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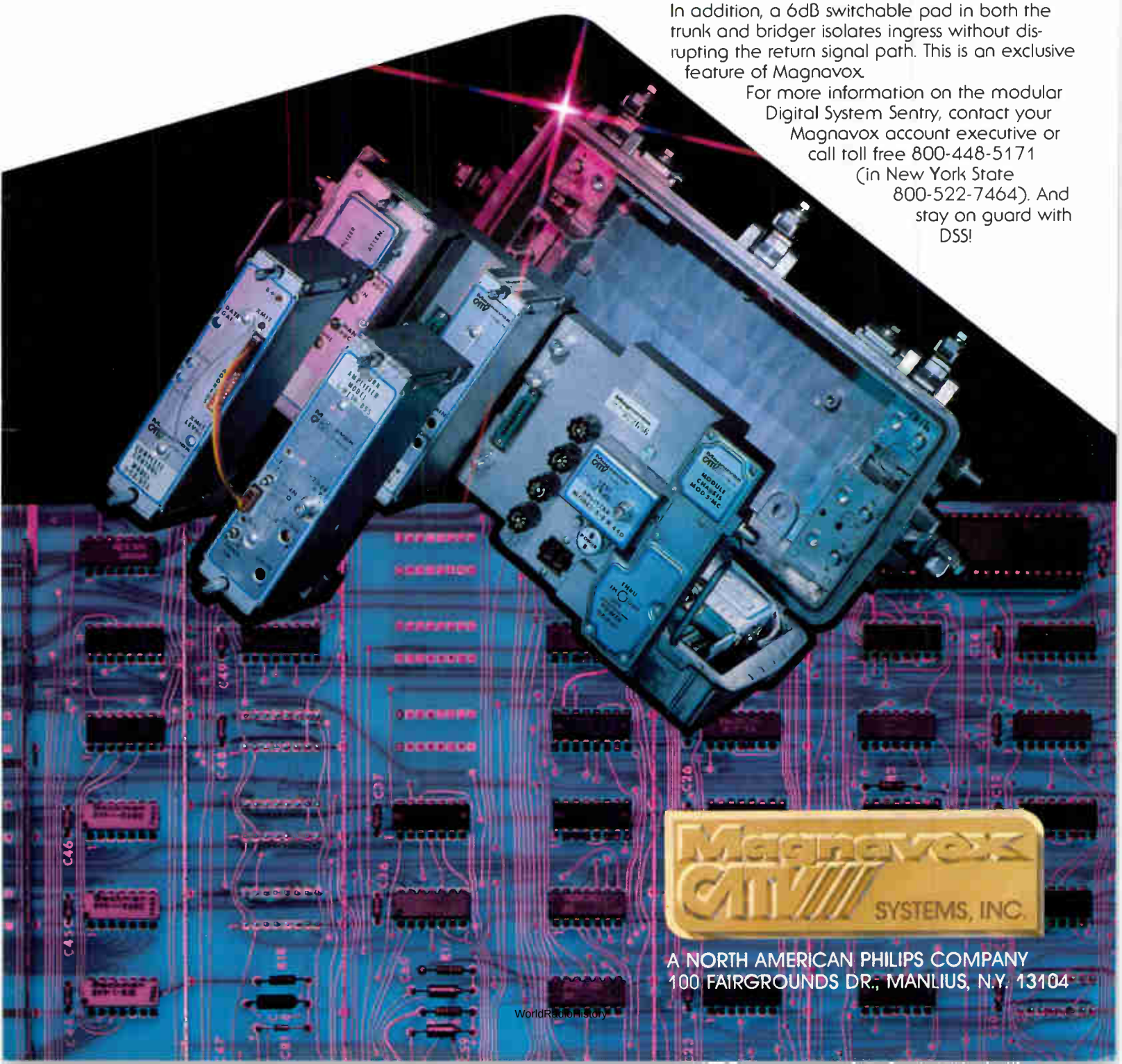
For more information on the modular Digital System Sentry, contact your Magnavox account executive or call toll free 800-448-5171 (in New York State 800-522-7464). And stay on guard with DSS!



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CATJ VOL. 10 NO. 6

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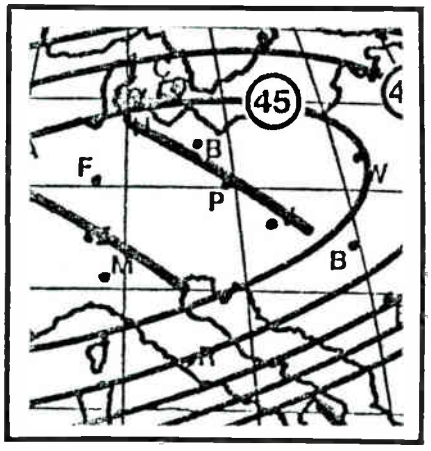

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ABOUT THE COVER

CATJ is geared towards the "how-to" techniques, and this month's issue exemplifies that philosophy with the three features highlighting technology spotlighted on the cover.

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catatorial

Peter Athanas
President of CATA

What is "Cable"?

Things have gotten totally out of hand. The impression on Capitol Hill these days is that the cable television industry and the telephone companies, particularly AT&T, are going to go head to head in competition with each other and, therefore, the regulation of these industries must be similar. Of course that impression is being spread primarily by AT&T, but it's important to recognize that a lot of people in "our" industry are fighting back based on the same presumption. **What business are we in anyway?**

The Community Antenna Television Association has been saying for many years that there was a great danger in the confusion between the "traditional" cable television industry and the so called urban broadband communications industry. That danger is now coming to pass. Regulations are being written, arguments are being formed and minds are being set based on the presumption that all of cable television is in one way or another part of the urban "broadband communications network". It is not! We have been caught up in a fight of the giants. The large multiple system operators who are vertically and horizontally integrated within their own companies have gotten into the so called cable television business with an eye toward the urban markets. They, of course, are looking at data transmission and all of the other supposed great things that cable television can do. None of these great things, we would point out, are proven, particularly economically. However, that is a gamble they are willing to take, and we say more power to them!

Unfortunately, the impression has thus been given that the rest of the cable television industry is also looking in that direction. That's simply not true. Cable television in the main in this country today is still a delivery mechanism for entertainment video programming, and we don't think that is go-

ing to change significantly over the near term. Indeed, the more you listen to some of the big multiple system operators talk, the more you find that they are moving back in that direction as well because all of the blue sky of cable is just that — **blue sky.** There is no question that we can technologically do a great deal; however, the mere fact that we can do something with the technology that is in the streets does not necessarily mean that there is an economical way of doing it, or that the subscriber or the customer, whoever he or she may be, wants it. This goes for a long list of the **supposed** services that cable can offer running from burglar alarms to institutional loops.

It simply is not clear at this time whether people really do want to bank at home, or shop at home, or read their entire newspaper on a television screen. Sure, we can do all these things, but do people really want the services that technologically can be provided. We don't know. What we do know is that video entertainment services are something that people do want, and that cable television is the best provider of those services. **That, in the most simplistic form, is what the cable television industry is.** The broadband telecommunications networks, the urban systems of the future that some are trying to build today, are wonderful dreams and perhaps they will be effective and economically successful in the future. They are not today, and it is a big mistake for legislation to be designed based on the presumption that those experiments are what cable television is. They are not! It's our job to get our regulators and our legislators back on a realistic path regarding the cable television industry. At the moment the cities, particularly the big cities, are trying to mandate a new form of telecommunications, and nobody knows whether it will be successful. Legislators are attempting to draw up a legal scenario that presumes that we are an industry that does not yet exist and may never.

CATA is calling on all of its members to contact their Congressman, contact their Senators, talk to their local officials and let them know what cable really is. If we don't, who will? □

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Theory Of Operation And Practical Uses Of The Time Domain Reflectometer.

By Marshall Borchert
President
AVTEK, Inc.

All major, most medium, and many small cable systems own or have access to a TDR (TIME DOMAIN REFLECTOMETER). It is probably one of the least understood pieces of field test equipment available to the technician, but it need not be. The point of this article is to explain the operation of the TDR and give several examples of their application. Hopefully, some of the applications will be new to you and, therefore, expand the usefullness and value of the TDR.

THEORY OF OPERATION

If a signal is put on to a properly terminated cable all of the signal will be absorbed by the termination. If the cable is not properly terminated some of the signal will be reflected back up the cable. The two extremes of an improper termination are a dead short and a complete open. In these two cases all the signal is reflected back up the cable.

This law of nature is what led to the development of the TDR. Referring to **Figure 1,** let us look at the building blocks that make up the TDR.

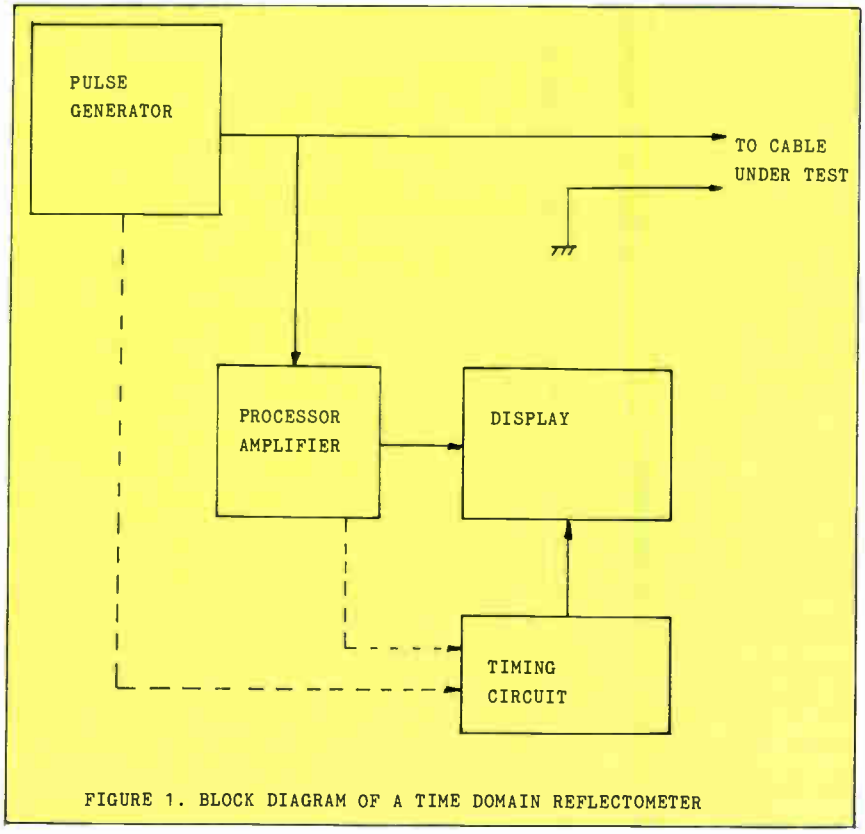

FIGURE 1. BLOCK DIAGRAM OF A TIME DOMAIN REFLECTOMETER

A **PULSE GENERATOR** transmits a signal down the cable under test. A **PROCESSOR AMPLIFIER** is connected to the same output connector as the **PULSE GENERATOR** and will receive and process any reflection coming back from the cable under test. This processed signal is then sent to a DISPLAY of some sort. The **DISPLAY** may be as

cont. on P. 10

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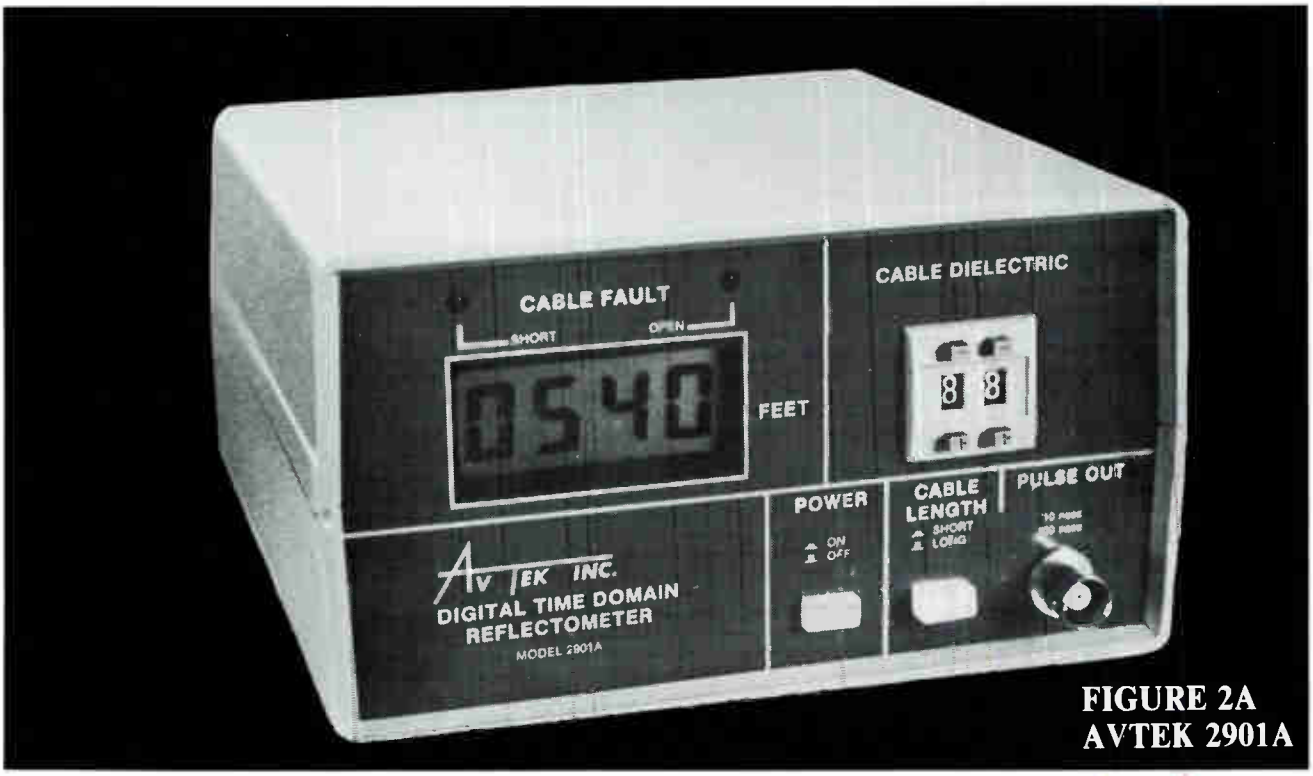

FIGURE 2A
AVTEK 2901A

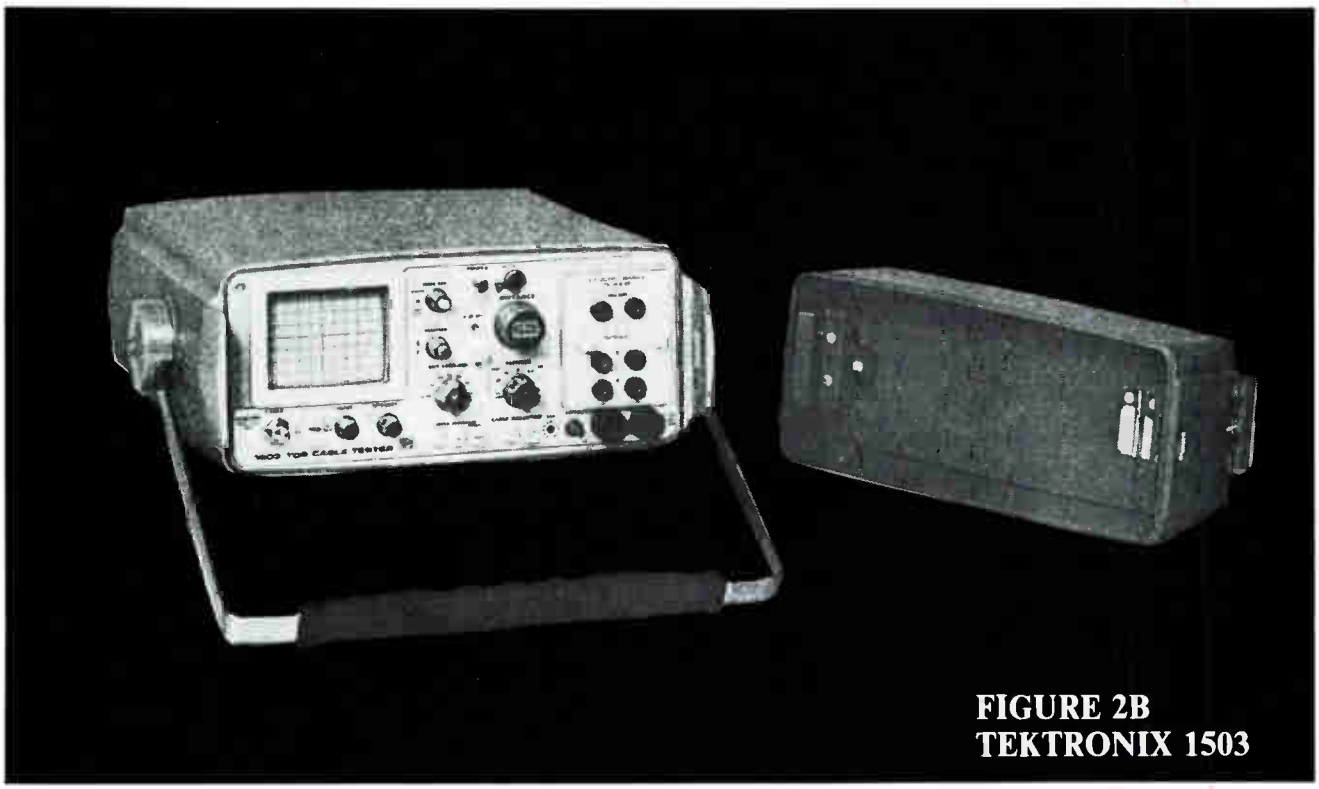

FIGURE 2B
TEKTRONIX 1503

cont. from P. 6

simple as a digitial display where you will get a simple footage reading of the cable and an indication whether the fault is an OPEN or a SHORT (see **Figure 2A**), or as elaborate as an oscilloscope where you will get a picture of the quality of the cable and you must evaluate this picture (see **Figure 2B**).

The **PULSE GENERATOR** will also start a **TIMING CIRCUIT;** then the reflected signal will stop the **TIMING CIRCUIT.** In the digital readout TDR the **TIMING CIRCUIT** will read out its information in feet. In the oscilloscope TDR, the

cont. on P. 14

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January, 1983

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KBLE OHIO, INC.
Columbus, Ohio

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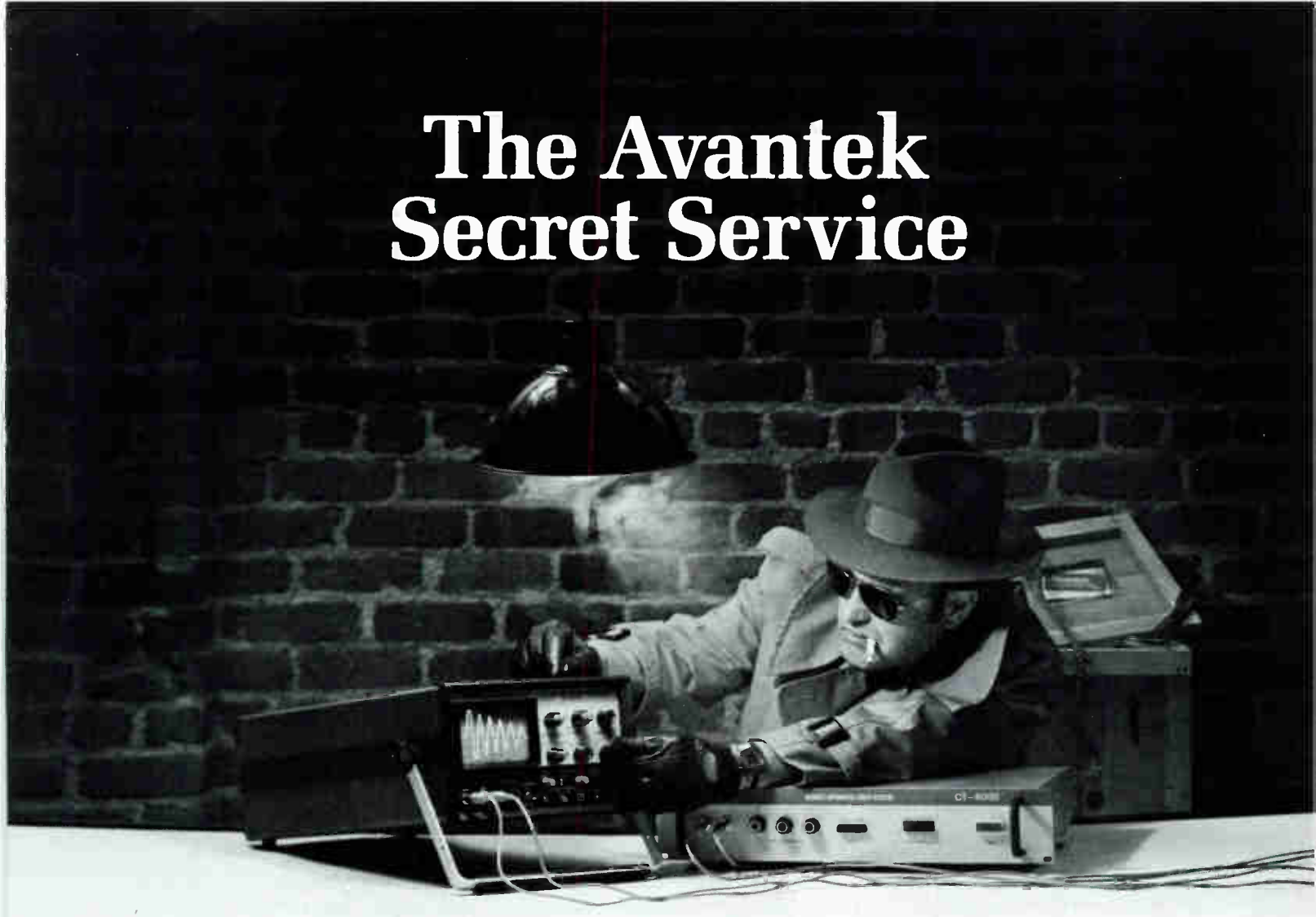

CATV system surveillance without bugging your customer.

Now you can sweep test your entire CATV system during prime time, or anytime with no interference to your subscribers' reception. The CR/CT 4000 low-level sweep system can automatically monitor the performance of up to 58 channel capacity systems. A low-level, non-interfering test signal below video occupies each channel for only milliseconds. The response is displayed on a portable tracking receiver. It's everything you need for regular maintenance and proof of performance including the spectrum analyzer functions of signal level, co-channel interference, cross modulation, hum, and other system conditions. The CR/CT 2000 offers the same features, but is designed for lower frequency systems.

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Any Avantek product will make your system run better. All of them could make it run the best. Call or write today for immediate applications information or to set up a product demonstration.

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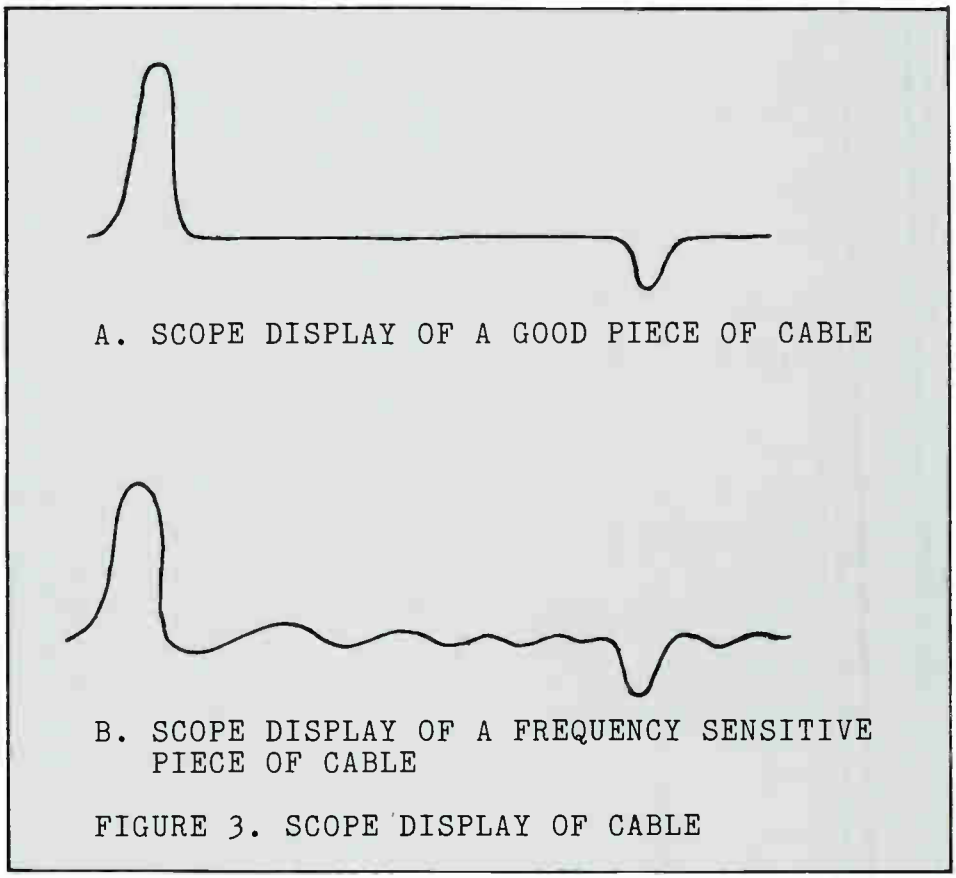

A. SCOPE DISPLAY OF A GOOD PIECE OF CABLE

B. SCOPE DISPLAY OF A FREQUENCY SENSITIVE PIECE OF CABLE

FIGURE 3. SCOPE DISPLAY OF CABLE

TIMING CIRCUIT simply moves the beam across the screen and the operator must measure the distance to a problem by way of front panel controls.

APPLICATION

Normally a TDR is thought of as a piece of test equipment used only to look for faulty cable. With the expensive TDR's that require interpretation of a CRT display that is true. With the introduction of an inexpensive TDR (like the AVTEK Model 2901A) the range of applications is increased.

The TDR can be used to look for faulty cable — damaged by moles, bad splices, water in the cable, etc. The CRT type TDR with its increased sensitivity can find even the slightest problem. It can also show, to some extent, the quality of the cable. As shown in **Figure 3 A-B,** a good piece of cable will have a flat line up to the reflected signal. Cable that will not pass all frequencies with linear attenuation, commonly referred to as "suck outs", will show up as a ragged line between the transmitted pulse and the reflection. You do not know what frequencies are bad; you only know the cable is less than top notch and can lead to problems.

Remember, the TDR is transmitting a signal and looking for a reflection, the cable must not have any other signal on it, either RF or AC. It is best that the cable be disconnected from the system at both ends. Then you know you are only looking at that piece of cable. Also, do not terminate the far end, that defeats the principle of the TDR.

The less expensive digital TDR also will find partial faults such as bad splices, water in the cable, or damaged cable, if the problem is bad enough.

You can use the digital TDR to inventory partial reels of cable in the warehouse. That way you can be sure of taking enough cable to the job site without guessing or breaking out a new reel.

The digital TDR is useful in identifying multiple cables into a pedestal on a new build. By knowing where the cables should go and their approximate length, you can identify them by reading their cable length. This is helpful not only on buried plant but also apartment buildings and high rises.

Construction crews can inventory how much cable has been installed in a new build by electronically measuring each cable before installation of taps, splitters, and amplifiers.

CONCLUSIONS

As with any tool, the TDR is of little value **sitting on the shelf.** It must be used frequently so the technician can retain familiarity with its operation. Too often the TDR is only used as a last resort when it could have saved time and money to use it when the problem first appeared. If the TDR is close at hand, in your service van, you are more apt to use it first rather than trying to solve a problem in an indirect way. Hopefully we have given you some ideas how to keep your TDR out in the field with you, and it can be treated as a close friend. □

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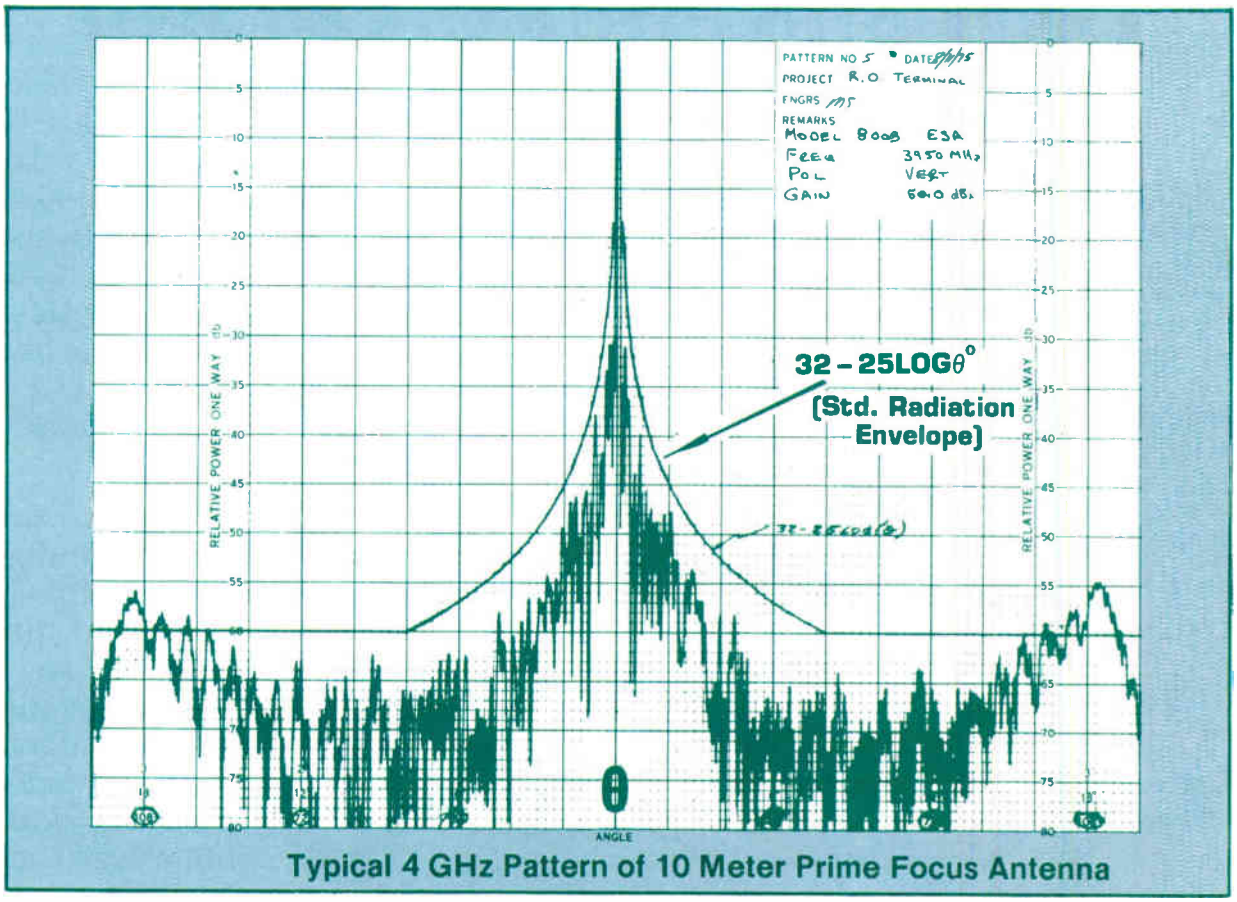

Typical 4 GHz Pattern of 10 Meter Prime Focus Antenna

(COURTESY SCIENTIFIC ATLANTA)

total radiated power, distance to the TVRO site and the azimuth difference between beam pointing and the TVRO site.

It then makes a correction in TI strength based on specific TVRO pointing (azimuth and elevation) and arrives at a **relative** TI received level: the db difference between the TI signal and the satellite signal, as presented to the downconverter.

It is this **difference,** not the **absolute** TI signal strength, that creates picture degradation on the TVRO.

This is a "free space" calculation: as if the TI source and the TVRO were isolated free of the earth, its terrain and intervening structures. While it gives approximate results only, these are likely to be "in the neighborhood", and even pessimistic: the antenna radiation envelopes chosen **over-estimate** the radiation intensity from the TI source as well as the off-angle receptivity of the TVRO.

The best use of the method is to detect catastrophically strong TI to justify resurvey by more precise means. The calculations themselves are quite simple, but obtaining the parameters of the TI sources will take some legwork.

Some of the professional frequency coordinating companies[1] have programmed very similar methods and have "chained" these programs to extensive data bases of microwave tower location, pointing and other parameters. Hence, they are able to provide reports giving bearing and signal strength of all potential sources within a prescribed radius of a proposed TVRO site. These "arm chair" surveys are usually available overnight.

The Standard Antenna Radiation Envelope (ARE)

For regulated earth stations, the FCC imposes a radiation envelope on acceptable antenna performance:

Off Angle θ Relative to Maximum Radiation	Maximum/Field Strength Relative to Isotrophic Radiator
between 1° and 48°	(32 - 25LOGθ) dbi
greater than 48°	− 10 dbi

This calculation method adopts this standard even though it is pessimistic, as shown by the illustration. We use this equation to formulate two corrections for use in the calculation method:

Correction I: the reduction, from maximum interfering antenna radiation, at an off angle θ:

$= (32 - 25LOG\theta't - GI_{dbi})$ db

Where GI_{dbi} is the gain of the ►

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Scrambling is totally unnecessary.

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See Us At The NCTA Show-Booth 3500

$$TIRdb = 47 - 33 + 20LOG(39.5 \times 10^6/10^4) = +85.93\ db$$

Correction I (see illustration) = −22.48 db

Correction T (see illustration) = − 42.46 db

therefore:

$$RRTIdb = +85.93 - 22.48 - 42.46 = +20.99\ db$$

or, the downconverter will see TI 20.99 db **above** the strength of the satellite signal.

Correction I:

$$\text{Sin}\ \theta'_t = \sqrt{\text{Sin}^2\theta_{et}\text{Cos}^2\theta_t + \text{Sin}^2\theta_t} = .0872$$

$$\therefore \theta'_t \cong 5^\circ$$

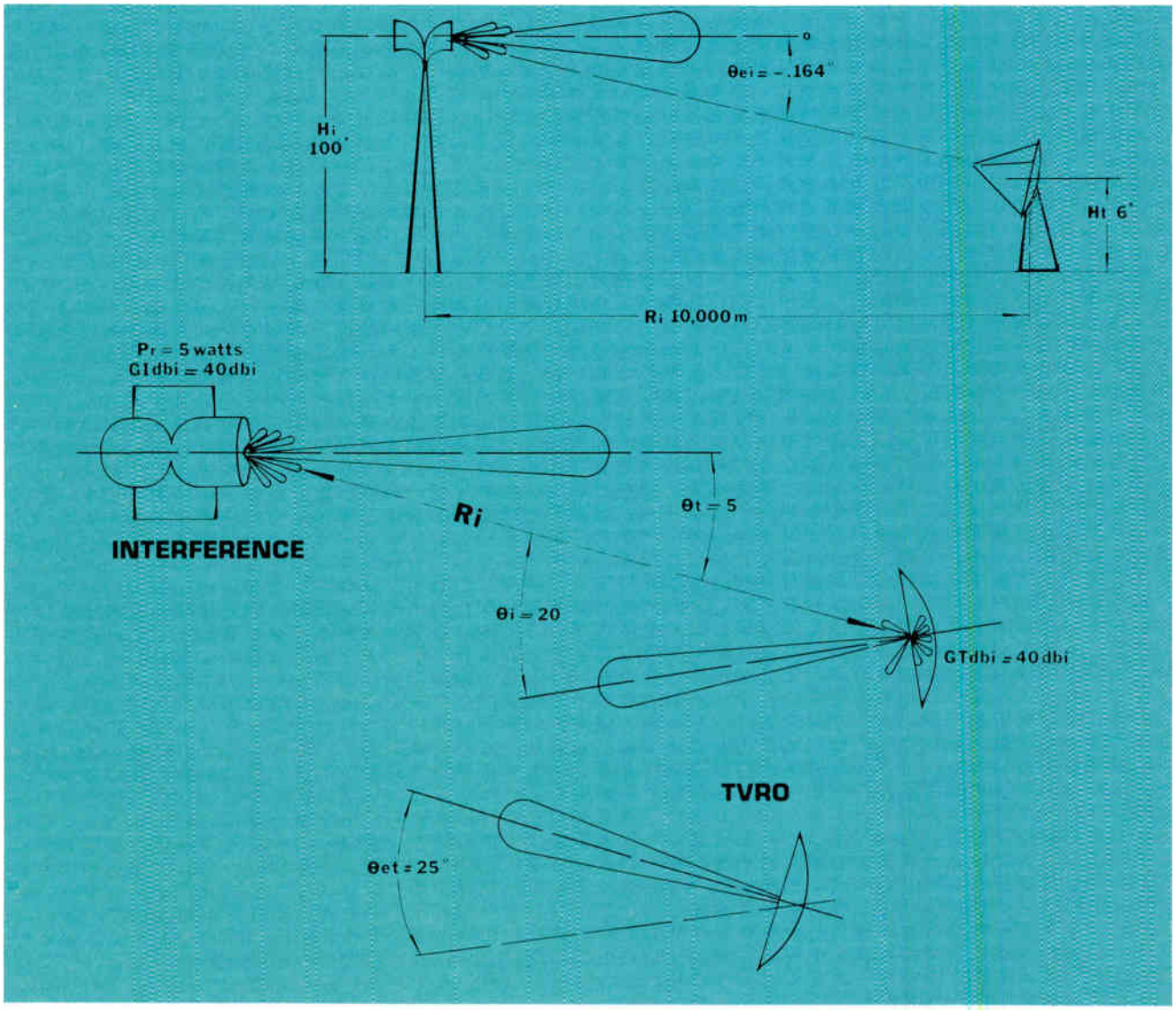
$$\text{Correction I} = (32 - 25\text{LOG}5^\circ - 40) = -22.48\ db$$

Correction T:

$$\text{Sin}\ \theta'_i = \sqrt{\text{Sin}^2[\theta_{et} + \theta_{ei}]\text{Cos}^2\theta_i + \text{Sin}^2\theta_i} = 0.522$$

$$\therefore \theta'_i = 31.5^\circ$$

$$\text{Correction T} = (32 - 25\text{LOG}31.5^\circ - 40) = -42.46\ db$$



Other uses of the Method

The method is useful for analyzing the report of the professional surveyor. These reports given both the expected satellite field strength (in db relative to watt/meter²) and the detected TI field strength **at the site.** One may convert these numbers to RRTIdb:

RRTIdb = (TI field strength, db w/m) - (Sat field strength, db w/m) + Correction T

For example, suppose the surveyor's report shows these field strength levels at the proposed site:

Satellite field strength
– 118.00 db (W/M)

3750 MHz TI Field strength
– 85.00 db (W/M)

using the situation illustrated, the Correction T = 42.46 db so we would expect:

RRTIdb = – 85.00 – (– 118.00) – 42.46 = – 9.46 db

Or, at the downconverter, the 3750 MHz TI is 9.46 db **below** the satellite signal. If the TI is also vertically polarized, we know that Transponder #3 (vertically polarized at 3760) will be affected, probably with "light sparklies".

Next Time

We'll continue to examine the pre-installation survey. Specifically, we will examine both the **purchased** and the **do-it-yourself** field strength survey.

Acknowledgements

Many thanks to Chris Bostick for the sketch, to John Greatrex for the interference illustration, to Bill Bostick for validation of the computational method and to Carol Ryan for typing and editing.

FOOTNOTES:

(1) **COMSEARCH, INC.**
11503 Sunrise Valley Drive
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703-620-6300
Jerry SCHULMAN, V.P. Marketing

COMPUCON, INC.
P.O. Box 401229
Dallas, Texas 75240
214-233-4830
Becky SHIPPMAN

SPECTRUM PLANNING
P.O. Box 1360
Richardson, Texas 75080
214-699-3536
Debbie MEAD, Jerry ARMES

□

LETTERS

Dear Mr. Sheldon:

I thought you might appreciate the attached information on FCC Docket 83-114. It should be of interest to you since the Notice of Inquiry portion of the Docket discuesses abolishing the current FCC technical standards governing Class I cable television channels (that is, all of Section 76.605 except the cable radiation limits).

While the first reaction may be "great, the less federal regulation of cable the better", if the FCC eliminates its cable television technical enforcement, the federal preemption of state or local government cable technical standards will also presumably disappear. Instead of a uniform set of relatively mild technical standards applying only to Class I cable signals, the industry may well find itself faced with at least 50 different standards.

The Commission's current cable television enforcement is limited, since there are only five FM/TV/CATV Enforcement Units. These units are supposed to regulate 5000 cable systems, 5000 FM stations, and 1000 TV stations. It should be obvious that FCC enforcement is not exactly omnipotent. If regulation passes to the state or local level, those governmental agencies without a California type 'Proposition 13' restrainer may enter this regulatory vacuum with a vengence.

Docket 83-113 is certainly food for thought. I would be interested in reading CATA's reaction in a future issue of CATJ.

Incidentally, I enjoyed your discussion with Chris Papas in the March issue. I would like to see a feature article on the FCC Enforcement Unit if Mr. Papas and his van can make it to CCOS '83 in August.

Sincerely, •

Dane E. Ericksen

Celeste Rule
CATJ
4209 N.W. 23rd
Suite 106
Oklahoma City, OK 73107

Dear Ms. Rule:

It has come to my attention that several operators have had problems with secure converters that can be defeated with a small piece of paper.

To a small operator, this situation could be disastrous. Perhaps Ralph Haimowitz could investigate the matter and alert the industry if indeed there is a problem.

Sincerely,

Thad Smotherman
General Manager •

ATTENTION CATJ READER JAMES RIEGER:

PLEASE SEND YOUR ADDRESS SO THAT WE CAN BE IN TOUCH WITH YOU CONCERNING CABLE FM INFORMATION. YOU WROTE US A NOTE BUT DIDN'T INCLUDE YOUR TOWN SO WE DIDN'T KNOW WHERE TO RESPOND. •

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How to Upgrade A 220 MHz System to 300 MHz *without* Respacing

BY: WILLIAM H. ELLIS
BROADBAND ENGINEERING, INC.
JUPITER, FLORIDA

As Easy As Replacing A Module . . .

Can an older 12 channel 220 MHz system be upgraded to 300 MHz, 35 channel operation without respacing? The quick answer is "maybe". It depends on a number of factors including your amplifiers, system passive devices, present system amplifier spacing and desired system specifications after upgrading. We'll discuss each of those factors and make system distortion calculations to evaluate performance at the new bandwidth.

Before getting into details, let's define what we mean by the term "upgrade". To me an upgrade is the modification of system active components to accommodate additional bandwidth and, therefore, additional channel capacity. In most cases, it is as simple as ordering the correct replacement electronic modifications for your amplifier modules and replacing the existing printed circuit boards with new ones designed to fit in your old modules. As an alternative, you can send your modules to the manufacturer for installation and alignment. Then all you have to do is plug them into your amplifier housings just as you would a repaired module.

The cost is quite low compared with the purchase of new amplifiers or modules and the performance is generally equivalent.

Use Hybrids Not Transistors . . .

If an upgrade from 220 to 300 MHz is to be feasible, then the system trunk, bridger and line extender amplifiers must be upgraded to greater bandwidth. Most, but not all, of the amplifier upgrades available use push-pull hybrid circuitry. The use of push-pull transistor upgrades is not desirable, since the second order distortions cannot be easily maintained over a long period of time because of device aging and repair cycling. Hybrid upgrades use the same hybrids used in brand new equipment and will maintain their specifications over the long haul.

Many operators who presently have transistor push-pull amplifiers choose to upgrade to eliminate many of their performance problems in addition to obtaining additional bandwidth.

Old Passives Remain Active . . .

System passives include splitters, directional couplers and taps. Also don't forget the amplifier housing baseplates and feeder makers. Most amplifiers manufactured since 1968 or so will pass frequencies to 300 MHz.

If your system still has old splitters, directional couplers and taps, don't despair. With an upgrade you

Microdyne Satellite TV Receiving Equipment. Nobody Does It Better.

That's because we've been the specialists in satellite TV receiving equipment since satellite TV began. And, our equipment has a well-earned reputation for performance and reliability. We have thousands of terminals installed world-wide.

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Should you wish to expand your existing system, Microdyne offers the 1100 CSR — a local/remote fully tuneable receiver with automatic polarity switching at a price you'd expect to pay for a fixed frequency receiver.

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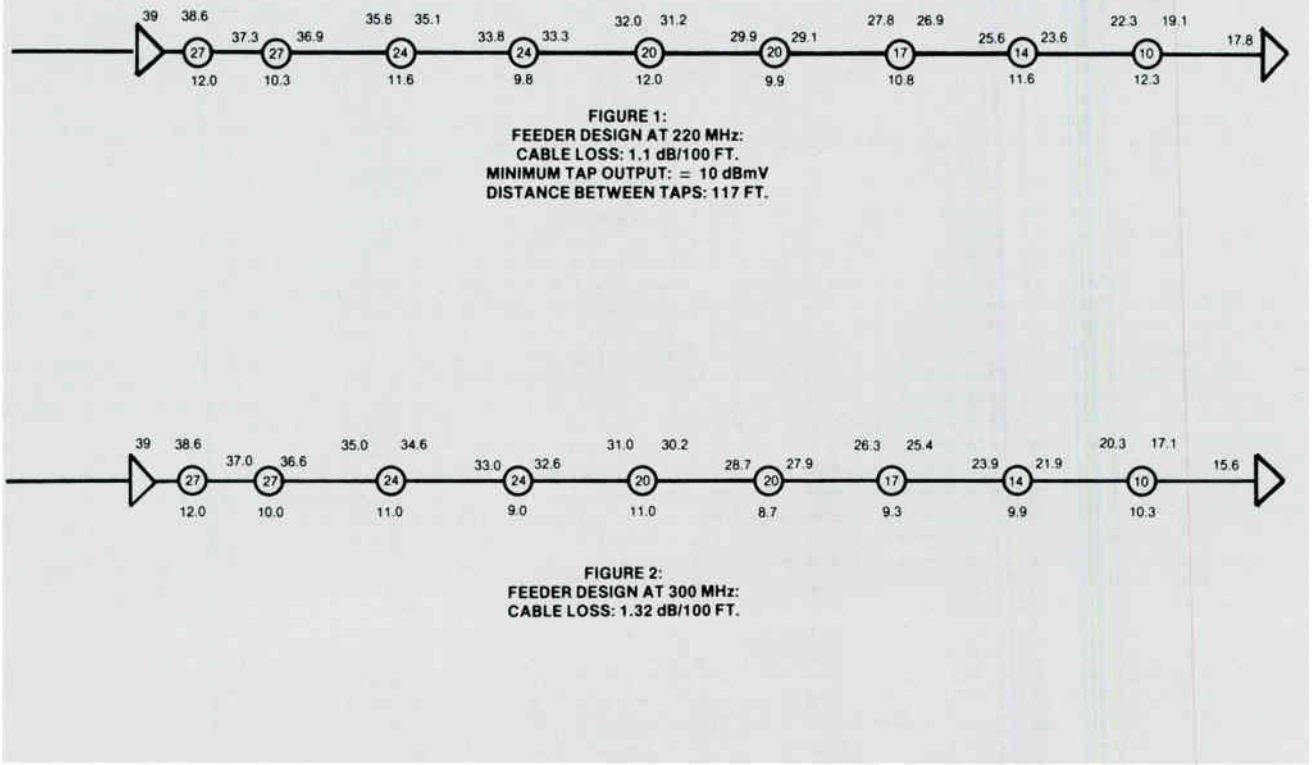

FIGURE 1:
FEEDER DESIGN AT 220 MHz:
CABLE LOSS: 1.1 dB/100 FT.
MINIMUM TAP OUTPUT: = 10 dBmV
DISTANCE BETWEEN TAPS: 117 FT.

FIGURE 2:
FEEDER DESIGN AT 300 MHz:
CABLE LOSS: 1.32 dB/100 FT.

can still use your entire midband and get much better system performance than you now have with your 12-channel equipment. You can also choose to upgrade by using your midband initially, then change your passives at a later date to use some or all of your superband channels.

Spacing No Problem . . .

Most systems to be upgraded will have a nominal amplifier spacing of 21 dB of cable at 220 MHz. However, there were a number of 12 channel systems constructed in the early 1970's that had cable spacing of 18 to 21 dB at 240, 260 or 270 MHz. These are especially easy to upgrade to 300 MHz operation.

By the same token there are systems in operation that are overspaced. That means that too much cable and/or flat loss exists between amplifiers. Don't expect to get 300 MHz operation easily if you have one of these systems. If overspacing exists in only a few locations, the problem may be easily corrected. In any event, by upgrading you will still obtain the use of your midband and in many cases improve on overspaced situations by using hybrid replacement electronics.

Finding System Specs . . .

This is, of course, the critical part. What happens to the system performance when a system spaced at 220 MHz is operated at 300 MHz? To find that, we must compare the distortion parameters of the old system with the new distortions after upgrading. In the analysis, we'll assume the system passives will pass 300 MHz.

For calculation purposes, we must make some additional assumptions. While they may not fit your situation exactly, they will at least give you the basis for making your own calculations.

Signal-to-Noise-Ratio

Amplifiers spaced at 21 dB at 220 MHz will have an approximate spacing of 25.2 dB at 300 MHz. We derive that number from typical coaxial cable data. Since the cable-spacing is greater by 4.2 dB, amplifier input levels will be 4.2 dB lower than in your present system, assuming the same output levels. Also, the minimum full gain of the amplifier must be higher by 4.2 dB.

Since most AGC amplifiers have an AGC range of plus or minus 4 dB, the minimum full gain of the replacement electronics module must be 25.4 dB plus 4 dB AGC reserve gain, or 29.2 dB. Manual stations require a minimum full gain of 25.2 dB. Naturally, a few extra dB's are desirable for added margin. Many of the standard replacement electronic modules do not have that gain, but the manufacturer can usually provide it for you at little additional cost, if the modules use hybrids. (Those modules using quads do not have the same flexibility, and the required gain may not be possible.)

Because input levels are lower, we must calculate the system signal-to-noise ratio (SNR). To do that, we must

Broadband's great little MDA:

Now — a 35-channel, 300 MHz hybrid apartment amplifier for as low as $89.95*!

- 8 dB Noise Figure
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- Cross-Mod @ 48/43 dBmV: 35 Channels: −63 dB
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- Capable of full channel loading at designated bandwidth.

*Price for 50 units (MDA-300-30-T).

Designed for use in apartment house, hotel and motel CATV or MATV distribution systems, our Multiple Dwelling Amplifier (MDA) also comes in a 54-channel, 440 MHz model at an equally attractive price.

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We don't think you can beat the price — we know you can't beat the performance.

Model	Bandwidth	Gain	Output Capability*
MDA-300-30-T	50-300 MHz	30 dB	+ 49/44 dBmV
MDA-440-40-T	50-440 MHz	30 dB	+ 47/42 dBmV

*Output specified at −60 dB CTB @ 54-channel loading for 440 MHz units and 35-channel loading for 300 MHz units.

For additional information on specifications or pricing, call us toll-free at 800-327-6690, or write Broadband Engineering, Inc., P.O. Box 1247, Jupiter, Florida 33468.

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Quality and Innovation

first find the noise figure of the upgraded trunk modules and the trunk cascade. For calculation purposes, we'll assume a 20-amplifier trunk cascade. The result is a 10 log 20, or 13 dB cascade factor.

Using a typical replacement electronics trunk noise figure of 7 dB (Broadband Engineering BMK-64 manual trunk module) results in an amplifier noise floor of −59 + 7, or −52 dBmV. Using typical trunk levels of 32/29 dBmV, input levels will be (at the highest frequency) 32 − 25.2 (cable loss), or 6.8 dB giving us a single amplifier SNR of 6.8 − (−52), or 58.8 dB. Thus the system SNR is 58.8 − 13, or 45.8 dB - an excellent SNR.

Second Order Distortion

Just as in the noise case, the cascade factor for second order distortion is 13 dB. The same amplifier has a signal-to-second order distortion of 90 dB. After we apply the cascade factor, the system signal-to-second order ratio is 90 - 13, or 77 dB.

Composite Triple Beat and Cross Modulation

Third order distortions have a 20 log 20, or 26 dB, cascade factor. The amplifier signal-to-cross-modula-

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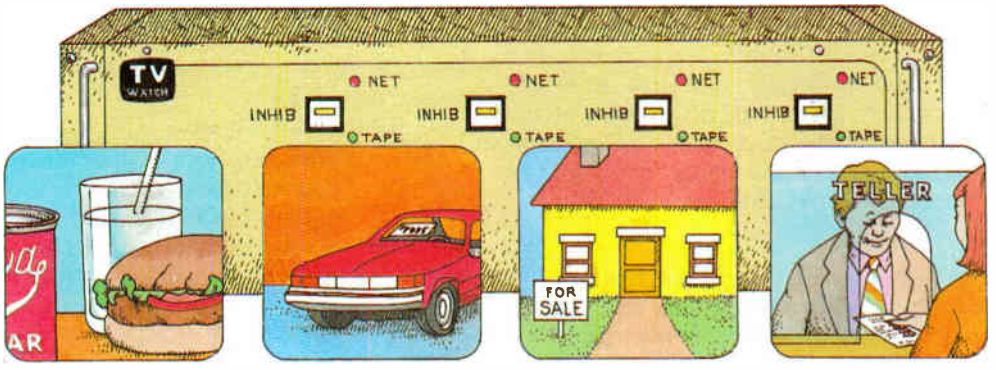

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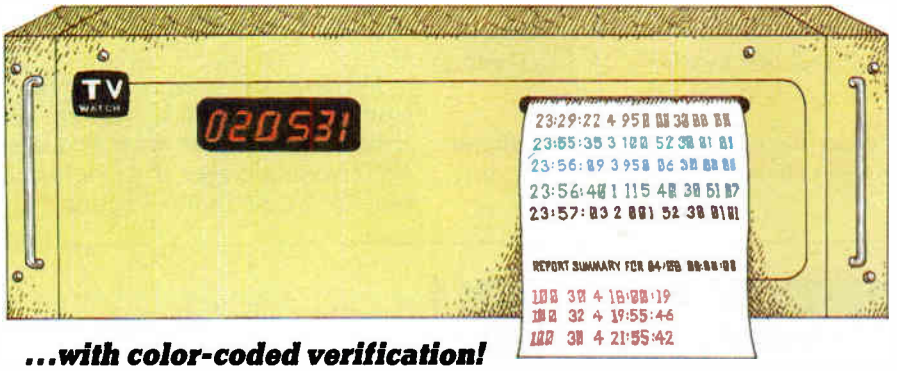

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And The Stationmaster cannot be fooled when it comes to true verification either. Because The Stationmaster inserter tells the verifier if only part of a commmercial block ran.

The Stationmaster is so logically integrated you don't have to be an engineer to operate it. It even comes pretested and rackmounted.

Make a logical decision today! Call Chuck Fox at (404) 355-0100 and arrange for a demonstration. Or stop by booth #3201 at the NCTA. Ask about our local ad sales and production services, as well as our TV Watch Program and Shopping Guide of the Air, too.

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tion ratio and CTB ratios are 95 and 91 dB respectively. With the 26 dB cascade factor, the trunk system crossmod and CTB are 69 and 65 dB.

We must also calculate feeder distortions and combine them with the trunk distortions to determine overall system distortions. We'll assume bridger levels to be 48/45 dBmV. These levels are usually somewhat higher than those of the original amplifiers. Typical bridger and line extender levels for the older single ended equipment were 47 dBmV and 39 dBmV, respectively. The typical amount of cable in a feeder line is 14 dB at 220 MHz, which translates to about 16.8 dB of cable at 300 MHz. However, if feeder line calculations are made at 220 MHz and again at 300 MHz using the same tap values, there are few, if any, changes needed in tap values.

Figures 1 and 2 show a feeder between two line extenders designed for 220 MHz and then tap levels calculated at the new frequency of 300 MHz. Note that a 1 dB increase in the line extender output level would increase tap levels to the minimum design value of 10 dBmV. With the 48/43 dBmV output from the bridger and a 43/38 dBmV output from the line extender, equal or higher tap output levels are available in the feeder system.

We calculated feeder distortions using a Broadband Engineering BMK-63 bridger and BMK-53 line extender.

The results show the following:

A. **Bridger**

1. 1. Signal-to-second order distortion: 74 dB
   2. Signal-to-crossmod distortion: 62 dB
   3. Signal-to-CTB distortion: 60 dB

B. **Line Extenders (Two In Cascade)**

   1. Signal-to-second order distortion: 73 dB
   2. Signal-to-crossmod distortion: 63 dB
   3. Signal-to-CTB: 63 dB

When you combine the trunk, bridger and line extender distortions mathematically, you get the following system distortions:

A. **System Distortions**

   1. Signal-to-second order distortion: 70 dB
   2. Signal-to-cross-mod distortion: 55 Db
   3. Signal-to-CTB distortion: 53 dB

The results show that system performance is well above minimum standards. The cross-mod calculation for the original system shows a signal-to-cross-mod ratio of 46 dB-and that is with only 12 channel loading. Comparing that with the upgraded system, there is an improvement of 9 dB, even with 23 additional channels.

AGC Performance

The electrical spacing is increased when you upgrade from 220 to 300 MHz without respacing your amplifiers. Therefore, we must evaluate the amplifier AGC performance to see if there is adequate AGC range. Most older 12 channel systems have AGC amplifiers

located at each third trunk station. At 21 dB of cable between amplifiers that is 63 dB of trunk cable. In the worst case situation it's 87 dB of trunk and feeder cable.

Let's assume a temperature swing of plus or minus 70 degrees from the balance temperature. This results in a maximum level change at the highest frequency of plus or minus 4.4 dB on the trunk and plus or minus 6.09 dB on the feeder line at the original 220 MHz. At 300 MHz, the situation is worse, since there is a maximum of 75.6 dB of cable between AGC amplifiers on the trunk and 100.8 dB of cable to the end of the worst case feeder.

That translates to a level change of plus or minus 5.22 dB on the trunk and plus or minus 7.05 dB on the feeder. You can improve the situation by simply using an AGC amplifier at every other trunk station instead of at every third trunk station. Making that change results in a maximum swing of plus or minus 3.53 dB on the trunk and plus or minus 5.39 dB at the end of the worst case feeder. Naturally, the same comments apply to the use of AGC/ALC amplifiers which are preferred.

Upgrading: The Quick, Cost Effective Route To Increased Channel Capacity, Better Performance

Based on the calculations, we see that not only is it possible to upgrade a 220 MHz system to 300 MHz operation without respacing but system performance will actually be much better than it was with the original amplifiers before upgrading.

On a practical basis, upgrading can be nearly painless in comparison with rebuilding, since no actual construction work is needed. The least complicated way to upgrade is first to upgrade your spare trunk, bridger and line extender modules.

When completed, start at the first amplifier out of the headend and replace your trunk and bridger modules with upgraded units in sequence, installing new 300 MHz equalizers in the process. To balance your upgraded amplifiers properly, you should have a carrier at the highest frequency that you are going to operate.

After completing one or more trunk stations, you can then install your upgraded line extenders associated with the upgraded trunk amplifiers. You are, of course, left with the modules that have been removed. You can then upgrade these and repeat the process until you've completed the entire system.

The process may be as slow or as rapid as you wish. If system technicians are upgrading your old modules, the turnaround time will be quite fast. If you are sending your modules to the factory for upgrading, the cycle time will be about two weeks.

As you complete the upgrade cycle, your system performance will improve and you should see better pictures and have fewer trouble calls.

In summary, upgrading from 220 to 300 MHz without amplifier respacing is not only possible but is an excellent, cost-effective way to increase channel capacity and improve system performance. □

The Cable Television Modulator

KARL POIRIER
V.P. ENGINEERING
TRIPLE CROWN ELECTRONICS INC.

As a cable operator, you have only two methods of placing a channel on your system. These are —

— to convert or process an existing television channel

— to modulate base-band sources to television channel

In addition to off air sources, a CATV system will acquire several video sources requiring a modulator. These may consist of

— satellite receiver
— telecom link
— character generator
— local origination

Due to the nature of these sources, variations will be observed in the quality of signal delivered.

A character generator is the most stable source of video. Telecom is quite stable, with minor variations in quality.

A satellite receiver is variable, with noise being the most noticable effect.

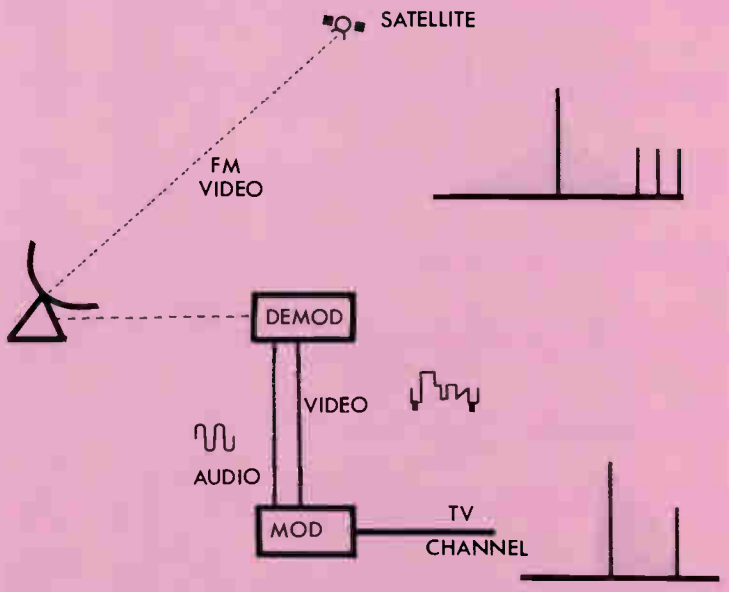
Local origination is prone to level variations as well as sync level problems.

Satellite video is frequency modulated, so conversion processing is not possible. The signal must be demodulated to baseband, and remodulated as amplitude modulation to be accepted by the television receiver. The modulator may be part of the satellite receiver, but this is not common. A monitor output may be provided, but this is usually a poorly filtered low quality signal, and unsuitable for CATV. In most cases, a proper cable television modulator will be required.

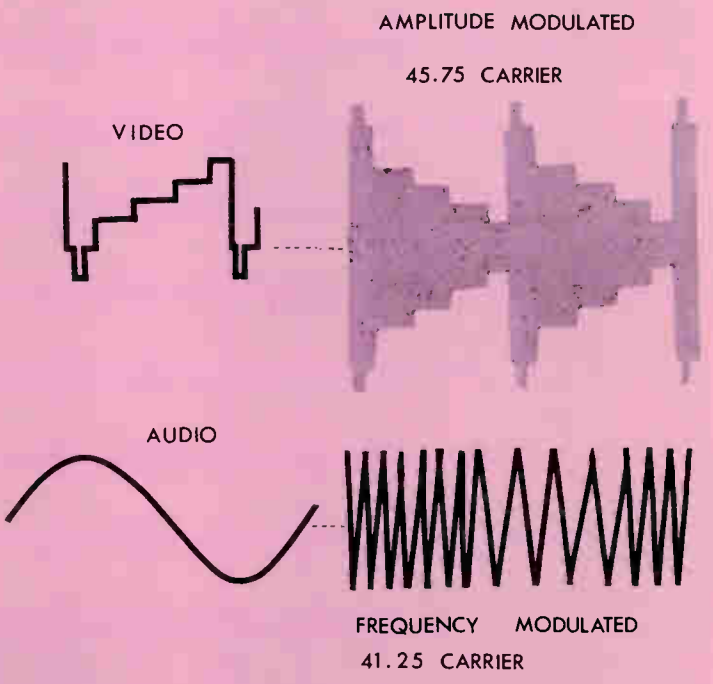
As a manufacturer of modulators, you may expect that I will discuss modulator parameters and enter into long proofs of why our product is better but the value of this would be minimal. Let's look instead at **problems** that you will encounter with possibly any brand of modulator.

We will also not concern ourselves with areas such as differential phase, axis shift, envelope delay etc., as these are either controlled or not at the manufacturers' level and are usually beyond control at the field alignment stage.

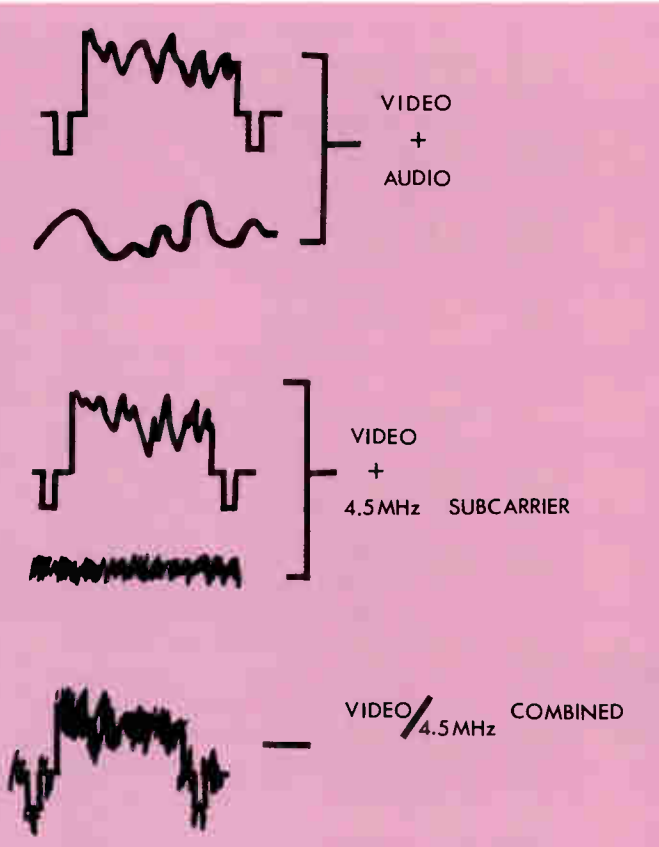
The modulator, as we call it, is in reality a modem, containing two modulators. Its purpose, is to modulate the incoming video and audio baseband signals into two carriers, which must meet the television channel requirements.



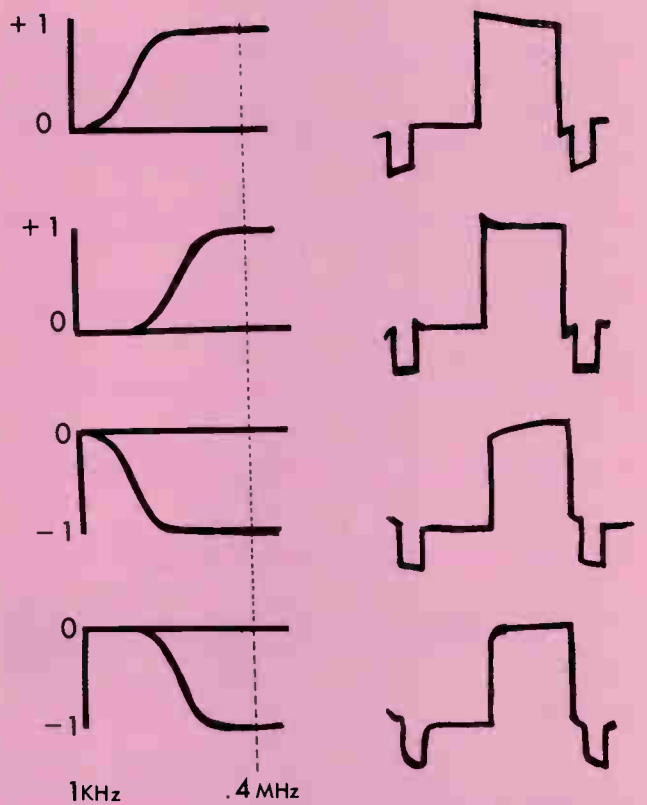
SATELLITE TO SYSTEM



TV MODULATOR



MODULATOR INPUTS

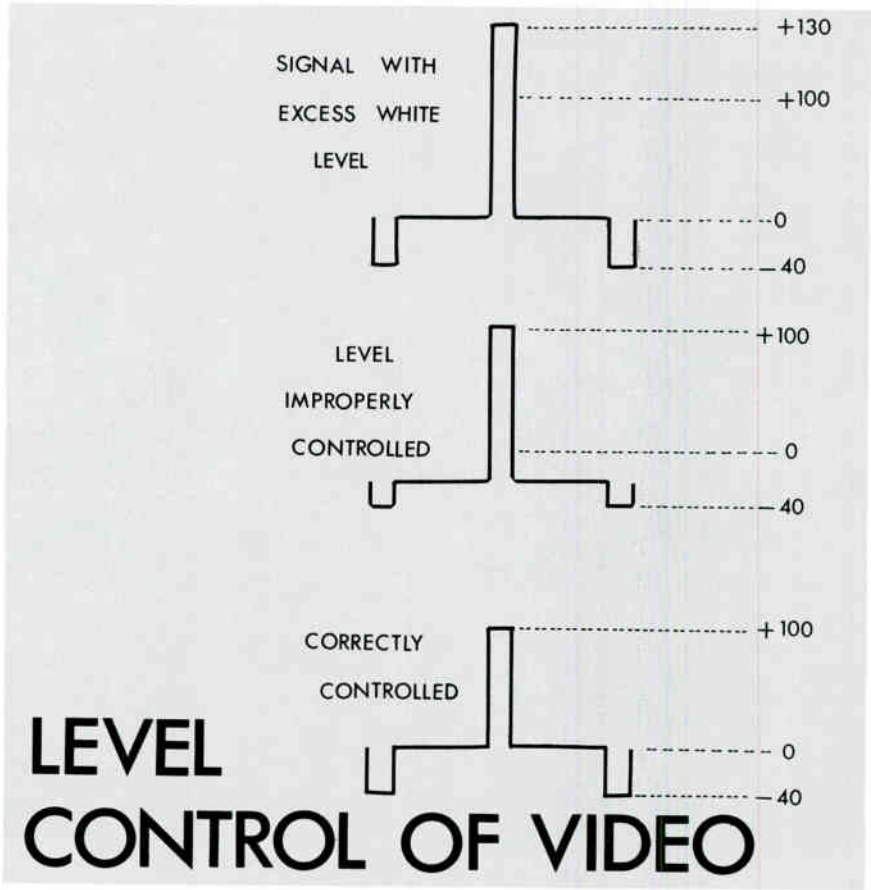


EFFECT OF 1dB RESPONSE ON VIDEO WAVEFORM

The basic requirements for television reception are that the video and audio be modulated on to two separate carriers spaced at 4.5MHz apart for North American systems. The video information is amplitude modulated on a carrier such that a **reduction in light level causes an increase in carrier power.** The audio signal is frequency modulated on to a carrier spaced 4.5MHz higher in frequency than the video carrier. Both carriers must be carried within specified frequency and level limits as will be seen later.

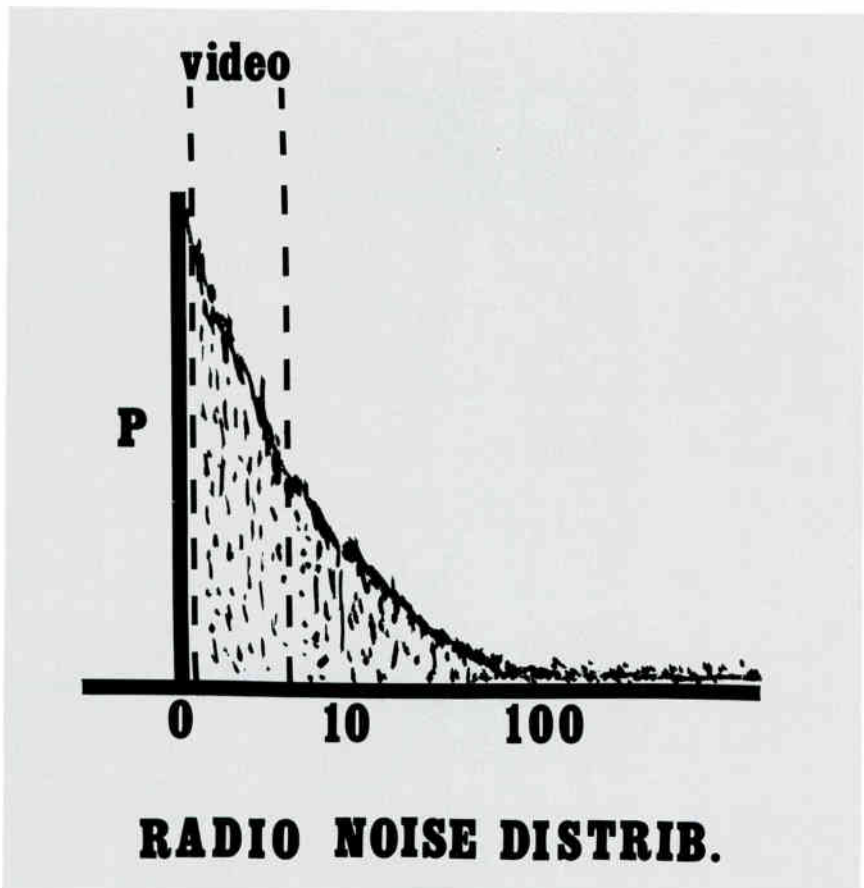
We will, therefore analyze this operation in four stages.

— The Audio Input
— The Video Input
— The Modulation Process
— The Output



The Audio Input

The audio signal may arrive at the modulator in two forms; raw audio, or audio modulated on a 4.5MHz carrier. It is important to note that the 4.5MHz subcarrier may be on a separate cable, or may be combined with the video on one cable. In the case of 4.5MHz subcarrier, the modulator audio section has effectively been replaced by a similar device farther back in the system, but the problems discussed will still apply.



Audio typically suffers from problems in the areas of

— response
— level stability
— direct pickup

Audio signals are information in analog form, employing both change in level and frequency to achieve the electrical equivalent of sound. The system carrying this signal must therefore not affect the level of the energy as well has having a bandwidth response which does not affect the gain/frequency of the energy. The audio signal requires a minimum clear bandwidth in order to accurately resolve the information. Normally all system carrying audio will have responses up to the 15KHz area, which allows accurate transmission of signals up to 5-6KHz. There is one area, however, which has restricted bandwidth and can cause unexpected

problems: **The telephone circuit.** If, in transporting audio from source to modulator, it is necessary to employ a telephone channel, it is important to determine the class and response of the circuit leased, so as not to end up with a low frequency response and severe audio degradation.

— Level control of audio signals, whether manual, or automatic, must be linear, so as not to vary the relative level of different parts of the signal.

To this end, most modulators do not employ any automatic level control of incoming audio and assume level stability of the signal before it is applied.

Any unwanted change in level of audio signals has two effects. The first is compression or clipping of the signal resulting in audio distortion. The other effect will be direct alteration of deviation of the aural carrier.

The Video Input

Video signals are essentially similar to audio signals with several basic differences

— Video requires much greater bandwidth

— Video incorporates both information and control signals.

The video signal incorporates information encoded as

Amplitude,
Phase,
Pulse timing
Pulse duration
Frequency

The gain/frequency requirements of video are quite severe, as video information spans over 16 octaves in one signal, and even minor problems in the response of the transporting system can have major effects. **Figure D** shows the effect on a video signal of a 1dB error in response. With a maze of cable, connectors, amplifiers etc., a response problem of this magnitude is not difficult to create.

The area of level control of video is perhaps the most difficult to handle. Video information is carried as amplitude changes of part of the signal, while the sync portion must remain stable. True level control of video must be done by separation of the signal into component parts, and controlling the level of each part separately. Peak level control circuits, such as the ALC in video tape recorders, usually have the effect of reducing sync level when picture level increases towards white.

See Figure E

In all cases, the standard video level of 1V p.p. is absolutely necessary for proper operation of any video modulator. The dynamic range of video equipment is, due to the nature of the signal, not designed to accommodate level variances. Most equipment is therefore specified at a minimum input video and audio level.

Because of the frequency spectrums of both audio and video, major problems can be encountered in the area of direct pickup. As can be seen by **Figure F** the average power of all man-made and natural electrical energy tends to peak directly in the video-audio baseband spec-

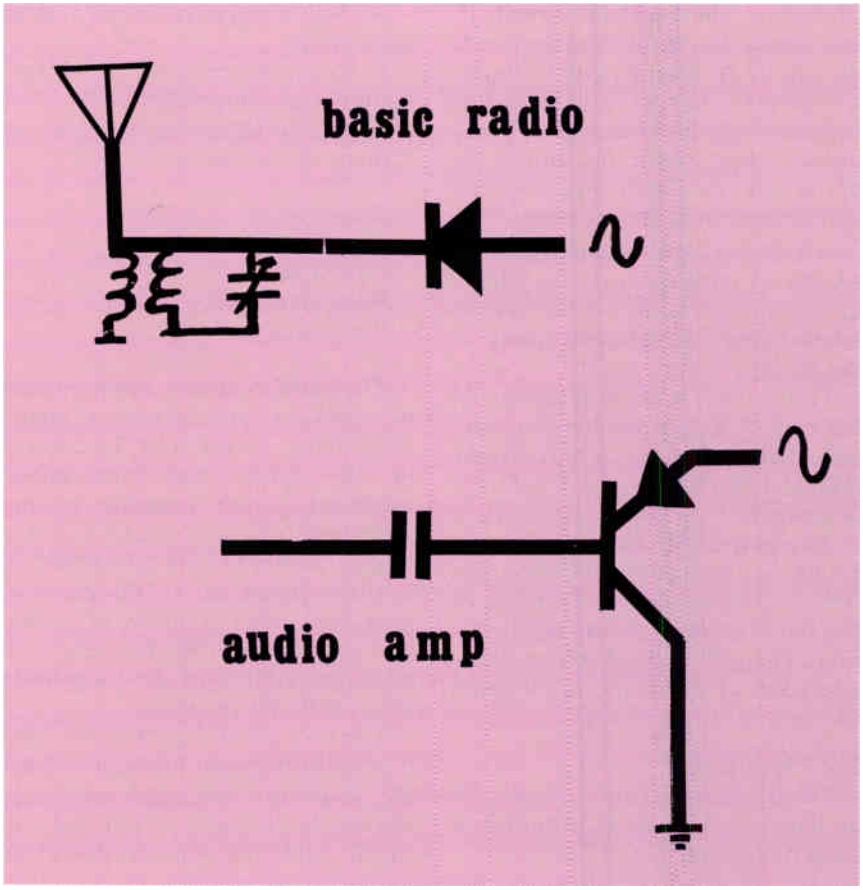
trum. The physical cable and connections used to transport these signals act as antennas in this spectrum. In particular, the level of energy from electrical, ignition, and lightning are particularly severe, not to mention AM radio station at 100 thousand watt or greater.

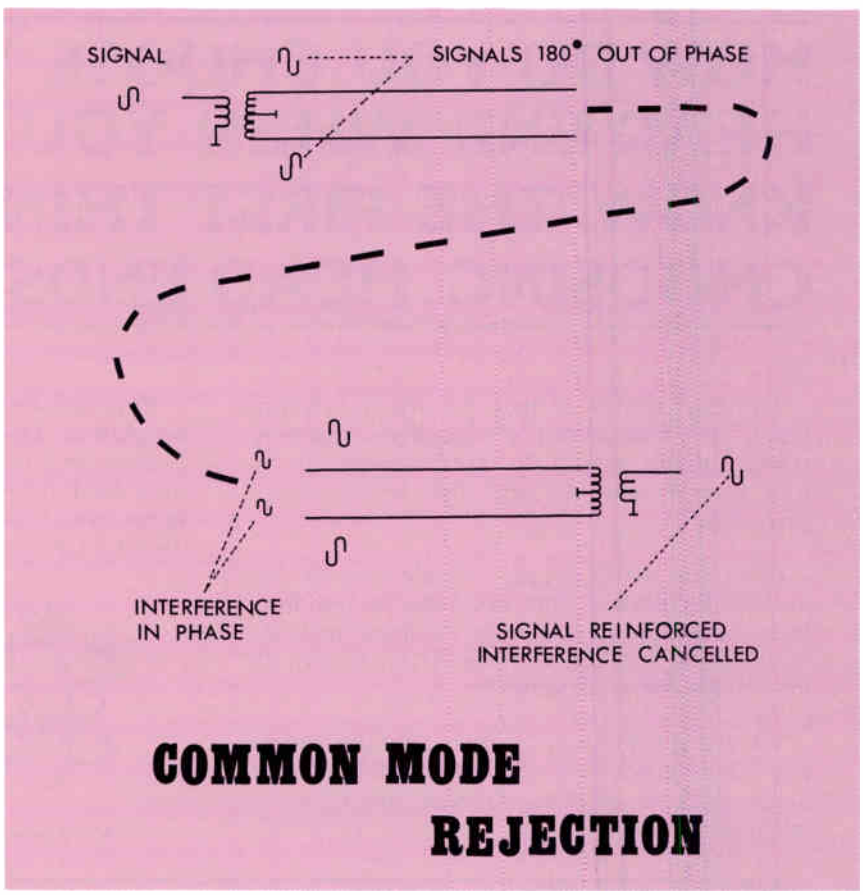
To compound these matters, **Figure G** shows the similarity between a baseband amplifier, and a basic crystal radio. If any of these unwanted signals such as hum, AM radio, electrical interference, etc., appear at the input, they will be processed as readily as if they were designed to. Before we give up, and decide it cannot be handled, let's look at what we can do.

Most of the low frequency interference can be controlled by careful shielding and grounding. Grounding, however, must be carefully engineered, as random excess grounding can result in ground loops, and worsen the problem. Those of us in the RF business may not be aware, but a ground loop can be the most difficult problem a technician will ever face.

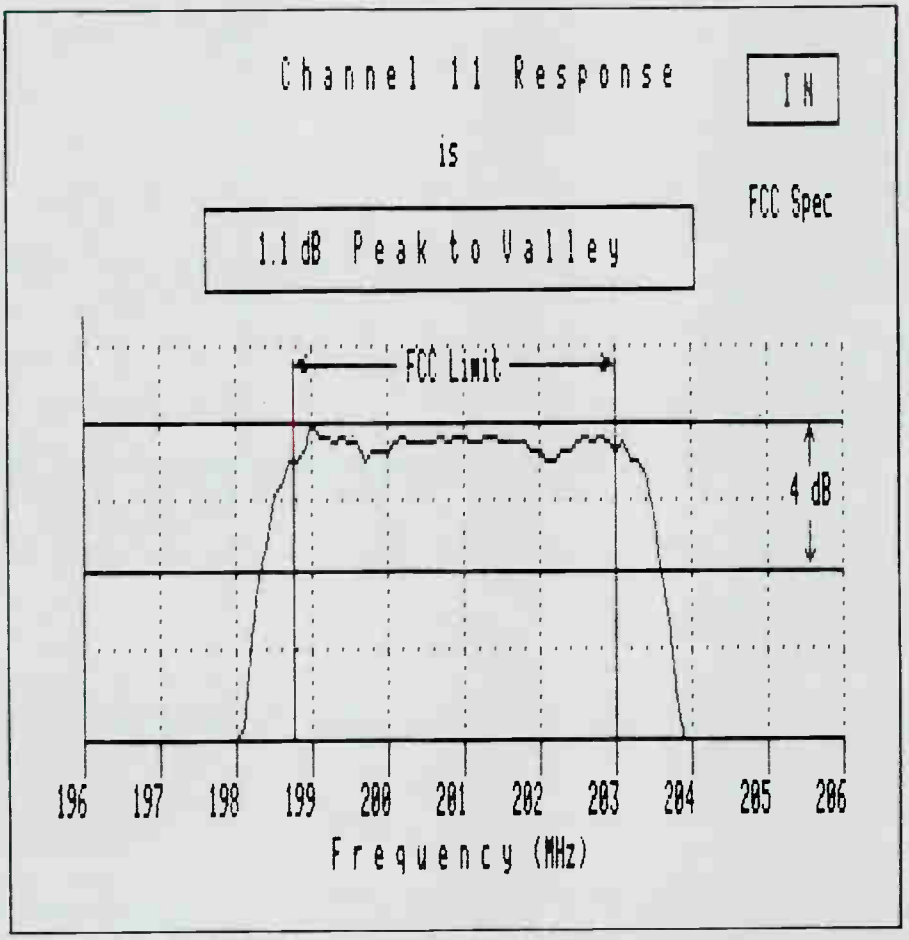
Another common way of handling this problem **(Figure H)** is to use balanced transmission lines. This is a system of carrying the signal on two conductors out of phase and combining through a phase reversal at the delivery point. The result is common mode rejection, where the out of phase wanted signal is added and enforced, while the direct pickup, which is in phase on the conductors, is cancelled by the combining. This method is used primarily for audio, but telecom companies also use balanced video.

Let us now assume that we have overcome these obstacles, and delivered the audio and video signals to the modulator. The modulator will take the video signal and amplitude modulate a carrier of either the TV picture carrier frequency, or more commonly a TV picture I.F. frequency. In cable operation modulation via I.F. is the most realistic method of operation. I.F. modulation allows easy change of output channel; as well as the possibility to feed two channels simultaneously. Direct video to channel modulation is not suitable





FCC Computer Based Testing



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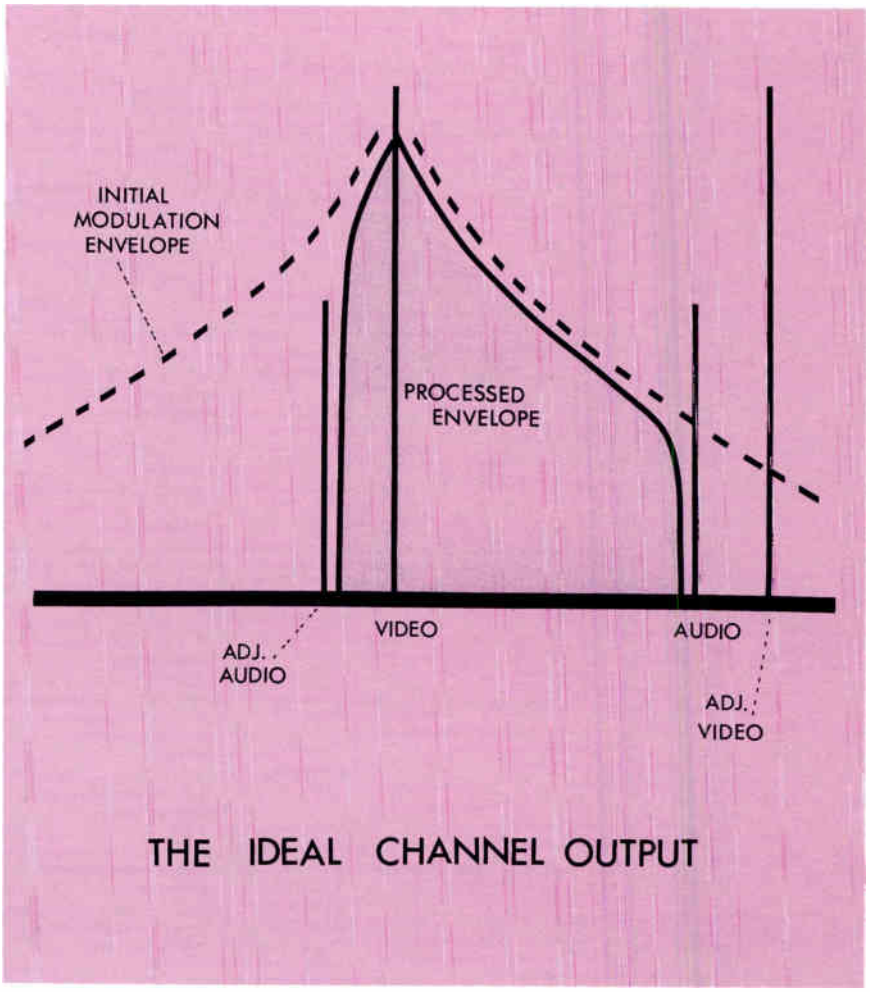
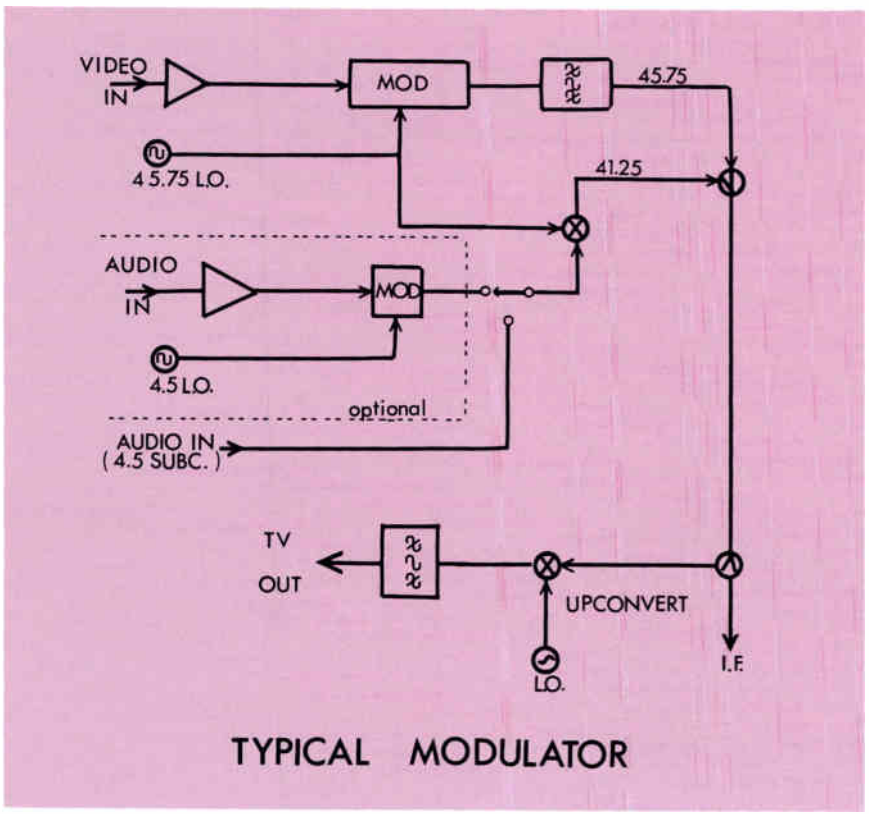
for any application other than those requiring minimal delivery quality, such as apartment surveillance etc. This I.F. can then be converted to any desired television channel **(Figure J).** A typical television modulator will operate in the following manner. The incoming video will be amplified and adjusted for level. In some models, white peaks will be clipped, while in others, the entire picture envelope will be compressed in this stage. The video will be modulated on an internally generated carrier, usually I.F. picture 45.75MHz. This carrier may be free running or coherent, depending on the system used. The resultant modulated picture carrier will be filtered through a vestigal sideband filter.

If the input is baseband audio, it will be amplified, adjusted, and modulated on to an internally generated 4.5MHz carrier. If the input is audio subcarrier, it will only be amplified and adjusted.

The 4.5MHz audio carrier is mixed with a sample of the picture carrier oscillator. This results in a sound carrier 4.5MHz above and below the picture carrier. Filtering allows the proper sound carrier (lower in the case of I.F. processing) to be fed to a combiner where it is added to the modulated picture carrier. Most modulators provide a tap and switching circuit at this point. The I.F. can be used for other purposes or can be substituted by another signal if required. This combined video/audio I.F. can then be up or down converted to any desired television channel.



THE IDEAL CHANNEL OUTPUT



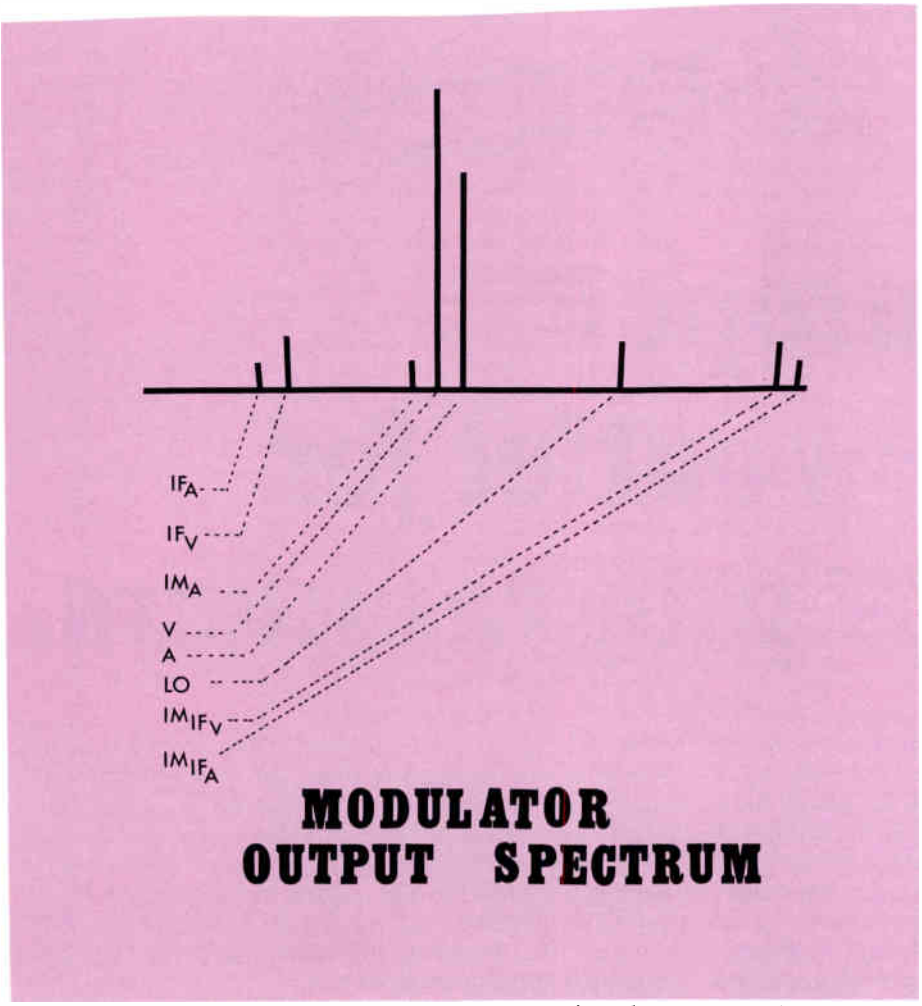
TYPICAL MODULATOR

Problems

In a television processor, we are usually concerned with carriage of an off-air television signal. The parameters of this signal are strictly controlled by the broadcaster, and the operator normally has control only of video and audio carrier level.

In the modulator, the operator usually has control of: —

Audio Input Level
Video Input Level
Audio Deviation
Video Modulation



Intercarrier Frequency
Video Carrier Level
Audio Carrier Level
Output Frequency

Assuming an input signal which is of the proper level and stability for both audio and video, what can go wrong?

Figure K shows where a modulator output must fit into a television band.

The initial modulation envelope is filtered to fit within the 6MHz band between the audio carrier, and the lower adjacent audio carrier.

The audio carrier must deviate within limits so as not to interfere with the video modulation, or more probably, the upper adjacent channel. As we saw earlier, any change in audio input, or audio gain, will translate into increased deviation.

The video modulation must be adjusted to a depth of 87.5% for a full 100 unit white signal. Modulators usually allow for an over white signal to be modulated to a depth of 93%. At no time must modulation depths exceed 93%, as the remaining **7% of unmodulated carrier must serve as a reference signal for the audio detection.** Any incursion of information into this 7% carrier area, will be translated as audio; the effect known commonly as sync buzz or video buzz.

The audio signal, which is in effect an FM radio signal is detected in the receiver as a 4.5MHz signal referred to the video. As well as observing the required video carrier modulation limits, the actual intercarrier frequency must be maintained. Any deviation from 4.5MHz causes the audio carrier to apparently move off the center of the discriminator curve, thus degrading the sound. The problems caused by modulation and deviation adjustment can also be caused by power problems. In most cases, the depth of modulation will vary with the DC voltage available to the components, and the effects can be long term, as in apparent modulation change, or short term as in hum modulation.

Figure L shows the output spectrum of a modulator. These signals are present to some degree in all modulator outputs. The ratio between the level of the desired signals, and th unwanted outputs, is controlled by design, and by user adjustment.

The location and level of the L.O. residual will be affected by adjustment of output frequency. The level of audio image will be affected by the audio carrier level, and generally any deviation of the frequency of internal oscillators will degrade performance.

While a modulator will do many things for you, it has the potential to cause problems with other channels as well as the one being processed. A modulator has much more potential for misalignment, because it has more user accessible controls. Possibly most important, the modulator deals with baseband which is very complex, and unfamiliar to many of us.

Read the manual! □

Europe: A new outlet for CATV programmers.

Towards the end of April, the British Government outlined in a White Paper its detailed plans for the introduction of a full cable TV service in the United Kingdom, along the lines of cable in the USA. Until now only in a handful of pilot schemes have operators been allowed to add their own (or any) "made-for-cable" programs, or for that matter movie channels, to the statutory relay of Britain's four broadcast TV channels. So tightly has broadcasting been regulated in the UK that only in special cases have cable relay systems been allowed to carry even an "out of area" ITV (that's *Independent* Television) service in addition to the local one. So to the British public cable has come to mean just an alternative to an antenna, or a means of getting adequate TV reception in areas poorly served by broadcast TV transmitters.

In the last few years many of these "cable" systems have become superfluous, as the third phase of the UHF broadcast plan has brought 2 BBC and 2 ITV channels, all in 625 lines color, to all but a very small percentage of the British population. A network of high power main stations, plus well over a thousand automatic relay stations, now serves all but a few pockets of less than 200 population. These communities are being assisted with the installation of small "self-help" relays, often active deflector systems.

In areas newly served by UHF broadcast relay, cable distribution systems have closed down, and now the closure date of the old VHF 405-line black and white service has been brought forward from 1986 to 1984, so well is the country covered by UHF.

Into this scenario comes the new communications optimism of the Thatcher government. Already a private consortium, Mercury, has broken British Telecom's telecommunications monopoly, (in the face of stiff union opposition) and now market forces will be allowed to decide the future of cable TV. 1982 was dubbed Information Technology Year, we are now in World Communications Year, the first operational European Communications Satellite will be given over largely to program services for cable TV, and of course the European DBS projects are only three years away. Realize also that the UK has the world's largest VCR and home computer count per head of population, and it is clear why Information Technology (in its broadest sense) is a prime investment area.

The media here are buzzing with talk of cable and satellite, what they will bring, how they can be made viable, and whether anyone wants them anyway. But it isn't only in the UK that people are looking towards new television services. In many European countries cable is already a way of life. In Belgium for instance it is possible to view not only the cable channels and the Belgian broadcasters, but also French, German, Dutch, British and Luxembourg TV. The European cable operators see ECS (the European Communications Satellite) with its pan-European cable channels, as a potential shot in the arm. There will be hard-fought political battles in some countries, where the media are regulated in a manner quite alien to anyone from the USA, (advertising is a particularly inflammatory issue) but eventually in more or less democratic western Europe, the people will get what they want.

And what a great many want, much to the dismay of their governments, is English-language programming, and especially, American entertainment. Over the past twelve months US industry has become aware of a budding market in Europe for CATV and TVRO hardware (several leading American companies have reserved booths at CAST-83, the big Cable and Satellite show at Birmingham, England in September). Now perhaps the programmers should be looking for ways to deliver their products to European outlets.

I refer here not to the pre-packaged broadcast day,

S.J. BIRKILL on EXPERIMENTAL TERMINALS

neatly canned and flown over a month in advance. Sure, there is a ready market for premium movie channels, but they will be assembled much closer at hand. I'm thinking rather of the more immediate currency of American television: the big fights and ball games, live concerts by international artists, celebrity shows, the variety of the super-stations . . . and all-day international news. I will not attempt to say how these services should be sold or what the economics might be; I will merely examine here the means by which they might be delivered, in real time, to those European head-ends.

Figure 1 shows the predicted footprint for the ECS-1 Spot West beam over western Europe. This is the 11 GHz downlink (10.95 - 11.2 and 11.45 - 11.7 GHz) that will carry the new European cable services when ECS becomes operational. The contours are of power flux density, dBW/m² in clear weather, with an allowance for 0.5 dB atmospheric absorption and 0.2° satellite beam pointing error. – 118 dBW/M² corresponds to an EIRP of approximately 45.5 dBW under these conditions. So for CATV grade service within the – 119 dBW/m² contour (United Kingdom, Ireland, France, Germany, Denmark, Belgium, Netherlands, Luxembourg, Switzerland, northern Italy and southern Norway) we are looking at around 3 meters antenna size. The satellite is at this time due for Ariane launch early June. If the bird flies and checks out, orders will be placed for uplink terminals, by the 9 European bodies awarded transponders. Lead time is expected to be some 6 months, so realistically early 1984 should see these new services available via satellite. Some programmers with access to existing uplink facilities could well be up and running as early as this fall.

Now ECS has six 72 MHz (nominal) channel frequencies, giving 12 transponders by frequency re-use with orthogonal linear polarizations. Eight of these transponders can be selected to the Spot West downlink beam. Enough? The ECS governing body, Eutelsat, headquartered in Paris, doesn't come over as the kind of outfit that can easily be bought. Competition to obtain a transponder was fierce, and national (and European) pride figured largely. Unless you can negotiate time on someone's existing allocation without falling foul of Eutelsat, you will not get on to ECS-1. Remember too that Eutelsat is fearful most of all of starting an unofficial European DBS. Everything on their satellite must be encrypted.

In the unlikely event of your acquiring an ECS channel (ECS-3 may in due course provide further TV channels; ECS-2 is to be the primary telecommunications satellite) you will still require a feeder link to your European base — at 10° E ECS-1 is well beyond the range of US-based uplinks. An Intelsat 4 GHz global beam circuit, full-time international lease, is required. And you'll need a domesitransponder to deliver your service to one of Comsat's international gateways, Etam WV or Andover ME for the Atlantic region. At some point you will provide a standards converter to put your pictures into 625-line PAL-B format, for compatibility with most of Europe's TV sets.

So the alternatives to ECS? Intelsat naturally comes to mind. Over the Atlantic there are 7 operational Intelsat slots, each visible both from Europe and from the US eastern seaboard. The process of upgrading all Intelsat locations to series V birds continues, and an increasing number of IV and IVA series satellites are hovering around as contingency spares. Neglecting those, the current situations is something like this:

53.0° W	INTELSAT IV	F1	Mexican Lease
34.5° W	INTELSAT V	F2	Major Path 1
27.5° W	INTELSAT V	F4	Reserve for Primary
24.5° W	INTELSAT V	F3	Primary Path
21.5° W	INTELSAT IVA	F4	Domestic Lease
18.5° W	INTELSAT IVA	F1	Major Path 2
1.0° W	INTELSAT IV	F8	AFRTS Lease

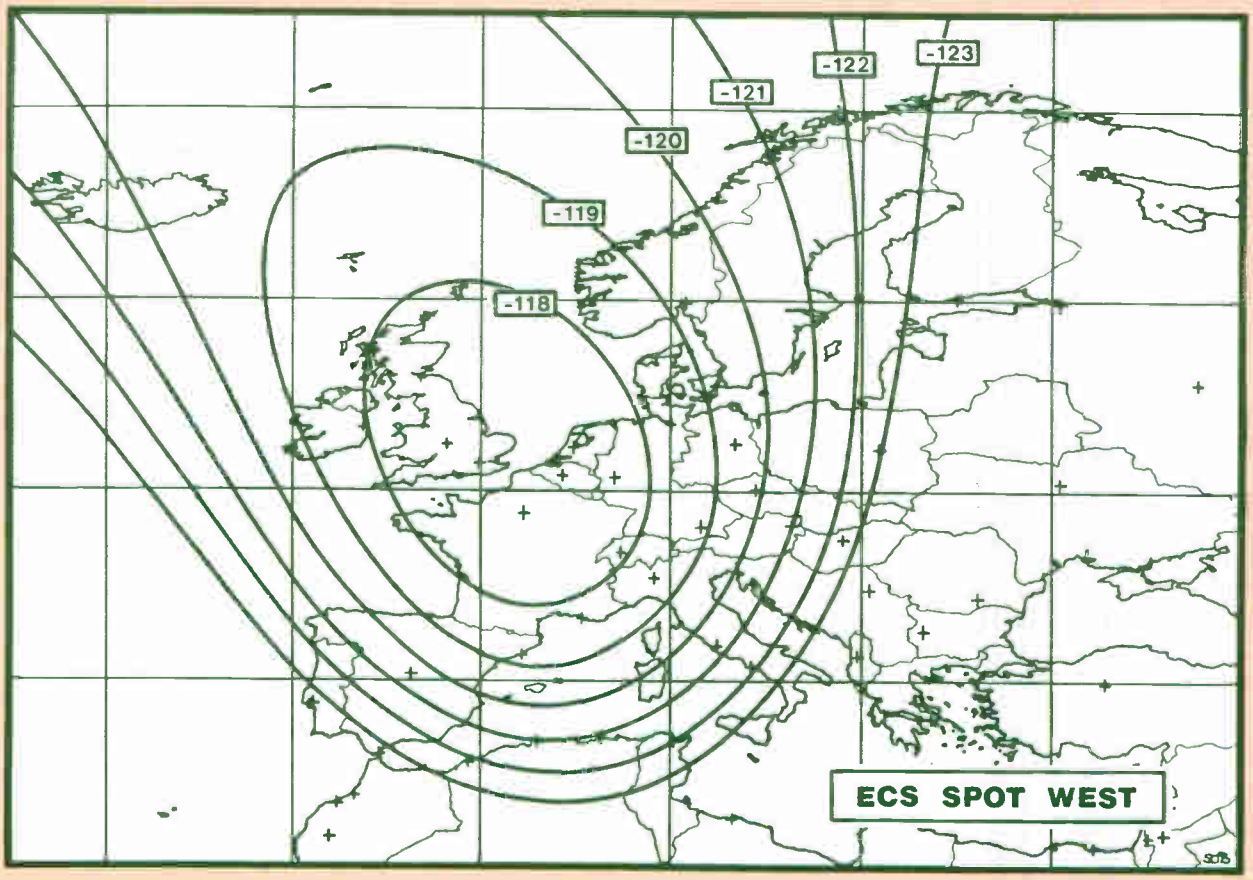


FIGURE 1

The 53° W bird has spare capacity in global and eastern spot beam transponders, but must be ruled out on account of its low elevation angle into Europe. The three Intelsat V satellites are already heavily loaded with telecommunications traffic, but spare capacity could be available on left-hand circular zone beam downlinks at 4 GHz, guaranteeing 29 dBW beam edge. These zone beams cover Europe, Northern Africa and parts of the Middle East, and in fact offer saturated EIRPs as high as 33 dBW in their three highlight regions. 32 dBW could be seen over most of western Europe, allowing cable grade service to a 5 meter antenna.

On the 1° W Intelsat, ten of the twelve transponders are unused. Global and spot beams are available, delivering 22 dBW and 34 dBW respectively over the area of interest. Here the look angle problem is at the American end, where uplink could be provided only through the Comsat international earth station at Andover, Maine. The future status of this Intelsat is uncertain, but assuming a continuing commitment to AFRTS service to Europe and the Indian Ocean, it seems likely that it will be maintained in some form. The likelihood is that a displaced Intelsat IVA will take over the position in due course, maintaining that AFRTS global beam EIRP, but by the nature of its hemispheric

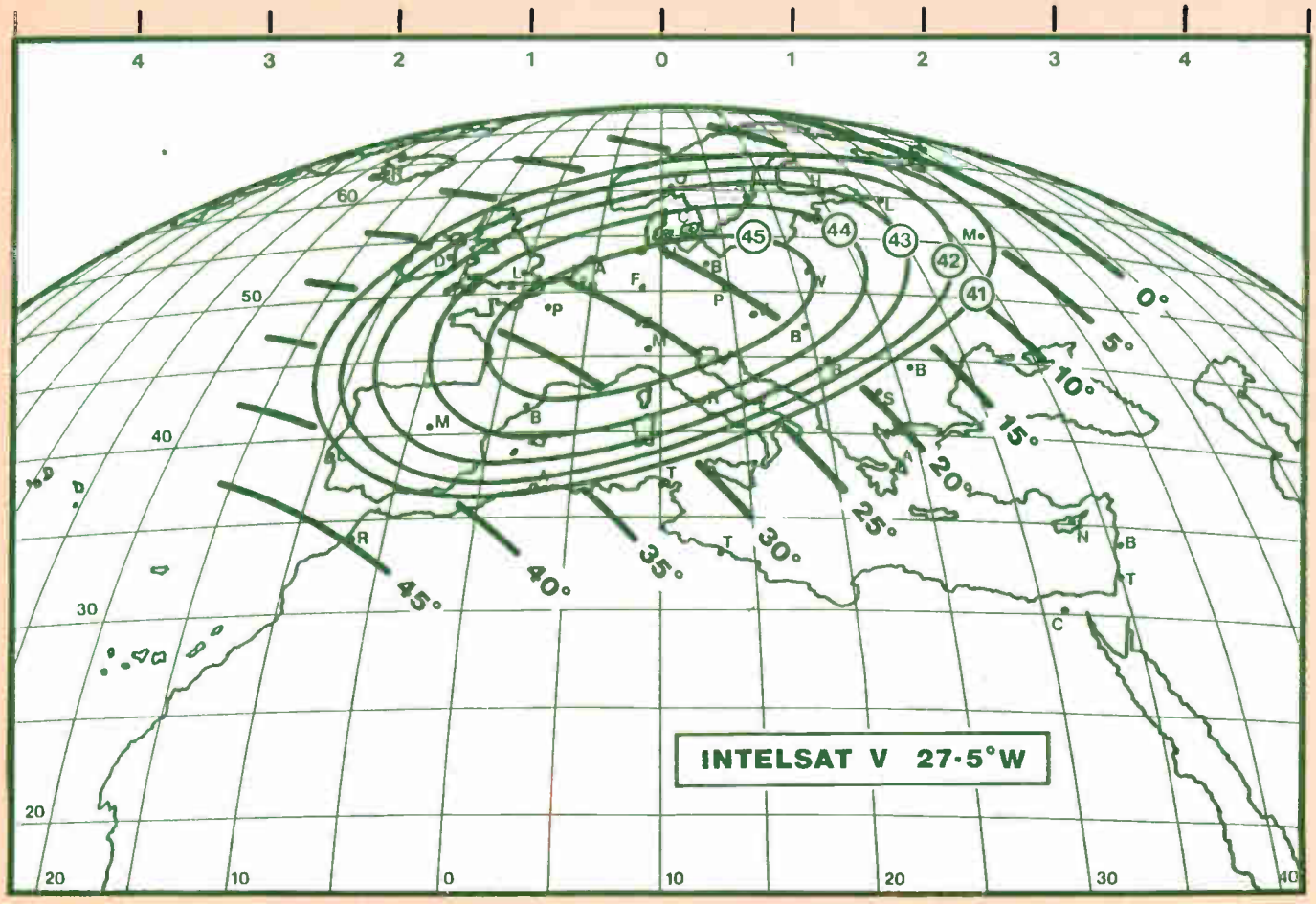


FIGURE 2

beam pattern, removing the option of a higher power footprint to Europe.

An altogether better way of using Intelsat space segment would be the lease of Ku-Band capacity. Here **(Figure 2)** the eastern spot beam of an Intelsat V satellite is seen to deliver 41 dBW guaranteed beam edge EIRP in a steerable footprint capable of covering most of Europe. In the central area, EIRP typically exceeds 45 dBW, inviting comparisons with the ECS coverage. The comparison can be taken further: Intelsat V Ku-Band downlinks occupy the same 10.95 to 11.2 and 11.45 to 11.7 GHz sub-bands, and are also linearly polarized. The TVRO requirements are identical. And a second 3 or 3.7 meter antenna would be far more acceptable at a European head-end than would a 5 or 6 meter at 4 GHz.

Transponder availability is another thing. There are only three, albeit wide band, transponders available at Ku-Band on each Intelsat V (Bandwidths are 72 MHz, 72 MHz and 240 MHz). With the rise of international business and teleconferencing services between Europe and America these are much in demand. Replacement of the Major Path 2 satellite by an Intelsat V might offer the next opportunity for a transponder, and allow good elevation angles from both sides of the Atlantic, but I rather think your application should be in now. Remember also that an Intelsat V can "cross-strap" 4

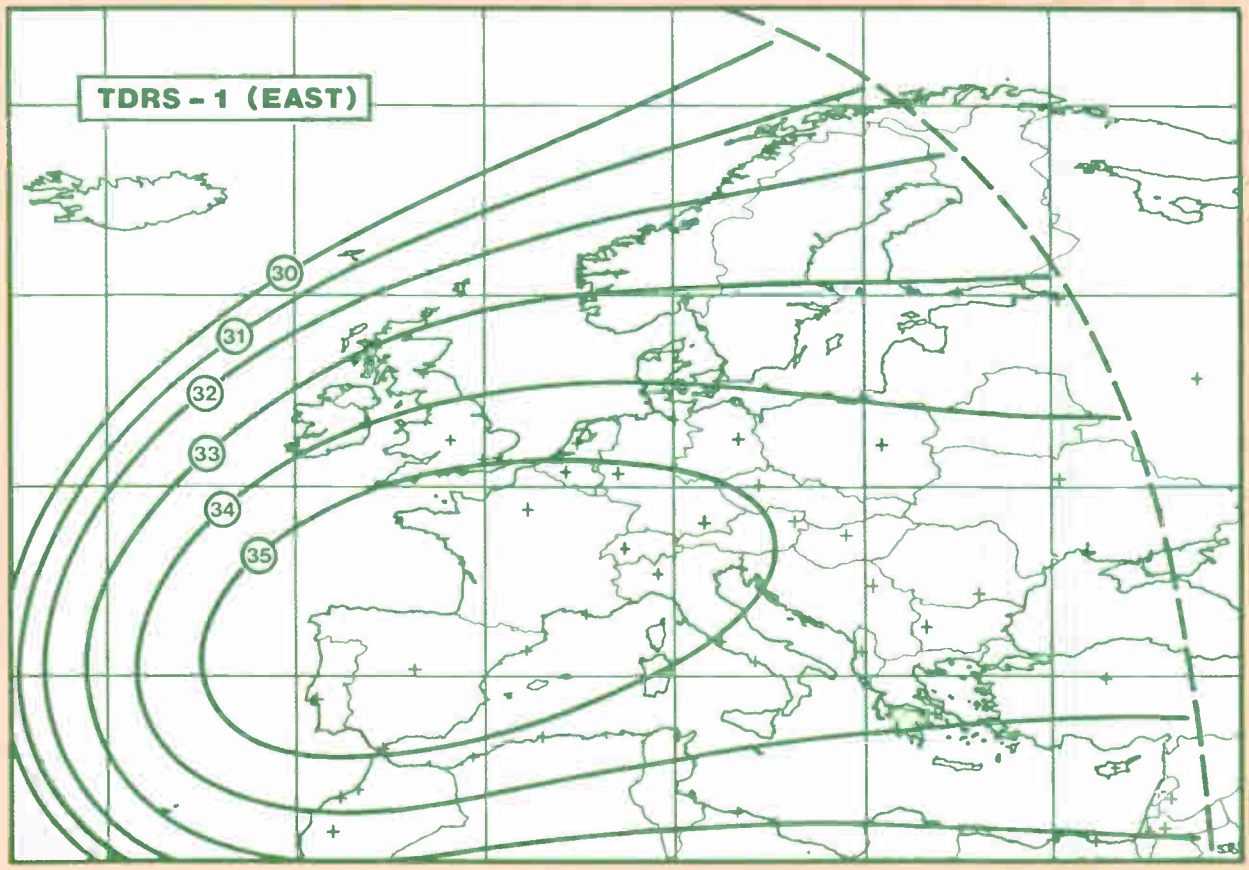


FIGURE 3

GHz uplinks to 11 GHz downlinks and vice versa — you might even be able to uplink from your own premises.

One further transatlantic possibility could exist. As we discovered early in April, TDRS-A's Inertial Upper Stage failed to place the satellite into its correct geosynchronous orbit over 41° W. At the time of writing I have not heard whether the attempts to adjust the orbit have been successful. If they have, the option of north/south stationkeeping will almost certainly have been lost, if the satellite is to achieve anything like its nominal lifespan. If the orbit has not been circularized at geosynchronous altitude, NASA will be aiming to place TDRS-B into the Atlantic slot on the next available Shuttle mission.

With the abandonment of the Advanced Westar project, (CATJ July 1982) the C-Band 12-transponder domsat payload and the Ku-Band SS-TDMA payload have become redundant on all the TDRSS-series spacecraft. Even as it was, in TDRS service the 12-channel C-Band package would have remained unused. Now the C-Band antenna is body-fixed to the spacecraft, optimised for domestic coverage from the Advanced Westar slots of 79° W and 91° W. With AW cancelled and the prospect of other uses of the C-Band transponders there remained insufficient time before the TDRS-A launch to modify its C-Band antenna. A re-

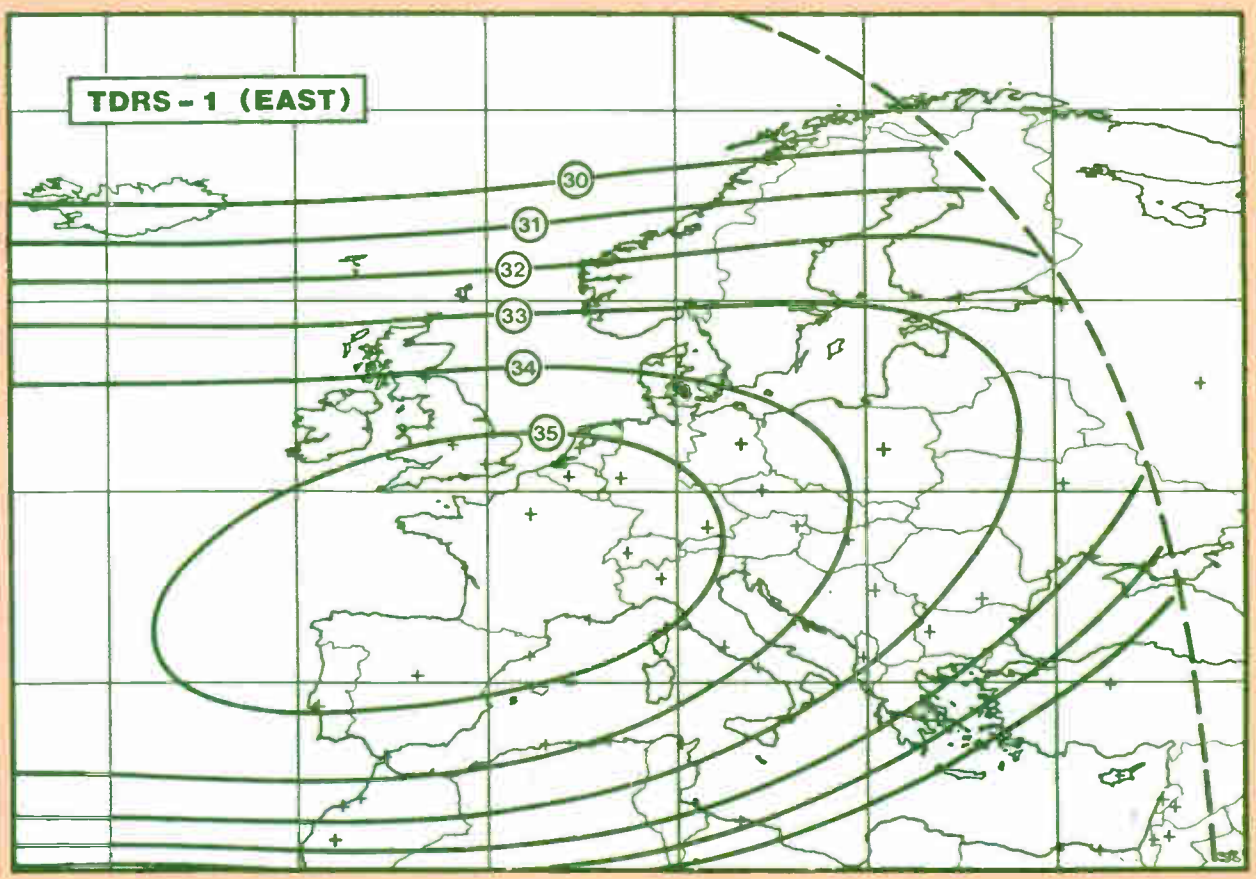


FIGURE 4

allocation of (say) the TDRS-C bird to the Atlantic slot would allow such a modification.

Assuming no change of antenna pattern, only of pointing, **Figure 3** shows the expected European footprint from 41° W for optimum coverage. A second possibility is shown in **Figure 4.** Here the "AW" pattern is centered in mid-Atlantic, giving adequate coverage of Europe but also permitting uplinking into what would have been the Hawaiian spot beam, but now aimed towards the south-eastern United States. (The same reflector is shared by 6 GHz uplinks and 4 GHz downlinks).

If a complete change of antenna pattern were made, there is no reason why the C-Band pattern could not be optimised for transatlantic service, generating dual spot beams of up to 36 dBW, one over the eastern states and one over Europe. This way twelve channels of TV could be uplinked from either Europe or the USA and downlinked into both. Receive terminal requirements would be identical to everyday US domsat practice.

Any use of TDRS for cable TV services would require full 0.1 degree stationkeeping regime, which NASA would have to budget for in the TDRSS program — it is most unlikely they would compromise their vitally important (to the space program) TDRSS mission for commercial applications.

Washington Update

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by Stephen R. Effros
CATAs Executive Director

S. 66 APPROVED BY SENATE COMMITTEE

It took a lot of work, but it finally happened! The Goldwater cable bill, as modified by the National League of Cities/National Cable Television Association compromise that we explained in last month's CATJ, has been approved by the full Senate Commerce Committee on a 15 to 2 vote. In the final days before the vote, several additional compromises had to be made because the original compromise was falling apart. The National League of Cities, just days after the compromise was announced, decided that it could no longer support the full compromise since many of its large city members began to rebel. As CATA predicted, the ultimate compromise, which resulted in the passage of the bill through the Senate Commerce Committee, primarily centered on the grandfathering of the bells and whistles in the major city franchises.

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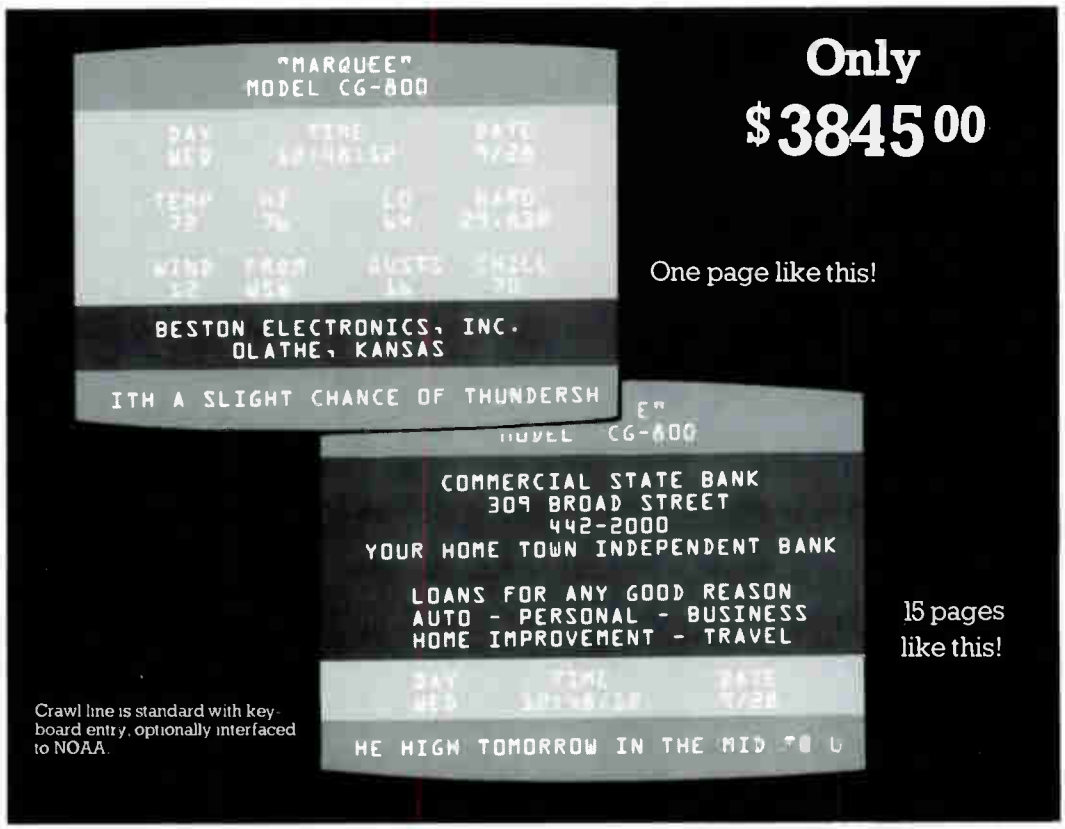

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Several other compromises were also reached; for instance, the final draft of the bill now makes it clear that the 5% franchise fee ceiling does not include bond requirements or any of the other requirements incidental to the enforcement of the franchise. Further, there is a slight change in the basic service definition to allow for so called "lifeline packages" for senior citizens and so on. Both of these changes are also primarily aimed at the large city franchises and have very little relevance elsewhere in the country. The most important part of the Goldwater bill for most cable operators, that is, the renewal section, was not significantly changed in any way.

This is a very complicated bill, and it is subject to many, many interpretations. We are not going to go into a detailed explanation of those interpretations here because we expect that the bill will be modified several more times before its ultimate passage if, in fact, it gets passed. Suffice it to say that it's a lawyer's delight! It is not at all clear, given the compromises that were ultimately reached, what some of the sections mean when they say cities are restricted with regard to negotiating with cable operators and then enforcing the subsequent promises. It would appear that the key for the cable television industry with regard to new franchises is that any promises, whether in the RFP or in the franchise process itself, that are made are subject to the caveat that if circumstances change and it is found that those promises are no longer reasonable or sensible from an economic or any other point of view, they can be abrogated and a legal defense is supplied against any suit for breach of contract.

As we said, this thing may very well be the lawyer's relief act of 1983, but, once again, those problems mainly relate to the major city bells and whistles franchises — the big urban problems that we have been talking about for the last several months. They do not relate to the rest of the industry, and for most members of the cable television industry the bill is very clear. It is also clear, in most circumstances, for the cities. The bill does benefit both sides and if it is passed, you can expect to see a lot less litigation and a lot less contention between cities and cable television operators as more and more renewal franchises are granted. Of course, it should be pointed out that regardless of what happens with S. 66, the primary issues of whether a city has the authority to grant quasi exclusive franchises, and particulary to grant franchises that can be interpretated as interfering with First Amendment rights, have not been resolved. Those will be resolved in court, and that court test, the Mountain States Legal Foundation case that we have discussed with you before, is still going on. It will not significantly be altered by either passage or the failure of passage of S. 66.

So where do we go from here? Well, of course, the next step is the Senate floor and we already know that there are likely to be amendments to the bill introduced on the floor. The key one at this time is an amendment, or series of amendments, by the telephone companies who very belatedly figured out what this bill was all about. There is a key section of S. 66 which says that cable television may not be regulated as a common carrier even in those areas where we provide "telecommunications services", such as data transmission. Of course, the telephone company is regulated as a common carrier when it provides those services. The telephone industry finally realized that this would create a situation where we and they were offering the same services, but they were regulated and we were not. They objected at the last minute before the bill went to markup before Senator Packwood's full Commerce Committee. The objections were duly noted, however, most Senators said that the objections came too late for any attempt to change the legislation during markup and they were unwilling to delay a vote on the bill simply because AT&T had acted so late. So the scene shifts to the floor of the Senate where those amendments will be introduced. The most likely amendment will be one that was outlined by Senator Hollings. Rather than attempt to regulate the cable television industry, he suggested that at the appropriate time, that is, when the telephone company no longer is overwhelmingly dominant in such fields as data communications, that it would be possibly appropriate for them to be deregulated. He suggested that the legislation reflect that and allow state public utility commissions to deregulate the telephone companies at such time as they are no longer dominant. He did also point out that he believes that time has not yet arrived.

To be sure, there will be other amendments. However, the AT&T Amendment will be the most important. The large cities are still opposed to the National League compromise and have formed their own caucus group to oppose the bill, however, they were not at all successful in their attempt to derail it at the committee level. Similarly, efforts to include the "must carry" rules in the bill failed on the Senate side, at least so far, as did an effort to eliminate the pole attachment law. One amendment that was added, which CATA had a great deal to do with, was the amendment by Senator Paul Trible of Virginia allowing a city and a cable operator to negotiate the banning of obscene material or other material that is not protected by the U.S. Constitution. Originally Senator Trible had proposed a much broader amendment, one that would simply allow cities to negotiate regarding any program service. CATA opposed that amendment and sent a comprehensive letter to Capitol Hill explaining why the granting of such power to the cities would simply lead to another negotiating battle between the cities and the cable operators which was totally

contrary to the First Amendment. Senator Trible subsequently modified his amendment to speak only to the issue of obscenity and, as narrowly drawn, neither CATA nor the NCTA objected to the amendment.

As we have already noted, it is a strong possibility, particularly with the overwhelming vote in the Commerce, Committee, that S. 66 will be adopted by the Senate. The question of what happens in the House, however, looms large. It's going to be our turn to work the political fields in order to get a vote favorable to S. 66, or whatever the number will be when it is introduced on the House side. We already know there are going to be some problems. For instance, the House Communications Subcommittee is much more sympathetic to the issue of the "must carry" rules, and the Chairman of that committee, Congressman Wirth, has already indicated through his aids that the issue of access, and particularly leased access, will be raised in his subcommittee. So, suffice it to say, this bill is far from passed. However, it is the best chance the cable industry has had in years for comprehensive legislation and, we might add, it is the best chance for the cities to get out from under the burden of antitrust litigation that is now popping up nationwide.

Contrary to popular belief, the bill does give the cities a great deal that they did not have before. In the original S. 66, the one prior to the NLC/NCTA agreement, the cities would have been virtually cut out of any regulation in the cable television business. In the compromise version of the bill there are clear and delineated areas where the cities may regulate cable television. So, from a political point of view the cities have gained a lot by this compromise and they should be supporting it. There is no question that there is going to be vociferous objection by some of the larger cities. However, it is the attitude of those larger cities that has caused the drum beat for legislation in the first place. We would have to say that the sentiment voiced by the Telecommunications Officer in Denver pretty well spells it out. When Bill Bradley, that Telecommunications Officer, was asked about S. 66 he said ". . . we might as well forget about providing a service to the residents of Denver. We'd just become spectators not pilots." Well, that is precisely the problem with most large city administrators. They think they are offering the service and they think they are the pilot of cable television. They're not! That's what they've lost sight of, and it was because of that severe misperception of the private marketplace and business as it relates to government that S. 66 has become necessary in the first place. It is true that many cities, and particularly many city administrators with regard to cable television, think that they are the ones running the system and that the city is the one providing service. Neither, of course, is true, and S. 66 will straighten that out.

It is vital that every CATA member now go to their city council and to their mayor and to the cable administrator, if you have one in your city, and sit down and explain the benefits of S. 66. It is vital that we contact our Congressmen and our Senators in support of S. 66. We fully expect that the bill will be passed by the Senate and as soon as the bill is introduced in the House and a new number is assigned, we'll get it to you so that you can immediately inform your congressmen of the number of the bill. However, that doesn't mean you should wait until then to start talking to them about the problem that this legislation aims to solve. **We have a golden opportunity and that opportunity is now! If we don't grasp it, we have only ourselves to blame.**

CATA PLANS DIRECT ASSAULT ON "MUST CARRY" rules

It's no secret that CATA is opposed to the "must carry" rules of the FCC. We have long maintained that those rules violate our First and Fifth Amendment rights. They are a taking of our property without due process and compensation and they are a violation of our First Amendment rights to free speech. They limit diversity by requiring cable operators to carry broadcast stations, which can already be seen in the community via other telecommunications means, and they take away the consequent First Amendment rights of other programmers to be seen on a cable system because of the channel capacity used up, particularly by duplicating network signals. Several different actions have now been taken to fight those "must carry" rules. The first one is a court case filed by a small cable operator in Quincy, Washington who objects to an order by the FCC that he carry duplicating network signals and that he pay a fine for his prior refusal not to carry those signals. We support the Quincy Cable case. We think that the cable operator is correct. He is being ably represented in court, and CATA has been in contact with and is cooperating with the counsel representing Quincy Cable. We are doing all that we can and all that is requested of us in that case.

There is one problem with the case, and that is the irony that it is almost too good a case. Not only is there an argument about the First and Fifth Amendment, the case also challenges a series of administrative actions by the FCC that led up to the fine of the cable operator. Unfortunately, from our perspective, it is so clear that the FCC made reversible errors in its administrative actions that we fear that the Court will never get to the issue of the First and Fifth Amendment and the overall issue of the validity of the "must carry" rules since the Commission violated its own procedures, and the Court will be able to throw the case out on that ground before ever reaching the principal issue.

Another proceeding that does go directly to the issue is the long outstanding petition by Ted Turner

to overturn the "must carry" rules at the FCC. The Commission has refused to act on that petition for over two years! CATA is joining Turner in petitioning the Commission for swift action on that rule making request. We believe we have a new and novel position to add to the Turner petition that will show that the FCC simply does not have the jurisdictional authority to require the "must carry" rules in the first place, and that rather than having to rule on a Constitutional test of whether those rules are valid, the Commission will have no choice but to eliminate the rules because of prior Supreme Court decisions that clearly delineate their jurisdictional limits with regard to cable television.

We're taking this action now rather than proceed with a carefully planned legal test, which we have been working on for some time, because it is our belief that during the deliberations on the Goldwater bill, explained elsewhere in this issue, in the House of Representatives there will be an attempt to negotiate on the issue of "must carry". We have every reason to believe that those negotiations will be serious and that there is a strong potential that some sort of "must carry" legislation will be written into the Goldwater bill in the House. That being the case, we want to make it very clear now that the "must carry" rules that presently exist at the FCC are on an extremely weak foundation, and we believe that foundation is about to crumble. We will be spelling out why they are on such weak foundation in our petition to the FCC filed prior to May 20th. We'll give you full details on that petition in the next issue.

SOUTHERN ASSOCIATION SUPPORTING ITS MEMBERSHIP BY PROVIDING CATA TECHNICAL SEMINAR

The Southern Cable Television Association, the same group that brings you the Eastern Show every year, has now figured out a way to bring a more personal touch to the education of Southern Association members. They are sponsoring the CATA Technical Seminars in the southeast. Six of them each year are being supported by the Southern Association and reduced fees are charged to Southern Association members. The Association is also contributing funds to the CATA Technical Seminar budget that will allow more research and development to be done on further technical training seminars to be presented in the future. The technical training seminars have become very successful throughout the nation, and the lead taken by the Southern Association has now spread across the country. Other state and regional groups are talking about supporting the CATA Technical Seminar to assure that cable operators in their areas of the country have the availability of these comprehensive seminars. CATA's Director of Engineering, Ralph Haimowitz, reports that they have negotiated with the Texas Association for a supporting role in the CATA Technical Seminars, and we have initiated conversations with both the California Association and the Mid America Association for some sort of supporting role. If any other Associations are interested in a supporting role in the CATA Technical Seminars in their areas, they should contact the CATA Engineering Office immediately. We obviously only have a limited number of times available during the year that we can run these comprehensive seminars. The Southern Association, being the first, has managed to reserve six of those seminars for the southeast; Texas and California are likely to get their share as well. We want to make sure that we have some even distribution around the country. So, if you're interested, be sure to get in touch with Ralph Haimowitz immediately! Just for your information, the technical seminar program schedule for the remainder of the year is as follows: June 13-15, Baton Rouge, Louisiana (Basic, sponsored by the Southern Association); July 11-15, Richmond, Virginia (Advanced, sponsored by the Southern Association); August 1-3, Lake Worth, Florida (Basic); October 3-7, San Antonio, Texas (Advanced, sponsored by the Texas Association); November 7-9, Atlanta, Georgia (Basic, sponsored by the Southern Association); December 5-9, Revere, Massachusetts (Advanced).

SETTING THE RECORD STRAIGHT — HOW ACTIVE ARE THE "SUPERSTATIONS" AT PROTECTING THEIR CABLE INTERESTS?

Everybody knows that CATA opposes the Copyright Royalty Tribunal decision that resulted in massive increases for cable television copyright payments. Everybody also knows that Ted Turner does too, but what about WOR and WGN? Well, in a speech before the Women in Cable Club in Atlanta, Ted Turner was on a panel with CATA's Executive Director, Steve Effros, as well as the NBA's Vice President, David Stern. Turner caused a minor bruhaha by saying that while he was fighting in Washington to protect cable's interests, WGN and WOR didn't really care. That resulted in an immediate reaction from both Eastern Microwave and United Video, the satellite carriers of WOR and WGN, who have most certainly been extremely active in the fight against the CRT rate increase. Bob Price and Roy Bliss from United Video, we can tell you from personal observations, have been right in the thick of the battle for a long time and have been assisting CATA in that battle as well. There is no question that United Video has been fighting long and hard to protect cable's interests as well as Ted Turner. But as Steve notes, we don't think that Ted was aiming his barb at United Video or Eastern Microwave in the first place. Ted is well aware of the efforts of United Video, for instance, with their "Black Tuesday" campaign and he acknowledged as much as that meeting. What he was really aiming at was the station owners themselves. Both WGN and WOR, when contacted, have stated that they are

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"passive" as far as cable is concerned and, indeed, from that point of view Turner is correct. The stations don't really care about cable. United Video and Eastern Microwave certainly do, and they should be complimented, as well as Turner, for the efforts they have made in our behalf. Of course, it's in their behalf as well since the more cable operators carry distant satellite distributed signals by United Video and Eastern Microwave, as well, of course, as Southern Satellite Systems which carries WTBS, the more those carriers succeed, and we wish them all the best of success.

Another statement that was misinterpreted at that Women in Cable meeting was one by CATA's Executive Director. He noted that several years ago there were 4 satellite carried signals and now there are only 3, and with the impact of the Eastern Microwave move to a different transponder, as well as the CRT decision, there might some day only be 2. This was misinterpreted as being a statement that CATA believed that Eastern Microwave was going to stop carrying WOR. **We want to correct that here and now.** They clearly are still carrying WOR, they have not gone out of business and from what they tell us, things are going very well indeed. We hope they continue that way!

ANSWER YOUR MAIL!

We know it's a pain sometimes, and we know it takes you away from many of the things that you have to do every day to run a cable system, but nevertheless it is important. What are we talking about? Answering those questionnaires that you periodically get from various people, including CATA! You're going to be getting another one shortly from us asking you about what political district you're in, and what Congressmen you know, and what Senators you know, and so on. This is the only practical way we can keep tabs on where our political strength is, and as you can see from other articles in this issue of the CATJ, we need to know those things and we need to know them now. So please, when you get your questionnaire, fill it out and send it back. It really is part of being a member of CATA.

Along the same line, you will probably be getting questionnaires from other people. One of them will be Cablefile which is a part of Titsch Publications and one of the few comprehensive listings of cable television systems in the United States. We would urge you to fill out that questionnaire as well. The reason, again, is for lobbying purposes. The industry is in desperate need of consistent, reliable figures with regard to the number of systems, the size of the systems, the capacity of the systems in the United States and so on. While a lot of that information is contained in the FCC's files, those files unfortunately are not only incomplete, but almost impossible to get compiled within a reasonable period of time. To give you some idea, the financial figures for 1981 were just released several weeks ago! That's just not fast enough for our purposes! CATA, for one, is standardizing on the use of the numbers that are published in Cablefile. It would be a great help if everybody focused their attention on filling out as accurately as possible the information requests from publications, such as Cablefile, and, of course, ther are others that we would recommend you fill out as well, so that a uniform picture of the industry can be developed. This too is for your benefit. It works on Capitol Hill, it has an impact on Wall Street, it has impact on advertisers, and all of those ultimately have an impact on you regardless of how big or small a system you have. So, please, answer your mail!

FCC AUTHORIZES TELETEXT AND LPTV BUT NOT ON "MUST CARRY" BASIS

The headline pretty well tells the story. Despite the efforts of the low power television folks and the broadcasters with regard to Teletext, the FCC has decided that neither of these new services, which are both now officially recognized, have to be considered "must carry" services under the Commission's Rules. As we have noted elsewhere in this issue, we don't believe that even the broadcast stations are legally "must carry" under the Commission's jurisdiction. However, that is a fight that we are now engaged in with the FCC. Unfortunately, the Teltext decision may not stand. The vote was 4 to 3, and one of the principal Commissioners voting against "must carry" status, Ann Jones, has now announced that she is leaving the Commission. With the Commission itself going from 7 to 5 Commissioners, starting in June, this means that it is highly likely that any reconsideration of this decision would only take place after ther are only 5 Commissioners to deal with rather than the present 7. A vote on reconsideration could change this decision. However, once again, we would reiterate that we believe that the Commission does not have the jurisdiction to require "must carry" in the first place, and that would supersede any vote by the Commissioners once it is decided by a court.

As to the decision on LPTV, while we can all cheer about the rare consistency of the Commission in announcing very early in the game that LPTV would not be a "must carry" signal, and now confirming that decision, that does not end our problems with low power television. Under the newly adopted rules cable systems will be protected from interference to the headend and at the output of the converter, however, some LPTV interference problems are caused by the direct pickup of the signal by a subscriber's television set. This, of course, is particularly the case if an LPTV operation is commenced in the VHF frequencies in your community. You would be wise to monitor any proposals for LPTV in your area and object early if you suspect that a potential interference problem could be created. □

CATA Announces New Seminars Schedule

CATA, under the direction of its Engineering Committee, chaired by Director Wayne Sheldon, has announced the first half of the 1983 schedule for the Basic and Advanced Technical Training Seminars. The Engineering Committee, working closely with CATA's Director of Engineering, Ralph Haimowitz, has designed the schedule in accordance with suggestions and requests received from cable operators over the country. In addition, the Southern Cable Television Association is again cooperating on the sponsorship of three of the first half of 1983 and three scheduled for the second half. The Southern Association co-sponsored two in 1982 and has selected appropriate locations to insure this valuable training, so vital to the entire industry, be available to their membership.

There are some changes in both the Basic and Advanced curriculum as previously presented; both sessions have had an update to cover the additional technical areas where training is needed.

REGISTER NOW!

Following is registration and information that is self-explanatory. If you wish additional information, please contact the CATA Engineering Office (305) 562-7847. Take advantage of this opportunity to add to the experience and expertise of your technical staff and thus help your system become more efficient and better maintained. Use the registration form **TODAY** to register for the seminar more applicable to your needs and location. CATA has arranged with the hotels for reasonable housing rates, and those hotels are listed with the addresses for you to make your **reservations directly with the hotel.** Be sure to list that you are registering for the CATA Seminar so that the discounted rates will be honored with your reservation.

Don't delay . . . take care of your registration today as each seminar is restricted to a certain number so that each attendee will have the full advantage of the equipment and laboratory facilities.

BASIC SEMINAR

(Monday thru Wednesday)

TOPICS

SIGNAL SOURCES
- Broadcast TV
- Satellite TV
- Microwave Transmission
- Local Origination

HEADEND
- Antennas
- Preamplifiers
- Receivers
- Processors
- Modulators
- Filters
- Combiner

TRUNK SYSTEM
- Coaxial Cable
- Trunk Amplifiers
- AGC/ASC
- Two-Way Systems
- Powering

DISTRIBUTION SYSTEM
- Bridgers
- Line Extenders
- Distribution Taps
- Splitters/Couplers

SUBSCRIBER MATERIALS
- Taps
- Drop Cable
- Transformers
- Grounding Blocks
- Set Top Converters
- Splitters/Couplers
- Apartment Amplifiers

HOUSEDROP
- Aerial Installation
- Underground Installation
- Tap Selection
- Multiple Outlets
- Bonding & Grounding

CONNECTORS
- Connector Types
- Cable Preparation
- Proper Installation
- Signal Leakage

FINDING PROBLEMS
- Signal Level Meters
- Common Cable Problems
- Finding Faults

OPERATING PROCEDURES
- System Maps & Symbols
- Recording Information
- Subscriber Relations

LABORATORY
- Equipment Identification
- Installing Connectors
- Measurements With SLM
- Troubleshooting

ADVANCED SEMINAR

(Monday thru Friday)

TOPICS

FUNDAMENTALS REVIEW
- Decibels/dBmv
- Formulas
- Logarithms

OPERATIONAL REQUIREMENTS
- FCC Technical Standards
- FCC Forms and Records
- System Records & Programs

SYSTEM PROBLEMS/FAILURES
- Common Cable Faults
- Sheath Currents
- Impedance Mismatch
- Radio Frequency Interference
- Signal Leakage

LABORATORY

Days four and five are primarily devoted to hands-on test equipment sessions in the cable system laboratory where attendees actually perform the required tests and measurements.

EQUIPMENT
- Spectrum Analyzers
- Sweep Generators
- Sweep Transmitters
- Sweep Receivers
- Signal Leakage Detectors
- Frequency Counters
- Fault Finders

TESTS AND MEASUREMENTS
- Spectrum Analysis
- Bench Sweeping
- System Sweeping
- Proof of Performance Tests
- Isolation
- Return Loss Measurements

SYSTEM DESIGN CONCEPTS
- Coaxial Cable
- Active Equipment
- Passive Devices
- Grounding & Bonding
- Powering
- System Noise Limitations
- Crossmodulation
- Intermodulation
- Hum
- Reflected Signals

FREQUENCY SPECTRUM
- Spectrum Conflicts
- Channel Expansion
- Frequency Restrictions

CATA CATV TECHNICAL TRAINING SEMINAR
HOTEL INFORMATION

A block of hotel accommodations has been set aside for each seminar at the hotels indicated. Please make your own reservations directly with the hotel by completing and mailing in the hotel reservation form below to the appropriate hotel. For telephone reservations, be sure to include the information that you are attending the CATA CATV Technical Training Seminar to receive the special room rates as indicated.

BASIC

BATON ROUGE, LOUISIANA
JUNE 13-15

PRINCE MURAT INN
1480 NICHOLSON DRIVE,
BATON ROUGE, LOUISIANA 70802
PHONE: (504) 387-1111
The Prince Murat Inn is located on the Nicholson Drive exit off I-10. Limousine service from airport.
S - $27.00
D - $36.00
Sponsored by the SCTA

LAKE WORTH, FLORIDA
AUGUST 1-3

COUNTRY SQUIRE INN
7859 LAKE WORTH ROAD
LAKE WORTH, FLORIDA 33463
PHONE: (305) 968-5000
Take exit 36 off the Florida Turnpike.
S - $33.00
D - $35.00
Sponsored by the SCTA

ATLANTA, GEORGIA
NOVEMBER 7-9

MASTER HOST INN MIDTOWN
1152 SPRING ST. N.W.
ATLANTA, GEORGIA 30309
PHONE: (404) 875-3511
Located at I-75/85 at 14th Street in Atlanta.
S - $28.00
D - $32.00
Sponsored by the SCTA

ADVANCED

RICHMOND, VIRGINIA
JULY 11-15

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RICHMOND, VIRGINIA 23219
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OCTOBER 3-7

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DECEMBER 5-9

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REVERE, MASS. 02151
PHONE: (617) 284-7200
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D - $53.00

CATA wishes to extend their appreciation to the Southern Cable Television Association (SCTA) and the Texas Cable Association, for their cooperation in sponsoring the above indicated seminars.

CUT HERE

HOTEL RESERVATION FORM

Please reserve the following room requirements in the name of the company or individual shown:

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(Company or Individual) Area Code

ADDRESS: _____
(P.O. Box or Street No.) (City) (State) (Zip)

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ARRIVAL: _____ DEPARTURE _____
(Date) (Time) (Date)

SEND DIRECTLY TO HOTEL CATA CATV TECHNICAL TRAINING SEMINAR

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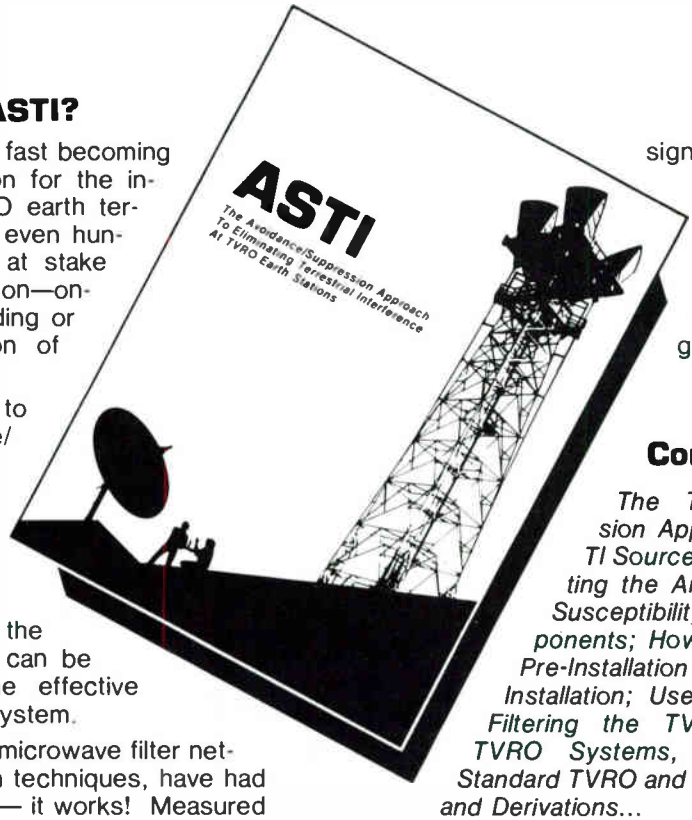
What Is ASTI?

Terrestrial interference (TI) is fast becoming a major economic consideration for the installers and operators of TVRO earth terminals. Thousands of dollars, even hundreds of thousands, may be at stake when the earth station is turned on—only to discover that TI is degrading or altogether preventing reception of desired satellite signals.



The purpose of this volume is to introduce ASTI — the avoidance/suppression approach to eliminating TI — to the 3.7-4.2 GHz TVRO industry. Conscientious application of ASTI will reduce the possibility that TI will be encountered at turn-on, increase the probability that unavoidable TI can be suppressed, and enhance the effective operating quality of the TVRO system.

The authors, as designers of microwave filter networks and other TI-suppression techniques, have had ample opportunity to test ASTI — it works! Measured over a period of time, the costs are substantially lower than any alternative, especially in terms of dollars saved when the initial or only site can be made operable. Furthermore, both cost and complexity of filtering to eliminate TI are lowered considerably when the essential aspects of ASTI are employed.

About the Authors:

Glyn Bostick is the founder, president and chief engineer of Microwave Filter Company, Inc. Mr. Bostick, who writes CATJ's monthly "Filtered Earth Station" articles, has been designing filters to suppress interference at CATV systems and TVRO earth stations since 1967.

John Fannetti is MFC's senior technical consultant and head of the company's Field Service Division. He has 30 years of engineering and earth station troubleshooting experience.

William Johnson, chief engineer of R&D, has designed many of MFC's CATV and TVRO products. Mr. Johnson earned his BSEE at Syracuse University and is currently engaged in graduate studies there.

Contents Include:

The TI Avoidance/Suppression Approach; Why Satellites; TI Sources; TI Symptoms; Selecting the Antenna for Least TI; TI Susceptibility of Other TVRO Components; How to Select a Site; The Pre-Installation Site Survey; Defensive Installation; Use of Artificial Shielding; Filtering the TVRO; Filtering Special TVRO Systems, SMATV Techniques; Standard TVRO and Satellite Data; Formulas and Derivations...

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D5—CATV passives	M5—CATV passives	S5—CATV billing services
D6—CATV hardware	M6—CATV hardware	S6—CATV publishing
D7—CATV connectors	M7—CATV connectors	S7—CATV drop installation
D8—CATV test equipment	M8—CATV test equipment	S6—CATV engineering
D9—Other	M9—Other	S9—Other

Associate Roster

Note: Associates listed with * are Charter Members.

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Alpha Technologies,
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206—671-7703
(M9, Standby Power Supplies)

AMCOM, Inc.,
Bldg. E, Suite 200,
5775 Peachtree-Dunwoody Rd., N.E.,
Atlanta, GA 30342
404—256-0228
(S9, Brokering & Consulting)

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950 Lawrence Dr.,
Newbury Park, CA 91320
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(M4)

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(D1)

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(M9)

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Milpitas, CA 95035
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(M8, 9 TVRO Components)

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Aurora, NE 68818
402—694-5201
(M8)

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Olathe, KS 66061
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(M6, 9)

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(D9, M4, S9)

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(M3)

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(M3)

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(S3)

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(S1, 2, 4, 5, 7, 8, 9)

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(M9)

Eagle Com-Tronics, Inc.,
4562 Waterhouse Rd.,
Clay, NY 13041
1-800—448-7474
(M9 Pay TV Delivery
Systems & Products)

Eales Comm. & Antenna Serv.
2904 N.W. 23rd
Oklahoma City, OK 73107
405—946-3788
(D1, 2, 3, 4, 5, 6, 7,
S1, 2, 7, 8)

Eastern Microwave, Inc.,
3 Northern Concourse,
P.O. Box 4872,
Syracuse, NY 13221
315—455-5955
(S4)

Electroline TV Equipment, Inc.,
8750-8th Ave.,
St. Michel,
Montreal, Canada
H1Z 2W4
514—725-2471
(M4, 5, 7, 9, D7, 9)

Electron Consulting Associates,
Box 2029,
Grove, OK 74344
918—786-5349
(M2, D1, S1, 8)

Elephant Industries,
P.O. Box 3626
N. Ft. Myers, FL 33903
813—995-7383
(M9)

ESPN,
ESPN Plaza,
Bristol, CT 06010
203—584-8477
(S9)

The Entertainment Channel,
1133 Avenue of the Americas,
New York, NY 10036
212—930-4900
(S4)

Franey & Parr of Texas, Inc., (Formerly Doherty & Co.),
One Turtle Creek Village,
Suite 524,
Dallas, TX
214—528-4820
(S9, Insurance)

GTE Products Corp., Sylvania CATV Div.
1790 Lee Trevino Drive,
Suite 600
El Paso, TX 79936
1-800—351-2345
(D7, M1, 4, 5, 9,
Converters, S4, 8)

Gardiner Communications Corp.,
3506 Security St.,
Garland, TX 75042
214—348-4747
(M9 TVRO Packages, S1,
2, 8)

General Cable Corp.,
1 Woodbridge Center,
P.O. Box 700
Woodbridge, NJ 07095
1-800—526-4385
(M3)

Gilbert Engineering Co.,
P.O. Box 23189,
Phoenix, AZ 85063
1-800—528-5567 or
602—245-1050

Group W Satellite Communications,
41 Harbor Plaza Dr.,
P.O. Box 10210,
Stamford, CT 06904
203—965-6219
(S4)

H & R Communications,
Rt. 3, Box 102G,
Pocahontas, AR 72455
1-800—643-0102
(M2, D1, S2, 3, 8)

Harris Corporation,
P.O. Box 1700,
Melbourne, FL 32901
305—724-3401
(M2, 9, S2)

Heller-Oak Communications,
105 W. Adams St.,
Chicago, IL 60603
1-800—621-2139 * 7600
(S3)

Home Box Office, Inc.,
12750 Merit Dr.
Dallas, TX 75251
214—387-8557
(S4)

* **Hughes Microwave Communications Products,**
3060 W. Lomita Blvd.
Torrance, CA 90505
213—517-6233
(M9)

Ind. Co. Cable TV, Inc.,
P.O. Box 3799
Hwy. 167 N,
Batesville, AR 72501
501—793-4174
(D1)

* **Jerry Conn Associates, Inc.,**
P.O. Box 444,
Chambersburg, PA 17201
1-800—233-7600
1-800—692-7370 (PA)
(D3, 4, 5, 6, 7, 8)

KMP Computer Services, Inc.,
703 Central Ave.,
Los Alamos, NM 87544
505—662-5545
(S4, 5)

Karnath Corporation,
2001 Westridge,
Plano, TX 75075
214—422-7981 or 7055
(S1, 2, 8, 9)

Katek, Inc.,
215 Wood Ave.,
Middlesex, NJ 08846
201—356-8940

Klungness Electronic Supply,
P.O. Box 547,
107 Kent Street,
Iron Mountain, MI 49801
1-800—338-9292
1-800—682-7140 (Mich)
(D1, 8, S2, 8)

LRC Electronics, Inc.,
901 South Ave.,
Horseheads, NY 14845
607—739-3844
(M7)

Lash-Ade Company,
P.O. Box 147,
Guntersville, AL 35976
205—582-6333
(M9 Cable Protector,
S9 Equipment Repair)

Larson Electronics,
311 S. Locust St.,
Denton, TX 76201
817—387-0002
(M9 Standby Power)

Lemco Tool Corporation,
Box 330A,
Cogan Station, PA 17728
1-800—233-8713
(M8, 9 Tools)

Lindsay Specialty Products, Ltd.,
50 Mary Street West,
Lindsay,
Ontario, Canada K9V 4S7
705—324-2196
(M1, 2, 4, 5, 7, 9)

Magnavox CATV Division,
100 Fairgrounds Drive,
Manlius, NY 13104
1-800—448-5171 or
1-800—522-7464 (N.Y.)
(D4, 5, 7, M4, 5, 6, 7, S3, 8)

McCullough Satellite Equipment,
Route 5, Box 97,
Salem, AR 72576
501—895-3167
(M2, 9, D3, 4, 6, 7)

Microdyne Corporation,
471 Oak Road,
Ocala, FL 32672
904—687-4633
(M9 Satellite TV
Receivers)

* **Microwave Filter Co.,**
6743 Kinne St., Box 103,
E. Syracuse, NY 10357
1-800—448-1666
(M9 Bandpass Filter)

Midwest Corp.,
P.O. Box 226,
Clarksburg, WV 26301
1-800—624-3845
(D1, 2, 3, 4, 5, 6, 7, 8)

Modern Cable Programs,
5000 Park St. N.,
St. Petersburg, FL 33709
(S4)

Distributors	Manufacturers	Service Firms
D1—Full CATV equipment line	M1—Full CATV equipment line	S1—CATV contracting
D2—CATV antennas	M2—CATV antennas	S2—CATV construction
D3—CATV cable	M3—CATV cable	S3—CATV financing
D4—CATV amplifiers	M4—CATV amplifiers	S4—CATV software
D5—CATV passives	M5—CATV passives	S5—CATV billing services
D6—CATV hardware	M6—CATV hardware	S6—CATV publishing
D7—CATV connectors	M7—CATV connectors	S7—CATV drop installation
D8—CATV test equipment	M8—CATV test equipment	S8—CATV engineering
D9—Other	M9—Other	S9—Other

Note: Associates listed with * are Charter Members.

Mullen Communications Construction Co., Inc.,
P.O. Box 1387A,
Green Bay, WI 54305
414—468-4649
(S2)

National Farmers Union Property & Casualty Co.,
12025 E. 45th Ave.,
Denver, CO 80251
303—371-1760
(D9, Insurance Service)

North Supply Company,
600 Industrial Pkwy.,
Industrial Airport, KS
66031
913—791-7000
(D1, 2, 3, 4, 5, 6, 7, 8)

Oak Industries, Inc.,
Crystal Lake, IL 60014
815—459-5000
(M1, 9 Converters, S3)

Octagon Scientific, Inc.,
476 E. Brighton Ave.,
Syracuse, NY 13210
315—476-0660
(M9)

Phasecom Corp.,
6365 Arizona Circle,
Los Angeles, CA 90045
213—641-3501
(M1)

Power and Telephone Supply Company, Inc.,
530 Interchange Drive
N.W.,
Atlanta, GA 30336
1-800—241-9996
(D1)

M/A Com Prodelin, Inc.,
P.O. Box 100
Claremont, NC 28610
704—459-9762
(M2, 3, 7, S2)

Pyramid Industries, Inc.,
P.O. Box 23169,
Phoenix, AZ 85063
1-800—528-4529
(M7, 8)

Quality RF Services, Inc.,
825 Park Way, Suite 3,
Jupiter, FL 33458
305—747-4998
(M4, S9)

RMS Electronics,
50 Antin Place,
Bronx, NY 10462
1-800—223-8312
1-800—221-8857 (Poleline)
(M4, 5, 6, 7, 9)

Reuters,
1212 Avenue of the
Americas, 16th Floor,
New York, NY 10036
212—730-2715
(D9)

Rockwell International,
M.S. 402-101,
Dallas, TX 75207
214—996-5954
(M9, Microwave/Satellite)

S.A.L. Communications, Inc.,
P.O. Box 794,
Melville, NY 11747
1-800—645-9062
(D1)

Sadelco, Inc.,
75 West Forest Ave.,
Englewood, NJ 07631
201—569-3323
(M8)

Scientific Atlanta, Inc.,
3845 Pleasantdale Rd.,
Atlanta, GA 30340
404—449-2000
(M1, 2, 4, 8, S1, 2,
3, 8)

Showtime Entertainment, Inc.,
1633 Broadway,
New York, NY 10019
212—708-1600
(S4)

Southern Satellite Systems, Inc.,
P.O. Box 45684,
Tulsa, OK 74145
918—481-0881
(S9)

Superior Electronics Center,
2010 Pine Terr.,
Sarasota, FL 33581
813—922-1551
(M4, S9)

TVC Supply Co., Inc.,
1746 E. Chocolate Ave.,
Hershey, PA 17033
717—533-4982
(D1, 2, 3, 4, 5, 6, 7, 8)

Teledac, Inc.,
1575 Tascherean Blvd.,
Longuevil,
Quebec, Canada J4K 2X8
514—651-3716
(M9 Character
Generators)

Tele-Wire Supply Corp.,
7 Michael Ave.,
East Farmingdale,
NY 11735
516—293-7788
(D1, 2, 3, 5, 6, 7, 8, 9)

* **Texscan Corp.,**
2446 N. Shadeland Ave.,
Indianapolis, IN 46219
1-800—528-4066
(M9 Bandpass Filters)

* **Theta-Com CATV,**
2960 Grand Avenue,
Phoenix, AZ 85061
602—252-5021
(M1, 4, 5, 7, 8)

* **Times Fiber Communications,**
358 Hall Avenue,
Wallingford, CT 06492
1-800—243-6904
(M3)

Tocom, Inc.,
P.O. Box 47066,
Dallas, TX 75247
214—438-7691
(M1, 4, 9 Converters)

* **Toner Cable Equipment, Inc.,**
969 Horsham Rd.,
Horsham, PA 19044
1-800—523-5947
In PA. 1-800—492-2512
also 1-800—523-5947 (PA)
(D2, 3, 4, 5, 6, 7)

Triple Crown Electronics, Inc.,
4560 Fieldgate Dr.,
Mississauga, Ontario,
Canada L4W 3W6
416—629-1111
Telex 06-960-456
(M4, 8)

Turner Broadcasting System,
1050 Techwood Dr.,
Atlanta, GA 30318
404—898-8500

Tyton Corp.,
P.O. Box 23055,
Milwaukee, WI 53223
414—355-1130
(M6, 7)

United Press International,
220 East 42nd St.,
New York, NY 10017
212—682-0400
(S9 Automated News
SVC.)

United Video, Inc.,
3801 South Sheridan Rd.,
Tulsa, OK 74145
1-800—331-4806
(S9)

Video Data Systems,
205 Oser Ave.,
Hauppauge, NY 11787
516—231-4400
(M9)

Viewstar, Inc.,
705 Progress Ave.,
Unit 53,
Scarborough,
Ontario, Canada M1H 2X1
416—439-3170
(M9 Cable Converter)

Vitek Electronics, Inc.,
4 Gladys Court,
Edison, NJ 08817
201—287-3200

Warner Amex Satellite Entertainment Corporation,
1211 Avenue of the
Americas,
New York, NY 10036
212—944-4250
(S4)

* **Wavetek Indiana,**
5808 Churchman,
Beech Grove, IN 46107
1-800—428-4424
TWIX 810—341-3226
(M8)

Weatherscan,
Loop 132,
Throckmorton Hwy.,
Olney, TX 76374
817—564-5688
(D9, Sony Equip. Dist.,
M9 Weather Channel
Displays)

Western Towers
Box 347,
San Angelo, TX 76901
915—655-6262/653-3363
(M2, 9 Towers)

Winegard Company,
3000 Kirkwood Street,
Burlington, IA 52601
1-800—523-2529
(M1, 2, 3, 4, 5, 7)

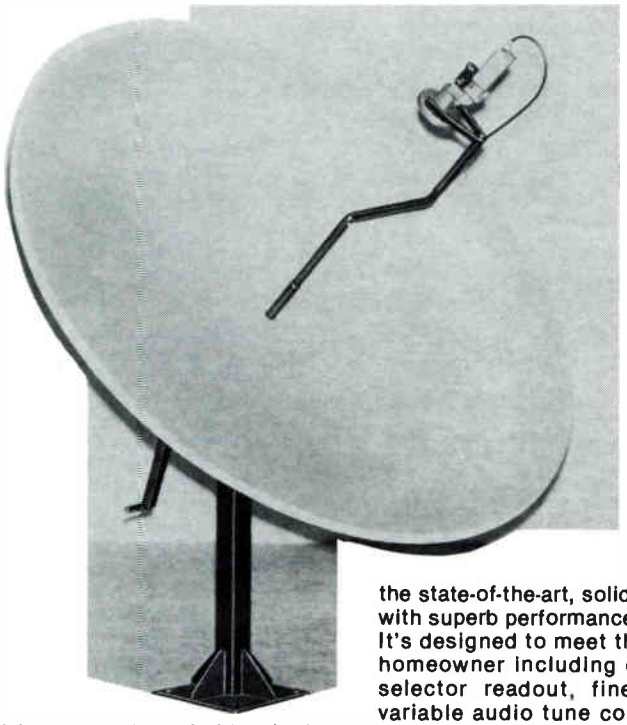
Zenith Radio Corp.
1000 N. Milwaukee Ave.
Glenview, IL 60025
312—391-8195
(M1, 6) □

Showcase

WINEGARD ADDS TWO EARTH STATION SYSTEMS TO SATELLITE LINE

Winegard Company has introduced two, new complete earth station packages to its line of satelite television receiving equipment.

Model SC-5000 consists of an 8-foot spun-aluminum parabolic antenna, heavy-duty polar mount with buttonhook feed, 120-degree low noise amplifier (LNA) with Polarotor (TM), deluxe receiver with antenna-mounted down converter, 150' cable and all hardware.



The SC-5001 package is identical to the SC-5000 except the LNA is a more sensitive 100-degree model.

Winegard's new 8-foot dish is fabricated of heavy-gauge spun-aluminum, with an attractive parchment white painted finish. Gain is 37.5dB and F/D ratio is .375. The dish implements a prime focus feed with automatic polarity selection. Depth of the dish is 14.5 inches, focal length is 36 inches.

The heavy-duty, pedestal-type polar mount is constructed of 10 and 11 gauge steel. It bolts to the dish at four points and has an Azimuth adjustment jack with a turnbuckle adjustment for the latitude declination angle. A manual satellite selector control is standard with the mount. The mount is painted flat black and weighs 125 pounds.

The new receiver included with both systems is the SC-7032 which features the state-of-the-art, solid-state concepts with superb performance and versatility. It's designed to meet the needs of the homeowner including digital channel selector readout, fine-tune control, variable audio tune control and automatic polarity switching. Dimensions are 13-1/4" W x 3" H x 10-1/4" D. Suggested retail price for the SC-5000 is $2,550 and for the SC-5001 is $2,745.

For more information, contact Gil S. Cunningham at (319) 753-0121 or write him at P.O. Box 1007, Burlington, Iowa 52601. ●

PAY-TV SECURITY FROM VITEK

Pay-TV security in scrambled systems is getting an extra boost with traps from **Vitek Electronics, Inc.** The Edison, New Jersey based company's Descrambler-Trap has shown encouraging results in preventing signal theft in a system on Long Island. Cablevision Systems Development Company, in Woodbury, New York, began a pilot program in 1982 using Vitek traps and expects to install over 80,000 more in 1983.

Management officials at Cablevision believe that Vitek's concept of trapping scrambled systems before they enter a subscriber's home is the most effective way of eliminating "pirate descrambler" boxes from their system. By taking aggressive action to stop signal theft before it occurs, Cablevision has been successful in recovering Pay-TV revenues.

While Vitek traps have been used in cable systems for almost ten years, the Cablevision project represents one of the first major applications of the product in conjunction with scrambling equipment.

For more information, contact **Vitek** at (201) 287-3200. ●

ON TV PROGRAMMING TO BE BROADCAST VIA SATELLITE

Oak Media Corporation has begun the start-up of the first fully scrambled national pay television service to be broadcast via satellite.

Oak Media, a subsidiary of **Oak Industries Inc.**, said the new service is part of a joint venture with Telstar Corporation to distribute Oak's ON TV programming nationwide utilizing Oak's ORION satellite signal security system and two leased transponders on the Comstar D-4 satellite.

The 24 hours-a-day programming service will be broadcast from Skaggs Telecommunications Corporation Inc. in Salt Lake City, Utah.

Special features of the new service include separate east and west coast feeds to ensure optimal scheduling of the service and long-term programming contracts designed to encourage operators to develop numerous systems.

The joint venture will market satellite-delivered programming to private cable systems and multi-point distribution services. Oak will continue to market its satellite-delivered programming to subscription television (STV) services, low-power television systems and cable television systems. Telstar will market the programming to hotels, motels, resorts and similar outlets.

Oak Media has already received numerous inquiries regarding the new satellite service and will announce the first affiliates to contract for ON TV programming within the next few weeks.

The basic ON TV programming package includes movies, sports, concerts and other entertainment events. A late night, optional tier of programming designed for mature audiences will be available at an additional charge. ON TV will also deliver a series of special pay-per-view events to subscribers for an additional fee.

Telstar Corp., based in Beverly Hills, Calif., is a leader in providing satellite-delivered entertainment and other communications to the lodging industry.

ORION was introduced by Oak in 1980 as the world's first operational and fully-addressable satellite security system.

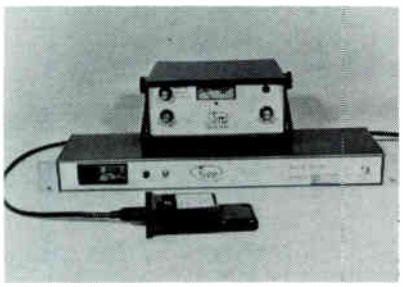
Oak Media Corporation operates subscription television systems and provides television programming, marketing and distribution services to subscription television, cable television systems and other pay television systems. ●

Klungness Electronic Supply Co.

(Klungness Electronic Supply Company), distributors of CATV systems and supplies, has opened a new distribution center in Indianapolis, Indiana. This new fully stocked warehouse will supplement the KES Iron Mountain, Michigan facility and allow KES to provide faster, more efficient service to the cable television industry. This new facility is the first of several such distribution centers planned for other key market locations. •

COMSONICS, INC. MODIFIED "SNIFFER" RF LEAKAGE DETECTION SYSTEM

To simplify RF leakage detection in cable television systems, **ComSonics, Inc.** has modified its "Sniffer" detection system to allow for more accurate pinpointing of ingress/egress problems that occur in strong off-air signal situations.



Similar to sophisticated mobile communications receivers, this new front-end high selectivity "Sniffer" features a narrow band crystal-controlled detector with a fixed frequency signal source, near field probe, and omni-directional monopole antenna which helps pinpoint leakage in the presence of strong, off-air FM/TV broadcast signals.

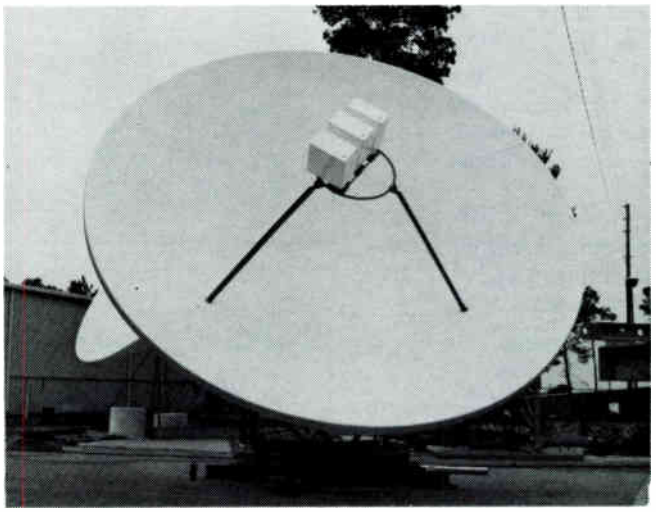
"This newly modified version of the original "Sniffer" RF Leakage Detection System alleviates long labor search hours because it pinpoints RF leakage more accurately than any other detection device on the market," according to Warren Braun, ComSonics president.

ComSonics, Inc. is a multi-faceted, full service CATV company specializing in equipment repair, system engineering and design, and product research and development.

For more information, contact **ComSonics** at 1-800-336-9681 or write to P.O. Box 1106, Harrisonburg, Virginia 22801. •

MICRODYNE ANNOUNCES NEW MULTIPLE FEED SYSTEM FOR SIMULTANEOUS RECEPTION OF UP TO 5 SATELLITES ON ONE ANTENNA

Microdyne Corporation announced that it is now offering a new Multiple Feed Satellite System that enables the reception of signals from up to 5 adjacent satellites on the same parabolic reflector. When installed on the antenna, Microdyne's Multiple Feed System allows the reception of programming from adjacent satellites at about 1/5 the cost of a new dish. In addition to its economy, the MSF-16 offers the user flexibility in utilizing the new programming that is constantly being added.



In a TVRO system designed with adequate margins, this MSF-16 System will provide quality pictures on all feeds. Retrofitting existing Microdyne/AFC antennas requires only the replacement of the spars and brackets of the feed support hardware, and can be performed easily in the field. Antennas purchased from any other manufacturers can also be modified for use with Microdyne's MSF-16 Multiple Feed System.

Microdyne Corporation is a leading manufacturer of receivers, antennas and complete earth stations for the cable and broadcast industries. The Company is headquartered in Ocala, Florida and operates manufacturing plants in both Florida and Maryland. Microdyne common stock is traded in the over-the-counter market with the NASDAQ symbol MCDY.

For more information on this product, contact: Marketing Department, Microdyne Corporation, 491 Oak Road, Ocala, Florida 32672. •

United Video, Inc.

United Video, Inc. announced today it has created a new division, Transmission Services, to "focus more squarely on numerous satellite activities and opportunities for the future."

Roy Bliss, executive vice president, said that Transmission Services combines many functions that have been delegated throughout the organization. Included are United Video's uplink facilities and its satellite engineering and operations functions. The new operation will become its own profit center according to Bliss.

Thomas M. Keenze, a United Video employee since 1976, has been named Vice President of Transmission Services. Jack Riley, director of United Video's microwave transmission services, was named Director of Sales.

"This new organization is a necessity because of the rapid expansion United Video is experiencing," Keenze said. "Seven years ago, we had nine people in our headquarters operation. Today, we have over 100.

"With this growth in people has come a tremendous expansion of services. It was clear we needed an operating structure that allowed for more management concentration on key areas of growth. Transmission Services provides that ability."

Keenze and his staff will develop ideas that take advantage of opportunities United Video sees in the cable industry and businesses outside the industry, Bliss said. "We are discovering more applications for satellite, and we want to concentrate on developing customers for the transponder space we have available," he noted. •

Classified

FOR SALE

Computer system for sale. Texas Instruments DS990 model 2. 64K memory, DS-10 10-megabyte removable-pack hard disk, FD-1000 dual 8" DSDD floppies, 911 video terminal. Excellent condition; only 2 years old, has had light-to-medium use, continuously maintained by Texas Instruments. Upgrading, must sell. Current mfg's price is $24,000. Asking $10,000. **Roxboro Cablevision, Roxboro, N.C. (919) 599-1128.**

CABLE TV SOFTWARE

1) Design Program — for TRS-80 pocket computer. Feeder design, earth station aiming and evaluation, distortion calculations, and more. Listing & instructions $25.00.

2) Character Generator — uses TI 99-4A computer. Cassette & instructions $50.00. Total package less than $500.

3) Other programs available.

Cable TV Software
66 Ponderosa Lane
Elizabeth, Colo. 80107

OPPORTUNITIES

Exclusive franchise in America's most profitable and dynamic industry is being offered for the first time in your area. International company will place qualified individuals in "Turn Key" business, train key people, provide inventory, finance your customers, and pay you thousands of dollars "up front" on orders where your customers pay only on future energy savings. Existing customers of our franchisees read like "Who's Who" of Fortune 500.

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Suite 200, 336 N. Foothill Road,
Beverly Hills, Ca. 90210

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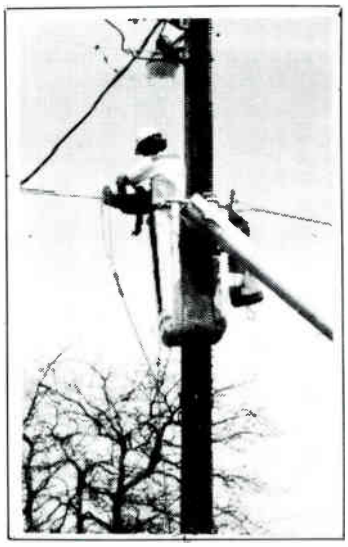

ATTENTION!

SYSTEM MANAGERS — TECHNICIANS NEEDED

Excellent opportunity for system managers and technicians for our systems in Colorado, Texas, and Oklahoma. Need qualified personnel for these Southwestern locations; good working conditions and opportunity for the right people who want to work and stay actively involved in the cable business. These systems have good equipment to work with and offer excellent situations to grow in the cable business. If interested, send resume to the box number indicated below.

Box 71080
c/o CATJ
4209 N.W. 23rd
Suite 106
Okla. City, OK 73107

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ANY member of CATA may advertise in the CATJ classified section FREE of CHARGE (limit of 50 words per issue — 3 issues per year.)

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1.) Systems — paying regular monthly dues based on number of system subscribers.
2.) Associate Members — pay an annual fee.
3.) Individual Members — pay an annual fee.

NON MEMBERS may also use the Classified section at the rate of 50 cents per word with a minimum charge of $20.00. Add $2.00 for blind-box. Non-members should include full payment with the ad insertion.
Deadlines for all Classified Advertising is the 1st of the month for the following month's issue.
Address all Classified material to: CATJ, Suite 106, 4209 N.W. 23rd, Oklahoma City, Okla. 73107.

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IT'S SECURITY
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IT'S PLAIN & SIMPLE

Addressability is here and Eagle's addressable descrambler is ready now for systems seeking return-on-investment addressability.

Applying proven in band sync suppression technology, Eagle's addressable scrambling system provides superior pay TV security and is compatible with any HRC, ICC or standard system configuration.

Protect your investment in converters! Eagle's addressable unit can be used with any single channel output converter (channel 2, 3, or 4) and descrambles under computer control up to 15 tiers of service. Pay per view, tiered channels, disconnect services, and billing systems are all at your control.

It's the answer, addressability . . . converter compatible . . . proven technology . . . security . . . a solid investment. Most important, It's An Eagle!

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COMTRONICS INC.

OFFICE ADDRESS: 4562 Waterhouse Road, Clay, N.Y. 13041 (315) 622-3402
MAIL ADDRESS: P.O. Box 2457, Syracuse, N.Y. 13220
IN CANADA: Deskin Sales • Montreal • Toronto • Vancouver (416) 495-1412, 77D Steelcase Road West, Markham, Ontario L3R2M4

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