and WTCG. I could give them two pay channels for about \$5.00 per month. I might even get as good a penetration as the system in Maine. (I have a captive audience with 93% penetration and just over 700 customers and growing at the rate of 150-200 per year.)

"The FCC is going to be asking for the world with the fines and forfeitures; let's us ask for the world also with a good sweeping program like the one that I have given here. The FCC has already asked for what they wanted, and now they have it. It is reasonable to tell them, OK, we'll go along with the fines and forfeitures, but you have to give us something in return.

"You asked for support and what we should do to take the lead and not leave it up to someone else. Let's not leave this one up to the chowder and march-

ing boys, they botched things up for us in the past, do not let them do it again."

Jonathan Lippitt
Signal Master
San Diego, Ca. 92108

Of all of your excellent thoughts and suggestions, the one that really makes superb sense is the section dealing with the FCC making available, as part of the annual CAC validation process, copies of all CATV rules and updates and proposed changes to ALL system operators. The usual FCC cop-out is "the notices and rules are published in the Federal Register". Which is no answer for people who don't subscribe, and even if you do, the percentage of CATV material therein is very small. We know ONE cable operator who does subscribe, and he assigns a gal 2 hours per day to go through the Register just to pick out the CATV related material. Very few of us have that kind of time available. However for your suggestions to work will require massive support from the cable industry. What say fellows...is it worth fighting for?!

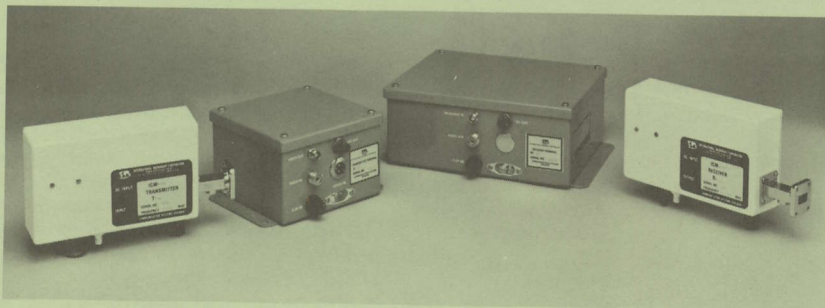
New FM Atlas Available

Anyone who has ever attempted to make any sense out of the over 4,000 FM broadcasting stations scattered throughout North America has probably come to the frustrating decision that nobody really publishes a useful guide to FM stations, their operating conditions and what type of material

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JUNE 1978

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

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they program. This becomes even more of a problem when you are faced with preparing the necessary 'log-list' of FM stations required by the U.S. Copyright Office.

Well, help is on the way. The brand new Fifth Edition of the **FM Atlas** is now out and at a mere \$3.95 per copy it is a fantastic bargain; perhaps even a steal. Editor Bruce F. Elving is "Mr. FM Radio" in North America and he knows what to put into a convenient (8-1/2 by 5-9/16 inch) manual to make life easier for those of us who wonder things like:

- 1) Where are all of the FM stations around here,
- 2) Which stations operate with vertical and horizontal polarization,
- 3) Which stations program their 67 kHz sub carrier (and with what type of material)
- 4) What type of programming format do the stations employ
- 5) What is the coverage radius of the station

and much, much more. Dr. Elving (he has a Ph.D. in Communications from Syracuse University) has made it his lifetime work to know more about FM broadcasting stations than perhaps any other individual in the world today. His 'FM Atlas' is the latest in a series of highly recommended reference books and between the maps, charts and tables you can't help but have at your fingertips everything you will probably ever need to know about FM broadcasters in North America. Recommended for everyone, the price is \$3.95 post-paid from **FM Atlas Publishing Company, P.O. Box 24, Adolph, Minnesota 55701.**

Right On The Mark

"With reference to your cover on the March CATJ, the only thing 'un-natural' about the piece of cable is that it is 50 ohm; which could be a wise technician installing a communications antenna on a CATV tower."

B.W. Hughes, Jr.
Sales Manager, Comm. Prods.
Utility Tool Corporation
Cromwell, Ct. 06416

The March issue featured a piece of aluminum jacketed cable, center conductor bared, and a 'filing job' to smooth off the rough edges of the center conductor preparatory to putting on a fitting. We asked the question 'what is unnatural about this piece of cable'. Mr. Hughes is dead on the mark; it is 50 ohm cable. He's also right about the application of the cable; it was intended for installation of a VHF two-way antenna, on a CATV tower. Mr. Hughes' company is a well known supplier of cable preparation tools.

Some System

European CATV (often owned and operated by an agency of the federal government in European countries) recently got a big boost when Vienna, Austria announced that it was awarding a six year contract (starting in 1979) to Philips to construct a massive 450,000 housing unit CATV system. The new system, potentially one of

the largest in the world, will provide 18 channel capacity with two Austrian, three from West Germany and one from Italy or Switzerland.

An Additional Caribbean Outlet

A new channel two outlet is due on the air shortly from Santo Domingo in the Dominican Republic. The 90 kW ERP station is RCA color equipped, will broadcast from a 200 foot tower at an elevated site. Coverage is projected to include an area west into Haiti and east to the Mayaguez region in western Puerto Rico.

Non-Cable Trivia

While the Government Printing Office release of the 1979 (fiscal year) Federal Budget will never make the best seller list, there are a few interesting lines in the budget which may give you food for thought.

For example, close to home:

- 1) **The FCC's projected budget** is to be \$67,035,000 (up about 9.1% from 1978);
- 2) **The CPB (PBS) federal subsidy** will be \$120,200,000 (they will seek \$152,000,000 for 1980);
- 3) **Board for International Broadcasting**, \$85,180,000 (up about 13% over 1978);
- 4) **International Communication Agency**, \$75,111,000 for broadcasting affairs (up some 6% over 1978).

The Board for International Broadcasting, and, the International Communication Agency may not ring a bell with you. 'BIB' is the agency that operates Radio Free Europe and Radio Liberty while ICA is the group that operates the broadcasting affairs of the U.S. Information Agency (USIA). Combined they will spend \$160,291,000 of U.S. taxpayer's money to carry the 'American message overseas; or some \$8,000,000 (5.5%) more than the CPB/PBS programmers will receive from the treasury to provide non-commercial television here in the United States.

The numbers say something about the sense of priorities one finds in the ever growing federal budget. An interesting example of how the Board for International Broadcasting spends U.S. taxpayer money to operate Radio Free Europe and Radio Liberty is found in the announcement of January 27th by an official of the U.S. sponsored stations, Tony Shub. Shub has offered 'communist officials fairness doctrine free air time' on the two stations as an 'alternative to intentional signal jamming by communist regimes behind the iron curtain'. Shub calls his offer 'a civilized alternative to jamming'. What an interesting way to spend \$85,180,000 in the next fiscal year; providing the kilowatts for communist officials to talk back into their own countries on radio station facilities designed and operated as a means of getting 'alternate views' to the population of the Soviet-block nations. Such creative use of taxpayer funds should be rewarded in 1980 by another 13% budget increase!

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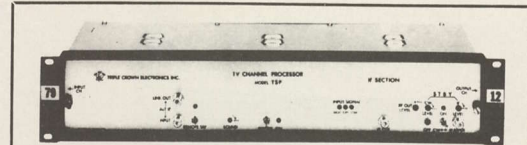


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DT-9R

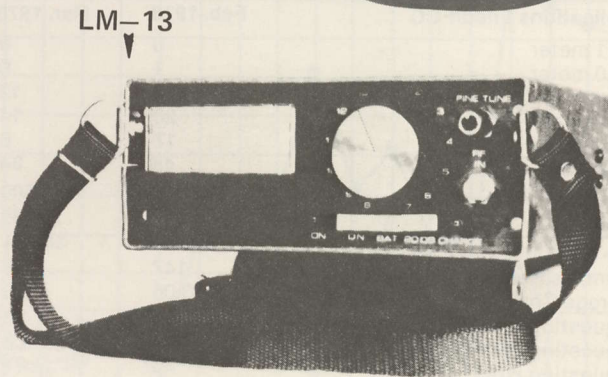
The DT-9R is an improved version of the DT-series introduced five years ago. It is basically a combination ohm meter and two channel signal level meter. The units are available in any two channels desired from 30 to 300 MHz. It is easy to use and a real value at \$169. Quantity prices available. Delivery for channels 2 and 13 is normally two weeks. **\$169**



DT-9R

LM-13

The LM-13 is an installer-middle tech type meter. Its operation is very simple, and it operates from throw away or rechargeable batteries. The standard LM-13 measures the video carriers of channels 2 through 13. This meter also has provisions for adding a 13th channel if you have a pay channel or pilot carrier you wish to measure. A leather carrying case is available. **\$225**



LM-13

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TVRO STATS—June

Now showing up in our monthly tabulation here of TVRO growth statistics is the first indication that systems are now planning for the eventual (summer of 1978) start up of alternate independent broadcast signals via satellite. During the month of April two systems requested KTVU (Oakland) and WGN (Chicago) for satellite delivery; the first such application.

With the FCC no longer requiring that TVRO applicants list **each and every** satellite delivered signal they plan to carry on the applications, and more and more applicants listing only one or two of the actual services they intend to carry, the long term future of the accuracy of **this portion** of our monthly statistical analysis is not good. Under the present FCC concept, your application need only list **one** satellite delivered signal; when your TVRO is granted a CP/license, you are authorized to add other satellite delivered signals at will provided only that you are entitled to those additional

signals under signal carriage rules and have a valid contract with the common carrier/program supplier. No further FCC notification is required.

This 'relaxation' of the paperwork burden is certainly good for CATV, but it makes accurate statistics almost impossible if there are no further reporting requirements. This area impacted by this rule change is that portion of the statistics box which lists the number of applicants for specific services available by satellite. The remainder of the data continues, as it has been, accurate to FCC records.

\$1,000 Home Terminals? Hughes.

The Electron Dynamics Division of Hughes Aircraft has been awarded a \$146,000 "developmental contract" by NASA's Goddard Space Flight Center to develop working proto-type 12 GHz receiving systems for "home use". The contract calls for Hughes to develop a receiver with a 4 dB noise figure that

can be utilized with 12 GHz family satellites planned for launching in the 1980's time frame with receiving antennas as small as 1 meter in size.

According to Goddard, the primary use of the new 12 GHz "low cost" receiver package will be for public service applications in schools and hospitals; although some "commercial" applications are envisioned, including linking motel, hotel and public gathering spots together via satellite communication networks. The \$1,000 price tag is a design criteria for receivers produced in 1,000 quantities per annum.

The primary impact of this program is felt to be in areas where Japan is expected to offer both satellite relay systems and low cost receiving terminals, based upon experiments now under way with their recently launched BSE (experimental) satellite. Hughes has been a major supplier of the satellites themselves on a world wide basis, but the general feeling is that when the next generation of (12 GHz downlink) satellites becomes feasible that they will require very large quantities of inexpensive downlink terminals for an ever expanding world market.

Game Plan For Canadian TVRO Service?

A "firm" proposal for inauguration of satellite program delivery service to Canadian CATV systems, via the domestic ANIK satellite system, is nearing final approval by the various groups involved.

Under the proposal seven channels of service would be offered to Canadian CATV systems, probably on Canada's ANIK-II bird (109 degrees west longitude). The signals involved would be Detroit's **WJBK** (channel 2, CBS), **WWJ** (channel 4, NBC) and **WXYZ** (channel 7, ABC), plus educational **WTWS** (channel 56); a Canadian CTV Network signal from either Toronto or Ottawa, a Canadian educational station (from either Toronto or Ottawa), and a cable public service channel originating from Ottawa and carrying (among other things) the House of Commons live, gavel to gavel.

One of the obstructions to Canadian CATV systems utilizing satellite delivered signals in the past has been the restriction by the Canadian Telesat Corporation (owner and operator of the ANIK series birds and operator of the space communications network in Canada) that **all earth receiving terminals must be owned and operated** by Telesat. Under the newly devised program Telesat **will allow private terminals in Canada to utilize the Telesat ANIK signals**, and a Canadian CATV system carrying **all seven** of the proposed channels of service would pay **90 cents per subscriber per month** for the service.

The uplink service for the Detroit area off-air U.S. signals would be handled from the Canadian side of the border near Windsor. Not all channels of service would be available at the outset of the service (the public service channel with gavel to gavel

CATV TVRO STATISTICS—MAY, 1978

Applications Filed/FCC	Feb. 1978	Mar. 1978	April 1978
1) 11 meter	0	0	0
2) 10 meter	1	0	2
3) 6 meter	10	12	10
4) 5 meter	20	14	17
5) 4.5 meter	17	8	17
Total Apps	48	34	46
Cost Max.	\$78,050	\$56,500	\$145,000
Cost Min.	21,555	19,935	20,250
Avg. Cost	36,289	36,901	37,942
Channels Requested	147	88	132
Average Channels	3.06	2.6	2.93
Requesting WTCG	36	23	29
Requesting CBN	33	26	37
Requesting HBO	38	21	33
Requesting MSGE	19	7	19
Requesting SHOWTIME	6	7	5
Avg. Cost Per Channel	\$11,859	\$14,192	\$12,949
TVRO's Licensed/FCC	27	48	39

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

coverage of the House of Commons is expected to be the first channel available), although some are forecasting service **could begin** on the first channel or channels **as early as** early September of this fall.

Many U.S. firms, anticipating this relaxation of satellite signal useage by Canadian authorities, have recently established Canadian representatives and outlets for their TVRO equipment and services.

Trinity Up

Trinity Broadcasting, licensee of channel 40 **KTBN in Cornona, California** began full time (religious) programming on SATCOM transponder 14 on Saturday April 29th. Trinity made a decision just prior to inaugurating service on SATCOM II that it would provide full-time (24 hours per day most days) service. Because Trinity's feed is a full broadcast service feed (identical to that telecast on channel 40 over the southern California area), this is the first religious **'broadcast signal'** available to CATV feeds via satellite. Unlike the present PTL feed or the CBN feed, which are not simultaneously broadcast over television stations, CATV systems carrying **KTBN must** have a CAC for such carriage if they have more than 999 subscribers. Systems with fewer than 1,000 subscribers need no CAC to add KTBN service.

And, because the Trinity feed is a broadcast service, this becomes the first religious programmed satellite distributed signal which qualifies as it stands for re-distribution via terrestrial translators established with satellite feeds. There were numerous rumors of such translator filings being prepared for filing to the FCC as CATJ went to press.

Moving Day On Schedule

The "great move", swapping all CATV service from RCA's SATCOM II to RCA's SATCOM I bird was, as CATJ went to press in mid May, on schedule for the latter portion of May. After the move the following transponder line-up will be in effect on SATCOM I:

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

And the explanations. *-Super 17's call letters, WTCG for many years, are scheduled for a change to WTBN soon, perhaps in June. **-FANFARE (Houston based regional movie and sports pay service) scheduled to begin operation June first. ***-Home Theater Network (see CATJ for February 1978) now scheduled to begin service July 4; San Francisco/Oakland KTVU (independent station) scheduled to begin service August first.

Et Tu Ku?

With more and more interest in smaller and smaller terminals for video reception this might be an appropriate time to put to rest the various rumors floating about concerning how the next

generation of Ku (11-12 GHz downlink) band satellites may impact upon the terminal scene.

As demonstrations are showing and continue to show, the 'floor' for cost effective terminals for the 4 GHz downlink band has probably not yet been reached. As **Coop's Cable Column** reported here in May, ten foot terminals in 35 dBw or better EIRP footprints are very capable of producing video signal to noise ratios in excess of 48 dB when mated with a quality LNA. In 37 dBw footprint areas smaller antennas, perhaps down to 6 foot in size (1.8 meters approximately) will also work in the 48 dB video signal to noise region provided the LNA is a quality unit.

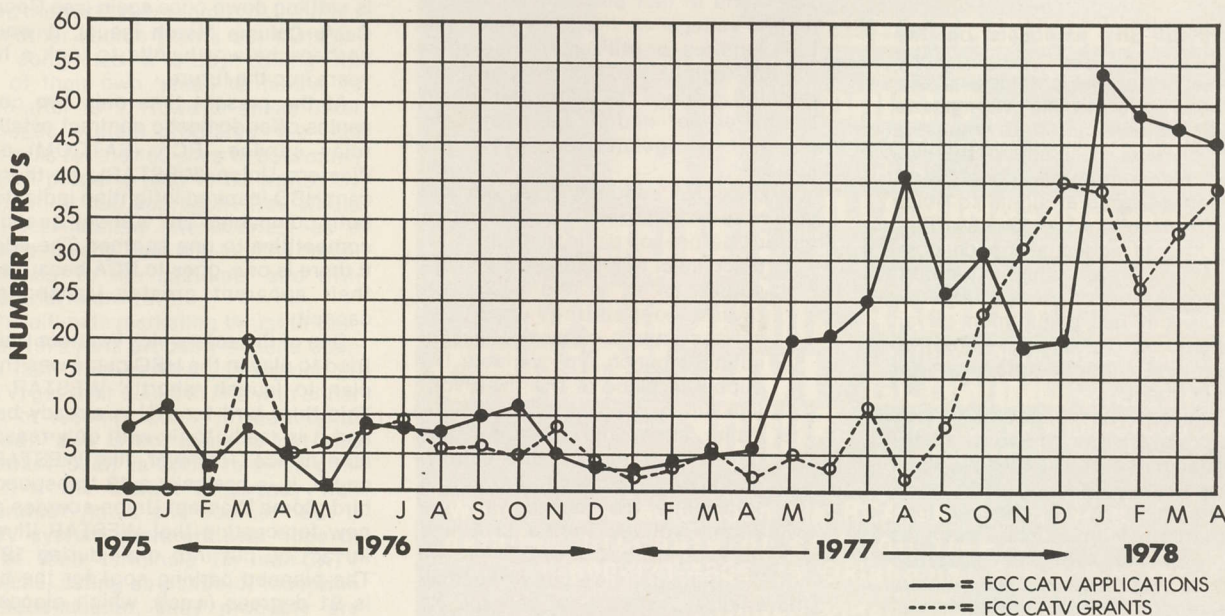
A good question is simply 'how low can it go?' There is no firm answer until we see how much better LNA manufacturers can make the low noise amplifiers, and, how soon new PLL (phase lock loop) receiver technology matures. It does seem reasonable however to **forecast** that **within 35-37 dBw** footprints that 6 foot antennas with quality LNAs will produce noise free signals under **most** conditions of **no objectionable terrestrial interference**. Beyond that 6 foot level, only time will tell.

Time is on the side of the next higher satellite downlink band; or Ku band which has downlink channels in the high 11 and low 12 GHz region.

The big unknown about Ku band is what percentage of the time will rain attenuation wipe out the satellite to earth path? Rain losses of 12-18 dB are not uncommon in that frequency range in heavy downpours for just a one to two mile path. Even given the 'slanted approach' of satellite signals in mid-latitudes (i.e. those with look angles of say 30-50 degrees) there can well be a

TVRO DEVELOPMENT PROGRESS—THRU 4/28/78

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mile or more of rain on the ground end of the path. Ku band planners know this, and most of the to-be-launched Ku band systems are planned around much higher output power EIRP's than the present C band or 4 GHz downlink bands. To be cost competitive it is assumed that most Ku band transponders need to be in the 55 dBW EIRP region; some 18-19 dB hotter on the transmit end than present C band transponders. Seemingly that 18-19 dB would make up for virtually all of the rain problems one is likely to encounter.

However, if you go to the people who are building the actual 'birds' you find there are no plans to launch such 55 dBW Ku band birds until the 1981-1982 time frame. And the first such birds are being planned for **foreign** (i.e. non-U.S.) areas such as Iran, India, and closer to home, Canada. The first likely high power transponder launched for U.S. domestic service will probably be put up by Western Union; but **not before** the 1982-1983 period.

So for the moment 'smaller terminals' seem, at least through 1982 or thereabouts, to be "toys of C band" or the 4 GHz downlink region. And if you are sitting around waiting for higher power transponders to get into service, you will have at least a 4 and perhaps five year wait.

More on MBS S/N

As reported in the January issue of CATJ (see **Satellite Technology News**, page 42) the proposed Mutual Broadcasting System utilization of WESTAR I for multiple audio channel program relay has a number of interesting 'twists' to it.

The January report 'bothered' some people who had a difficult time putting the EIRP and G/T numbers together "to reach the 65 dB signal to noise ratios" forecast by Western Union. Some clarification was needed, and perhaps this will help.

- 1) **Without any emphasis** on the audio signal the projected aural baseband signal to noise is 42 dB;
- 2) **When 75 microsecond pre-emphasis** (and the companion de-emphasis at the receiver) is added, the system picks up an additional 13 dB of effective aural signal to noise (now we are at 42 + 13 or 55 dB);
- 3) To this is added a speech compression system which a Western Union spokesman describes as 'novel'; it has a minimum of an additional 10 dB of 'effective' signal to noise improvement built into it.

WU has been investigating various speech compression/computer techniques for several years now, since this type of additional signal to noise improvement is by far cheaper than more traditional approaches such as larger antennas, higher satellite powers or improved receive system noise temperatures. WU has looked at single band (2 to 1 ratio) compression devices, multi-band (1.5 to 1 ratio) de-

VICES (such as is produced by Telefunken) and a relatively obscure system designed by a chap in New England called the 'DBX' system. The DBX system operates with a combination of emphasis (in the compression loop) plus it has multi-band compander circuits in it. The DBX 'box' has been demonstrated to potential users such as NPR (National Public Radio), MBS and others. The inventor is apparently keeping a tight hold on the actual device, reluctant to sell the system on a one-sy-two-sy basis for fear that as soon as the box is out in the field his 'rights' to it may evaporate under an onslaught of copies. Western Union plainly believes in the system however and it is likely that its first large scale use (and the end of its 'secrets') will come with the MBS system detailed in the January CATJ.

Western Union tests have shown that once the signal to noise ratio gets to around 55 dB (at baseband audio) it is very difficult (if in fact possible) for **subjective** tests to properly indicate whether the signal to noise has in fact improved beyond that point. The problem is not unlike the video signal to noise tests when the baseband video reaches the same approximate point; 55 dB. In WU tests of the DBX box, the signal was purposefully degraded into what one engineer called 'a crappy level condition', or near 39 dB audio baseband S/N, and the 'DBX' machine turned on. "**When we saw 60 dB or better baseband audio S/N with the DBX unit in the line, with 39 dB S/N going in, we knew we had a saleable system**" commented the engineer.

LNA On Fritz? A Hint

If your TVRO installation should experience an LNA failure wherein the satellite pictures seem to drop well into the sparklies (**but not totally out**) you **may** have a voltage regulator problem with the LNA. Most LNA devices (and in fact probably all) feed a higher voltage to the LNA than the LNA requires (or utilizes) for operation of the amplifier. The higher-than-required voltage is regulated down to the proper in-unit operating voltage with a regulator; usually a chip device.

If your LNA suddenly goes out and you have a noise and sparklie laden picture, before you panic try this:

- 1) **Disconnect** the normal DC voltage supply (often in the 12-24 volt region, depending upon the voltage source chosen) and **substitute** a bench type variable DC supply in place of the fixed voltage supply.
- 2) Using either the voltage meter on the external variable supply, or a VOM connected to the source to **monitor the voltage**, vary the supply voltage to the LNA line **between 9 and 10 volts DC**.

If the regulator has gone you may find a narrow 'window' of perhaps 0.1 to 0.2 volts DC supply voltage where you can ride **under** the regulator and

'snap' the LNA back into more or less normal operation. The solid state regulators often lose their ability to regulate down a higher than required (i.e. source) voltage but they will still pass through an operating voltage **near** the normal regulated voltage level that will bring the LNA back to life. This voltage is often **lower** than the normal required voltage for the LNA GaAs-FETs or bi-polar transistors, and thus the gain may be down somewhat on this 'emergency voltage' basis; but at least you have the LNA back operating while you get a replacement in.

One word of caution. Many LNAs are very susceptible to **over voltage** problems and are essentially 'unprotected' from voltage sources over say 25-30 volts DC. Some installations are going into the receiver proper to a (typically) 24 volt DC source to power the LNA. This is in the best case only a few volts below the 'no protection' point and in the worst case only 1 volt below that point. The slightest change (upward) of that supply voltage, due to a momentary transient or other malfunction in the DC powering system can raise the operating voltage to the LNA above the point where the source voltage is held at a safe level to the LNA. The LNA GaAs-FETs are very much like fuses (see **CATJ for December 1977, page 42**) and are intolerant of source voltages that rise (even if momentarily) above a safe level (typically 25-30 volts DC). The best LNA powering advice (other than that given on pages 56 to 56-b in **CATJ for April, 1978**) is to keep your source voltage **down** close to the 'bottom' of the manufacturer's operating voltage window (typically near the 12 volt point).

The Domestic Bird Future

Now that HBO has gone ahead and signed up with RCA for an extended contract period and it appears that the CATV satellite delivery business is settling down once again (see **Coop's Cable Column March** issue), it would perhaps be worthwhile to look a few years into the future.

At the present time only two companies offer domestic contract satellite relay service—RCA (SATCOM) and Western Union (WESTAR). As the recent HBO inspired infighting indicated, both companies are without question competitive to one another. The edge, if there is one, goes to RCA because of their apparent greater transponder capacity.

One of the aces which Western Union tried to play in the HBO game was their plan to launch 'shortly' WESTAR III. This third bird for WU is already built and it is ready to fly with only reasonable notice. However, like WESTAR I and II, it is basically a 12 transponder bird. Some Western Union sources are now forecasting that WESTAR III will in fact be put into orbit during 1978. The planned parking spot for the bird is 91 degrees (west), which places it some 4 degrees further east than the present 'further-east' bird, COMSTAR

II. However this exact spot may no longer be available to WU, as changes are now likely when the bird is launched according to some sources. At the height of the HBO negotiations the WU 'plan' was to launch WESTAR III, move all high speed data and other 'non-contract' customers/traffic to III and thereby free up WESTAR's I and II for 'contract customers' (such as CATV and others). This still appears to be the game plan.

Beyond WESTAR III there are no immediate plans for new domestic birds prior to the space shuttle technology of 1980 and beyond. This statement is made with full recognition that there is also an RCA SATCOM III bird available for launch on fairly short notice, although at the moment this does not appear likely. RCA already has 48 transponders in orbit (24 horizontal and 24 vertical) whereas WU has 24 in orbit at the present time (all horizontal with 12 per bird).

One conjecture unknown at the moment is the 'position of ATT/General Telephone' with their COMSTAR I (128 degrees) and COMSTAR II (95 degrees) birds. By agreement before the birds were launched, Bell and General are precluded from engaging in any type of message traffic other than normal telephone (type) communications until 1979. But after 1979, when that federal imposition goes away, it is likely that the COMSTAR folks may play a heavy part in the ultimate future of domestic satellite communications. Bell of late has been making noise about 'advanced technology' satellites in the 11/14 GHz band which would sweep narrow (0.1 degree) beams across the country (see *Satellite Technology News*, CATJ for February). However, more quietly Bell has been exploring (with terrestrial equipment) 18/30 GHz systems and one source suggests that Bell may attempt to 'hitch a ride' on a launch sometime in 1979 to explore on an experimental basis the 18/30 GHz region.

Another source points out that Bell has completed a study calling for 150 of their own 'small terminals' to go in after 1979. However unlike other domestic system programs, the Bell plan calls for the 150 sites to be located on Bell property (and to be owned by Bell), on a 'hub approach'. Bell would contract satellite inter-connect as a 'service' linking their hub-located 'small terminals' to the customer site with terrestrial microwave.

The ultimate marketing thrust of Bell, 'after 1979', will probably depend upon how fast other service users (such as CATV) get their ducks in line with either RCA or Western Union in the interim period. "Bell is not likely to get into a market (such as CATV relay on contract) if the market is already well saturated" notes one source. "But if CATV system operators ever hope to utilize their terminals for non-CATV services, acting as points of reception or transmission, they probably are dreaming" notes the same source. "The combined resources of Bell will

certainly not allow that to happen on a very big scale".

Finally, a major effect is underway at WU to create a system whereby all Telex and TWX and other Western Union traffic now handled on leased lines and microwave from Bell can be moved off of the Bell circuits "hopefully by 1979". In addition to the obvious distaste WU probably has for sending money each month to Bell for use of Bell circuits for these WU services, that '1979 magic date' is again at play. "We simply don't know what to expect from Bell in 1979; but we want to be prepared for almost anything" notes a WU source.

F2 As A Back-Up

When a CATV applicant prepares his TVRO application for the FCC, he must show his calculated C/N for not only his primary bird (F1 if you are into RCA services) but also his secondary or 'back-up' bird. When all RCA CATV traffic was over on F2 (prior to the just completed move) you did your primary bird calculations for F2 and showed alternate calculations for F1 (F1 was then your back-up).

The F1 bird has considerably hotter (or higher) footprints in areas such as New England (see CATJ for May-pages 61-63 for footprint maps). This means that an applicant could get by with say

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a 4.5 meter terminal in Maine on F1, whereas on F2 he needed at least a 6 meter terminal antenna. The question becomes "If you can squeeze by the 3.0 dB 'margin' with a 4.5 meter terminal on F1, are you on the spot to specify a 6 meter terminal anyhow simply because you can't make the 3.0 dB margin on the F2 footprints?"

The answer, according to the FCC, is as follows:

- 1) Do your C/N (and S/N) calculations for F1. Be sure you have at least the 3.0 dB margin required for the primary (i.e. F1) bird.
- 2) Do the same calculations for the back-up or secondary bird (F2). If, with a terminal that is cost effective for F1, you do not have the required 3.0 dB margin, simply state in your cover letter with the the synopsis of your system calculations something like this: "The applicant recognizes that the terminal system specified does not meet the necessary 3.0 dB

margin for the back-up bird, RCA F2. However, the applicant is prepared to assume full risk and full responsibility for the system performance on the back-up bird should there be a catastrophic failure of F1 which requires all CATV traffic being diverted back to the F2 bird."

That is all there is to the 'problem'; i.e., it is a 'non-problem' if you accept responsibility for possibly degraded pictures on F2 should you ever have to go back to F2 for back-up purposes.

In the event of such a total (or near total) failure of F1, CATV traffic would in fact be moved back to F2 although not on a transponder for transponder assignment basis. RCA does have a 'back-up game plan' which they keep locked away in a safe in the event of a failure on any given bird or portion of a bird. For the record, should F1 fail and CATV traffic be moved back to F2, RCA has a long standing agreement with Telesat in Canada to move non-video

services to one of the ANIK birds (that means no CATV traffic would move to ANIK). This agreement with Telesat covers 'emergency use' of 11 of the ANIK 12 transponders.

12 vs. 24

We have, as an industry, grown up so thoroughly indoctrinated with the 24 channel approach of RCA that when we find ourselves suddenly having to switch to a 12 channel bird (such as WESTAR II), we have some difficulty adjusting to the allocations scheme.

Remember these basic facts. Whether it is a 12 channel satellite or a 24 channel satellite, it operates fully within the 3,700 to 4,200 MHz (3.7-4.2 GHz) region. On a 24 channel bird there are really two sets of 12-channel groups, with the horizontal set offset from the vertical set by approximately 1/2 transponder width (i.e. 20 MHz).

On 12 channel transponders with 24 channel receivers, here is how you figure out which channel to set your

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receiver to when you only know the transponder channel number on the 12 channel bird:

Take the transponder number given (by Western Union or the user of Western Union), multiply by 2 and subtract one. For example, if you are looking for WESTAR II's transponder 5 (such as is in use by ASN), multiply 5 x 2 (10) and subtract 1 (10-1 = 9) for the answer; set your receiver to channel 9.

Or if you have found the channel on your 24 channel receiver and want to identify it by its actual WESTAR II transponder number, work the process backward. For example, you find the WULATOC color bar pattern on channel 23 on your receiver. Take 23 and add one (23 + 1 = 24) and then divide by 2 (24 divided by 2 = 12). In this example you are tuned to WESTAR II transponder 12.

Just in case it isn't evident, you end up tuning to odd channels (1,3,5, etc.) on a 24 channel receiver for the 12 channel bird transponders. The same technique

that applies to WESTAR birds also applies to ANIK and COMSTAR.

That Sun Noise Again

During the first couple of weeks in March most CATV sites utilizing the SATCOM II transponder signals went through the twice-annual sun noise signal outage. At the CATJ Lab site near Oklahoma City our peak sun noise day was Sunday the 5th of March although there was noticeable degradation from Friday through Tuesday (3rd through 7th).

If our Lab terminal is typical, you experienced sun noise degradation for around 18 minutes time with peak noise riding just a couple of dB below the peak transponder signal level at the same instant. When you consider the distance to the sun is some 93,000,000 miles and the distance to the satellite is a "mere" 23,000 miles or so that works out to one very powerful transmitter on the sun's surface!

The sun this spring is much more 'active' than it was last fall or in the

spring one year ago. An 'active sun' simply means there are more (potential) noise sources operating in the solar RF generation equipment and while the noise level may vary considerably from day to day (or from a 'quiet sun' to an 'active sun') as a rule you will experience greater sun noise at 3.7-4.2 GHz during a period of an active sun than during a quiet sun period.

In cooperation with several other TVRO sites across the country we made chart recordings and sun noise measurements during the spring solar noise crossing and will give a detailed report in a future issue of CATJ. Techniques for utilizing the sun's noise source as a tool to plot the antenna pattern and system gain are being refined at a rapid rate and CATJ will outline how you can plan to use the semi-annual solar conjunction with SATCOM (or WESTAR) to plot and measure the operating parameters of your own system between now and the September crossing.

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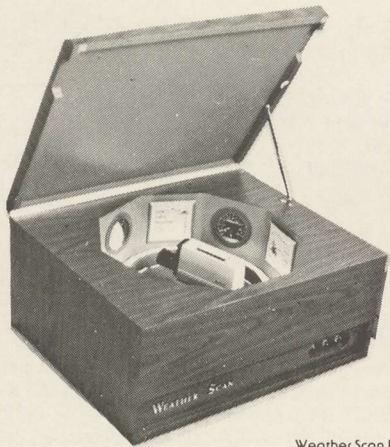
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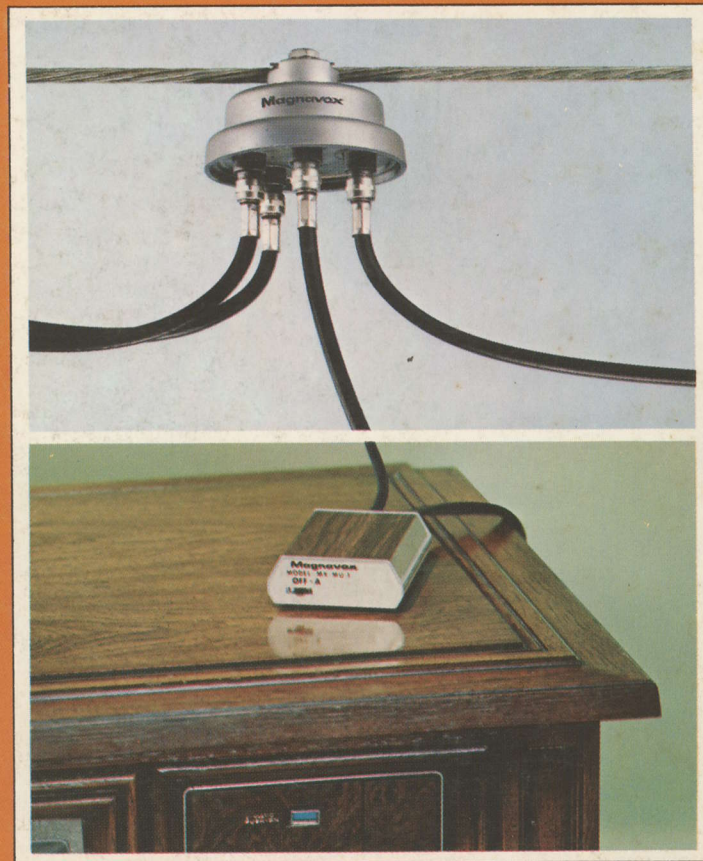
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If the first descrambler looks familiar, it's probably because you've met. Our Magnavox MX-MU-1 Descrambler has become an industry standard since its introduction a year ago. Now, meet the next industry standard—Magnavox's new Descrambler II. An unbeatable combination of low price and high security, in a 2-unit descrambler.

The new Magnavox Descrambler II is doubly secure because it offers two-unit protection. Your subscriber has access to only one part of the Descrambler. More important, if he moves and gives his set-top unit to a neighbor, you will not be supplying free service. This is because the second part of the descrambling unit is housed in an aerial mount activator, mounted on the pole or wire outside.

And the new Descrambler II not only costs less than its main competitor, it can do more. Each new Magnavox aerial mount activator serves **two** subscribers*. Most competitive units serve only one.

For more information on how the new Magnavox Descrambler II can give you effective Pay TV security, economically, contact: Magnavox CATV Systems, Inc., 133 West Seneca Street, Manlius, New York 13104; toll free, east of the Mississippi: 800-448-9121; west: 800-448-5171, or 315-682-9105.

*Magnavox also offers a compact, single subscriber aerial mount activator.

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