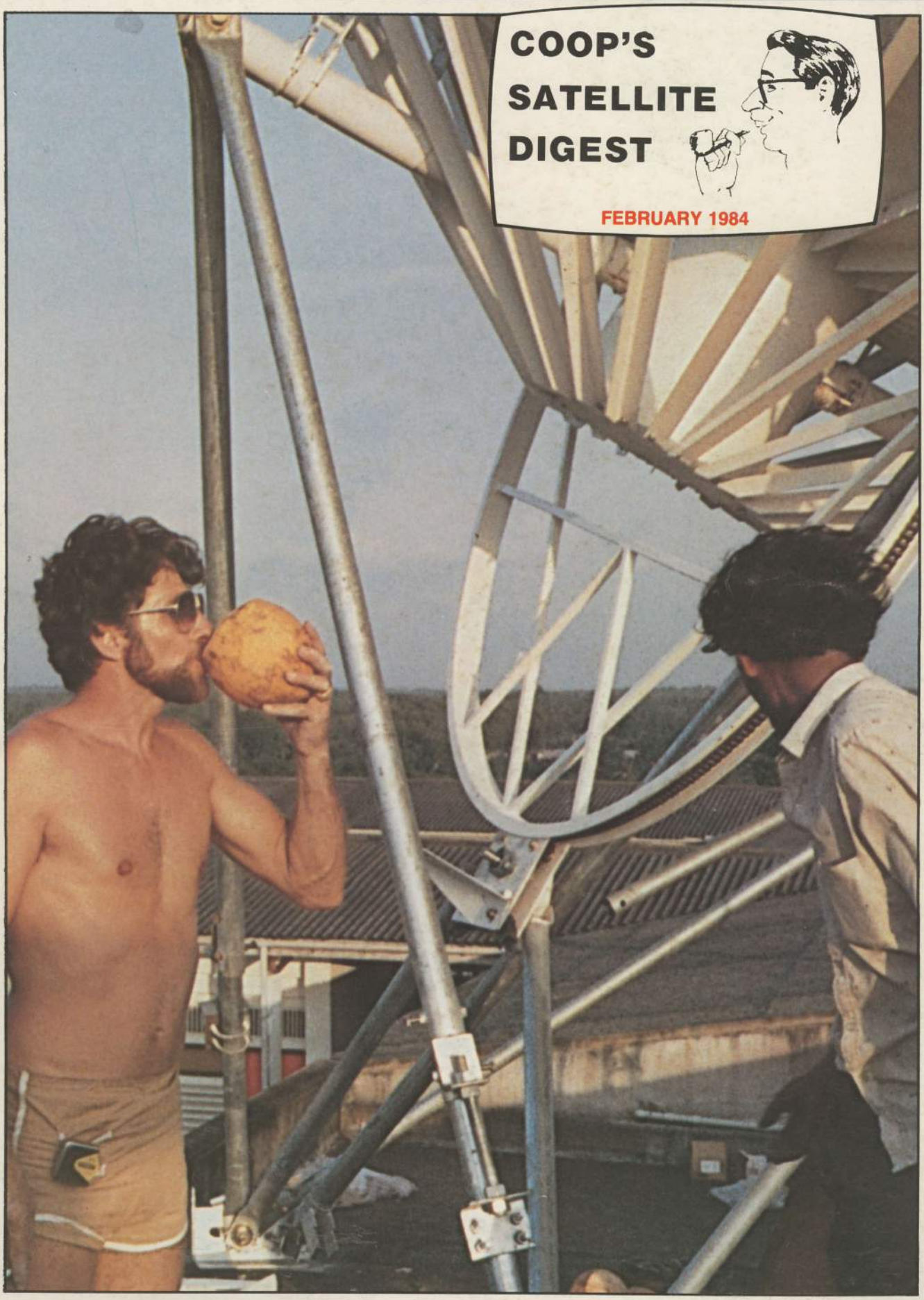
COOP'S SATELLITE DIGEST

FEBRUARY 1984



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TOP OF THE MONTH

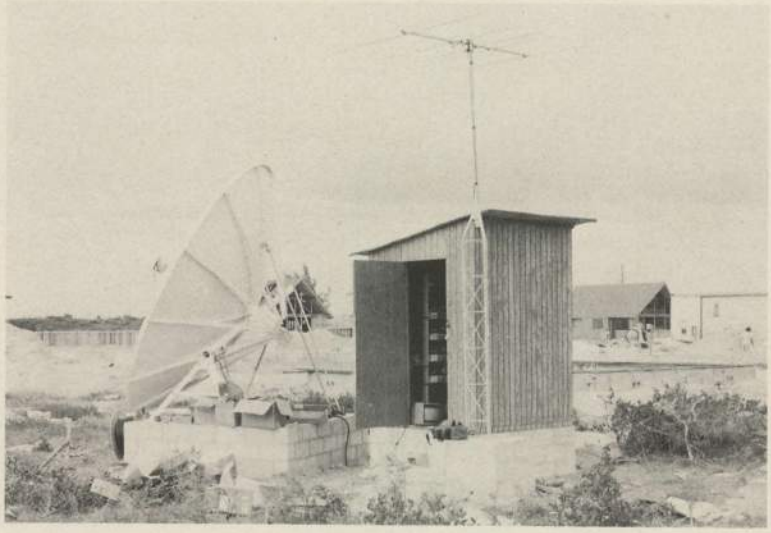
WELCOME IN CANADA! This issue of **CSD** is getting extra-circulation at the **'First Canadian Satellite Exposition,'** being held in Vancouver February 3-4-5. This is my kind of good, old fashioned show. Lots of space-age equipment, loaned to the show by the Canadian space oriented firms, three channels of in-hotel-room programming created especially for show attendees and Frank Ogden!

SMATV. We begin a several part look at satellite master antenna television or 'private cable' this month. By accident, this is especially appropriate in Canada since as **CSD** reported last month in some detail, a Canadian high court has ruled that SMATV systems in Canada can carry US DOMSAT programs without breaking any Canadian laws. The report will hit home, 'at home,' here in the US as well.

FEEDS are back again as we resume our multiple part series on feed tests in this issue. Law suits or threats of same grind on in the US 'feed mini-industry' as we continue our look at the technical aspect of feeds.

SPEAKING of law suits, by now you must have heard about the falling out between SPACE and STTI over the Orlando-announced 'joint show' for this March in Vegas. Coop Comments on this and other timely topics in this issue.

FEBRUARY 1984



OUR COVER/ **Jamie Gowen** of **ADM** three stories above ground at the University of Moratuwa, Sri Lanka, takes the local version of the 'pause that refreshes'; a less-than-chilled coconut milk break. Part of the **Arthur C. Clarke TVRO Expedition,** Gowen and ADM's Ed Randall oversaw installation of the six meter ADM dish, partially shown to right, for the University's Department of Electrical Engineering. A full report appeared in the January issue of **CSD.**

COOP'S SATELLITE DIGEST

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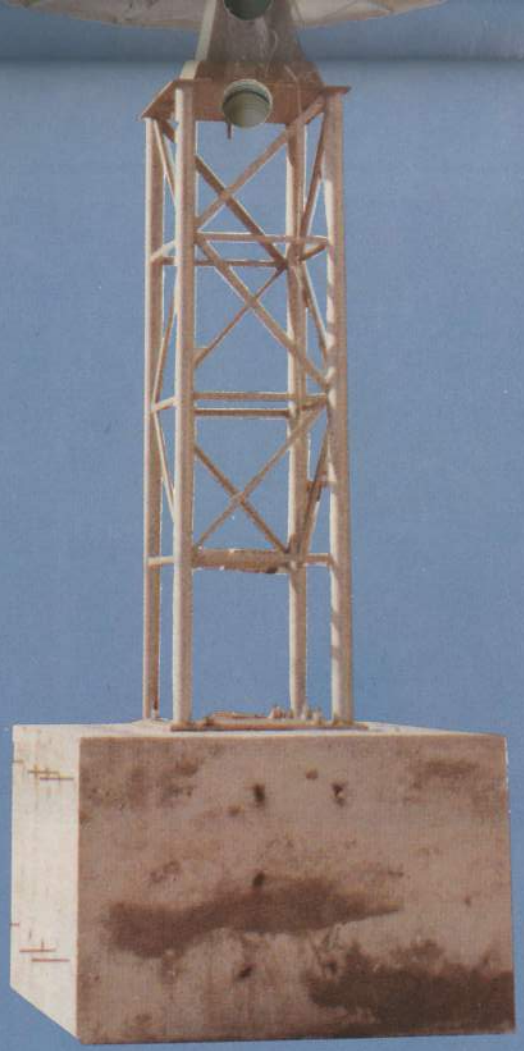

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COOP'S SATELLITE COMMENT

- PARTS Crunch
- MARCH SHOW Snafu
- I WAS DBS When DBS Wasn't Cool!

TURNER'S OTHER Cheek

Many years ago a brash young man from Georgia took on the television broadcast industry. Virtually all by himself. **R.E. 'Ted' Turner** aligned himself with the cable television industry when, in 1976, he opted to place the programming from his struggling Atlanta UHF television station (then using the call letters WTCG) on satellite. When the first cable homes in America tuned in WTCG (WTBS) far away from Georgia in December of 1976, a love affair between America and Turner was off and running.

Turner loved the cable industry; it was, like him, unstructured, 'brash' and an upstart. He loved appearing at cable shows, holding forth from the podium telling cable operators that the networks were the 'bad guys' and cable was going to save America from narrow minded views. On more than one occasion Turner's operations were attacked by broadcasters, broadcasting trade press, and just about everyone else in 'the establishment.' Cable operators and cable subscribers became a 'cult' for Turner. Within a few years Turner's brashness was earning him interview slots inside **Playboy,** in the major national news magazines and on network television.

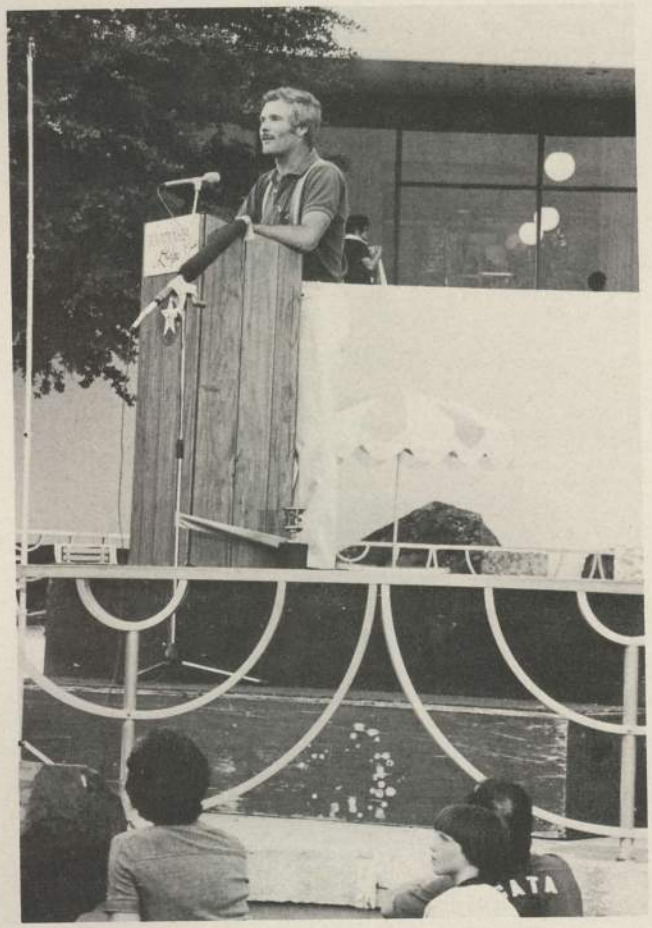
More than one cable operator worships Ted Turner. More than one cable operator looks to Ted as the 'Jesus Christ' of the industry, leading the industry out of the black ages of master antennas into the bright, new world of (international) satellite communications. As a body, cable operators hold the conviction that 'Ted Turner can do no wrong' and most members of the cable fraternity would defend Turner in virtually any forum.

The love affair may be coming to an end; a 'marriage,' if indeed there ever was one, may be ready for Tijuana. Turner's outspoken comments regarding the 'future' of DBS is at the root of the break up.

Appearing in Anaheim, California at the Western Cable Television Show this past December, Turner shook the cable tree by forecasting that '**DBS** (with HBO) was coming.' Cable operators see red when they hear those three magic letters and they saw red when Turner uttered the phrase. Now that he had their attention, he took it a step further.

Turner is a fierce competitor; he knows the thrill of victory and the agony of defeat and clearly the victory thrill is his first choice. Not all cable operators have given Turner the support he has asked for. Not all cable systems have opted to carry WTBS, and not all cable systems have opted to carry CNN or CNN-2 (headline news). Turner's concept of 'victory' is that **every** cable system in **every** town should carry **all three** of his services. He figures he gambled his fortune and his Atlanta UHF TV station to force the satellite industry to 'happen,' and in return for this gamble he expects **every** cable system to support **every one of his efforts.** but, alas, there are some old style cable systems around, such as Binghamton, New York, where the cable system has only 12 (VHF) channels available. This puts the Binghamton cable operator in a spot; with but 12 channels to play with, the cable operator has to be very selective about which services are placed on the cable. If WTBS + CNN + CNN-2 are not in the channel mix, Turner feels the cable operator is not supporting Turner in the way Turner has supported the cable industry.

From the cable operator's point of view, Turner's "demands" to be carried on these old style cable systems have merit but the demands are impractical. The cable operator can't always toss other services off the cable in favor of one or more Turner services; there are FCC rules around which establish certain 'signal priorities' for the cable systems. In some instances, the FCC rules 'demand' that certain signals **must be carried** by the cable system, and if the sum total of those 'must carry' signals is 12 or so, that leaves the cable operator no room to carry signals he might **wish** to carry; such as WTBS. The obvious answer to this problem is for the cable operator to spend some bucks, and increase his 'channel capacity' to more than 12 channels. On the surface that does not seem like such a stiff problem since cable systems have been routinely offering 20 plus channels for more than a decade now.



TED TURNER/ appearing at a cable symposium in 1978 told the cable crowd, "We are all going to get rich together." **Five years later, few would deny he helped them improve their bottom line.**

Still, that decision, to sit down and spend several hundred

thousand or several million dollars to 'upgrade' the capacity of an older style cable system to more than 12 channels is a decision which **the cable operator** must make. For whatever reason he may have, if he elects not to do this, now or ever, that is **his** decision. To put him in an awkward spot, 'demanding' that he add new equipment to increase the system's channel capacity, is to get involved in the cable operator's private business affairs.

Turner, increasingly of late, **has done just this.** Ted apparently figures that after seven years of being on satellite, after seven years of dramatic cable industry growth in the satellite area, the time has passed when cable operators can plead 'poverty' on the channel expansion issue. So the WTBS folks have taken to singling out various cable systems where Turner is not carried because of 'channel capacity' problems. The cable operators put on the spot by this tactic are not very happy.

At the Anaheim cable show Turner gave each of these cable operators a stern warning; perhaps the ultimate warning. He told them **if** they did **not** carry a suitable mix of WTBS/CNN/CNN-2, that he and his new 'partner' in the DBS market were going to enter **their cable markets** and 'sell' DBS. In effect, if cable won't give WTBS et al a dial position in Binghamton, WTBS et al would go direct to the consumers with 4 GHz 'CBD/DBS.'

Predictably, the cable operators were someplace between enraged and insulted. One suggested from the floor of the meeting room that Turner was trying to be a part of 'his' corporation, 'assisting' **him** in making corporate decisions. First Turner warned them that 'DBS is coming' and then he threatened cable with a new 'Turner DBS.'

It is a habit of R.E. 'Ted' Turner to walk a thin line between insult and threat. It is the nature of a fierce competitor that if you intimidate the opposition, you can often force an issue to go 'your way.' It has been that very 'habit' of Turner's which has until now endeared him to most of the cable operators. Of course, **until now,** Turner's insults and thin-line verbage has always been directed at cable's mortal enemies; the networks and the FCC.

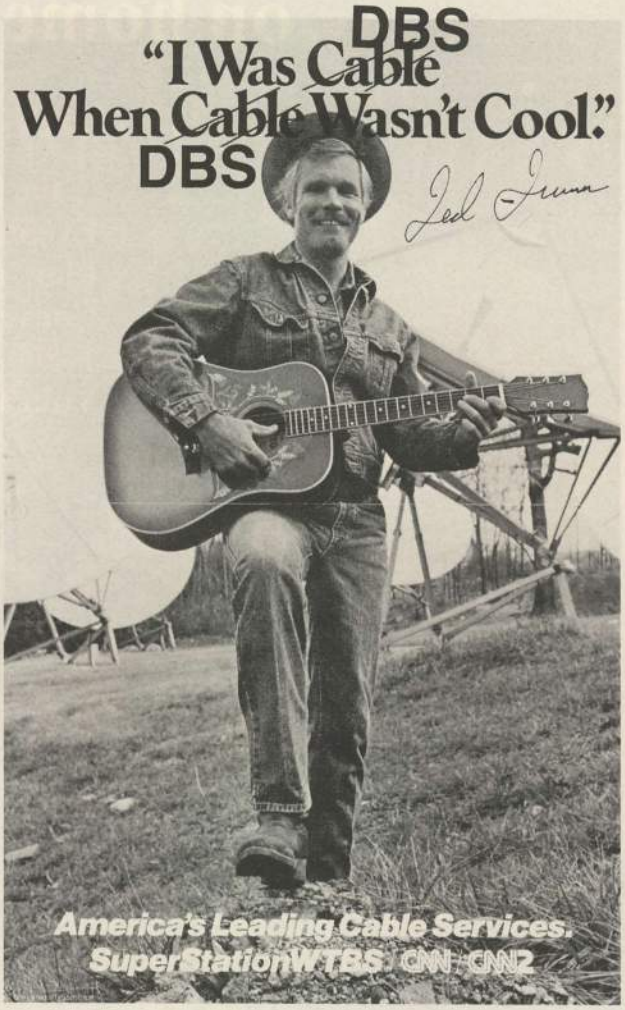
Apparently Turner's Anaheim appearance was cable's first real dose of seeing the tables turned on them. Many attending were shocked; unable to comprehend that a favored 'lover' had suddenly begun making statements which clearly were not positive towards cable interests. Those that were not shocked were worried that Turner's infatuation with cable may be over and that he had found a 'new love'; CBD/DBS.

If cable was shocked with the Turner presentation in Anaheim, cable has no one to blame for that surprise but itself. Turner has been making it very plain for some time that he cannot afford to continue losing money on CNN and CNN-2. He has made it equally plain that he has kept 'subscriber rates' on CNN and CNN-2 'low' to the cable firms because he wanted the service to have maximum exposure. He did this because he knew that unless CNN and CNN-2 gained true national exposure, the services would never attract sufficient advertising revenues to be viable. The demise of SNC this past fall proved what happens when you lose too much money for too long a time; the service simply has to cease operating.

What Turner is saying to the cable folks is that cable **is** his **preferential distribution medium** for WTBS/CNN/CNN-2. **But,** if the cable folks don't take the bundle of three services, he must, just to stay alive, find some other outlet for those services. CBD/DBS is the new kid on the block and it offers Turner a new option he did not previously have; the ability to 'go direct' to the viewer's living rooms, bypassing the cable operator.

When Turner appeared before the SPACE show in Orlando this past November, most felt he was invited to speak because he was something of a colorful character in an often drab industry. Few recognized that Turner's appearance was part of a 'master plan' to get Turner's operations deeply involved in **our industry;** to provide a starting point for Turner's CBS/DBS aspirations. Those who found Turner difficult to take and hard to understand in Orlando simply lack the historical perspective which is demanded if you are going to be anything more than a repeater of 'headlines.'

A few years back Turner's advertising people created a poster which showed 'the man' standing before his WTBS dish farm with guitar in hand. Borrowing a phrase from a popular country and western tune of the day, the poster headlined, **"I Was Cable When Cable Wasn't Cool."** A more modern version of the same poster would change the headline; **"I Was** DBS **When** DBS **Wasn't Cool."**



WHO IS To Blame?

By now it should not come as 'news' to many that the 'bargain' struck in Orlando to **jointly hold** the STTI **and** SPACE shows in Vegas this coming March fell apart back in December. Our **CJR** reported in mid-January the sequence of events leading up to the cancellation of the joint show effort and the threat of lawsuits that followed.

I will not recount those events here; if you don't get CJR, that is your own fault. If you read accounts of this elsewhere, you probably got a biased view of what happened.

The popular telephone talk these days seems to be attempts to fix blame on one side (say STTI) or the other (say SPACE). **SPACE** releases on this isssue focus on the unwillingness of STTI's **Rick Schneringer** to stick by his original, verbal, agreement made in Orlando. Schneringer in turn focuses on his 'over generosity' in agreeing to send checks to SPACE totaling more than $600,000 per year.

This is one of those situations where I doubt there is a single direction for the blame to go. I happen to believe, having reviewed the events that led up to the Orlando 'accord,' that SPACE got more from Schneringer than it was entitled to get. It is one thing to have Rick Schneringer in a position of weakness and to be **demanding** certain concessions from the man because you are in a position of strength. But Schneringer was not in a position of weakness (he had 320 of his 344 booths 'pre'sold for Vegas; whereas SPACE had but 81 booths

COOP/ continued page 75

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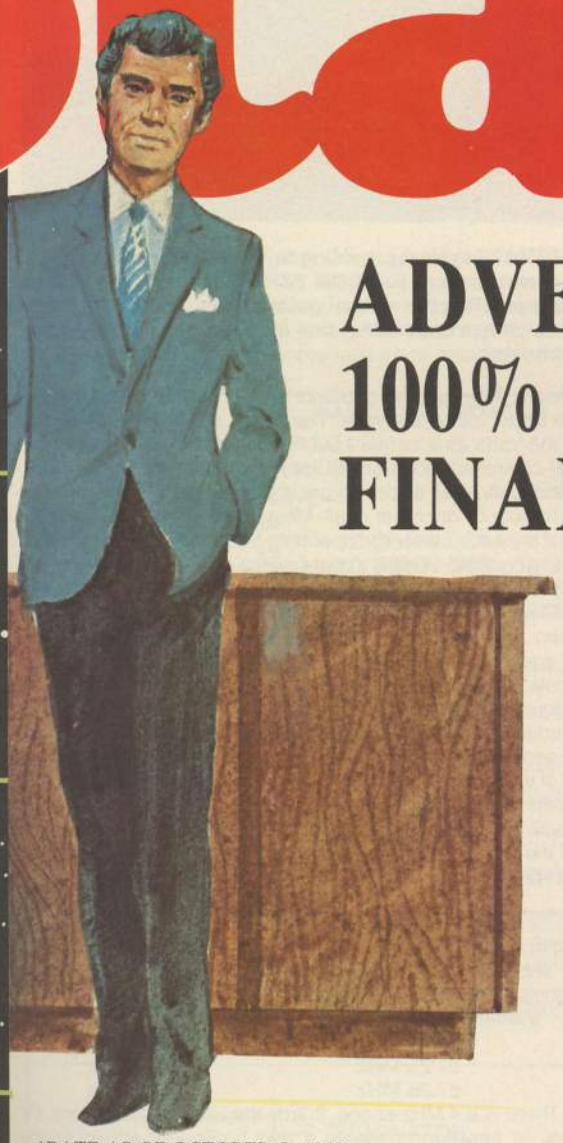

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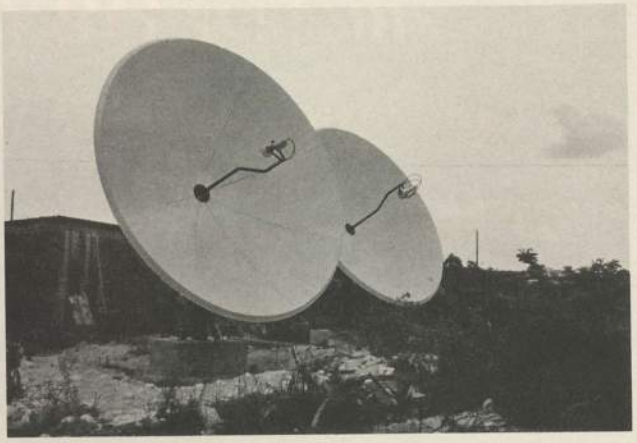
SMATV HEADENDS/ GETTING ON ONE CABLE



TWO DISH SMATV system providing two channels from Westar V and four channels from SATCOM F3R. F3R dish (nearest) **has single LNA operating on vertical polarization for four TV channels; back dish has dual LNAs, one for each polarization, for a pair of channels.**

ALL IN One Wire

Many people find it fascinating, perhaps even difficult to understand, how one small wire only slightly larger than a standard pencil in diameter can transport into their living room or bedroom dozens, indeed a hundred or more, totally separate channels of television. After some 35 years of cable television or CATV, the mystery of how all of this works, and when working properly, works so well, mystifies many.

The 'secret' of cable television, whether the cable system serves two homes or two million homes, is really quite simple to understand. Each television channel has its own operating frequency. The same wire can carry an almost unlimited number of 'frequencies.' It is the job of the cable system designer to 'transmit' those separate frequencies from the starting point (called **'headend'**) of the cable system in such a manner that any television receiver connected to the cable can in turn 'separate' the frequencies so that only one, at a time, is processed by the TV set. This is not unlike the 3.7 to 4.2 GHz 'satellite band' which transmits, as a 'band of frequencies' as many as 24 separate TV program channels. We have all learned that the individual TVRO receiver is 'tuned' through those channels so that only one at a time exits the TVRO receiver, even if 24 went in.

There are two legal definitions of 'cable' which concern us. As a companion series appearing in **CSD**'s mid-month companion publication **CJR** is presently pointing out, there is one definition created by the FCC, and another definition created by the U.S. Copyright Office. The **FCC** says that whenever you connect **50 or more** residences or living units to a single, common antenna, you have a 'cable television system.' The **Copyright Office** says that anytime you connect **two or more** residences or living units to a single, common antenna, you have a 'cable television system.' We'll leave the legal definitions to **CJR,** for now, and concentrate here on how all of this magic works.

MODULATORS And Channels

Remember that if we want to send two or more TV channels down the same piece of cable, we have to start off with the two or more channels operating on descrete, separate channels or frequencies. More than 40 years ago the FCC established the basis for the present TV channel system, by assigning certain TV 'channels' to certain, specific, operating frequencies. TV receiver manufacturers, in turn, have designed and sold TV receivers which are also designed to operate on these same frequencies. A table of standard VHF channel frequencies in North America appears here.

A modulator, even the kind built into your KLM or other brand TVRO receiver, operates on a specific frequency. The frequency is determined by either a **'crystal'** which initiates the frequency creation process, or something called a **'free running oscillator.'** A crystal is a small, sealed, electronic device which will create a 'signal' on a specific frequency when the crystal is wired into a special electronic circuit called an oscillator. A crystal virtually guarantees that the frequency of the signal will be very stable, very 'pure,' and that the frequency will not 'drift' or change on you as you use the device. But crystals cost money and the oscillator circuits they plug or wire into are often quite complex. So there is a low-cost approach to the same circuit called a 'free running oscillator.' This is essentially a signal generation circuit minus a crystal. The circuit still produces a signal (known in the trade as a 'carrier') but the **absolute frequency** of the non-crystal-controlled oscillator **will vary;** with time, and temperature.

Every modulator has an oscillator circuit; without it, it would not be creating a frequency or carrier at all. Most **home** receiver modulators do not use a crystal to create the operating frequency; they depend on a free running oscillator. This is a cost savings to the receiver (modulator) manufacturer. Some modulators sold as 'stand alone' modulator units also do not use a crystal to create the specific operating frequency. They, too, are subject to some variation in operating frequency as the circuit ages, or alternately gets cold and warm.

A modulator with a crystal 'turns on' very close to the crystal created frequency it is designed for, and it stays on (or very-very close to) that frequency. A free running oscillator 'turns on' on one operating frequency and then as the circuit warms up and the parts heat up, the frequency of the modulator changes. Perhaps not by a great deal, but there is some change nonetheless.

The oscillator creates the frequency for the modulator, but the 'power' of the oscillator is not very great so typically this oscillator signal must be 'amplified' inside of the modulator before the signal is

TABLE ONE

These are the standard TV channel frequency assignments for VHF channels 2 through 13 in North America.

Channel	Visual Carrier Frequency	Aural Carrier Frequency
2	55.25 MHz	59.75 MHz
3	61.25 MHz	65.75 MHz
4	67.25 MHz	71.75 MHz

Note: There is a 4 MHz space, 2/3rds the width of a standard TV channel, in between channels 4 and 5. Special public safety two-way radio signaling systems occupy this frequency range. Thus 4 and 5 are not 'true-adjacent' channels.

5	77.25 MHz	81.75 MHz
6	83.25 MHz	87.75 MHz

Note: The FM broadcast band occupies a space from 88 to 108 MHz, immediately adjacent to VHF channel 6. Between 108 MHz and 136 MHz are various air to air and ground to air radio assignments. Between 136 MHz and 174 MHz are various two-way radio services.

7	175.25 MHz	179.75 MHz
8	181.25 MHz	185.75 MHz
9	187.25 MHz	191.75 MHz
10	193.25 MHz	197.75 MHz
11	199.25 MHz	203.75 MHz
12	205.25 MHz	209.75 MHz
13	211.25 MHz	215.75 MHz

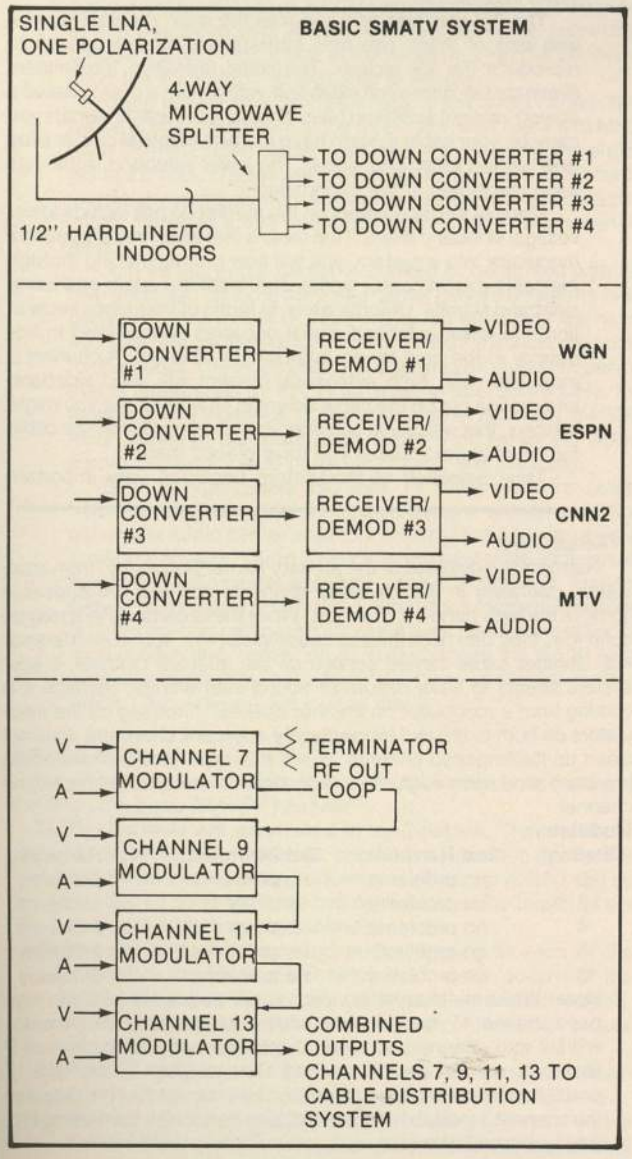
strong enough to be useful in our applications. The oscillator also is a 'pure carrier,' that is, there is nothing resembling 'intelligence' or information attached to the oscillator's signal. This is what a **modulator** really does; it takes the basic 'pure carrier signal' generated by the oscillator circuit and it 'marries' that pure signal with our video and audio information coming from our TVRO receiver. We'll look, in some detail, how all of this happens in a subsequent portion of this series.

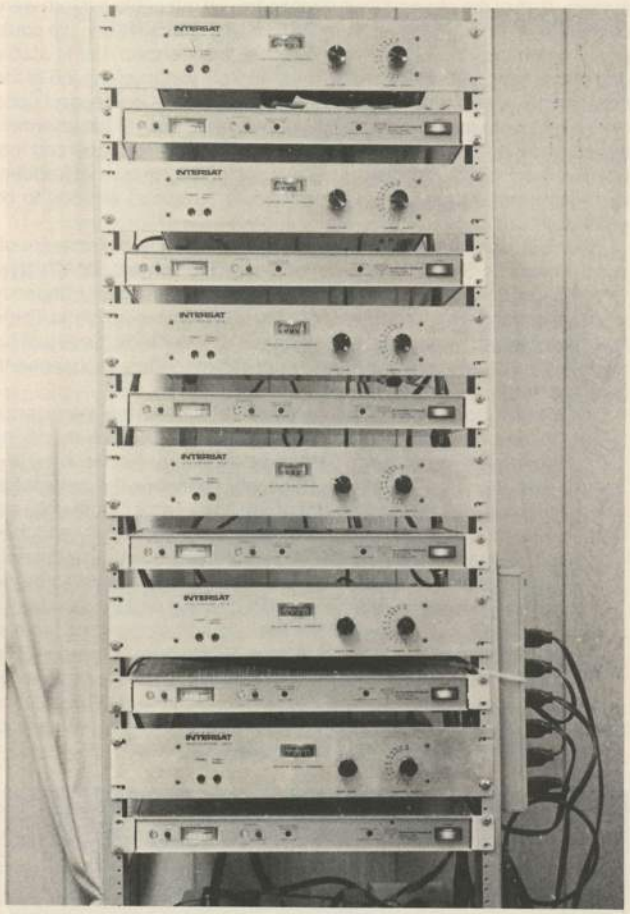
For now, keep in mind that we have the following sub-sections **inside of** the modulator:

1) **An oscillator** that creates the actual signal on a specific frequency;
2) **An amplifier** which boosts the power of the modulator's oscillator to a level or strength that is sufficient to allow us to 'use' that signal, and,
3) **A circuit** (the actual 'modulator circuit') which marries the desired video and audio signal coming out of the TVRO receiver demodulator to the 'pure carrier' created by the oscillator.

NOT ALL Satellite

While it would be expedient to consider an SMATV/Private cable system as an 'all satellite fed' system, using only satellite delivered signals for re-distribution via cable to the (subscribing) interconnected homes, the truth is that most such systems are actually designed to function with some mixture of satellite fed signals **and**





SIX CHANNEL headend using recently released Intersat SPL40 receivers (single channel, digitally tuned) **with separate down converters. Modulators are Blonder Tongue ESM series.**

some combination of 'off-air' terrestrial signals. As we shall see, life would be far simpler for the SMATV/Private Cable system installer if only satellite video signals were utilized for cable distribution.

We are forced to 'modulate' satellite signals onto a standard TV channel because of two factors:

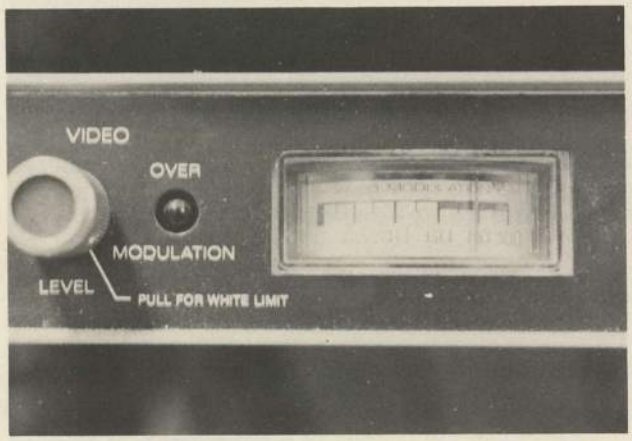
1) **The satellite signals** are transmitted to our dish antennas using a type of modulation known as 'FM'; or, **frequency modulation.** Our standard TV receivers have been designed to work using a different type of modulation known as 'AM,' or amplitude modulation. The two are not compatible and to make it possible for the TV receivers to work with satellite signals, we have to turn the FM signals into AM signals. The TVRO receiver turns the FM signals into 'pure' video and 'pure' audio. Once we have video and audio available to us, we can then send the video and audio into a new 'modulator' which works as an **'AM'** modulator, and that is compatible with our 'AM' standards television receivers.
2) **The satellite signals** are transmitted in a frequency range which standard TV sets will not tune-in, directly. The TVRO receiver 'down converts' the microwave signals from their special frequencies to a much lower frequency; and then the receiver demodulates these FM signals into basic video and audio for us.

Terrestrial television signals, coming from a VHF or UHF transmitter, are already 'AM' modulated and they are also already operating on a frequency which corresponds to the channels found in the TV set's tuner. When we wish to 'mix' some terrestrial TV signals with some satellite delivered channels, we have to make sure that as we do this we are not allowing either one to interfere with the other on our cable

system. If all of the channels we might carry on our cable system were coming to us through the air from VHF or UHF transmitters, we could pretty much depend upon those channel 'frequencies' being stable and in the right 'frequency spot.' That, afterall, is part of the job of the broadcaster operating the station. However, when we depend upon our own system installed modulators to create some of the channels we will carry on our cable system, now we have to be concerned that our own modulators (oscillators) are operating on the correct frequency to insure that they do not interfere with terrestrial stations to be carried on our cable.

Correct operating frequency is but one of the parameters-of-concern with an SMATV system modulator. Since most SMATV systems do employ crystal controlled modulators, with high frequency stability, a 'wandering' modulator-oscillator is not a big concern. There are other operating parameters which we will touch on here, just for identification, this month and then look at in greater detail subsequently in this series.

1) **Modulation index.** The process of 'adding' the intelligence (video and audio) to the oscillator 'carrier' involves modifying the original 'pure' carrier. The modifying agent is the video and audio signals. There is a relationship between the **amount** of video signal **and** the **amount** of oscillator carrier. Both units are measured in terms of power levels, each separately and then the pair as combined. Most commercial quality modulators have a **video modulation control.** This is a system to fix the proper 'ratio' between the raw video signal and the oscillator's pure carrier so that when the two are added together, we end up with a high quality picture on a TV channel frequency. The visual quality of the picture depends almost entirely upon the relationship between the carrier 'power' and the modulation 'power.' Being able to control this relationship and measure or monitor its performance is important.



BLONDER TONGUE TVM series modulators have front panel metering for video modulation adjustments. The knob adjusts the percentage of modulation and just to the right of the knob an LED flickers (red) **when you are beyond 87.5% modulation.**

2) **Oscillator harmonics.** When you create a pure carrier on channel 2 (operating frequency of 55.25 MHz), and then connect the output of that oscillator to a cable system, you must be concerned that 'multiples' of the operating frequency do not also come out of the oscillator (modulator). For example, 2 times 55.25 is 110.50 MHz. Three times 55.25 is 165.75 MHz. And four times 55.25 MHz is 221.00 MHz. Any oscillator will create its own designed-for frequency, **and** it will also have 'harmonic signals' at 2, 3, 4, 5 and so on times **that** frequency. The main power will be on the designed-for frequency. But some amount of power will also appear at the output of the modulator at harmonic frequencies (110.50, etc.). If **harmonics** of the oscillator-modulator happen to 'fall' inside **another** TV channel in the system, these harmonic signals will cause interference to the other channel. An example.

In our first example, 110.50, 165.75 and 221.00 MHz are not inside of any of the **standard** TV channels. Therefore any harmonics from a channel 2 modulator would not cause cable-system interference since there are no standard TV channels affected. However, if we were using a modulator on channel 3, the 'third haronic' of its visual carrier frequency is 201.75 MHz (three times 67.25 MHz) and 201.75 MHz is within the assignment for TV channel 11 (channel 11 is 198 to 204 MHz; see chart). A table of harmonics appears here.

When a modulator (oscillator) has harmonics that are allowed to get into the cable system, these harmonics represent interfering signals, on the cable, for the TV channels in which the harmonics fall. There are ways to eliminate these harmonics, either inside of the modulator or if that is not practical outboard from the modulator. We'll learn what this is all about.

3) **Sidebands.** When you apply video information to an oscillator carrier signal, you modify the original oscillator 'pure' carrier with the intelligence from the video signal (voltage). A pure carrier, modulated in the 'AM' format, then becomes a **trio** of signals; there is still the original carrier, plus, there is a new signal **above** (higher in frequency) the original carrier which contains the video information, and **another** new signal **below** (lower in frequency) the original carrier and it, also, contains the video information.

The TV receiver only requires the main (original) carrier **and one** of these two new carriers (called 'sidebands') to reproduce the TV picture. Terrestrial television transmitters eliminate the 'unwanted sideband' with a filter; a device called a (lower) vestigal sideband filter. Thus any terrestrial signals you carry on your cable system have the **one original** carrier **plus one** (upper) **sideband** signal. The lower sideband signal has been eliminated at the transmitter.

Many of the modulators on the market do **not** include lower vestigal sideband filters. That means that when you plug such a modulator into a system, you will now be transmitting through the cable a main carrier signal, and, **both** the upper **and** lower sideband signals. Unfortunately, in terms of frequency separation, the lower sideband signal occupies space down in frequency in the next lower, adjacent TV channel. A channel 3 modulator with both sidebands present will send sideband information out on the cable down on channel 2. As you might suspect, this will cause considerable interference on the cable for the channel 2 signal you have placed there.

Thus selection of modulators becomes very important

TABLE TWO

Harmonics (multiples of the primary carrier frequency) from modulators operating in the low-band channels can and will appear in some of the high-band TV channels. While these carrier levels may be quite low, they can nonetheless cause picture or sound interference with another cable carried service on the affected channel. If your system seems to have picture or sound interference, perhaps it is coming from a modulator on another channel. If turning off the modulators on both of the two **immediately adjacent channels** does not clean up the impaired channel, check this table to determine which low-band modulator might be interfering with the affected high band channel.

Modulator Channel	2nd Harmonic	3rd Harmonic	4th Harmonic
2	no problems	no problems	no problems
3	no problems	channel 11	no problems
4	no problems	channel 13	no problems
5	no problems	no problems	no problems
6	no problems	no problems	no problems

Note: While the channel 3 video carrier frequency falls into high band channel 11, the video modulation **products** third harmonics will fall into channels **12 and** 13 and the audio from channel 3 (times 3) will fall into channel 13. The solution to this type of problem is to install a bandpass filter, for channel 3, at the output of the channel 3 modulator to prevent **any** harmonics from falling into any high band channels.

when you are going to operate a cable system with 'adjacent channels.' Using channels 2, 3, and 4, for example, is to use 'adjacent' (or immediately consecutive) channels.

One solution to this problem is to only use these (typically) lower priced modulators when you will be able to get by without using immediately-adjacent channels. You could, for example, use channels 2, 4, 6, 7, 9, 11, and 13 for a seven channel cable system and get by using the lower-priced modulators that come to you without a lower vestigal sideband filter. We'll look at that in some detail, also.

4) **Audio generation.** We said that the terrestrial TV transmissions, and the companion TV sets, use a modulation format known as 'AM.' That is partially correct. Actually, the video portion of the signal is 'AM,' **but the audio portion is 'FM.'**

The audio carrier is a second, separate carrier. It has a relationship with the video carrier which must be precise. We generally talk about the visual carrier frequency (see table one, here) but pay less attention to the audio carrier's own frequency. **The audio carrier frequency is always 4.5 MHz above the visual carrier frequency.** Thus if the video carrier frequency is 55.250 MHz for channel 2, the audio carrier frequency is 55.250 MHz plus 4.500 MHz or 59.75 MHz.

The TV receiver locks onto the visual carrier frequency using a form of 'AFC' (automatic frequency control) and then it **expects** the audio carrier to be **exactly** 4.500 MHz away. The audio detector circuits in the TV receiver have been designed so that they will recover audio only if the audio carrier falls in the precise, correct 'slot' inside of the receiver. That slot depends upon the 4.500 MHz relationship to happen.

There is very little tolerance here. If the audio carrier, because of mis-adjustment of the modulator, ends up 4.510 MHz away from the video carrier inside of the TV receiver, the audio will buzz, hiss, crackle and generally be distorted. Most commercial grade modulators attempt to maintain the audio carrier 'offset' between 4.499 and 4.501 (with 4.500 being nominal) MHz.

Just as the visual carrier is created or generated with its own oscillator, so too is the audio carrier generated with its own oscillator. Thus inside of the TV channel modulator we have two separate oscillators functioning: one for the video and one for the audio. The video oscillator operates on some frequency that is determined by the TV channel in use; 55.25 MHz, for example, for TV channel 2. The audio carrier is always at 4.500 MHz, **inside of the modulator,** and it is 'added-to' the visual carrier oscillator inside of the modulator, electronically.

Even in high quality, big-buck TV modulators for cable, where the **video carrier** is created using a crystal oscillator circuit, the audio carrier is almost always created using a 'free running' oscillator. There is typically not much need for a crystal controlled audio carrier oscillator since at 4.500 MHz, the stability of an oscillator is very good. What does happen, however, is that somebody will get inside of the audio oscillator section of a modulator and 'tweek' on it. This changes the 4.500 MHz operating frequency and instantly you have 'garbled' audio as a result. Of course we will look at that as well.

QUICKIE Review

Let's review the basic points again before we move on to the world of wiring up a basic SMATV headend.

1) **TV channels are generated in modulators.** The modulator has two separate oscillators; one for the video and one for the audio. There is a precise frequency relationship which must be maintained between these two oscillators, or the quality of the audio will suffer (garbled sound).
2) **The amount of video** (and audio) applied to each of the respective oscillators determines the overall 'quality' of the video (and audio). Controls or adjustments within the modulator allow the user to adjust the modulator for optimum picture and sound performance.
3) **Any TV channel modulator will have harmonics.** You eliminate these harmonics because you do not want them interfering with the quality of service on 'other channels' in the system. If the modulator unit does not have this type of filtering built-in, you add it externally with a device called a 'bandpass filter.'
4) **You may use virtually any working modulator** if you do **not use** immediately-adjacent channels on your SMATV system. But if you are gong to 'stack' channels one after the other (2, 3, 4 etc.) you must use a quality modulator which includes a built-in 'lower vestigal sideband filter.' Failure to do this will disrupt the reception quality on all channels which have an immediate-upper-channel in use.

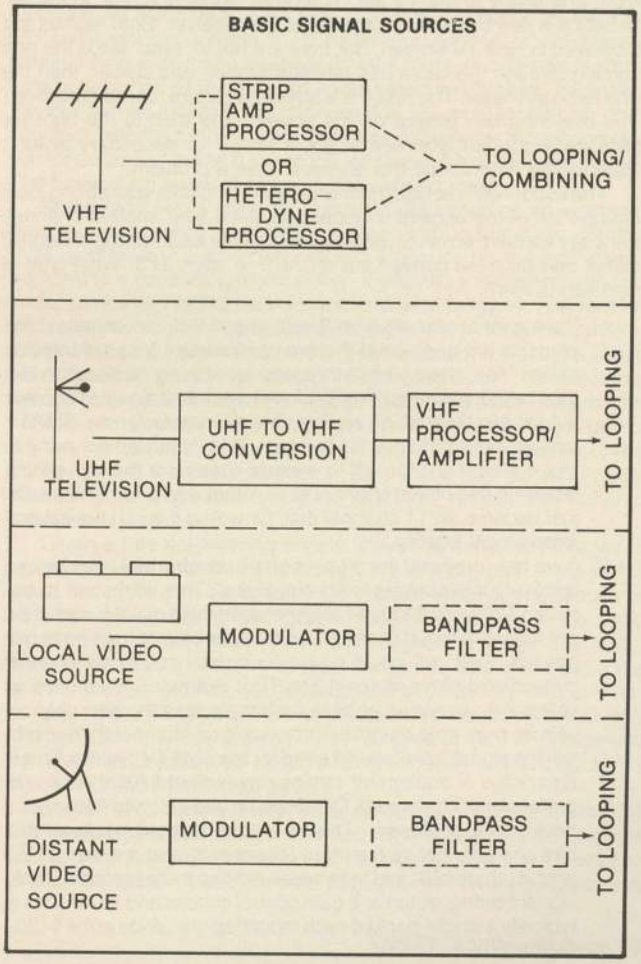
WHERE Signals Come From

As illustrated here, there are four basic signal sources available to the SMATV system planner. There are off-air **VHF** signals (channels 2-13) which can be placed on the cable on either their original channel, or an alternate channel. There are off-air **UHF** channels which must be frequency converted to VHF (i.e. channel 43 to channel 3) before being placed on the cable.

Both the VHF and UHF 'stations' maintain their own modulation levels, their own frequency stability, their own 4.500 MHz 'offset' for their audio carriers, and, they eliminate their own 'lower sideband' signals. All you have to do is to insure that their 'levels' or strength is proper for your SMATV system.

There are also **video signals** available; from a tape deck if your system will use any taped programming or a local, live camera if your system will have one or more local surveillance cameras as part of the system. And there are the 'distant,' satellite delivered, microwave signals which you reduce to video and audio signals before you apply them to your system modulators.

All local video (and companion audio) sources require modulators and depending upon the channel configuration selected, external 'filters' (or having originally selected modulators with built-in filters).



The function of the **'Headend'** is to insure that each of these separate channels is individually 'treated' with whatever electronic magic as may be required to make the pictures and sound of high quality to the TV sets plugged into the cable distribution system.

1) **VHF Channels.** If you are able to carry the VHF off-air signals on the original transmission channels, you can save some money and long-term headaches. Let's assume you have local television broadcasting on VHF channels 2, 4, 6, 7, 10 and 13. Now, what determines whether you can carry these channels 'on-channel' or must shift them to a new channel?

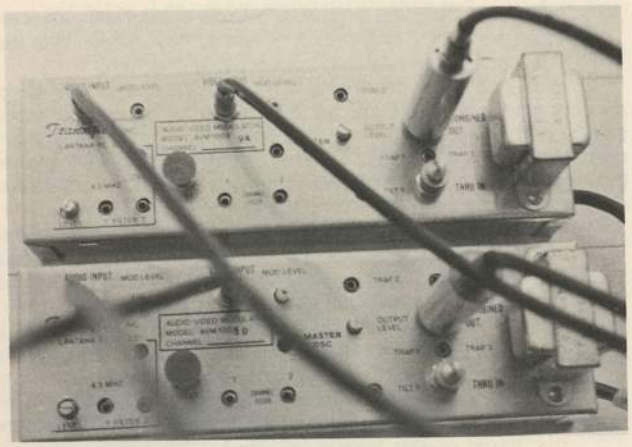
What you are trying to avoid is 'interference' between the signal you deliver to the TV set via your cable system, and, any signal that might float through the air from the TV transmitter itself and wind up inside of the TV set. What happens is this.

When you are close to the TV transmitter(s), there is a large amount of signal present in the air. You will capture some of that signal with your roof-top antenna. You will then carry that signal to the headend in a piece of cable and plug it into a single channel VHF processing system. Then you will add that channel to the other channels in the system and carry them all, together in one cable, to the TV receivers served by the system.

Ideally, the only signal the TV sets receive on that channel (call it 2) should come into the TV set from the cable connection you make. However, if the signal level from channel 2 is very high in your area, some signal may leak **directly into the TV set** from the air around the set. When this happens, the TV set gets a double-shot of our channel (2). Some of the signal comes into the set's innards from our cable service; some more comes into the set from the air around the set, working its way into the set's internal wiring. Now the TV receiver has channel 2, **twice.** Only, **one** of the signals takes longer to get to the TV set than the other. The one you pick up with an antenna travels through the antenna, through the cable, through the processing equipment and finally to the TV set. The other signal, the one 'in the air' around the set, travels 'directly' to the TV receiver. Both signals are displayed on the TV screen. But they are not in 'sync' since the one coming through the cable has traveled further, and slower, than the one through the air. The result is a smeared picture, called 'ghosting.' You see the main picture on the screen, and then to the right (or perhaps to the left) you see a 'ghost image' or secondary picture. Viewers will not tolerate this and you have a problem.

The usual 100% solution to this problem is to take your strong local channel off of the original channel and place it on another channel. Let's say we have so much 'direct pickup' of the local, strong channel 2 signal that we must convert the channel to channel 8. What type of decision is this?

1) If we cannot use channel 2 with channel 2, 'on channel,' the chances are quite good that we cannot use it for anything else either. Yes, there are techniques for 'saving' a situation like this, called 'phase locking' the local channel 2 signal to another substitute channel of service, but the costs for an SMATV system are prohibitive. So for most SMATV systems, having to move a local channel off to another channel is the same thing as losing use of that channel at all. What was a 12 channel dial just became an 11 channel dial. Or worse if you have several strong local signals.
2) If we can 'process' the off-air signals **on-channel,** we can use relatively inexpensive 'strip amplifiers.' This works out to between $250 and $450 per channel using high quality units. If we are forced to move channel 2 to another channel, we have two options. First, we could employ a crystal controlled channel converter to move channel 2 to 8 (for example). Then once on channel 8, we would need to further process the new channel with its own 'strip amplifier' (operating on channel 8) to establish the signal 'level' we will need for the SMATV system. This is a package of equipment costing upwards of $700 if done with professional equipment. Or, we could use a device known as a heterodyne processor. This is a sophisticated package that has one channel as the input (channel 2) and another as the output (channel 8) and in between the two there is considerable signal filtering, automatic gain control circuits and so on. This is typically a single-packed-rack mounting unit; price in the $1200 region.

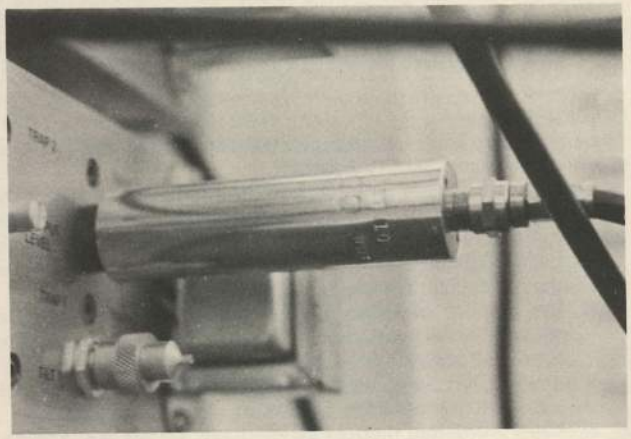


RACK MOUNTED Transifier AVM100 series modulators for channels 9 and 10 in a 12 channel SMATV headend.

Staying 'on-channel' is obviously the most cost effective way to go. **There is a test you can perform** to see, in advance, whether you can get away with this in your installation. Inspect several of the residential units which your SMATV system will serve. Go in and **disconnect** either **the built-in** (rabbit ear) **antenna**(s), or any external antenna from the customer's TV receiver. Now tune through the dial. With no antenna connected to the TV receiver, **can you still see** a picture and hear sound on any channels? **Yes?** That means you **do have** sufficient 'direct pickup' to cause you problems. If the picture is so weak as to not lock 'in sync' and the sound is garbled and noisy (or, gone altogether), you are home free. Your cable delivered signal will be strong enough to override that little bit of signal being picked up directly by the TV set's innards. You need to do this at several locations, on all floors of any multiple story buildings, since VHF signals tend to be spotty even close-in to the transmitters.

2) **UHF Channels.** All ultra high frequency channels must be 'down converted' to a **VHF** channel. How come? Well, most of the commonly available cable distribution equipment is designed for the VHF range only. True, there are MATV systems around that distribute UHF channels directly on UHF ('on channel') but they are typically more troublesome to maintain and perhaps not as satisfactory as moving the UHF channels to a 'spare' VHF channel.

The most common, cost-effective way to do this is to install a single channel UHF to VHF crystal controlled converter between the UHF off-air antenna and the VHF single channel strip amplifier. This would convert say channel 43 to channel 6. The output of the crystal controlled channel converter then plugs into a channel 6 'strip amplifier' and from that point onward you treat the UHF channel just as if it was



TRANSIFIER/Pico-Satellite supplies this tubular-shaped bandpass filter/trap to eliminate harmonic outputs from their AVM100(X) series of modulators.

originally a VHF channel 6 signal.

At this point it would be good to remind you that if you have moved any VHF channel off of its original channel to a new VHF channel, or if you have any UHF channels in your system, that the 'frequency integrity' of the channel conversion equipment is of some concern. It is possible to acquire non-crystal-controlled converters to move channels around. They work, but they may not have the frequency stability to insure that your channel 2 signal stays squarely on the 'assigned' channel 8 spot, or that your channel 43 signal stays squarely on the 'assigned' channel 6 spot. If the oscillators 'wander' around, you could have 2 half way into 7 or 9, or 43 halfway into 5 and in the process screw up reception on those adjacent channels. You avoid all of this by sticking to crystal controlled converters (or heterodyne processors which are also, by design, crystal controlled).

3) **Local Video.** A video signal from a surveillance camera, or a video and audio pair of signals from a TVRO receiver, are fed to appropriate modulators to get into the system. Sufficient discussion of the modulator parameters has already taken place for now and you are already aware of what to watch out for when selecting modulator equipment for an SMATV job. Let's look now at how we begin to 'mix' these channels together.

BASIC SMATV System

Let's assume for discussion that our SMATV system is but four channels, all four of which come from satellite. **This system here, on page 9.**

We have selected WGN, ESPN, MTV and CNN2 for our service channels. They all fall on a single polarization (vertical) from a single bird (F3R). Thus with one dish, one single pole feed and one LNA, we have the four signals desired.

There are three separate ways to do this; only one is **shown** here. In the system shown, we have four separate down converters, each of which corresponds to a single transponder. We drive those four down converters with a microwave four-way signal splitter to provide separate outputs to each of the down converter inputs.

The equipment will typically be installed indoors. Therefore in this example we run a length of 1/2" or other suitable hardline from the LNA output to the input of the four-way microwave signal splitter. We will be in type 'N' fittings all of the way, so far. The four-way splitter divides the available satellite microwave signal power into four equal parts. Each of these "1/4th level" signal voltages will then appear at the input to the down converters. The down converters will frequency-shift the microwave satellite signals to the 'IF' range of the companion demodulator/receiver units. By dialing up or selecting the appropriate down converter frequencies, we convert inside of each down converter/receiver package the incoming selected satellite microwave signals to baseband video and audio. This is the 'traditional' approach to such a system, but it is by no means the only approach.

Another popular approach is to employ a single down converter unit which takes the full 3.7/4.2 GHz microwave satellite 'band' and converts it to a lower 'block' of frequencies; such as .95/1.45 GHz (DX) or .25 to .75 (AVCOM, S-A, etc.). In this case the single 'block' down converter typically mounts at the antenna in a weather tight housing and low cost RG-59/U, RG-6/U or RG-11/U cable is run from the output of the block down converter to the indoor equipment. Once inside, a UHF region signal splitter is employed to divide the available signal voltages into (in this example) four parts; 1/4th of the original total going to each of the separate, single channel, demodulators.

A third approach, used extensively several years ago but less often now, is to use single conversion receivers and signal isolators. In this case a microwave region four way splitter would be installed after the LNA and the four-way-split microwave signals would be fed into four separate single-conversion down converters. Between the splitter output and the input to the down converter would be a microwave 'isolator.' This is required because single conversion receivers feed 'back' their own local oscillator signal(s) through their inputs to any equipment attached to the same antenna. In our example, a receiver tuned to ESPN could, for example, cause reception interference to the receiver(s) tuned to WGN and/or MTV. The isolator should cure that problem. Then the demodulator units provide video and audio baseband signals to the modulators.

The output of the demodulators will be video and audio; the so-called **baseband** signals. The video output connects to the video input on the modulator; the audio output connects to the audio input on the modulator.

There are some potential compatibility problems here.

Most of the demodulators in use for semi-commercial and commercial applications provide a one volt peak to peak video signal. Most of the modulators available happen to want to see one volt peak to peak video, for 85% modulation of the video carrier. Most modulators provide a modulation control to set the modulation 'percentage,' and many receivers provide a handy 'video level control' to raise or lower the actual video signal level coming out of the TVRO demodulator.

A few of the modulators available (Blonder Tongue's ESM and TVM series, for example) provide a meter or LED indicator to tell you when you have reached the proper modulation control level setting with either the modulator's video gain control, or the receiver mounted video output level control.

The 'depth' of video modulation is an important parameter for high quality pictures. A real perfectionist would hook up an oscilliscope and measure the modulation. That is not entirely necessary; a reasonably good quality television, hooked to the modulator directly, can do the same thing. We'll see how, later in this series.

Most of the **modulators** used for semi-commercial and commercial applications have a 600 ohm **un**balanced audio input connection. Most of the **de**modulators have a 600 ohm audio **un**balanced output connection. Seemingly, it would be a matter of connecting one to the other. There are a few curves in there however.

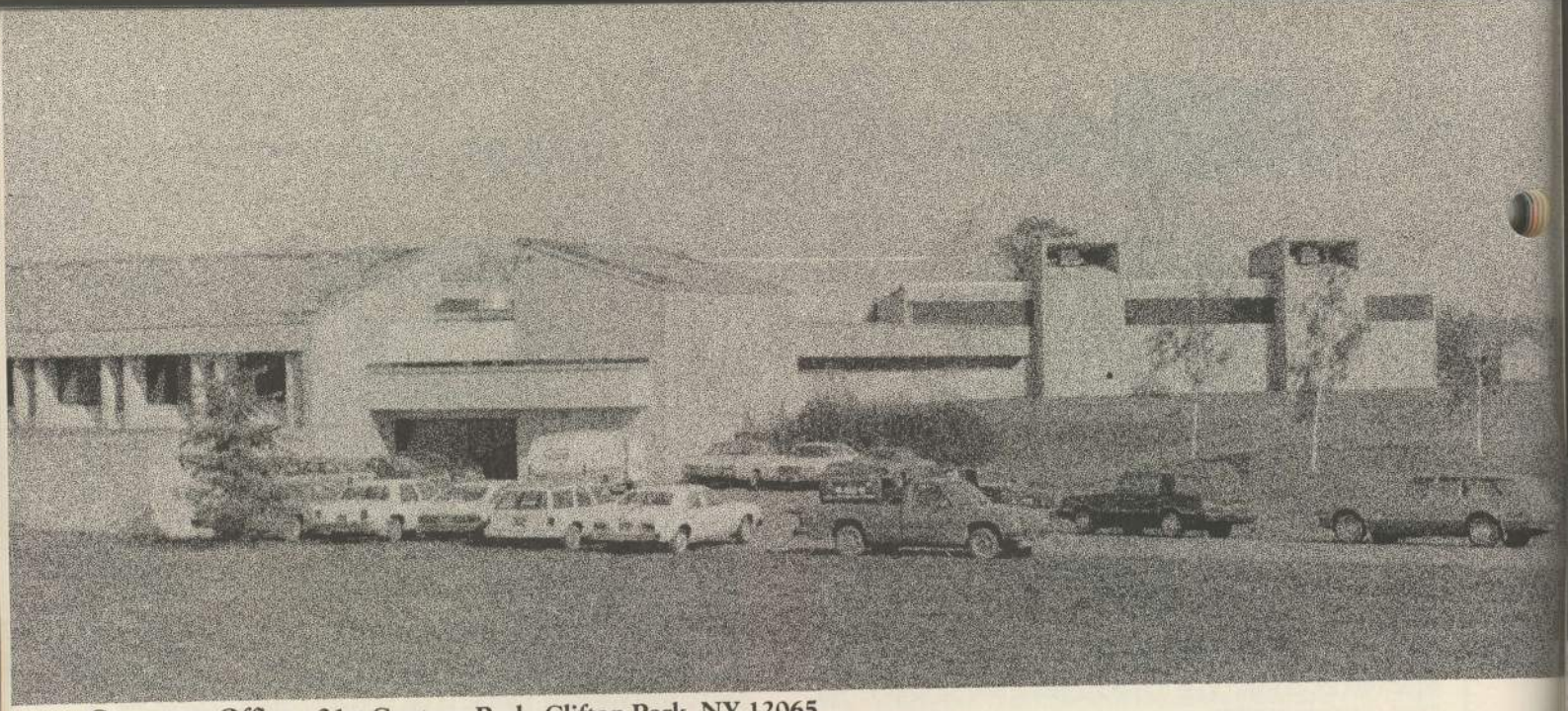
Balanced versus unbalanced audio. In a balanced audio system, both sides of the audio line 'float above ground.' That means that neither of the audio connections coming out of the receiver are at chassis ground. An RCA fitting, with a tip that inserts into a jack and a 'ring' that slides over the chassis mounted fitting/connector is not a 'balanced connector.' Because one side of the line goes to chassis ground, it is always unbalanced. The output fitting on the DX series receivers, for audio, is an RCA jack. The output fitting on an AVCOM 66T series receiver is either an RCA jack (unbalanced) or a four screw terminal strip. One might **suspect** that the four terminal-strip is some type of balanced **or** unbalanced audio **selection.** Not so. Internally, the four terminal screws are connected in an unbalanced-only configuration with the furthest right screw being the hot or center connection for audio and the next two to the left being simply chassis ground. The furthest left terminal screw is not connected up.

Some modulators (Blonder Tongue TVM series as an example) give you an optional approach to connecting up the audio. On the TVM, you have a pair of red colored terminals on the rear panel, adjacent to a 'grounding terminal lug.' If you had a 600 ohm balanced audio source available, such as you find in Microdyne receivers for example, you would do best to connect the 600 ohm balanced audio to the two red terminal screws on the TVM modulator. Now you would have balanced audio connecting to balanced audio. On the other hand, if your receiver has unbalanced audio, you would connect the hot lead of the audio (the center pin on the RCA jacked-end) to one of the two red terminal screws of the TVM (either of the two) and you would connect the interconnecting cable shield (ground wire) to the chassis 'grounding terminal lug' on the TVM; unbalanced audio to unbalanced audio.

Given a free engineering choice, there are some advantages to having balanced audio in the system. By keeping both sides of the audio line 'above' or away from the chassis ground, you reduce or eliminate the possibility that 'ground loops' will appear in the audio circuit. You know when you have a ground loop; the audio 'hummmms' on you. When you elect to use one side of the audio line as the chassis ground, you introduce the possibility that any extraneous 'AC' (60 cycle stuff) in or around the chassis will find its way into the audio line. However, as noted, very few of the TVRO receivers do offer true unbalanced audio, and even fewer of the modulators around accept unbalanced audio.

Some TVRO receivers offer an audio output level control (DX DSA 643) while others do not. Most if indeed not all of the semi-commercial and commercial grade modulators offer at least an audio modulation control. So like the video controls 'at both ends,' it would appear that

SMATV/ continued page 16



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SMATV/ continued from page 13

you have more than ample opportunity to 'set' the audio modulation amount to a pleasing level.

There are at least two audio adjustments which seem to have the same effect on the audio you are listening to or measuring. One is the true modulation control. Since this is an FM (frequency modulation) system, there is another control which may seem like it does the same thing. This is the deviation control; it sets how 'wide' or 'narrow' the frequency 'modulates.' The deviation control is not readily accessible on most modulator units; it is possible to find on the Transifier (Pico-Satellite) AVM100X series, for example. The rule here is that you carefully read the instructions with any modulator, and if you are tempted to start tweeking on 'unmarked' adjustments, don't.

There is one more control which also has the effect of adjusting audio 'level' in the receiver, although when you mess with it you are really living dangerously unless you have the proper test equipment. This is the **audio carrier level** control.

The audio carrier requires far less 'power' to the TV receiver than the video carrier. Standard off-air TV transmitters operate so that the audio carrier is at least 10 dB weaker than the visual carrier level. That means that if they are transmitting 100,000 watts of 'power,' the visual carrier is 100,000 watts (100 kW) but the audio carrier is 10 dB weaker than this; or, 10,000 watts (10 kW). Cable system operators learned many years ago that when you 'stack' immediately adjacent channels (such as 7, 8, 9, etc.) you cannot operate your audio carrier levels as strongly as they do 'off the air.' **For this reason you need to be able to adjust your audio carrier level to a lower level.** This requires some form of signal strength or field strength meter. We'll look at meters as a measurement tool subsequently in this series. For now, know that the **most desirable** audio carrier level is **15 dB below** the visual carrier level. That means that you measure the visual carrier level with a field strength meter (FSM), and then measure your audio carrier level; tweeking on the audio carrier level control, set it so that it is 15 dB weaker (or −15 dB) than the visual carrier.

And if you don't?

When channels are stacked one after the other on the dial, the TV set in the home is asked to separate those closely spaced channels. The average TV set can do this provided there is a close 'balance' between signal levels on adjacent channels. However, if the signal level on channel 3 is considerably stronger/hotter than the signal level on channels 2 and 4, on the cable system, the TV set will find it difficult (or impossible) to produce a clean channel 2 or a clean channel 4; there will always be some 'channel 3 interference' in the picture (channel 4) or sound (channel 2). By reducing the audio carrier level on each channel to a point that is 15 dB weaker than the adjacent video carrier, and, 15 dB weaker than its own video carrier, we give the TV set a little extra 'edge' in making clean pictures (and sound) on the adjacent channels. We'll take a long look at channel 'levels' in this series as well.

TRANSIFIER identifies the 4.5 MHz oscillator adjustment (slug tuned form just above '1 Filter 2' /'OSC' markings). **Best advice? Leave it alone unless you are desperate, or, have proper test equipment!**

STACKING CHANNELS

LOW COST
MODULATORS / NO OFF-AIR SIGNALS

NON-ADJACENT
CHANNELS — 2, 4, (5 **OR** 6), 7, 9, 11, 13
OR
3, 5 (OR 6) 8, 10, 12

MEDIUM COST
MODULATORS / WITH EXTERNAL BANDPASS FILTERS

CHANNELS — 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13

PREMIUM MODULATORS

CHANNELS — 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13

COMBINING The Channels

Up to this point we have each channel being created individually, in the headend, with its own signal processing equipment. Now, how do we get them all together into a single cable?

There are three techniques for doing this; all pretty much follow the same approach, but the hardware differs.

There are two rules in effect here:

1) You never directly 'combine' adjacent channels together in the same 'string,' and,
2) You always combine channels by low and high band groupings.

Now, what does that mean?

Most of the modern semi-commercial and commercial modulators have a **pair** of output terminals on the back plate or cover. They call these 'looping outputs.' Logic tells you that you only need one of these two outputs to connect that channel to some master connection where all are combined together.

What you do is stack the modulators or signal processor equipment in the rack in the sequence that you will 'combine' the channels. Here are the typical combining sequences for a 12 channel system:

1) String One: Channels 2, 4, 6
2) String Two: Channels 3, 5
3) String Three: Channels 7, 9, 11, 13
4) String Four: Channels 8, 10, 12

Any lesser combination than 12 channels would merely eliminate the 'string' or the channels not in use.

If the modulator has a built-in 'looping output connector series' (i.e. two output connectors per modulator/processor unit), you start off by taking the **first channel in the string** (2, 3, 7, or 8) and insert a 75 ohm terminator in **one** of the two looping output connectors. 75 ohm terminators are simply 'F' fittings with a tiny 75 ohm resistor soldered into the fitting. That leaves you with one unused output F fitting on those (four) channels. Now make up a short patch cord with an F fitting on both ends. Connect it from the unused output connector on channel 2 to **either of** the two output connectors on the channel 4 unit. Next make up another short patch cord of RG-59/U and repeat the process connecting from the unused channel 4 connection to one of the two connections on channel 6. Now move to the next string, starting with the terminator, and ending with the last modulator or processor in the string.

When you are all done, you will have four strings wired up, with one empty chassis mounted F fitting on channels 6, 5, 13 and 12. Now take a two-way hybrid signal splitter (**hybrid** is important!) and mount it so that you can run a patch cord from the unused fitting on channel 6 and the unused fitting on channel 5 to the two **output** fittings on the hybrid splitter. Do the same thing with the channel 12 and 13 unused fittings, connecting them to the **output** side of the **second hybrid** splitter.

SMATV/ continued page 20

WHY WOULD WE ADVERTISE A HOUSTON SATELLITE SYSTEMS PRODUCT?

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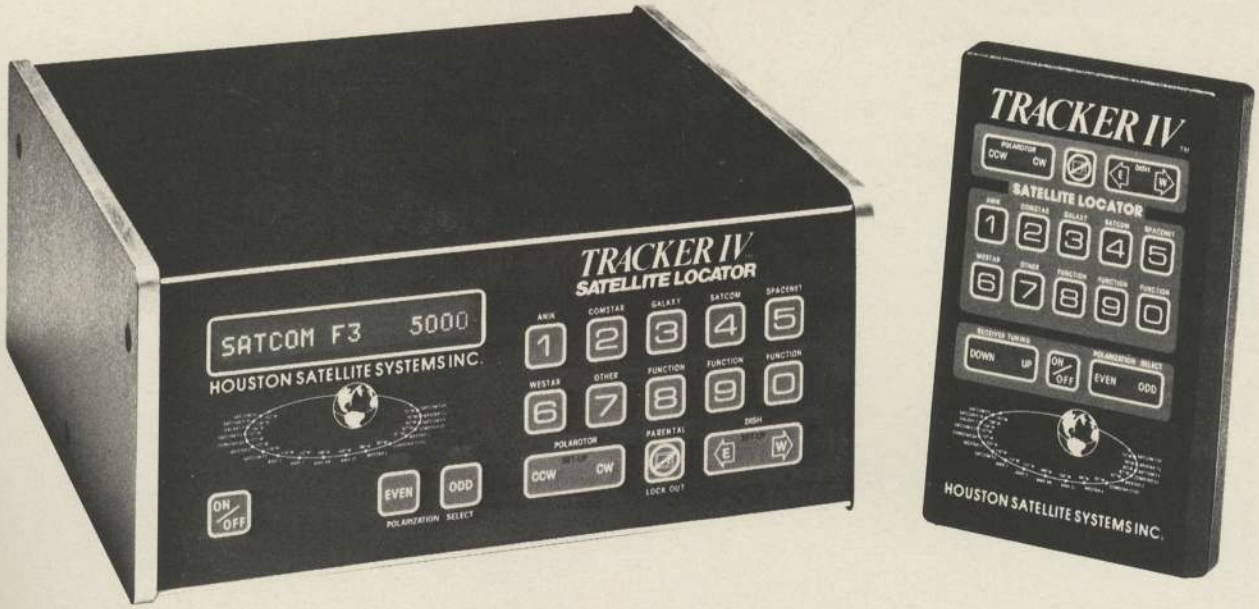
Our congratulations to Mike and his group at Houston Satellite Systems for a job well done!



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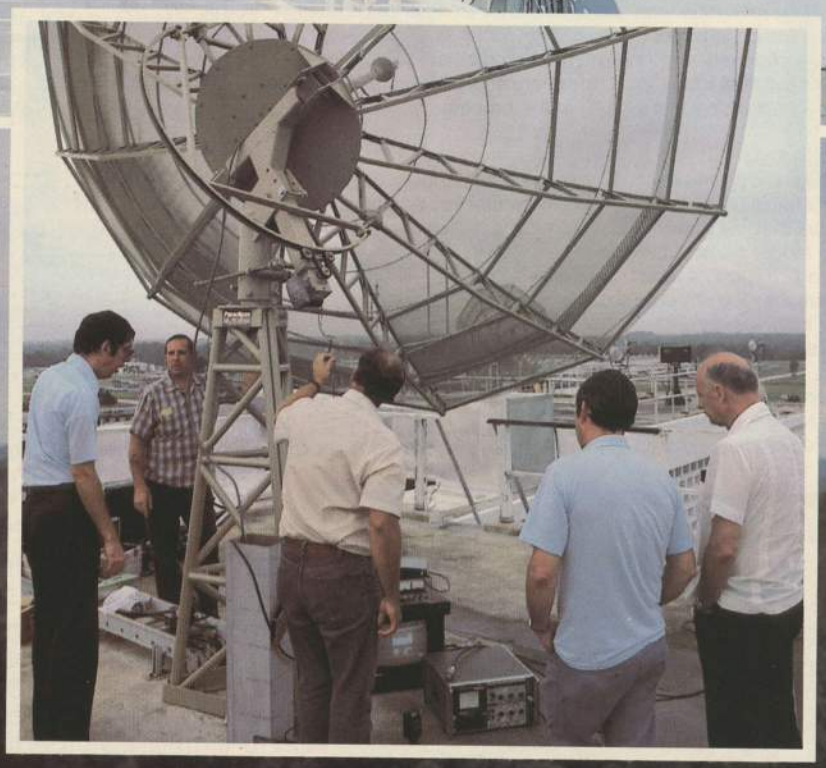
The Paraclipse 4.8 meter satellite antenna was installed atop NASA's Central Instrumentation Facility, at the Kennedy Space Center, November 1983. Paradigm engineer Gene Campbell (l.) and chief engineer Frank Casten (r.) assemble the superstructure using only simple hand tools and step ladders.

The completed installation of the 4.8 meter antenna with the 3.8 meter Paraclipse in the background.

Mark Fator photographer



NASA engineers watch as Gene and Frank fine tune the 4.8 meter with a spectrum analyzer.

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Paraclipse

HIGH PERFORMANCE SATELLITE TELEVISION SYSTEM

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Now we have two fittings left unconnected; the 'input' side of the two hybrid (two-way) splitters. Find either one more hybrid splitter or find a 'Low Band/High Band' splitter and hook it up in the same manner; the unused input side of the **low band** (channels 2-6) double string to either side of the third hybrid, or the **low band side** of the Low/High splitter; the unused input side of the **high band** (channels 7-13) double string to either side of the third hybrid or the **high band** side of the Low/High splitter. **Now you have** one **unused fitting;** the input side of the last (third) hybrid, or the input side on the High/Low splitter. This is your combined output for all 12 of your channels (or whatever number you have). Into this port you will connect your cable 'trunk line' to feed 12 channel service to the homes you are connecting up'.

This technique makes use of the internal 'combining networks' found in the modulators or processors. Not every modulator ever built has such an internal combining network. And, as we shall see, there are special circumstances where using the internal combining networks is not the best approach. So what **other techniques** are available?

All hybrid splitters. If you wish, you can 'turn around' two and three and four way hybrid splitters and use them as 'external' (to the modulators/processors) combining networks. A pair of **three-way** hybrids, using the output sides as inputs, would combine channels 2, 4, 6, and, channels 8, 10, and 12. A two-way would combine channels 3 and 5. A four-way would combine channels 7, 9, 11 and 13. Then you would use more two-way units to combine those 'strings' as we did in the preceding example.

Combining network. In the CATV world, it is possible to purchase a neat appearing rack mounting 'external combiner' that builds all of the separate hybrid networks into a single package. You have 12 (marked) input channels and one (marked) combined output. It will cost you about twice as much as using separate hybrid combiners but it sure cleans up a wiring "rat's nest" in the process.

LEVELS To Set

One of the basic premises of all cable systems is that all cable has 'loss.' You are familiar with this since you know that you can use only a certain amount of cable between your home installation down converter and your indoor demodulator.

There are two rules of thumb concerning cable 'loss.'

1) **The smaller** the physical size of the cable, the more apt it is to have 'high' losses.
2) **The higher** the frequency of the signal being carried by the cable, the greater the loss of power for the signal.

Any cable you buy has a known loss factor. You can check the specifications of the manufacturer to determine what the loss will be, at different frequencies, per foot or per hundred feet of cable. **These are very important numbers.**

SADELCO analog type field strength meter has scale calibrated in dBs (dBmV) **directly. Speaker grill allows technician to tune in audio carriers to confirm identification of signal being worked with.**

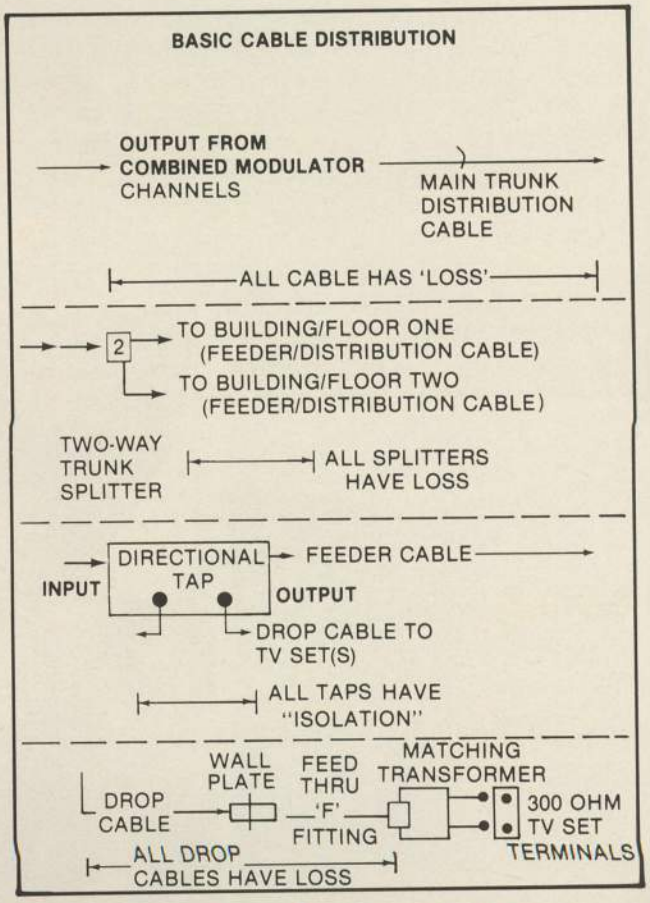
Let's make some statements and then plug some numbers in.

There is a desirable 'signal level' to be delivered to the TV set antenna terminals by the cable system 'drop' (the final connection to the TV set is called a 'drop'). **That number in cable jargon is 0 dBmV.** In TV installation terms, 0 dBmV is not zero signal; it corresponds to 1,000 microvolts where one microvolt is one-millionth of a volt. We determine how many microvolts or how many dBs of signal we have at any point in the system (including the output of the headend modulator/processor units) with a field strength meter (FSM).

Now the numbers.

Cable TV planners like to use the dB measurement system rather than the older microvolt system because you can directly add and subtract dBs whereas microvolts have many more numbers to handle for each computation.

1) If the TV set should have 0 dBmV minimum signal to produce a clean, clear picture, and we have +42 dBmV signal coming from our modulator at the headend, how much cable can we lay between the modulator's +42 dBmV output and the TV set 'drop' and still have 0 dBmV remaining?



Remember, 0 dBmV is not 'zero signal'; it is the equivalent of 1,000 microvolts which is plenty of signal for a standard TV set.

The answer is obvious. We can have **42 dB of cable loss** between the two points and still reach the TV set with an adequate picture. Now, how much cable is 42 dB of cable? The answer depends totally on what type of cable we are using. And, it also depends upon the frequency of our signal. Remember, cable loss is a function of cable length AND the operating frequency of the signal.

Smaller cable has more loss than bigger cable; higher channels (frequencies) have more loss than lower channels (frequencies). Some example numbers.

SMATV/ continued page 23

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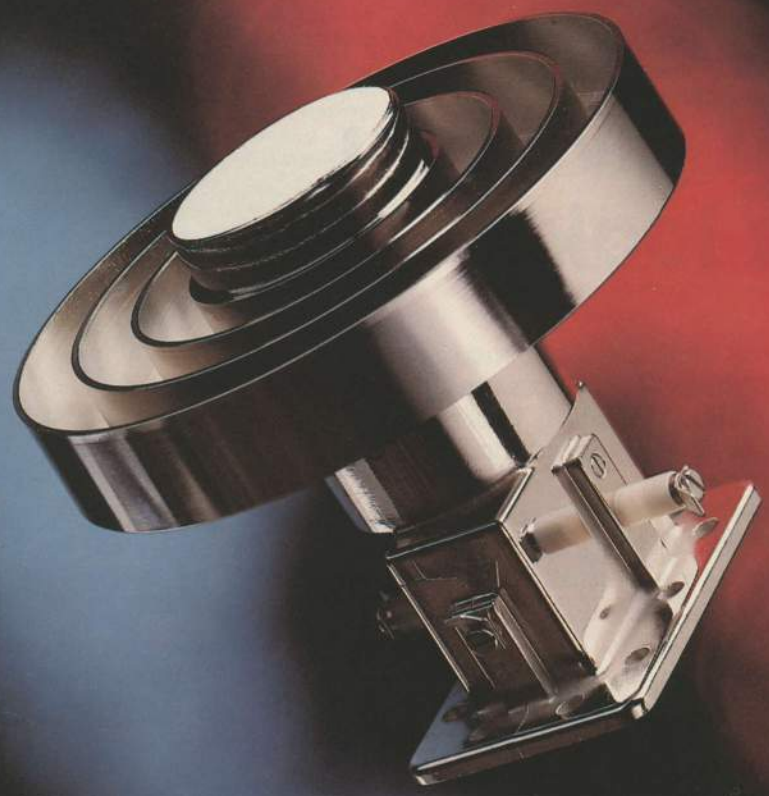

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SMATV/ continued from page 20

1) Our cable has 3 dB loss per 100 feet at channel 2, and,
2) 6 dB loss per 100 feet at channel 13.

That means we could transport the +42 dBmV signal through 1,400 feet at channel 2 (42 dB divided by 3 dB loss per 100 feet) or through 700 feet of the same cable at channel 13. And still have 0 dBmV signal left for the TV receiver. Those numbers, 6 dB loss at channel 13 and 3 dB loss at channel 2, are 'ballpark' numbers for **some** of the RG-59/U cable now on the market.

Another set of example numbers.

3) Our cable has 1 dB loss per 100 feet at channel 2, and,
4) 2.5 dB loss per 100 feet at channel 13.

Now we could transport the channel 2 signal through 4,200 feet of this cable or our channel 13 signal through 1,680 feet of the same cable. And still have 0 dBmV signal left at the end. These numbers (1 dB at channel 2, 2.5 dB at channel 13) are 'ballpark' numbers for **some** of the size .412 aluminum jacketed cable commonly used in cable systems.

There is an obvious design problem here; we could travel through more than 3/4ths of a mile of cable at channel 2 but less than a third of a mile of cable at channel 13. We probably want to travel through the same length of cable with all 12 channels (or channels 2 and 13 in our example) so how do we 'compensate' for this considerable difference in cable loss?

The most obvious answer is that we accept the channel 13 number (1,680 feet in .412 type cable; **always** check the manufacturer's **exact** specifications **before** planning ANY system) and design our system around that shorter number. If, it turns out, we can reach our intended end-of-cable destination before we run out of signal, **at channel 13,** our problems are simplified. But suppose we must go say 2,300 feet to reach our last home location; what then? The answer is that we must place an amplifier in the cable line to re-amplify the signal. We'll return to amplifiers separately.

Most cable systems do not start at the headend, run through a **single** piece of cable, and end up at a **single** TV set. Most cable systems serve dozens or hundreds of TV sets along the way. So how do we get signal to these additional sets that are not located at the end of our single line?

First of all, we take a close look at the area to be served. Suppose it is a two story building with some number of outlets on each floor. We know where it will all begin; where all (12) channels are combined into a single outlet. If the distance from the headend equipment to the two floor levels is more than 25 feet or so, we can install a length of cable from that **single** combined headend output to a convenient location where we will install a two-way (hybrid) splitter. The cable from the headend to the first cable-line splitter can be called a **'trunk'** since this is our 'main' signal line. Then from the (hybrid) splitter we have two lines outputting; **one to each** of the two floors in the building. We will call this new cable, leaving the splitter, **'feeder cable.'** We hang this name on it because it will directly connect to TV outlets on each floor, feeding signal to each.

The splitter has loss. All signal splitters 'lose' signal simply because they take whatever signal is fed into their input and they divide that total available signal into two, three, four, six or eight more or less equal parts. So they don't actually lose (very much) signal; they simply divide it into parts. That 'loss' however is important to us because when the signal is split into two parts, we now have only half as much available to us for subsequent cable runs on **either of** our two 'feeder lines.'

Here is an important number to remember. An ideal signal splitter will 'lose' 3 dB of signal in a two-way split. There is no such thing as an ideal signal splitter so it is safer to assume the signal 'loss' through the two-way splitter is 4 dB (a three way splitter typically will 'lose' around 5.5 dB per split leg while a four way splitter will typically lose 7 dB per output leg). When we resume our calculations of signal 'loss' or degradation between the headend and the end of the line(s), we must now add 4 dB of loss into our calculations to account for the splitter. That is the equivalent of shortening up the maximum cable length (remember, it was 1,680 feet for type .412 cable) by 4 dB of cable; or, 160 feet of cable.

Now we have two separate feeder lines, **one for each floor.** And

off they go to provide multiple channel TV service to the TV sets located there. We get TV signal **out of the feeder** by 'tapping into' the feeder. The device that does this is called a 'signal tap,' or to cite a specific type of signal tap, a 'directional tap' (also known as a directional coupler). This is a passive device (it uses no electricity to operate) which has an input and an output connector, and one, two, three, four or more 'tap connectors.'

Directional taps (DTs) are available in various 'values.' Here is what they do and why they have numerical values.

1) You will install a directional tap in the feeder line at a location which allows you to serve one or more TV outlets. You will select the DT based upon two parameters. One of these is the number of TV sets you wish to serve at that location. Let's assume you have two TV sets to serve at our first location, either in the same residence or because you were careful or lucky, you can locate a DT where you can reach two separate residences from the same DT location. So our first DT will have 'two tap connections' or outlets.

2) At each location where a DT will go in the line, you have some known amount of signal strength. You can (and in fact you MUST) calculate how much signal will be present **on the feeder line** at that tap's location. You calculate this by starting off with the total amount of signal available to you on the highest frequency channel (+42 dBmV) and then subtracting all of the losses up to that point.

A) Assume we have 25 feet of .412 trunk, and 100 feet of .412 feeder. That is 125 feet of .412 cable which we shall say has 2.5 dB loss per 100 feet. That works out to 1.25 times 2.5 or 3.1 dB of cable loss.

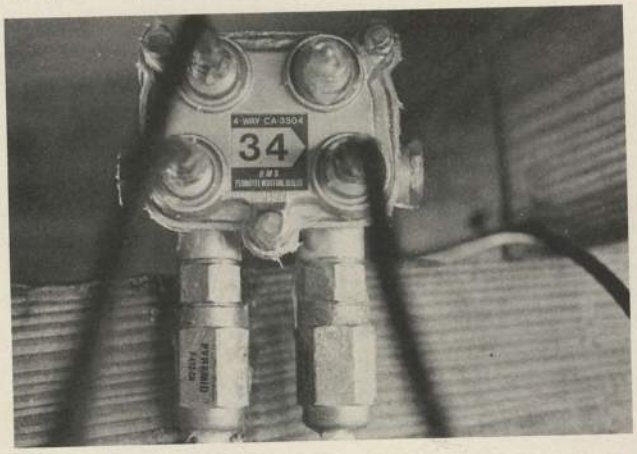
B) We also have that trunk splitter that creates our two feeder lines, and we know it has 4 dB of loss.

The total loss, between the headend and that first DT location is 3.1 plus 4 or 7.1 dB. If we started out with +42 dB dBmV of signal, and we have lost 7.1 dB of signal getting to the first DT location, we now have 42 − 7.1 or (+) 34.9 dBmV of signal **in the cable** where the DT will install.

Now, to get from the DT's actual location to the furthest TV set outlet inside the residence, we have 100 feet of RG-59/U cable. That cable will have 6 dB of loss, in our example, at channel 13. So now we have an additional 6 dB of loss, before we reach the TV set, so our (+) 34.9 dBmV signal has now become 34.9 − 6 or 28.9 dBmV.

That is an important number since directional taps have something known as an **isolation** value. So what's that?

Just as there is an optimum signal level for a TV set (0 dBmV) so too is there a 'maximum' signal level if we want to avoid 'overloading' the TV set with too much signal. Generally, that level would be around +10 dBmV. If we considered the directional tap to be a loss-less device, one that just pumped all of the signal available at that point straight to the TV set, we would have +28.9 dBmV of signal going to the TV set. If +10 dBmV is a safe 'upper limit' for too much signal, that tells us that somehow we have to reduce the signal actually going through the tap by some considerable amount.



DIRECTIONAL TAP serving three outlets. This unit has 34 dB of isolation (marked on the plate). **The fourth outlet is 'terminated' with a 75 ohm terminator; unused.**

Isolation does this. Built into the DT is a circuit that by design reduces the amount of signal the tap allows to flow from the feeder line through the 'tap connector' to the RG-59/U line that goes to the TV set. This circuit is known as an isolator and it simply controls how much signal is available from the line to the TV set.

Taps are available in various 'dB isolation values'; 32, 29, 26, 24, 22, 18, 15, 12 and 10 are fairly common values. What you have to do is to select the proper DT, having both the appropriate number of 'tap connections' **and** the proper amount of isolation for **each tap location.** In our example, we would select a tap with 29 dB of isolation because we found out that we had +28.9 dBmV of signal left when we caluculated how much signal we needed to reach the example outlet with 0 dBmV after 100 feet of final-leg RG-59/U cable.

You repeat this calculation process for each tap location, starting off with the amount of signal you have at the headend and then summing all of the loss factors (cable and splitters) along the way. There is one more loss factor to consider. The DT itself.

While the DT is 'passive' and it uses no operating power, **it does remove some of the signal in the feeder line** to go to the TV outlet(s) connected to that tap. So as we move 'down the line' from the headend to the end of the cable run, we have to keep adding additional losses as we go:

1) Cable loss in trunk
2) Cable loss in feeder
3) Loss in splitter(s)
4) 'Through' loss in each DT (loss between the feeder line input and the feeder line output)

These losses will be cumulative as you go further and further from the headend. Then for each drop along the way, you must add in the loss of the RG-59/U (or other type) of drop cable connecting the individual sets to the feeder line proper.

DT losses vary as a function of isolation value. The **greater the isolation** (29, for example) the **lower the DT 'through loss'** added to the feedline level. The lower the isolation (10 dB, for example) the greater the DTs loss contribution to the feeder line. Loss values such as .3 dB are common for high isolation DTs while losses such as 1.5 dB are common for DTs with low isolation values. Each DT manufacturer will tell you what 'feeder line' losses to add to your calculations for each value of DT.

FLAT vs Tilt Loss

We noted earlier that cable has more loss as the frequency of the signal increases. Channel 13 has more loss than channel 2, for example, in all cable.

Not everything the signals travel through has this type of loss. Signal splitters and DTs, for example, have **'flat loss.'** That is, their loss is the same at channel 2 **and** 13. A splitter with 4 dB of loss at channel 2 will have 4 dB loss at channel 13.

Therefore your system calculations have to be twin calculations. In one column you are calculating the total system loss at the lowest channel (2) and in another parallel column you are calculating the loss at channel 13. But there is a problem coming, as you might suspect.

If we have designed the system for the maximum loss factor at the highest channel (13), what is happening to the lowest channel(s) through all of this? Remember that there is a **maximum level to the TV sets** as well and as we approach the end of the feeder line where we are nearing the point of no return at channel 13 (0 dBmV delivered to the last set through the last DT) where do you suppose the channel 2 signal level is at this point? The answer is that it will be much-much higher, since it has not suffered as much 'cable loss' as has channel 13.

You can pre-calculate this difference, and in fact you will have to in laying out the system. Then before you turn the system on, you will have to **'compensate'** for this extra signal on the lower channels.

Let's assume you determine that at the end of the line, last tap out of last DT, you will have just 0 dBmV at the end of the drop line to the TV set; on channel 13. Now let's assume you calculate that your channel 2 level will be 15 dB stronger than this (the equivalent of 1,000 feet of cable loss). Ideally, we would have channel 2 at 0 dBmV **and** channel 13 at 0 dBmV at the **same** point. The easiest, safe, way to do this?

Tilt the signal levels at the headend.

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Tilt means that there is an on-purpose difference between the lowest and highest channels, as they go through the cable system. Let's concentrate only on that end-of-feeder line tap outlet for a minute. Our calculations tell us that there will be 15 dB more signal on channel 2 than on channel 13 at that location. **One solution** would be to **turn down channel 2 at the headend by 15 dB;** rather than operating at an output level of +42 dBmV as we started off with initially (for channel 13), we will lower it 42 − 15 or to +27 dBmV. Now they will both come out **even at the end.** But what about closer to the beginning, say the first drop?

Remember that we had 3.1 dB of cable loss plus 4 dB of splitter loss as we entered the first DT. If we whacked off 15 dB of channel 2 signal at the headend, we would be around 13 dB weaker on channel 2 than on channel 13 at THAT tap location. Hummm.

That shows us that while we must consider the signal ranges at the last tap in the line (the one MOST affected by cable tilt differences) we must **also consider** the reverse effects of tilting the headend output levels at the intermediate taps as well.

There are two solutions to this one.

1) Install into the various tap lines some passive 'tilt equalizers'; devices which allow you to artifically reduce the low band signals while passing the high band channel levels with no attentuation. This is a pure way to do it, but it raises the cost of those drops by around $6 each for the passive 'tilt equalizer.' There is another solution.

2) Remember that while 0 dBmV is the minimum and also the recommended signal level to reach the TV receiver antenna terminals, that +10 dBmV is the maximum. **And anything in between these two numbers is very acceptable.**

If we would be 13 dB too low on channel 2 at the first tap, or, 15 dB too high on channel 2 at the last tap (when we operate the headend with channel 2 reduced 15 dB in the first instance, or level with channel 13 in the last instance), why not 'split' the difference; that is, operate channel 2 so that it is 8 dB lower than channel 13 at the headend? Now we would be 0 dBmV on channel 13 and +5 dBmV on channel 2 **at the first tap** outlet, and 0 dBmV on channel 13 and +7 dBmV on channel 2 **at the last drop.** Everyone is more or less happy, and the system operates within the proper **window** without any add-on-cost passive tilt equalizers.

As you may suspect by now, we are not simply dealing with channels 2 **and** 13; if we have a 'fully loaded' system of 12 channels, we have 12 channels to adjust and balance. A typical headend output level chart, for our example system, might look like the following:

Channel	Output Level
2	+34 dBmV
3	+34 dBmV
4	+35 dBmV
5	+35 dBmV
6	+35.5 dBmV
7	+40 dBmV
8	+40 dBmV
9	+41 dBmV
10	+41 dBmV
11	+41 dBmV
12	+42 dBmV
13	+42 dBmV

As the table suggests, we are going up in frequency (and channel number) as well as output signal level for the channels. Channels 2-6 are called 'low band' and they operate between 54 and 88 MHz. Channels 7-13 are called high band and they operate betwen 174 and 216 MHz. There is a considerable 'spectrum space' between low and high band, and thus there is a considerable 'jump' in headend output power as we jump from 6 to 7.

THE TV Set As A Test Instrument

With considerable experience and a sixth sense for what is wrong and right, it **is** possible to use a television set as a test instrument. However, this caveat: **there is no substitute** for a field strength meter (FSM) to properly set up an SMATV system.

At the headend. The first place you need to 'test' the signals is at the headend. Any modulator channels require adjustment of the video modulation, the audio modulation (level) and perhaps the ratio between the visual and aural carriers. You can use the TV set with modest precision to adjust the video and audio modulation levels. The ratio between the visual carrier and the audio carrier (remember, the audio carrier should be 15 dB weaker than the video carrier) is another matter.

SUMMING SYSTEM LOSSES

TRUNK CABLE LOSS = −_____dB
(PER FOOT, HIGHEST FREQUENCY)

SPLITTER LOSSES = −_____dB
('FLAT', SAME CH. 2 OR 13)

FEEDER CABLE LOSS = −_____dB
(PER FOOT, HIGHEST FREQUENCY)

DIRECTIONAL TAP LOSS = −_____dB
('FLAT', SAME CH. 2 OR 13)

NOTE: 'LOSS' IS STRUCTURED OR CONTROLLED BY 'VALUE' OF **DT**; KNOWN AS 'ISOLATION'.

DROP CABLE LOSS = −_____dB
(PER FOOT, HIGHEST FREQUENCY)

ADDITIONAL LOSSES

DIRECTIONAL TAPS; ALL = −_____dB*
HAVE 'THRU LOSS' PLUS 'ISOLATION' TOWARDS 'TAP' OUTPUT TO DROP CABLE

*-SUM OF ALL THRU LOSSES, ALL DIRECTIONAL TAPS, BETWEEN MODULATORS (HEADEND) AND SPECIFIC DT CONNECTING TV SET TO HEADEND MODULATORS

Recall that a TV set has optimum input level parameters. On the cable system itself, we are spending considerable time (and money) to insure that **each channel** is arriving at the customer receivers at about the same signal level, and within a 'window' of 0 dBmV to +10 dBmV. You can**not** run a cable from the output of the modulator directly to a TV set and expect to analyze the quality of either the video or the audio.

A typical SMATV type modulator has an output level of between +40 and +60 dBmV. That is several tens of thousands times as much signal as the TV set is designed to handle, properly. There is no danger of blowing anything up; it is simply that when you put too much signal into a TV receiver, the TV set no longer does its job properly and what you see on the screen or hear in the speaker is no longer a proper representation of what a subscriber will see.

Most SMATV type modulators have an output 'test port' or tap. This is usually marked "−30 dB" or "TEST." An output test port that is marked "−30 dB" means that whatever output level you have available at the real output connector will be 30 dB 'weaker' at the test point/port. A modulator that is capable of putting out +60 dBmV will still have +30 dBmV (60 − 30) at the output TEST port. That is too much signal for a typical TV set to handle, gracefully. If the modulator has a master 'output level control,' you can reduce the output level with that control and simultaneously reduce the output level at the test port. Most such controls cover a 20 dB range which means that you could lower the level at both the regular and the test port by 20 dB; to

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+10 dBmV in our example. You should do this **before** making any serious critiques of the video and audio.

The video modulation control establishes the percentage of modulation; the ratio between the carrier level and the video signal that is used to add 'intelligence' to the carrier. A properly modulated carrier will have 87.5% modulation. That is a difficult level to **maintain,** however, since the amount of modulation changes constantly as the video scene itself changes. With a TV set as your own test tool, anyplace **below 85%** and **above 55%** is probably a reasonable goal to shoot for.

Too much video modulation. The picture has a bleached-out white look; white objects appear super-white, all detail is lost in them. Black objects 'smudge' and if the video modulation is close to 100% or beyond, the TV set may 'buzz' when there is an excessive amount of white or light colors on the screen. Turn it down.

Too little video modulation. The picture looks washed out, the yellow and blue and white colors seem to be behind a filter and there is no 'snap' to the video. Contrast levels are low. Turn the video up.

If the modulation is being adjusted, in this manner, during regular programming, stick with it a few minutes to insure that when there are many bright colors the picture does not **over** modulate and bleach out (or buzz). Most people tend to set the video modulation 'too high' rather than too low, initially.

This would be a good point to suggest that the color level, the brightness, and the contrast on the test receiver should be properly adjusted **before** you do much else. There are two ways to do this, in the field.

1) Tune in a regular terrestrial station and make sure the picture looks like a quality picture should look. Then without touching any of the three above mentioned controls, check out the modulator channel.

2) Switch the satellite receiver to a channel with color bars up (TR22, for example, on F3R). Adjust the TV set for proper color bar display. Then leave the TV set controls alone and proceed to the modulator channel.

The audio level controls are very difficult to set properly on the modulator unless you have a reference to go by. The **best reference** is a local, terrestrial TV station signal. Adjust the TV receiver's audio control to middle range and note how 'loud' the sound is. Make sure there is normal talking, not a quiet scene or loud music, on the air. Now switch to the modulator channel and attempt to match the two, to your ear. Not very professional, but you can get to within 3 dB of audio level to the local station in this way. A videotape machine as a source will also work if you are minus a local signal.

If your TVRO receiver has **its own** audio output level control (i.e. DX DSA series) **and you also have** a modulation level control on the modulator, you have two controls to work with. Some modulators are very sensitive to too much audio **drive;** that is, too much audio signal **coming from** the TVRO receiver. Therefore, when you run the adjustable audio level control way up high or maximum on the TVRO receiver, you may find that you have to but barely 'crack open' the modulator's modulation control to get the proper audio level. **That is a mis-adjustment** since you may overdrive the input circuit on the audio side of the modulator in doing this. The result will be proper audio **level,** but some fuzzy sounding audio that may crackle, hiss or garble on high voice peaks/loud sounds. The appropriate thing to do is to compromise the two controls; set the TVRO receiver's output level control back to about half way, and then adjust the modulator audio level control to an appropriate level for 'comparable' audio levels.

The following adjustment is not recommended but we do pass it along as a skill which perhaps you can acquire. The subject here is setting the audio carrier level to something approximating the desired 15 dB 'down' level reference the video carrier.

A typical TV receiver will still recover reasonably good audio when the audio carrier is reduced below the video carrier by 20 dB (i.e. −20 dB). The same receiver will all but lose, or lose totally, the audio when the audio level is set to a level that is **25 dB below** the visual carrier. So if you can tweek on the audio carrier level control, and turn it so that the sound **disappears** on the TV set, you know you are in the vicinity of −25 dB reference the visual carrier level. Now, marking that spot on the shaft, you can then turn the audio carrier level control fully up. At this point you will be around 5 to 8 dB below the visual carrier level with **most** modulators. Mark **that** spot on the knob or shaft. Look closely at the shaft; how much did you turn it to get from the −25 dB region to the −5/8 db region? If you split that difference, you should be in the −15/17 dB region with the audio carrier level.

When you have the **audio carrier level too high,** you end up with 'worms' in the screen on the **next higher** (immediately adjacent) channel. When you fine tune the TV picture on channel 4, for example, you find a spot where the color is best on 4 but you also have 'worms' crawling through the picture. Those worms would go away if you turned off the channel 3 modulator; indicating the audio carrier on channel 3 is too high and the channel 3 audio is getting into the channel 4 picture. You could then turn down the channel 3 audio carrier level to the point where the worms cleared up in channel 4. If you can also still comfortably hear the sound when tuned to channel 3, that is a good spot to leave everything alone until you get your hands on an FSM!

The danger in all of this is that without an FSM, you have no real way of telling whether you have worms in channel 4 video because the channel 3 audio is too high, **or,** because somehow the carrier levels on channel 3 are too high (or levels on channel 4 are too low). Sooner or later you will **have to invest in** a field strength meter (FSM) if you are going to play in this game.

Next month this series will continue and we will look at the test equipment aspect of SMATV plus walk through the many unusually perplexing problems that can occur when you are combining off-air terrestrial signals with locally generated modulator created signals.

FADED SIGNALS

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FADED Signals

Although the TVRO home antenna industry is but three years old (some would argue it did not **really begin** until 1980) there is already a rich history associated with those would-be programming entrepreneurs who wanted to be another Ted Turner or HBO. A substantial number of services, other than those that tried and failed during 1983,

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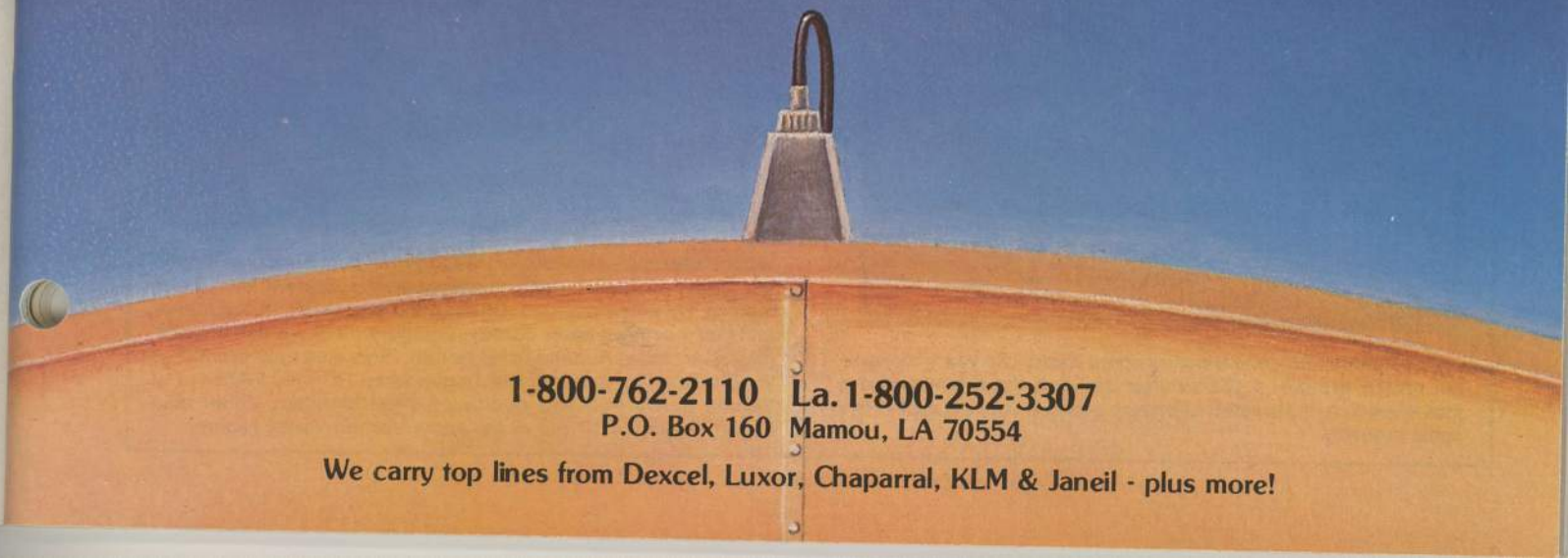

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Perhaps the most colorful entrant that came and went was something called the **'American Satellie Network'** or ASN for short. ASN came on the scene late in 1977. They announced they were going to become a 'super common carrier' and that they would provide four channels of television, as a 'package,' to cable systems all over the United States. This announcement came at a time when only WTCG/WTBS was operating on satellite (as an 'independent' signal) and three of the ASN services were going to be indie signals as well. ASN had selected New York's **WOR,** Chicago's **WGN** and **KTTV** from Los Angeles as its trio of non-network signals; effectively covering the nation and time zones in the process. The fourth channel was to be a movie channel.

ASN had problems from their first announcement. What they proposed to do was not covered by then-existing FCC rules. That made it easy to slow them down, if you were somebody who felt threatened by what they proposed (many, including HBO, felt some threat). You just kept shoving pieces of paper at the FCC and everytime you filed a piece of paper that bought another 30 to 90 days of keeping ASN 'on ice.'

The FCC aside, although the roadblocks set before ASN by the FCC can hardly be dismissed that easily, ASN had two other major problems as well.

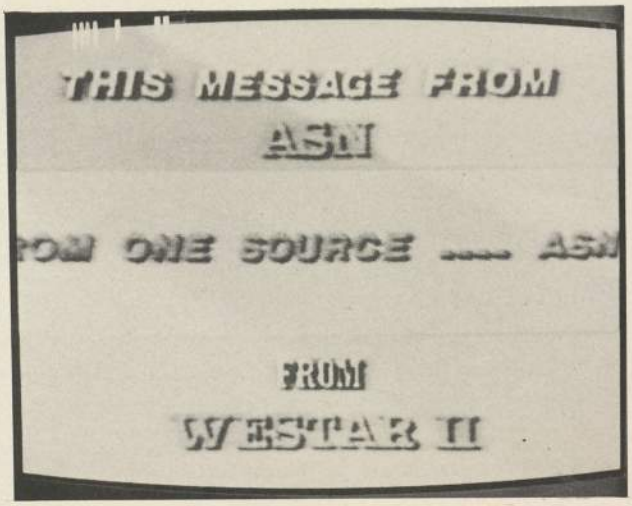
1) **It appeared** they were 'light on funding' and probably could not afford to do what they proposed to do, with the capital they had available to them. The FCC was concerned that this might be the case, but FCC rules only lightly touched on 'fiscal ability' in this area of telecommunications so the lack of funds was more of an operating problem than a legal problem.
2) **ASN wanted** to do their thing over on **Westar II.** This was back when Western Union's second bird was operating from the position now occupied by Westar IV (99 west).

At the time, cable was using RCA's F2, at 119° west. Fewer than 25% of all cable systems had one dish, and dish antennas were still in the $30,000-up region. So ASN faced a problem no other programmers had previously faced; how would it get the cable operators to install a **second** dish, for their four channels of service? Or, alternately, talk cable operators into abandoning F2's cable home in favor of 99 west.

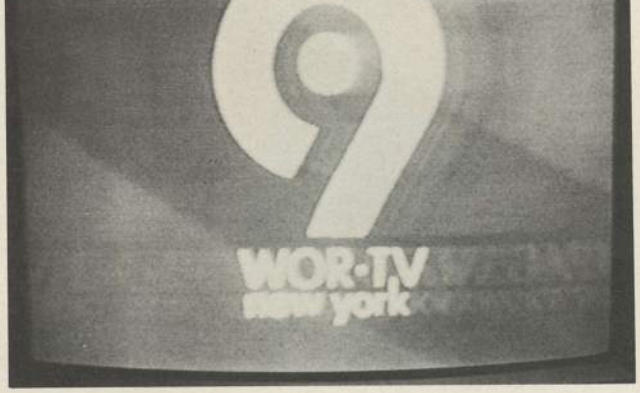
During 1977 the ASN project bounced from FCC basket to FCC basket. They would surface for a month or two, upset the cable marketplace, and then disappear into the 'noise' once again. It was during 1978 that ASN made its big moves. After an abortive attempt to get 'temporary service' onto Westar II during the November 1977 California cable show, they set their sights on the spring of 1978 National Cable Television Show in New Orleans. Even though they had managed to get **temporary permission** to send demonstration signals on Westar II, all did not go smoothly. By this time WTCG/WTBS had been joined on F2 at 119 west by two more independent signals; WGN in Chicago was now up and San Francisco's KTVU was also on the bird. Part of the original appeal of ASN had been that they would offer a 'package' of four signals (three indies and a movie channel) to cable operators. At the time of the project's conception, that was two indies better than F2 could offer. By the spring of 1978, it was dead-even and over on F2 there were many other desirable signals also operating as well. ESPN was active, Madison Square Garden/USA Network, Showtime . . . the list was indeed long. Additionally, RCA was planning to move all of the cable services off of F2 to F1 (then at 135° west) on June 1 (1978) and when that move happened, the 14 or so transponders then available to cable on F2 would suddenly become 22 or 23 transponders on F1.

ASN did demonstrate in New Orleans and for a brief period of time after the New Orleans show there were daily feeds from WGN, WOR

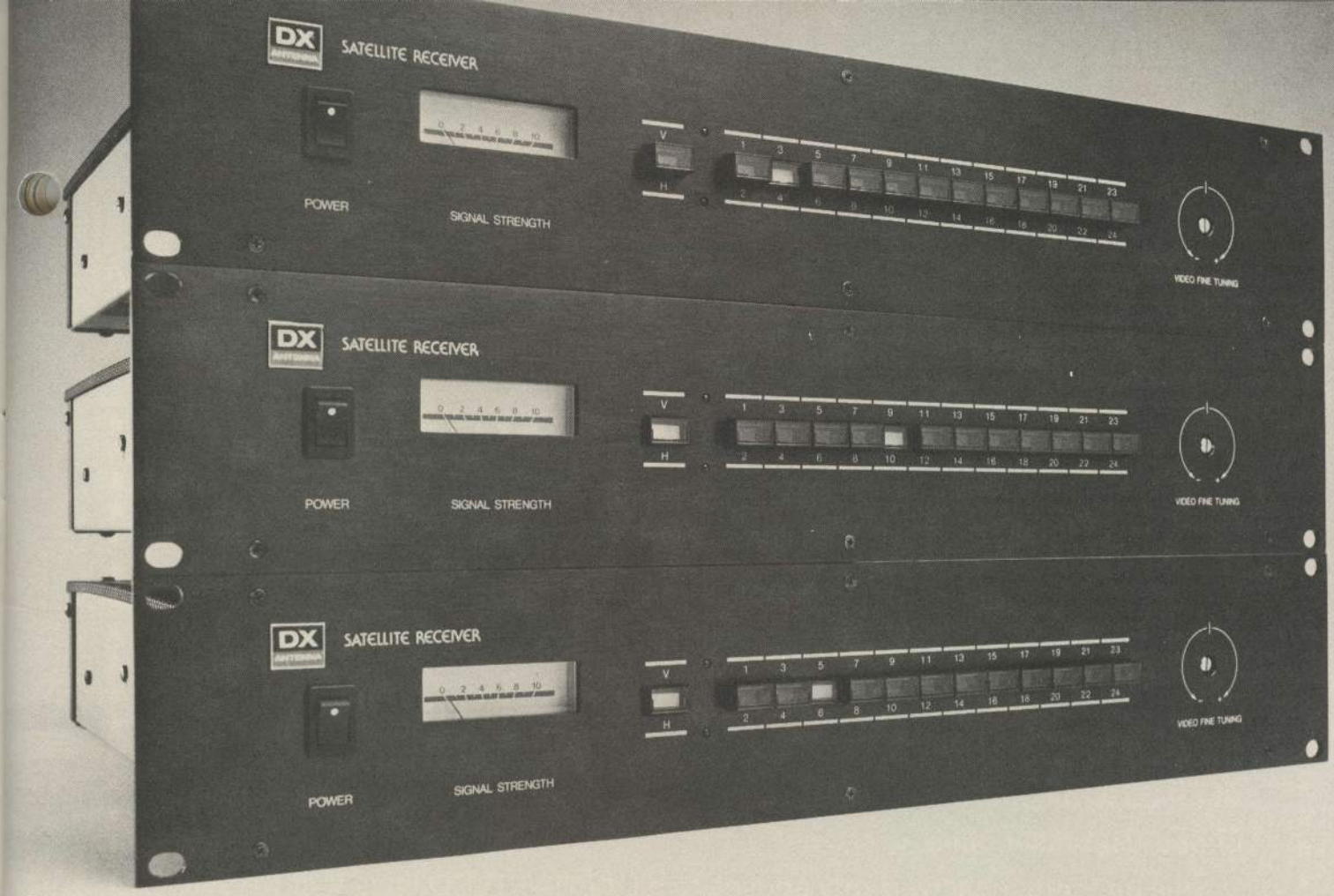
KTTV LOS ANGELES/ was one of the three 'Indie Super Stations' ASN had on satellite for a brief period of time.



ASN/ American Satellite Network spent nearly two years trying to get off the ground. A W2 service featuring three indies and a movie service, it attracted plenty of negative interest within the cable industry.



WOR's simultaneous feed on Galaxy 1 should herald an end to the 'ghost problem' which has plagued the Eastern Microwave feed on W5 since day one. Off-air pickup of WOR, in the mountains of northern New Jersey, brings with it 'ghost images' caused by local, mountainous terrain. 'Smeared appearance' of WOR is result; a problem that began when RCA fed WOR out of Vernon Valley (NJ) and continued when Western Union also began feeding WOR out of the same Vernon Valley region.



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and KTTV. A movie even ran for test purposes on the fourth of the ASN channels. But the money available was quickly spent and by the summer of 1978 ASN was once again in a holding pattern.

There was one last gasp from ASN in the spring of 1979. The pusher in the project was a chap from Florida named Mike Paolini who was operating hotel stand-alone movie services there. Paolini announced in February of 1979 that he **wanted** to use HBO for his movie channel service, on Westar II, rather than create his own stand alone service. Paolini had wisely decided that if you cannot beat HBO the best thing to do is to join them. Alas, this announcement was the end of the line and ASN was gone forever.

Paolini was last heard from in Costa Rica where he was attempting to put on the air a UHF television station, fed by satellite from the US, to operate in a scrambled mode. Some guys never give up.

The FCC in 1978 was in the midst of recently enacted rules which put the cable operator in a spot. Under the Commission's rules and some recently (1976) enacted copyright legislation, cable systems wee suddenly told **how many** independent signals they could carry on cable. Distant indie signals, such as carrying WTBS to San Diego, were in particular trouble. As it was sorting out, a cable system in a small town might get away with carrying as many indie signals as it wished. Provided the small town was not close to a big city that had its own indie station or stations. But the medium sized and large size cable markets were severely limited. This was at a time when ASN was proposing three of its own, and then there were KTVU in San Francisco (Oakland), and WTBS as well. Had the ASN plan flown, ultimately WOR could have been on two birds (each with a different 'carrier') and WGN would be in the same category. The cable industry was 'abuzz' as to **which** indie station would be **'next.'** Another Los Angeles station (KTLA) and a Boston station (WSBK) were frequently mentioned.

The FCC saw this one coming, and since their **intent** was to turn cable into its own programming medium rather than to allow it to develop as a satellite fed network for 'super stations,' it was slowly becoming apparent that **no more than three** 'super stations' would succeed in the marketplace. Three, it turned out, was the maximum number of super station signals which FCC rules and copyright law would allow into **most** markets.

When WOR came up on satellite (in the middle of 1978) the handwriting was on the wall for San Francisco's KTVU. The California station offered a west coast option to the eastern programming, and it was generally rated as one of the better indie TV stations in the country. However, the three hour 'negative' time difference worked against it in the east and cable operators were having trouble adapting their subscriber's viewing habits to **Romper Room** at 1 PM or the 10 O'Clock news at 1 AM. And while WTBS was attracting millions of homes on cable and WGN was making a decent if not spectacular showing, KTVU was having a difficult time getting to the **first** million homes. Since it took at least a million plus homes using the service at the time just to pay the uplink and transponder bills, the common carrier offering KTVU eventually sold off the transponder rights (TR1 on F1) to Nickelodeon. The common carrier bringing KTVU to satellite, by the way, was Southern Satellite in a partnership deal with Holiday Inns of America. Southern still operates the WTBS common carrier service today, as well as SPN (F4).

It was while KTVU was being carried on TR1 of F2/F1 that **SPN** was born. It happened this way.

KTVU was a west coast station and it generally signed off the air around 1 AM California time. That made it 4 AM in the east. KTVU generally resumed programming around 7 AM Pacific time which was 10 AM in the east. Southern/Holiday wanted to keep something other than a test pattern up between 4 AM and 10 AM eastern. But what?

One of their first efforts was to go to the FCC and ask permission to carry the 'CBS Late Movie,' from CBS affiliate **KPIX** in San Francisco. The idea was that this would give cable systems another shot at the CBS fare, and since it would be three hours after it first appeared in the east, it might fly. It got up, alright, but it was not a marketable service.

Their second effort was more innovative. Southern had the concept that there were programs being created **within the cable industry,** by some of the larger cable TV systems, which deserved to be on the air on a national basis. Would these cable systems 'loan' a tape of these programs to Southern for uplinking after KTVU left the air? They would, and did. And after a fashion, it worked although the time frame for the programs worked against it. But the germ of an idea was starting at Southern.

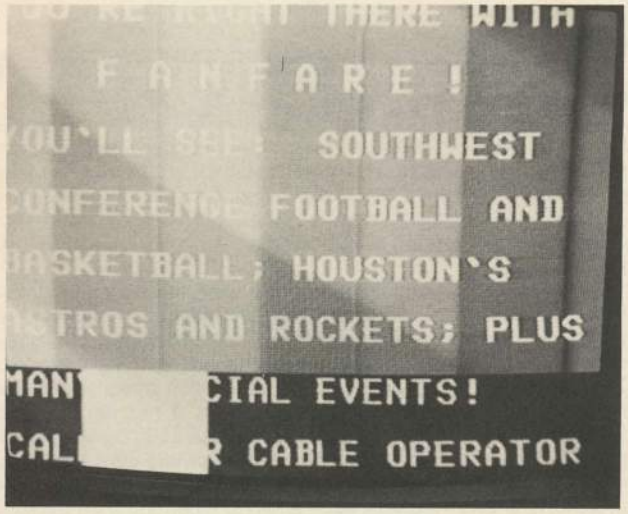
If they had the transponder time available, were there not people and firms out there who would **pay** Southern money for the ability to transmit those programs nationwide? The answer was yes, and in fact Southern discovered there was a small but identifiable market for various language-minority groups and others. And so SPN/ the **Satellite Program Network** was born. For the first few months SPN got by as a 'fill service' during those hours KTVU was not on the air. Today SPN has grown into its own 24 hour per day service on F4 and it holds two reservations for two additional channels on a new bird to be launched in 1984. And so, while KTVU did not make it, a small, filler service created to keep the transponder active when KTVU was off the air did. Such are the wonders of satellite television.

While the indies were having a difficult time sorting out their respective markets during the 1978-1979 period, another service area that was having a tough time was pay TV. When HBO began service on September 30, 1975, it transmitted but a single transponder for a five to seven hour period per day, in the **eastern** time zone slot. HBO was, at that time, a **'regional pay service'** serving only the eastern time zone of the country. Feeds for the west would come later.

Showtime, meanwhile, was making a living by sending videotapes around to each of its affiliates from coast to coast. There were other regional efforts, also using tapes and short hops of terrestrial microwave to interconnect cable systems in a given area. One of the most successful of such terrestrial-connected services at the time was called **PRISM;** operating in the Philadelphia area. PRISM had found that there was a nice market when you packaged premium movies with **premium,** local sports. By taking Philadelphia regional professional sports (basketball, hockey, etc.) and offering it on a special channel, and then using premium movies to balance the schedule, PRISM had created a successful operation.

The concept of a regional service, balancing sports and movies, seemed good. And so students of PRISM took the concept into the Houston area where they created a service known as **'Fanfare.'** This would be a satellite fed service, initially operating on transponder 16 of F1, running from around 5 PM to midnight (central time) seven days per week. By going after Texas and Southwestern Conference college sporting events, and professional sports from Houston, 'Fanfare' hoped to duplicate the PRISM program in the southwest.

Fanfare lasted not much more than 18 months. It lost money from the beginning, and failed badly at attracting 'live program rights' to the necessary college and professional sporting events. They had hoped that they could serve Arkansas, Louisiana, Texas, Oklahoma and New Mexico with a Houston base and a Houston flavor. But by falling short on the sporting contracts, they simply became another



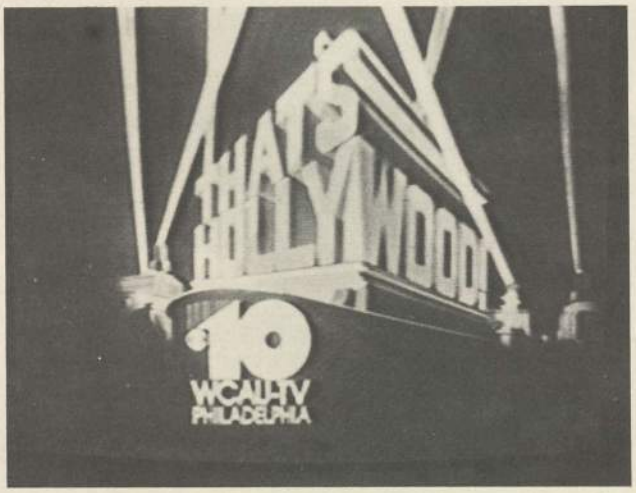
FANFARE/ was an almost-amateur attempt to regionalize sporting events from the 'southwest' and premium movie fare using F1's TR16. Showtime finally bought it up.

pay movie service which happened to have **some** sports. Since the sports were not live (they showed college football games only on a delayed basis), their schedule became difficult to understand and more difficult to adapt to. When Fanfare folded, Showtime picked up the option to the few subscribers they had, and the ownership rights to transponder 16 at the same time.

With Showtime owning transponder 16, but not using it, on F1/F3R, their efforts concentrated on simply making sure that transponder 16 would not cost them money month to month. That is why today transponder 16 is in use by so many different services through the course of the week; each simply uses and pays for what it can use. Lacking a full time **user/owner** such as HBO or CBN, the transponder becomes a 'melting pot' for services that require limited amounts of transponder time.

There have been plenty of other signals up on the bird on a regular basis, for relatively short periods of time, as well. During the period 1978/9, several New York and Philadelphia area network signals were fed to Anchorage, Alaska for videotaping. Because of the Alaskan time zone differences, and because Alaska was at the time feeding an evening television schedule via F2 (TR23) to approximately 60 **'bush terminals'** at small Alaskan communities, there was a need to get the same day's news and network programs **to Anchorage** where the programs could be taped, and delayed, before re-transmission back to the (small, 4.5 meter) Bush Terminals. This was initially done using network signals such as Philadelphia's **WCAU** (CBS) and later the Alaskan folks decided to take the direct feeds out of Los Angeles on F2 for transmissions to Anchorage. In all of this, there was a considerable amount of network television carried on satellite on a daily, dependable basis.

So this month as the **Spotlight** service on F3R (TR4) and W5 (TR21) 'leaves us' after a multi-year trial, and failure, to attract suitable subscriber support, it is hardly a unique happening in the annals of the satellite industry. Every year there are new starts, and every year there are new failures. The satellite TV business continues, as always, to be a very unstable bowl of jello!



WCAU PHILADELPHIA/ was the most reliable CBS service on satellite for nearly a year, fed by RCA to Anchorage as part of the 'Bush Terminal' project.

TESTING TVRO FEEDS/ PART THREE

CRITICAL Analysis

In our last segment of this multiple part report, we appeared in the December issue of **CSD** and looked at the apparent 'feed receiving patterns' for a number of commonly available TVRO feeds. We interrupted our look at feed test range measurements long enough, in January's **CSD,** to deal with the growing controversy over who owns what patent and trademark rights in the apparently lucrative TVRO feed industry.

While dealers may believe that they are 'the' important link in determining the success or failure of a TVRO feed in the marketplace, the apparent truth is that it is the antenna OEMs that make the biggest dent in the feed marketplace. A sizeable and growing number of TVRO parabolic antennas are now supplied with some type of feed mechanism **included** in the antenna carton. It has become both fashionable and competitive for the antenna OEMs to offer a 'complete' system, including feed, to the distributor and dealer network.

The distributor in turn will look carefully at the type of antenna feed system he is receiving with each antenna type, and then package around that a suitable receiver and perhaps polarization control system to interface with the feed supplied with the antenna. It would not be appropriate, for example, for an antenna OEM to supply an 8 foot reflector surface and a Chaparral **Super Feed** if the distributor was planning to package a receiver that included a control system for a **Polarotor I** with the antenna. The Super Feed would simply become a 'throw-away' item, neither required nor desired for **that particular** equipment package. A surprising number of feed systems have that very fate each and every month; especially when dealers go to one source for their receivers, to another source for their LNAs, and yet a third source for the antennas. Parts duplication, by category, especially in the feed and feed control area, results in a 'surplus' of feed systems in the marketplace.

There was a period of time when some felt you could 'measure' the size of the marketplace by simply counting the number of feeds being shipped per month. Is not **one feed** required **per TVRO installation?** When it became apparent that there may be as many as 25% **more feeds** being manufactured as placed into use, and that 'spare feeds' that could not or would not interface with the particular 'TVRO system' the dealer was using were piling up in distributor and dealer warehouses from coast to coast, the counting of OEM feeds-shipped stopped. It was decided that counting feeds was not that relevant afterall.

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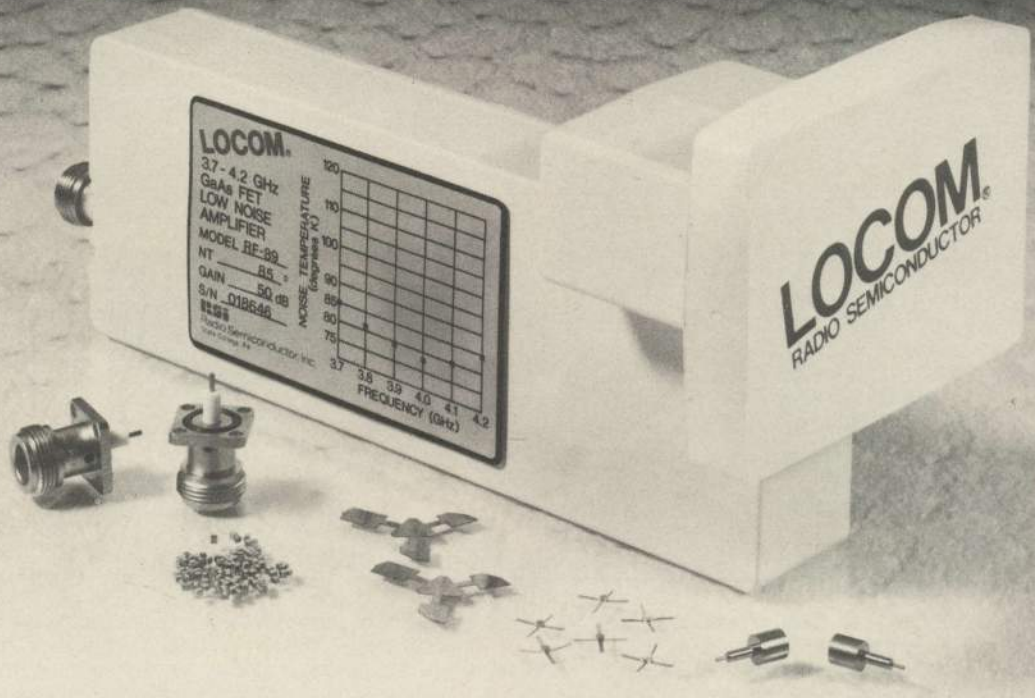

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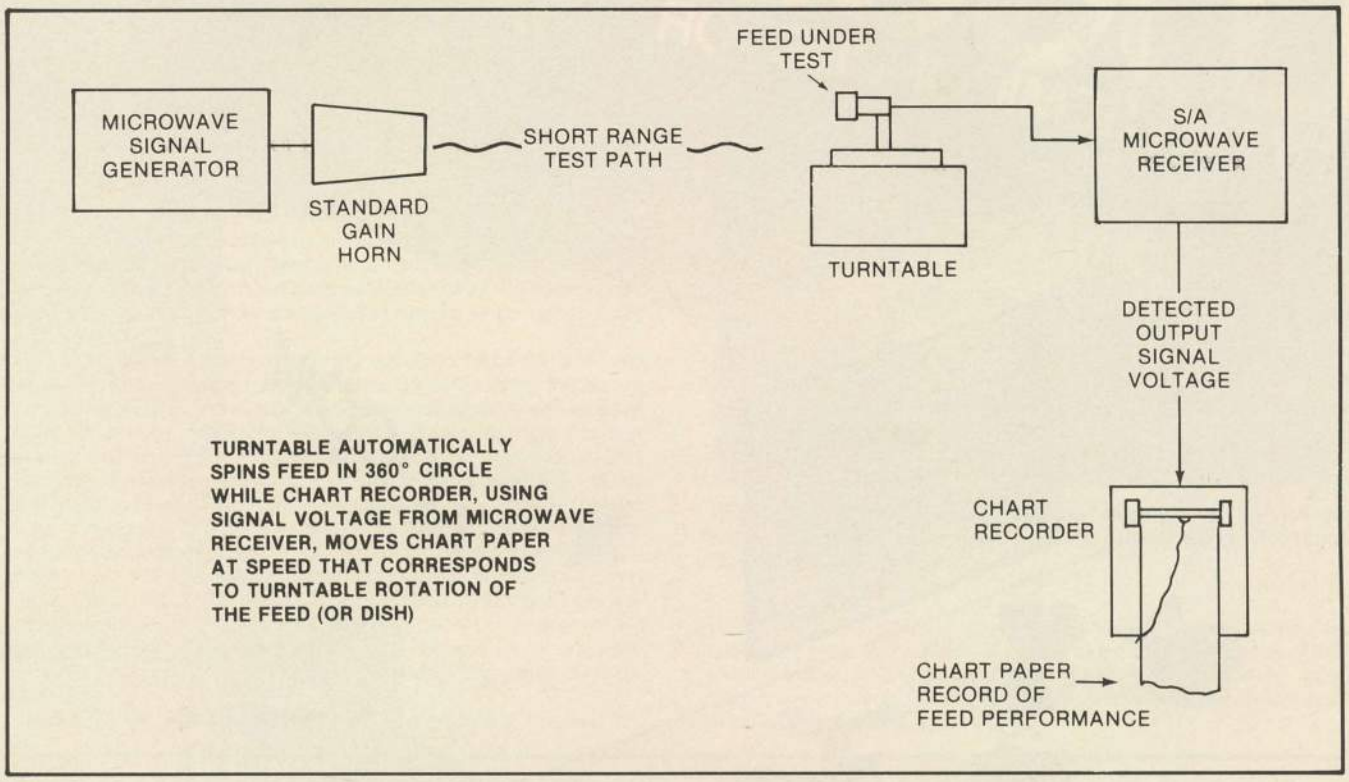

Still, each feed that leves an OEM's warehouse does count for something; it counts for dollars in the feed manufacturer's bank account if nothing else. And as **CSD** attempted to show in our January issue, there are some very big dollars at risk in this portion of the business at the present time.

Our look at feeds began in the December issue; we talked about how feeds are tested on an antenna test range and what the test range or test 'bench' can reveal to you about a particular feed. For those joining us 'late,' here is what we have done.

A group of feeds, representing most of the popular and widely distributed models and brands within the industry were gathered and taken to **Microwave Specialty Corporation** in San Diego. There the feeds were placed on a 'short test range' designed for feed evaluation. The test range consists of a signal source, or transmitter end, and a receiver/measurement end. The receiving system consists of a rotating mount on which each feed is installed, and an interconnecting cable that sends the received signal into a special (Scientific Atlanta) receiver designed for microwave antenna test range work. The S/A receiver in turn 'outputs' to a special chart recorder which creates a paper record of the receiver's signal strength.

CHECKING THE RANGE/ Duane Tubbs of MSC on the telephone to 'signal source tower' during initial range-proofing session to insure the range was operating properly.

The test antenna is rotated at a controlled rate around a 360 degree circle. The signal coming out of the receiver is recorded on special graph paper and after you have rotated the feed around its own axis, you have a written or paper record of the 'gain' and 'pattern' of the antenna being tested. You can then compare the written record for the antenna against other antennas, or make changes in the first antenna and 'cut a new plot' of the same antenna. You can compare two or more antennas on the same graph paper or create separate graphs for each antenna and compare them by cross checking.

We also did bench tests with some of the feeds. In the bench testing sequence we wanted to measure the 'VSWR' or impedance match of the feeds. The impedance match of a feed is a critical element in the feed's performance since a 'poorly matched feed' will not transfer all of the energy that the feed intercepts from the reflector surface into the 'mouth' of the LNA. Satellite energy 'lost' within the feed because of a poor 'VSWR' or match is lost forever. In our fourth and final part of this series, we will look at VSWR measurements for three feeds and show you why the feeds in question have special VSWR concerns for the feed users. Our fourth part will also rate the feeds, for various dish focal point to diameter ratios (f/D) and from all of this information you should have a better handle on the proper selection of a feed for the particular reflector or dish surface you are using in your own installations.

CLEARING Up An Impression

In the December issue we looked at the following feeds:

1) Boman EFH-75
2) Chaparral Super Feed (a new one, **and,** one that had 'weathered')
3) Polatron III

On page 12 of the December **CSD,** lower right hand corner, there appeared a photograph of a Boman EFH-75 feed with a 'prototype' plastic throat cover. In the text surrounding the photograph, we talked about what happens when you attempt to protect the throat or opening of any feed by inserting over or into the throat some type of plastic or compressed cover. Our message was that **anything you place in the**

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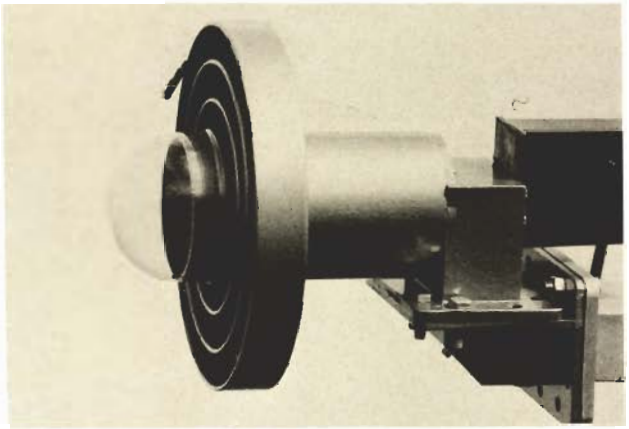
throat is going to change the characteristics of the feed. That change may be very slight (as is usually the case) or it might be quite substantial. It happened that during the tests in San Diego at MSC, Boman was attempting to find on their own an improved version of their own dome-shaped plastic cover for their various feed models. One new test dome-shaped cover which they felt was superior mechanically to their then-current cover was shipped down to MSC so that we could, on the antenna test range, compare the peformance of the feed with the new prototype cover, **and,** with the older style plastic cover.

We showed that the **prototype cover** had slightly greater losses (i.e. microwave signals going through the cover lost some power) and a slightly wider beamwidth (i.e. the plastic dome 'spread' the signals out more over a wider area) than the then-in-use cover. The photo appearing on the bottom, right-hand side of page 12 for December had the following caption:

"BOMAN EFH-75 FEED with thicker plastic throat cover. Objectionable losses."

We have received a couple of letters from readers who apparently only read photo captions and ignore the text!

"Does this mean Boman EFH-75 feeds are lossy?" we heard several times from readers. The answer, clearly stated in both the text and in the graphic chart portrayed at the top of the same page is that, **'No, the Boman EFH-75 feed had no objectionable losses.'** The loss we measured was with a **prototype** plastic dome cover in place. We advised Boman of what we found with that new, trial cover and they (wisely) decided not to use that cover in production model shipments.



BOMAN FEED with lower-loss plastic dome cover. (All covers have 'some loss'; **see text!)**

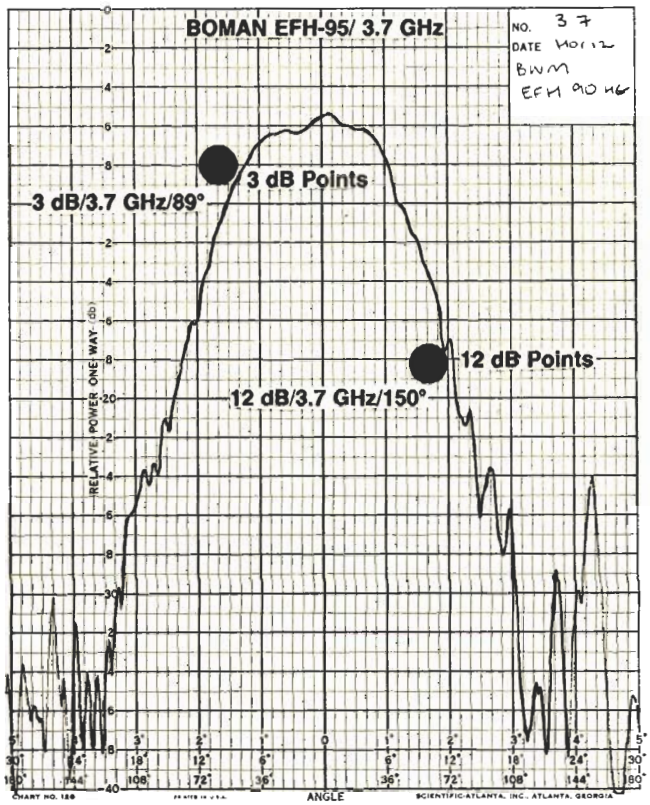
NO MIS-Impression Here

If the Boman EFH-75 feed was found to be high quality and capable of providing excellent performance (it was), another Boman feed model really had us scratching our heads for several hours.

The **Boman EFH-90** feed had been designed and promoted by Boman for the expressed purpose of being used on the 1983 antenna craze; **the .3 region f/D dish.** Chaparral had responded to the .3 antenna rush by bringing out their 'golden ring' which is a metallic insert that mounts inside of the primary throat opening of a Super Feed or Polarotor. Chaparral, at the time, felt that the best way to handle the .3 dish 'movement' was to continue to sell a feed designed for a .4 f/D (the standard Super or Polarotor feeds) but to offer a special 'ring adapter' for that feed to turn it into a .3 device.

The reason why the feed throat must be changed for a change in f/D is basic to feed system design. The feed has a 'field of view' or a 'vision angle.' Imagine that your eye is located in the exact center of the feed's throat, at the front towards the dish surface. One eye only.

Looking straight ahead at the center of the reflector, **your eye** can see around 50 degrees **either side of the center** (left and right, and, up and down) before the eye loses 'contact.' The feed has the same problem. When you have a .4 region dish, the distance from the center of the dish to the center of the feed (where your 'eye' is) happens to be 40% of the distance across the dish surface; a ten foot (120 inch) dish,



BOMAN EFH-90 feed, 3.7 GHz, horizontal. Essentially flat at low end of band.

and, the feed will properly be located 4 feet or 48 inches in front of the dish. That's 40% or .4 f/D.

A .3 f/D dish, on the other hand, has the feed **closer to** the dish; only 30% of the distance back from the dish's surface. A ten foot (120") dish surface with an f/D of .3 (30%) will properly have the feed 36 inches (3 feet) back from the center.

The lower the f/D, the closer the feed mounts to the dish.

As the feed gets closer and closer to the dish, it has to see better and better out of the edges of its throat. In other words, the 'vision' to the extreme edges of the dish must be improved. If you don't change the feed's design, if you insist on using a feed designed with a .4 dish in mind on a dish that has a feed focal point to diameter ratio of .3, the feed will only see a **part** of the dish surface. As much as 30% of the surface of the dish catches microwave satellite signals and returns them to the feed; **where they die.** They never get 'inside of' the throat and they never get to the LNA. A 10 foot dish ends up working like perhaps an 8 foot dish.

If antenna OEMs were insisting on building .3 f/D dishes, and Chaparral was going to react with a 'Golden Ring' to adapt their feeds, **what was Boman going to do?** They went to a noted, industry, feed expert and they asked that 'expert' to design for them a feed which, from scratch, was for a .3 f/D dish. Boman thought they saw a way to make their .3 feed better, by making it **strictly for .3 dishes,** to begin with. That was, perhaps, a marketing decision rather than an engineering decision.

Well, the EFH-90 feed we received for test at the MSC test range was unpacked and hooked up. The first thing we noticed, before we started to spin the EFH-90 feed around for the 'polar plot' graphic on paper, was that the feed seemed to have a substantial amount of additional 'gain.' In other words, where we left the receiver controls and where we had left the chart recorder controls for the last feed just ahead of the EFH-90, we were now seeing substantially (perhaps .75 to .9 dB) **more signal** from the EFH-90. On the surface, that may sound good. It turns out it was bad.

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one of three things so it:

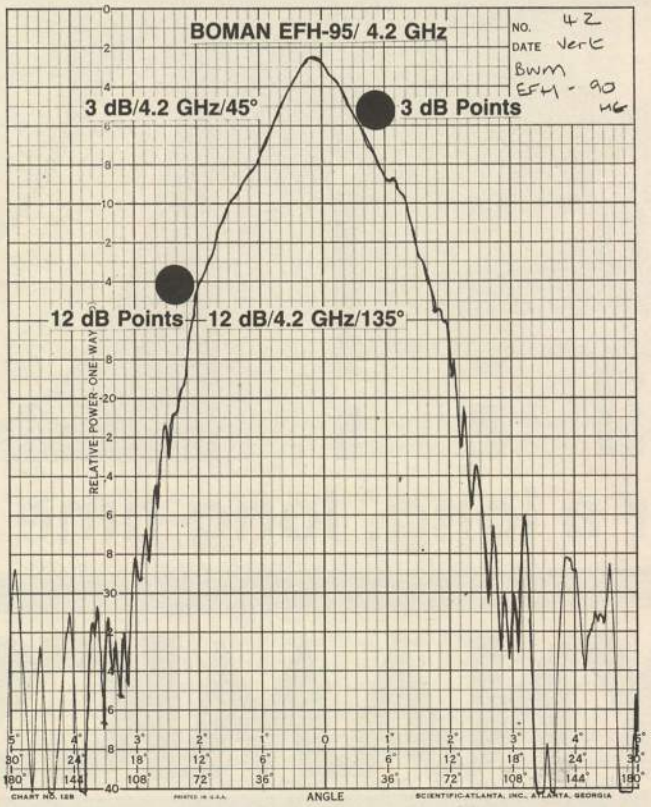
1) **Improve the** (VSWR) **match,** so more of the intercepted energy gets from the throat through the waveguide flange to the coax line going to the receiver system;
2) **Make the antenna larger,** so it captures more signal to begin with (a basic law of physics we all understand, from dish sizes), or,
3) **Make the beamwidth of the antenna narrower.**

Remember that one of the reasons we get more gain out of a 10 foot dish than we do from a six foot dish is that our beamwidth is more tightly confined; more of the energy is pointed in **one single,** straight-ahead direction. A feed is the same way; if you are pointing your test antenna at a **'point source'** (i.e. a single transmit antenna straight in front of you, **rather than** at a dish surface which has a 'spread source' over a broad area in front of you), and if the beamwidth of the feed antenna you are testing is unusually narrow (more confined or sharply defined), you will indeed notice 'more gain' from the feed.

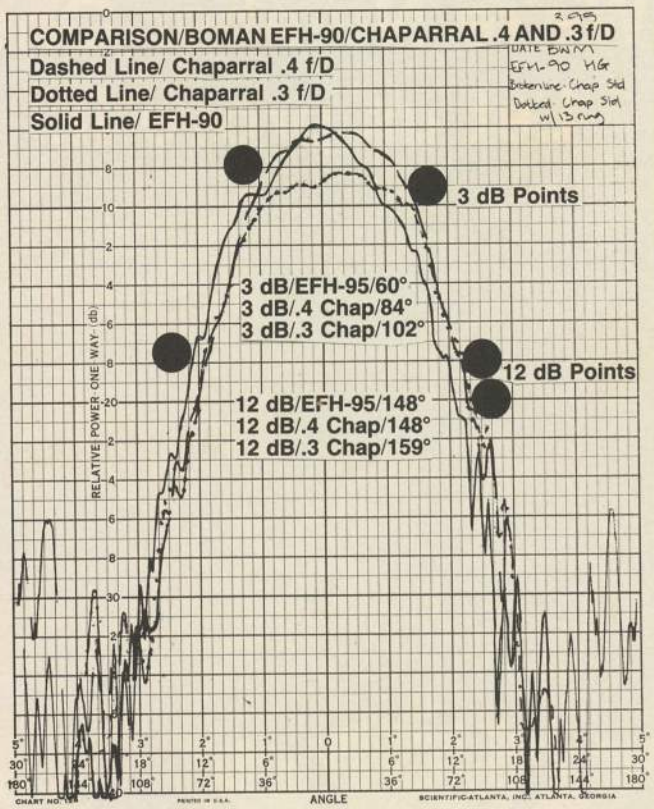
Unfortunately, this is exactly the opposite **of what you** should have **with a .3 f/D feed.** Remember that a feed designed to operate with a .3 f/D dish is shoved in close to the surface of the dish; for it to catch signal from all of the dish's surface, including that portion that is way out there on the edges of the 'vision field,' the feed has to have good 'vision' on the **edges** of its field of vision. This means that the feed may, indeed, have less 'apparent gain' dead-straight-ahead but that is only because some of the 'dead-straight-ahead gain' has been transferred, by feed design, to the edges of the feed pattern. A .3 f/D feed pattern would have a square top, as we shall see here.

The opposite end of the feed world from a .3 f/D feed might be a dish that had an f/D of say .6 or even more. This would require that the feed be quite far back from the center of the reflector (60% or 6 feet with a 10 foot dish). There are dish antennas around that have taken this 'far-back-focal-point' design approach; **Wilson Microwave,** for example, has a dish similar to this.

As the first pattern for the Boman EFH-90 feed **here** shows, we have not a **flat-topped** feed pattern but an almost **'pointed feed pattern.'** The first chart is of the Boman feed at 4.2 GHz (the top end of the band), vertical polarization. You should be aware that in our patterns, we measured three different frequencies (3.7, 3.9[5] and 4.2 GHz) on both polarizations (vertical and horizontal) with each feed. We found no feeds where the patterns stayed identical through all six measurements. A slightly-more-peaked response on the low end of the band (transponders 1/6) was evident on many feeds.



BOMAN EFH-90 feed, 4.2 GHz, vertical. More apt to be useful on a .5 f/D ratio dish.



COMPARISON/ BOMAN EFH-90 (solid line), **Chaparral** (standard) **.4 f/D Super Feed** (broken line) **and Chaparral Golden Ring** (.3 f/D) **with the dotted line. 3.95 Ghz, vertical.**

This 4.2 GHz pattern told us that what we were seeing was a feed that had been designed, perhaps by accident, **not for a .3 f/D dish** but rather for a dish in the .5 or .6 region. A dish where the feed would be back a substantial distance from the reflector surface.

Then we left all of the test range controls alone and we 'cut' a new, trio of, patterns. Moving to 3.95 GHz, we first measured the **Boman EFH-90** feed. It is shown on the chart here as the **solid line.** Taking the Boman feed off of the test stand, we then placed a **Chaparral** standard (Super) feed on the rotating mast and we measured it over the top of the graphic presentation of the Boman EFH-90 feed. It is shown here as the **broken line.** Note that it is wider, although not quite as 'tall' as the EFH-90 plot.

Finally, we inserted the **.3 f/D ring** into the Super Feed and we ran a third plot on the same piece of graph paper. It appears on the chart as the **dotted line;** substantially lower on the graph paper (indicating less gain 'straight ahead' in a narrow field of vision) but also wider than the other two feeds (if you do the proper thing to **directly** compare the three, you would 'pull' or 'lift' all three to the same maximum-height line on the graph paper for 'pattern integration').

Next we returned the EFH-90 to the test stand and re-ran through all of the tests for all three frequencies and both polarizations. A third chart relating to this antenna, the EFH-90 at 3.7 GHz horizontal, completes the set on this antenna. Note that as the frequency came **down,** the pattern broadened out.

The bottom line?

The EFH-90 was designed for Boman by a well known antenna system designer. Someplace between the planning, the design, **and,** the execution something went awry. The feed that resulted has some

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unusual characteristics which frankly beg further study and product modification. This particular feed would have superior performance on a dish that is in the .5 f/D (or above) region. Perhaps, as we told our report to Boman's people that one of them exclaimed, "That must be why Wilson Microwave is purchasing these feeds." Wilson, you will recall, does have a dish with a far-focal point. And this feed, on a dish with a .5 f/D or so, would certainly perform better than a feed designed for say a .4 f/D dish.

Editor's Note: The design 'anamoly' found on the test range with the EFH-90 feed has not gone uncorrected at Boman. When **CSD** made Boman aware of what we found, steps were taken to correct the design and a feed that has been antenna-range-tested for a .3 f/D dish is now in the Boman lineup.

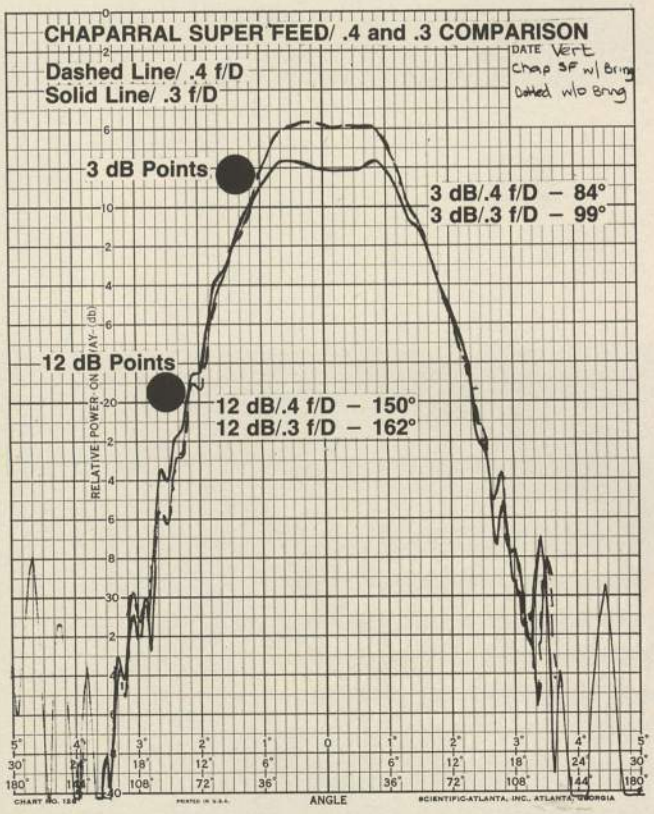
CHAPARRAL .4 vs .3

While we have your attention on the .3 f/D matter, let's finish up this area of interest by looking at what happens to any of the Chaparral feed products when you make the field modification from .4 to .3 by using their 'Golden Ring.'

As noted, the ring is a throat-modification 'kit' which changes the 'vision field' of the feed itself. It is supposed to broaden the field of vision, giving the feed better vision off to the edges towards a dish that is closer to the feed.

There are two ways to operate the polar plotter when making a direct comparison such as this; you can lay one pattern **directly on top of the other,** which has the effect of showing each point on the two patterns at the same 'amplitude' or level, or, you can allow the 'higher gain' version to fall where it will on the chart, and then allow the 'lower-straight-ahead' gain version (the .3 f/D) to fall where it will.

For publication purposes we chose the latter approach since it makes it easier for you to see what happens with the two plots. You cannot do a direct engineering-evaluation of the two patterns with this approach, however, because you need to 'integrate' the patterns so that the same point on one is on the same amplitude (vertical height)



CHAPARRAL Super Feed/ vertical, 3.7 GHz. Dashed line-standard .4 f/D configuration. Solid line-with Golden Ring and .3 f/D configuration.

GOLDEN RING installed/ Jimmy Yates of Microwave Specialty Corporation retrofits the Chaparral Super Feed for .3 f/D operation.

line as the other. We correct that here by calling out the 3 and 12 dB points on our charts.

What the Chaparral measurements tell us is that the Golden Ring does precisely what it was designed to do; it flattens, and broadens, the field of vision of the feed resulting in a better capturing of signals that come to the feed from a far-to-the-side angle. In short, the ring works and that is what counts.

THE ADL Feed

Many months ago **CSD** received a feed from **ADL** for test and evaluation. The feed is a double-scalar-ring design with the normal throat in the middle. It has one-less scalar ring than say the Chaparral or Boman feeds. This is not the most important consideration in a feed; the rings are really 'modifier devices' which change **the flow of currents** or antenna captured signal as those currents of signal flow into the feed throat. A **single** scalar ring (this is the circular protrusion surrounding the throat) does about 90% of the required 'current flow modification' for a feed. A second ring does about 8 more percent. You rapidly reach a point of diminishing returns as you continue to add rings around the throat. Three may be a good number, but 2 is not a bad number either. Four, or five, is considered by many to be 'overkill.'

What is most unusual about the ADL feed is that it is **all** plastic. Well, it is all of man-made materials, apparently a form of plastic. To make the normally non-conductive plastic work as a microwave current-carrier (the microwave signals 'flow' or are 'carried' along the **surface** of **metal**), the ADL people have coated the plastic with a metallic coating. We'll re-visit that topic later on, here, with another 'plastic' feed.

ADL PLASTIC FEED/ and polarization rotation system. A 'dip' in the center.

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There have been other plastic feeds, but perhaps none as elaborate or as seemingly complex and probably expensive to manufacture as the ADL.

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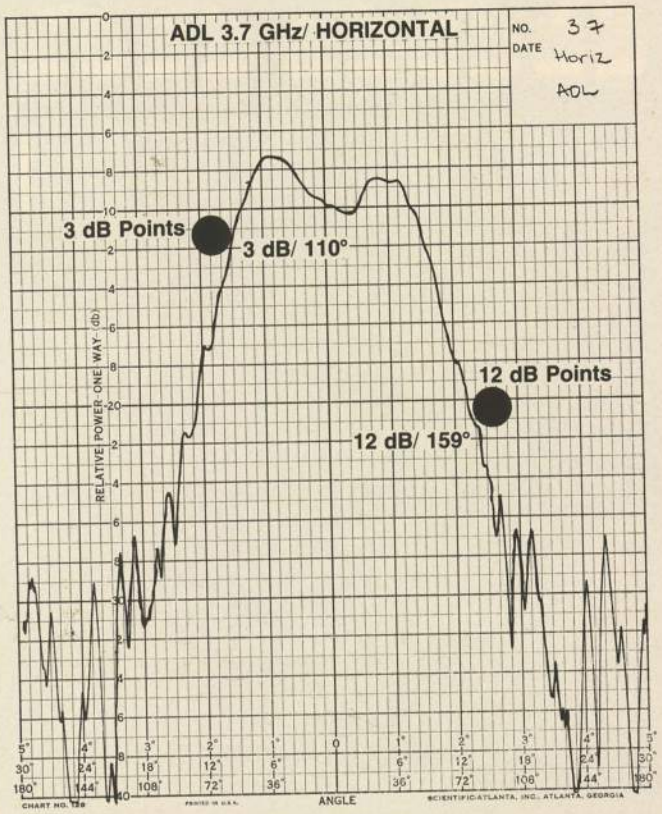
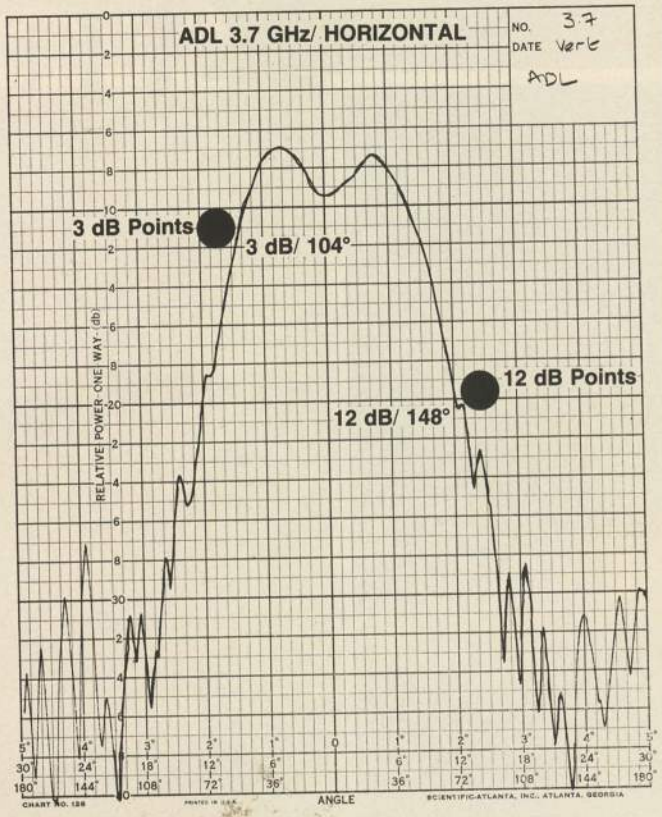
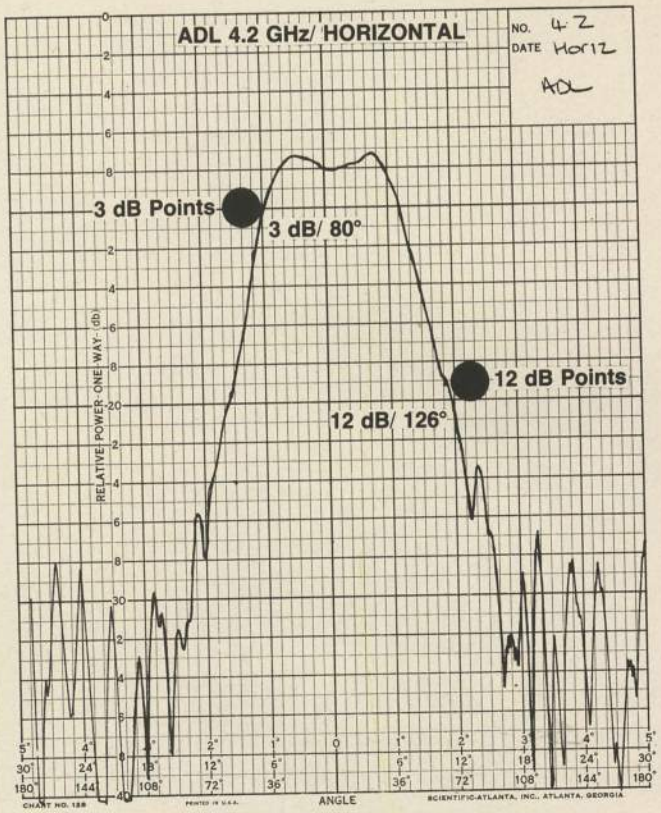


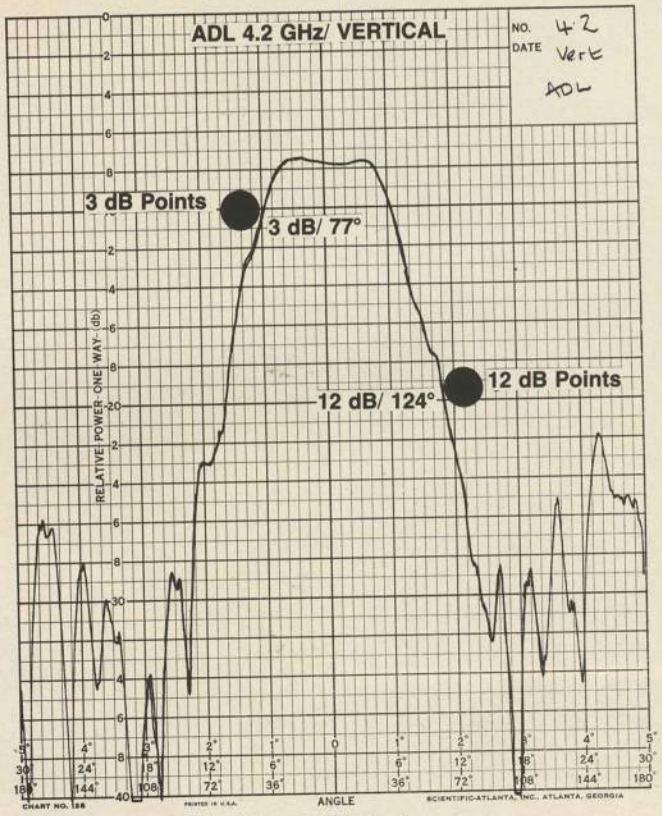
3.7 GHz/ horizontal for ADL plastic feed.



3.7 GHz/ vertical for ADL plastic feed.



4.2 GHz/ horizontal for ADL plastic feed.



4.2 GHz/ vertical for ADL plastic feed.

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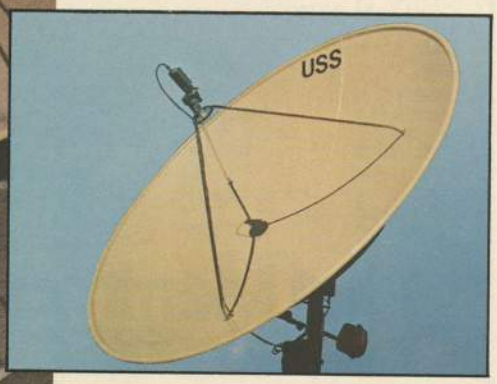

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plastic. It is a rather massive feed, in physical size, although because it is plastic, very light in weight. The people at ADL had provided us with their own antenna test range plots of the feed which seemed like a decent place to start.

There are four polar plots for the ADL feed shown here. We have selected 3.7 and 4.2 GHz as the two 'band edges' on both vertical and horizontal polarization. We direct your attention to the fact that both of the 3.7 plots have a definite dip in the center of the performance curve-plot, indicating that there is a 'suck out' or failure to respond to energy that is coming to the feed from dead-ahead; the center of the dish. It amounts to less than 0.5 dB when the patterns are fully integrated although it may appear to be more than that here.

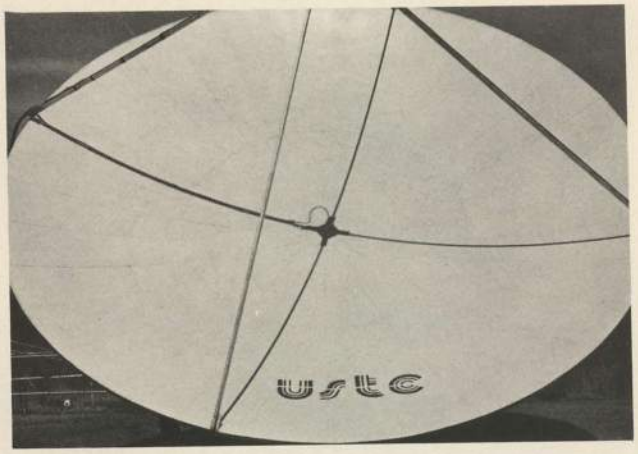
In the 4.2 GHz plots, however, the feed has pulled up its dip on both polarizations and it now has a more or less flat-topped response across approximately 54 degrees of antenna beamwidth. This makes it quite comparable, in performance, to the Chaparral Super Feed, for example, at the **top end** of the band. At the low end of the band, however, it is more similar to the performance of the Super Feed **with** the .3 f/D ring inserted in the throat.

The question of how to deal with plastic feeds has been around for several years; if, indeed, you want to deal with them at all. Plastic seems like an unlikely, perhaps even unsuitable material, for a TVRO feed when you remember that microwave signals are a form of (RF) electricity and for electricity to 'flow' there must be a conductor for the electricity. **Plastic,** in its normal form, is the opposite of a conductor; **it is an insulator.**

Shortly after Chaparral brought out their original feed/Super Feed in 1980, there was a rash of copy-cat feeds on the market. The copy cats were trying to drive down the price of feeds and were made from aluminum at first. Soon somebody discovered that you could make a feed out of plastic, and then 'coat' the plastic with some type of conductor. The microwave 'electricity' that flows on the feed is for all practical purposes on the surface only. There is something called 'skin effect' at work here where the electrical energy pretty much stays on the outer surface and does not go very deeply into the metal it is flowing through or on.

Metal feeds are heavy to ship, and given the right kind of tooling and the right kind of production capability, plastic is not a bad way to go. It does bring the price of the finished product down below even an all aluminum version, **provided** you can get into big production numbers.

Unfortunately, the metalizing of the plastic is not a perfect art. Getting a conductive metal to 'stick' to a plastic surface is not all that easy. To get the metal to **stay** on the surface, over a period of time, through physical and temperature abuses, is even more of a problem. As the industry learned, metal flakes start to come off the coating and before you know it whole 'patches of metal' have fallen off or been knocked off the plastic body.



SOLAR ECLIPSE time is rapidly approaching; when shadow from prime focus feed on your dish appears directly **in** center **of dish, the sun is directly aligned behind the satellite and solar noise will** 'drown out' **your satellite TV signals.**

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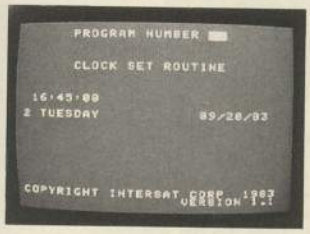

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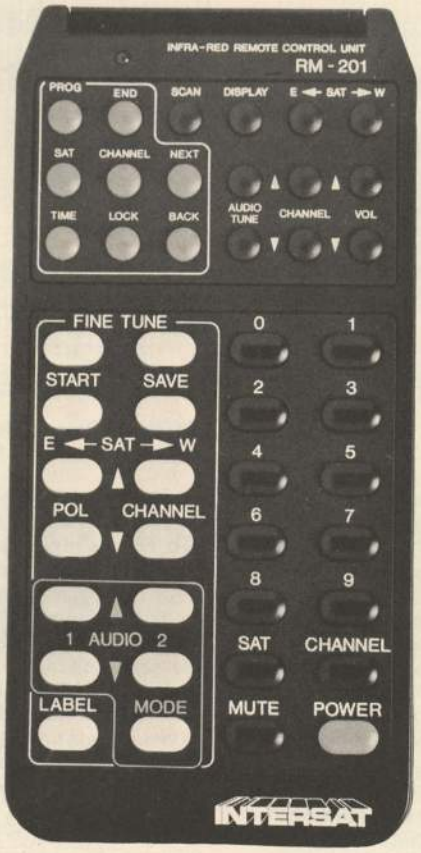
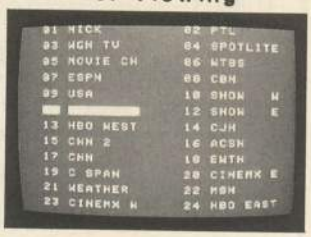


Available Satellites for Viewing



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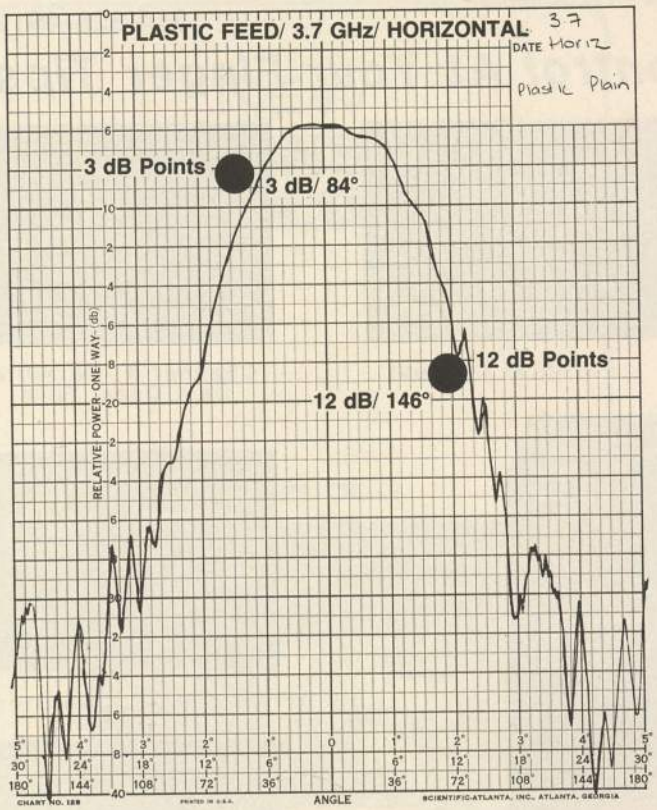
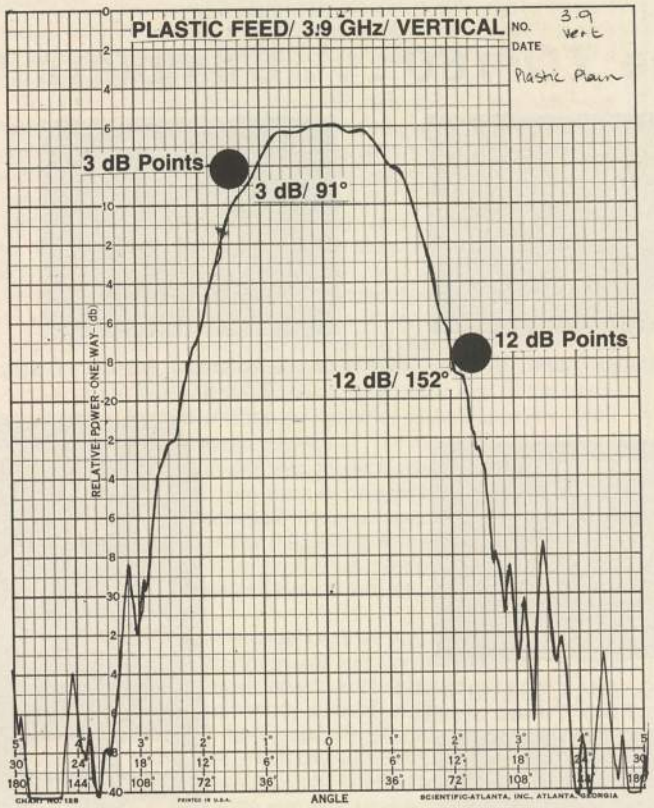


HORIZONTAL Polarization/ 3.7 GHz for plastic feed (copy) **of popular Chaparral Super Feed.**



VERTICAL Polarization/ 3.95 GHz, for plastic feed (copy) **of popular Chaparral Super Feed.**

There is one more cosideration; the melting of the feed. As the August 1983 issue of **CSD** displayed **(see page 32),** it is possible for a feed to 'melt down' when there is an alignment of the TVRO dish and the sun. This happens, by itself and without any assistance, twice per year. When the sun's normal travel route takes it into a position where the sun itself tracks along the Clarke orbit belt from your particular latitude, there will be several days when the sun is more or less directly behind the satellite for a period of time that can reach 8 to 10 minutes for your dish.

If the dish is metal, and solid; if the dish is not properly painted or protected to disperse the sun's rays, some or a high percentage of the sun's rays are collected by the dish and bounced back to the dish's focal point. Which is precisely where the feed is mounted.

Given this unfortunate set of circumstances, the heat build up in the focal point/feed region is considerable. Depending upon how good a reflector the dish surface is to the sun's rays, temperatures up to several thousand degrees C/F can result. It takes a temperature only 30% or so of this to start melt down on many plastics.

A melted feed is not all that might happen, of course. And, only a small percentage of dish reflector surfaces are so poorly painted or poorly planned that they act as a giant solar collector/reflector. But it is a concern, nonetheless. More than one feed, even more than one LNA, has been destroyed by the excessive heat build up occurring during the solar alignment period.

Between melt down, and surface conductivity problems; between plastics that crack when it gets too cold, or metallic surfaces that flake or peel off, the plastic feed world has never been a big world in the TVRO industry. Still, there are some in the marketplace and there have been problems with them.

We had one of these feeds, an exact (as exact as is required) copy of the Chaparral Super Feed, on the test range for testing. This particular version had been in service for several months and to the eye, an inspection did not reveal any of the usual cracking or flaking or peeling which many have experienced. We placed it on the test range simply because we wanted to compare the reception performance of this thinly-coated all plastic feed with the Chaparral Super Feed.

There are two charts here. One shows the Plastic Feed at 3.7 GHz, horizontal polarization. The second shows the same feed at 3.95 GHz, vertical polarization. There is no peaked response, no dipping, and in fact the pattern would have to be judged quite acceptable. Gain (or more appropriately, a lack-of-loss) for this particular, weathered and used feed, was right there with the Chaparral which it was possibly 'struck' off of.

If, indeed, there are mass production efficiencies to be realized with non-metallic feeds, if indeed there are potential advantages to precision parts using a plastic or non-metallic base for the feeds, this should suggest to those who are looking for a new business opportunity in the TVRO field that the day of non-metallic feeds may simply not have arrived yet.

Plating of plastic parts, the major problem to date with plastic feeds, would appear to be the 'area' which requires the most research. Strengthening the part, so that it will withstand temperature extremes without breaking or cracking would seem to be less of a challenge. As plastic feeds stand today, they do have problems. But that is not to say that given the right kind of expertise and technology that these problems cannot be resolved in the year ahead.

In our final part of this series, we will look at the **Omni-Spectra** feed and then give you our rating for the feeds tested at the Microwave Specialty Corporation antenna test range. Oh yes, this addendum.

Since the testing done in October, there has been a radical change in the feeds at Boman Industries **(see CSD for January 1984).** The new and latest version of Boman feeds have **not** been range-tested by **CSD** and the reports appearing here regarding the Boman feeds deal **only with** those feeds that were in **current production** in October of 1983.

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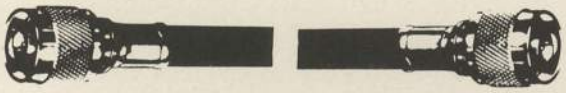

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4 COND. #22 — 49/M
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THE ROOTS OF TVRO (Part 12)

THIS SERIES, now in its 12th installment, is designed to acquaint the TVRO dealer with 'why' there are homes in America with poor TV. The series originated in **CATJ** Magazine, 1975.

The FCC was on the defensive. FCC chief economist Hyman Goldin, speaking before a meeting of educators in Columbus, Ohio, told the group:

"The rumors of UHF's death are greatly exaggerated. There is no denying that there is a long list of woes for UHF, but these high channels will eventually be used."

Goldin's comments did little to console the operators of two UHF stations in Spartanburg, South Carolina. In line with the *then* FCC round of granting existing VHF stations permission to raise powers to 100,000 watts for channels 2-6 and 316,000 watts for channels 7-13, and to use 1,000-2,000-foot towers or elevated sites, the Commission was permitting channel 7 in Spartanburg to move to a 3,500-foot (above sea level) mountain 25 miles from the city. Two UHF stations then on the air in the area protested that "this would allow *the channel 7 station to cover our coverage area from some distance away, and we will lose our network affiliation.*"

FCC Commissioner Frieda Hennock responded:

"These economic injury allegations are purely speculative..."

The station *moved* to the mountain top; *the two UHF stations subsequently left the air.*

Madam Commissioner had more to say about the problem of "who is to blame" the next month (mid-1954) when Senator Charles Potter of Michigan opened Senate hearings into the UHF mess. The Commissioner burst out:

"If you want me to tell you the truth, when you Senators call this Commission to tell us to hurry up and give you television in your community, and give us until tomorrow to do it, and in the most unethical manner known to man...I am ready to cry and give up!"

Subsequently, FCC Commissioner Hennock scolded the Senate for "permitting station applicants to file and *not allowing anyone to compete* for the specific channel involved, or allowing two applicants to merge their applications *without the FCC holding merger hearings* or letting the public know about the merger."

She retired from the stand with:

"I have no intention of serving on a dishonest Commission if I am an honest woman, and I don't want to see the Commission get all of the blame for this mess."

An honest or dishonest Commissioner, Frieda Hennock would retire in the summer of 1955.

In the same hearing Dr. Allen B. DuMont made *one last stand* for the saving of his crumbling empire and for network competition. He urged that the Commission adopt one of three plans to save UHF. They were as follows:

(1) **"Each of the networks should be required to make full-time affiliates of specific UHF stations where the stations are suffering and may go off the air;**

(2) **Or, each network would be required to**

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release on demand 25% of its prime time and other time (by category) programming on demand to UHF stations in the same market;

(3) **Or, as an incentive plan, for each seven UHF stations which the network affiliated with, full time, the network would be allowed to own and operate one additional UHF television station itself, up to a maximum of 11 stations** (VHF of which they could own five and UHF of which they would own six under the DuMont plan)."

The operater of UHF station WCAN in Milwaukee told the Senate committee:

"...viewers have invested upwards of $30,000,000 in conversions in the UHF market of Milwaukee alone; there are presently 300,000 receivers so equipped. We propose that the present VHF stations be given five years to move to UHF, and this will allow everyone to adjust to a truly equal situation."

With things as bad as the hearings indicated, it was inevitable that a new round of "solutions" would start popping up. Shortly after the hearings began in the Senate chambers, FCC Commissioner Frieda Hennock proposed:

"All further VHF dropin assignments must be halted; network programs must be made available to UHF stations; UHF construction permits which were canceled for lack of construction should be reinstated; UHF stations should immediately be authorized substantial power increases and tower height increases; legislation should be passed to bar from interstate shipment any TV receivers not equipped for VHF and UHF; and eventually, all TV broadcasting should be moved to UHF."

Senator Edwin C. Johnson popped up again when he told the nation's CATV operators in their 1954 annual meeting, *"The decision to mix channels* (VHF and UHF) *was insane; it is like trying to mix water and oil. Yet the FCC still stubbornly maintains that its original decision was correct."*

CBS President Frank Stanton took exception to everyone else's concerns. He said:

"To move all television to UHF would weaken the whole system, deprive some areas of service, and damage the quality of programs. The suggestion that VHF antenna heights and power levels be reduced is absurd; this is the equivilent of abandonment of the low bands because service areas would be reduced."

Which of course was exactly what the UHF proponents had in mind. They were losing network affiliation because they did not have or could not obtain circulation in sets. Without programming, they could not compete with big network quality programs; it was a vicious circle that the networks were completely in control of.

In the early fall of 1954 the Commission sanctioned two measures which they hoped would help ease the UHF pain. In historical perspective, it was about as effective as chasing an elephant with a fly swatter:

(1) The 10% excise tax on television receivers was modified to allow a $7 discount to the buyer when he bought a receiver equipped to receive both VHF and UHF. On a $500 receiver, 10% was $50, while $7 was 1.4%. Senator Potter had *originally asked* that the full 10% excise tax be eliminated on all VHF-UHF tuning receivers.

(2) The FCC authorized TV stations to set up satellite stations, programming as relays the programs of the mother station. *This was not restricted to UHF stations*, however, but was au-

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thorized for any stations.

The $7 discount was of *no importance to anyone;* not when combination tuning sets sold for up to $60 more than VHF-only sets. The authorization for VHF stations as well as UHF stations to operate satellites was the cause for a new cry of "foul" *from the beleaguered UHF broadcasters.* Many feared, and rightfully so as it turned out in places like Lufkin, Texas, that the new satellites would improve VHF signals even further out from the origination transmitters and *further encroach into UHF regions.*

The early hearings, first held in 1954, paved the way for a more comprehensive array of hearings in 1955. Named to head the inquiry was former FCC Commissioner Robert Jones and former FCC General Counsellor Harry Plotkin. Plotkin was to represent the Democratic minority of the Senate Interstate and Foreign Commerce Committee. One of the areas the committee would consider was "an investigation into industry licensing among transmitter and receiver manufacturers." This had been a pet project of Jones's when he was a Commissioner, but it had been shelved when it was discovered the Commission did not have the statutory authority to regulate in that area. Some time later the matter found its way over to the Justice Department, but it was eventually dropped at Justice also.

Another name that TV and CATV would learn well came along about that time; Nicholas Zapple would serve as a "communications expert" in the gathering of data and a comprehensive report, which he would make directly to the full committee in January of 1955.

It might be well to stop our study right here for a short time and report on *some of the stations* which began operation after the freeze lifted but which had *already gone off the air* by January of 1955. The impact is in both their numbers and their locations:

KITO-TV, channel 18, San Bernadino, Calif.; WTAC-TV, channel 16, Flint, Mich.; KACY-TV, channel 14, Festus-St. Louis, Mo.; WKLO-TV, channel 21, Louisville, Ky.; WFPG-TV, channel 46, Atlantic City, N.J.; WACH-TV, channel 33, Newport News, Va.; WKAB-TV, channel 48, Mobile, Ala.; WCOC-TV channel 30, Meridian, Miss.; KSTM-TV, channel 36, St. Louis, Mo.; WCHA-TV, channel 46, Chambersburg, Pa.; KBID-TV, channel 53, Fresno, Calif.; WRAY-TV, channel 52, Princeton, Ind.; KFAZ-TV, channel 43, Monroe, La.; WBKZ-TV, channel 64, Battle Creek, Mich.; WFTV, channel 38, Duluth, Minn.; WBUF-TV, channel 59, Buffalo, N.Y.; KNUZ-TV, channel 39, Houston, Tex.; WTOV-TV, channel 27 Norfolk, Va.; WKJF-TV, channel 53, Pittsburgh, Pa.; WECT-TV, channel 18, Elmira, N.Y.; KUSC-TV, channel 28, Los Angeles, Calif.; WLBR-TV, channel 15, Lebanon, Pa.; KCEB-TV, channel 23, Tulsa, Okla.; WNMA-TV, channel 42, Neenah, Wis.; WPFA-TV, channel 15, Pensacola, Fla.; WTVE-TV, channel 24, Elmira, N.Y.; WTRI-TV, channel 35, New York, N.Y.; KMPT-TV, channel 19, Oklahoma City, Okla.; WBTM-TV, channel 24, Danville, Va.; WKNA-TV, channel 46, Charleston, W. Va.; and WCAN-TV, channel 25, Milwaukee, Wis.

This list is *by no means complete;* the total list is quite a bit more extensive. Keep in mind, however, this was *only through* late December 1954 and that many more UHF stations would leave the airwaves in the ensuing balance of the 50's and beyond.

Again, the calculated (estimated and closely computed) total losses to the

ROOTS/ continued page 65

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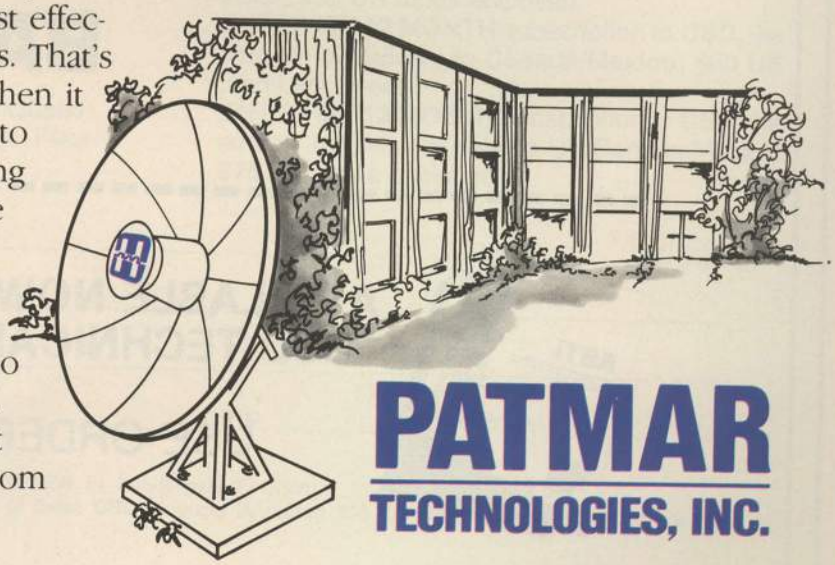

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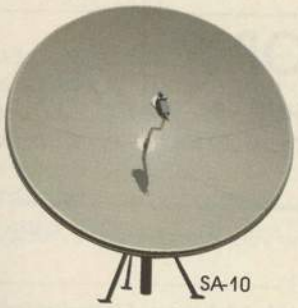

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ROOTS/ continued from page 56

American public is in excess of $300,000,000 for the period.

As the Senate probe progressed, Senator Warren G. Magnuson told the gathering:

"The Plotkin Memo accuses the industry and the federal agency (FCC) **for a lack of initiative and progressive thinking."**

The Plotkin Memo *could* have been a turning point in the FCC's supreme rein of control over all facets of television broadcasting. It was not—for apparent political reasons—pursued as it should have been (see separate report coming in April CATJ). The Plotkin Memo represented the Democratic faction on the Senate committee. Former Commissioner Robert Jones, representing the Republican majority on the Committee, said:

"It does not appear practical that the television industry and the public (note the order he placed them in!) **would accept any plan to drop VHF. Many of the past actions of the Commission, however, have served to accentuate rather than minimize the operational difficulties of the UHF stations facing VHF competition. The pending** (FCC) **proposal to double maximum antenna heights, to 2,000 feet, will further lessen the chances for successful UHF operation. An increase in transmitting antenna height of this magnitude would substantially increase the size of the VHF service area and act as a halter to the successful operation of UHF stations. The future of the UHF stations lies in economics. The allocation problem is the core of the problem. Many VHF operators simply had too much time to build up their systems and as a result promote the purchase of too many millions of VHF-only receivers. And even after the freeze ended, the only transmitting equipment available to UHF was low-power transmitting equipment** (less than 5% of the

ROOTS/ continued page 68

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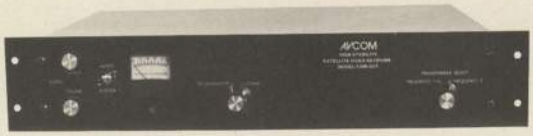

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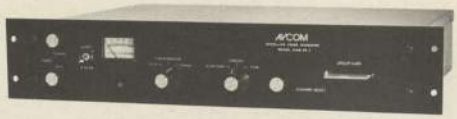

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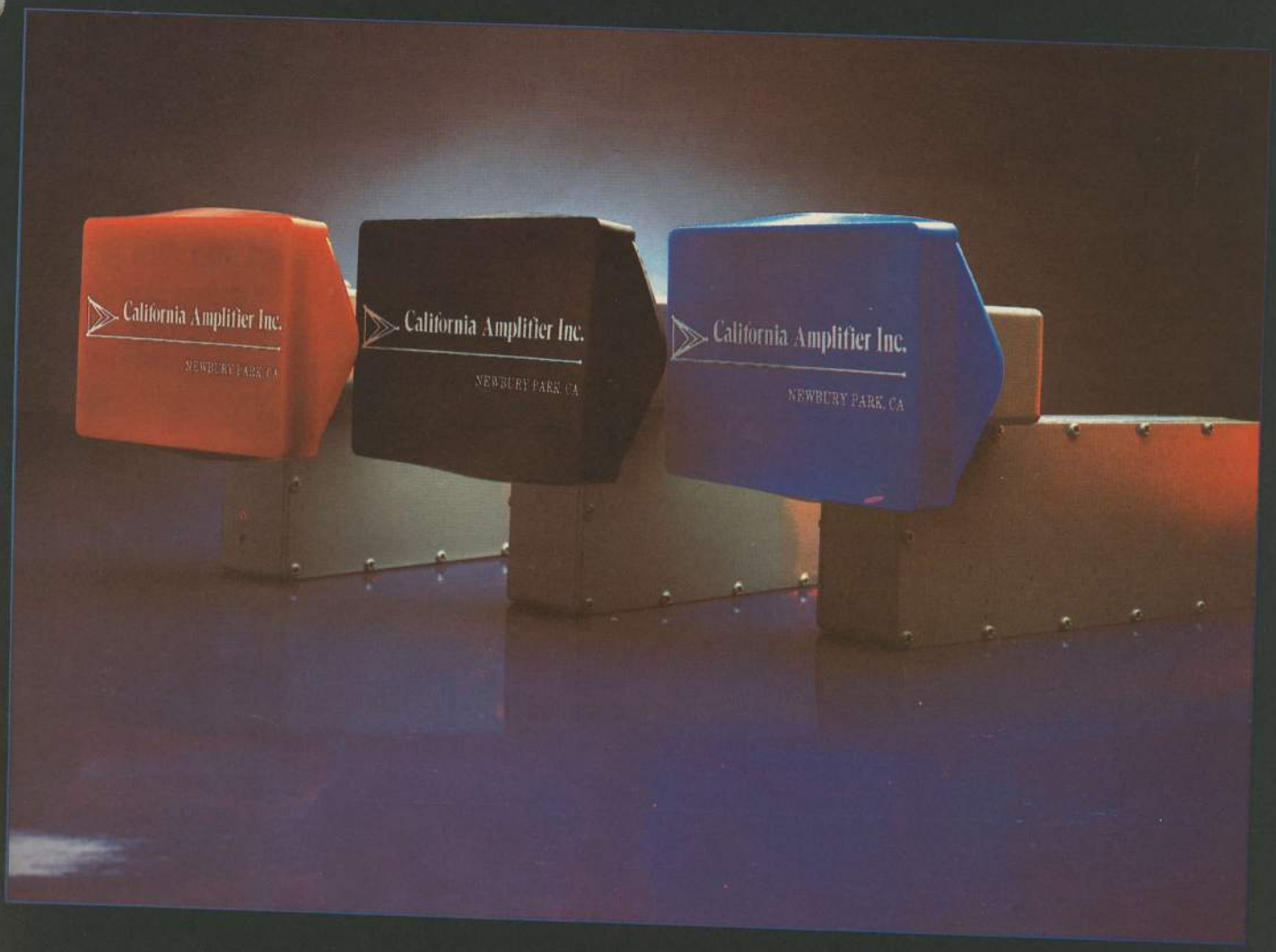

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ROOTS/ continued from page 65

maximum powers then authorized—Ed.), **and so the march to VHF continued. No amount of wishful thinking or executive fiat will remove these differences, until there is adequate circulation of UHF receivers."**

Former Commissioner Jones also found fault with the FCC's VHF allocation program, noting:

"During the freeze much expertise was directed at obtaining proper spacings between VHF stations so that they could derive maximum set circulation in their fringe areas. Co-channel spacings and adjacent channel spacings were carefully calculated so that signals would penetrate to their furthest extremes. This was based upon the assumption of maximum powers and maximum antenna heights for VHF, something that has been attained by many VHF stations. Thus the VHF stations operate at maximum coverage capacity while the UHF stations, because of a lack of adequate power transmitting equipment, operate at 5% or less of coverage capacity."

The Chill of 1955

Freeze was an ugly word. So the Commission announced a "chill," having heard, in the Senate hearing chambers, all of those not very complimentary things being said about their abilities and past actions.

The plan called for a "stop" (or freeze if you will) on the granting of *any new VHF channels* in areas *within 50 miles of a community where UHF operation has been authorized.* At the same time, the Commission announced it would not act on any pending applications that fell within 50 miles of a UHF community, including applications for power or tower height increases in those areas.

The Commission also began to talk about "UHF islands," secure regions where UHF stations would operate without any VHF stations inside of the islands.

At that time, the Commission reported, 5,000,000 of the 35,000,000 TV receivers in the country were capable of UHF reception; and 20% of the annual (1955) output of 5.8 million receivers would be factory equipped for UHF.

Later in the spring the Commission would announce its plans to de-intermix (i.e. create UHF-only service) for the cities of Evansville, Ind., Peoria, Ill., Hartford, Conn., and Madison, Wis. All four areas had each been assigned a single VHF channel, and each had two or more UHF channels allocated. *Twenty years later*, it is interesting to note that Evansville, Hartford and Madison *still have* one VHF channel and two or more UHF channels each; only Peoria became a UHF island. In the other three markets, the VHF stations, through their national trade association, their Senators, Congressmen, and state officials, were able to bring sufficient pressure to bear on the FCC that it eventually *dropped* the de-intermixture program.

And the stations continued to go off the air. A few of the new dropouts included KTVU-TV, channel 36, St. Louis, Mo.; WTVI-TV, channel 54, Belleville, Ill.; KGTV, channel 17, Des Moines, Iowa; WLAM-TV, channel 17, Lewiston, Me.; WRTV, channel 58, Asbury Park, N.J.; and WFMZ, channel 67, Allentown, Pa. For these stations and their viewers, de-intermixture and Plotkin Memos were of little comfort.

THE ROOTS OF TVRO originally appeared in Coop's **CATJ** Magazine during 1975. It examines the history of television broadcasting, and the heavy hand of FCC regulation that shaped today's TV system. This series will continue in **CSD.**

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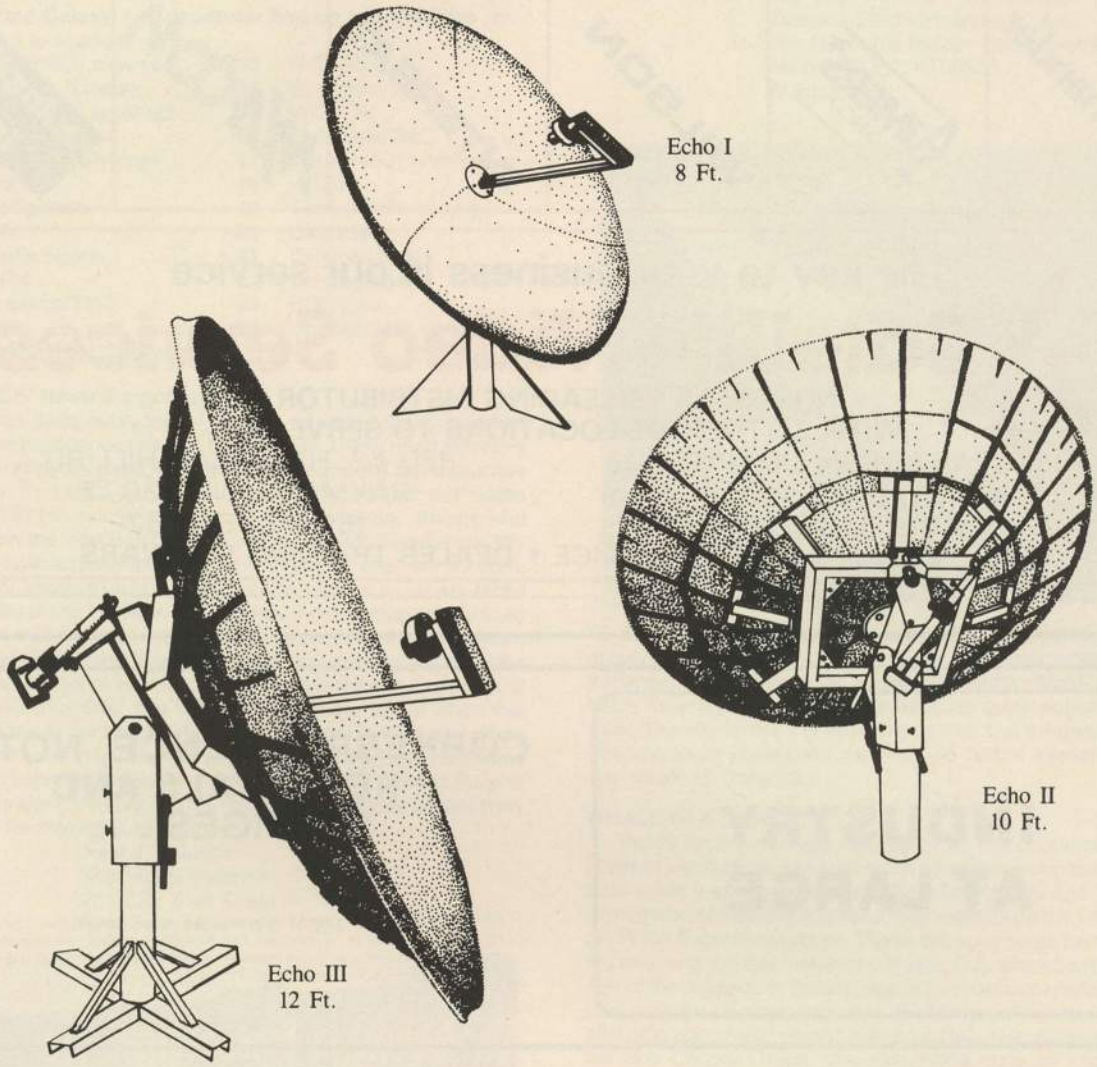

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NO Name Please

I have been a subscriber to **CSD** or more than a year and recently subscribed to **CJR** which I find very helpful as a dealer. I need to know the following information for a planned installation in (name of country in Central America).

1) Will all of the transponders on Galaxy 1 transmit with a power of approximately 9 watts?
2) The Hero 16 foot antenna uses a pair of 80 degree LNAs and a dual feed Chaparral feed horn. You have written that if the dish is parked halfway between F3R at 131 degrees and Galaxy at 134 degrees, you should be able to receive both satellites at the same time. This is obviously a special type of feed. Where can I get one of these?
3) When HBO scrambles their signals, what annual rental rate do you feel will be charged to home viewers? What do you think they will charge for a descrambler? Do you have HBO's address?
4) Will there be a sports channel on Galax 1?

Name withheld by request

Remember that channel polarizations are reversed from F3R with odds horizontal and evens vertical. */C-SPAN will have to occupy one of the other transponders **with 13 dead. Best guess is 22, or, one of the HBO/Time reserved channels.**

All of the operational transponders on G1 are rated at 9 watts of power. TR13 is reported **to be 'dead.' It is possible to 'stack' two or even more feeds in an 'arc' slightly either side of the normal dead-on-center focal point of the dish and receive satellites that are spaced 3 or 4 degrees apart in the sky. You really don't need a special feed** (although some are sold or offered at outrageous prices). **What you** do **need is a special feed** 'mount'; **a system that will allow you to mount feeds such as you saw on page 80 of** CSD **for December 1983. Contact Odom Antennas** (P.O. Box 517, Beebe, Arkansas 72012) **for information on such mounting systems.** HBO? **Anyone who recites a price for scrambled service,**

now, is guessing. Here is our guess; **$29.95 a month for six to nine channels on G1, including HBO and Cinemax. What will they charge for the descrambler?** HBO **will not sell the descrambler; M/A COM Linkabit will. How much? Probably around $400 dealer cost, each. HBO's address is not important and it doesn't matter . . . yet. They won't answer your letters except with a form letter.** When **it is time to contact them, we'll print all of the important information here. And a sports channel on Galaxy 1? ESPN has leased transponder 9 on G1 but they claim that for now, they will** not **use it to feed their** full **service** (i.e. such as is found on TR7 of F3R).

The reported **Galaxy 1 transponder line up is as follows** (as always, subject to change):

TR1	Time (HBO) reserved	**TR13**	C-SPAN **(*)**
2	Nashville Network	**14**	Showtime/TMC
3	Time (HBO) reserved	**15**	WOR-TV
4	Disney/East	**16**	Showtime/TMC
5	The Movie Channel/ West	**17**	Time (HBO) reserved
		18	WTBS
6	SIN/Spanish	**19**	Time (HBO) reserved
7	CNN	**20**	Galavision
8	Seattle Sports	**21**	Cinemax/East
9	ESPN	**22**	Westinghouse
10	Showtime/TMC	**23**	HBO/East
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12	DC-Maryland Sports		

EXPERIENCE/ Never Forgotten

Coop, you gave everyone of us who attended the Sri Lankan expedition an experience never to be forgotten. I have been reflecting a great deal on what we did, what we learned, and the impression we left behind in Sri Lanka. You have certainly fulfilled your self stated commitment to the industry to educate and illuminate. Anyone who wants to know the 'real Bob Cooper' has to look into themselves. We all have the optimism and curiosity which you have, when we are born. Unfortunately, most of us lose both of those senses as we are faced with the reality of life. I believe you sparked those feelings again in so many people that we as an industry have been given the enthusiasm and energy to grow in the face of adversity. You have given us all the feeling of that special power which a new high technology needs, and then you have tempered that with reality to sober us up when that power has gone to our heads. I have to say that I have learned many things about myself in my life, and I have always had the good fortune to bump into important information providers when I needed them at certain points along the way. You have been one of those people in my life. Thanks for making it all happen.

John J. Zelenka
Star Video Systems
201 East 61st Street
New York, New York 10021

Zelenka, with Arthur C. Clarke in his study in Colombo, during the industry's expedition to Sri Lanka.

BUILDS IT In Mexico

I find that **CSD** is a must for anyone in the TVRO field who needs to be kept informed and updated. My firm manufactures aluminum mesh antennas, up to seven meters in size. However the most common TVRO antenna for central Mexico is a 5 meter size dish. We receive excellent reception from all US satellites using a 7 meter dish and a 90 degree LNA. Only the ANIK channels have noise in them. Is it possible that a **CSD** reader can help me find a computer program to calculate the offset angle for different latitudes? The program should be in Basic and should be useful with my TRS80, Model 1, computer.

Ing. Jose Ignacio Agraz Gomez
Disenos Electromecanicos, S.A.
Rio Danbubio 69-201 Delegacion Cuauhtemoc
Mexico, D.F.C.P. 06500
Mexico

Several such programs exist and we feel confident you will receive at least one from a reader who has worked it out in advance. Manufacture of antennas, within Mexico and other Latin American countries, has become quite popular in the last year. The electronics is still shipped in, but antennas have now become local products from Mexico to the eastern Caribbean and south to Colombia.

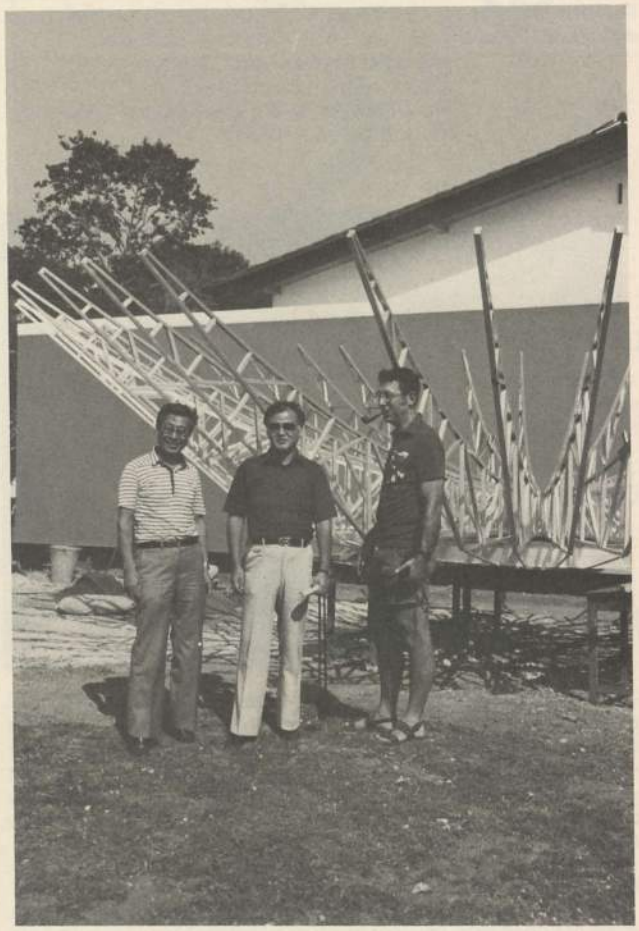
WHALE Of A Time

Words cannot express our thanks for the opportunity to have a whale of a good time, enjoy so much good fellowship and benefit from such a fine learning experience. Both Dr. Konishi and Tom Kawada concur wholeheartedly and send their regards (to the entire Sri Lankan TVRO Expedition group). These are busy times here in Japan, in the middle of the last month of the year. But, since Saint Nick is not a part of the religious or cultural scene for most Japanese, there is one less topic for conversation here. Right now at Uniden the talk is all about the upcoming yearend bonuses, New Year plans and the visit of the Bob Cooper Group. You (all) made quite an impression; like replacing Santa Claus! One business note; Japan is scheduled to launch BS2a on the 23rd of January from the Tanegashima Island launch site. A second (12 GHz) satellite will launch between April 1985 and May 1985. Both of these satellites will have a pair of 12 GHz channels and they will open up the first Japanese 12 GHz regular service for the country. A more powerful, three channel Japanese 12 GHz satellite is scheduled for April 1988.

John W. Lane
Senior Advisor
Uniden Corporation
4-7-4 Onitaka
Ichikawa City, Japan

Uniden was scheduled to show-off a mock-up of their three TVRO receivers at the January CES **gathering in Vegas; and is presently scheduled for the first operational demonstration of their equipment at the Vegas STTI show March 20-22.** Tom Kawada, **the gentleman in charge of the Uniden Indianapolis office, will**

become a familiar figure to American TVRO distributors in the months ahead. For the record, he appears in the photo here in front of the under-construction Hero 25 foot dish at the University of Moratuwa in Sri Lanka. Uniden recently expanded its US force by snatching Guy Davis away from Intersat Corporation and Davis will, also, play a key role in the introduction of the Uniden product line in North America.



TOM KAWADA (center) **flanked by the creator of the world's first cost-effective 12 GHz systems, Dr. Konishi** (left) **and Coop in Sri Lanka.**

CONIFER Review

I have just finished reading a reprint from **CSD** of your review of the Conifer DE-2001 TVRO system, which I received from Conifer. I liked the chatty style and it was very easy for me to understand the non-technical description of the installation and its problems. I have also read other reviews of the same product and I must say **CSD**'s was the most comprehensive of those read. However, it has also succeeded in raising a number of questions in my mind about the product.

Can you advise me how the Conifer system compares with others in the same price bracket on a scale of 1 to 10? I live in a remote area of British Colombia and I have been attending cable and satellite shows in the US and Canada to learn more about the systems available. I am also wondering if there are any hands-on demonstration video tapes *available in the TVRO field which give someone like myself, trying to* learn what the systems are all about, the opportunity to learn more *about the systems.*

My USA address is given below.

Edward G. Ellis
69-258 Crestwood Drive
Desert Hot Springs, Ca. 92240

The Conifer DE-2001 system would rate an 8 **on a scale of 1 to 10. We understand the system is back ordered for a substantial period into the future, indicating that their product has been well accepted and that their marketing efforts have been successful. There are presently** three **of these systems operating in the Turks and Caicos Islands and all continue to perform as they did the day they were installed. In our July issue product review, we were critical of the mounting system for the LNA. The units received down here in** August **and subsequently installed still had** not resolved **that to our satisfaction, making peak-performance an unnecessary chore. Perhaps that has been sorted out by now. In the heat, with high salt content in the air, and subjected to a constant buffeting of trade winds, the 12 foot DE-2001 antenna has held up exceedingly well.** Videotapes? **After nearly three years of** not offering **videotapes** (we originally had a complete library of tapes, back in 1979 and 1980) **we are now in the process of creating a new tape-library program. By May or June we hope to have an extensive catalog of tapes covering virtually every aspect of TVRO systems and their installation, from International satellite reception to the more mundane daily problems of LNA installations, and failures.**

NAME Withheld

I am not presently a TVRO dealer, but I am making plans to become one. I can see from studying **CSD** that Coop's experience in this industry is very broad and I would like to have some guidance about becoming a TVRO dealer.

I am 47 years old and I have been with a division of General Motors for 22 years. I have been a quality control supervisor for 20 years and I have an extensive background in mechanical and electronic engineering. I have never encountered anything in either of these two fields that I could not handle. I am presently 8 years from retirement at GM, and I feel the TVRO industry is not only exciting and growing, but something I wish to be a part of. I believe I have the aptitudes to grow with it and to make it a second-start vocation as I phase out, in retirement, of my present work. Can you suggest any steps I should follow within the industry to gain a proper start?

Name Withheld
Indiana

Several years ago we wrote a book designed to help people become TVRO dealers. It is mostly out of print now **but anyone just entering the business should drop a line to** STTI, P.O. Box G, Arcadia, Oklahoma 73007 **and ask for a listing of the presently available** 'dealer manuals.' **Anyone entering our business without an extensive background in TVRO systems is going to need an education. You will pay for that education one way or the other. If you rush to a trade show** (such as the STTI show coming up in Las Vegas, March 20-22) **with the idea that you can go from neophyte to successful dealer merely by attending** one **trade show, you are making a mistake. Without a background in the technology itself, you are heading for several complicated installation disasters. We once saw a study which indicated that fewer than 20% of those who become TVRO system dealers** last out the first year. **Fewer than half make it through** six months. **The reasons are very simple:**

1) The technology is not complicated, but it is unforgiving. **Mistakes made in an installation are hard to correct unless you have the experience and wisdom that only comes from having done the same thing** (installing a system) **several dozen times.**
2) The basics of the system and installation, how to set up the antenna, the feed, the (polar) mount and so on cannot be grasped in one quick pass. **You must do this several times before you know enough to do it with confidence.**
3) System failures, or total failure to perform when the system is *turned on, are complex to diagnose.* ***The most common*** **approach is to take out one piece at a time and replace it with another identical part** (such as LNA for LNA or LNC for LNC substitution). **To do this, and to find the problem, you need both experience and a ready (on-site) stock of back-up parts.**
4) Optimizing a system for peak performance, and then tightening down all of the adjustments after the peak performance is found, is a totally different level of expertise than simply finding

satellite pictures. **Some people take a year or more to learn how to squeeze the last sparklies out of a picture.**

5) Selecting the best equipment for **you** to sell is a common problem. **Too many new dealers have limited operating capital so they start off purchasing bottom-end-priced systems because those are the systems they think they can afford. Bottom-end-priced systems ought to be 'outlawed' for neophyte dealers. They** always **require more attention to detail, in the installation, to get the best quality pictures since many of the operating refinements have been left out to get the price down. If your funds are limited, don't select a system for re-sale which allows you to buy** three **initially; move up a step and select a better class of system and buy** two **instead. If you have problems with your first installations, you won't make it the first year. Learn on a reasonably high-class system and then when you have the experience, try making the lower priced systems work. It takes more experience to make low price systems work than it does higher priced systems.**

6) Read everything you can get your hands on. **When you don't understand something you read, and it seems like it is important, find somebody to explain it to you. The only thing that separates a dealer from his customer is the dealer's ability to buy systems wholesale, and, the dealer's knowledge. You may be able to qualify as a wholesale buyer by merely attending a trade show or calling up a distributor. You can never learn more than your customers unless you commit yourself to** learning everything you need to know **to be a good, service-oriented dealer.**

7) Most of all, do not rush into being a dealer. **Take an extra 30 or 60 days and seek out the opportunity to learn. Ask a dealer if you can hire on as a helper, or simply go along to see how it is done. Watch how an installation goes in, and learn what the problems are. Find a distributor or OEM near you who holds seminars or classes and** attend those classes. **Touch a dish, install an LNA, route a cable, put on an 'F' fitting, adjust the IF gain in a receiver for best picture. Do all of this** BEFORE **you sit down and write out a check to anyone for any equipment.**

And, good luck!

SHOW Ratings

I am writing to inquire about the procedure in which trade shows are rated for the **Cooper/James Report.** I understand it is the policy not to rate premier shows; however, we are interested in the process for future shows. As you are aware, Satellite Reception Systems, Inc. sponsored the first satellite showcase in Ohio; The Great Lakes/Ohio Valley Satellite Technical Show and Consumer Fair. If you would be interested in gathering a few observations from manufacturers let me suggest that you contact Bob Dushane (Janeil), Mel Woolfe (Amplica) or Gary Gordon (KLM) for their insight into the relative value of the Ohio show, in terms of dealer response and attendance.

Jennifer L. Philips
Satellite Reception Systems, Inc.
145 Columbus Road
Athens, Ohio 45701

Shows are 'rated' in CJR **based upon past performance, or, where the group sponsoring the show/meeting has a track record in that area, on that basis. Shows are rated from one** (*) **to four stars** (****). **The system is hardly infallible; we rated the Nashville Show last September as a ** event and it turned out to be a ****. The next time you hold the SRS show in Ohio, if it follows the same general format as the first, it would rate a *** rating.**

TRANSPONDER WATCH

RECENT REPORTS OF ACTIVITY ON DOMESTIC / INTERNATIONAL SATELLITES

Send your reports to CSD Transponder Watch, P.O. Box 100858, Ft. Lauderdale, FL 33310. For late news, call (305) 771-0505.

Hughes has filed an application with the FCC to operate the first 20 GHz down/ 30 GHz up or Ka band satellite system. There have been repercussions. NASA and RCA have been working on a Ka band package; NASA felt that 20 GHz would only happen **after** Federal government funded **'tests'** on that next-up band and RCA was attempting to get a contract with NASA for that job. Hughes application suggests no federally funded government testing is required and Hughes wants to be first to have operating 20 GHz system.

SYSTEM would be highly focused with 150 mile wide 'spot beams' over 16 major metropolitan areas. Concept is that 20 GHz down links/30 GHz uplinks would allow total two-way communications from ground terminals as small as 2 feet in diameter and using transmitter powers as low as 1 (!) watt.

MURDOCH's Skyband system, put on hold this past fall, is apparently dead. Firm is engaged in tussle with SBS, from whom they had contracted to rent 5 transponders at $1.4M a month, over desire to cancel contract for $75M lease.

ALCOA-NEC (Ancom) and Toshiba will build two foot terminals for STC's early entry 12 GHz DBS service scheduled to begin this fall. It also appears that STC **may** opt to use the C-MAC system for transmission (scrambled video, digital audio).

VISTA is the name assigned by Intelsat to a new low-cost ('thin route') satellite telephone service being prepared for commercial offering. Using antennas in 4.5/5 meter class, total two-way radio telephone systems will cost approximately $30,000 according to forecasts.

INTELSAT has approved leasing five 11 GHz spot beam transponders (72 MHz wide) to England effective September of this year. Transponders will be largely used for video services to support new cable TV industry there.

$500M British Unisat project in grave danger of folding after recent studies (**see** Coop's Comments, **this month**). Irish, meanwhile, are apparently sincere about offering four or five channel DBS service to anyone that wishes to lease their transponders, as early as 1987.

CONTROVERSIAL Orion/ISI requests to provide private (non-Intelsat) cross-Atlantic 11/12 GHz service for video and other users moved step closer to approval on US end. The next step would appear to be convincing at least one European country that it should be eastern-end terminus for system(s).

NIGERIA is latest nation to suggest it should have its own domestic (4 GHz) satellite system. Country presently leases from Intelsat.

FRENCH application for a pair of satellites has Europe buzzing over 'intent' of French. Applications request orbit spots that would allow coverage to eastern USA, and to Malaysia. Some concern that France may be planning its own 'international satellite system/service' outside of Intelsat.

A SECOND Catholic satellite TV network is planned; DeRance, Inc., Milwaukee based, plans 24 hour service similar in concept to PTL but with Catholic flavor. No satellite has been selected for distribution of the service.

MICRODYNE, through Anixter U.K. Ltd., is providing 50 TVRO systems in Ku band for start-up systems in England taking Sky Channel service from ECS-1 bird.

SPOTLIGHT service officially becomes part of Showtime/The Movie Channel network February 1st. Whether TR4 service on F3R and TR21 service on W5 will discontinue on that date, or continue for brief period is unknown. Ultimately, both transponders will be reassigned within Showtime/TMC transponder stable.

HBO scrambling tests continue on F4, TR1 daily; additional testing may come up on either TR23 or TR21 on Galaxy 1 shortly. You can witness VideoCipher in operation by checking F4, TR1 during daytime hours, weekdays.

ATTEMPT to load up F4 by RCA continues; now they have trimmed monthly lease for a preemptible transponder to $66,667. This replaces flat $150,000 per month rate for a minimum of three years; protected basis.

FCC continues to study how many transponders will be required by North America through year 2000. Estimates, all conducted by researchers hired for task, vary from low of 690 to high of 4794 by 1990; low of 1123 to in excess of 10,000 by year 2000.

WESTAR 6 undergoing pre-launch testing. Photo courtesy Sue McClaskey, Intersat (shown).

MEETINGS of incidental interest upcoming: **NAB** (National Association of Broadcasters) annual conference in Las Vegas **April 29-May 2** (202/293-3500); **European Cable and Satellite Television** Exhibition and Conference in Basel, Switzerland **May 5-9** (Eurocast '84, 5 Barret Way, Tudor Road, Harrow, Middox HA3 50G, England).

GOES weather satellite program will be updated starting in mid 1986 by new $100M contracted-birds provided by Hughes. New packages will be very similar to present GOES birds but add experimental 'search and rescue' communications package for downed aircraft and ships at sea.

PRESSURES to review the 1963 Intelsat agreement, which authorizes Intelsat operations and defines the type of exclusivity offered to Intelsat, building. Present agreement, authorized by enactment of US legislation, is thought by some to be too restrictive to development of new technologies.

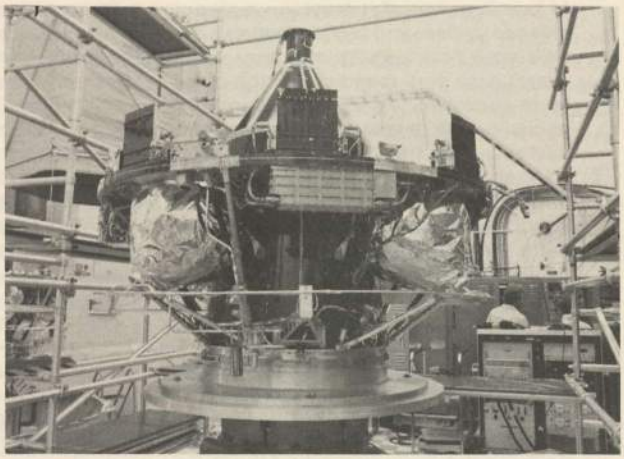
CBS and COMSAT 'may' have struck a bargain to explore, jointly, DBS opportunities. STC's fall of '84 program launch for northeastern USA DBS at 12 GHz has had as major weakness any solid program plans. CBS may become involved in programming aspect as well as pushing its own plans for HDTV (high definition television), via satellite.

SOVIETS have launched another G(h)orizont satellite; orbit position unknown at this time.

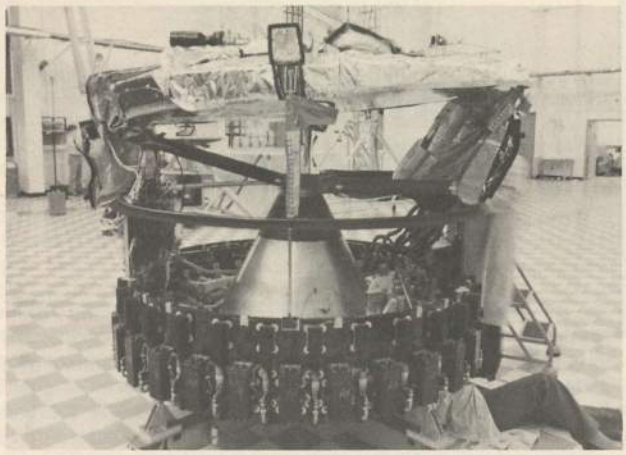
WESTAR VI will be on board Challenger in scheduled February 3rd flight. Bird is virtually identical to WESTAR V with 7 watt region transponders. Also on board is Indonesian **Palapa-B** bird which will complete the current generation of Palapa birds for southeast Asia.

SPACE effort to get local zoning ordinance restrictions against private TVROs has gone to FCC. After FCC issued ruling last fall that SMATV systems are 'preempted' from local or state regulation by protective federal 'umbrella,' SPACE feels that similar case can be made for local (city or county) zoning ordinances against TVRO systems. SPACE argues that FCC should preempt local zoning boards attempted control of home TVRO systems.

STC/Satellite Television Corporation (Comsat 12 GHz DBS program) has opened New York City offices; 1212 Avenue of The Americas, New York, NY 10036; 212/398-7900.



LOWER SECTION, Palapa B hydrazine tanks and thrusters at pre-launch check-out at the Cape.



DESPUN SECTION 24 channel Palapa B showing 9 watt TWT amplifiers (on ring). **Photos courtesy Dan Walton, Intersat.**

USCI 12 GHz DBS can now be purchased by 'qualified customers' using VISA credit card.

STEREO TV broadcasting step closer; committee selected by TV receiver suppliers has chosen Zenith system with 'dbx companding.' Next step is formal submission to FCC of group's agreement, and hope that Commission goes ahead to approve the industry selected system.

REACTING to lawsuit brought against its activities by two Wichita cable firms, TVRO dealer **Starlink** has bounced back with a $6M lawsuit charging the cable companies with Sherman Antitrust violation and for interference with Starlink's contractural and business relationships.

DAVE and Buster's Restaurant, Dallas, is being sued by a Dallas cable system for allegedly displaying a 'closed circuit' satellite fed

game between the University of Oklahoma and University of Texas, this past fall. The cable firm alleges it had the exclusive right to the game, in Dallas.

NEW York satellite dealers are facing a new problem; the State of New York has decided that TVRO terminals can be taxed as part of real estate. The dealers argue that the TVRO systems are not 'permanent' additions to the property (such as a building) and should be exempt from taxation. Widespread publicity of the state ruling reportedly is hurting new TVRO sales in the state where bias against taxes, **any** new taxes, runs high.

COOP/ continued from page 5

sold) and he entered into the negotiations with SPACE because he was, I suspect, genuinely tired of the intra-industry wrangling over this issue. I know I was shocked, if that is an appropriate word, when I was told that Schneringer had agreed **on his own** to jointly running not just the Vegas show but two others each year, and that he was willing to 'guarantee' SPACE coffers $600,000 per year for the 'privilege' of jointly running three shows per year. Somebody suggested to me that Schneringer had 'seen the handwriting on the wall, and knew that sooner or later SPACE would be running **all** of the industry trade shows anyhow, so he was simply getting ahead of the pack' by offering to (more or less) split the show receipts with SPACE. **"He is buying himself a lifetime annuity, an insurance policy,"** I was told.

I wonder how many other members of the Board of Directors, virtually all of whom are in business themselves, would have been so generous if their local Kiwanis club came to them and said, **"We want to help you run your business and we only want 50% of your receipts per year for this help."**

I know Rick Schneringer better than anyone else on the Board. I know the grief and pain he has been through to get STTI to where it is. I have not always agreed with Rick, and in fact usually disagree with him. But, I have to admire him for his single minded approach to running HIS business; and, his tenacity. In particular his tenacity.

It was his tenacity, that I admire most, which bothered me the most when I heard that he was willing to fork over $600,000 a year to co-op SPACE. I wondered, to myself, what Rick Schneringer was going to get for that $600,000. **Would he be able to take a $600,000 deduction on his annual income taxes** because he 'donated' that much money to a 'non-profit trade associaton'? I can see the busload of IRS agents that would swoop down on his Arcadia, Oklahoma home when he turned **those** papers in!

Would he get a retirement policy that insured that as long as he and Gloria lived, they would have a comfortable retirement income? I hadn't heard any discussion about such an arrangement. There was none.

Maybe he would get a plaque for his office from SPACE each year. Surely there was 'something tangible' involved for STTI? Afterall, he was 'giving' $600,000 each year to SPACE!

The negotiations broke down (after a series of perhaps insulting telegrams and letters in late November and December) because Rick had asked that a new seat on the SPACE Board of Directors be created and that he be appointed to that seat. He had also asked that several things he agreed to, willingly, in Orlando, be changed. For example, he had agreed that in addition to the $600,000 'guarantee' per year to SPACE, that SPACE receive 25% of the gate or entrance ticket receipts. The evidence suggests this was a suggestion he himself made, although I can't understand how after agreeing to $600,000 he would then tack on another $100,000 or so. But he did, and when he got home, he had second thoughts. I would have had second thoughts about alot more than that!

He had also agreed, perhaps not so willingly, that out of his receipts, in addition to the $600,000 plus 25% of the gate, that he should 'donate' another $15,000 per show to SPACE to be used for paying the cost of bringing political dignitaries to the conventions. You will recall that **Senator Goldwater** and a pair of U.S. Congressmen appeared in Orlando. SPACE paid their way and whatever else they wanted. SPACE wanted to continue that posture, sure they are that having influential friends in Congress is important when there is a political showdown in Washington. Whether that is correct is not in question; **whether STTI should pay** $15,000 towards this goal AFTER paying $200,000 to SPACE at **each** of three shows per year, and, after paying 25% of the gate to SPACE, is the question. Yes, in Orlando, Rick Schneringer apparently did agree to this. And more.

By a Fed X package shipped from SPACE's offices in Washington on December 19th I was asked, as a member of the Board of Directors, to vote on two questions.

Question Number One:

"Should SPACE institute immediate litigation against STTI and Mr. Schneringer(?)".

Question Number Two:

"Should SPACE conduct a trade show in Las Vegas in March of 1984(?)".

Because my Fed X package had to be hand carried by Carol across Fort Lauderdale to Provo Flying Service, and we were in the midst of the Christmas season, my own package was delayed several days longer than normal. Over the Christmas holidays I reflected on how I would 'vote' on this, knowing that by the time I did vote the voting would be all over. That was one of those times where my 'slow mail' delivery was appreciated.

When I finally did mark my ballot and send it off, the decision was already made by the other 20-plus members of the Board. It would be January 6th before I would know the outcome.

My conclusions are these.

Rick Schneringer, uncharacteristically perhaps, was generous to a fault here. He had no business 'giving up' $600,000 of his show receipts in 1984 **plus** 25% of the gate **plus** $15,000 per show to pay for some political big wigs travel and incidentals. I must remember to ask the other members of the board how **they** would have reacted if they were in Schneringer's shoes and SPACE came to them asking for a $600,000 **plus** 'annual donation.'

SPACE, on the other hand, should have been far less greedy. They went into the negotiations willing to settle for far less. I know, I heard the before-hand discussion. The two negotiators in this one are not to blame for 'taking advantage' of Rick since they frequently reported back to the Board or the elected officers for advice and counsel. I heard one remark, **"Each time we ask for more, we get it."** And the response, **"So go back and ask for MORE!".** Again, I wonder how anyone participating in this would have handled it if **they** had been in Rick Schneringer's shoes.

My father used to tell me, **'Son, a good deal is where both sides benefit and both sides have equal perceived value from the contract.'** My father was a bright, fair man; rest his soul. I'm not so sure the negotiators in this one, and that is to include everyone on and off the board whose counsel the twin negotion team sought out, ever heard my father expound on this topic.

So no, I could not vote to 'sue Rick Schneringer' nor could I vote for SPACE attempting to jury-rig a show in Vegas in March, right on top of or directly ahead of STTI. I could not vote to 'sue Schneringer' because to do so would be to 'second' the unfairness of the deal that Schneringer may have originally agreed to and then re-thought out. That he may have agreed to it is not my concern; that he went home, 'sobered up' and realized what a horrible mistake he was making is my concern. **I cannot see the wisdom in taking advantage of someone just because they have a weak moment or two.**

I could not vote to jump in on top of STTI with a SPACE show in Vegas for an entirely different set of reasons. Number one, after Schneringer, I have more 'show experience' than anyone else in this industry. I know, because it has been my responsibility to do it, what a tremendous job putting together a class-act show really is. There are not sufficient days remaining for a full time staff of knowledgeable people to do it, SPACE has no such staff and 'volunteers' from the industry is no answer. A man who has to spend 8 hours a day worrying about where he is going to locate enough NE564 chips to keep his production line running cannot 'volunteer' two hours a day to figure out how to make a show run properly. This is especially true when that man has never created a show before.

Now assuming that by some miracle there were enough days or enough skills in the limited time available to put together a class-act show, and assuming that by some other miracle a substantial portion of those 344 booth users at the STTI show could be talked into bailing out of the Riveria and showing up at Caesar's Palace or some other

quickly acquired location, let's think about what this does to the industry. When we had two shows planned for March, we had deep divisions within the industry. Only a handful of firms had signed up for **both** shows. Almost nobody saw any wisdom in two shows back to back.

Having stated why **I** (in **December**) could not vote to sue Schneringer nor approve of a Vegas Show for SPACE in March, let me relate the primary events that followed.

1) Schneringer, on January 1st, decided he had a legal problem. He traveled to the east coast and located a law firm he was comfortable with. At this point we have some confusion. SPACE denies they had, on their own, filed a law suit at this point against Schneringer. For some reason Schneringer **believed** such a suit had been filed, using a law firm in Tulsa, Oklahoma.

2) Schneringer's law firm **did file a suit,** in Washington, DC, on January 6th; a Friday. On Sunday January 8th Schneringer, two of his attorneys, Taylor Howard, Peter Dalton and Bob Behar met in a lengthy session in Vegas. In that session, Schneringer's side asked for substantive changes in the Orlando agreement, **according to** the SPACE version. **Schneringer denies** there were substantive changes; suggests they were merely 'fine tuning' of the general agreement in Orlando. That session broke up without agreement.

3) The SPACE Board, with 15 members present, met on Monday January 9th. Further negotiations, with Schneringer and his attorneys present, continued. One of the primary problems was the matter of show program content control; Schneringer's position was that 'his side' would control all or at least 50% of the program. SPACE's position was that SPACE would control the program. SPACE, for example, is planning an extensive full-day 'course' on downlinking for dealers. Schneringer, **reportedly,** did not believe the subject was worth spending a day on.

SPACE has been working with two major groups (the names are confidential, for now) on the downlinking business. The concept, as we reported here in **CSD** last October, is that SPACE Dealer Members could be carefully trained in properly operating a downlink; these are commercial downlinking jobs with money paid to the Dealer Member for doing the work. SPACE's **David Johnson** has been working on this project for more than a year. We'll come back to this momentarily.

4) **There was an impasse.** There would be no agreement to settle the differences. Schneringer and attorneys left the meeting. The SPACE board discussed the matter further, and voted **not to continue** negotiations.

5) **There was a knock on the Board meeting door.** It was a man with pieces of paper; **VP Rick Brown,** President **Peter Dalton** were 'served' by an official paper-server. SPACE, plus Dalton and Brown individually, were being 'sued' by STTI/Schneringer.

The impact of the suits was immediate. SPACE would defend itself, plus Brown and Dalton, using outside Counsel. SPACE would pick up the tab. A new vote was taken during the Board meeting; SPACE would NOT sue STTI/Schneringer but latitude was given 'counsel' (Brown) to take whatever (legal) steps as might be required to insure that SPACE **would** have a show March 18-20.

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA

NORVAL M. SCHNERINGER,
Anderson Road
Arcadia, Oklahoma 73007

and

SATELLITE TELEVISION TECHNOLOGY INTERNATIONAL, INC.
Anderson Road
Arcadia, Oklahoma 73007,

Plaintiffs

v.

SOCIETY FOR PRIVATE AND COMMERCIAL EARTH STATIONS, INC.
1920 N Street, N.W.
Suite 510
Washington, D. C. 20036

and

PETER J. DALTON
1920 N Street, N.W.
Suite 510
Washington, D. C. 20036

and

RICHARD L. BROWN
3714 Calvert Street, N.W.
Washington, D. C., 20007

Defendants

84- 0048

CIVIL ACTION NO.

FILED
JAN 06 1984
CLERK U.S. DISTRICT COURT
DISTRICT OF COLUMBIA

HAROLD H. GREENE,

E

JURY ACTION

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COMPLAINT

Norval M. Schneringer (Schneringer) and Satellite Television Technology International, Inc. (STTI), Plaintiffs, by C. Stanley Dees, Francis B. Burch, Theodore Sherbow and Henry R.

PAGE ONE/ the now infamous suit brought by STTI against SPACE plus Dalton and Brown. Tens of millions **sought in damages.**

Given the circumstances of the impasse, a perhaps amazing thing next happened. On the telephone, and on the floor at CES, SPACE left the CES show with commitments for **220 booths** March 18-20. The distributors (the BIG distributors) agreed to promote the SPACE show to all of their dealers; massive dealer mailings would be made starting almost immediately, through the distributors. **Mark Sheldon,** former Marketing Manager for California Amplifier, was hired to promote the show to the 'grass-roots' dealers. A major PR firm in New York City was hired to get the word out.

SPACE's banquet would feature **Joan Rivers** and **The Smothers Brothers.** Leading political figures WOULD be on hand. And the 'Downlinking Seminar'?

SPACE's Johnson wants dealers to become more professional, in every way. His concept is that by first teaching, formally, the finer points of downlinking, and then acting (through SPACE) as a 'clearing house' for downlinking assignments, SPACE can create valuable new regular business income for is members. A full day (perhaps longer) training seminar on this topic is the kick-off of the program. Waiting in the wings are two, very large and national, groups who are ready to sign on board for dozens of downlinking 'jobs' in the last nine months of 1984. SPACE's Johnson.

"This is a golden opportunity to dealers; by handling these professional downlinking jobs in a professional manner, the stature of each participating dealer will grow immensely. Plus, he will have direct contact with dozens of new, potential, business and private customers for his normal TVRO sales business at each downlink he handles. It is the best of all worlds."

The 'SPACE Downlink Program' will be the cornerstone of the SPACE Las Vegas Show March 18-20.

And after Vegas? SPACE remains committed to a **pair** of shows per year. A fall date, and location, are being studied. All future cooperative shows between SPACE and STTI are off.

I believe SPACE has done the right thing by backing off the law suit against Schneringer. I hope the events that transpire over the next few weeks don't force a change in that decision. SPACE has also

decided to avoid any additional provocation of STTI, avoid 'bad mouthing' of the STTI Las Vegas show, and generally handle the forthcoming confrontation in an 'upbeat' and 'positive' way.

There will be considerable confusion at the grass-roots level over **'which show'** to attend. Schneringer's strength is or has been in bringing in 'new blood' to the shows. SPACE's strength has been just the opposite. Exhibitors at the SPACE show may NOT tear down their booths until 3 PM on the 20th; nearly a full business day **after** the STTI show is to open its doors. It is a pity the SPACE Show could not have been arranged so that there was at least an 'overnight' between the two, to allow exhibitors time to 'move.'

I suspect, guess is a better word, that what may happen here is that attendees will plan to show up on perhaps the 19th, attend the **last two days** of the SPACE show and the **first two days** of the STTI show. The middle day is common to both. **If SPACE** schedules its 'Down Linking Program' **early in its show** (likely) to attempt to get people into the SPACE show 'early,' we may see those who are coming for that special event coming early but the big crowd coming late.

The losers are the exhibitors who are now faced with double booth costs, a moving expense within Las Vegas, and an uncertain shuffling of personnel. The winners may well be the attendees who will benefit by seeing more booths, attending more seminars, and meeting more people than ever before possible.

As all of this news of suits and countersuits, federal marshalls and cross country rushed flights by expensive attorneys reached me, I wondered just how all of this was going to **look** to the rest of the TVRO world. **What kind of trade association allows itself to get into this kind of legal squabble?** Was this an industry that a proud company such as Uniden Corporation wanted to be a part of? Would HBO **really** sit down and work with a bunch of people who seemed bent on getting themselves into virtually every Federal court this side of Seattle over something as mundane as running their own trade shows? **Where did we all go wrong?**

Then I began to collect bits and pieces of another side of the story. Somebody was out there collecting affidavits dealing with SPACE VP and General Counsel Rick Brown. Was Brown really involved in what I was hearing? Was there a conspiracy to 'get Brown' out of SPACE?

The questions, as we approached the last possible moment before **CSD**'s February deadline, far outnumbered the answers. The answers to much of this was going to have to await the February issue of **CJR,** or perhaps the March issue of **CSD.** Clearly, there was a very tangled web being woven here and not enough time to sort it all out.

F3R/Revisited

Back in the March 1982 issue of **CSD** we took a critical look at the performance of then-new F3R and were generally pleased that the new RCA bird was such a dramatic improvement over the formerly used F1 bird. Then in our June 1983 issue we re-visited the subject of bird performance, coupling it with the fears that 2 degree spaced birds at 4 GHz might cause some problems for dishes starting at ten feet in diameter and working down. Our 1983 analysis showed that on the average, one-year-old transponders had lost 0.7 dB in effective radiated power (E[I]RP) and we made the forecast, based upon RCA data and good engineering common sense that over the additional life of F3R we might anticipate losses in the **0.4 dB per year** region, **per transponder.** We summarized those findings by suggesting that whether a particular dish installation survived 2 degree spacing or not, a more serious concern was whether smaller dishes would survive and perform as the satellite's basic transmission power backed off (and off) year by year.

Satellite degradation is at the moment a controversial subject in the satellite systems design world. The first generation of satellites utilized a type of on-satellite power amplifier called **Traveling Wave Tubes** or TWTs for short. TWTs are, indeed, **tubes** and all tubes have a finite life. If a tube does not stop operating altogether before its programmed time, it will slowly deteriorate such that its maximum output power will decline as a function of use and time. A TWT, simply stated, will not run forever.

The newest and latest versions of satellites (such as F5) have replaced the TWTs with solid state (as in transistor type) power

amplifiers. Transistors also have a finite life, but that life is far longer than the TWT life. Solid state power amplifiers have a very small, almost unmeasurable, loss of performance per year. And thus, where we can measure and see and anticipate say 0.4 dB annual loss in output power from a TWT type of amplifier on board the satellite, we probably cannot detect the companion 'annual loss' from a solid state power amplifier. Such are the miracles of transistors.

A gradual 'failure' of the output power amplifier is hardly the only contributor to the gradual loss of a satellite's performance. The TWT or solid state amplifier represents the 'power block' which gets the signal down to earth, or back to your dish. To make this power amplifier (and the balance of the satellite) work, there are configurations of solar cells to collect sunlight and turn that sunlight into electricity. The electricity is stored on board the satellite in special long life batteries.

Before a satellite is launched, the designers know how long they expect the solar panels to continue to perform at their original efficiency. Solar cells, in space, have a rate of deterioration of their own and a fairly common value of 'performance loss' over seven years of satellite life is 15 to 20%. Thus at the end of a seven year span, it is likely that a satellite's solar cell array will be producing only 80% of the output it initially had when new. A loss in 'primary power,' caused by deterioration of the solar cell system, means that all of the systems on board have that much less operating power available. Some of that power loss ends up affecting the performance of the TWT/solid state amplifiers. Less current available for operation means the ground controllers have to command the power amplifier stages to **'back off'** or reduce their operating power levels. So now we have two factors contributing to the on-ground degradation we see; a loss in power amplifier **output capability,** and, a loss of **primary power** to make the power amplifier (and sub-systems) perform.

There are other losses as well; the batteries on board lose 'capacity' as they are used and re-used. A lowered battery capacity has the same effect as a reduced solar array efficiency; less current is available to run the system. The uplink signal is received by a complex 6 GHz receiver system on board the satellite. This receiver has gradual deterioration on its own. The 6 GHz signal is converted inside of the satellite to a 2 GHz region IF and then it is bumped back to the appropriate 4 GHz downlink channel. This down conversion/IF/up conversion system also has a gradual deterioration in performance.

Other than the losses associated with the TWTs, however, the annualized deterioration is relatively modest. The next significant factor is the solar cell and battery system. All of this adds up to a finite life for the satellite itself, even if everything on board performs as it was hoped and planned before the bird leaves the pad.

It should be noted, however, that even the best plans will fault and there is ample history since the original launch of Westar 1 to illustrate how often some part of a satellite will quit, without warning. F1 (before the present F1R) lost a couple of transponders almost immediately after launch. F2 had a mal-functioning solar panel gyro system which required manual operation of the panels for a period each day. F2 also one day decided it wanted to point 'the other way' and flipped over, beaming into space. Getting it back, pointing towards earth, was a nervous exercise. F1R has had recent operational problems. F2R has had heating problems. And so on. And not only RCA has been hit by unexplained or sudden problems. Galaxy 1 has a bum transponder (13) and one of its two back-up receivers, used to bring the uplink signal into the bird, has failed.

There are redundant (back-up) parts built into the system. The failure of a Galaxy 6 GHz receiver front end has not shut down the half of the bird (polarization) it was connected to simply because the unit that failed was intended for backup service in the first place. But with it gone, there is now no backup for 12 of the transponders on G1. **If the receiver now operating should fail, there goes 12 transponders on G1!** Since F3R, the latest series of birds have carried typically four extra output power amplifier stages; spare TWT Units. They are 'switchable' on command, from earth, so that say the output power stage on TR4 suddenly quit operating, by command, one of the backups could be switched in to replace the crashed TWT. That would keep the transponder running.

Our look at transponder signal levels in 1983 was intended to focus attention on the slow but continual deterioration of satellite

signal levels on earth as the system ages. We sought to alert those who might be tempted to sell dishes that are on the small end of 'big-enough' that over a period of years, those pictures that appear 'adequate' in 1983 might turn out to be poor pictures in a few years. Let's revisit the state of footprint signal levels now that we are down the road two full years for F3R.

To date, we have not had a catastrophic failure on F3R. All 24 transponders continue to function at various levels of power. Remember that there is a bank of six transponders (TRs 3, 7, 11, 15, 19 and 23) which were originally 8.5 watts in power; and that the remainder of the transponders began life as 5 watt power units.

1) The loss, measured and calculated, since our eary 1983 year-one check, seems to be very close to the 0.4 dB-per-year predicted. However, that 0.4 dB is an **average** of all 24 transponders, and there are those which have fared better and those which have not done as well.
2) There have been operational changes, affecting the picture quality on earth, during the past year. Remember that each time a transponder operator allows the addition of one extra (audio) sub-carrier, he is taking away an average of 0.75 dB from his video transponder power available. In other words, the picture gets weaker each time an additional (audio sub) carrier is added to the transponder.

With these two factors in mind, here are the losers and the winners during calendar year 1983:

A) **The transponders** that lost the most ground (i.e. those that deteriorated the most during 1983) are **4, 6, 8, 14,** and **24.** Not necessarily in that order. The biggest loser was transponder 8.
B) **The transponders** that lost the least during 1983 were **11, 19** and **23.**

There is some significance that those that lost the most were in one of the two horizontal channel sets while those that lost the least were all in the same vertical polarization set.

The significance of the power loss in 1983 only seems to 'come home' where you are directly affected by the losses. Naturally you notice power losses when pictures that were formerly 'clean' now have some sparklies in them. Your customers may be telling you "transponder 4 is not as good as it was when you put our system in . . . can't you do something to fix that?". The answer is that you cannot fix a TWT that has had more than its expected loss during the past 12 months, especially when the TWT is more than 23,000 miles away!

Losses are gradual, barely measurable from month to month by the most sophisticated test or monitoring equipment. And only marginally detectable over a full year's time. What **is detectable** to the viewer is the realization that signal levels have changed, and that the pictures are not as good 'now' as they were 'before.'

As a dealer, you should be prepared to explain why such things do happen, and also be knowledgeable enough yourself that you do not spend unproductive service call hours trying to 'get transponder 8 back to where it once was' when in truth the only way you will do that is to upgrade the installation to a larger antenna!

HBO Competition Stiffens

When Home Box Office went to the movie producers this past fall and told them "**We** are going to do DBS On 4 GHz, and **YOU** are going to do it **WITH** us," they got less than enthusiastic support from many of the movie producers (see **CSD,** January 1984). The movie production people have been on the short end of the cable stick for as many years as there has been a cable television premium movie industry. At least that is how **they** tell it.

HBO is known in the movie land as a tough negotiator, difficult to deal with and out to get the last penny in film rental rights. That's not bad; that's good business. HBO, as we saw in our September look at the premium television giant, got in early and wrote the game rules before anyone really realized that game rules were being written. When you write the rules to any game, the chances are pretty good you will always be a leg up on those playing 'your game.'

Paramount, one of the major movie houses, has never been keen on HBO and has in fact always been the most difficult for HBO to 'deal with.' Paramount has been stuck more or less accepting HBO's price for Paramount film product for several years, knowledgeable that while they feel they really deserve more money than they have been

getting for their product, from HBO, if they get too tough in their own negotiating stance with HBO, they are apt to end up with HBO simply passing their film(s) by and they end up then leaving a couple million 'easy dollars' sitting on the table.

Paramount was one of four movie firms that attempted to get a cable service of their own off the ground a couple of years ago. The Justice Department squashed that one because Justice said the proposed movie licensing scheme planned by the quartet was essentially a restraint of trade of a free market item. Paramount has been looking for some way to get into the pay TV business, without losing its shirt, since that time.

Now the third part of the mix; Showtime. When The Movie Channel (Warner) and Showtime finally merged this past fall, it was an attempt by the weak number two premium TV firm (Showtime) and the weaker number three premium TV firm (TMC) to pool their resources and 'together' take on the big boy in the game; HBO. If you count subscribers, the total combined resources of Showtime and TMC was still not a significant portion of HBO's subscriber 'base' but together they saw greater strength.

Anyone who spends anytime watching the trio of services still up (with Spotlight now leaving us) on F3R has to come to the conclusion that in any given month, sooner or later you are going to see most of the MAJOR features on **any** of the three movie services. In other words, if you watch only TMC, you won't miss much except for the special productions HBO and Showtime throw in to water-down their schedules.

The newly born combo package of TMC/Showtime recognizes this fact and they also recognize that in the cable world, selling 'multiple premium services' is the name of big dollar cable success. Cable industry stats tell us that most cable homes taking premium services take over three such services, nationwide, now. So for some years cable operators have been wrestling with the problem of 'which three' or 'which four' premium services do you offer. Some cable systems offer each premium service as a 'stand alone'; that is, you have a Chinese Menu presented to you and you take one of these, one of those, and one of the last column to get your selected premium channels. Other cable operators think the smart thing to do is to batch premium services into 'tiers' of subscriber service. HBO brought out Cinemax as a second service on the theory that cable operators would, or could, 'batch' **Cinemax with HBO** to offer subscribers a 'pair of channels' for a 'bulk price.' Cinemax has been sold as a 'tiering partner' from the very beginning by most of the cable industry; a 'tag-along' for HBO (or some other premium service). Since both Cinemax and HBO were coming from the same place, and were being 'programmed' by the same corporate people, there was the opportunity to schedule movies and specials opposite one another on the two channels so that people would always find something different in appeal when they switched in their homes from HBO to Cinemax, for example.

Showtime went through a period where it tried to promote itself as a 'perfect tier partner' with HBO. They went to some time and trouble to document how if cable operators offered Showtime **AND** HBO, the cable operators taking that particular pair in a tiered service were going to do better (at the bank) than cable system operators who paired up HBO with say Cinemax. Some cable operators bought this idea, but the majority noticed that when you paired HBO with Showtime you ended up with a very high 'repeat' ratio of premium movies in any given month. Part of this problem can be traced to the fact that when a movie company such as Paramount releases a new, highly desirable film such as **Flashdance,** it ends up going to all of the premium suppliers at the same time. Have you ever noticed how as a new month begins there is a rash of big-movie debuts, starting as early as midnight on the 1st day of the new month? That's because the premium folks, aware that they have competition from other premium programmers, are trying to be able to get **their** customers **the latest releases at the earliest possible moment.** Midnight on the 1st is the earliest possible moment.

This type of competitive spirit is, after all is said and done, a tad on the childish side and most of the premium people finally realized what they were doing was at best less than totally professional. That's when HBO and Showtime decided that the best way they could keep their respective services 'different' from one another was to go out and

create their own programming product.

Each of the premium programmers wants to be included in the cable system operator's chosen 'first tier service.' In other words, if the cable operator is going to batch two premium services in 'Tier One,' a movie service and **Disney** and **The Playboy Channel** in 'Tier Two,' and so on down the line, and premium folks want their service to be in the **first level** of tiering. They know they will get more 'sales' that way.

HBO usually ends up in Tier One. Showtime usually does not end up in Tier One, when the cable system offers **both** services. If you were Showtime, what would you do to get your service into Tier One? The handwriting is on the wall; all the clues are here. You make your (Showtime) service 'stand out' from HBO; you do something to grab the attention of the cable operator and you give the cable operator a tool so he can say to his prospective customers, **"And, if you take Tier One, you get** all **of the following features on HBO,** PLUS, **you also get all of these** DIFFERENT **features on Showtime . . .".** That is far better than having to explain to the potential customer that, 'Yes, there is (some) duplication in movies between HBO and Showtime, but this is REALLY for the convenience of you, the viewer . . .".

Since there are only so many **Fairie Tale Theaters** which you can create at Showtime, because of time and budget constraints, and since all of the movie producers always release the same movies to ALL of the pay TV services at the same time, how do you break this vicious cycle?

Let's return to Paramount now. The movie people who dislike HBO, who have tried on two occasions (or more) to get directly into the pay TV business. Paramount is riding a crest of some pretty big flicks right now, and Paramount would like to break **another vicious cycle;** the cycle that has Paramount getting less for their films, per home, at HBO and elsewhere, than Paramount believes the films are worth.

Paramount and Showtime/TMC have signed a $100M deal. Starting right now, this month, Showtime is going to get the exclusive use of Paramount films until 1989. All of the Paramount films. And the $100M? That is just the up-front cash, according to reports. Between now and 1989, some observers feel the deal could put as much as $700M in the pockets of Paramount. That's a bunch of bucks.

Here is how it works. Paramount has worked out a new compensation formula. Rather than getting paid per film/per CATV home as they have in the past, by negotiating for each film separately, and by often getting around $.25 per home per film, Paramount will now be paid for each film on the basis of how that film actually did in the box office. A big film, bringing in lots of box office dollars, will automatically earn Paramount big pay-cable dollars. A lesser film will earn accordingly.

The results start now; this month. **Flashdance** will appear in the Showtime/TMC lineup in the middle of the month (**TMC** February 12th; **Showtime** February 13th). Other Paramount releases, such as **Staying Alive** scheduled for cable release in July, may be handled in a different manner; the Paramount deal with TMC/Showtime allows the newly aligned duo to release a film such as **Staying Alive** in say July on TMC and then retire it for a month or two, and bring it back on Showtime in September. The concept is that this gives TMC/Showtime a better way to make their own two services 'look different' to the average movie watcher on pay cable.

Paramount movies do not a successful pay cable service make; if **just one** studio was able to pull off that kind of monopoly, we would have had a 'Paramount Cable' service on satellite years ago. The truth is that in a **year** such as 1984, Paramount may have 15 or fewer really attractive movie products to bring to market. The premium cable people 'eat up' 40 to 60 products **a month,** every month; 12 months a year. They cannot all be big, new releases since Hollywood puts out far fewer than that per month; at all levels of attractiveness.

What the through-1989 exclusive deal with Paramount does for Showtime and The Movie Channel is give them a one-upsmanship-posture in the cable 'tiering battle.' Showtime now has some 'exclusive' product which it can dangle before the cable operator's eyes and hopefully it will increase Showtime's chances of getting into the 'first tier.'

But it also creates some problems for the new duo.

Most of the cable industry felt that with Showtime and The Movie Channel now being sold as a pair, there would be a gradual but definite change in the makeup of The Movie Channel programming schedule. If 'HBO + Cinemax' was one attractive 'tier,' could not

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'Showtime + The Movie Channel' be an attractive tier as well? Remember that when you tier, you like to put together services which **compliment** one another, **not battle one another.**

Showtime, like HBO, has its own exclusive features. Cinemax has created its 'exclusive look' by relying heavily on old-but-good movies which it can bring back as 'classics,' plus it attempts to appeal to the more splinter movie groups; those that dig horror films or what have you. Cinemax is a 'minority film service,' on-purpose **not** like HBO.

The Movie Channel, on the other hand, had an original concept. It would show nothing but movies. No specials, no sports, no comedians in nightclubs. **Just movies.** Since Showtime makes movies its first level of attraction, and counts on other programs to fill in around the movies, there is bound to be some duplication between a 'Showtime Month' and a 'TMC Month.' And there is. Which makes it a difficult pair to tier with the same impact and effectiveness of say an HBO + Cinemax tier. That's why cable industry folks have expected to see 'TMC' change hats a tad, to make it stand out as a 'separate product' from Showtime.

With Showtime/TMC both getting exclusive rights, as an operating pair, to Paramount films through 1989, and with the likelihood that by having exclusive use of Paramount films Showtime will become an even more attractive companion **to HBO** on cable's "Tier One," what does that do to The Movie Channel? At this point in time, nobody seems to know just what direction TMC will be going. But the smart bets are that during 1984 TMC will become much more "it's own stand alone product."

With TMC in the Showtime family, Showtime is in a muddle. It wants to be on the first tier and the Paramount deal helps that. But when it ends up on the first tier with HBO, it leaves its junior partner (TMC) out in the cold. Does it help the corporate fortunes to have Showtime getting better acceptance but to have TMC losing ground? A most difficult position, to be sure.

THE EUROPEAN Scenario

When we last visited the subject of DBS In Europe (see **CSD** for November 1983) it was apparent that the 4 GHz services we now understand and 'love' in North America are never going to amount to much, if indeed anything at all, in Europe and the Middle East. As long as there is an Indonesian Palapa bird flying in the Pacific there remains **some hope** that it **may** eventually provide the basis for an 'industry' in at least limited segments of Asia. And until Africa gets its act together, the 4 vs 12 GHz battles for that continent are still on paper.

The two prime movers in Europe would seem, on the surface, to be the United Kingdom and France. Both have ambitious plans for deployment of their own satellite systems and both have announced various schedules for the creation of **12 GHz DBS** services. However, the best of plans have a way of going 'bad' and this is unfortunately the trail we see as we come back for a visit early in 1984.

The only operational service at the present time remains the Murdoch PLC service which has been re-named **'Sky Channel.'** It is now on the air from 5 PM to 10 PM daily and because it is in English and because it attempts to support itself with advertising, it is a unique service for Europe. Cable systems and a few hotels here and there take the service, which is 'free' to the users. It remains scrambled, however, which continues to hurt since they need every viewer they can get to make it. A typical week's programs include American imports **Fantasy Island, Charlie's Angels, Starsky and Hutch** and movies such as **'Atlantic City.'** This service uplinks from England.

Sky Channel's acceptance (they began using the European ECS-1 bird, finally, on January 19th) has been slow but things look much better in 1984. Several German cable systems (the first to be allowed there) will be taking Sky Channel during the first four months of 1984; The Vienna (Austria) cable system was to start taking Sky Channel February 1st. Cable systems in Morocco (North Africa), Denmark and Sweden are scheduled to come on line before 1984 is over.

The big growth for Sky Channel will be 'at home,' in the UK, however. Approximately 2,000,000 new homes could be reached by Sky Channel in the UK, through **existing** cable systems, if the British 'Home Office' decides to allow this. English cable operators were hopeful that this approval would come during January. Approximately 150 UK cable systems are said to be ready to add Sky Channel as

soon as approval comes along.

Reception of Sky Channel, in the unfortunately scrambled mode, is relatively painless. A 3 meter dish is overkill for most sections of Europe and the 11 GHz signals end up on baseband using technology we all use every day. Then into a modulator, and out into the cable system. Inspite of all of this apparent activity, there is **very little good news** here for the **manufacturers** of TVRO antennas or receivers. The sum of all of this is barely 250 new 3 meter dish antenna systems; hardly a dent in the millions forecast by some.

Another significant service is planned for operation starting on March 1st. **United Cable Programmes** (UCP) has leased transponder space through British Telecom on Intelsat V to send a spot beam back to the UK. This is a movie service, not unlike HBO or showtime in the states and some other non-movie programming. What we have developing here is an early 'Westar' vs 'Satcom' battle; the all-European ECS (1) satellite against the Intelsat V bird. Even **before** the European cable industry gets off the ground there is a need for two, separate 3 meter size antennas; one for ECS and one for Intelsat. If one accepts the assumption that all cable firms will install two dishes, our 'market' for 11/12 GHz terminals now becomes 250 x 2 or 500. **Still not a big market.**

Those who would like to sell hardware to thousands or millions of individual viewers are only modestly interested in the early cable aligned services. As long as the cable programming is scrambled, they see very little mass market appeal for the programs. And they are right.

Manufacturing 'hopes' are instead pinned on 1985 and beyond when the original plans called for at least a French DBS service and a British DBS service, widely available over Europe. The British service is called **'Unisat'** and it involves a customized, high-power satellite system which even on paper looked like a farce. In effect, the British were planning to spend **more** money to launch Unisat to provide **two channels** of television than RCA has spent cumulatively to launch F3R, F4 and F5. Recently some economists have put a pencil to the project and have declared that if it goes ahead, it can never even pay back the costs of the birds; not to speak of the costs associated with the project's operation. Naturally this has caused a furor in the UK, and the BBC, behind the project, is having second (and third) thoughts about Unisat. If it flies, now highly in question, we are looking at 1987 or beyond.

One of the reasons Unisat now looks very **un**attractive is that the British had hoped that there could be an agreement over all or most all of Europe on 'standards' for DBS. You will recall that while we have 'NTSC' standards for North American television, Europe has two other systems; 'SECAM' and 'PAL.' And from country to country using the SECAM and PAL 'standards' there are national variations as well. French SECAM is not the same as Russian SECAM, for example.

And since all of the standards were created and adopted in the early years of television (see **CJR** report for November 1983), it seemed like a good idea to re-visit the question of standards some 30 plus years after they were established. Using 1980's technology, were there not changes that could be made which would create better quality television? The British thought so and created **C-MAC;** a new system which was defined, from start, for the particular problems associated with satellite transmissions.

When C-MAC was first shown, there was high praise for the system, its design and the quality of its pictures. The British **thought** they had Europe agreeing that **(1)** there **should be** a (new) single standard, and, **(2)** that C-MAC **should be** that standard. So they plowed ahead with Unisat and many other projects planning to use C-MAC. Well, after the engineers got done praising C-MAC the politicians got into the act. The French were the first to say a firm 'no' to C-MAC and since then it has been one country after another saying the same thing.

The whole concept of Unisat was that one powerful 'BBC in the sky' service would send English television to all of Europe. But, when the C-MAC standard which Unisat planned to use was 'booted out' by most of the European countries, the whole BBC concept fell apart. It is one thing to shove a strong, high dBw, signal down on top of everyone's rooftop; it is quite another thing to have the electronics inside those rooftops not be compatible with the 'standards' you are employing. Obviously a **few** people would go to the trouble and expense of getting a **special** TVRO receiver which would function with C-MAC. But not the big, mass market which Unisat was counting on.

So between the unfortunate error in designing a satellite which cost tens of millions of dollars more than any satellite ever cost before, and the unfortunate scenario which eliminated 'your' satellite's signals from most of your target area's receivers, the Unisat project suddenly looked very dark indeed.

While the British were stumbling over the C-MAC/expensive satellite problem, the French meanwhile were having totally different problems. Way back when, they decided to launch a French bird that would 'speak French' to Europe. Then they got together with Germany and the pair teamed up for a network of birds which would speak French **and** German to Europe.

Now the French approach to anything is to look at how many new jobs might be created by allowing some new form of technology. They put the forecast people to work and ask them to develop a study on how many jobs will occur if this new business or that new business is 'allowed' in France. Without government approval, no new business activity starts in France.

The French DBS project always looked marginal, as far as creating new jobs. But there was a counter balance to jobs; French national pride. If the British were going to have 'English speaking television' all over Europe, then the French would naturally have to offer 'French speaking television' all over Europe.

At about the same time the pencil pushers were studying how many new jobs would be created with a French DBS service, another team was studying how many new jobs would be created with a 'national' cable television network. The jobs vs jobs comparison was dramatic; **cable was the hands down winner.**

Cable has several distinct advantages to the French. First of all, it is secure. If they can put cable in front of all or most all of the homes, they will insure that most of the French homes are kept from being 'exposed' to non-French programming. It serves the French 'national interest' to keep all non-French television programming from reaching French homes.

With Unisat in trouble, several things happened in France.

TDF-1, the first of the Franco-German birds is well down the road. It will fly. But TDF-2, the second generation bird, could be stopped. That appears to be what is happening right now; the French are pulling back confident that with Unisat either dead or badly set back in time, they can **now** have the luxury of a several year 'window' during which they can get a giant jump on the nationwide cable system they much prefer.

All of these international power plays point up that DBS for Europe is not going to happen smoothly, or overnight. Cable, at least in England and France, is the preferred medium. Cable 'controls' its signals; DBS does not.

If Unisat does fall totally apart, if TDF-**1** is the first, **and last,** of the French national DBS birds, DBS for millions of homes in Europe may be set back a decade or more. There are no other strong runners in the game; and that includes the Germans. Without 12 GHz DBS, operating freely across national borders and providing a universal 'format' service to a dozen or more nations, the only K band activity we are going to see in Europe is likely to be of the ECS/Intelsat variety; scrambled, and totally occupied by **cable** programming services. That is bad news for those firms who had been planning on Europe becoming a major 12 GHz DBS marketplace.

PARTS CRUNCH

The mid-January issue of CJR **(Cooper James Report)** digs into the recent realization that our industry is in a heap of trouble because there is a very significant shortage of 'raw microwave parts.' Various parts, such as the NE564 Phase Locked Loop, some microwave transistors used in LNAs and downconverters, and microwave diodes used in downconverters have all but totally dried up and when OEMs can locate the much needed parts, the prices are from 200% to 900% what they were one year ago.

This in depth report is must reading for anyone who manufactures or sells TVRO electronics. Some probably far-out charges are made by members of our industry, in the report; including a 'conspiracy' charge **(*).**

The plain truth seems to be that we are in a transition period between an era when only our small, insignificant industry was using certain high-tech parts, and, a whole new world of satellite AND computer OEMs jumping into our parts pipe-line with their own demands for the same basic parts. The tragic point here is that we have reached this 'no-mans-land' in critical parts just when we as an industry are poised to really take off into the wonderful world of consumer electronics.

The commonly used NE564 PLL, usually found in receiver demodulator circuits, has been discovered by the folks who are building Floppy Disk Drives. I read a prediction that the marketplace for Floppies in 1984 is expected to increase 1000% or more. That's tough on us.

The microwave parts (various high tech transistors and diodes) are found in both our downconverters and in the back end of our LNAs. Unfortunately, they will also be found in the new 12 GHz DBS receivers as well, in one form or another. Predictions of several million 12 GHz receivers being built and marketed in 1984 should send shudders up and down our backs since every microwave part that gets siphoned off for a 12 GHz receiver is one-less part available to 4 GHz receiver builders.

Many of the 'design pros' in the business tell me that we are in for a very tough six months; starting back in January. Some of those who are not given to optimism suggest that getting through the first six months, and still being able to ship receivers in quantity, is the 'easy' part. Getting through the second six months will be the tough part.

Of course 1984 is not expected to be the 'big year' for 12 GHz receivers. It just happens to be the first year for mass produced 12 GHz hardware, and, the year we are stuck with right now. And equally, of course, the people in Japan and Europe and the United States who manufacture NE564 chips and microwave parts are not sitting around

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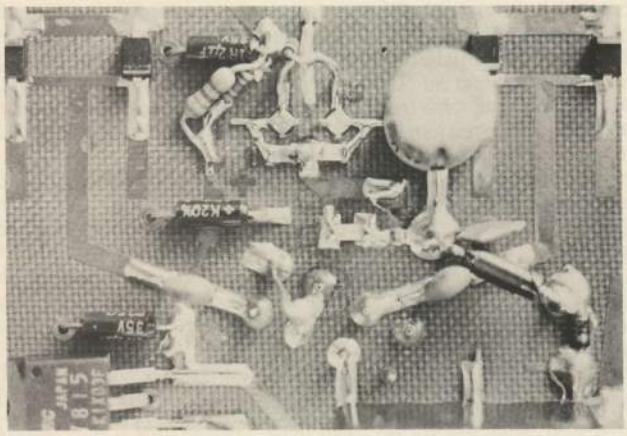

watching all of this happen without some reaction. But you have to read **their own forecasts** to understand **when** we might get out of this mess.

Remember, our total use of NE564s and microwave transistors and diodes is not significant. Not on the world market (of course it IS significant to us!). The people who make these parts know how many we use, and how many they expect (forecast) we will use in say 1984. They have not been impressed with us, so far. What has impressed them is the unmitigated growth of computer terminals, and, the projections for millions of (11)/12 GHz DBS type receivers in 1985 and beyond. That was a **'5'**, not a '4'.

So the NECs and the Motorolas and the Fujitsus of the world have been making their own plans to bring on line new, expanded, high speed and automated 564 production plants and microwave transistor and diode plants. They expect to start cranking up these mega-buck facilities in the **last half of 1984** and through 1985. They will be ready when **they perceive** the market itself will be ready. Alas, "our 4 GHz market" is so small that it does not even warrant a 'recognition line' in their planning schedule.

We have been able to coast along with the limited parts supply because we have been growing at a rate which did not tax the parts suppliers. Our own rate of growth, **if** we were the only industry using these parts, has been matched by the slow but sure ability of the parts producers to gradually increase their own production capabilities. Unfortunately, along came "Floppies" and "12 GHz DBS" just as we started to double and re-double our own rates of growth. It all hit late in 1983 and now we are feeling the pressures.

There are three possible scenarios which I see.

1) Everyone is lying to me; there is no parts shortage and suddenly, tomorrow, some guy on a white horse will ride into town with all of the 564s and microwave parts anyone (or everyone) will need in 1984. If you believe that one, I have a condo in beautiful downtown Bombay I would like to talk with you about.
2) Prices on TVRO equipment, especially receivers, are going to escalate; fast. If a guy who is geared up to ship 2,000 a month finds he can only get parts for 500 or 1,000, he is going to have to raise prices to keep his doors open. And, lay off some people.
3) Some very bright person is going to figure out a way around the missing parts, creating a TVRO receiver that doesn't use 564 chips or microwave diodes or hard to get microwave transistors. If there is a guy out there with this receiver ready to fly, I would sure like to hear from him!

There may be a fourth scenario as well. If you lower the performance quality of the TVRO receiver system, you can get by with some lower grade parts. We use the high tech microwave transistors and microwave diodes because they give us top performance for our money. If you **insisted** that **everyone use** 50 dB gain LNAs, rather than the 40's and 30's that now proliferate, you could cheapen up the receivers by shifting some of the operating burden back to the LNA guys. This would put new performance demands (such as higher or even much higher gain) back on the LNA manufacturers, but if this is the only way we can continue to grow in 1984, it may happen. The end

result, by the way, would be cheaper receivers but probably more expensive LNAs so at the consumer level it would be someplace between an even 'wash' and a slight (perhaps 10%) price increase.

As the January CJR reports in depth, there are alot of TVRO receiver engineers burning the midnight oil in search of solutions. If you are a dealer or distributor, be advised. it looks like tough times are ahead.

IF YOU Understand This . . .

There are, for the record, TWO trade associations which purport to represent the SMATV/Private cable industry. SPACE is one of these, and SPACE has generously allotted a couple of 'seats' on the Board of Directors to SMATV types. SPACE has also, under Rick Brown's direction, conducted some SMATV type seminars at various trade shows and SPACE has made a few filings at the FCC in matters relating to SMATV.

The other trade association is **NSCA** and when last we talked about NSCA, it was in the form of an article written by SMATV operator **Peter Sutro** reporting on the most recent (then) SMATV convention (see **CSD** for October, 1983). NSCA and SPACE do not agree on much.

The General Counsel for NSCA is a chap named **W. James MacNaughton.** I do not know Mr. MacNaughton; I don't think we have ever met. I knew little of his REAL work until I opened the January 1984 issue of **SATguide** and read his comments on a matter that had been bothering me; the 'SPACE position' on the recent FCC decision that states and cities should be pre-empted by the FCC on matters relating to the regulation of SMATV.

Back last summer an SMATV operator in New Jersey had been hauled into a New Jersey court and told to stop operating/stop building an SMATV system there. The New Jersey SMATV operator was building a system inside of what was claimed to be the 'franchise territory' of a powerful New Jersey cable operator. **The franchised cable operator didn't want SMATV competition** and he went to the New Jersey state folks who regulate CATV and he asked them to 'expand' their area of regulation to include SMATV. The state obliged, went to court, and shut down the SMATV operator.

The SMATV operator was hurting. He went to NSCA for help. NSCA decided that the best way out of this mess was to go **to the FCC** and ask the FCC to rule on whether or not SMATV, like CATV, was really a subject for federal regulation rather than state regulation. NSCA felt, or perhaps hoped, that SMATV would look like **small CATV** to the FCC, and that the Feds would tell the state to back off.

Now when all of this happened, I was quite shocked to see SPACE file comments (i.e. pleadings) at the FCC which **opposed** the NSCA suggestion that the **FCC pre-empt the state regulations.** I asked why SPACE had taken this position (and could not recall, as a member of the Board of Directors, voting on this issue). I got no satisfactory answer except the suggestion that **IF** the FCC was to pre-empt state regulation of SMATV, **the next thing** the FCC would do is issue rules *and regulations* (***national*** *rules and regulations) for SMATV.* **I was told** that the FCC would be a much harsher regulator than the states. The option offered to me, and apparently to the New Jersey SMATV operator, was that the SMATV operator should take the State of New Jersey to court. And not get involved with the FCC.

At the time that did bother me. First of all, court cases have a way of dragging on for years. As they drag on, they cost big bucks. Big dollars in court costs, big dollars in legal fees. Could the SMATV operator afford to pay these big bucks? I suspected he would be out of business long before the normal four to six year span for court cases of this type had run out.

I spent from 1952 to 1978 having a great deal to do with the CATV business. I was known as something of an expert on FCC cable television rules and regulations during much of that span and I wrote extensively about those rules. I wondered to myself just how bad it would be IF the FCC **did adopt rules** and regulations for SMATV systems.

It happens that the FCC cable rules are very difficult to master. But, **and this is the important part,** it also turns out that **if** you operate a **'small'** cable system with say 999 subscribers **or less,** those rules for all practical matters do not pertain to you anyhow. The rules are 'staged' in 'steps'; the bigger your cable system, the more rules you

have to abide by. If you are down there in the hundreds of subscribers per system, you have a few pieces of paper to file each year and a few measurements to make and record. That is about it. Not a big deal. And, SMATV is 'down there.'

So what was so terrible about getting out of four to six years of protracted court action and big legal fees, and getting one set of national rules for SMATV? I didn't know. I did know this.

If the New Jersey SMATV system ended up in court, as SPACE was suggesting, all NEW activity for SMATV in that state would stop **until** the court decision was resolved. Nobody was going to put **new dollars** into **new SMATV** systems if that cloud of legal uncertainty hung over the New Jersey SMATV industry. I also knew that if the SMATV industry had to look forward to battling through the courts in 50 states to make itself an industry, we would be close to the year 2050 before all 50 states had it sorted out. I was sure that SMATV/private cable was far better off with one single set of federal regulations. And even those regulations were far from certain; to date there has been no noise at the FCC about getting involved in SMATV.

So when the FCC ruled in favor of the NSCA comments in the New Jersey SMATV decision, **ruling AGAINST the SPACE comments,** I was pleased. It seemed like the smart, common sense answer to me.

Now if someday the FCC **does** decide to regulate SMATV, I for one would much rather see there **one** forum before **one federal agency** that at least understands communication matters than a series of 50 court fights spread from Hilo to Bangor and Gainesville to Anchorage. But it still bothered me why SPACE, through its law firm Brown and Finn, had taken the opposite position on this matter. I did some digging.

The franchise area where the New Jersey SMATV operator tried to build his system is a big one. The cable operator there is significant in size. And that cable operator has legal counsel in Washington, DC. Since the battle began when the cable operator brought the matter to the attention of the regulatory people who handle cable in the State of New Jersey, I was inquisitive about who the legal counsel in DC might be for that big cable firm.

The answer shocked me.

The name of the cable firm is Suburban Cablevision. There are many ways YOU can determine who the legal firm representing Suburban Cablevision in Washington was, **last summer,** when all of this started. If you care, you might look into it.

As I read through W. James MacNaughton's reasoned arguments why SMATV should support NSCA rather than SPACE, I was impressed with MacNaughton's mind and his arguments why NSCA is the right vehicle for SMATV operators. **SATguide** is someplace between a magazine for SMATV/Private Cable operators and a magazine for cable operators. It was the first of the David Wolford publications; a stable that now includes just about one magazine per month for every possible splinter group dealing with satellite television. It is not a publication that is friendly towards SPACE; or at least towards some elements of SPACE. Thus I was surprised when MacNaughton, or **SATguide** proper, did not 'name' the attorney which represents Suburban Cablevision. Or, at best did represent them at least through the end of this past summer (I get conflicting reports on **who** represents Suburban **now**).

SMATV/private cable has its hands full getting established, legally, nationwide. It needs strong representation and unity of purpose. If NSCA is their trade association, SMATV operators should support NSCA. If SPACE is going to continue to file 'comments' in actions pertaining to SMATV at the FCC and elsewhere which are **counter to** SMATV's growth, and SMATV operators perceive this, then SPACE should get out of the SMATV business totally and stick to representing those individuals who own home TVROs. To attempt to do both is possibly a 'conflict of interest' which cannot sort itself out. David Wolford saw this when he started off **SATguide** as his single publication. As the satellite receiving industry grew, expanded, and became more diverse, he was intelligent enough to break **SATguide** up into a number of 'specialty' publications. SPACE cannot break up that easily, so that leaves SPACE in the position of deciding that it is one trade association for one group. I'm not so sure it can continue to be several **different** trade associations operating under one umbrella much longer.

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