

**Coop's
Satellite
Digest**



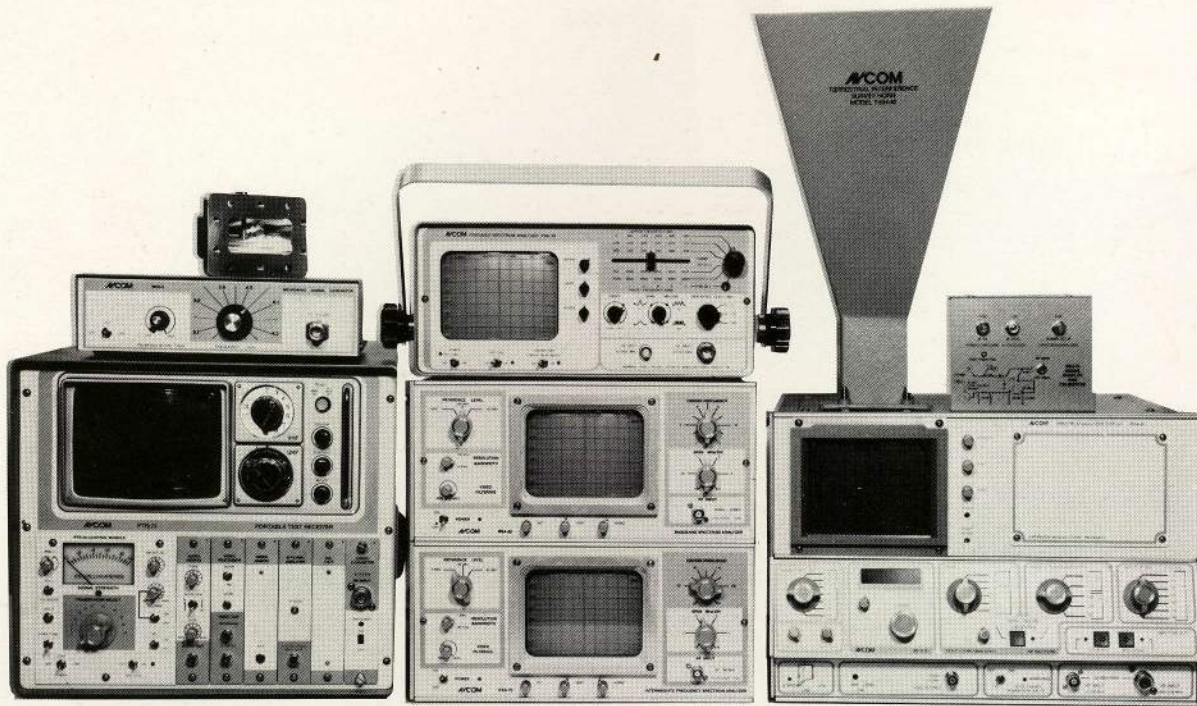
April 15, 1986

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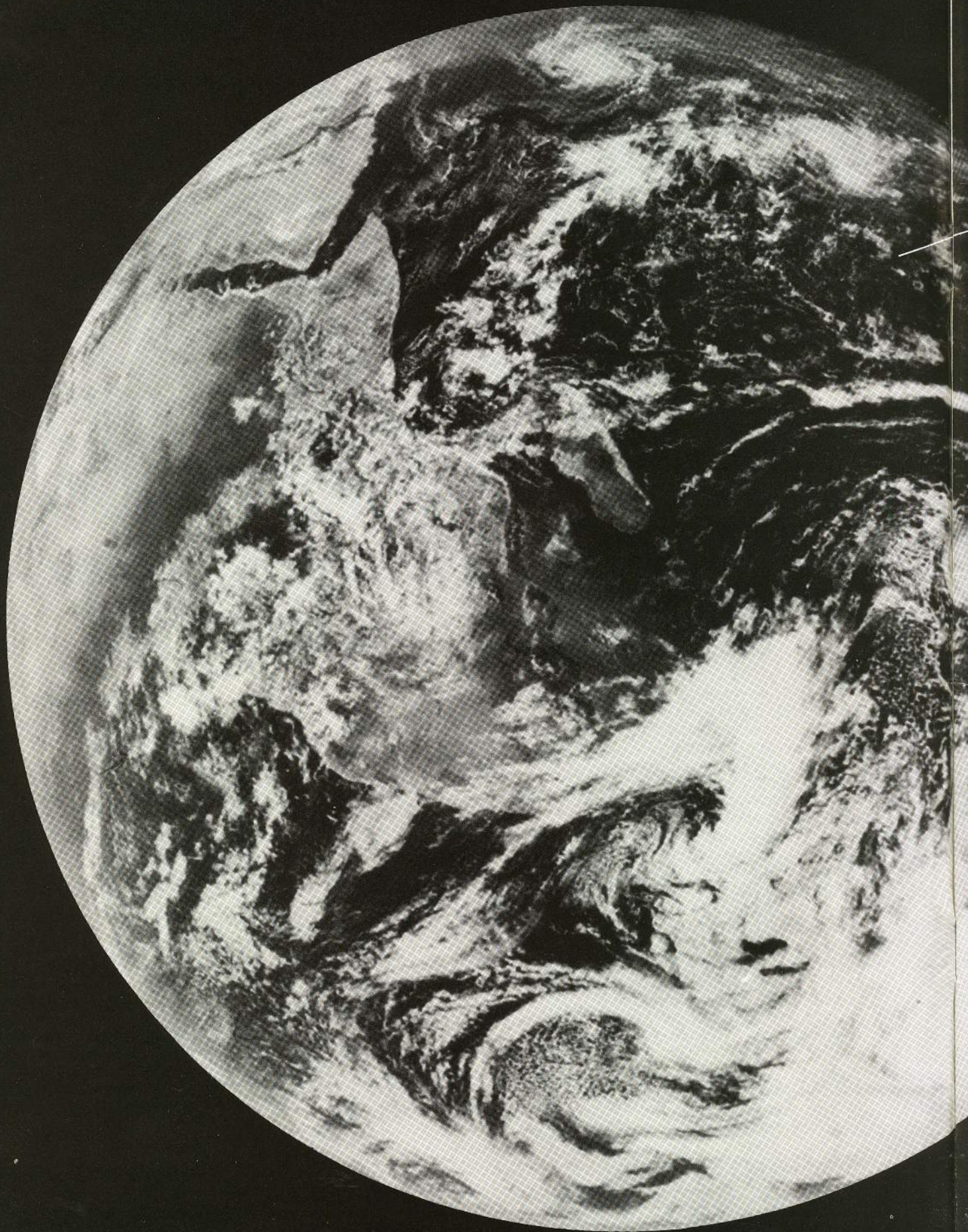
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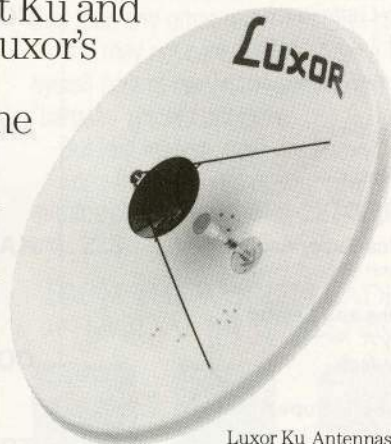
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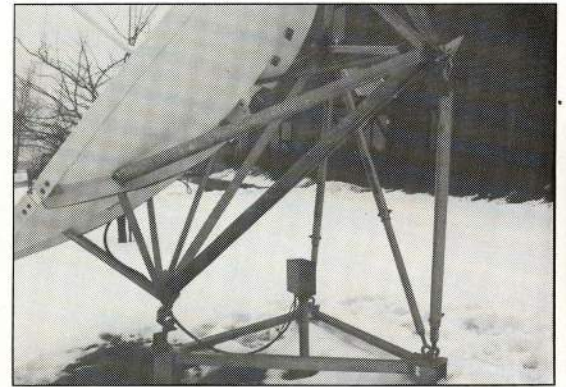


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Our Cover/ HBO warned us the skies would go dark; but they neglected to prophesy what might happen if the dishes went dark! "When the skies go dark, the stars come out." (Sandy Wirth, 1986.)



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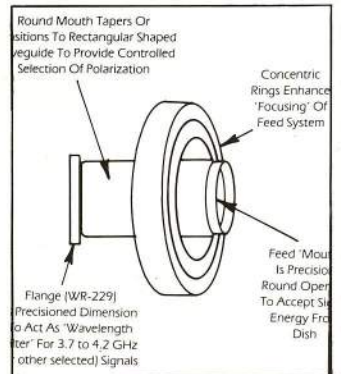
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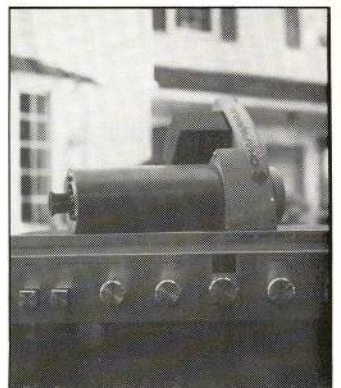
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COOP'S SATELLITE DIGEST is published on the 15th of each month by Triple D Publishing, Incorporated (P.O. Box 2384, Shelby NC 28151-2384). All advertising and subscription requests should be directed to Triple D Publishing. CSD has been issued monthly since October of 1979 with Bob Cooper, Jr., as Editor In Chief. Coop launched the home TVRO industry by building the first FCC licensed home TVRO in 1976. This is the 105th edition of CSD. Subscription rates are \$60 per year where US zip-codes apply, \$65 (US funds) for Canada and Mexico, and \$75 (US funds) elsewhere. All non-US copies are sent AIRmail, worldwide. COOP'S SATELLITE DIGEST table of contents and heads are protected by US and foreign copyrights and any reproduction without the expressed permission of Triple D is prohibited. Second class postage paid at Shelby, NC, and additional offices. Application to mail at second class postage rates is pending at Shelby, NC, and additional offices. **NOTE:** Letters to CSD, technical articles, and new product announcements should be mailed to Coop at West Indies Video, P.O. Box 100858, Ft. Lauderdale, FL 33310 (305/771-0505).

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Coop's Comments



DESUG

There is an element of desperation loose in TVRO which unfortunately manages to permeate virtually everything we do and every business transaction within our industry. Over-hyped and overwritten about, scrambling is of course the culprit here.

As we report separately in this issue, the public's reaction to the various 'black box solutions' to scrambling might be laughable were it not also a potential black eye on the industry to have people collecting \$50 bills for a pile of essentially worthless information.

Out of a universe of perhaps 1.7 million TVRO systems, it is reasonable to expect perhaps 1/10th of 1% of these people to spring for a cheap and dirty solution to scrambling. Hoping against all odds that their \$49.95 will bring them the key to unscrambling those scrambled signals.

Some of the solutions offered are downright fraud. One outlet in Boston (others in Phoenix, Toronto, et al) is buying VC2000E descramblers in the open marketplace for \$360 or \$395, getting them authorized through the normal channels like everyone else, and then repackaging them for resale at \$695 to \$995 with the promise that the units will never have to be reauthorized and will never require additional payments of monthly fees. Pure and simple fraud. When the units suddenly stop working, because they have been turned off by an unfriendly computer that detects their unit code is no longer payment-current, how much luck do you suppose the new owner will have in getting the units turned back on? Only after he or she agrees to pay for the monthly service, I assure you.

Some of these units are sold by people who claim that they have gone into the units to remove chips, or erase memory, or permanently close switches. They claim that by playing these games, units once authorized cannot be deauthorized. We doubt that very much. The M/A-Com people are far too smart to engineer a system which is that easily defeated.

Others have been completely repackaged so that any physical resemblance to the original VC2000 consumer descrambler is gone. People buying these units, repackaged by the seller, believe they are buying knock-offs built by somebody else. Also, not true.

Units repackaged or with their 'memory erased/switches closed' will continue to work for the new owner as long as the seller keeps on sending in the required HBO and/or Cinemax fee. At some point, the crook will decide he has milked the TVRO gullibles for everything he can and he'll stop sending in money. That's when the descrambler will stop descrambling.

With desperation breeding foolishness, there is no end to the attempts being made to circumvent the VideoCipher system. Tune in Lamonica on his FM America program and you will hear a long list of proposed solutions. Send \$10 here, \$50 there, call this secret phone number and ask for George; the babble goes nonstop with every new

caller breeding the diatribe in an incestuous fashion. It is history repeating. Many years ago one of the most powerful radio stations in North America was in Mexico; XERF were its call letters. Taking advantage of its power and its clear channel frequency, XERF sold radio time to every kookie evangelist and medicine show faith healer in the world. Each promised new health, new sexual encounters, new faith, and new riches, if you would only send \$10 to the XERF post office box. Lamonica is a mod 1980's version of XERF, peddling his hope and blind faith to the unwashed and often undereducated masses who are gullible enough to believe anything they hear.

Talk shows such as Lamonica's are controversial and they have been purposefully designed to be as radical and controversial as possible. Keith, like the preachers on XERF decades ago, is appealing to the worst fears of people. He weaves a tangled web of intrigue and corruption, all designed to identify him and only him as the true Messiah. His followers border on fanatical, not unlike the Iranian death squads dedicated to the Ayatollah. It is amazing to watch it all unfold and to witness the depth of emotion exhibited by people over something seemingly as mundane as television reception. We propose a new bumper sticker:

"I'll give up my dish when they pry my cold, limp fingers off of the dish controller...."

Throughout this insanity and diatribe there are those who feel, from a far more detached viewpoint, that the descrambling system might actually be infiltrated. For the most part, those who subscribe to this theory are engineers, scholars, technicians, and scientists who follow a different type of high-tech Messiah. They have their own bumper sticker:

"What one man can scramble, another man can unscramble...."

The tools of this group are far removed from the rantings and ravings of FM America. Their profile is low, on purpose, and their intensity for the challenge of the product is significant. Some of the most talented in this area have decided that the original scrambling system was the product of a multi-talented corporate mind and involved hundreds of individuals each with their own contributions. To 'crack the system' will require an equal number of talented and dedicated people with each making their own contribution to the effort.

And so they have formed DESUG which is short for 'DES Users Group.' DESUG is being coordinated by a fellow named Robert M. Richardson, or Bob to most. He is an author of numerous highly technical manuals and books dealing with complex computer system programming. He is also the author of a nifty book dealing with microwave transmissions and reception. If you have some of the first year's CSDs around you should look there for a series of articles by Richardson describing low-cost terrestrial point-to-point microwave systems.

COOP/ continued on page 55

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Introducing The New BMF 70



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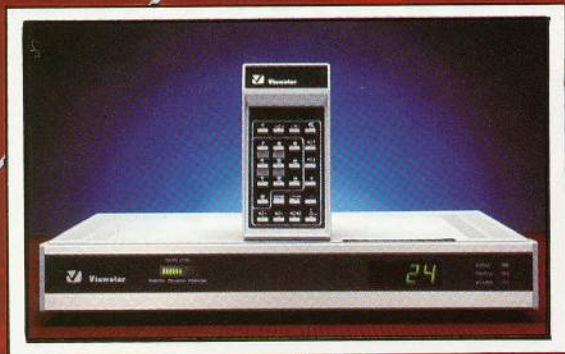
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All ESP filters are Videocipher® compatible.

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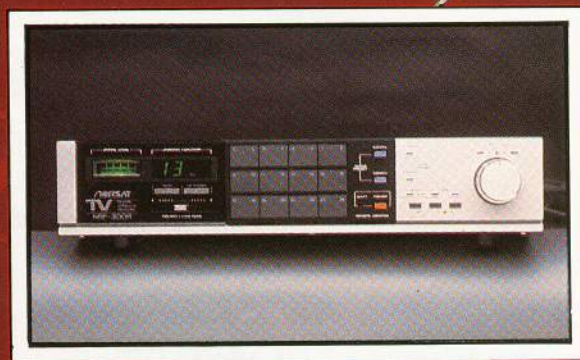
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It Started Here



Perhaps the recent Las Vegas show, jointly hosted by STTI and SPACE, will be best remembered for what it did not do, or the events that did not happen. Of all of the industry trade shows to date, it was perhaps the least dramatic and in many ways least controversial. But, surface appearances can be deceptive.

If you had conducted a survey before the Las Vegas Show, the vast majority of those surveyed would have expressed:

- 1) The show will be lightly attended. (In fact, the attendance was lower than the 1985 Vegas show, but not significantly.)
- 2) There will be many empty booths vacated by firms that will not show up because of the downturn in industry business in 1986. (In fact, there may have been 45 empty booths in all; but more booths overall than any previous show.)
- 3) Those attending will be negative, down in attitude, and the mood of the show will be dismal. (In fact, the mood was positive, many booths wrote significant orders and the aisles were exceptionally busy and crowded for all but the last half of the third day.)

It would be difficult, and dishonest, to attempt to build a story around the failure of the Vegas show as an industry showplace. There was no failure and many of the anticipations about dealing with the heavily unionized city run Las Vegas Convention Center turned out to be mostly inaccurate. They were not totally inaccurate, however, as some who had long cable runs will tell you. Some booths were handed bills for thousands of dollars by union electricians. These bills were charges for routing their TVRO antenna cables from the inside to the outside. Show organizer Rick Schneringer is to be commended for keeping the lid on an explosive situation.

Not that there were no touchy moments between those participating in the show from our industry and the local union workers. Example: The TV coverage crew needed to run Triax cable and audio cables from the van located outside into the

Convention Center. All of the TV crew members are union and they ran their cables themselves. The local IBEW contractor objected, maintaining that only her crew could run the TV camera and audio cables. They read their contract with STTI to include any and all cables of any description. A heated exchange ensued (caught on videotape), with the labor leader demanding that her crew run the television cables. No settlement was reached. In truth, the TV cables for the TV coverage were already in place when the exchange took place. The labor person wanted them rolled back up and removed, and then handed to her workers on spools so they could be laid down again. The TV people thought that was something of an overbearing demand and refused.

Enter now Rick Schneringer. He had been told the IBEW people were 'taking a walk;' they would not continue to run TVRO cables, install lighting circuits and so on unless the TV cables were rolled up and then laid down by the IBEW people. This was to be done at a ferocious charge, of course. It all worked out in the end, but not before the IBEW people made it very plain that if it was a cable, it was going to have to be laid down by them; nobody else.

Some exhibitors had problems moving their exhibit booth supplies inside to their booths. Under local union rules, every box and container had to be moved by the union people. Exhibitors were not allowed to move materials or equipment on their own. There was an escape clause in the rules; if you carried one box at a time, you could slip by the (union friendly) guard at the door. No handcarts or dollies however.

Some booths, who had up to 50 boxes, got set up only after hauling every box in, one box at a time, by hand. The alternative was a double edged sword; not only pay the demanded excessive charges for moving the boxes inside, but also accept delays of up to eight hours before your boxes could be moved into your booth area. For many exhibitors, the price was palatable but the delays were not.

The Las Vegas Convention Center was a one-year experiment for TVRO. Next year the industry is scheduled to return to the MGM Grand Hotel for its exhibits and functions. We got into the larger, and well laid out, Convention Center this year only because there was a hole in the scheduling for the hall in the desirable spring period. No such scheduling hole appears on the 1987 calendar.

Other Confrontations

We brought some of our own confrontations with us. One of the most vocal was a group led by FM America talk show host Keith Lamonica. The Salt Lake City broadcaster aligned himself with a dissident trade show group which attempted to stage an 'After STTI/SPACE Show' at the Tropicana Hotel on February 20-22. The second show was staged by American Shows, Inc., of Bend, Oregon. They promise additional shows to parallel future SPACE events in Dallas and Nashville later this year. Lamonica, having adopted an adversarial posture towards SPACE, has become something of a self-appointed spokesman for the group. A reported 50 or so booths were set up at the Tropicana by the dissidents. Attendance was reported as very light, but in fairness to the second show, very few people even knew it was happening. Lamonica used the public address system at the Tropicana Show to urge his followers to do battle with the 'SPACE people.' One of his less memorable public address outcries to his followers (perhaps 50 were on hand at the time) was "Let's all go to the Convention Center and kick some ass!" At one point, Lamonica was forcibly escorted from the Las Vegas Convention Center by security guards who were told to remove him from the premises. A milling crowd of fewer than 75 Lamonica supporters moved like an oversized amoeba throughout the Las Vegas Convention Center looking for prey to beat upon. They found plenty of targets including Shaun Kenney of Boresight whom the crowd attacked for being 'soft' on SPACE.

More sensible arguments broke out in sessions scheduled by SPACE to introduce various congressmen to the industry. A standing-room-only session held on the closing day of the three day gathering brought Congressmen Carlos Moorhead (R-CA), Don Ritter (R-PA), Henry Waxman (D-CA), Charles Hatcher (D-GA), Bill Richardson (D-NM), Wayne Dowdy (D-MS), Jim Bates (D-CA), and Mac Sweeney (R-TX) to the assembly hall. Sweeney was clearly the crowd's favorite. The session was orchestrated by Rick Brown who handled the congressmen like a series of circus performers. Each was introduced by Brown with a lengthy description of his accomplishments and why their assistance in congress was important. Not all were there because they supported home TVRO ('agin cable) and several made it plain they were not going to make up their minds on this issue until after the hearings had been held.

Sweeney was something of a special case. First of all, he is the youngest member of congress this term (30). Sweeney is from a rural district in Texas and during December he created his own legislation relating to TVRO. It basically asks that there be no scrambling until (1) there are an adequate number of descramblers available, (2) there is a common scrambling technology for all programmers, and (3) the pricing structure for home style descramblers and the programming services has been adjudicated fair. Sweeney's bill slid quietly into the

house hopper late in 1985. He wrote his bill and introduced it without talking to SPACE or apparently anyone else except his own constituents. With no contact with the TVRO industry, Sweeney presented some unique challenges to SPACE. First of all, what he was asking for in his legislation made a good deal of sense to many people. It was not the simplistic moratorium of two years first proposed one year ago; it had definite start and stop points to public availability (at fair prices) of scrambled signals. Second, Sweeney offered an alternative to the SPACE orchestrated legislation. Lamonica at FM America (his nightly radio program gets credit for first noticing the legislation in congress) hopped on the Sweeney bill quickly and they fanned the fires so brightly that it was impossible for SPACE to ignore what was happening. Sweeney's appearance in Las Vegas was not certain until quite late. The printed program addendum did not, for example, contain his name.

Sweeney received a standing ovation at the end of his initial presentation. A new cult hero of TVRO was being born and SPACE had to roll with the punches.

Everything about the entire SPACE show was being orchestrated to come to a head on March 6th. That was the date when Congressman Tim Wirth of Colorado would be holding day-long hearings. His staff had chosen the title "Ensuring Access To Programming For The Backyard Satellite Dish Owner." A synopsis of those hearings appear at the end of this report.

If there was a sub-theme to the show, after the build up for the March 6th hearings, it would have to be defined as 'attitude.' To the point of monotonous repetition, speaker after speaker urged the TVRO dealers to reflect on their own negative attitude concerning the fears of scrambling. Dealers were told repeatedly that if they have a down or defeated attitude regarding scrambling, they are losers before they begin.

TVRO retail business was at all-time low just prior to the Vegas meeting. Few offered contrary reports. However, the week of the show it came up enough to measure and within a few weeks after the show it came up quite significantly. For some, the worst could be over. In the pipeline from OEMs to dealers, the OEMs were feeling the drop-off the hardest. Many distributors were simply not buying any product. Most were maintaining minimal inventories of merchandise because nobody knew how long the slowdown might last. Several distributors, operating on borrowed floor planning capital, were forced to retard purchases of new equipment until they had satisfied their bankers or floor planners that they had reduced inventory and improved their cash positions.

M/A-Com introduced their most aggressive selling program to date. Some distributors characterized this program as 'controlled distribution.' M/A-Com claimed the program was designed to put profit into the distributor and dealer pockets; certainly a desirable new direction for many. Others thought the 1986 M/A-Com marketing plan was a dead ringer for the 1985 Uniden plan. You will recall that Uniden managed to get into the number one position and sell something more than half of all systems sold during 1985 with their plan. M/A-Com was offering complete systems to dealers on a trial basis for \$999 less antenna or \$1500 with a 10 foot mesh antenna. The VideoCipher descrambler was included in both packages. Other distributors were offering packages inclusive of antennas for as low as \$1299, and they also included the Vid-

Home Satellite Television — The Technology Of Choice

When President Reagan signed the Cable Communications Act in 1984, making home satellite television legal, he opened a new world of satellite technology to everyone.

That new technology is still open to everyone. The skies will not go dark — ever.

Over five million people across the USA are enjoying the choice home satellite television brings them. Choice entertainment such as news, sports, movies, children's programs, music and inspirational programs. Over 112 channels in all with more being added every month.

People in rural areas — where the only television choice is between poor reception and no reception — are tuning in to the world with home satellite television.

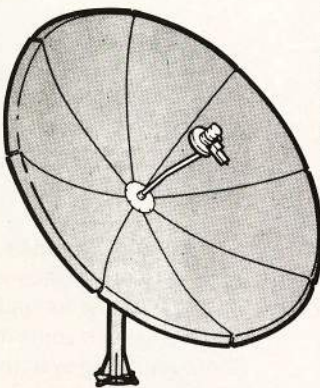
Even people in metropolitan areas — fully one-third of home satellite owners live in cabled areas — prefer the wide choice and studio-quality reception which satellite technology brings.

Some pay TV services have scrambled and other have plans to scramble. The Cable Communications Act, which President Reagan signed, protects your rights to subscribe to these program services. With whatever technology you choose.

However, confusion surrounding the scrambling issue has caused concern nationwide, leaving many consumers without the information necessary to make an informed choice.

Echosphere Corporation and Houston Tracker Systems want you to have the facts about satellite television — the technology and the choice it can bring you.

Echosphere and Houston Tracker Systems split the costs on full-page advertisement appearing in USA Today newspaper. Ad was designed to tell industry's side of scrambling and reestablish consumer confidence in TVRO as an entertainment medium. The ad broke in USA Today at opening of Las Vegas convention.



FACT: It is legal to receive satellite-delivered programming on your home earth station.

The Cable Communications Act of 1984 made it legal for private citizens to receive satellite signals. It guarantees you a choice of delivery systems — satellite technology, free broadcast or cable.

FACT: There are 112 channels of free and clear satellite programming available to home earth station owners.

There is a wide range of clear programming available to consumers including news, sports, music, business, inspirational programs and superstations. Plus, most of these services have absolutely no plans to ever scramble their signals.

More entertainment choices are being added for the home earth station owner all the time. In fact, there are plans for over 20 additional services in 1986 alone.

FACT: No program service intends to scramble without making its service available to home earth station owners wishing to subscribe.

If your favorite program service does scramble, you'll have the choice of subscribing. However, most services have no plans to scramble their signals — ever.

You can subscribe to HBO and Cinemax, two pay services which have scrambled, simply by calling your local cable operator or HBO itself. But shop around for the best deal because monthly subscription fees can vary.

Earth station owners may choose from all of the satellite-delivered services, not just those selected by local cable operators.

FACT: Only one decoder is necessary to receive all of the scrambled programming you choose.

One VideoCipher II, which you can purchase from your satellite dealer, will be able to descramble all programming operating under the system. All popular program services that have plans to scramble are using the VideoCipher II.

FACT: Signal descrambling equipment works with all of the satellite receivers being sold today.

Your satellite dealer will see to it that the equipment you buy is compatible with the VideoCipher II consumer descrambler.

FACT: The VideoCipher II does more than simply descramble signals.

The VideoCipher II has pay-per-view capabilities which allow home earth station owners to watch first-run movies and specials before they appear on cable or video cassette. It has credit and viewing history, on-screen graphics and message center plus parental lock-out based on a film's rating. All this plus improved audio and video quality.

FACT: Advances in home satellite technology have brought the size — and cost — of home earth stations down.

You can receive studio-quality, dependable satellite television anywhere in the country with a six- to ten-foot dish. And system prices now average below \$2000.

FACT: A home satellite system still gives you the widest variety of entertainment choices — and will for many years.

Your home earth station still provides you with the widest choice of programming of any technology available. You always will have access to all non-scrambled satellite-delivered programming, plus you will be able to subscribe to premium scrambled programming. The choice is yours.

Satellite TV is still the best entertainment investment you can make. We want you to take advantage of all the excellent entertainment that the heavens offer. We hope these facts will encourage you to find out more about home satellite TV.

Call or stop in to visit your local satellite TV dealer. He or she can answer your questions about satellite TV and show you the choices only satellite television can offer.

This information is brought to you by the leaders of the new technology of satellite television.

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Houston Tracker Systems
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Houston, TX 77036

eoCipher. The VideoCipher descrambler, although it has earned a black eye in the marketplace, is quickly becoming a significant part of the distributor packaging for 1986.

The anticipated big fallback in sheer volume for 1986 had

to hurt some firms more than others. Uniden stands to lose the most in 1986 in terms of growth and profits if the year turns out to be a down year. From sales of over a quarter million in 1985, Uniden privately was projecting total industry sales of under

Answers to Questions about the Black Box Solution

Q. What is a "Black Box"?

A. "Black Box" is a name commonly given to electronic devices having the ability to perform unauthorized decoding or descrambling of specific communications signals.

Q. What is *The Black Box Solution*?

A. *The Black Box Solution* is a how-to manual containing complete specifications and step-by-step instructions for building a "Black Box" that can clear up TV signal distortion commonly associated with satellite signal scrambling.

Q. Which Scrambling techniques are covered by *The Black Box Solution*?

A. *The Black Box Solution* design covers multi-format de-scrambling techniques which can decode M-A/COM VC II, OAK, Orion and other encryption methods.

Q. What is the approximate cost of the total parts required to assemble a multi-format Black Box Decoder?

A. The approximate total cost of all the parts in the Black Box is \$90.00.

Q. If I build a Black Box, will I be required to Pay a Fee for any Program Services that I receive?

A. No. However, you should be aware that use of the Black Box to decode scrambled TV signals may be illegal. We do not encourage anyone to violate any Federal Law, or FCC Regulation.

Q. Do We Sell Completed Black Boxes?

A. Absolutely Not. Current Federal Laws and FCC Regulations are not clear concerning the manufacture or selling of satellite signal descramblers. However, since these devices can be used to intercept and decode pay TV signals, it must be assumed that they could be illegal.

Q. Do I really need any type of Decoder or Black Box to enjoy satellite TV?

A. Certainly not! There are still over 100 unscrambled signals available to the home satellite dish owner, with a wide variety of entertainment choices, including news, sports, spiritual and adult programming.

The Black Box Solution

© 1986 by Black Box Solution. All Rights Reserved.

Black Box Solution booklet sold like hotcakes in Vegas and before at nearly \$50 a copy. Buried in the fine print was the fact that complicated circuit only recovers video from scrambled services. Audio (by their own admission) had not been 'cracked' as of the date of their booklet publication.

200,000 home systems for 1986. That would drop the Uniden share from a quarter million in 1985 to perhaps 100,000 in 1986. The anticipated cutbacks at Uniden were plainly evident in Las Vegas.

One of the brighter spots in merchandising was in the Ku system area. Some of the Ku-band pioneers, such as Ed Grotzky of Arunta Engineering, were warning listeners that the antenna portion and tracking portion of the Ku-band add-on systems were still very primitive. Grotzky reports on that subject in some detail elsewhere in this issue of CSD. Interest in Ku-band systems, especially at commercial establishments such as bars, clubs, and restaurants is already high. With the successful launch of the new three channel, medium-high-power (100 watts per transponder) Japanese bird in February, it is expected that a significant part of the Japanese TVRO industry resources will now be drawn off to their own home market for the balance of 1986. This, say some, could have a posi-

tive effect on the depressed American market for 4 GHz terminal equipment. There is the suspicion that a buoyant Japanese market for the internal sale of 12 GHz terminals during 1986 will leave the American market alone long enough for a recovery.

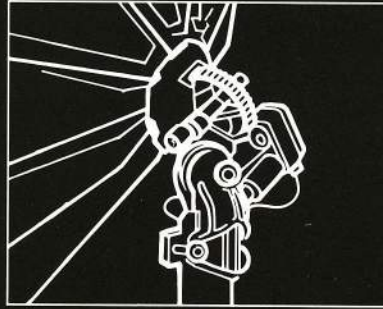
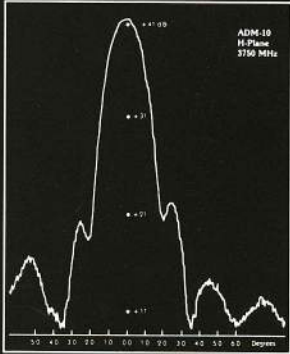
Scrambling Charades

In spite of no evidence to the contrary, there was the continued belief that someplace out there in America's great backyard workshops some inventor had licked the HBO and M/A-Com scrambling system and (illegal) 'black box' descramblers were shortly to arrive in the marketplace. Rumors related to this belief permeated the trade show floor.

"There are 5,000 black box descramblers on a boat waiting to be unloaded from Taiwan," said the man in hushed tones. "I have ten on order and will receive them next week." We

The GAIN Is Always ADM QUALITY

The Model ADM-10' perforated dish offers attractive see-through advanced design with the added plus of fast assembly and exceptional performance even at 12 Ghz. A motorized

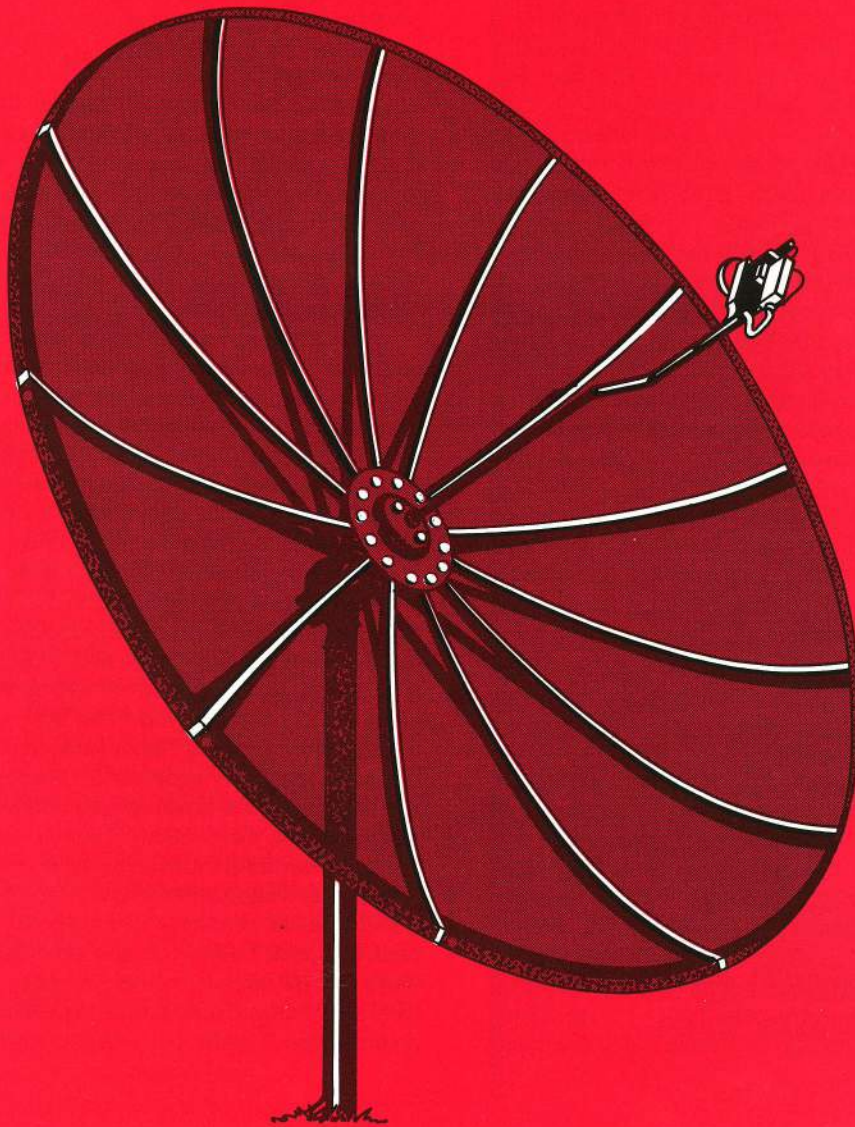


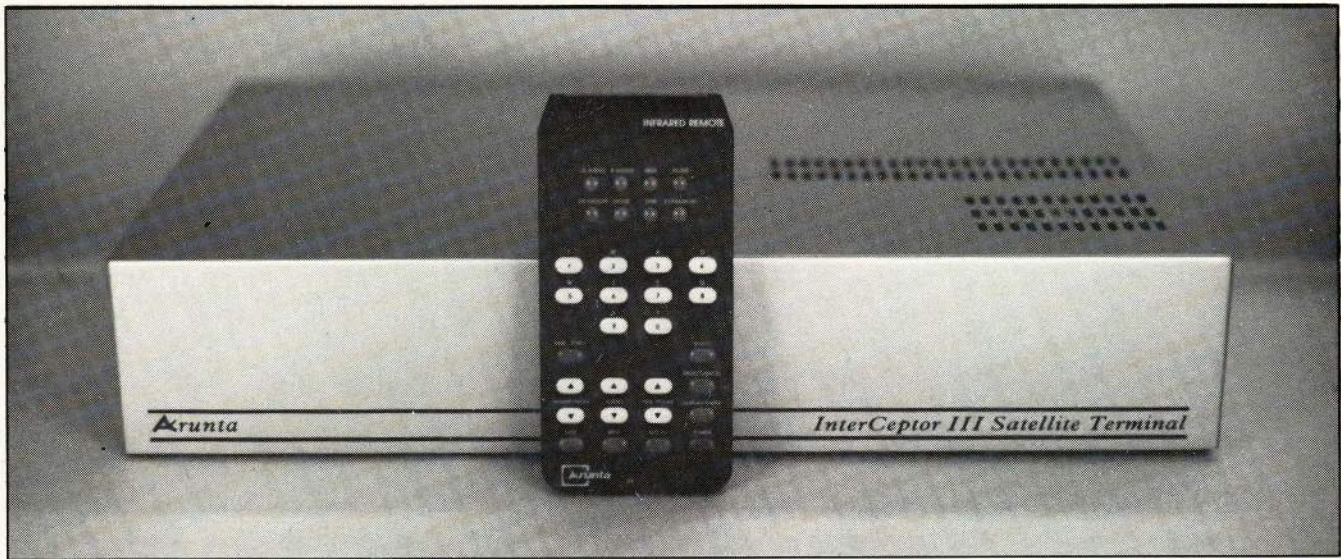
horizon to horizon mount with control, .050 aluminum perforating at 1/8 x 1/4 staggered and interlocking rim band for maximum strength are just some of the features. The Model ADM-10' perforated antenna is a major advancement

in the performance of see-through antennas and best of all makes ADM quality affordable. ADM also manufactures a 10' steel and 10', 11', 13', 16' and 20' aluminum models to round out a comprehensive selection. Call an ADM representative for more information and experience for yourself the benefits of the ADM quality tradition.

Antenna Development & Manufacturing, Inc.

P.O. Box 1178, Hwy. 67 South
Poplar Bluff, Mo. 63901
[1-314-785-5988]





Arunta interceptor III receiver may be only truly operational 4 and 12 GHz dual band system now available in industry. Receiver was demonstrated in Vegas with dual mode feeds for C- and Ku-band, equipped with four separate LNB units; one for each polarization on each band. The feeds and LNBs weighed in at nearly 18 pounds.

checked with him 'next week' and the week after that. He was hoping there was still time to stop payment on his check.

At least one firm was doing a land office business in a \$49.95 manual which it called (with some guts) 'The Black Box Solution.' The book describes an extraordinarily complicated video only descrambling system which it claims will correct the scrambled video from the Oak Orion and/or the VideoCipher. The same book also promises that the firm will provide a separate manual (for another \$24.95) to describe how to build an audio descrambler as well. They promised that manual in March, but they didn't clearly say which March. The book is a total waste of money unless you are into extremely complex solutions to basically simple problems. An example.

The 'Black Box Solution' video descrambler uses four transistors, four IC op-amps, a phase locked loop IC, three IC video amps, an IC color processor, a pair of switching ICs and another pair of sync generator ICs, and 11 additional solid-state devices, for a total of 28 active parts, to recover the Oak or M/A-Com scrambled video. Keith Anderson of Anderson Scientific had a working unit at his booth that did the same thing on the Anik Oak Orion scrambled and Galaxy VideoCipher scrambled video with a single IC and two transistors. Keith had his parts list priced at Radio Shack and it came to under \$10. The 'Black Box Solution' cost over \$50 in parts before you get to the bottom of page two of the three page list.

At press time, Anderson was still undecided whether his firm would offer his video-only units for sale or not. He has decided that if Anderson Scientific does not put the units for sale in the marketplace, they will release the schematic to the industry through CSD.

It is difficult to criticize a group such as those involved in 'The Black Box Solution' for taking commercial advantage of a situation such as the present scrambling fiasco. But by their own admission, they had sold some 1,500 of their \$49.95 manuals before they arrived in Las Vegas and the stack of 50 and 20 dollar bills at their very busy booth in Las Vegas suggested they did at least as well there. That's a quick

\$150,000-plus for a set of plans that very few people will ever really benefit from.

The Hearings

Congressman Tim Wirth opened the hearings into the scrambling problems March 6th by noting that in all of his years in congress, he had encountered very few issues with as much emotion as the scrambling issue. His sentiments were echoed by other congressman who spoke during the hearings. Several also noted that the amount of misinformation and the misconceptions held by the average TVRO consumer were astronomical.

If the callers participating in the call-in segments to the various C-SPAN special programs built around the hearings were any indication, the public at large (including that portion that owns a TVRO) is exceptionally dense about the real issues in scrambling. In spite of significant attempts to educate the public, there was simply no real understanding of how or why the scrambling was here, who controls it, and why it is not the responsibility of the US government to unsnarl the mess.

There were several disappointments associated with the hearings. First was the television coverage. C-SPAN in electing to cover the hearings, had decided to televise live only those portions between 9:30 and 11:00 AM on the 6th. That turned out to be a portion which was dominated by the various members of congress who sit on the subcommittee conducting the hearings. Only Taylor Howard managed to get a portion of his testimony in before C-SPAN ceased the coverage and returned to live coverage of congress in session. As you might suspect, the C-SPAN telephone lit up in a hurry when they cut away from the live coverage.

A further disappointment came from the realization that not a single dealer, consumer, or distributor was scheduled to appear or speak before the subcommittee on March 6th. Of those who did appear, only two are directly a part of our industry (Taylor Howard and Rick Brown). More than 20 others representing the TV networks and programmers appeared. There

was the promise that sometime prior to June 1st a second day of hearings would be scheduled and in those hearings the people most directly impacted by the scrambling could be heard. This, too, did not sit well with the estimated audience of several hundred thousand TVRO dish owners tuned into the coverage.

What did come through loud and clear in the limited amount of live coverage presented on C-SPAN was the following:

1) Most of those testifying in the first 90 minutes were playing to their home constituents. One congressman said it right up front, "If I didn't testify here, today (in favor of legislation), I could not go back to my district this weekend!"

2) Congress has received extremely heavy mail and significant telephone calls on this issue. Several congressman related the volume of mail and calls to the heaviest they had ever received on any issue in the past.

3) Chairman Wirth is in a delicate position, and may attempt to hold the second set of hearings in his home state of Colorado in the late spring. He is running for senate in Colorado in the next election and the rural vote from his state could have a beneficial effect on his senate chances.

In other words, the TVRO scrambling issue has become a political football with each congressman carefully weighing what he can do, say or how he can react to gain maximum exposure and mileage from the issue. This suggests that it would benefit many in congress to let it drag out perhaps a year or so. We don't expect any action soon enough this year to have an effect on the ultimate number of systems sold during 1986. Sorry.

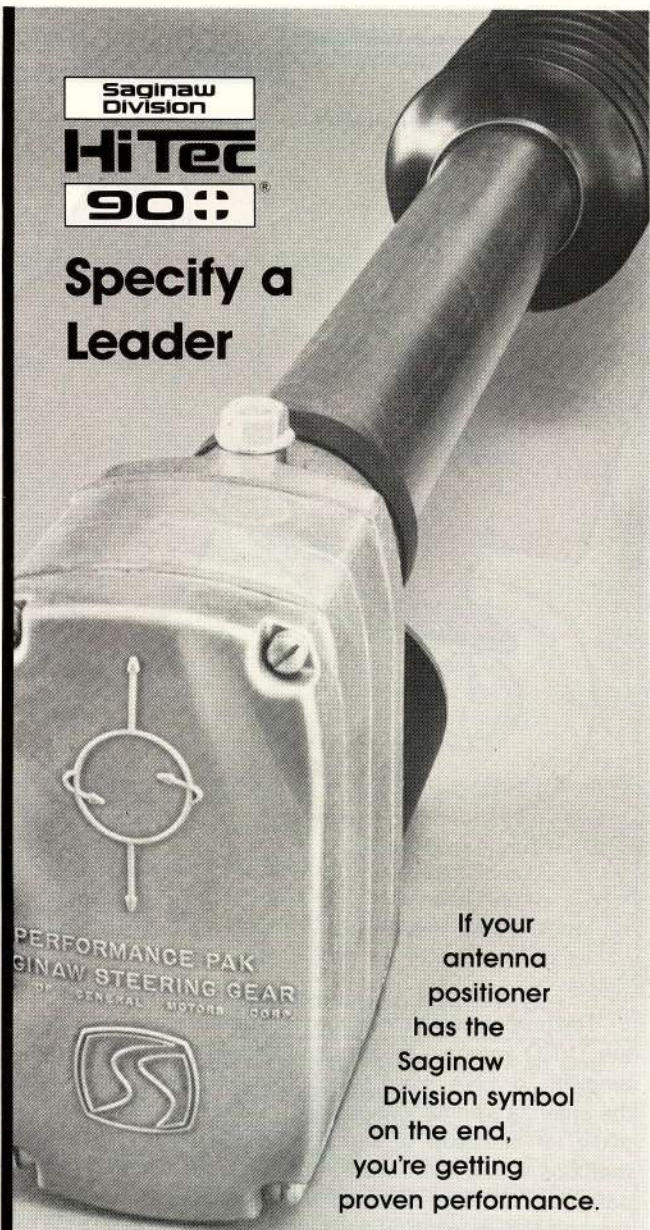
Summary

The 1986 Las Vegas show presented the TVRO industry with its first real adversity since the industry launched in 1979-80. Most of those present were reacting with the dignity of winners and with the responsibility of mature adults. The handful who marched around with signs and placards damning 'the establishment' are found in any free society damning one thing or another. The industry will be leaner and stronger for the downturn this year, as painful as it may now be or continue to be for many of the participants. One antenna OEM summed it up very well. "When the first slow down in business hit, I went into the shop and laid off 10% of the work force. The foreman predicted dire problems. I watched what happened to production; it went up 5%. When the second slowdown hit, I went back into the shop and into middle management and let 20% of the people go. Again I heard loud protests from the shop foreman. Production fell 5% and that put me back to where I started; the same production, with 30% fewer people. We all get fat and sloppy when times are good; we neglect to watch our internal operations closely enough because the money is rolling in by the bushel basket. We'll come out of this a far better company when it is all over...."

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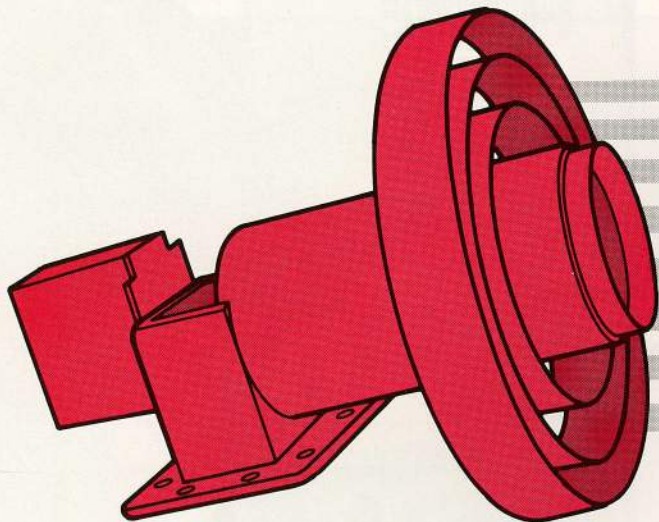
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CSD/April 1986



TVRO Feeds

by Alli Lake

Lake, appearing in CSD previously in matters dealing with the scrambling of satellite signals, looks at the basic elements in a TVRO feed as a quick course in bettering your understanding of the TVRO feed systems.

The purpose of the feedhorn is to gather signal energy from the TVRO antenna, or dish, and couple it into the low noise amplifier, or LNA, while rejecting noise signals from outside the antenna's primary beamwidth. Certain types of feeds also allow for selection of signal polarization by a number of methods. Some allow tweaking of the feed to remove skew for satellites twisted in orbit and to compensate for the apparent twist placed upon the signal as the antenna is rotated through the polar arc.

There are basically two types of feedhorns used for TVROs: the tapered rectangular or conical horn, used for illuminating spherical antennas, and the now very popular scalar feedhorn with concentric rings, used with parabolic dishes.

To expand further on the types of feeds, we will address the following: Single Pole

Dual Pole

Electro-Mechanical Polarizer

Solid-State Polarizer and,
variations of the above.

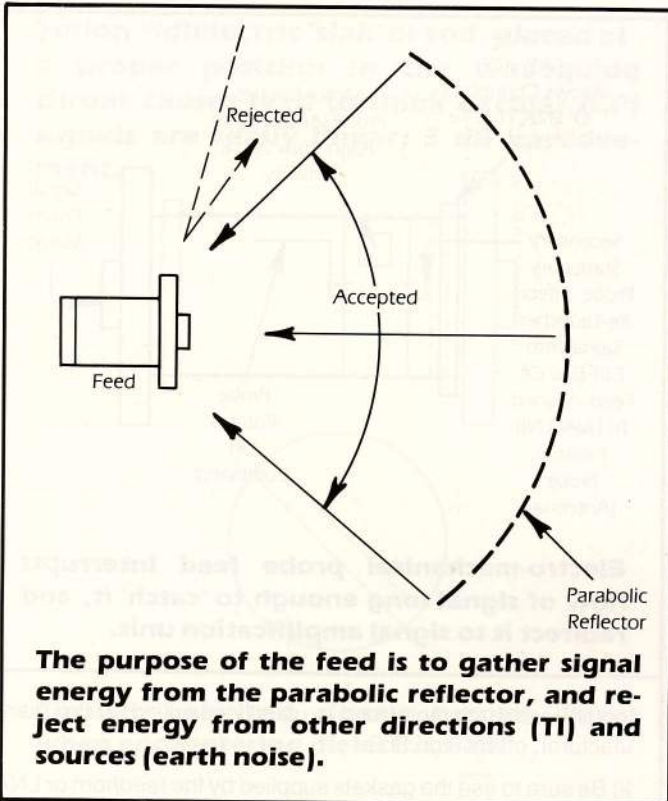
The single pole feed is a simple device. It typically has a mouth made of circular waveguide, surrounded by concentric rings to gather the signal which funnels into a rectangular waveguide, terminating in a flange (WR-229 for C-band) to which a single LNA or LNB is attached. The horn receives a single linear polarization. In the early days of TVRO, the entire feedhorn/LNA assembly was physically rotated by a TV antenna type rotator for the purpose of selecting the opposite polarity.

The dual feed is similar to the single feed with an additional

output port mounted perpendicular to the first. A probe is inserted into the straight-thru port, to couple energy (signal) into a second port, whose waveguide is perpendicular to the orientation of the straight-thru port. The dual feed allows the use of two LNAs (or LNBs) simultaneously, each receiving a different polarity (normally horizontal and vertical). The dual feed is typically used in multiple receiver systems to allow independent selection of any channel from one satellite.

The next feed we shall examine is the electro-mechanical single feed. This feed has a metal probe in the cavity facing the opening which is rotated by a servo-motor or by a small DC motor. The signal coming from the probe is coupled to the output flange. This setup allows selection of either polarity (one at a time) while using only one LNA/LNB (in a single receiver system or master/slave system). The use of the servo allows precise recall of a certain polarity, while some tweaking is typically required to switch polarity with the DC motor version. A disadvantage of the electro-mechanical polarizer is that it uses moving parts which may wear out in time. Also, solid-state control circuits in servo-motors are susceptible to power surges.

Another feed allowing selection of polarization while using one LNA/LNB is the solid-state PIN diode polarizer. One such feed is made by M/A-Com Omni Spectra. This unit consists of a single feedhorn coupled to two probes. The probes connect to two PIN diodes which function as microwave switches. The outputs of the diodes are combined and a DC voltage selects which diode and polarity are selected. Some disadvantages are a higher loss than the electro-mechanical polarizer and no means to adjust for skew or 'twist'.



Another solid-state polarizer is the ferrite polarizer. This starts with a standard feedhorn opening which is coupled to a ferrite device encircled by a coil of wire. As positive or negative voltages of different levels are applied to the coil, the magnetic field produced by the coil varies. An effect known as the Faraday effect twists the signal, resulting in a polarization change. A disadvantage is slightly higher loss than electro-mechanical units.

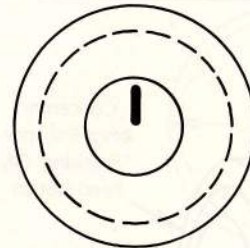
Two types of dual feeds with skew have appeared recently. One is the usual dual feed design, but with a ferrite device inside for rotation by the Faraday effect. The other utilizes a mechanical servo-motor which rotates a portion of the feedhorn to place a twist on the signal.

Some feedhorns are custom made for an f/D ratio specified by an antenna manufacturer. Other feedhorns have an adjustable scalar ring which can be moved out or in to achieve proper illumination for the depth of the dish being used. The Chaparral Golden Ring is meant to be installed on most Chaparral feeds used on dishes with an f/D in the .28 to .3 area. The ring installs in the throat end of the feed, lengthening it.

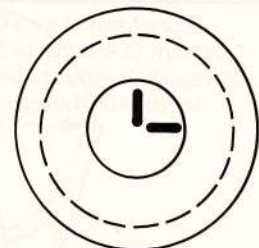
For reception of circular-polarized signals, such as from Intelsat, some manufacturers offer a CP kit. This kit consists of a Teflon[®] slab that is placed inside the waveguide of the feedhorn diagonally with relation to the rectangular waveguide portion. Use of this adapter provides up to 3 dB gain over a standard linear feed. The slab should be removed to receive normal linearly polarized signals or there can be a loss of up to 3 dB.

Some tips on installing feedhorns:

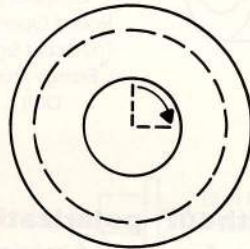
1) Know the focal length of the dish you wish to install the feed on. If you do not know the focal length, it can be calculated from the f/D ratio. The f/D ratio is the numerical ratio of focal



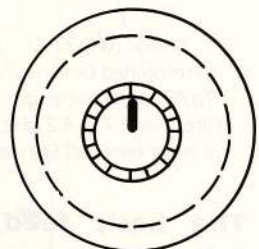
Single Pole
(Vertical Shown)



Dual Pole
(Vertical And
Horizontal)



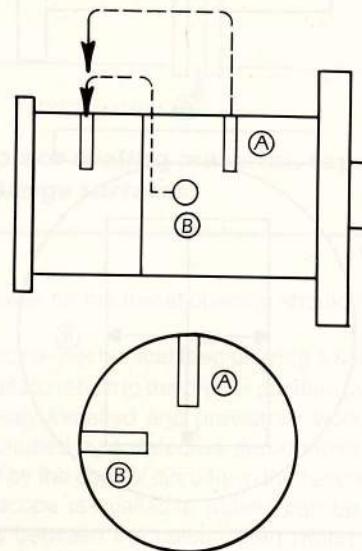
Electro-Mechanical
(Probe Moves On
Command)

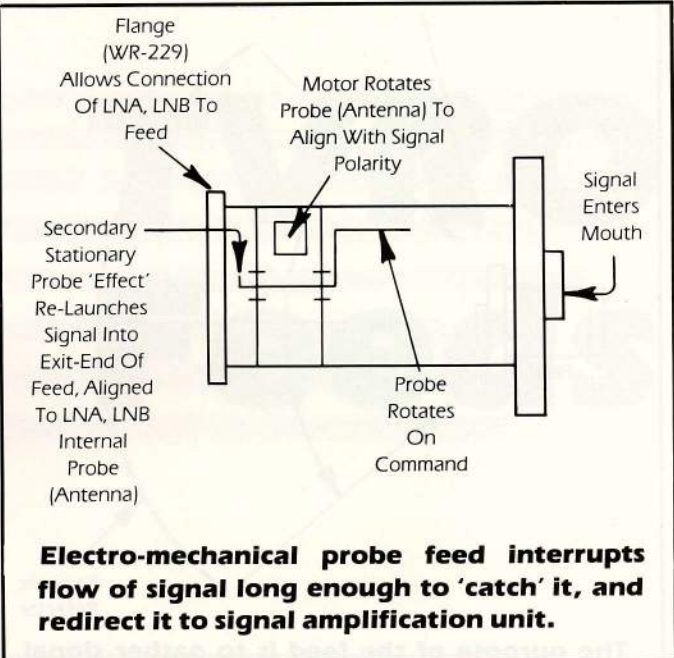
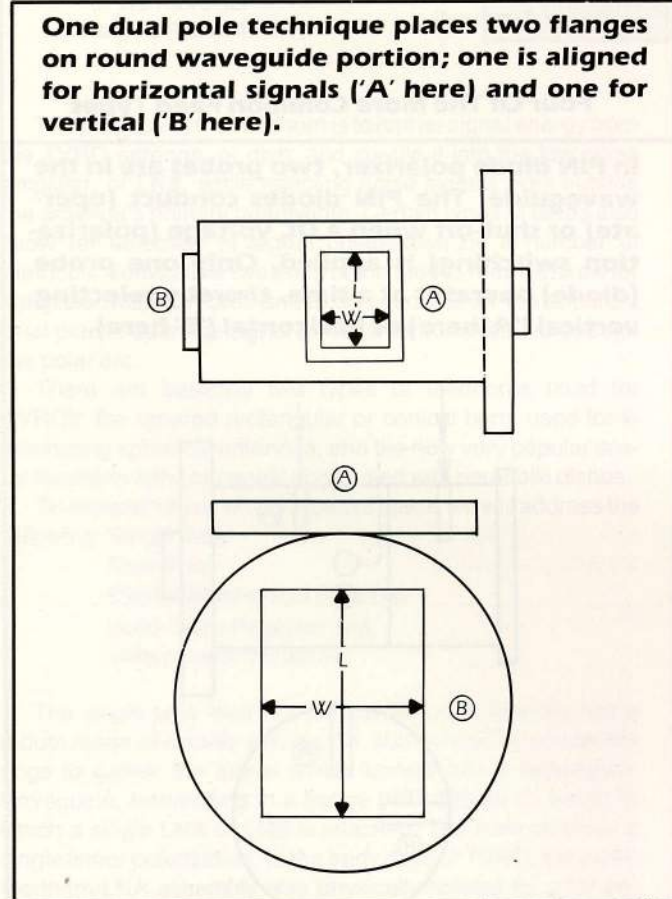
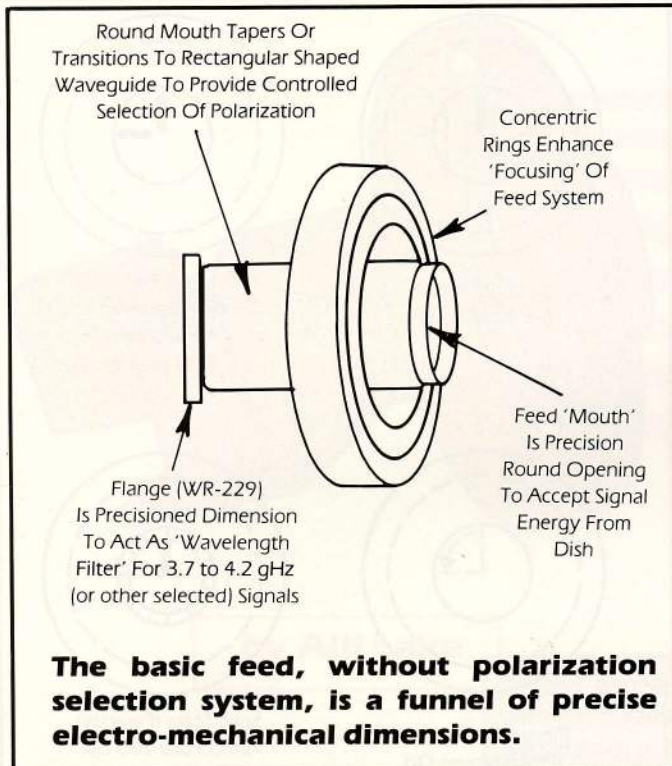


Solid-State (Faraday)
Affect Polarizers Use
Electrical Field To
Rotate The Signal

Four Of The More Common Feed Types

In PIN diode polarizer, two probes are in the waveguide. The PIN diodes conduct (operate) or shut-off when a DC voltage (polarization switching) is applied. Only one probe (diode) operates at a time, thereby selecting vertical ('A' here) or horizontal ('B' here).





length to dish diameter and is usually specified by the manufacturer, often .3 or .365.

2) Be sure to use the gaskets supplied by the feedhorn or LNA manufacturer when mounting an LNA or LNB to a feedhorn. Be sure to seal the LNA/LNB signal connections (a good sealant is Bishop High Voltage Bi-Seal Tape or Co-ax Seal). Also seal the flange area as well to prevent moisture entry. Do not put silicone on the inside area of the flanges. Good metal to metal contact is important here for proper operation.

3) When installing servo-motor feeds, use a larger wire size for long cable runs, to prevent voltage loss which could cause slow or erratic operation. The receiver or feed manufacturer should provide specifications on wire size in relation to cable length.

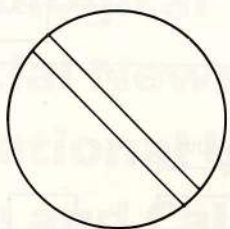
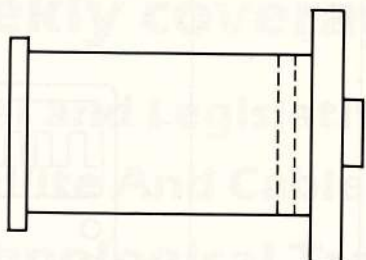
4) Consider the use of shielded wire. This is a requirement when your polarizer cable runs are next to a 90 volt DC motor power cable. Shielded wire reduces the chance of noise induction into the receiver system from the pulses on the control line. It also protects the servo-motor from surge currents induced by the actuator motor line.

5) When installing a straight single or dual feed, tweaking is done much more easily by nulling a signal than by peaking on it. This means that if we wish to place our feed on horizontal polarity, that we put our receiver on a channel corresponding to the vertical polarity and rotate the feedhorn until the signal is completely gone. This method is much more satisfactory than by attempting to peak up on the desired signal, which results in a much broader peak.

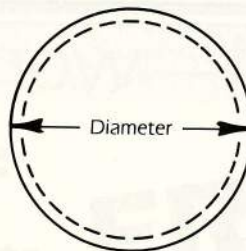
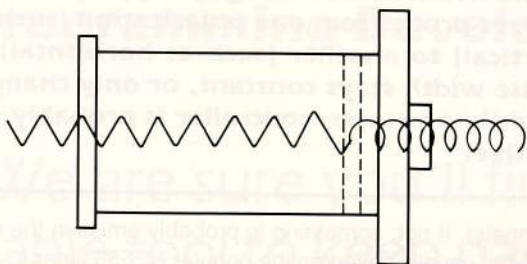
In case one has problems:

1) Some feedhorns have an open throat. This opening occasionally becomes home for wasps or yellow jackets. The presence of their nests can cause a reduction of signal, producing the dreaded sparklies and also cross polarization, which is two polarities being received at once. Those feeds provided with a

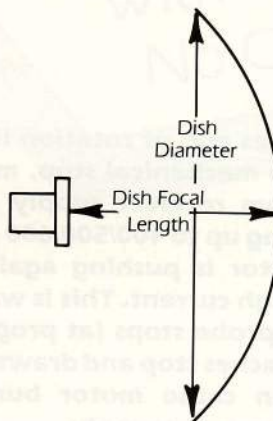
Teflon™/dielectric 'slab' or rod, placed at a proper position in the waveguide throat causes feed to think circular (CP) signals are really linear; 3 dB improvement.



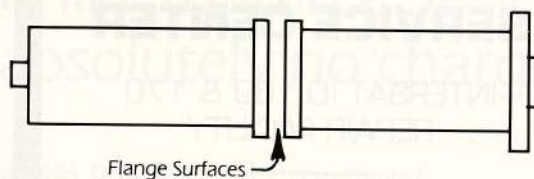
Circular polarized signals become linear when encountering dielectric slab.



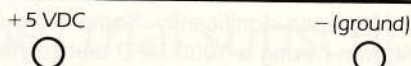
The effective f/D or focal length to diameter of a dish can be compensated at the feed by varying the width (diameter) of the 'mouth' opening of the feed. A 'ring' placed inside the mouth does this.



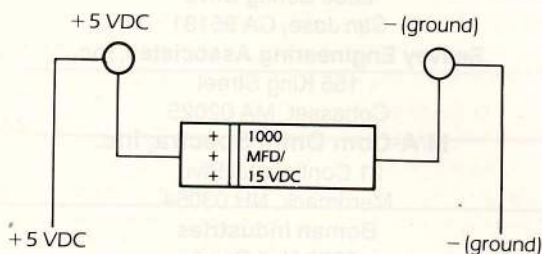
Seal flange to flange surfaces around outside only....



Do not place sealing material, tape, etc., between flange surfaces.



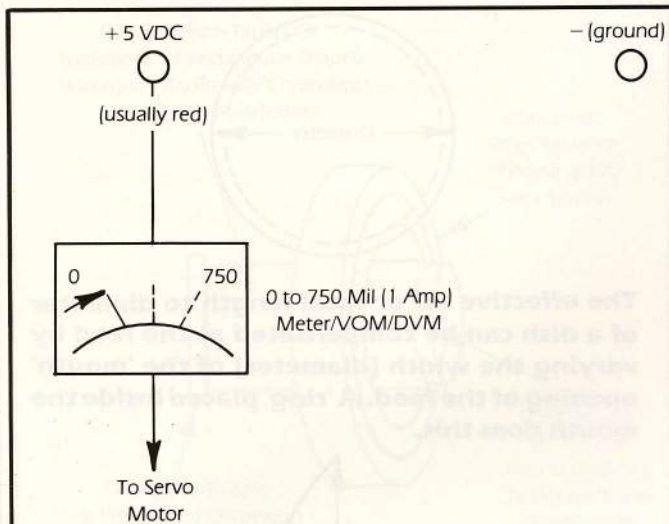
By adding 1000 MFD (15 volt, or more) electrolytic capacitor across supply lines for servo-drive polarizers, operation of feed rotation should smooth out.



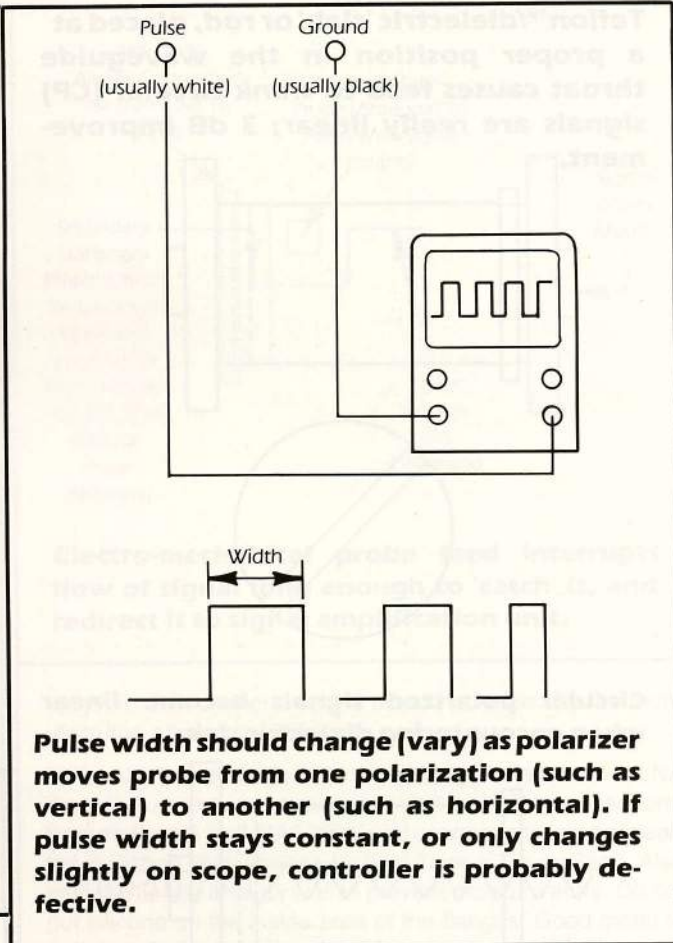
To Servo Drive

weather cover for the throat opening should have the cover in place.

2) If an electro-mechanical feed utilizing a servo-motor fails to rotate or fails to return to the proper position (assuming the unit was correctly installed and previously working), the fault is probably caused by a defective servo-motor, although it can be caused by the control circuitry in the receiver motor drive. If an oscilloscope is available, pulses can be observed when measuring between the pulse (often white) line and ground (often black) line. The width of the pulses should vary as the controller requests horizontal and vertical (odd and even



As motor reaches end of rotation limits and probe comes to mechanical stop, motor current drawn from receiver supply increases rapidly; shooting up to 400/500/600 plus mils. As long as motor is pushing against stop, motor draws high current. This is warning to rotate feed so probe stops (at proper polarity) before it reaches stop and draws high current which can cause motor burn-out or 'smoke' receiver power supply.



Pulse width should change (vary) as polarizer moves probe from one polarization (such as vertical) to another (such as horizontal). If pulse width stays constant, or only changes slightly on scope, controller is probably defective.

channels). If not, something is probably amiss in the control circuitry, usually based on the popular NE555 timer IC.

Another test that can be done is to insert a DC millimeter in series with the +5 volt line (usually red). When the controller approaches stop, or end of rotation, the amount of current drawn should increase significantly. Some servo-driven systems benefit from having a 1000 MFD electrolytic capacitor placed across the +5 volt line and ground, with the minus terminal of the cap to ground. This may be particularly useful where a long cable run exists.

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M/A-Com Omni Spectra, Inc.

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MOUNT BASICS

by Bob Crean

As with installation on rock, installations on roofs are to be avoided if possible. Unfortunately, this avoidance can lead to lost sales now that smaller dishes are working better and better. The natural place for these dishes is the roof.

By far the most convenient roof to work on is a flat one, and many tripod type of supports used on the ground can be used on this type of roof. If the roof is on a commercial or city dwelling building, the roof is probably made of concrete or heavy wooden rafter construction, the former being one of the best materials to mount the dish on. Care must be taken in sealing any penetrations in the roof surface, as water which penetrates this barrier will travel laterally and possibly do damage to whatever is below.

The residential pitched roof is somewhat more difficult to work on, unless you are a mountain goat. The most widely used mount for this type of roof is the A-Frame tripod. This mount has two legs that mount at right angles to the roof pitch and a third leg going up the roof. If properly manufactured, its design provides one of the stiffest foundations possible for the post and dish that go on it. They are also fairly easy to install.

Another type of roof mount is the four legged peak roof mount. Although usually more expensive than other types, and more difficult to install, they can provide good support for dishes. An important thing to realize about roof mounts is that the installation is only as good as the roof it's on. This means careful inspection of the roof structure, and that means getting inside the attic or ceiling to make sure that there is a sufficiently strong structure to carry the loads.

Elements Of Mount Design

Many mounts today are not designed, but are simply thrown together to provide the necessary axis of motion in a polar tracking mount, or copied from someone else's thrown-together mess. You don't have to go to many trade shows to realize that there is plenty of garbage out there. Dealers buy it because there is often not enough product available for everyone. This will change soon for two reasons. First, the supply will catch up and surpass the demand, allowing the dealer to be more selective. Second, as failures in mounts start to occur (one, two, or three years after installation), and as 2 degree spacing becomes more prevalent, a new standard will emerge for mount designs that work well, provide the required stiffness at minimum weight and cost, and are easy to install and maintain.

While there is no simple way to describe all the elements of good design in a mount, experience over time is to be relied on in selecting anything purchased for resale; mounts included. The best thing to do is find a good one and stick with it. A dealer can improve his chances of finding a good one by avoiding

anything that looks like it was built in a garage, because it probably was! Look for stiffness, using the technique we've described. When you are at shows, don't avoid telling the people who manufacture a product you have used about ways to improve it or make it simpler to install. We at Roundhouse Manufacturing have produced some of our best products in response to such an expressed need of our customers.

Finally, a note on installation procedures. We find that it is a good idea to keep a logbook to be used during installation, to record certain dimensions or procedures associated with mount installations. Declination angle, for instance, might be measured in linear distance between two marks on the mount. The jack tube might be similarly calibrated so that if you are called back to the site, you will know instantly if the problem is mount related. Using care in selecting and installing the polar mount should minimize callbacks for that reason.

Basic Mount Design—The Differences

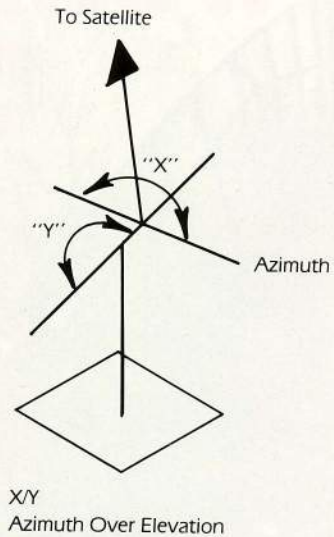
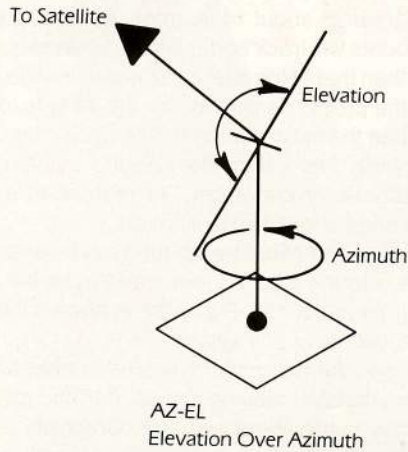
Then there are the questions of which type of mount to use for a particular installation. In the boom of home TVRO dishes, most everyone assumes there is only one type of mount—the common polar mount which we are all so familiar with.

With the number of satellites increasing and being spread out more in the geosynchronous orbit, and with the advent of C-band DBS systems popping up in dealer showrooms, it might be a good time to take a look at the entire spectrum of mounts, including polar, az-el, X-Y, fixed, as well as several different actuation methods including horizon-to-horizon and linear actuators.

Let's start with the old days when commercial installations were the only type around. More often than not, they were fixed—that is, other than small motions available for fine tuning when they were installed, they did not move again (unless taken down by a hurricane). The advantages of a fixed mount are obvious: no drive system to purchase or maintain, less installation time, less down time, usually very stable. One of the most common fixed mount arrangements is the trapezoidal az-el type seen outside of radio and television stations to pick up network feeds. They always point at one satellite, and even though the basic motion allowed during setup is az-el, we don't classify them as such if they are fixed upon installation.

These mounts are very stiff for their weight, and because they are usually nothing more than a number of tubes or structural shapes, they can be easily shipped. The disadvantages include not being able to track the geosynchronous orbit, and the rather large pad required to mount them—usually at least as large as the diameter of the dish.

Virtually any other type of mount design can be made a fixed mount by removing the actuator or motor-drive, but this is



Not All Mounts Approach The Rotational 'Axis' In The Same Manner.

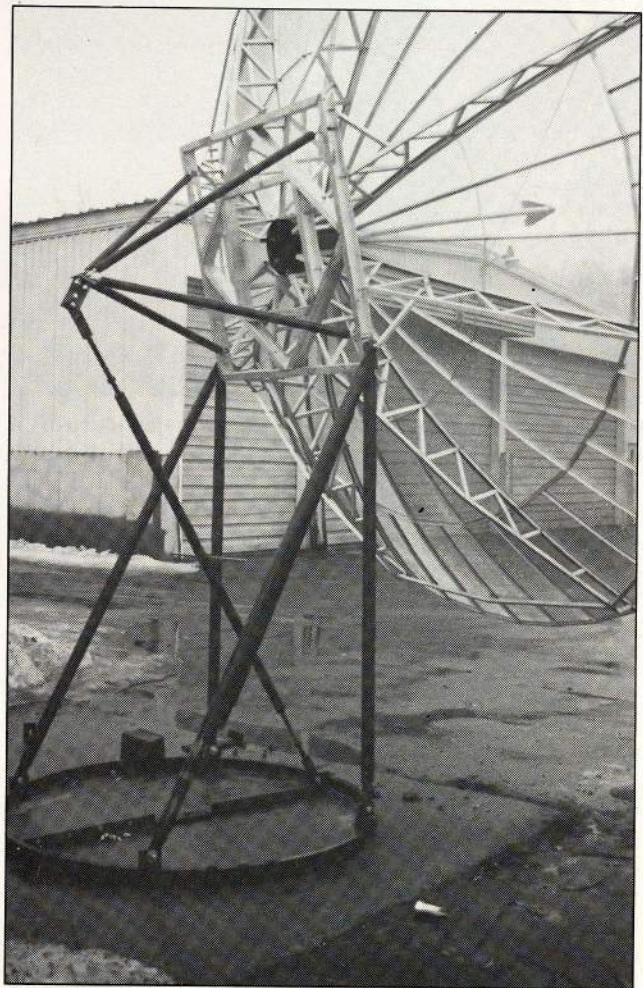
a wasteful and costly use of material if a fixed mount is desired. Az-el mounts are the most common types to be used in this fashion because they are the simplest to point during installation.

The simplest type consists of a pipe in the ground, over which another pipe is placed. This pipe supports an axle which allows elevation movement. This is sometimes called an EL over AZ mount, because the elevation axis is placed on top of the azimuth axis. Many of the C-band direct 6 foot dishes on the market today have such an arrangement. These dishes are fixed, once aimed at Galaxy 1.

The same arrangement is used for many large (10 meters and up) commercial installations. Each axis is driven by large electric or hydraulic actuators. To move from one satellite to another both actuators are moved, usually preprogrammed by computer controls. The advantage of this type of mount is that it is easy to aim at any satellite in the arc with great precision. Large aperture reflectors with a narrow beamwidth need this precision if every last fraction of a decibel is to be gotten from the system. Another advantage is that this type of mount is usually simpler than a polar mount. At Roundhouse Manufacturing, the az-el mounts we have designed and manufactured are on average 20% lighter and less expensive than a polar mount for the same size dish. The place to use an az-el mount is where great precision in aiming is required or where only occasionally moved fixed mount is required.

Another type of mount which is a 'two axis' is the X-Y mount. This is similar to the Elevation over Azimuth mount except the two axis are reversed in terms of which supports the other. Instead of the elevation axis being supported by the azimuth axis, in an X-Y mount the azimuth axis is supported by the elevation axis. Technical readers will observe that a polar mount is a unique type of X-Y mount, with the elevation set for a particular location and fixed.

X-Y mounts are rarely seen today. Roundhouse Manufacturing makes specialized X-Y mounts designed to track the



Elevation over Azimuth mount created by Roundhouse for use with ECI 16 foot dish. Note narrow stance required by mount.



Polar mount with motorized Y axis created by Roundhouse for ECI 16 foot dish.

Molniya satellite. These mounts, incorporated into Orbita Systems' (New York) complete reception system, allow for precise tracking of the very peculiar track that Molniya takes across the sky when observed from the ground. Other than this use, the satellite TV dealer is not likely to have need of this type of mount.

Polar mounts are by far the most commonly used in our industry. Their primary advantage is the reason for their widespread use. They require only one axis of motion to very nearly track the geosynchronous orbit. I say very nearly because no polar mount will track the orbit belt perfectly unless it is on the equator. There is a small error (about 12 degrees) between the satellites due south of the observer and those very near the horizon. There are ways to incorporate correcting motion in the design of a polar mount, and Roundhouse Manufacturing has designed such a mount but the cost is not justified because the beamwidth of most reflectors under 16 feet is greater than the 12 degree to begin with.

It must also be understood that the most common way of peaking a dish (alternating between adjusting elevation at a high satellite and azimuth at a low satellite) compensates for this error, and when done properly, puts the maximum error to half of the 12 degrees or about 14 degrees. It is a little known fact that polar mounts will track better if the elevation is set for a higher latitude than that of the site, and the declination set for a little less than the proper declination for the latitude to compensate. Other than the initial setting for the declination, most installers accomplish this using the peaking system mentioned above, without even knowing it. The real secret is knowing how much to undershoot the declination.

This whole discussion might be splitting hairs considering that most dishes, around 8 to 10 feet, can't even be aimed closer than a degree and a half. But, there is always the challenge to get the most out of any system.

Having discussed the four major types of mounts, we turn our attention to methods of moving dishes. Far and away the most popular today is the linear actuator. Originally used in hospital beds, these actuators, (which are really just a threaded rod inside a tube which extends when the rod is turned) do the job well although many installers have learned (the hard way) that you can't just take something out of one application and put it into another without problems. Freezing is one of the major problems with these units—especially those not manufactured with rubber boots and drain holes to allow moisture to escape. Newer units have been designed specifically for the satellite industry and have fewer problems.

The chief advantage of linear actuators is that they are common and fairly inexpensive. Additionally, they are easy to mount, and aside from the freezing problems, work pretty well. Their chief disadvantage is that their motion is limited, and the forces exerted on the movable part of the mount tend to change as the dish goes from the horizon on one side of the mount to approximately south (or, the highest satellite).

This can be disastrous if the mount is poorly designed and does not position the clamp and upper end support in the right places. Stories abound about wrapping jacks around mounts or bending the tubes. Granted, most linear actuators have internal limits designed to prevent this, but in some mounts so little motion is allowed (or side loads are placed on the jack) that it is difficult for the installer to get all the desired satellites without risking damage to the actuator.

This factor, as well as the fact that the geosynchronous orbit is getting filled up and spreading out, has created much interest in horizon-to-horizon motion systems. These are identified primarily by the large D shaped ring that carries a chain, which acts as the transmitter of energy to the mount. Other systems available include a worm and wheel arrangement, but the chain drive type was there first.

The chief advantage of this type of drive system can be found in its name: Horizon-to-Horizon coverage of the satellite belt. These mounts are really polar mounts with 180 degrees of azimuth coverage. This is essential if the customer would like to look at satellite programming available from satellites over the Atlantic, as well as, the domestic satellites. The primary disadvantage right now is cost—a good, well engineered system costs considerably more than a linear actuator, and probably worst of all, most horizon-to-horizon systems are not an option—they are either designed into the mount or not.

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Antenna Basics (Part One)

by Jim K. Vines

In keeping with our back to the basics theme in this issue of CSD, we have called upon Jim Vines to initiate a detailed look at the basics of parabolic antennas for TVRO. Vines, an early designer of home-style and light-commercial antennas for satellite service reception (Paraframe) begins his multiple-part report by comparing the often misunderstood parabolic reflector to a number of common optical instruments.

The Antenna—"Eye" Of The TVRO System

Very literally the antenna is the eye of the TVRO system. It is an optical instrument whose performance depends on the precision contour of its surface. Ideally the antenna's reflective surface will focus incoming satellite RF energy no matter what the environment contrives: heavy icing, high winds, or that bain on the low look angle user, gravitational distortion.

There are two types of optical instruments; reflecting and refracting. A camera lens or the lens of the eye are examples of refractive optics. So is the objective (front) lens of a refracting telescope.

Surface contour accuracy and surface smoothness are not the same. Newcomers to TVRO technology are often impressed with the smoothness of an antenna. Certain manufacturers have exploited this naivety by advertising how smooth their antennas are. If you could observe the seemingly smooth surface of a camera lens or the parabolic mirror of a reflecting telescope, what you would see is a craggy, pitted 'no mans land' as rugged as any terrain on Earth. As the following diagrams illustrate, contour accuracy is the key to optical performance. The eye has a light sensitive film called the retina located at its focal plane. At the focal plane of a TVRO antenna is its feed, which together with the probe in the front cavity of the LNA is frequency dependent. The LNA probe is analogous in function to the similarly frequency dependent (or wavelength dependent) rods and cones of the retina of the eye. The feed



Straight line edge view of the 6.0 meter TVRO antenna indicates that all of its cross-sections share a common optical axis. The net result is a maximum concentration of satellite RF energy in a single focal point for high gain and low side lobes. This antenna employs a novel stressed/prestressed parabolic framework to ensure long-term shape-holding. Usage at low look angles causes some antennas to exhibit 'clamshell distortion' or petal droop. Photo courtesy of Paraframe Communications, Inc.

acts as a loading device to shape the probe's 'field of view' so that the reflector (dish) is efficiently illuminated.

The feed is electrically coupled to the LNA probe and the two together act as elements of an antenna. The driven element is a quarter-wave ground plane antenna (the probe). Because it sits on a ground plane (which is one of the faces of the LNA cavity) it acts as an electrical half wave element. The feed-dipole-cavity complex acts in concert to illuminate or 'see' the dish (which it faces) as evenly as possible, with as little spillover as practical beyond the edge of the dish.

Description Of A Parabola

The wave front approaching the reflector is called "incident". After it strikes the reflector it becomes the "reflected" wave. All of the incident wave front is in phase with itself. Ide-

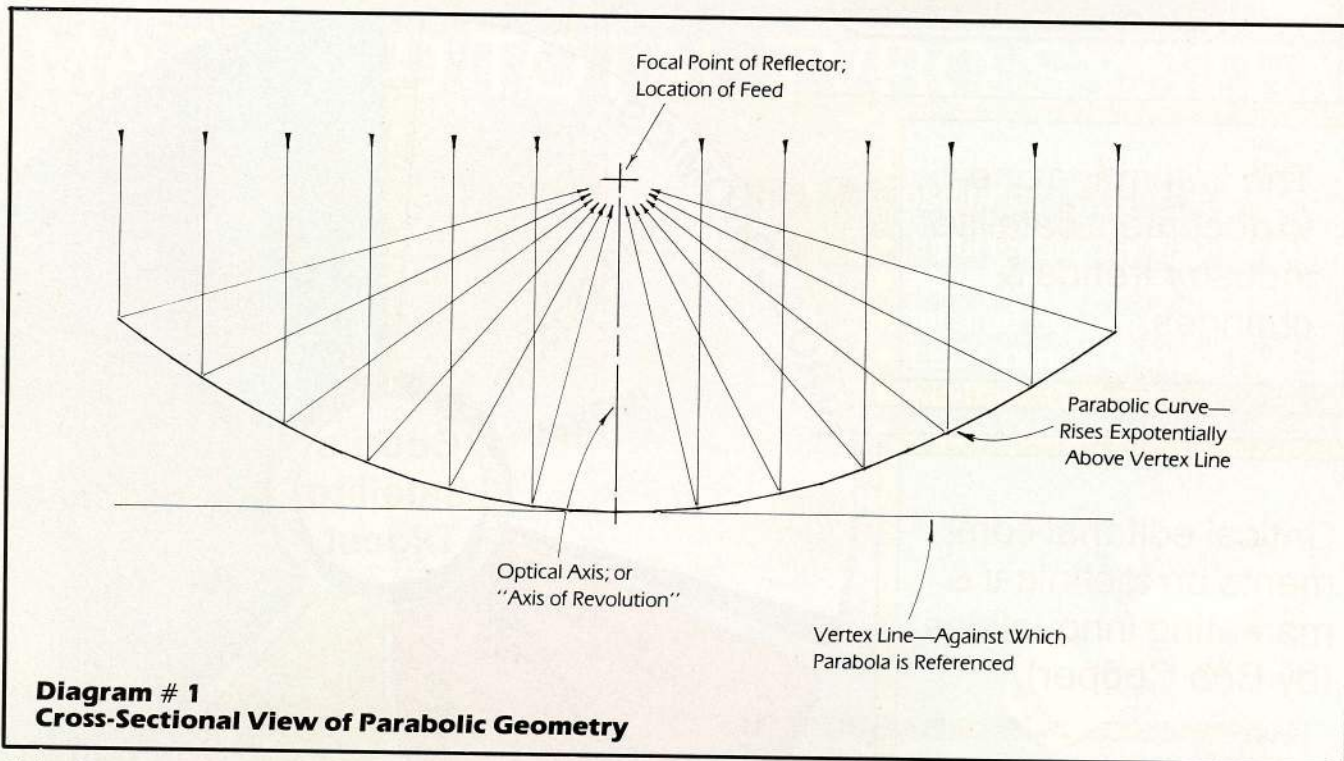


Diagram # 1
Cross-Sectional View of Parabolic Geometry

ally it will remain in phase after it strikes the reflector. It will remain so if the reflector conforms accurately (in cross-section) to a parabolic curve. Diagrams 1 and 2 show that parabolic accuracy is not merely a matter of cross-sectional precision. All parabolic cross-sections must share a common axis of revolution or optical axis.

The formula for a parabola is $Y^2 = 4AX$, which means that as the curve goes outward from the axis or center line, it rises exponentially above the vertex line. Thus as the distance outward from the axis is doubled the parabolic curve's rise above the vertex is quadrupled. And so on.

The wave front approaching the reflector is called "incident." After it strikes the reflector it becomes the "reflected" wave.

Deviations From A Parabola Revolution:

Now to consider a case where rim integrity is good, yet there are deviations from a parabola of revolution. Back in the early 1970's, Taggart¹ and others investigated the effects on antenna performance when flat panels were used to surface a parabolic antenna.

The sample tested was 7 feet in diameter with 10 panels, which were parabolic from dish center to edge, but flat across. Intended for Third World manufacture and deployment as part of a Stanford University Center for Radio Astronomy study, this antenna demonstrated a 0.9 dB loss versus a 'perfect' dish at a frequency of 2.62 GHz.

Extrapolations of the Taggart/Stanford test data in 1978 resulted in estimates of gain losses at both 4 and 12 GHz as a function of three variables: the number of panels used, the diameter or aperture of the parabolic reflector, and the f/D ratio of the reflector. (See Table 1.)

| Antenna Diameter | No. Of Flat Panels | f/D = .375: | | f/D = .30: | |
|------------------|--------------------|-------------------------|--------------------------|-------------------------|--------------------------|
| | | Gain Penalty (dB) 4 GHz | Gain Penalty (dB) 12 GHz | Gain Penalty (dB) 4 GHz | Gain Penalty (dB) 12 GHz |
| 8 ft. | 12 | 1.30 | 11.7 | 1.60 | 14.4 |
| 8 ft. | 16 | .45 | 4.0 | .56 | 5.0 |
| 8 ft. | 20 | .17 | 1.5 | .21 | 1.9 |
| 10 ft. | 12 | 2.00 | 18.0 | 2.50 | 22.5 |
| 10 ft. | 16 | .68 | 6.1 | .85 | 7.6 |
| 10 ft. | 20 | .28 | 2.5 | .35 | 3.2 |
| 12 ft. | 12 | 3.00 | 27.0 | 3.70 | 33.0 |
| 12 ft. | 16 | 1.00 | 9.0 | 1.25 | 11.2 |
| 12 ft. | 20 | .40 | 3.6 | .50 | 4.5 |
| 12 ft. | 24 | .21 | 1.9 | .26 | 2.3 |
| 16 ft. | 20 | .71 | 6.4 | .89 | 8.0 |
| 16 ft. | 24 | .37 | 3.3 | .46 | 4.1 |
| 20 ft. | 24 | .60 | 5.4 | 5.40 | 49.0 |
| 20 ft. | 28 | .28 | 2.5 | .35 | 3.2 |
| 40 ft. | 32 | .68 | 6.1 | .85 | 7.6 |
| 40 ft. | 40 | .26 | 2.3 | .32 | 2.9 |

TABLE 1—Predicted gain penalty when perfectly flat panels are used to surface a parabolic antenna. The use of fewer panels results in a lumpier surface. As antenna diameter increases, resulting penalty increases, if the number of panels and f/D ratio are held constant. As the f/D ratio is shortened (with dish diameter and number of panels held constant), the antenna gain is also sacrificed. A perfect P O R (parabola of revolution) could be said to have an "infinitely large number of infinitely narrow flat panels."

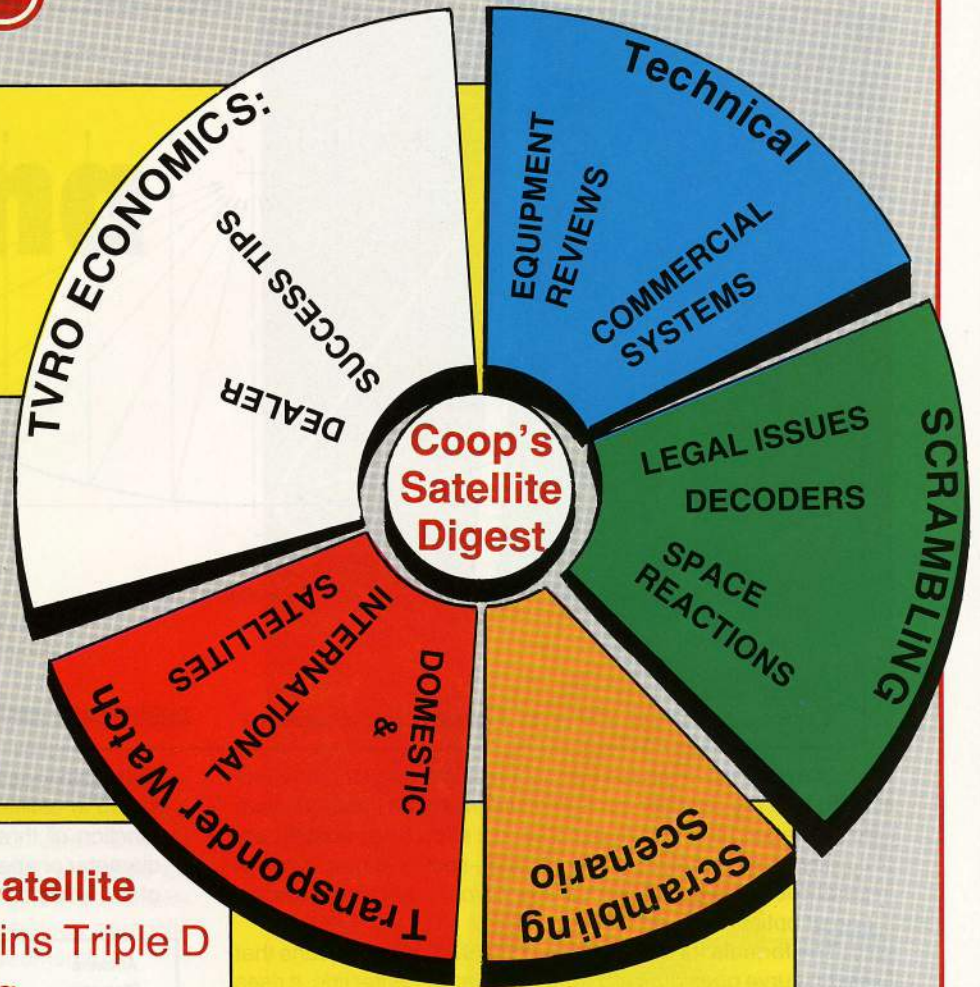
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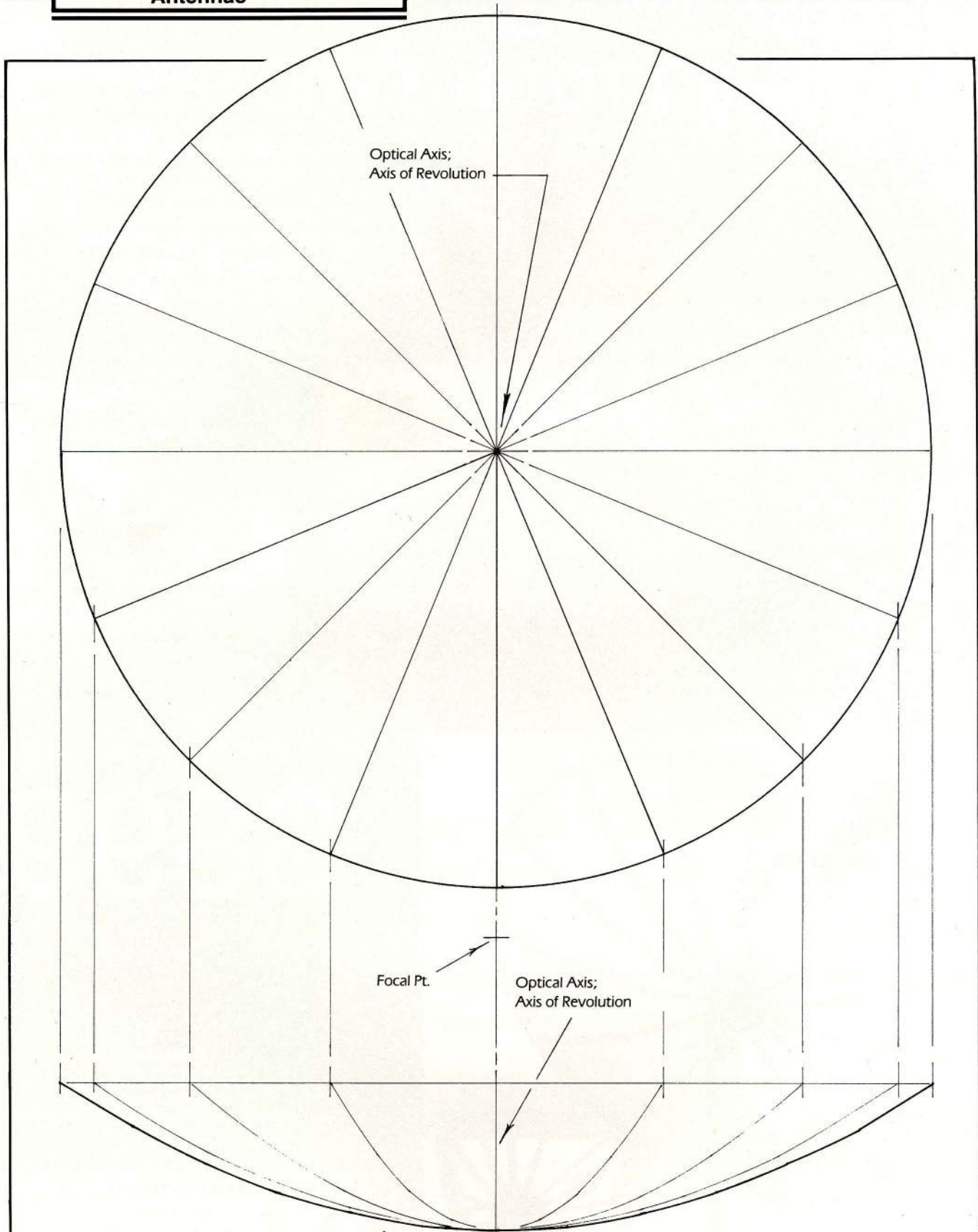


Diagram # 2
Parabola of Revolution: All Parabolic Cross-sections Share a Common "Axis of Revolution."
(Note Perfect "Rim Integrity.")



A severe case of 'rim wow.' This antenna's real world gain can only remotely approach its specified gain level. (Moral? Specs are merely ink on paper.)

One reason for using flat panels is that costly metal forming tooling is not required. In the hands of a competent designer, flat panelled antennas actually outperform their 'compound-curved' cousins because of careful attention to details such as rim integrity (axial integrity), cross-sectional accuracy and rigidity. When the number of flat panels is kept high (20 or more for a 12 foot dish) a certain amount of compounding occurs well out from the optical axis as the panels are firmly secured to the parabolic framework.

In June 1983, one of this writer's semi-flat panelled antennas was given an informal test at 12 GHz. The test (or demonstration) was done with a 12 foot dish with 24 flat panels. The f/D ratio of this dish was .375. Reception of Anik C at the Calgary demonstration site was judged equal to other equal-diameter antennas in the area.

Shortly after the Calgary demonstration a new type of panel was developed by this writer which had 'strain relief' slits on both sides. The slits allowed the panels to conform more closely to a parabola of revolution, a critical detail if a truly superior 12 GHz dish was to be realized. This time a 16 foot dish (also with 24 panels and f/D ratio of .375) was used. The half-power beamwidth (the arc-angle between the -3 dB) was approximately 0.35 degree indicating "diffraction-limited" performance. (Aiming something that directive can be quite a test for even the best 'satellite navigator'.)

Design Approaches To Rim Integrity

It has probably become apparent by now why rim (or axial) integrity is essential for top flight antenna performance. The professional antenna installer is constantly confronted by manufacturers' claims of superior performance. What happens in the real world? How do you make informed decisions?

Once piece fiberglass and spun or hydroformed metal antennas are the only totally idiot-proof types to install. On the down side, the experienced perfectionist installer can do nothing to improve a bad production sample of a one-piece antenna. (Even spun dishes can have 'rim wow'.) All segmented dishes (framework and skin, skin as exoskeleton, or hybrid designs) must be assembled in accordance with the manufacturers' instructions.

Fiberglass Surface Accuracy

There are two approaches to fiberglass antenna manufacturing. First there is the traditional 'hand laid' approach where the glass is allowed to cure on the tool. Then, there is the 'thermo-compression mold' process where one or another composite plastic material is used. It is difficult to exceed the surface accuracy of a one or two piece traditional hand laid fiberglass antenna which has been slow-cured over a precision tool. This in turn has been generated from a precision master mold. Ideally, the reflective surface is a metallic coating such as zinc which has been flame sprayed or otherwise evenly applied to the fiberglass dish surface; not an embedded mesh which may or may not conform faithfully to the phys-



This aggressively advertised and promoted antenna's glaring design deficiency is the absence of an adequate rib backing structure to lock all of the ribs in the same plane (of revolution). Gently nudging a single rib set up a wave action around the entire dish circumference; not good for performance and definitely not good for long term survival in the elements.

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ical surface and which may have tears or gaps.

This is how two traditional fiberglass OEMs (Odom and United Satellite Systems) do it. What these two manufacturers do with fiberglass calls for vastly closer tolerances than boat-builders, for example, are accustomed to doing. Through first hand experience USS's Doug Denhart and Odom's Randall Odom independently arrived at the same conclusion: don't hire ex-fiberglass boat builders (or ex-fiberglass snowmobile body makers). Fiberglass antenna manufacturing technicians must be trained from scratch, according to both Denhart and Odom.

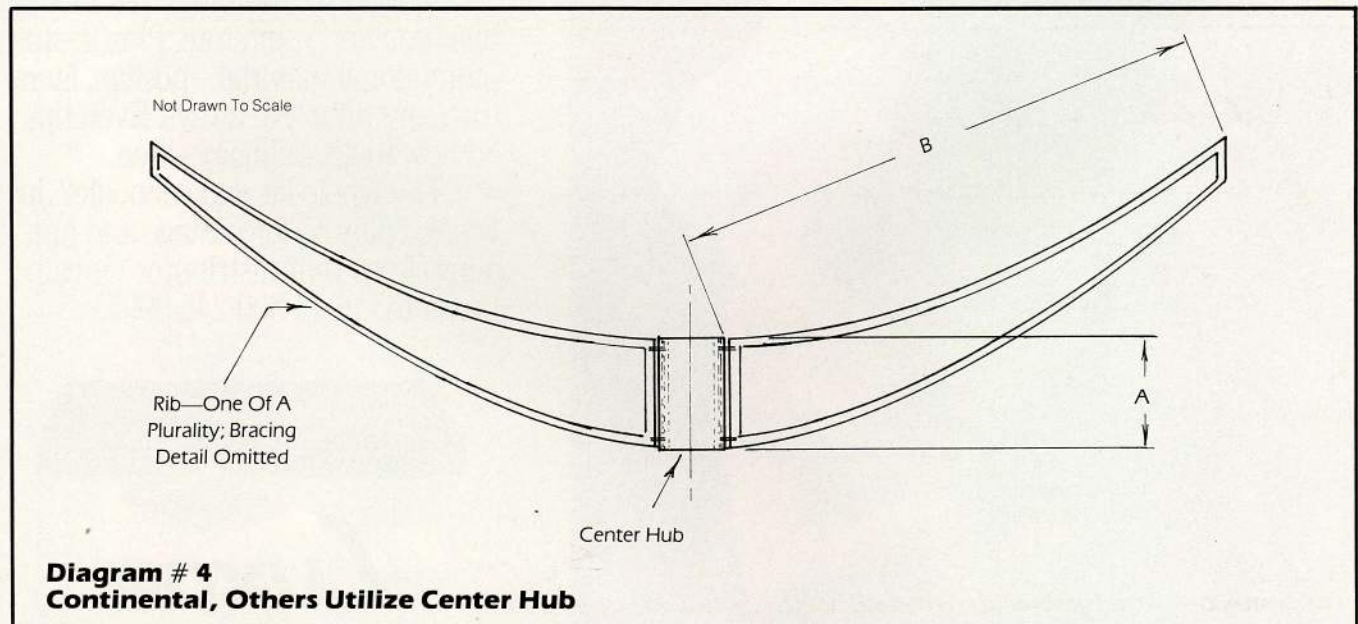
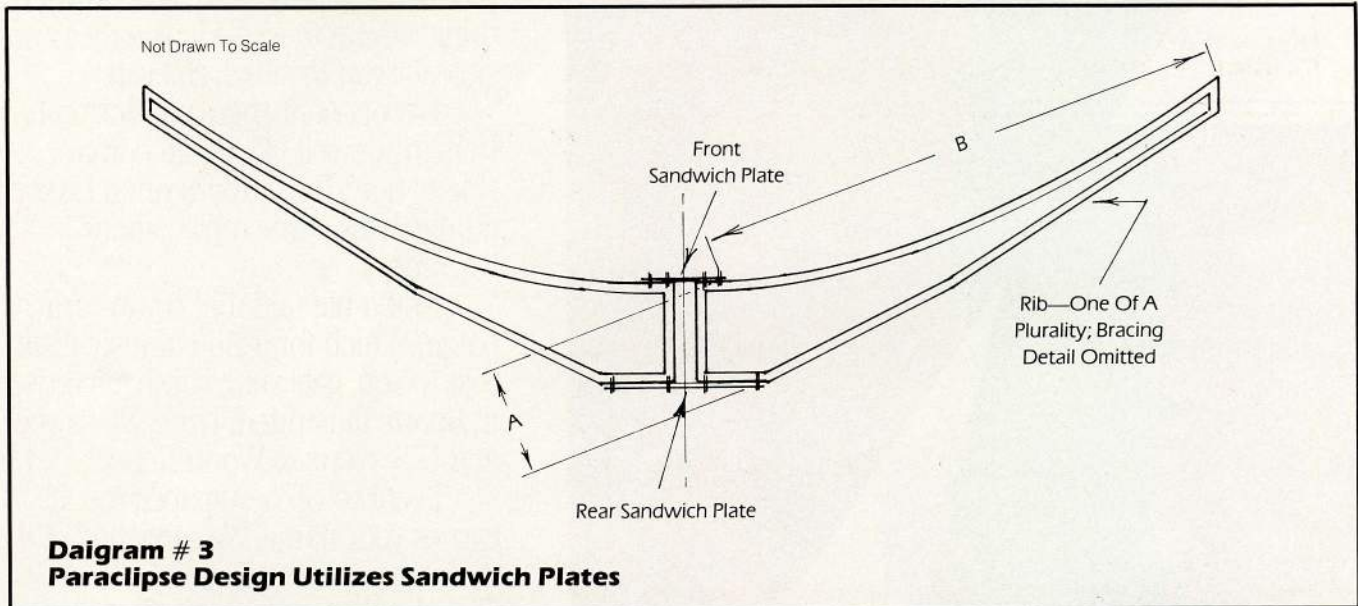
Thermo-compression molded dishes typically have six to eight panels which fit together by means of interlocking tabs. The rear molded ribs and molded-in rim give each panel added rigidity. How well these antennas hold their shape depends on how well the panels interlock. This observer has seen no grossly bad examples of 'rim wow' exhibited by six or

eight section thermo-compression molded antennas.

Leading users of thermo-compression molded technology are Channel Master, M/A-Com, Prodelin, and Pico Products. Thermo-compression molding technology is capable of mass production of antenna panels to very tight tolerances. Long-term shape-holding of these antennas depends not only on panel interlock but also on how well interlocking stresses are spread continuously along the panel to panel interface. Whichever means of manufacturing (traditional or thermo-compression) is employed, the best work is done by antenna manufacturers.

Measuring Accuracy

It is often helpful if not necessary to verify the surface accuracy of the antenna. Techniques for checking rim (axial) integrity are applicable for all designs. One expects to see laser-like edge views when checking CATV-grade dishes, yet good rim



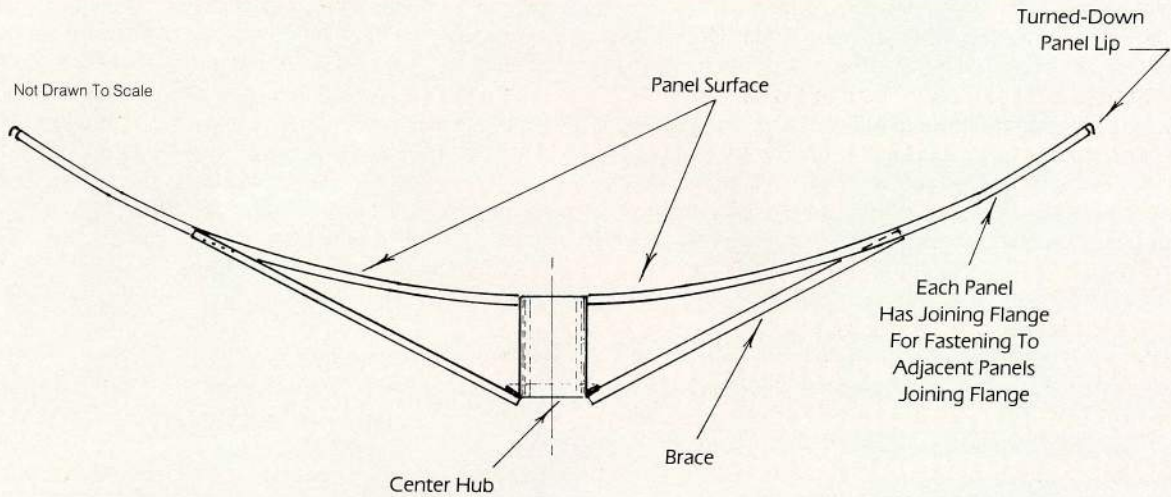


Diagram # 5
Classical ADM Design—Skin Acts as Exoskeleton With Bracing and Center Hub For Stability

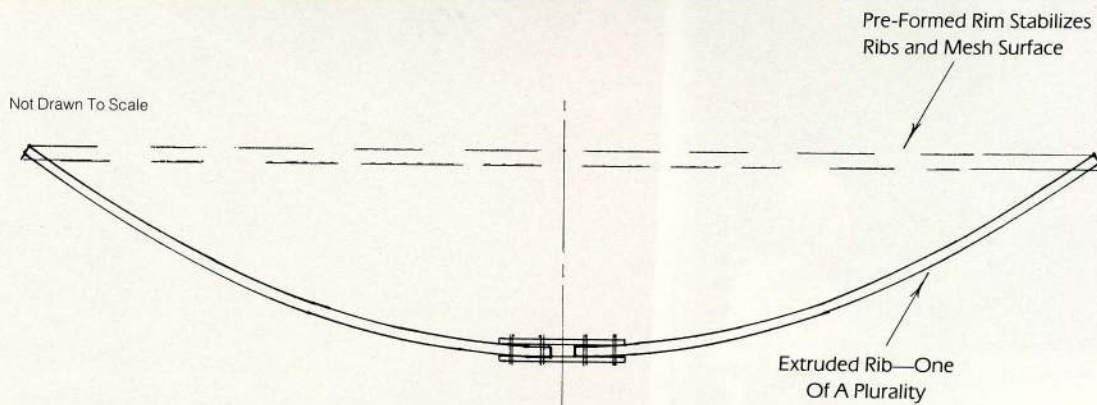


Diagram # 6
Design By Raydx Utilizes Center "Sandwich" and Pre-Formed Rim

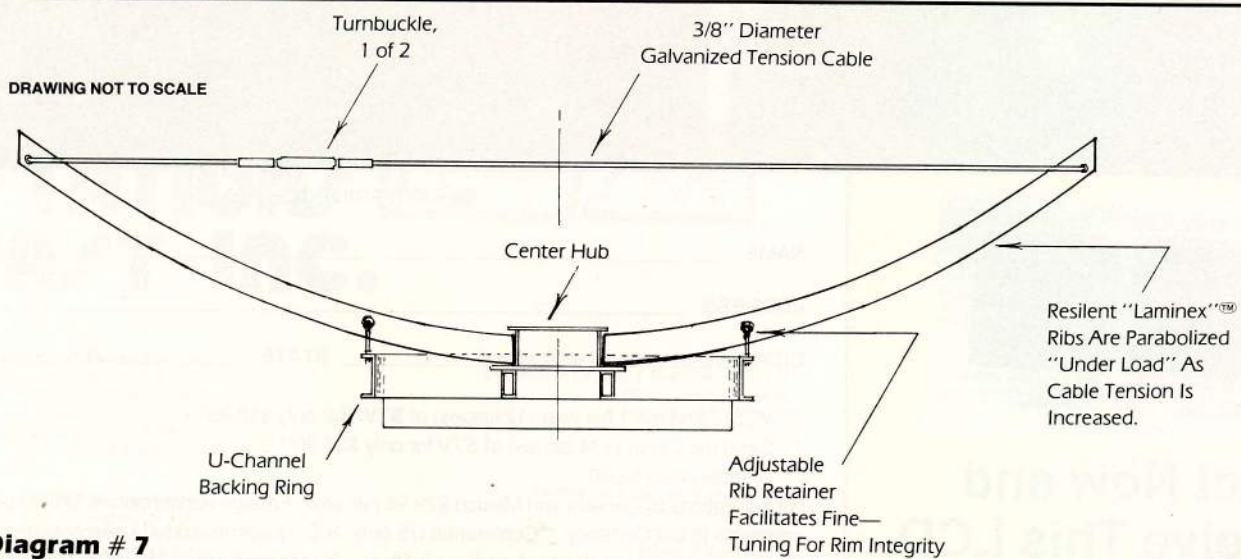
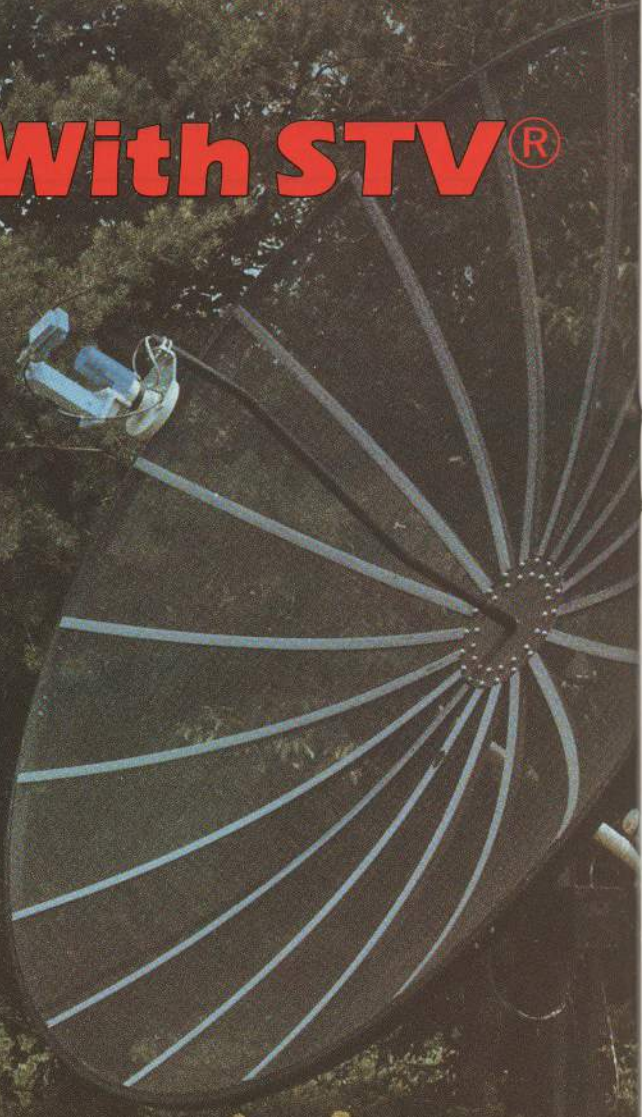
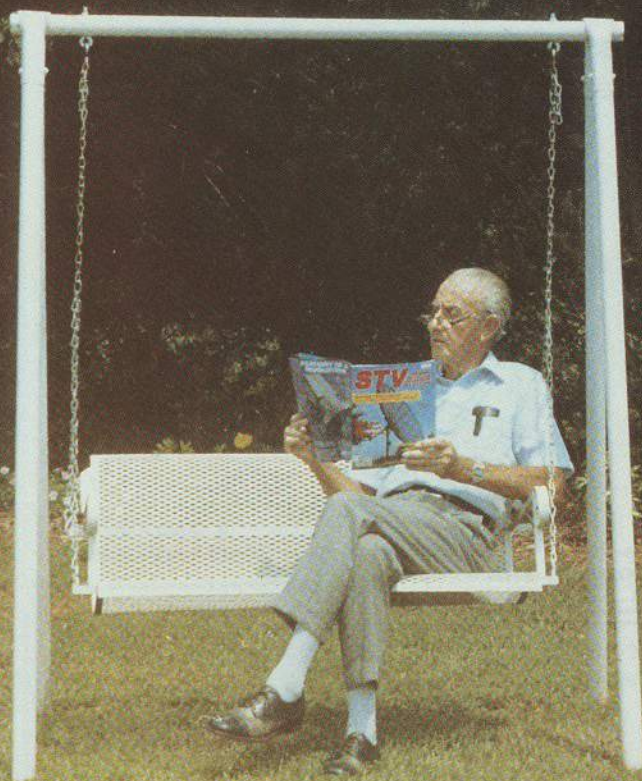


Diagram # 7
Tension-Compression Design of Paraframe Communications

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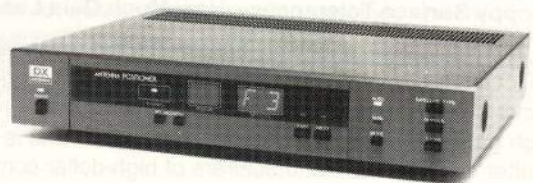
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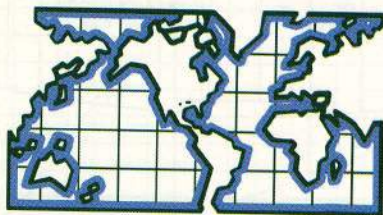


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integrity is not the rule even for high-priced commercial equipment. With stamped petal aluminum dishes, such as Scientific Atlanta supplies in large numbers to the cable industry, careless assembly can be the cause of 'rim wow' or 'petal droop.'

Not so long ago an engineer for Centel Cablevision boasted to this writer about having assembled an SA 5 meter antenna in just five hours almost unassisted. When asked if he had checked for rim integrity during and after assembly, he replied, "Rim What?!"

To measure cross-sectional accuracy, a parabolic template is used ². It is necessary to obtain manufacturer's focal length specification. The focal length number is essential because now there is something that everything else can be plugged into.

Having obtained the 'magic numbers' for a parabolic curve generated from a 54 inch focal length, we are ready to cut a precision template.

Sloppy Surface Tolerances—How Much Gain Lost?

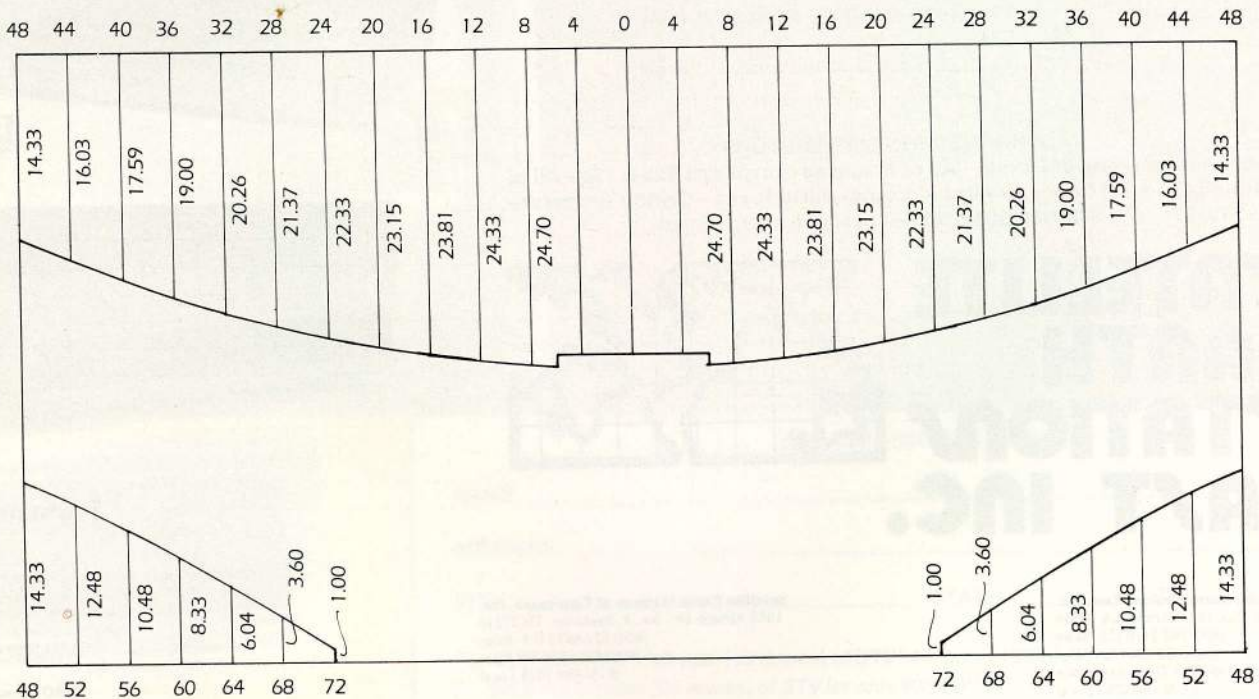
It is fairly easy to lovingly hand-build one antenna of 6, 8, 10, or even 12 foot diameter, then ship it to a test range where factory technicians carefully assemble it so that it registers high gain and low side lobe levels. The real world is another matter as even the manufacturers of high-dollar commercial antennas have discovered.

For convenience our diagram considers only cross-sectional errors. In the field one can estimate the degree or 'rim

Focal Length = 54" Measured Diameter = 144" (R = 72")

| Distance From Axis | Rise In Curvature |
|--------------------|----------------------|
| 0" | 0.00" |
| 4" | 0.07" |
| 8" | 0.30" |
| 12" | 0.67" |
| 16" | 1.19" |
| 20" | 1.85" |
| 24" | 2.67" |
| 28" | 3.63" |
| 32" | 4.74" |
| 36" | 6.00" |
| 40" | 7.41" |
| 44" | 8.97" |
| 48" | 10.67" |
| 52" | 12.52" |
| 54" (= FL) | 13.50" (= 1/4 of FL) |
| 56" | 14.52" |
| 60" | 16.67" |
| 64" | 18.96" |
| 68" | 21.40" |
| 72" | 24.00" |

TABLE 2 — Determining parabolic curve for a template. For a perfect parabola the rise will equal 1/4 the focal length at a distance from the axis that equals the focal length ($Y^2 = 4AX$).

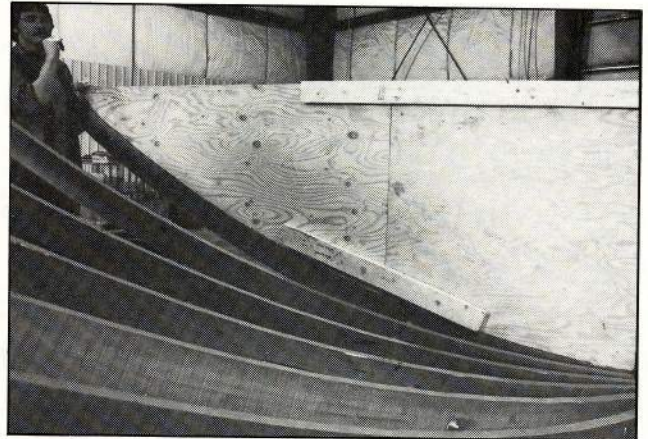


**Diagram # 8
Layout For 12 Foot Template (F/D = .375) Dimensions Given In Inches — Material: One 4' x 8' Sheet of Plywood, 1/2" Thick**

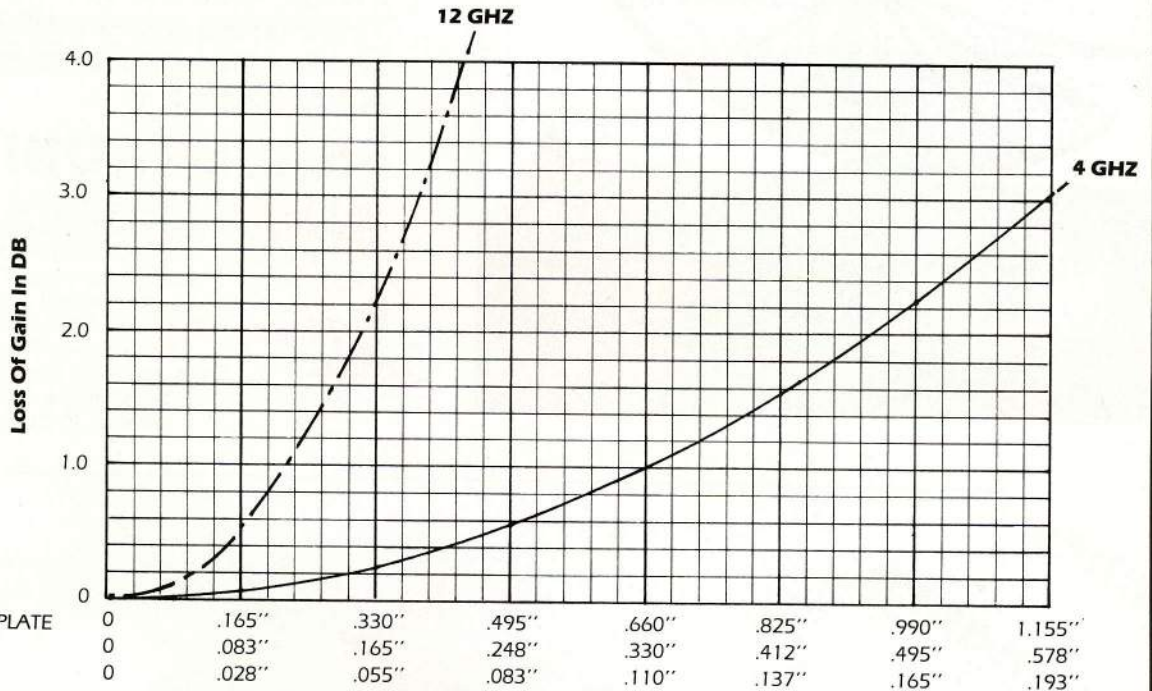
wow' rather accurately. At Resolute Bay the largest cross sectional error as indicated by the template was $\pm 3/32$ inch (based on a $3/16$ inch gap under template) occurring in a very small area (less than one square foot) near the center of the dish. The worst rim error was estimated to be $\pm 1/8$ inch after photographs of the dish with its 3 inch rim were examined. The Root Mean Square (RMS) error is typically one third of the peak-to-peak error measurement. Common sense correctly tells us that small area surface glitches should be thrown out. (Actually, they would be averaged-in.)

RMS is a rather sophisticated statistical averaging technique used to qualify errors in many applications ranging from audio amplifiers to parabolic reflector surfaces. If the largest ($\pm 1/8$ or $.125$ inch) error found in the Resolute Bay dish is weighted, the RMS accuracy is substantially tighter than $\pm .042$ inch. This and several other subsequent samples were in fact tighter than the 12 GHz demonstration units cited earlier.

How much 'rim wow' is permissible? Plus or minus $1/2$ inch is about average for dishes in the 8 foot range. One would expect a gain sacrifice in excess of 2 dB but it is substantially less due to the relatively poor (thank goodness) illumination of the dish's outer regions by the feed. Back in 1980-82, it wasn't unusual to see 12 foot 'no-name' fiberglass and early version



Seating a cross-sectional proofing template, Greg Johnston of Calgary, Alberta, verifies the accuracy of this 6 meter TVRO antenna during assembly at the Gulf Oil/Beaudril Tuktoyaktuk, NWT (Canada) Arctic Base camp facility. Hyper-accuracy is important for both 2 degree satellite spacings and the ultra-low noise amplifiers married to this big dish at exceedingly low look angles where the incoming wave fronts barely skim over the noisy Earth below. Photo courtesy of Paraframe Communications, Inc.



GAP UNDER TEMPLATE
 \pm PK to PK Error
 \pm RMS Error

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Diagram # 9
For Interpreting Gaps Under Proofing Template. Rim Errors Not Considered. Note: Measure Template Gap Perpendicular To Ground, Not To Antenna Surface.

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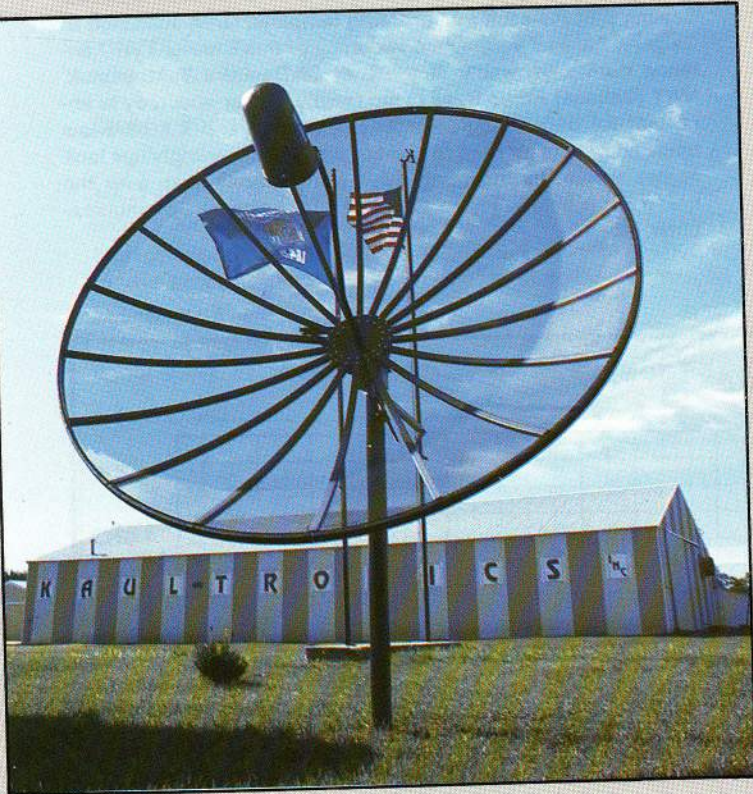
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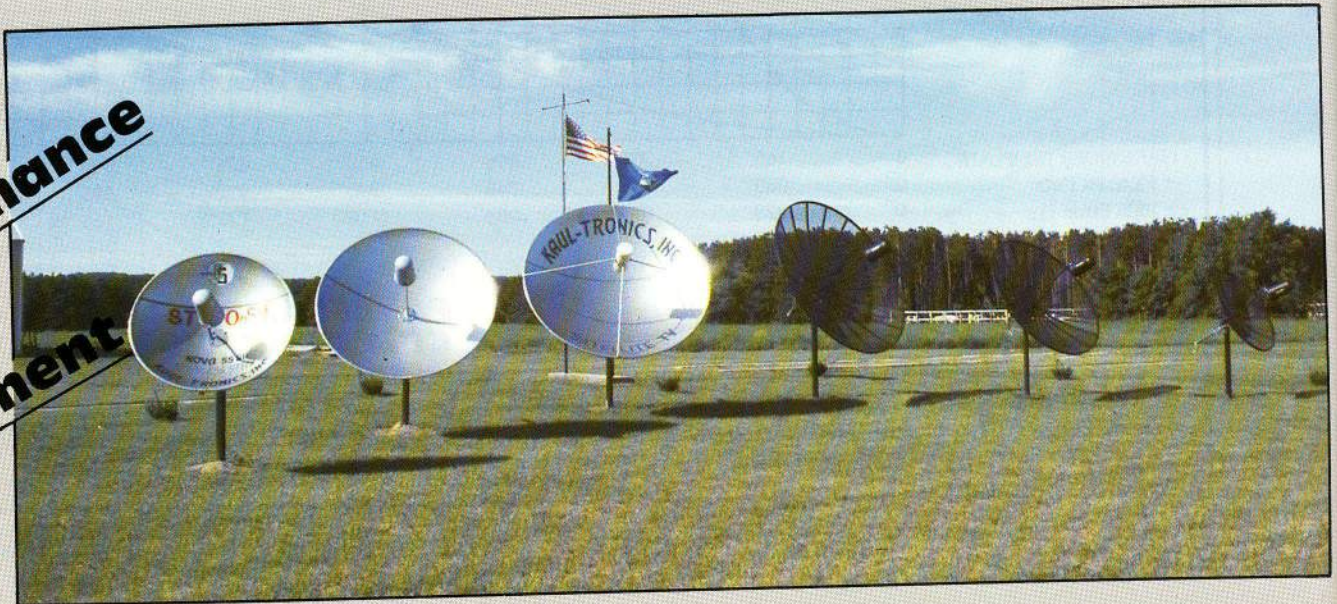
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mesh dishes with 'rim wow' of plus-minus two inches! Errors of that magnitude cannot be confined to the dish edge but will intrude toward the dish center where the feed's 'hot spot' is located.

At an early satellite TVRO trade show (SPTS '79 Oklahoma City), we saw the real world effect of poor rim integrity. A 12 foot antenna on the lot had 'rim wow' that equalled every bit of 2 to 2 1/2 inches. Where an equal-diameter dish with virtually zero 'rim wow' rendered sparkle-free video on Satcom F1R, this unit rendered little more than sync bars. To the practiced eye, it was apparent that at least 6 dB of gain had been squandered. The 'wowed' antenna's effective diameter had been halved to about 6 feet.

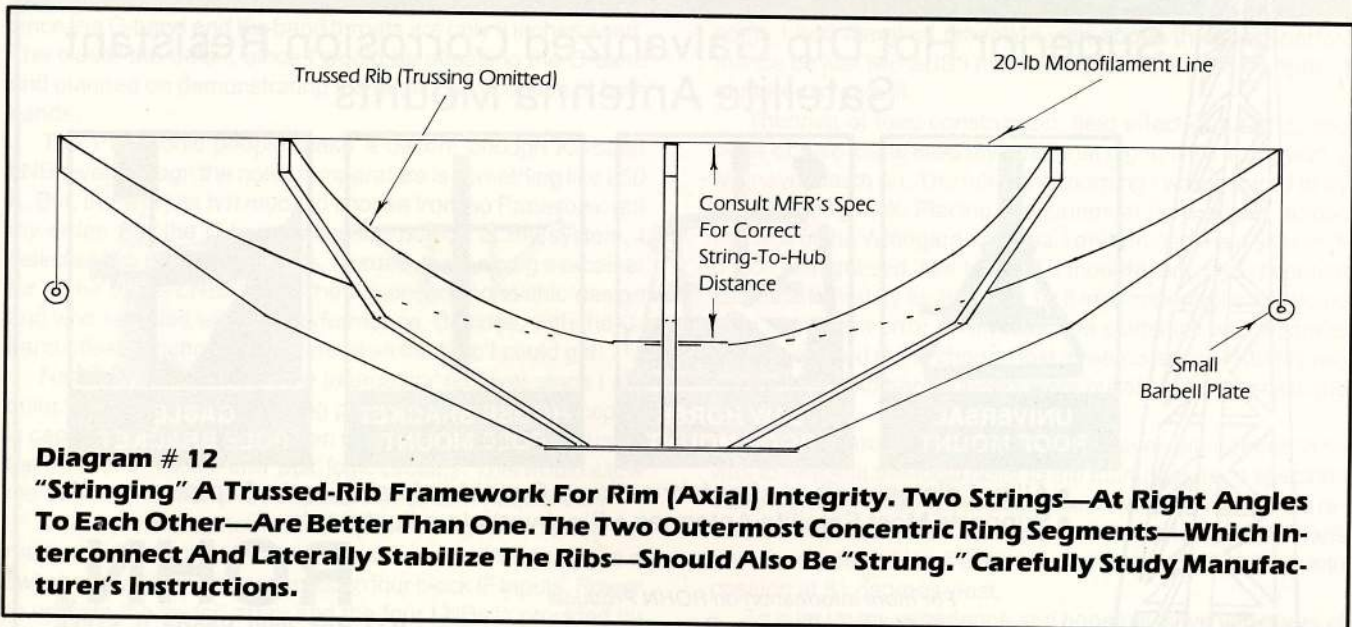
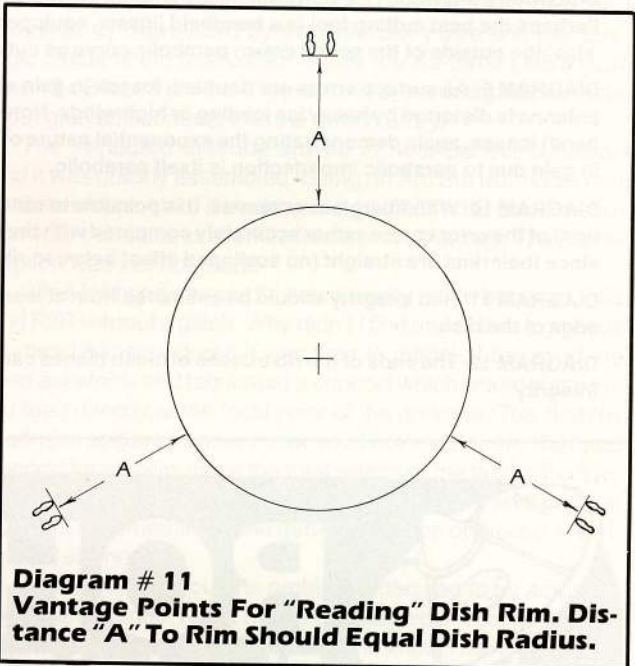
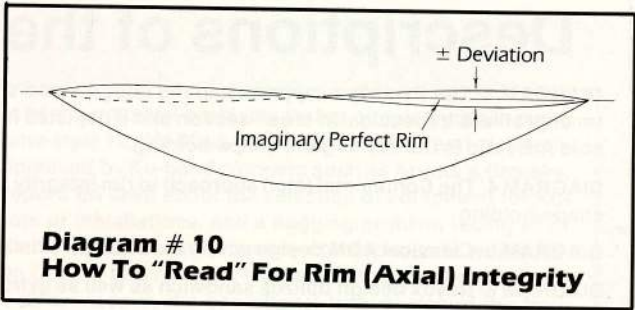
Large 'zonal' errors of high amplitude cause the main lobe of the antenna to break up into two or even three lobes. When aiming the antenna, one seemingly crosses the same satellite more than once. A dish in this condition actually has more than one focal point and more than one optical axis. The RF energy being captured by such a dish is diluted rather than being concentrated at one discrete point.

This series will continue in the May 15th issue of CSD.
(See description of diagrams on page 42.)

FOOTNOTES

1) Patent No. 3,832,717 "Dish Reflector for a High Gain Antenna" application filed by Robert B. Taggart, Jr. on March 3, 1972. Patent granted on August 27, 1974. Briefly, in 1980, Chaparral Communications manufactured 10 and 12 foot TVRO antennas based on the Taggart design. Although it never gained widespread market acceptance in the early TVRO industry, it was an excellent design. Bob Taggart was a founder of Chaparral Communications and remains with Chaparral to this day as president.

2) With large (9 meters and larger) uplink antennas, a theodolite is commonly used to measure surface accuracy.



Descriptions of the preceding diagrams.

DIAGRAM 3/ The Paraclype approach to rim integrity and shape-holding. By using a larger 'sandwich plate' in the rear, the fastener profile is trapezoidal in cross-section and if depicted in three dimensions, would be a 'truncated cone.' Maintaining a favorable A:B ratio is the key to good shape-holding.

DIAGRAM 4/ The Continental (etc.) approach to rim integrity and shape-holding. Adequate center hub length is essential for good shape-holding.

DIAGRAM 5/ Classical ADM design where the antenna skin acts as an exoskeleton.

DIAGRAM 6/ Raydx design utilizes sandwich as well as extruded rim.

DIAGRAM 7/ More cost-effective at sizes larger than 5 meters, the Paraframe Communications design employs laminated, pre-stressed ribs. The ribs are laminated in a non-parabolic curve and are parabolized as cable tension is applied.

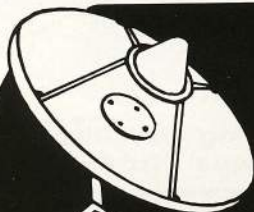
DIAGRAM 8/ Plywood (1/2 inch thickness), smooth on one side, is satisfactory template material. Draft all lines with a sharp pencil. Perhaps the best cutting tool is a handheld jigsaw, equipped with a medium or coarse plywood cutting blade. The blade should 'kiss' the outside of the pencil drawn parabolic curve as cutting progresses.

DIAGRAM 9/ As surface errors are doubled, losses in gain are quadrupled; explaining why losses can mount rapidly if the TVRO antenna is distorted by heavy ice loading or high winds. Note also that 12 GHz (Ku-band) losses are nine times as great as 4 GHz (C-band) losses, again demonstrating the exponential nature of the increased losses. Paradoxically, the curve that describes losses in gain due to parabolic imperfection is itself parabolic.

DIAGRAM 10/ With fiberglass antennas, it is possible to obtain an 'averaged' or plus-minus view of the rim. The amplitude (deviation) of the error can be rather accurately compared with the measured width of the dish rim. Fiberglass antennas are easy to read since their rims are straight (no scalloped effect between ribs as with most mesh antennas).

DIAGRAM 11/ Rim integrity should be estimated from at least three vantage points and all should be at least 10 feet from the near edge of the dish.

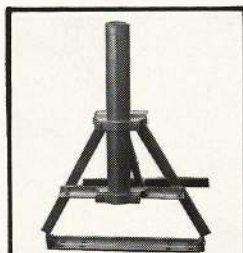
DIAGRAM 12/ The ends of the rib trusses of mesh dishes can be strung so that their frameworks can be adjusted for verifiable rim integrity.



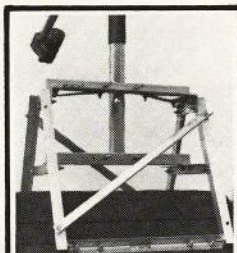
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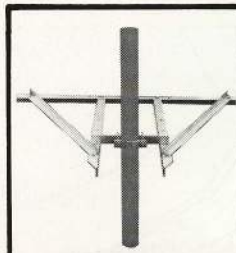
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TOP DISH MOUNT

KAYOU

by Edward Grotzky

Some of the practical problems facing people trying to make early home-style 12 GHz (Ku-band) terminals track and play have been addressed by Ku-band pioneers such as Arunta's Grotzky. In this report, Ed talks about the selection of equipment for Ku-band tests or installations, and a nagging problem facing all of the Ku-band users; which frequency corresponds to which Ku-band. On C-band and between Ku-band satellites, there are significant differences in the operational frequencies of the transponders. Grotzky suggests a solution.

"This 10 foot Winegard antenna will work like a 6 footer at Ku." At last, I heard something which made sense to me. I quickly placed an order for immediate delivery.

Any salesman willing to admit that the Ku reception quality of his C-band antenna might be different deserves to be heard. Besides, the Winegard antenna has an apparent surface accuracy smoother than most other antennas. I knew for my attempt at Ku the Winegard would be a good choice.

My company, Arunta Satellite of Phoenix, Arizona, manufactures very advanced satellite television equipment. It became apparent we needed to experiment with Ku-band reception and design a system which the satellite dealer could use for demonstrations of both C and Ku reception. Since the satellite dealer typically displays several receivers on a single antenna, we chose an orthomode C-band, orthomode Ku-band feed system.

"Place the C-band feed at prime focus and offset the Ku-band," is the advice I received from one industry leader who should know better. I learned in fact, if the Ku-band feed is not precisely at prime focus you may as well give up. This explains why this industry leader's Ku-band feedhorn on the side still hasn't been released.

I ordered a Seavey dual ortho feed since I decided to take the plunge in a big way. The feed cost me over \$500 and I hoped it wouldn't end up in the warehouse closet with all my other mistakes of the past six years. I chose the Seavey feed since the C-band and Ku-band throats are only 3 inches apart. The closer the better, since I would be offsetting the C-band and planned on demonstrating the quality of reception of both bands.

The Panasonic people make a decent enough Ku-band LNB, even though the noise temperature is something like 250 K. But, there is just not much to choose from so Panasonic got my order. For the C-band reception portion of my system, I selected two 60 K Hytek LNBs. I traded Joel Leipzig a receiver for some of his LNBs. I like the advanced monolithic design and was satisfied with the performance. Besides, with the C-band offset 3 inches, I would need all the help I could get!

Naturally, I chose my own Interceptor receiver since I am quite biased by its outstanding performance. The Interceptor is capable of selecting between one of four block inputs using the Polarotor™ pulse and 'aux' logic circuitry. This would allow me armchair control over any satellite at both frequencies.

Only a switching network had to be designed and built for me to enjoy the ultimate satellite experience. We designed a switch array which can accept up to four block IF inputs. Power to operate the switch array and the four LNBs is provided by

the coaxial input from the Interceptor receiver. Control of the switch array is provided by the Polarotor pulse and the 'aux' logic circuit of the Interceptor. Since the Ku-band LNB's gain was 15 dB less than the C-band LNB's, we designed variable input gain adjustments into the switch array.

The Winegard antenna arrived in near perfect condition and it was quickly assembled. Using an Arc Set from Gourmet Entertainment, I had it tracking in no time. The C-band reception was perfect and sparkie free across the belt. The Ku reception was just not there!

What had gone wrong? I could easily move between F1R and F2R without a glitch. Why didn't I find any of those glorious Ku-band transponders? It was time to rethink. I removed the feed assembly and fabricated a support which would place the Ku feed directly at the focal point of the antenna. The Seavey feed also required some minor modifications at the Ku-band support for stability since the total weight of the dual ortho system exceeded 13 pounds! Upon reinstallation, I was greeted by a hint of something in the general location of Westar 4. Better, but still no cigar.

After thinking about the problem, I decided to try adjusting the focal distance. Now I haven't measured a focal point in six years. I believe in dead reckoning and know I have an inch or so to play with. I found the focal point for the Ku transponder to be a full 1 inch past the focal point specified by Winegard for their own antenna. When properly adjusted at this new focal point, I had marginal reception with above threshold performance on just two SBS3 transponders. "This can't be right," I muttered to myself.

Theories of feed construction, field effect of 12 GHz, and other obtuse ideas filled my head that night. If Ku is this bad, it will never catch on. The following morning I was inspired to try the old string trick. Placing two strings at right angles across the face of the Winegard antenna, I determined the dish was 3/8 inch clamshelled. Not too bad, I thought, but if Ku reception can be affected by as little as a 1/16 inch imperfection, it would be a significant error. I corrected the clamshell with washers as spacers and to my chagrin lost all semblance of Ku! My two above threshold transponders were but slight increases in the noise level.

Now I was mad. As it turned out, however, all I needed to do was to readjust the focal point to the manufacturer's specified distance. After making this adjustment two days later, I was rewarded with many fine examples of Ku-band transmissions from four video birds. I even located Satcom K2 drifting into position at 81 degrees west.

To sum up my experience and hopefully save you hours of

frustration, I offer the following advice:

- 1) Select the best antenna you can find for surface accuracy. Antennas with raised ribs and twisted expanded mesh may not perform well at Ku.
- 2) For both C- and Ku-band reception, choose a large antenna since the C-band will be offset and lose gain.
- 3) Assemble your antenna and use the string trick to eliminate any clamshell effect before you look for anything. This will sharpen the focal point.
- 4) Recognize the importance of placing the Ku feed at the prime focus of the antenna. Do not be misled by statements to the contrary. If you are using a dual band feed, select one with the C-band and Ku-band throats as close together as possible. Fabricate a support to hold the Ku throat at the prime focus.
- 5) Measure the focal point and adjust to the antenna manufacturer's specifications.

Tracking of Ku-band satellites is much more difficult than C-band birds. Since the focal point is very sharp, any error in tracking will be much more noticeable. The Interceptor receiver uses a mono-directional approach system to remove the slop from the polar mount. It will always approach the bird from the same direction regardless of the starting point. The Interceptor uses 192 pulses per inch of linear travel with a four digit position display. It will repeatedly find the Ku bird without error. If your system does not have this type of actuator, try approaching the Ku-band satellite from the same direction and if possible, increase the amount of pulses coming from your sensor.

So, Where Is Showtime On G-Star?

Orbit lists transponder 31 for G-Star while Satellite TV Week doesn't list it. Ku World says it's on transponder 16, and Channel Guide says it's on 48. My receiver tunes it in at 24. GTE owns the bird and says in the frequency assignment plan transponder 16 is at 12171 mHz but it is really found at 12186 mHz!

I am used to finding C-band transponders by a channel number which, although it may not match the transponder chyrion (such as 10X), at least is tied to a specific frequency regardless of the satellite.

The problem at G-Star is really quite simple. The satellite has 16 transponders, each 54 mHz wide. With 54 mHz of bandwidth to use, the video could be centered, or sent in the lower, upper, or both halves of the transponder. In fact, the video could be found almost anywhere and unfortunately usually is!

The simplest solution to locating Ku programs is to tune them in by frequency. I prefer this method but the program guides have yet to print a 5 digit frequency for each program.

Chart A illustrates the assigned transponders on G-Star and the actual program locations I found on January 20, 1986.

CHART A

| TR | POL | FROM | CENTER | TO | VIDEO | PGM | VIDEO | PGM |
|----|-----|-------|--------|-------|-------|------------|-------|----------|
| 1 | H | 11702 | 11730 | 11758 | | | | |
| 2 | H | 11763 | 11791 | 11819 | | | | |
| 3 | H | 11824 | 11852 | 11880 | | | | |
| 4 | H | 11885 | 11913 | 11941 | | | | |
| 5 | H | 11946 | 11974 | 12002 | 11962 | Amcee | 11992 | CSN |
| 6 | H | 12007 | 12035 | 12063 | | | | |
| 7 | H | 12068 | 12096 | 12124 | 12094 | Private | | |
| 8 | H | 12129 | 12157 | 12185 | 12160 | Occasional | | |
| 9 | V | 11716 | 11744 | 11772 | | | | |
| 10 | V | 11777 | 11805 | 11833 | 11792 | ESPN | 11822 | CNN |
| 11 | V | 11838 | 11866 | 11894 | 11856 | DATA | 11880 | DATA |
| 12 | V | 11899 | 11927 | 11955 | | | | |
| 13 | V | 11960 | 11988 | 12016 | | | | |
| 14 | V | 12021 | 12049 | 12077 | | | | |
| 15 | V | 12082 | 12110 | 12138 | | | | |
| 16 | V | 12143 | 12171 | 12199 | 12160 | WTBS | 12186 | Showtime |

CHART B

| ANIK CHANNEL FREQUENCY ASSIGNMENTS | | | |
|------------------------------------|--------------|-----------|-------------|
| CHANNEL | POLARIZATION | FREQUENCY | TRANSPONDER |
| 1 | V | 11717 | IV |
| 2 | V | 11743 | IV |
| 3 | V | 11778 | 2V |
| 4 | V | 11804 | 2V |
| 5 | V | 11839 | 3V |
| 6 | V | 11865 | 3V |
| 7 | V | 11900 | 4V |
| 8 | V | 11926 | 4V |
| 9 | V | 11961 | 5V |
| 10 | V | 11987 | 5V |
| 11 | V | 12022 | 6V |
| 12 | V | 12048 | 6V |
| 13 | V | 12083 | 7V |
| 14 | V | 12109 | 7V |
| 15 | V | 12144 | 8V |
| 16 | V | 12170 | 8V |
| 17 | H | 11730 | 1H |
| 18 | H | 11756 | 1H |
| 19 | H | 11791 | 2H |
| 20 | H | 11817 | 2H |
| 21 | H | 11852 | 3H |
| 22 | H | 11878 | 3H |
| 23 | H | 11913 | 4H |
| 24 | H | 11939 | 4H |
| 25 | H | 11974 | 5H |
| 26 | H | 12000 | 5H |
| 27 | H | 12035 | 6H |
| 28 | H | 12061 | 6H |
| 29 | H | 12096 | 7H |
| 30 | H | 12122 | 7H |
| 31 | H | 12157 | 8H |
| 32 | H | 12183 | 8H |

CHART C

| Gstar PGM | POL | FREQUENCY | Anik CHANNEL | Anik FREQUENCY | ERROR |
|-----------|-----|-----------|--------------|----------------|---------|
| ESPN | V | 11792 | 4V | 11804 | -12 MHz |
| CNN | V | 11822 | 5V | 11839 | -17 MHz |
| AMCEE | H | 11962 | 25H | 11974 | -12 MHz |
| CSN | H | 11992 | 26H | 12000 | -8 MHz |
| WTBS | V | 12160 | 16V | 12170 | -10 MHz |
| SHOWTIME | V | 12186 | 16V | 12170 | +16 MHz |

CHART D

| Gstar PGM | POL | FREQUENCY | Anik CHANNEL | Anik FREQUENCY | ERROR |
|-----------|-----|-----------|--------------|----------------|--------|
| ESPN | V | 11792 | 19H | 11791 | +1 MHz |
| CNN | V | 11822 | 20H | 11817 | +5 MHz |
| AMCEE | H | 11962 | 9V | 11961 | +1 MHz |
| CSN | H | 11992 | 10V | 11987 | +5 MHz |
| WTBS | V | 12160 | 31H | 12157 | +3 MHz |
| SHOWTIME | V | 12186 | 32H | 12183 | +3 MHz |

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tem—hundreds of movie listings as well as sports programming, movie reviews, programming highlights, and soap updates. All in easy-to-read formats.

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|--------------------|---------|---------|--------------|---------------|----------------|
| Weekly | ✓ | | ✓ | ✓ | |
| Magazine Size | ✓ | ✓ | | | ✓ |
| Movie Descriptions | 560 | 436 | 270 | 263 | 375 |
| Sports Categories | 26 | 25 | 19 | 7 | 4 |
| Specials | ✓ | ✓ | ✓ | | ✓ |
| Super Cinema | ✓ | | | | |
| Soap Watchers | ✓ | | | | |
| Letters to Editor | ✓ | ✓ | ✓ | | |
| No Distributor Ads | ✓ | | | | |
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Ku-Band

CHART E

| CHANNEL | POLARIZATION | FREQUENCY | TRANSPONDER | CENTER DIVIATION |
|---------|--------------|-----------|-------------|---------------------|
| 1 | H | 11717 | 1H | -13 MHz |
| 2 | H | 11743 | 1H | +13 MHz |
| 3 | H | 11778 | 2H | -13 MHz |
| 4 | H | 11804 | 2H | +13 MHz |
| 5 | H | 11839 | 3H | -13 MHz |
| 6 | H | 11865 | 3H | +13 MHz |
| 7 | H | 11900 | 4H | -13 MHz |
| 8 | H | 11926 | 4H | +13 MHz |
| 9 | H | 11961 | 5H | +13 MHz |
| 10 | H | 11987 | 5H | +13 MHz |
| 11 | H | 12022 | 6H | -13 MHz |
| 12 | H | 12048 | 6H | +13 MHz |
| 13 | H | 12083 | 7H | -13 MHz |
| 14 | H | 12109 | 7H | +13 MHz |
| 15 | H | 12144 | 8H | -13 MHz |
| 16 | H | 12170 | 8H | +13 MHz |
| 17 | V | 11730 | 9V | -14 MHz |
| 18 | V | 11756 | 9V | +12 MHz |
| 19 | V | 11791 | 10V | -14 MHz |
| 20 | V | 11817 | 10V | +12 MHz |
| 21 | V | 11852 | 11V | -14 MHz |
| 22 | V | 11878 | 11V | +12 MHz |
| 23 | V | 11913 | 12V | -14 MHz |
| 24 | V | 11939 | 12V | +12 MHz |
| 25 | V | 11974 | 13V | -14 MHz |
| 26 | V | 12000 | 13V | +12 MHz |
| 27 | V | 12035 | 14V | -14 MHz |
| 28 | V | 12061 | 14V | +12 MHz |
| 29 | V | 12096 | 15V | -14 MHz |
| 30 | V | 12122 | 15V | +12 MHz |
| 31 | V | 12157 | 16V | -14 MHz |
| 32 | V | 12183 | 16V | +12 MHz |

As you can see, several transponders (5H, 10V, 11V, 16V) are transmitting two programs simultaneously in the lower and upper half of the 54 MHz bandwidth. Others (7H, 8H) are transmitting single programs centered in the bandwidth.

Faced with the problem of tuning in 12186 MHz, I chose to design a frequency readout into my Interceptor receiver and made the channel number user selective. Since the Interceptor uses the TV screen for all displays, it was strictly a software change and did not require the addition of digital displays on the faceplate. By the way, if you own an Arunta Interceptor you can easily upgrade your receiver for Ku frequency display and tuning. Only one problem remains to be solved. What number do you assign to what frequency?

Orbit has assigned 32 transponders to the satellite but does not specify the associated frequency in its listings. I called up Jerry Poyser at CommTek and inquired how they chose the numbers. "I'll get back to you," was the answer.

Waiting for Jerry's call, I wondered if two channel numbers should be applied to each transponder. This seemed logical at first, but the channel number should be assigned to a frequency. Since the programs may be transmitted in the lower, middle, or upper half of the transponder, each transponder should have three channel numbers which correspond more closely. Assigning 48 channels to G-Star would only add to the confusion!

Another logical approach is to use the same transponder numbers assigned by GTE to the satellite and designate the program locations with + or - symbols. By this approach,

KAYOU/ continued on page 63

CHART F

ACTIVE Ku TRANSPONDERS AS OF 1/20/86 VISIBLE FROM PHOENIX, AZ

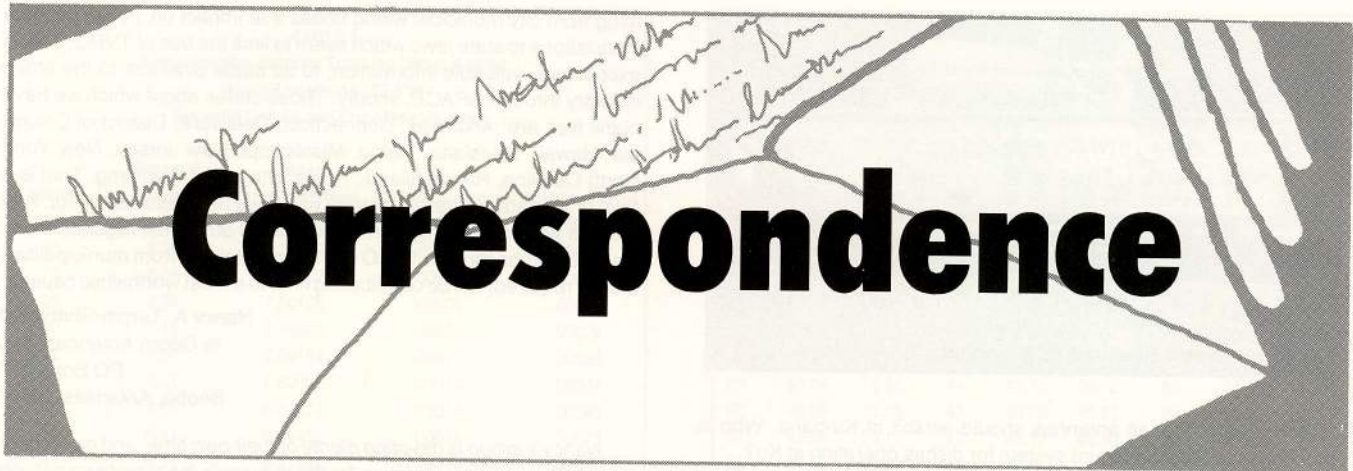
| SAT | NODE | POL | FREQ. | AUDIO | TRANSPONDER | SERVICE |
|-------|------|-----|-------|----------------|-------------|-------------------------|
| S2 | 69W | H | 11880 | Scrambled | 9 | |
| | | H | 11920 | Scrambled | 11 | |
| K2 | 81W | H | 11720 | Test | | |
| | | H | 11960 | Test | | |
| | | V | 12056 | 6.80 | 12 | COLOR BAR |
| | | V | 12110 | 6.80 | | NBC |
| SBS4 | | H | 11740 | Data | | |
| | | H | 12020 | 6.80 | | ATN/CNN |
| SBS3 | | H | 11728 | 6.80 6.20 | 01 | NEWSFEED |
| | | H | 11774 | Data | 02 | |
| | | H | 11823 | 6.80 6.20 | 03 | NBC NETWORK FEED |
| | | H | 11872 | 5.80 | 04 | |
| | | H | 11922 | 6.80 6.209 | 05 | NBC BURBANK |
| | | H | 11972 | 6.80 6.20 | 06 | NBC PRIME MASTER |
| | | H | 12020 | 6.80 5.41 5.74 | 07 | NEWSTAR NETWORK |
| | | H | 12068 | Scrambled | 08 | NBC |
| | | H | 12118 | 6.80 6.20 | 09 | NBC NY |
| | | H | 12166 | 5.41 | 10 | AMERICAN LAW NETWORK |
| Gstar | | H | 11962 | 6.80 6.20 | 09 | AMCEE |
| | | H | 11992 | 6.80 6.20 | 10 | |
| | | H | 12094 | | 13 | PRIVATE |
| | | H | 12160 | 5.50 6.12 | 16 | SPORTS FEED |
| | | V | 11792 | 5.50 6.12 | 19 | ESPN |
| | | V | 11822 | 5.50 6.12 | 20 | CNN |
| | | V | 11856 | | 21 | DATA |
| | | V | 11880 | | 22 | DATA |
| | | V | 12160 | 5.50 6.12 | 31 | WTBS |
| | | V | 12186 | 5.50 6.12 | 32 | SHOWTIME |

CHART G

The Ku-Band Solution

© Copyright 1986 by Edward Grotzky

| CHANNEL | ANIK CHANNEL POLARIZATION | GSTAR CHANNEL FREQUENCY | TRANSPONDER |
|---------|------------------------------|----------------------------|-------------|
| 1 | 1V V | 1H H | 11717 |
| 2 | 1V V | 1H H | 11743 |
| 3 | 2V V | 2H H | 11778 |
| 4 | 2V V | 2H H | 11804 |
| 5 | 3V V | 3H H | 11839 |
| 6 | 3V V | 3H H | 11865 |
| 7 | 4V V | 4H H | 11900 |
| 8 | 4V V | 4H H | 11926 |
| 9 | 5V V | 5H H | 11961 |
| 10 | 5V V | 5H H | 11987 |
| 11 | 6V V | 6H H | 12022 |
| 12 | 6V V | 6H H | 12048 |
| 13 | 7V V | 7H H | 12083 |
| 14 | 7V V | 7H H | 12109 |
| 15 | 8V V | 8H H | 12144 |
| 16 | 8V V | 8H H | 12170 |
| 17 | 1H H | 9V V | 11730 |
| 18 | 1H H | 9V V | 11756 |
| 19 | 2H H | 10V V | 11791 |
| 20 | 2H H | 10V V | 11817 |
| 21 | 3H H | 11V V | 11852 |
| 22 | 3H H | 11V V | 11878 |
| 23 | 4H H | 12V V | 11913 |
| 24 | 4H H | 12V V | 11939 |
| 25 | 5H H | 13V V | 11974 |
| 26 | 5H H | 13V V | 12000 |
| 27 | 6H H | 14V V | 12035 |
| 28 | 6H H | 14V V | 12061 |
| 29 | 7H H | 15V V | 12096 |
| 30 | 7H H | 15V V | 12122 |
| 31 | 8H H | 16V V | 12157 |
| 32 | 8H H | 16V V | 12183 |



Caveat Emptor!

Enclosed is a flier describing an illegal decoder. I called the postal office to try to find out who these people were. I wanted a street address and telephone number. I was told by a postal clerk not to send any money as this company was under investigation. Just a word of caution to all TVRO dealers; Caveat Emptor!

With HBO now scrambling full-time, there will probably be a large number of these no-good firms sending out fliers and advertising illegal products which you will never get because they do not exist. You will simply be throwing good money away. I had no intention of sending money to this firm. When there is no street address or telephone number for a firm, you should be exceptionally careful. I would hope that TVRO dealers realize that these post office box thieves will do or say anything to get your money. Using a post office box outside of the USA is not a guarantee that the seller will be exempt from lawsuits, postal department prosecution, and possibly going to jail.

I am well aware that HBO and M/A-Com prices are inflated at this time. However, I think that TVRO dealers can have a positive effect on lowering these prices by simply not buying their decoders or anyone else's until the prices come down. Once they are stuck with tens-of-thousands of decoders on their warehouse shelves, they will be forced to reconsider their pricing structure. As long as we buy decoders and programming services at the prices they are asking, we will be giving these firms economic bargaining power. Furthermore, purchasing illegal units resolves no real problems. It is apparent they cannot work and ordering them only raises false hopes about the ultimate solution to this complex problem.

Judy Shoqwers
VP, Carlisle Radio & TV Co.
1322 Spring Road
Carlisle, PA 17013

The flier Judy supplied is from a firm in Canada (Sothis Satellite) located (they claim) in St. John, New Brunswick. They headline their flier 'Better Living Through Science.' They claim that 'recently the encoding for the M/A-Com VideoCipher II has been broken which means Walt Disney, HBO, Cinemax, ESPN, Pay-Per-View TV, and much more are all available to you with no monthly bills; ever!'

We discussed the likelihood that such a black box would be developed and made available in our February 15th issue. This one claims that it decodes the video plus audio and they offer it as a kit for \$190 (build it yourself) or wired and tested for \$425. Those are US dollars.

The same firm also offers kits to decode the notorious FUN channel and these are \$75 each. They tell the reader, 'All payments must be in USA funds. We do not accept cheques nor COD orders; we accept (1) Cash, (2) Money Orders, and (3) Certified Bank Cheques.'

They also tell you that all orders will be shipped in 6 to 8 weeks.

Some will, unfortunately, send money. We predict none will receive anything in the mail capable of decoding the video and audio from HBO (et al). Our position is that you will never be able to place an order for a product that does indeed decode the audio and video from HBO (etc.) and receive a product that does this unless that product was manufactured by M/A-Com or by a firm duly authorized by M/A-Com (i.e. licensed). When someone has a 'bootleg black box' which has been submitted to CSD for testing and which does all of the required things, we will be delighted to feature it on the front cover of the very next issue and to write about it extensively. We really doubt we will see that happen.

Not Interested

I am not in favor of this scrambling thing. I am further quite upset by the fact that a person who has bought his own satellite system is then required to spend \$400 to purchase a descrambler unit. If all of the services are going to scramble, and descramblers become mandatory for the full enjoyment of a satellite system, I believe at that time the pricing for descramblers will come down and the descrambling function will simply be built into the TVRO receivers. Along the way, it seems logical to me that the cable companies will not be allowed to control the airwaves to the detriment of those people who live where cable reception services are not available.

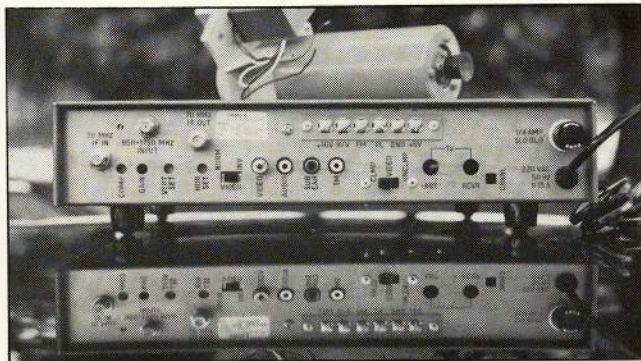
As a consumer who would like to own a dish system, I am simply going to wait to see how it all sorts out. I am very interested in owning a system but not under the present circumstances.

Louis R. Briones
29719 E. Niguel Road
Laguna Niguel, CA 92677

The amount of mail we receive expressing these or very similar sentiments has risen sharply over the past few months; a reflection of the degree of success attained by HBO (et al) in 'educating' the American public that ownership of a TVRO is a dangerous investment. Public opinion, and public attitude, is the challenge facing us all.

Scoop

I recently had the opportunity to take to Europe and test the new RL Drake Company European standards TVRO receiver. The Drake 324E has an 800 mHz wide IF that covers 950 to 1700 mHz, PAL video, operates on 220 VAC (50 Hertz) and uses a made-for-Drake LNB that inputs 10.95 to 11.7 GHz. The unit we tested had an 11 GHz (not 12) PolarotorTM from Chaparral. Together with a 6 foot Stolle 'Junior' antenna we had excellent results. Missing, however, is a mount system capable of accurately holding the Clarke orbit belt at the far nar-



rower beamwidths all antennas should exhibit at Ku-band. Who is working on a suitable mount system for dishes operating at Ku?

Peter Sutro
MPI Satellite, Inc.
PO Box 769
Bernardsville, NJ 07924

Photographic evidence of the existence of the 324E is here. There is a reluctance in Europe to purchase any television equipment which does not have (IR) controls (remote control). The 324E may have a difficult time in the marketplace because it does not include infrared remote.

State Help Needed

There are still a handful of states which are missing in our subcommittee study of state by state regulations pertaining to TVRO. The SPACE Subcommittee on Aggregation and Dissemination of Laws and Regulations in the Earth Station Industry has been able to collect a considerable wealth of valuable data to date representing every-

thing from city municipal wiring codes that impact on TVRO antenna installations to state laws which seem to limit the use of TVRO. This is exceedingly valuable information, to be made available to the entire industry through SPACE, shortly. Those states about which we have blank files are: Arkansas, Connecticut, Delaware, District of Columbia, Hawaii, Louisiana, Maine, Mississippi, New Jersey, New York, North Carolina, Rhode Island, Texas, Utah, and Wyoming. That is a total of 14 states (plus the District) which we need assistance for. Any readers who can help by sending copies of any rules, regulations, or state laws impacting on TVRO (zoning regulations from municipalities are not required) will be contributing time to a most worthwhile cause.

Nancy A. Turpin-Sherwood
% Odom Antennas, Inc.
PO Box 1017
Beebe, Arkansas 72012

Nancy's group is devoting plenty of their own time, and much effort to building a good foundation for the industry's legal problem solving. Those states (plus the District) missing are identified. If you live therein, please contact her directly at (501) 882-6485 or (800) 643-2950.

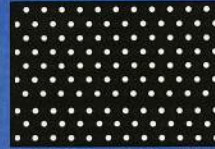
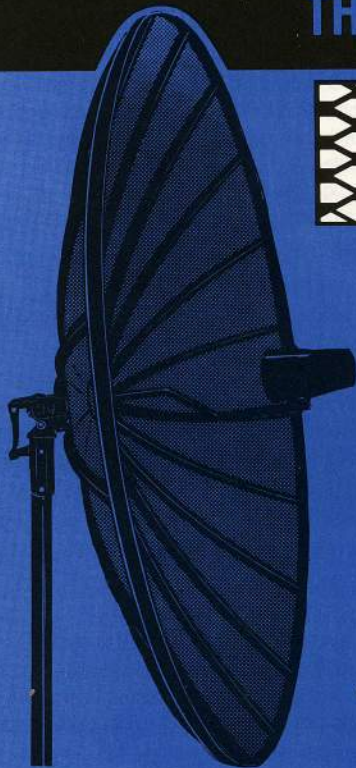
Labor of Love

I have laboriously worked up values of inclinations, pertinent to polar mount alignment, which are significantly different from the values widely reprinted throughout our industry. They are embodied in the enclosed Tables 1 and 2.

I have the suspicion that you were the original source of declination calculations. More important, I strongly suspect that your work was initially only partially understood, and/or misinterpreted, which has led to the widespread printing and reporting of incorrect declination numbers.

Having gone to a prodigious amount of effort to develop the ap-

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TABLE 1
Geostationary Satellite Tracking Offset Angles
Along Longitude 107.5°W
Showing Details and Error Magnitudes

| Latitude | Recom'd | Details | | |
|----------|---------|-----------------|---------------|---------------|
| | Offset | Extended Offset | Average Error | Maximum Error |
| 80° | 8.46° | 8.46446° | .00001° | .00003° |
| 75 | 8.31 | 8.30517 | .00002 | .00007 |
| 70 | 8.08 | 8.08352 | .00004 | .00011 |
| 65 | 7.80 | 7.80106 | .00006 | .00020 |
| 60 | 7.46 | 7.45973 | .00009 | .00026 |
| 55 | 7.06 | 7.06154 | .00011 | .00035 |
| 50 | 6.61 | 6.60936 | .00014 | .00004 |
| 49 | 6.51 | 6.51227 | .00014 | .00044 |
| 48 | 6.41 | 6.41412 | .00015 | .00045 |
| 47 | 6.31 | 6.31344 | .00015 | .00047 |
| 46 | 6.21 | 6.21080 | .00016 | .00050 |
| 45 | 6.11 | 6.10625 | .00016 | .00051 |
| 44 | 6.00 | 5.99987 | .00017 | .00052 |
| 43 | 5.89 | 5.89173 | .00017 | .00051 |
| 42 | 5.78 | 5.78151 | .00017 | .00052 |
| 41 | 5.67 | 5.66969 | .00018 | .00053 |
| 40 | 5.56 | 5.55596 | .00018 | .00053 |
| 39 | 5.44 | 5.44034 | .00018 | .00058 |
| 38 | 5.32 | 5.32327 | .00018 | .00058 |
| 37 | 5.20 | 5.20452 | .00019 | .00058 |
| 36 | 5.08 | 5.08401 | .00019 | .00060 |
| 35 | 4.96 | 4.96207 | .00019 | .00058 |
| 34 | 4.84 | 4.83835 | .00019 | .00061 |
| 33 | 4.71 | 4.71344 | .00019 | .00057 |
| 32 | 4.59 | 4.58675 | .00019 | .00058 |
| 31 | 4.46 | 4.45864 | .00019 | .00059 |
| 30 | 4.32 | 4.32124 | .00019 | .00057 |
| 29 | 4.20 | 4.19816 | .00019 | .00061 |
| 28 | 4.07 | 4.06606 | .00019 | .00059 |
| 27 | 3.93 | 3.93257 | .00019 | .00058 |
| 26 | 3.80 | 3.79780 | .00018 | .00049 |
| 25 | 3.66 | 3.66193 | .00018 | .00049 |
| 20 | 2.97 | 2.96550 | .00016 | .00049 |
| 15 | 2.25 | 2.24524 | .00013 | .00041 |
| 10 | 1.51 | 1.50699 | .00009 | .00027 |
| 5 | 0.76 | .75674 | .00005 | .00009 |

Satellite Orbital Radius: 22,753 nautical miles
Mean Earth Radius: 2,959 statute miles

TABLE 2
Axis and Zenith Inclinations For Americas
(Longitude 110°W ± 55°)

| LAT. | AXIS | ZENITH | LAT. | AXIS | ZENITH | LAT. | AXIS | ZENITH |
|------|--------|--------|------|--------|--------|--------|--------|--------|
| 80° | 80.22° | 88.69° | 52° | 52.68° | 32° | 32.66° | 37.25° | |
| 75 | 75.33 | 83.64 | 51 | 51.69 | 58.39 | 31 | 31.64 | 36.11 |
| 70 | 70.43 | 78.52 | 50 | 50.69 | 57.31 | 30 | 30.63 | 34.96 |
| 69 | 69.45 | 77.48 | 49 | 49.70 | 56.21 | 29 | 29.62 | 33.82 |
| 68 | 68.47 | 76.45 | 48 | 48.70 | 55.12 | 28 | 28.61 | 32.68 |
| 67 | 67.49 | 75.41 | 47 | 47.70 | 54.02 | 27 | 27.59 | 31.53 |
| 66 | 66.50 | 74.37 | 46 | 46.71 | 52.92 | 26 | 26.58 | 30.38 |
| 65 | 65.52 | 73.32 | 45 | 45.71 | 51.82 | 25 | 25.57 | 29.23 |
| 64 | 64.54 | 72.28 | 44 | 44.72 | 50.72 | 24 | 24.56 | 28.08 |
| 63 | 63.55 | 71.23 | 43 | 43.72 | 49.61 | 23 | 23.53 | 26.92 |
| 62 | 62.56 | 70.17 | 42 | 42.72 | 48.50 | 22 | 22.51 | 25.77 |
| 61 | 61.58 | 69.12 | 41 | 41.71 | 47.38 | 21 | 21.49 | 24.61 |
| 60 | 60.59 | 68.06 | 40 | 40.71 | 46.27 | 20 | 20.47 | 23.45 |
| 59 | 59.61 | 66.99 | 39 | 39.70 | 45.15 | 19 | 19.45 | 22.29 |
| 58 | 58.62 | 65.93 | 38 | 38.70 | 44.03 | 18 | 18.44 | 21.12 |
| 57 | 57.64 | 64.86 | 37 | 37.69 | 42.90 | 17 | 17.42 | 19.96 |
| 56 | 56.65 | 63.79 | 36 | 36.69 | 41.78 | 16 | 16.40 | 18.79 |
| 55 | 55.66 | 62.72 | 35 | 35.68 | 40.65 | 15 | 15.37 | 17.62 |
| 54 | 54.67 | 61.64 | 34 | 34.67 | 39.52 | 10 | 10.26 | 11.77 |
| 53 | 53.67 | 60.56 | 33 | 33.67 | 38.38 | 5 | 5.13 | 5.89 |

Satellite Orbital Radius: 22,753 nautical miles
Mean Earth Radius: 2,959 statute miles

Cosines used to precisely calculate the angles between the trial axis and each satellite line. The average, or mean of these angles, and the error of each angle from that mean is measured, noting the maximum error as well as average of the errors.

Then another trial axis is dropped through the same site, and the whole analysis repeated for average and maximum error in look angle to the satellites. A computer running all night, can try a lot of axes and find the best fit for that site and those satellites.

This is what we did, with a floating point Texas Instrument computer, to develop the whole family of "best fit" or least error trial axes for different latitudes and longitudes. We measured the difference in trial axes by their location of intersect in the equatorial plane. Eventually we were moving the intersect by only 0.1 miles to find the best fit. Even smaller increments could have presumably found even smaller errors or better fits, but the error ranges we were reaching looked pretty small and a lot of time and paper was being consumed.

In the process we found some interesting patterns of how the errors contour out for different latitudes and longitudes. It seems to explain how fixed declination mounts can do tolerably well if their axis is pointed a bit east, or west, of south. We also found slight sensitivity by longitude of sites.

All of this I would be delighted to discuss with you, but the most burning question to me is: Can you accept the value of Tables 1 and 2 and help get the word around the industry?

James F. Roberts
Gourmet Entertaining
3915 Carnavon Way
Los Angeles, CA 90027

James has done an excellent job of refining some numbers which have been a part of TVRO for nearly a decade now. The original numbers were computed by several sources, including the legendary Steve Gibson of Hollywood, California who properly deserves credit for bringing the original 'order' to the antenna declination offset confusion. Courtesy of Gourmet Entertaining and James, we now have this matter finally cleaned up!

proach and then the inclination values themselves, I bring them to your attention for review, hopefully your blessing, and your help in accelerating their widespread acceptance throughout the industry. They will save installers a great deal of time and effort in starting closer to the "correct" inclination of alignment, and they will provide the ultimate TVRO users with better reception and enjoyment of their investment by virtue of more systems reaching good alignment before the installer gets tired and stops.

The development of these numbers is simple, which legitimizes them, albeit a laborious process which probably explains why it has not been done previously.

For each site (latitude and longitude on the Earth's surface) and for the geostationary satellites visible from that site, specifically definable distances can be calculated from that site to each satellite. Then a trial axis can be dropped through that site to the equatorial plane and triangles created from the site, to each satellite, along the equatorial plane to the trial axis, and up the trial axis back to the site. The side lengths of these triangles can be accurately calculated and the Law of

ESPN
THE TOTAL
SPORTS NETWORK

THE NOSTALGIA
CHANNEL

PLAYBOY
Channel

THE DISNEY CHA

Transponder Watch

CABLE NETWORK

HER
NET

CNN

M
TV

USA

USA

EUROPEAN racing channel service, for bookmakers, using Intel-sat V spacecraft (Ku channel) scheduled to begin September or October. Service will be scrambled with B-MAC system and potential users number 8,000 betting shops in UK alone.

ARIANESPACE says it could offer three openings for launches of new satellites during mid-1987 and five additional slots during 1988. Ariane is competitor to US Shuttle program and is trying to provide answers to US and other satellite operators set back by Shuttle loss.

FCC says up to 50 cases of interference to uplinkers are reported each three month (quarterly) period. FCC has issued advisory letter to approximately 1,000 licensed uplinkers asking them to be more careful with the operation of uplinks.

ARGUMENTS over reasonable pricing of descramblers may be next major area of regulatory interest. Many feel M/A-Com's \$395 suggested retail pricing for VC 20000 units is greater than reasonable and that M/A-Com, in concert with HBO, has conspired to set pricing artificially high.

NBC, first attempting to get into CNN with Turner, and later deciding to attempt launch of its own news network for cable, has now decided it will pass all of the above. NBC tried to pre-sell cable news concept to major cable system owners and fell short of internal requirement for homes signed up.

JAPAN building extensive network of users for new ocean research satellite scheduled for launch in February of 1987. Thailand, Australia, and Indonesia will also be sharing data from MOS-1 satellite.

AT&T, always preferring to go-it-alone in the past, has signed an agreement with BTI (British Telecom International) and KDD (Japanese telecommunications carrier) which will allow all three firms to work together to build improved international telecommunications network.

SHUTTLE restart could be anyplace from four months to three years with most inside observers predicting at least 9 to 12 months before Shuttle begins flights again. At that point, backlog of unlaunched satellites will be significant setting back several operational programs by as much as two years.

CHINA, meanwhile, apparently had agreed to launch a prototype Swedish satellite as a commercial venture for unheard of (low) price of \$4 million (US). Mailstar Low Earth Orbit satellite will be scheduled on board Chinese Long March 2 launcher which has seen limited use for Chinese domestic satellite launch experiments.

POSSIBLE creation of non-government commercial launch vehicle industry in US is still viable plan many believe and US Department of Transportation is now looking at what special safety standards might be created for such an industry.

LOOK for JC Penney backed shopping mall network to begin operation. Original concept was for shopping mall screens to be fed via satellite links with specialized short video features directing shoppers

into chain and other stores for special promotions, nationwide. Ku-band is most likely place for service.

LAUNCH losses through end of 1986, assuming Shuttle disaster is not corrected before end of year, includes following launches which are now delayed: Palapa B-3, Skynet 4A, Westar 6-S; TDRSS-D; Insat 1-C; G-Star-3, Syncom IV-5. In 1987, no birds of significant interest were scheduled before December ('87) launch of Hughes K-1.

USA NETWORK now feeding Eastern and Central zone feeds on TR21 of G1; Mountain and Pacific zone feeds continue on TR9 of F3R.

US FEDERAL budget cut-backs chopped off the planned Ka-band (20/30 GHz) test satellite system proposed by NASA. Reagan administration cut \$28M (US) from NASA ending proposal for now. RCA would have built satellite for reported \$260M. Also endangered by budget cuts are Landsat program which involves systematic scouting of earth resources.

FORD Aerospace disagrees that there will continue to be a transponder glut and ongoing decreasing pricing for transponders. Firm suggests that the rate of transponder use will continue to grow at annual rate of 11% per year and in particular Ku-band transponder space will actually go up in price over the next few years.

UK MUSIC BOX service attempting to get its programming delivered via satellite into major French markets. French opposition to foreign programming is apparently not as strong for non-news and non-feature programs and Music Box (similar to MTV) service is less controversial to French government officials who must approve plan.

CHINA wants to build \$800M launch facility within Singapore industrial complex in Malaysia. Present pair of Chinese launch facilities are too far to the north for effective polar and equatorial orbit satellites.

CNN-EUROPE got unintended boost in interest during loss of US Space Shuttle. Service had only live coverage of event within Europe and most European broadcasters had to come to Turner's service for video feeds which they could in turn integrate into their own news coverage. Similar live coverage on CNN of departure of President Marcos from Manila brought European broadcasters to Turner where before they had chosen to ignore his presence.

CONCERN after Shuttle loss that nuclear powered satellites, on board a Shuttle that blew up, might create great danger to population below, drawing concern from some US congressmen.

SOLID-STATE power amplifiers on 2 of 16 transponders aboard new private Belgium Ku-band satellite will be part of operational test program. Units will generate approximately 50 watts and be run along with more conventional TWTA amplifiers on same bird. TWTA failures have been major cause of early Ku-band bird failures but solid-state technology is just now coming up to speed at Ku-band in required 50 watt power levels.

SATELLITE Music Network, Galaxy 1 transmitted music services carried by United Video for more than 1,000 Am and FM stations

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THE TVRO HANDBOOK/

Transponder Watch

nationwide, doing so well it is recalling its debt warrants early. Firm has turned profitable, wishes to retire debt before due.

FCC Commissioner Dawson has come down firmly opposed to FCC decision regarding TVRO antenna zoning, on side of TVRO dish users. Dawson feels FCC left gigantic loopholes that will allow cities to still stop use of TVRO antennas legally, feels FCC zoning decision did not say enough or go far enough to guarantee rights of TVRO dish users or installers.

PROJECT Share, delivering medical training to approximately 5000 doctors and medical technicians in most of Latin America, involved in uplink from Miami area hospital via Intelsat bird. Satellite time was donated by Intelsat as goodwill gesture; doctors had two-way audio to ask questions of those conducting program. Additional programs are scheduled.

WANG Labs has elected to use Oak Orion scrambling for 17 nation international video/audio link-up system. Wang will transmit up to four hours per month via satellite to corporate offices worldwide and allow employees attending class at foreign sites to communicate back to Lowell, Massachusetts, via telephone lines. SBS3 and RCA F1R will be involved in North America; Intelsat and Eutelsat for Asia and Europe.

COMPUSERVE is now transmitting wideband data on Aurora 1 satellite between Dublin, Ohio, headquarters and facilities in New York, Los Angeles, and Atlanta. CompuServe has five year contract to use Aurora 1 satellite.

INTELSAT became first satellite owner to sign contract for launch of new satellites with Space Shuttle. Three Intelsat birds scheduled for deployment in 1987 and 1988 are covered by the contract at \$60M (US) per launch.

WESTERN Union Corporation, suffering from financial problems, has sold its most profitable division dealing with government contracts to American Satellite Company for more than \$155M. This division had \$120M in billings to government agencies in the most recent fiscal year.

AT&T plans for use of RCA K-3, Ku-band, satellite coming into focus. Telco will use a pair of 54 mHz wide transponders (14 and 16) effective late in 1987. On an interim basis, AT&T began using twin transponders on K-2 bird April 1st. AT&T is paying \$616K (US) for K-2 transponders per month. AT&T will use transponders to provide one-way video, one-way digital audio and data, and two-way digital data (computer linking). The service will function with customer on-premise receive only or transmit/receive terminals. AT&T owned and operated hub stations will provide interconnection services for the micro stations of customers.

SCIENTIFIC Atlanta earnings most recent quarter again positive; firm had sales up 13% from year prior.

RL DRAKE has instigated \$11M lawsuit against Kansas firm claiming Drake was falsely accused of filing for bankruptcy in newsletter published by Kansas group. Company charged with suit is in business of supplying extended warranty insurance to TVRO consumers through dealers.

INTERNATIONAL Herald Tribune, originated in Paris and published worldwide for English speaking readers, now published in Miami for distribution throughout the Latin America and Caribbean regions. Paris is connected to Miami printing plant via satellite interconnect.

SOVIET Union has filed advance requests for satellite at 26 and 15 west, as well as 64.5 east; all new locations (presently 14 west only). Soviets have not identified when the new satellites will be launched or operational.

SELECTV has announced monthly rate of \$7.95 for 24 hour per day all movie service. Rate is approximately 80 cents more per month than charged to SMATV customers. SelectTV expects to scramble, using M/A-Com VideoCipher system, by end of 1986.

COMPUTERLAND, with more than 650 retail stores nationwide, is

| | | |
|-------|-------|-------|
| 11:00 | 11:30 | 12:00 |
| 10:00 | 10:30 | 11:00 |
| 9:00 | 9:30 | 10:00 |
| 8:00 | 8:30 | 9:00 |

Tender Mercies (PG-83) ★★★
 (Robert O'Neil, Tess Harper)
The Osterman Weekend (R-83)
 ★★ (Rutger Hauer, John Hurt)
Children of the Corn (R-84) ★
 (Peter Horton, Linda Hamilton)
Working It Out (84)
 (Joanna Storm)

Lies My Father Told Me
 (PG-75) ★★★
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The Westplex portable microwave system is a budget priced FM link operating at 10.525 GHz. The system is capable of transmitting NTSC color video, plus an audio channel and an optional duplex phase or dataline. 40 miles are realistic using an optional 2 ft. dish at each unit. Other options include a remote RF head, AC/DC operation, 35 mw or 50 mw output.

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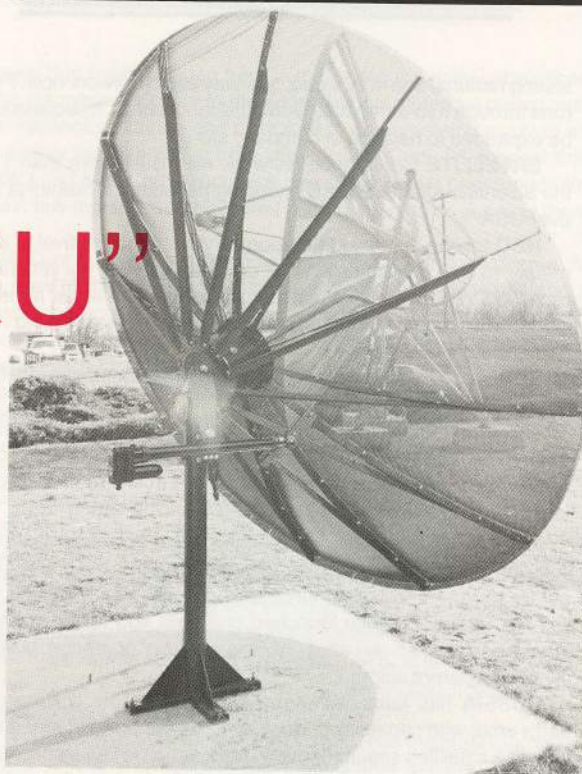
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testing national one-way video, two-way audio network now. Program runs through mid-June at 20 Computerland stores. If successful, it will be expanded to balance of company stores.

SATELLITE Conference Network will install more than 1,000 of the Scientific-Atlanta B-MAC encoding/decoding packages at sites all over USA.

HBO testing third pay television service called Festival at approximately 10 CATV systems in US. Format for service, not yet offered directly to TVRO owners, is similar to Cinemax with softer material designed not to upset those who complain of excessive sex and violence on normal pay TV services.

RCA said to be considering moving K1 (Ku-band) satellite from 85 west position; reason unknown.

COMSAT subsidiary Amplica, in dropping out of TVRO manufacturing business, apparently accepted financial loss in excess of \$20M (US). Comsat also discontinued operations in environmental consulting, computer software, and videoconferencing during 1985.

JAPANESE successfully launched latest broadcast service test satellite, BS-2B, from their own Tanegashima Space Center. Satellite will try to renew testing of three channel 100 watt DBS test service using Ku-band. Satellite launched one year ago failed when two of three transponders quit after only few weeks of operation; power supply was apparent culprit.

RUSSIA has launched massive space station, currently in low earth orbit, with capability to dock up to six separate manned and unmanned satellites simultaneously. MIR, which is Russian for 'peace,' will provide sizeable work station for cosmonauts and possible platform for both scientific and military activities. (Soviets say it is for peaceful purposes only.)

BRIGHTSTAR Communications of America is launching business of sending syndicated programs, commercials, and TV broadcast material internationally. World-type business, in operation within US for five years plus, will now be offered outside of US as well. Company claims to have clients awaiting service in South Africa, Spain, Latin America, Italy, France, and Israel. Firm began transmitting daily 'Agranews' service from Los Angeles to Europe this month as well, using Atlantic Ocean Major Path 1 satellite.

VIA SATELLITE, a new magazine launched initially for the Ku-band activities of new satellite services, has changed hands. Publisher Irl Marshall has negotiated arrangement with newsletter publisher Phillips Publishing to take over publication.

PBS with four transponders leased on Westar 4 is starting to shop for next generation of satellite service. PBS was first major US network to convert to satellite interconnection and network has largest amount of dollars invested in internal satellite networking of networks to date. Westar 4 is expected to serve PBS until 1991.

BRITAIN is trying for third time to get workable DBS program off ground; now says it will allow UK DBS operator to utilize foreign built satellites (read US, by Hughes or RCA) if they wish. Prior constraints

required use of largely UK manufactured satellites.

SPACE TODAY, slick news publication planned by CommTek Publishing and others, may be dead; CommTek has pulled out of deal.

PAY TV service grew less than 4% during all of 1985 according to reports with Playboy and Disney biggest gainers by percentage. (Both are relatively still small, however.) Survey also shows that HBO plus Cinemax had reasonable gains while Showtime/The Movie Channel lost subscribers during year.

RCA had announced they would enter TVRO system marketplace during 1986; now says no-way. Giant firm would have used same Hitachi as supplier as M/A-Com. RCA blames slowdown in market and uncertainty over scrambling as reasons for backing off of TVRO, for now.

ARIANESPACE expects to increase its charge for launching satellites by as much as 30 percent. Firm had originally charged NASA with holding down launch pricing with US Government subsidies.

GOLDSTAR, largest consumer electronics firm in Korea, has backed out of TVRO after making initial showing of equipment at January CES show. Goldstar never actually began delivery mode of TVRO hardware although many smaller Korean suppliers have been in field since 1981.

USSB, would-be 12 GHz DBS supplier, getting plenty of flack from others in requesting that FCC allow early DBS entrants to do things other than DBS. USSB wants to handle message traffic and videoconferencing to help defray start-up costs of DBS. Those already in those business areas naturally oppose the plan.

OAK has shut down stand-alone satellite TV products group and merged it into cable TV products area. Oak is also closing down the manufacture of satellite related products in Illinois in favor of their plant in Taiwan.

M/A-COM and SBS have completed contract where the two will offer small dish Ku-band business system packages and service.

BRIGHTSTAR Communications of America has begun transmitting live horse racing from south Florida to Casinos in Nevada using Westar 4, transponder 6X.

ELECTROHOME has dropped out of TVRO field, selling off TVRO related assets to firm called Finline Communications.

SHUTTLE loss cost launch window for scientific satellites called Ulysses and Galileo designed to explore deep space. Both satellites are now in 'deep storage' since next launch window does not occur until late June of 1987.

GALAXY 2, transponders 9 and 12 now being used by General Motors for major data transfer. The link-up is tied to seven electronic data processing sites nationwide.

RCA SERVICE CO. may be ready to announce motel and hotel SMATV movie and entertainment channel package, via K1 and K2 satellites, shortly. Service would be offered as competitive choice with Holiday Inn's Hi-Net five channel service.



Coop/continued from page 6

I first ran into Richardson on the radio; ham radio to be precise. Then a career pilot for a major US airline, Richardson was already something of a maverick in amateur radio ranks. He always liked to push the rules just a little bit to see if they would bend or break. I always hoped that he didn't fly airplanes with the same zeal.

Richardson's DESUG is a nonprofit, loosely structured collection of physicists, electronic industry corporate presidents, engineers, some technicians, and a host of computer hackers; people who love the challenge of breaking into somebody else's code. The Digital Encryption Standard or DES is of course the near ultimate challenge when it comes to secret codes. That turns many of the participants on.

Richardson should be a superb organizer of talents and goals. He sits in a pivotal position acting as a clearing house for individual efforts, assigning specific tasks to those most talented to deal with a specific problem, soaking up the results of the assignments, and then keeping it all together in a cohesive fashion. Every couple of weeks he sits down at his word processor and cranks out a new 'DESUG Newsletter.' The second newsletter reported on the availability of a VHS videotape which has the digital audio ciphertext recorded on the video channel of the tape. The object here is to allow as many DES members are as capable to analyze the twin paths and twin sets of information. The same newsletter also talked about some Motorola and Intel DES algorithm encoders and decoders.

Because of Richardson's open approach to the project, it will be difficult and perhaps impossible to keep the folks at M/A-Com and HBO from being quite current on the DESUG progress. All they have to do is get their hands on a copy of the DESUG Newsletter to know exactly where the group is pointed and what progress is being made. I expect some criticism from those who would prefer to see no widespread reporting of activities such as DESUG. Let me state my case for free and open reporting on DESUG or any other serious effort such as this.

M/A-Com has nothing to fear from the Keith Lamonica fans who raise their tightly clenched right fists in defiance of the HBO flag. About

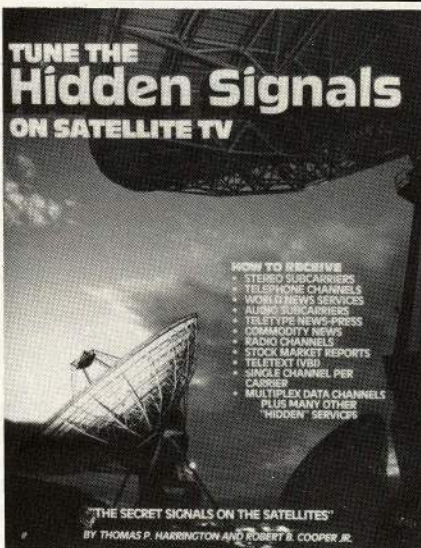
the worst that might happen here is that some mentally unbalanced person, dangerously close to the edge anyhow, could be driven over by the Lamonica diatribe and provoked to do something nasty to an executive or representative from HBO or M/A-Com. I'd suggest that the HBO and M/A-Com executives hire some skilled bodyguards for the next few months just to prevent such a crazy from gunning them down.

M/A-Com does have something to fear from their own people. At some point in the development of the VideoCipher, decisions about the design and coding approach were made which were compromise decisions. If in making those decisions, for cost reasons or other reasons, a M/A-Com designer left a tiny gap in the security of the system, sooner or later somebody will find it. If such a gap is discovered, then the integrity of the entire scrambling program is breached. If I were at HBO, I'd want to know about such a gap now, not three years from now when there might be 500,000 descramblers out there.

DESUG needs to find out if there is a gap in the system. If there is, the gap will have to be closed by M/A-Com. They claim there are no gaps there. Fine, then nothing is lost if DESUG studies the problem and finds no gaps. If in truth there are no gaps, then M/A-Com has been successful in designing and bringing into production the first really tamperproof encoding system in the history of mankind. And they deserve to be rewarded for their expertise. The best reward they could have would be if we are still using, and benefitting from, the VideoCipher system three years from now.

So, I applaud DESUG for the reason that it has the multi-talents required to seriously investigate the VideoCipher system. There are new talents signing on daily and room for additional talents if in fact they can contribute to the team effort. Richardson promises to keep me advised of progress and I in turn will do the same for you. If Richardson sounds like somebody you should know, his address and telephone number are Drawer 1065, Chautaugua, New York 14722 (716/753-2654).

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One of the first things to be cut during a general business slow-down is promotional activities. Many manufacturers routinely budget between 1% and 5% of their gross revenues for promotion, cognizant that this is a competitive environment and advertising and promotional messages are an important part of life. It is very tempting when sales slacken to look for easy things to cut back on. Advertising seems like an attractive target since it mostly happens outside of the office where you don't have to directly face the consequences. It is not like letting a trusted employee go or cutting back on travel expenses of the sales people.

Different firms cut back in different ways. Distributors can simply stop ordering new equipment and allow their warehouses to empty. This has a dramatic impact on the OEMs who build essentially to fill distributor warehouses. When sales slow down, the OEMs are hurt hardest and deepest because their sales may stop totally until business picks up again. The OEMs also have the longest pipelines to deal with since many of the component parts are scheduled up to a year in advance. You don't cut off the flow of .001 disc capacitors as easily as you stop the newspaper when you go on vacation. Not if you ever want to buy .001 discs from that same supplier again in the future.

When the OEMs are located offshore, the problems multiply. The longer the supply lines, the further the parts and finished products have to travel to arrive at the retailer, the more complicated the turn off becomes. To start all of this back is just as complicated. We were not surprised to find very little in the way of new equipment in Las Vegas. Several of the receiver suppliers had planned to show their 1986 models in Vegas. Virtually none did. And for good reason.

Most figured their 1985 model production would carry them until say March or April. They would then begin shipment of their 1986 models. But with sales dropping off, it became clear that the 1985 models were going to last until June or later. There is a rule that you don't show new models too far in front, or you end up hurting the final sale of the last of the prior year models. A mid-February showing for models that might not make it into dealer showrooms until July, August, or even September was simply too dangerous.

So when will the 1986 models be seen? The show most likely to benefit from a significant number of new models is the midyear show in Dallas. That is assuming that retail sales will continue their slow build-up between now and the Dallas show, and that manufacturers can see the light at the end of their warehouses, indicating that the piles are dwindling down. That could be a significant boost for the midyear show; usually a slow show with modest interest and relatively low attendance.

Something that has not slowed down is test equipment. There was a host of new test instruments in Vegas and more are promised from a host of suppliers. I was a little surprised to not see at least one direct copy of this unit, perhaps priced lower because latecomers always try to establish a new pricing point. What I did see were a number of LED and other quite clever visual display units which call themselves spectrum analyzers. Most try to show the installer the signal levels, the frequencies, and provide some sort of system of indicating relative differences in weak and strong signals. Competition in instrumentation is good, but just as we now have a significant number of publications in this field (far too many in all honesty) the test equipment field is beginning to look just a tad overpopulated as well. I'd suggest that those who think they see some sales opportunities in this end of our business take a hard look at all of the products now offered to the installing dealer. Yes, there are some holes remaining but they are getting smaller and smaller all the time.

The real opportunities for new products remain in the Ku-band region as best I can tell. Antenna systems, feeds, and motor drives with the required resolution and precise stopping ability required for Ku would seem to be where the budding engineer needs to be concentrating his efforts. Most of those challenges are suited to small entrepreneurial efforts, assuming the designer has a knack of these shorter wavelength frequencies. Ku equipment is tumbling in price and the

quality is getting better; but it is still not nearly as installer or user friendly as C-band. That's the best new marketing opportunity we have facing us right now.

Press Release

Date Line: Federal District Court, Central District of California, Chaparral Communication Vs. Boman Industries.

For Your Information:

Chaparral sued Boman in November 1983, alleging that Boman's "Polar-Matic" feed horn infringed Chaparral's rights in a utility patent, a design patent, and a "Polarotor" trademark. In early 1985, Boman attacked some of these claims with a motion for summary judgment, and a favorable decision was entered by the Federal District Court in Los Angeles on February 6, 1986.

The court found that:

1. The design patent is unenforceable because Chaparral withheld from the Patent Office examiner information which Chaparral knew or should have known was highly relevant to the allowability of the design application. The court's decision notes that "Chaparral's nondisclosure of the Yang patent and information on function was reckless and constitutes gross negligence under the inequitable conduct test."
2. The trademark claims cannot be asserted by Chaparral under the terms of a release signed by Chaparral in Boman's favor in settlement of earlier litigation between the companies. The court criticized Chaparral's conduct as seeking "to avoid the clear and unambiguous waiver it agreed to after having engaged in arms length negotiations with a competitor."
3. Chaparral is ordered to pay Boman's legal expense incurred in defending an "unwarranted and time-consuming legal action" based on an improperly obtained design patent and on a trademark where "Chaparral acted in bad faith when it settled its first civil action and signed a general release, and then filed another civil action for trademark infringement ..."

The primary remaining claim in the case is one based on Chaparral's utility patent which Chaparral admits does not cover the feed horn sold by Boman from a time only a few months after the case began in 1983.

Boman Industries issued press release that revealed they had won a victory in Federal District Court over Chaparral.

Boman Wins

The light-brown tinted paper had a carefully worded press release on it. Basically, it said that just days prior to the SPACE/STTI show in Las Vegas, a California court had ruled that Chaparral Communications was required to pay all of the legal fees of Boman Industries. The suit was initially festered by Chaparral against Boman. You may recall that Chaparral had charged Boman with pilfering its patent and the use of its trademarked name Polarotor™. Boman, starting to build mechanically rotated probe feeds after Chaparral was already in the marketplace, was essentially charged with design and name thievery. We looked at this topic in some length more than two years ago and came to the conclusion that the case would boil down to the validity of Taylor Howard's patent claims.

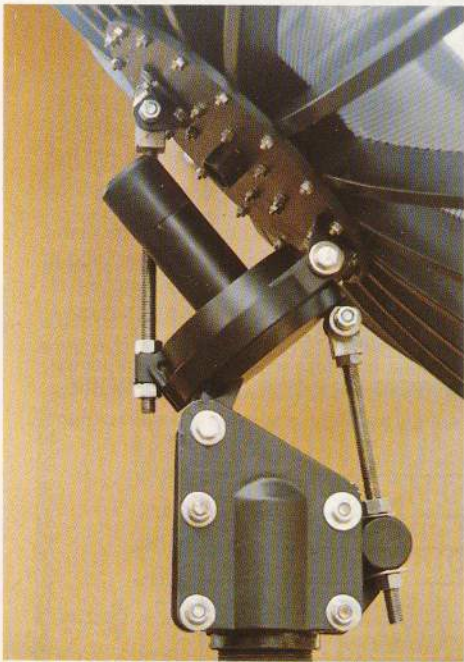
Essentially, the court found that Boman was not guilty of stealing a valid Chaparral patent or of misusing a valid Chaparral trademark. The court also told Chaparral to pay all of the Boman court costs. Boman in this instance receives no rewards or damages for being judged by the court to be the wronged party, but Bob Maniachi told me he intends to ask for significant damages in another pending suit.

It all started in earnest when Taylor Howard was awarded a patent for a section of his Polarotor. As soon as the patent was granted, Chaparral sent formal notices to virtually every distributor in the country advising them of their new patent, and also warning them if they continued to handle other units with similar feed probes, they (the distributor) would be expected to pay a license/royalty fee to Chaparral.

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1000 ft/lbs Torque. Well, that's the design that's got the TVRO Industry so excited. The engineers at Raydx found that existing Geo-stationary satellite tracking systems just couldn't meet the company's exacting standards for superior performance, dependability and consumer appeal. So they suggested that Raydx, the Leader In Dish sales manufacture their own. And that's just what they did.

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Boman received a similar notice. Naturally, out of fear of being embroiled in a series of lawsuits, distributors handling feed products from Boman immediately dropped the feeds. Boman also recalled their feeds with the probe design that Chaparral objected to and redesigned the probe into a new configuration.

Boman admits a small number of feeds were still in the pipeline, using something similar to Taylor Howard's design, when the patent was granted. Boman has offered to pay a reasonable licensing fee on those units, variously described as a "few hundred" to perhaps "a thousand or so." But the court found the Chaparral patent and trademark claims to the term Polarotor invalid.

I talked with a third player in the feed game about this, expecting not much more than venom and hostility from the two firms that were directly involved. You can guess on your own who my interview subject was.

"The Boman sales philosophy has been to squeeze the pricing down so low that the sales of the Chaparral units are slowed or cut off. They routinely sell their units for just over \$20 while Chaparral continues to sell to dealers for closer to \$45. In most situations, Chaparral would have been out of business with feeds long ago because nobody would buy a unit that cost twice as much but which ostensibly did no more. This is not a normal situation.

"Taylor Howard commands a high degree of respect. That respect may be tarnished by the court decision, which essentially said that Taylor's patent was not valid. I won't speculate why that might be so, but basically your patent is declared invalid because it is discovered that somebody else did it first, or because the statements you made in your patent application are found to be incorrect. As chairman of SPACE, a recognized industry leader, Taylor is a very difficult person to say no to. I think distributors and OEMs have been willing to pay a premium for Chaparral because of Taylor; not because the product was actually worth more than twice as much. I understand Boman now offers a five year warranty on their product. I think that is a foolish statement to make. No feed is likely to last five years in most climates. What is Boman trying to do here: signal us that they don't expect to be

around in five years? I would hate to have that liability hanging over me five years from now. Chaparral offers a one year warranty, while Omni offers a two year warranty. The Omni warranty is two years only when the feed is used with a M/A-Com T1 or H1 receiver which has achieved the properly selected polarization.

"The number one problem with feeds is when the motor comes up against the mechanical stop point but the power is still on. The power stays on while the feed is trying to push against a stop and this can cause the feed motor to simply burn out. A five year warranty that does not protect the manufacturer against that sort of misuse is an invitation to disaster.

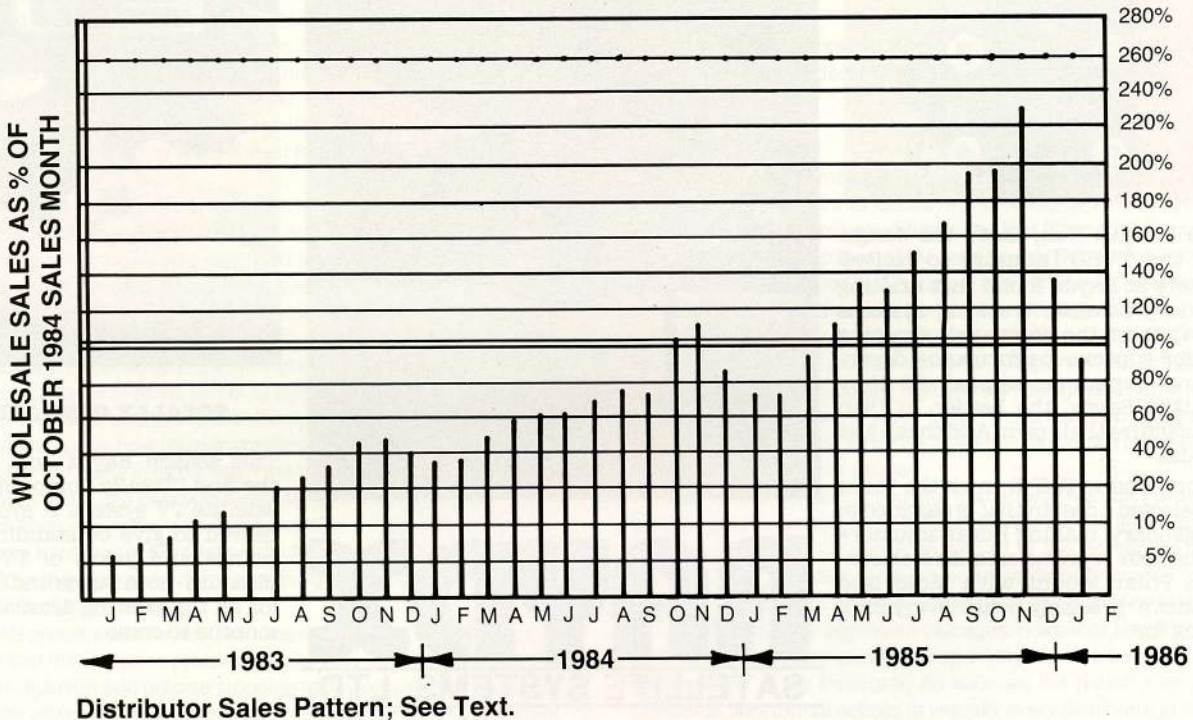
"Chaparral has such a big chunk of the market that they have no incentive to lower the price. If they can retain a 75%-plus share of the market with a \$45 price to distributors, why should they lower the price? Would they get a bigger market share by lowering the price to say the Omni Spectra price near \$35? I don't think their market share increase, by lowering the price \$10, would even come close to offsetting their losses of \$10 or so per unit.

"Unless Maniachi wins big in court in his damages suit, I don't think the results of this suit-win are going to change the way TVRO dealers perceive or buy feeds. Boman may feel better because they won, and Chaparral may feel slightly worse, but the market shares and money will stay about the same as before. If there is going to be a winner in this suit, it may well be the Korean or Taiwanese firms who perhaps now are free to bring in their copies at prices that even Boman may not be able to match."

Numbers

With extended deadlines between the time I prepare these comments and you read my reports, the danger that anything said about the relative strengths or weaknesses of TVRO as a marketplace is great. Still, I am moved to offer some quick observations on business immediately following the Las Vegas SPACE/STTI trade show.

As reported separately here, business was better than most expected. Coming out of Vegas, there was a universal upturn from the flat, way-off days of late January and February, in the last week of Feb-



Major Distributor sales chart from January 1983 through February 1986 reveals industry growth and stagnation periods as a percentage calculated against October 1984 as a median month.

ruary. The worst month of the current decline may well end up being a four week period that straddled two months; from mid-January to mid-February. Distributors universally were selling down to the bare floors and walls during this period, buying only those products which they had run completely out of. Some were under strict instructions from their bankers to not spend any money for anything, others were doing the same thing on their own without being told. Naturally that did not help the OEMs who were finding big holes in their shipping schedules.

Amplica's closing of TVRO operations sent significant ripples through the industry because of the earlier commitment of the firm to TVRO. Curtis Mathes, for example, had chosen Amplica as their supplier. Amplica had, at one time, commissioned Paracclipse to design a customized antenna. (More than 200 were still in stock when Amplica finally closed the doors.) It was apparent that Amplica's decision to close had not been foreseen even six to nine months ago. In their lists of production equipment being sold off were \$40,000 pieces of machinery which had been acquired in mid-1985.

The sales trends for the industry overall will probably never be known accurately but the sales results for a major equipment distributor pretty well sums it up (see chart). No names of course, and the actual numbers are disguised with percentages using October 1984 as a median month. The legendary seasonal nature of TVRO is clearly evident as is the growth of the industry overall from January 1983 through February of 1986. We've printed charts like this previously, but this year it means more because of the uncertainty about the future months. Good luck.

M/A-Com's Bigger Problem

While we may chortle and snicker at the latest reports that VideoCipher pioneer M/A-Com is having its share of problems keeping sales moving on its own TVRO products, and there may be some self-

ish satisfaction gained from knowledge that the VideoCipher system is not turning its originators into corporate giants, the truth of the matter is that M/A-Com's problems with implementing VideoCipher are causing only modest concern for the Burlington, Massachusetts, firm.

When you have thousands of employees and more than 43,000,000 shares of stock out, your corporate concerns are directed at your own survival. A single product such as VideoCipher cannot possibly do so badly with a diversified product base such as one finds at M/A-Com that even its complete failure can spell financial disaster for the firm.

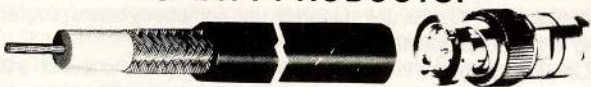
For several months now, M/A-Com has been getting heat not only from the TVRO crowd but from the financial people. The Wall Street Journal did an extensive report on M/A-Com, where they devoted the editorial space on a single page to an analysis of the M/A-Com problems. The headline read, "M/A-Com Could Have Problems Regaining Its Stellar Image With Institutional Investors." The thrust of the report was that the bloom was off the M/A-Com stock rose. The Journal reported:

"Last week M/A-Com stunned many money managers and analysts by announcing a drop in its fourth-quarter earnings. The company said its current quarter wouldn't be great either. M/A-Com fans are used to swallowing small earnings disappointments, but they haven't had a major disappointment for some time. To some investors it seemed as though everything had suddenly fallen apart. 'Is this company ept or inept?' asks Dave Macey of One Federal Asset Company."

Shortly after M/A-Com announced the sad news concerning their earnings drop, their stock fell. It fell 3-1/2 points, losing 22% of its value in a single day.

According to Sandra Roth, senior investment analyst for Union Carbide's pension fund, "I think they've hurt their credibility tremend-

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ously." She says she is inclined to avoid the stock until M/A-Com management "have put their problems behind them and their new markets are materializing in a profitable way."

M/A-Com, when all of this happened, explained away the drop in earnings by saying that their orders had decreased while at the same time their research and development costs had continued for new products. One of those new product lines was (you guessed it) video scramblers and descramblers. One analyst thinks the M/A-Com R and D mentality is akin to exploring space. "They have a culture (in there) that says 'If there is a mountain there, climb it.'" The Wall Street Journal report blames M/A-Com's love affair with scramblers and descramblers for some of their financial problems.

"For years, M/A-Com has pursued the opportunities in scramblers and unscramblers designed for pay television companies. These are its sexiest products and the primary appeal of the stock," suggests the lady spokesperson for the Union Carbide pension fund. The report also notes, "Few people doubt the pay television descramblers, especially the unscramblers, could eventually be very big for M/A-Com. Companies like Home Box Office have ordered tens of thousands of unscramblers (which) they, in turn, hope to sell to their viewers at a steep price...."

It is at least of interest to note that the Wall Street Journal reporter found the \$400 price (quoted in the report) as steep. The strong suggestion is that HBO or whomever may be selling them at \$400 each is contributing handily to the M/A-Com profit structure. Other investor-watchers believe M/A-Com is entitled to or due steep profits from the sale of the VideoCipher units. The article notes, "Some investors believe the operation (building unscramblers) won't be profitable until fiscal 1987. Some analysts worry that congress may delay the use of scramblers because some congressmen are upset about the cost to consumers and about M/A-Com's dominance in the field."

As I noted in the opening, the success or failure of the M/A-Com VideoCipher cannot by itself spell success or death for a firm as large as M/A-Com. They had sales of \$844.1 million for the year ending September 28, 1985. But the problems with scrambling have not been the only downturns of late for the firm. As the Wall Street Journal also noted:

"M/A-Com has other problems. The federal government and its military contractors have delayed buying electronic equipment because of the federal budget considerations. Semiconductor companies have also been buying less from M/A-Com's components operation. And in its data communications division, sales to US telecommunication companies have slowed because of the increasing use of fiberoptics...."

The report goes on but somehow misses that the US cable TV industry peaked out sharply in 1982-1983 and since that time orders for new cable and parts manufactured by various M/A-Com divisions have slowed way down.

In a firm such as M/A-Com, one of the primary reasons a fellow or gal works their buns off to get into the top ranks are stock options and stock bonuses. A man can get very rich, in a hurry, by gaining access to corporate stock at pennies on the dollar. Stock option plans for the highly placed executives gives them that opportunity. In theory, a man can corner batches of stock by helping the company be profitable during his normal course of being employed there. The stock is a carrot and it benefits every other stockholder as well. Remember, there are some 43.5 million shares out there.

In practice, there are many occasions where short-term gains for the sake of creating a good quarterly earnings record are not in the best long-term profit making interests of the firm overall. So there always have been, and always will be some problems with stock and bonus plans that are keyed to short-term performance.

In the real world, many of the decisions we see from M/A-Com which on the surface seem dumb or not defensible may in truth be decisions motivated by some employee thinking primarily of his stock op-

tions. That's a tough situation to correct since personal riches through stock acquisition is the single most motivating factor a firm such as M/A-Com seems to be able to offer to a talented employee.

Losses, or gains for M/A-Com over the next few years, resulting from the VideoCipher program will effect us all; but none, perhaps, more closely than those who work for M/A-Com and who have their own futures tied to the stock options they hope to see mature as a result of the success of the VideoCipher program.

Programming Plans

Last August a small group of four people from the satellite industry began to look hard at the programming possibilities for direct-to-TVRO service(s). I was one of those people and a report is perhaps overdue.

With a total universe of over 1.5 million homes, logic says that there should be an adequate audience now to attract a full-time, dedicated programming service for TVRO/dish owners. The 1.5 million potential homes places the market size someplace in the vicinity of the St. Louis, Missouri, market. In other words, there are about as many homes now with TVRO, continent-wide, as there are homes in the official St. Louis marketplace. Television stations in St. Louis do quite well (thank you), making plenty of money and serving their public with programming. One approach to the dish marketplace is to simply get a transponder and pretend you are an independent television station serving a national market the size of St. Louis.

Unfortunately, such an approach would require advertising support. Because of the national reach of satellite, the advertisers would have to be national in scope as well. The degree of sophistication attached to buying or selling national advertising time is quite complicated. We, as a quartet studying this opportunity, quickly realized that we might spend several years educating the would-be national advertisers about our marketplace before we sold the first advertisement. Pioneers in any area of business have to suffer the indignities of educating clients about the worth of a service or product. Could we sustain a service on satellite with virtually no income for two years before we started selling advertising? Not likely.

While in Las Vegas, numerous people talked with me about the concept of programming for dish owners. There were some novel and perhaps workable ideas and some neither novel nor workable. But, each idea had merit because people were thinking about the inherent problems of TVRO. We, unfortunately, use somebody else's programming to sell our product(s).

One fellow whom I interviewed for Boresight plans to launch a 24-hour per day independent, 'fourth network' on July 4th. He calls it "America's Network" and Turner will probably object to that. The home base for this new service is San Diego. He plans to include a wide range of entertainment, educational, and public affairs programming. I asked him how long the project could sustain if there was no revenue (a distinct possibility, I believe) and he replied, "At least a year...." He has some venture capital behind him, will use Spacenet 1 for service, and some unusual if not proven concepts about programming. I, of course, wish him well.

Several groups are out there asking for donations (\$10, \$20, \$50) to fund new dish service networks. Most of the literature I have seen promises programming (often on Spacenet; the best bargains may well be on Spacenet right now) sometime over the next 90 days. The actual programming promised seems very vague.

When we did our homework, we found that it would take 50,000 US homes paying \$180 per year to sustain a multiple channel service with zero programming costs. That's \$15 a month. We had in mind offering perhaps six channels of service. If you assume you will have programming costs, then your budget escalates rapidly. One channel, programmed with even old films and low cost programming, on a 24-hour per day basis comes to more than \$250,000 per month if you really scrape by with reduced overhead. With 50,000 people paying the costs, that works to a net \$5 per home per month.

Many people believe that \$5 per home per month is a threshold point. Anything more than that, for any single service, will be heavily resisted by the consumer. To collect the \$5 per home per month, you need to offer programming in the first run category of HBO and Showtime. That's a tough nut to crack since that type of programming costs an arm and a leg to create, produce or acquire. This is no game for the faint of heart or thin of pocketbook.

A new service, no matter how good it might be, would do very well to reach 50,000 regularly paying homes by the end of its first year. That assumes the service is scrambled, since it is unlikely that even that many would pay if the service was on an honor system. There are simply too many other, unscrambled or free, services up there to expect people to willingly pay for something that was there for the viewing. So, if \$5 is a threshold of resistance point, and 50,000 homes is a realistic point of growth for 12 months, we have a maximum available budget of \$250,000. That's not much to keep a transponder hot and entertaining 24-hours per day, all month long.

In our March 15th issue of CSD, I wrote about the concept of providing, as an industry effort, the three major US network signals. We studied the possibility of uplinking the New York City owned and operated stations of ABC, CBS, and NBC and came to the reasoned conclusion that as an industry we could afford to do this. Indeed, we probably could not afford not to do something like this. Soon.

While in Las Vegas, I was delighted to hear others with the same concept. In particular, Winegard Antenna President Randy Winegard came on camera with me to discuss his feelings about programming. Off camera, we talked about his proposal which is almost identical to mine. Randy feels that the TVRO industry must take positive steps to show that we have a concern about the diminishing of program availability. He suggests that with CBS hell-bent on scrambling its domestic network feeds, that we begin by selecting a CBS affiliate and placing its signal on satellite. Other network signals would follow as demanded.

Several people suggested that we would be making a mistake if we elected to place WCBS, the New York flagship station, on satellite. "Would it not be better to find a small-time CBS affiliate in a tiny market to work with?" was the suggestion. "A CBS affiliate in a market with 200,000 homes could suddenly become a CBS affiliate for 200,000 plus 1.5 million homes. They could promote themselves as 'The Nation's CBS Service,' the only one available via satellite. They would suddenly become a significant station for national advertising buys."

I like that concept because perhaps someplace out there we have a CBS affiliate-owner who would be willing to not only work with us, but perhaps somehow help fund getting himself onto satellite. Since a station lives and dies by its advertising revenues, being able to sell an audience of 1.7 million versus 200,000 has to help the station's revenue stream. It is like jumping from Pensacola, Florida, to St. Louis in market size.

The down side of that approach is that the evening news from Pensacola just does not carry the same weight or depth as the evening news from New York City. Programming options, at least for the first year or so, are going to be less desirable. But, perhaps for the long haul, a CBS affiliate who is beholden to the TVRO industry makes far more sense than a CBS affiliate in New York City who couldn't care less if he is sent nationwide or not. Good food for additional thought. I am tempted to hit the road to start calling on smaller market CBS affiliates. With spring weather finally here and our Corvettes raring to hit the road again, perhaps Patti and I will be doing just that as you read this.

I think I can see a natural evolutionary result to all of this. Broadcasters are just as greedy as cable people. There is a market-hole here for CBS, ABC, NBC, and even PBS to be available full-time on satellite. One of each of these could, in fact, make more money by being on satellite. Perhaps, two of each of these (one east coast, one west coast) would and should be available. Our problem (a lack of network programming) is solved whether we as an industry pay for this

happening, or an aggressive station does it. If we have to pay for it, we have to figure out where the money will come from. If we scramble the extra network service, there is that built-in bias against scrambling, the requirement that everyone using the service buy a descrambler, and those nasty monthly charges. On the other hand, if a TV station owner likes being able to jump ahead by 1.5 million (plus) potential homes, in a marketplace that could go up 30% or more this year, he will be quite willing to somehow fund such an uplink and then begin to profit by his larger audience. The television station can do it least expensively because all they need is an uplink transmitter and a new equipment rack to hold the equipment. They already have the land, the CBS signal, and the personnel who sit there watching meters move.

I think we'll see this happen, even if there are some very minor legal problems involved in pulling it off. As always, I'd like to hear your thoughts and if you have a friendly CBS affiliate station owner nearby, give me or Randy Winegard a call with his name.

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HBO Pricing

Perhaps the most heartening news I heard while in Las Vegas was that at least a few small cable TV systems were offering home TVRO owners discounted rates on HBO and Cinemax services. We first wrote about that in our February 15th issue (page 8) noting that a South Carolina distributor was offering HBO for \$12.95 per month in a package that included Cinemax with a \$2 entry fee.

Lower numbers began to surface in Vegas. The one that caught my attention was from Mountain Pine Cablevision in Mountain Pine, Arkansas (501/767-3329). They had a two-sided sheet offering to sell TVRO customers HBO for \$20.25 for three months (\$6.75 per month equivalent) or HBO plus Cinemax for \$35.25 (\$11.75 per month equivalent). Now, that was a little more like it!

I found out that this cable operator is active in our industry as well; Haden McCullough of McCullough Communications. Haden told me his little Mountain Pine system has around 450 regular subscribers. I brought these facts on the air in my Vegas TV coverage February 19th and mentioned the Mountain Pine Cablevision telephone number only

one time. That tied up their lines for hours. One of the calls came from their friendly HBO rep. "We cannot allow you to sell HBO service in this manner," said the HBO person to Haden's son. "You are authorized to sell HBO to private dish owners only in your own county, where you have a franchise."

Now, it happens that Haden had telephoned HBO not once, but twice some weeks prior to announcing his program. He pretended he was a TVRO dish owner and the conversation, which Haden taped (yes, that is nasty) went something like this:

"I want to subscribe to HBO but my local cable company does not carry HBO; they carry Showtime."

'Well, you can order it direct from us at \$12.95 for HBO and \$19.95 for both services.'

"Yes, but some of the cable companies are offering it for less. There's a cable company down the road a piece that will sell it to me for less money. Can I order it from them?"

'Yes, you can order it from any cable company that is an HBO affiliate.'

"Even if the cable company is out of my county, or state?"

'It doesn't make any difference where the cable company is located. If they are authorized to sell HBO, you can buy from them.'

Remember, this was Haden calling HBO and pretending to be a TVRO dish owner. Actually, he owns several so he wasn't pretending anything!

The next telephone conversation between Haden and HBO was with HBO VP Bob Caird. Haden wanted to know why he had been told one day he could resell HBO and then a week later he could not. Caird was frank with him and said, "We want to make money at this. If we let you sell at a lower price than we sell at, we won't sell any direct. We like that \$12.95 charge because it makes us money. So we can't let you sell cheaper than us, nationally. What you can do is offer it for anything you want to offer it for, within your own county."

After Haden hung up, he drafted a letter which he has been mailing in hundreds to every county in the United States. That letter asks the county commissioners for a 20 year, nonexclusive cable television franchise, for their county. Haden is offering to pay the counties 2% of his gross revenues from dish owners who take his premium service, just like the cable firms now pay a franchise fee from their gross revenues. Haden may be the first guy in history to have a nationwide franchise for cable TV when he gets all done! I'd like to be a bird in Caird's office when he reads what Haden is up to. By the way, Haden turned the taped telephone conversations over to SPACE.

Another bit of unpleasantness relative to HBO also surfaced in Vegas. Those people who signed up in mid-January for descrambled home service were getting their first invoices just as they went to Vegas. On the back of the invoice there was some strange language. In effect, it said that if you paid the bill, you were 'swearing' or 'attesting' that (1) your service was in a private home, (2) it was for your private, noncommercial use, and the zinger, (3) HBO reserved the right to "inspect the premises" where the descrambler was located as they wished. In effect, by paying the bill you were giving HBO the legal right to enter your home and snoop around whenever they wished.

Constitutional guarantees protecting citizens against unreasonable search and seizure aside, the unmitigated gall of HBO surprised many. Nobody could recall any cable contracts which contained similar language. To many, it was simply another example of Time, Inc. really believing they are in the driver's seat on this one. They believe that they can demand virtually anything they wish because people are so crazy about receiving their programming.

Through all of these contacts, formal and informal, it is clear to me that HBO still believes its proper role in all of this is 'adversarial.' It must not only protect itself but its cable affiliates from one another. HBO had been invited to appear on a panel during the Las Vegas show. They accepted and then cancelled after the program had been printed. A day later HBO's Caird was roaming the floor of the conven-

tion talking privately with people he needed to see. They continue to play the game close to their vest; anxious not to say or to do anything which might be taken as a sign of friendliness towards home dish owners or our industry.

TCI's John Sie, meanwhile, seemed to be having fewer problems with us as an industry. Sie appeared to tell us about the TCI plan (see CSD for March 15). More important than the details of his plan was his attitude.

I had not seen or talked with John Sie in about 10 years. I ran into him in the pressroom. He slid up next to me and in low tones said, "The press in this industry is very antagonistic and you are the ring leader!" We both smiled.

On the evening of February 19th when the dealer group held its rally and we provided three hours of live television coverage for the event, I got stuck being host. I spotted John Sie in the audience and invited him to come up and sit on the stage with me to talk. As a showing of goodwill, he took off his coat and I did the same as we sat down. I wanted people to know this man better. In the 20 years or so I have known him, I have never found him to be unfair or anything remotely touching on unscrupulous. In an earlier morning session, I didn't feel the 'real John Sie' had come off very well. I hoped that sitting on the stage chatting would force him to relax a bit and act like the John Sie I have known for two decades now.

John immediately launched into a soft attack on our industry leaders. He pondered as we talked why SPACE was taking such an antagonistic approach to the programmers and why we started every statement with "When we sue you...." He in effect asked, "If you really want to resolve our differences, can we not sit down as gentlemen and discuss this disagreement without this constant lawsuit rhetoric?" There were, of course, strong responses from our industry. Cable has not been exactly harmless with their HBO fertilized 'The Skies Are Going Dark' routine. But this was not a time to debate John. I felt he needed to get it off his chest, and we needed to know what was bugging the cable leaders. We found out, and I was glad I invited John Sie to the stage to sound off. Sie is much respected in the cable industry. He was once a brilliant engineer; his background includes stints at small and large equipment manufacturing firms (Intec, Jerrold/General Instrument), as well as programmers (Showtime), and most recently large group operators (TCI). I'd like to see a more conciliatory dialogue between cable leaders, such as Sie, and our own industry.

Showtime's failure to disclose their marketing plans surprised many. I chalked up their backing off the original plans to announce how they would sell to TVRO to the pending (then) March 6 hearings. I don't blame Showtime for delaying their programming package announcement until after there is time to assess the results of the Congressional hearings. Some of what happened there could indeed have a big impact on the way they offer their Showtime, Movie Channel, and potentially other services to dish owners.

WOR had been scheduled to be totally scrambled by March 1. The culprit here was Eastern Microwave, the common carrier responsible for WOR being on satellite. As was expected, delays in getting the descramblers to the cable affiliates for WOR slowed this one down. With WOR finally scrambled, there would be a problem remaining. Under federal copyright laws, Eastern cannot (they feel) sell to individual homes. That's the bad news. The good news is that the VideoCipher 2000 may descramble it at the home level, automatically.

The flow of descramblers had slowed to a trickle by early March. The initial surge of interest primarily fed by dealers and die-hards who have to possess one of everything, quickly disappeared. SVS, for example, had received 800 units by early March and had shipped approximately 700 of them out to buyers. The last 100 were moving very slowly. M/A-Com continued to make irrational statements about the actual number of descramblers shipped or available to the pipeline and their credibility approached an all-time low during the Las Vegas show.

Ku-Band

KAYOU/ continued from page 46

WTBS would be listed at 16 - and Showtime at 16 + . Unfortunately, double digital readout receivers cannot display 16 + .

Back to Jerry's approach. If each transponder were given two channel numbers, how did he end up with Showtime on 31 and WTBS on 32? Perhaps they were simply transposed and the lower half of transponder 16 is channel 31 and the upper half is channel 32. Could the same 32 channel assignments used by Anik C3 be applied to G-Star? Anik C3 has 54 mHz wide dual polarized transponders. Using the same channel numbering scheme would reduce confusion. (See Chart B.)

When these channel numbers are applied to G-Star, the frequencies don't come close to matching the video transmissions! (See Chart C.)

However, if the polarity is reversed, the match is excellent! (See Chart D.)

The following frequency assignment chart for G-Star now makes sense. (See Chart E.)

As you can see, the channel assignment divides each transponder into two equal sections with only 1 mHz error on the vertical side. Full bandwidth transmissions still fall between channel numbers; however, they will be visible if your receiver is tuned to the closest assigned channel. Fine tuning will center these programs.

When Jerry calls back I'll tell him Showtime is on channel 32!

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ROTOPROBE feed with 'TI rejection' shroud/ Raised motor mounting pad keeps water from entering feed/ 90° elbow built in — no flange to leak, no improper gasket seals/ 3-wire servo and 2-wire DC motor operation/ ALL aluminum die-cast alloy/ Universal mounting holes for virtually any mounting configuration/ 35 dB isolation between polarizations (minimum)/ VSWR 1.3 to 1 or better over 3.7 to 4.2 GHz/ Nearly five-years of established performance history.



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HURRICANE KATE

A few years ago we used the most destructive equipment available to create a "professional" hurricane. We blasted two of our stock antennas with driving wind and rain to equal a 140 mph storm.

Both antennas came through without so much as a piece of mesh bent or a clip missing. And we were naturally delighted.

But "deep down", of course, you always wonder if any test...however intense...can duplicate the real thing.

Now we know

When Hurricane Kate shrieked across the Caribbean last November, three of our stock Paraclipses in varying sizes were among a total of 22 dishes at Bob Cooper's West Indies Video (WIV) Test Site on Provo Island.

The WIV facility is also responsible for 15 additional "off site" antennas scattered through the Turk and Caicos Islands. And its reason for being there is to test performance... not storm survival.



But Kate could not have cared less. It was as if Hurricane Kate took dead aim at the Provo Test Site, slamming directly into it... battering its antennas from front, side and back with the first 100 mph winds the area had seen since 1960.

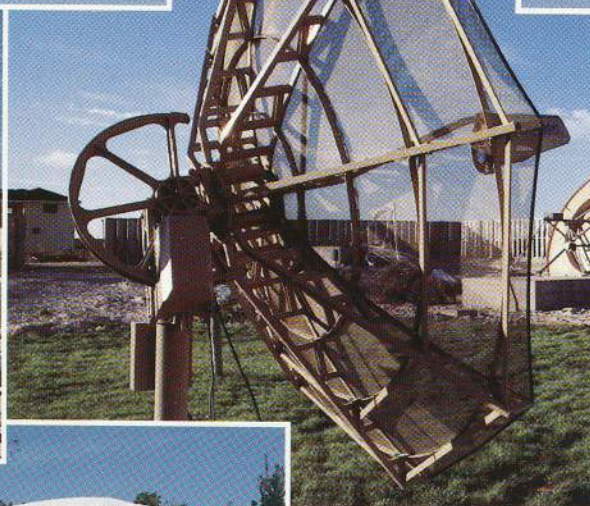
Of the 37 antennas at the test site and nearby locations, only two survived the 4½ hours of Kate's hammering with no damage whatsoever. Both were Paraclipse antennas... one was the new nine foot (2.8m) Cog Drive model (CD), the same kind you might find in use at any home, anywhere; the other a 16 foot (4.8m) antenna, our senior, commercial service antenna.

Several Paraclipse antennas survived with only minor damages due to motor drive failures.

In the accompanying photographs, you will see antennas utilizing various designs and materials. All of the antennas were equally exposed. None of the photos have been retouched except to delete specific logos.

Hurricane Kate proved that only the fittest will survive. Paraclipse.

All Paraclipse antennas are Ku-band compatible.



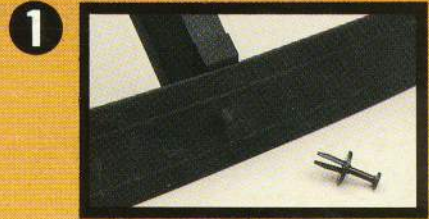
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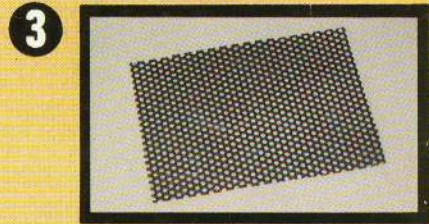
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