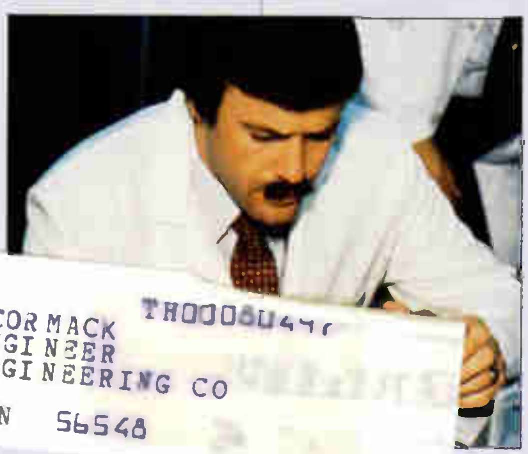
COMMUNICATIONS TECHNOLOGY

Official trade journal of the Society of Cable Television Engineers

Hands-on with Quality RF Page 32



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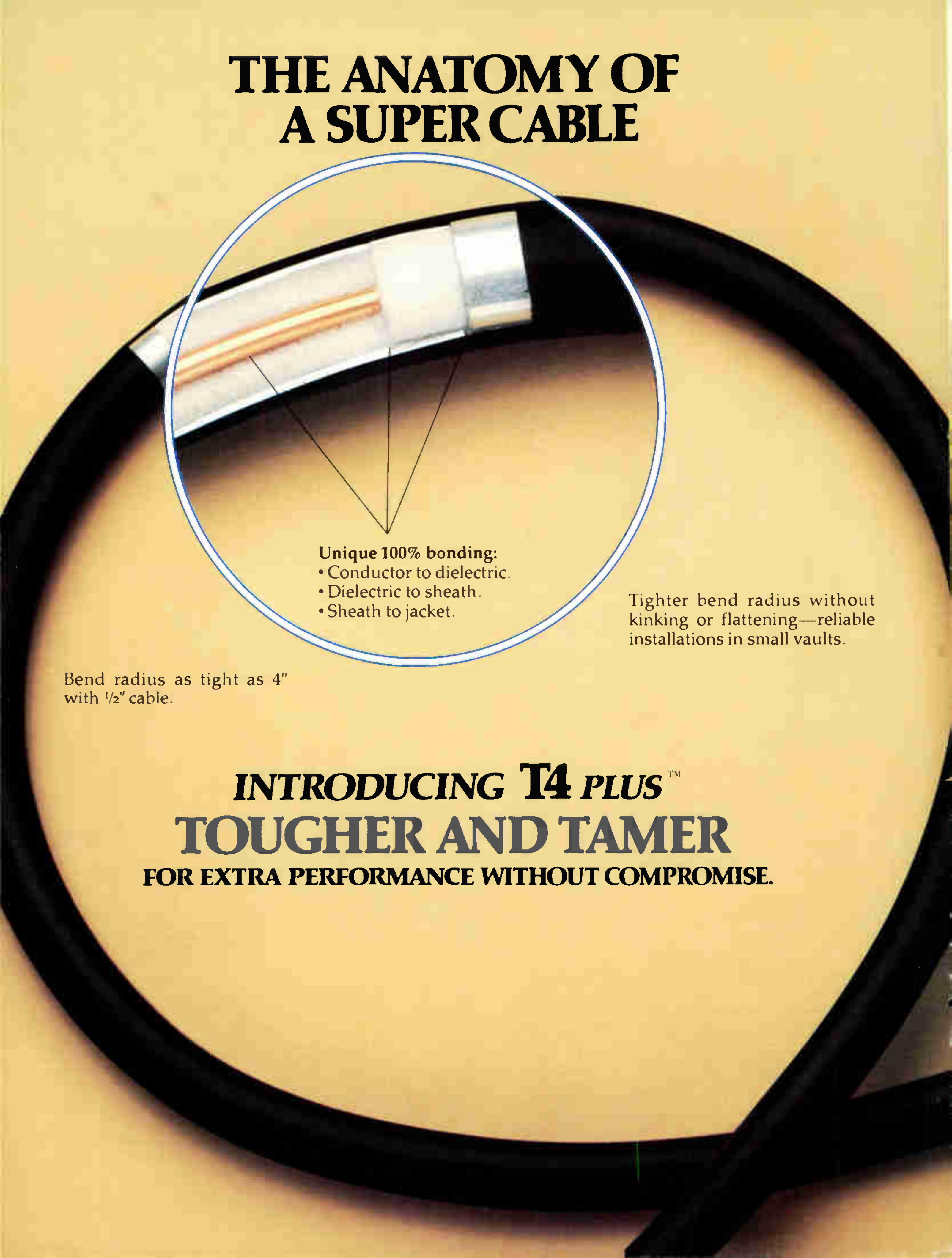
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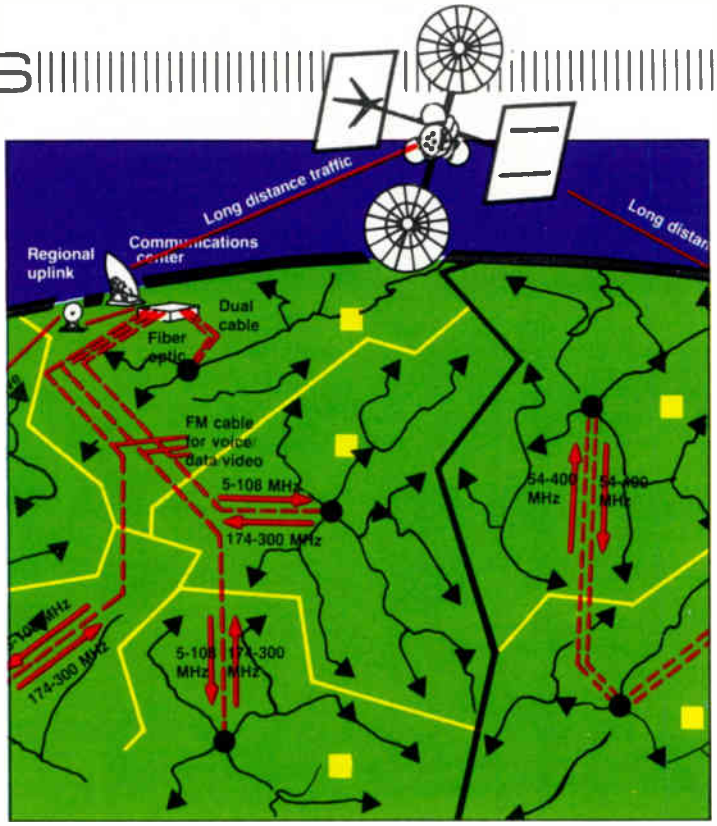

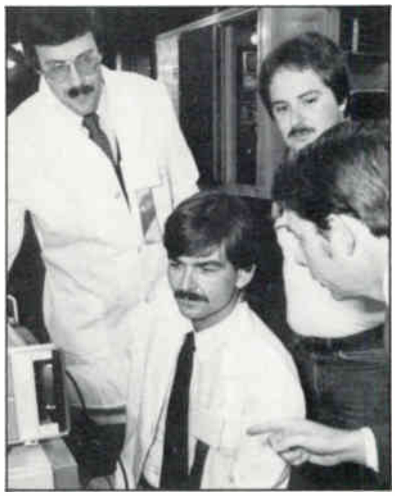

Features

Cover
J. Arthur Kenefick brings the cable/telco hybrid to life. Photograph of Quality RF's Fred Rogers by Rob Stuehrk. Art direction by Robert Tonsing.

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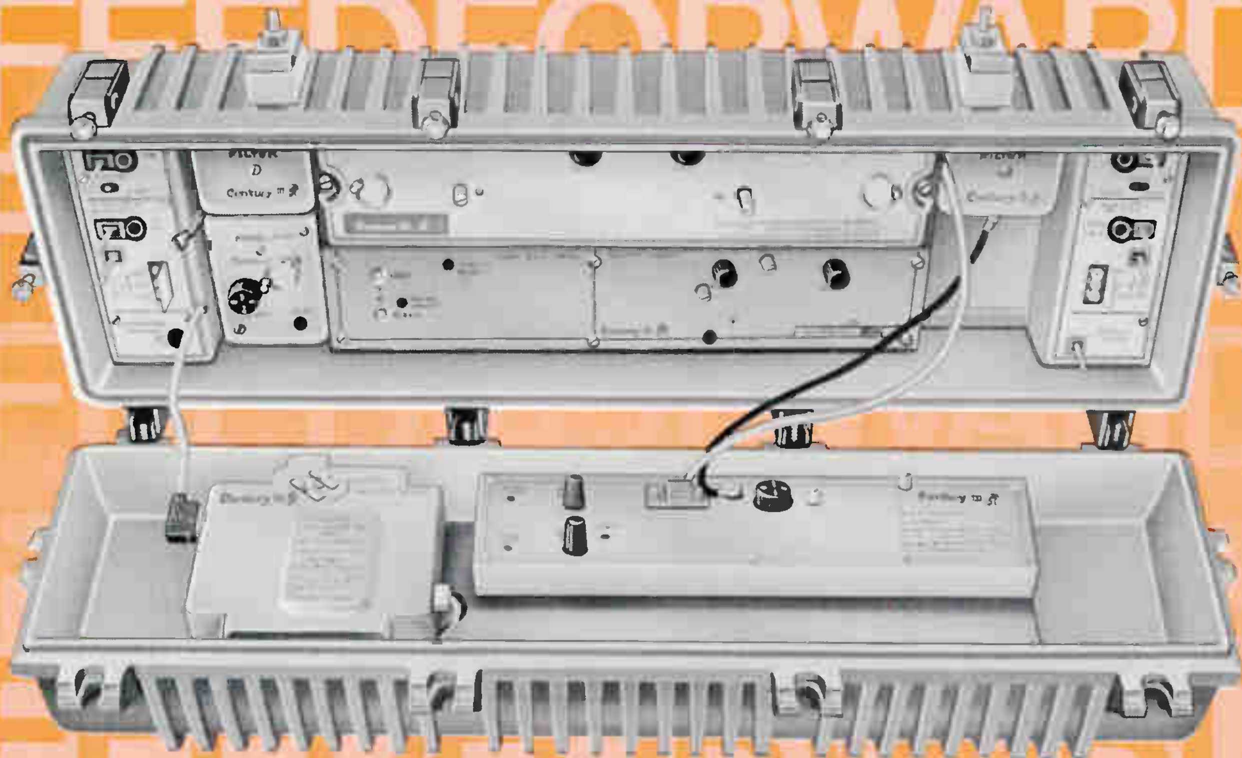

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EDITOR'S LETTER

Getting back to basics

I have recently experienced a phenomenon in the cable television industry that I haven't witnessed since the '70s. Back then, NCTA shows were engineering-oriented and geared towards hands-on applications for engineers. The Hollywood glamour had not yet descended en mass.

This present phenomenon was the Second Annual SCTE Cable-Tec Expo and Spring Reliability Conference recently held at the Opryland Hotel in Nashville, Tenn. At the Expo, SCTE members and other attendees banded together to fight a common enemy—ignorance!

The SCTE Board of Directors, and especially Tom Polis and Steve Cox (president and executive vice president, respectively) deserve a hearty congratulations for executing such an efficient, productive and successful convention.

The convention/trade show really got back to basics. Many of the seminars—installation practices, construction techniques: aerial and underground, TVRO maintenance and FCC compliance—were very down-to-earth. But judging from the attendee turnout and the questions asked, these basic sessions were sorely needed. Other seminars on using and maintaining feedforward and the digital primer were more advanced but as popular as the basic sessions.

Booth traffic at the show was not as heavy as was hoped for, but quality sometimes makes up for quantity. The mini-seminars sponsored by some vendors were extremely active. Vendors' comments were very positive. Even though not many sales were written at the show, vendors believe it is these technical attendees who will have input regarding what equipment will be purchased.

It was interesting to note that attendees included not only technicians and chief techs but the upper eschelon as well—industry veterans like Robert Luff, Harold Null and Andy Devereaux to name a few. It also was pleasantly surprising to see that no company or system operator was trying to steal anyone else's engineers or technicians.

I would like to add my appreciation to certain engineering entities who provided *CT* with invaluable support—Fred Rogers and his crew at Quality RF, Robert Vogel of Showtime, John Kurpinski of Cable Services Co., Jim Emerson with AM/E-Com and Chris Papas of the FCC. (And yes, Chris really does wear a white hat and *deserves to*.)

Equipment complicated, engineers aren't

We've made a megaleap in the CATV industry by upgrading our electronics to the point where CATV equipment has become very complicated. We seem to be mastering new threshholds of technology every day. Now, that's fine if everything's in good working order. Where the problems arise, however, is when the equipment is "down."

While our industry has paid special attention to upgrading its equipment, we've skipped over the "minor problem" of educating our technical personnel as well. After all, what good is all of this complicated state-of-the-art equipment if no one knows how to fix the darn thing? As evidenced by the recent Expo convention, we need to get back to basics and work our way up from there. There can't be too much emphasis placed on training, training and more training. How much good does it do to have the most advanced equipment when you have to wait weeks for someone outside of your staff to fix it?

Enough is enough

We all know that to win some franchise awards, a cable operator must promise the world (and the sun and the moon and the stars). Technically, we can build whatever type of system that's required. But why try and build the same type of system for a city *and its suburbs*? The needs are obviously different.

Since we realize that we don't really need 120 channels on a system, what do we need? We'd like to utilize some information retrieval from the home, we'd like to do some data transmission and teletext. But, those services don't require the same type of parameters that's required for entertainment television.

When you try and push all of these services through the same device, you penalize the data because you've got video. Conversely, you penalize the video because you've got data services.

Perhaps, what we should be doing today is to have the ability to insert, wherever the system happens to be, blocks of spectrum to do whatever we want to do—but dedicate it to that particular function. Presently, no manufacturer is producing that type of equipment. But, somebody's going to do it—and that's AT&T. The AT&T lab teams are working on utilizing blocks of spectrum now!

All things considered, the engineering community, with the guidance from qualified organizations such as SCTE and NCTA, has regrouped and revamped its strategy to get back to basics. We're headed in the right direction and we can't afford to slip back even a little.

Toni Barnett

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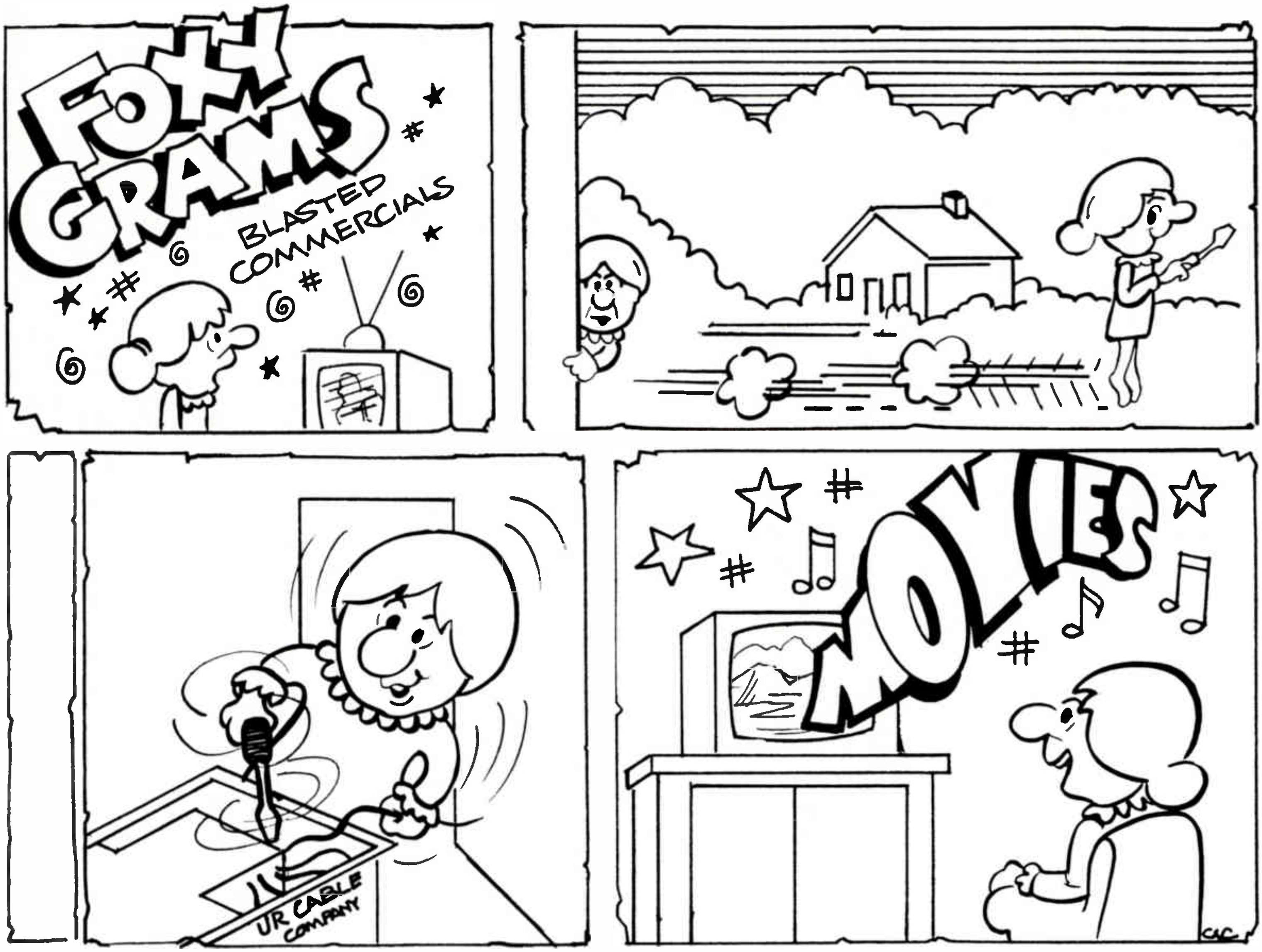

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Tech program firmed up for '84 NCTA confab

WASHINGTON—Twelve technical sessions (on topics ranging from commerical insertion and addressability to upgrades and rebuilds) are scheduled during the National Cable Television Association's 33rd annual convention in the Las Vegas (Nev.) Convention Center June 3-6.

Proposed papers on distribution systems and devices, data over cable, tests, measurements, home terminals, audio, signal leakage and satellite and microwave technology were chosen for the technical program by the technical session subcommittee of NCTA's Engineering Committee.

Oral presentations will address non-commercial aspects of communications issues and will be directed to cable television engineers and other telecommunications professionals. Soft-cover editions of the Technical Papers, including the 50 to 60 papers to be presented in Las Vegas, will be available for purchase during the convention and from NCTA afterward.

In addition to the technical sessions, which will take place in the Technical Corridor of the Las Vegas Convention Center, the convention will include discussions on management, programming and legislative issues led by cable programmers and operators and a host of telecommunications experts.

More than 200,000 square feet of exhibit space with displays of cable equipment and programming will be open for 27 hours, 12 for exclusive viewing. A welcome reception and a sneak preview of the exhibit hall are scheduled for 4-7 p.m. June 3.

Further details about the technical sessions can be obtained from Katherine Rutkowski at NCTA, (202) 775-3637.

Tech sessions working titles

- Commercial Insertion: No Pain No Gain
- Tests and Measurements
- Cable Revolutionaries: Scanning the New Blue Skies
- Advances in Signal Relay via Satellite and Microwave
- Audio: The New Playing Field
- (Re)Building Tomorrows for Cable
- Data Communications
- Distribution System Concepts
- Radiation Measurement and Prevention
- The Final Link: Today's Home Terminals
- Addressability: Coming of Age
- Cable Distribution Plant

The technical papers delivered in these sessions will be available for sale during and after the convention.

Group W staffers use the Jerrold status monitoring and control system to pinpoint system problems.

Group W employs Jerrold monitoring system

HATBORO, Pa.—The Jerrold Division of General Instrument Corp. recently installed its computer-controlled status monitoring system in Group W's Dearborn, Mich., cable franchise. The Jerrold system, which keeps the cable operator constantly informed of the overall operating condition of his plant, is designed to detect and diagnose faults in a system before they cause a disruption in valuable services to subscribers.

Thomas Sharrard, general manager of Group W Cable's Dearborn system, commented on the Jerrold equipment by saying, "Dearborn is a state-of-the-art 52-channel cable system that will be piloting major new applications, such as home security, data services and games. Jerrold's status monitoring is precisely the kind of equipment we need to achieve cost efficiency and reduced maintenance costs while offering our customers highly reliable service."

The Jerrold SM-1 System Commander is comprised of a single minicomputer located at the headend. Compatible with existing installed Jerrold CATV systems, it is designed to operate with the new Starline X amplifier system and the new STPS standby power supplies.

The Jerrold SM-1 is capable of controlling multiple hubs, both local and remote, as well as working with remote terminals. The system measures the forward and return RF levels, video display trend analysis, alarm histories, return feeder disconnects and provides hard copy of all actions. Additionally, SM-1 capabilities measure Jerrold's standby power supply's temperature, voltage and system load.

CATV Services offers direct computer access

FREMONT, Calif.—CATV Services President Richard Richmond announced the implementation of a direct computer access system for selected customers. The system utilizes the newly developed TRS 80 model 100 "briefcase computer" and proprietary software developed by DJS Systems.

This system enables selected customers to directly access CATV Services' mainframe computer located at the corporate headquarters in Fremont. Information provided directly to the customer via this system will include pricing and availability of inventory and will enable the customer to order materials and receive confirmation immediately.

The following companies have been invited to participate in a 60-day pilot program: Viacom Cablevision, Cable TV Puget Sound, Chambers Cable Communications, Tele-Communications Inc., McCaw Cablevision, Group W and Jones Intercable.

Richmond plans to expand the system into general use beginning 30 days after the pilot program's completion.

Canadian group blasts 4% ceiling

OTTAWA—In its recently released federal budget, the Canadian government extended its price restraint program for a third year, setting the limit for rate hikes by federally regulated industries at 4 percent. The Canadian Cable Television Association has come out against the new ceiling because it "not only curtails industry growth, but ensures that it will struggle to survive," according to Michael Hind-Smith, the association's president and CEO.

"We are extremely disappointed with (the new) federal budget because it effectively prevents the cable television industry from participating in the economic recovery this budget is supposed to help stimulate," said Hind-Smith.

With many of the new and planned services expected to help boost revenues of the already stagnant Canadian cable industry, a "Catch 22" situation could develop for the operators. CCTA Vice President of Public Affairs Susan Cornell, in a letter to Canadian Minister of Finance Marc Lalonde, stated that, "Many cable licensees who want to fulfill their role as retailers of (the) new Canadian services will have to upgrade or rebuild their cable systems at great expense. Unfortunately bankers and investors are already indicating their unwillingness to lend millions of dollars necessary when the cable licensee is guaranteed only a 4 percent rate increase, not enough to cover the cost of the essential loan."

Cable companies may continue to apply to the Canadian Radio-television and Telecommunications Commission for increases above the 4 percent limit if "exceptional circumstances" arise. The 4 percent period is scheduled to begin July 1.

NCTA offers book on measurement practices

WASHINGTON, D.C.—The National Cable Television Association Engineering Committee just released its first edition of the *NCTA Recommended Practices for Measurements on Cable Television Systems*. The publication—available at a cost of $35.00 for association members, $40.00 for nonmembers—comes in an easy to handle, undersized three-ring binder so it can fit into small spaces (glove compartments, etc.).

Updates for the book will be obtainable, and each issue has an individually numbered card that you send back to register it. Once registered, the NCTA will keep you updated in terms of revisions, additions or deletions to the manual.

The manual is in four parts with an appendix. The four parts are: distribution system, headend, technical considerations in the delivery of satellite signals to cable headends, and the NTC Report Number 7 Video Facilities Testing. The NTC 7 is reprinted from the June 1975 PBS publication. The appendixes that are attached are a sample weekly VIPS log and technique for approximating weighted video random noise.

The editor of the book is Michael Jeffers; contributing editors are Wendell Bailey and William Riker (Bailey is also the publisher). It is copyrighted 1983 by the NCTA Science and Technology Department. The manual can be ordered directly from the NCTA by contacting Katherine Rutkowski. The address is 1724 Massachusetts Ave., N.W., Washington, D.C. 20036, (202) 775-3550. (The SCTE is currently negotiating a discount for Society members.)

GI, TOCOM sign acquisition accord

NEW YORK—General Instrument Corp. and TOCOM Inc. announced that the two companies have signed a definitive agreement under which TOCOM will become a wholly owned subsidiary of GI.

As previously announced, the agreement provides that TOCOM shareholders will receive $3 in market value of General Instrument common stock for each of the approximately 8 million TOCOM shares outstanding. The $3 basis for exchange is subject to possible reduction, but in no event below $2.40, based on an audit of TOCOM's financial statements as of March 31, 1984.

The definitive agreement also provides that the market value of General Instrument common stock will be based on the average closing price for each of the 10 trading days immediately prior to the TOCOM shareholders' meeting, but this average price cannot exceed $38.25 per share or be less than $25.50 per share.

In related transactions, GI agreed to loan TOCOM up to $4.4 million prior to the closing (in addition to $5.3 million previously loaned to TOCOM) and TOCOM granted to GI a license to manufacture TOCOM's addressable baseband converters. This license will remain effective, subject to certain limited buy-back provisions, even if the acquisition is not consummated. The interim financing may be applied by GI as prepaid royalties under the license if the acquisition is not consummated.

Consummation of the acquisition is contingent on the approval of regulatory bodies and TOCOM's shareholders. Closing of the transaction is expected to occur in May 1984.

C-COR to acquire Condor Communications

STATE COLLEGE, Pa.—C-COR Electronics Inc. recently announced that it has reached an agreement with the shareholders of Condor Communications Inc. to acquire the assets of that company for an undisclosed amount. Condor will operate as a wholly owned subsidiary of C-COR.

Condor's Powervision Division manufactures and markets standby and standard power supplies that are used extensively in the cable television and the data transmission industries. Condor has other divisions: Aztec/Peerless, which designs and manufactures custom transformers and other magnetic components; and Power Products, which designs and manufactures battery chargers and cathode protection rectifiers. The acquisition is part of C-COR's action to broaden its product base in the cable television industry. In addition, the power supplies will complement data products which are designed and manufactured by C-COR's data product subsidiary in Beaverton, Ore.

Commenting on the acquisition, C-COR Chairman James Palmer stated, "With this acquisition, C-COR will benefit from the addition of a variety of quality power supplies to complement its cable television and data transmission products and transformers to be used in our equipment."

Also, C-COR announced that its board has authorized the corporation to purchase, in the open market, up to 200,000 shares of its common stock, at the corporation's discretion. C-COR has 3,178,190 common shares oustanding and is listed on the NASDAQ National Market System.

Texscan, U.K. firm form overseas venture

PHOENIX, Ariz.—Texscan Corp. and STC Telecommunications Ltd. of the United Kingdom announced the formation of a joint company, STC-Texscan Ltd. The company will initially market Texscan cable TV products in the U.K. Manufacturing in the United Kingdom under license and future product development are other intentions of the partnership. STC-Texscan will be located initially in north London and Stephen Partridge has been appointed general manager.

Carl Pehlke, chairman of Texscan Corp., commenting on the announcement said, "This partnership gives us the entry we have been seeking into an important growth area of the communications business, valued at $350 million per year by 1990. I am glad that we are in partnership with so large and dynamic an organization as STC. We plan rapid expansion of this new business."

Texscan Corp., with annualized net sales currently in excess of $100 million, also has a U.K. operating division, Texscan Instruments Ltd. The division has been supplying the U.K. telecommunications market with broadband test and measuring equipment since 1971.

STC Telecommunications Ltd. is a major management unit of Standard Telephones and Cable PLC, one of the leading UK telecommunications and electronics firms with annual revenues approaching $1.5 billion and an associated company of ITT. STC Telecommunications Ltd. is responsible for the manufacture and marketing of systems for national network operations and defense authorities, providing exchange, transmission and cable systems, as well as telephones and a wide range of end-user terminals.

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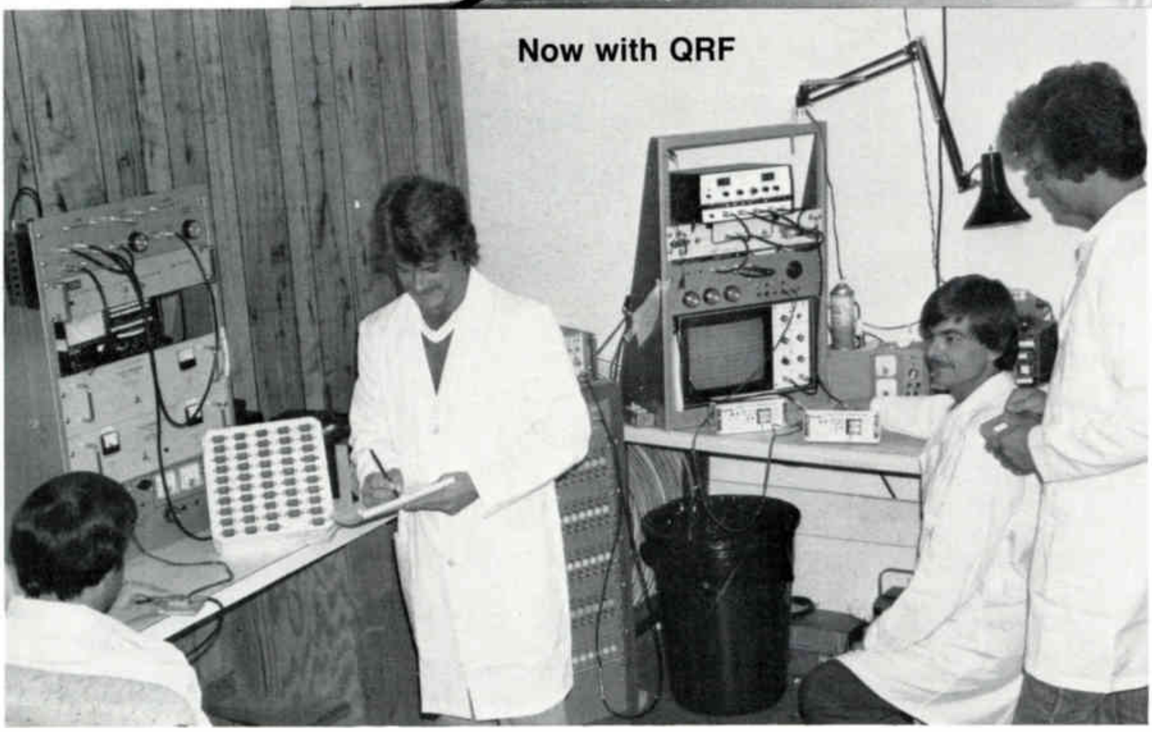

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The what, why and how of P/M

By James B. Emerson
AM Cable/E-Com Subsidiary

What is P/M? No it's *not* "make-work." Preventive maintenance is the regularly scheduled work you do in order to avoid catastrophic failures, unscheduled outages that adversely affect the delivery of your service product.

Why have P/M?

I think you know, but I must say it again. Consumers take exception to the interruption of services that they expect to be continuously reliable; like electricity, water, telephone and cable TV. If electricity, water or the phone go out, consumers complain bitterly and may be upset, but each of these services is the "only game in town." When "the cable" goes out fairly frequently, however, folks tend to drag out the old rabbit-ears, hook-up the antenna downlead and cancel the cable service.

What's P/M cost (if you don't have it)?

Even if a cable subscriber comes back to the fold after a month or two, the cost in churn expense and possibly downgraded value of services selected alters this account's profitability for months to come. If there is a significant percentage of subscribers churning, through dissatisfaction with service, then the entire operation's profitability is significantly degraded. This can actually lead to business failure.

Far fetched? No! I used to live on a system that acted in exactly this manner. Only after the system was purchased (cheap) by a small MSO—rebuilt and restaffed—did the community get value for its subscription dollars and the system, decent penetration.

What's the point?

Good maintenance is good business. Through this column we'll explore "P/M" with respect to how extensive it should be, how to define a schedule, how to document it and analyze results. Even if you have this knowledge, perhaps the information will be helpful in your training program. I first tripped over P/M as a practical, work-saving concept in USAF telecommunications over 20 years ago. In providing communications for the DOD, State Department and others, outages were really frowned upon. Since you deliver only one communications service to thousands of customers, your mission is even more highly critiqued, though less important perhaps than National Defense, except to management.

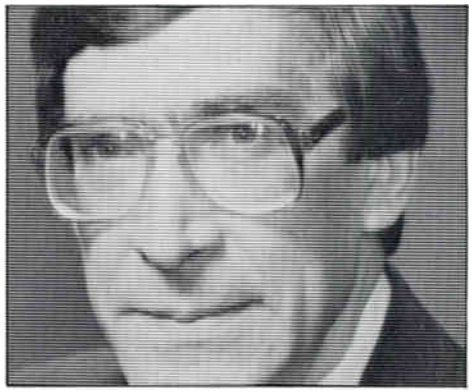
How do you do P/M?

Regularly, regularly, and regularly. There is a very good maintenance truism: "If it works, don't 'fix' it." But (and this is the big BUT) if you don't know *how* it's working, then you don't know *when* to fix it.

However, if you *regularly* test your system and its critical components, and if you *regularly* log this information, then you can *regularly* replace components when suspected of degradation and before outright failure.

How can you help (yourself)?

Please write to me at P.O. Box 505, Quakertown, Pa. 18951, or call me at (800) 523-9851 with any P/M experiences you've had that were weird, interesting or that you've really



learned from. Also, if you have P/M questions I'll try to answer them in this column, using the expertise of many friends and associates, as there are some genuine experts on P/M in CATV. I really need your input and questions. Nobody will "holler" at you for "dumb" questions. They are always the best anyway. Let's plan to visit here each month and compare notes.

James Emerson is currently engaged in engineering sales for AM Cable Television Industries' E-Com subsidiary, which engineers and manufactures digital interface equipment and addressable systems for cable television.

A member of the Society of Cable Television Engineers, Emerson was elected to senior grade in 1978, to the Board of Directors in 1981 and served as Eastern vice president during 1982. Emerson is a well known author and speaker and is chairing the Atlantic Show engineering program for the third year.

The cable/telco connection: A two-way relationship

By Fred Dawson

With every passing week in the post-divestiture era of telecommunications it gets clearer that cable TV operators hold the key to something the telephone companies want very badly.

While the liberated Bell units see their ubiquitous plant as essential to the success of videotex, they also appear to be convinced that it's going to take a hookup with wideband to put two-way services across to the public. With a remarkable, if low-key persistence through all manner of cold-shouldered indifference on the part of much of the cable television industry, several Bell regional holding companies (RHCs) and, in some instances, their operating subsidiaries (BOCs) have sought to persuade cable operators that the hybrid wide/narrowband approach to pay-per-view and videotex has enormous potential for all concerned.

So far, much of the telco pitch to cable has been based on the perception that while the cable industry is generally turned off to the notion of videotex potential in the near term, cable operators believe that pay-per-view will score big once a mass market is available with impulse buy capabilities. So there's been a lot of talk about a telephone network upstream link in pay-per-view operations.

But to the telcos, it's really the full range of two-way services embodied in the term videotex that could spell a new bonanza for the local communications transport business, cable and telephone alike. According to Joe Birch, staff manager for Bell Atlantic Management Services Inc., "Our thinking is that if we could work out a test arrangement of our plan with a single cable operator in any of our markets, the results would verify once and for all that the hybrid system approach represents a tremendous opportunity for everyone."

In the cable business, of course, the aversion to videotex has developed out of the

'The hybrid approach represents a tremendous opportunity for everyone.'

Joe Birch
Staff Manager, Bell Atlantic

sense that the industry has gambled too much money on committing to install interactive broadband systems. "It's been a mistake to build two-way plant with 100 channels when 50 channels delivered on a one-way system can get the job done," says Trygve Myhren, chairman and CEO of American Television and Communications.

Very few people in the cable business would dispute this assessment. But the interest of the telcos puts the videotex question in a new context. At this point, before the cable industry can afford to dismiss the videotex service concept out of hand, several questions should be addressed. How would the telco-proposed hybrid system work? What would it cost? Are there still other alternatives?

The telco hybrid concept

The key to telco interest in videotex potential lies in packet switching technology as advanced by Western Electric and others. Southern Bell, BOC subsidiary to BellSouth, in its work with Knight-Ridder on the Viewtron videotex service in Southern Florida, has been employing the Local Area Data Transport (LADT) packet switching system developed by Western Electric.

As described by Bob Morrow, director of service development at Southern Bell, the LADT modem in the home operates in an asynchronous mode, converting the outgoing signal to digital code and sending it to the digital multiplexer at one of several switching nodes in the Viewtron market region. The multiplexer picks up the incoming digital signal at the node and switches it onto one of the dedicated lines to the Viewtron system computers. The ordered service is then sent as a digital signal over dedicated lines back to the appropriate node, where the multiplexer "reads" its address and sends it on its way over the standard phone network to the subscriber. The modem in the home then converts the digital signal to the analog signal that produces an alphanumeric readout on the home video terminal.

Morrow says the system operates at only 1,200 bits per second and has the further drawback of tieing up the subscriber's telephone line when the videotex system is running. However, there are alternatives. With the average daily use running at one-half hour per home, upgrading to another version of the system that permits use of voice communications while the vodeotex is running normally isn't worth the cost. But small and medium size businesses, Morrow says, do have a need for the more complex system, which operates at 4,800 bits per second. He also notes that with "call waiting" service, which is now available from most Bell system telcos, customers can receive phone calls by simply "marking the page" on the videotex service and clicking in the call. When the call is completed, the videotex service can be reactivated where it left off.

According to Joe Birch at Bell Atlantic, the hybrid cable/telco videotex system envisioned by his firm would employ the same Western Electric LADT system, but only in the upstream direction. Under this plan, the upstream signal from the subscriber's keypad would be converted by the modem in the home to digital code and would proceed to the multiplexer at the appropriate switching node just as it does in the Viewtron system. But the ordered service would be transmitted back to the subscriber via the broadband cable system.

Along with the LADT modem this type of videotex service would require a one-way addressable CATV converter. According to Birch, the company would want to work out a deal with either the cable operator or a manufacturer or both to put the in-home hardware in one box.

Although the in-home gear in the Viewtron operation costs in excess of $600, Birch says the combined LADT modem/addressable converter box, on a mass-produced basis, could probably be priced at $300 or less. He said the major cost in the Viewtron gear is for the presentational protocol that changes incoming digital signals to analog for presentation on the home TV screen. Birch said the telco has had discussions with cable operators about the possibility of producing a hybrid system box, but nothing has reached letter of intent stage.

As has been widely reported, Bell of Pennsylvania, a BOC subsidiary of Bell Atlantic, was in discussions last fall with Warner Amex Cable on the possibility of a two-way hybrid system in Pittsburgh. Warner Amex's interest in such systems has waned since these talks began, largely because of corporate emphasis on trimming costs and contract renegotiations. There were also talks with representatives of NYNEX, the Northeastern RHC, in conjunction with planning the Warner Amex New York system to be built in parts of Queens and Brooklyn, but these discussions, too, have gone onto a back burner.

Most RHCs are very reluctant to talk about their interest in working with cable operators to develop hybrid systems. But it appears that most are continuing to pursue the subject as quietly as possible. And each would employ the LADT approach envisioned by Birch or something similar, although, again, most do not want to discuss their plans with any specificity.

Legal questions

One reason for the reticence has been Justice Department concern over how stringently Judge Harold Greene will enforce the terms of the consent decree that shaped the AT&T divestiture. On Feb. 21, the department expressed strong objections to a BellSouth plan to form a separate subsidiary to formalize an independent role in providing videotex networking service. This would have allowed the RHC to market the LADT capabilities and the accompanying hardware to all types of videotex purveyors and their customers—a far more significant role in engendering videotex startups than the joint-venture-by-joint-venture approach that is currently permitted under Judge Greene's rules.

According to Sam Cannavo, NYNEX line of business manager, his company's lawyers have advised that in light of the Justice Department position, the kind of marketing strategy NYNEX would like to pursue in the videotex realm may be out of bounds. If so, some other means may have to be found to make the phone company's network available to the videotex business and for development of two-way hybrid systems with cable operators. "How you get this out there, make it a real business, is a big concern," he said.

At Southwestern Bell, according to Claude West, assistant vice president for strategic planning at the St. Louis-based RHC, interest in involvement in videotex has waned since the Justice Department filed its objections to the BellSouth plan.

Other telco executives feel differently, however. According to Birch, "Anything we can do to add an increment of revenues from use of the network already in place is to our advantage."

Illinois Bell, a subsidiary of Ameritech, the Midwest RHC, has taken this approach to network utilization in a deal announced last month involving Keycom, a Chicago videotex service with Centel as one of the co-venturers. If deals involving cooperation between cable companies and Bell telcos strike some as strange, the fact that Illinois Bell is putting its network to use in service of an independent telco-owned videotex service should be a sure sign that the Bell divestiture is creating profound changes in the competitive relationships of telecommunications entities.

The Illinois Bell plan employs technology similar to that of the LADT approach taken by Southern Bell, but it uses Centel-developed packet switching technology and modems, and a new multiplexer put out by Infotron Systems of Cherry Hills, N.J. The path of the data signal from the home leads to one of 13 nodes in the Chicago metropolitan area, where the Infotron multiplexer routes the message to the downtown Illinois Bell switching center. At each node the multiplexer can combine over 100 videotex calls onto a single telecommunications line, so that thousands of videotex orders per minute can be processed at each node. As in Southern Florida, the downstream as well as the upstream path is narrowband, which means the range of videotex information and complexity of the graphics are limited.

Ken Hildreth, a spokesman for Illinois Bell, said he could not comment on the possibility of any ventures involving broadband except to say that the company is interested and has been pursuing the matter on an informal basis.

Costs

From a sheer capital cost standpoint, the two-way hybrid approach would not appear to have strong potential attraction to cable operators, assuming the $300 per box scenario described by Joe Birch would actually develop. With the cable industry already committed to two-way plant in most new-builds and with very few markets left for franchising, the older franchises up for renewal and possible upgrade are the most likely markets for developments of two-way hybrid systems.

Assuming the per mile amplifier cost on an upgrade to 300 MHz would run about $3,200 for two-way capability and a 10 percent savings if the amps are one-way, the per mile saving would run about $320 on amps if the upgrade did not go to two-way. On a 400 MHz system, the two-way amp costs on a per mile basis would run about $3,700, with a $370 per mile cut if the system were one-way. In a medium sized system with 120 miles of plant, the 300 MHz upgrade savings in line electronics would be about $38,400, while the savings at 400 MHz would run at $44,400.

Assuming a household density of 150 homes per mile, the system would pass 18,000 homes, half of which might be subscribing households. Assuming a fourth of the subscribers might be takers of two-way service, there would be 2,250 two-way subscribers. At $300 a box for the hybrid system, the in-home equipment cost for two-way would be $675,000. On the other hand, the cost of a top-of-the-line two-way addressable CATV box is about $165, which for the same number of two-way subscribers would mean total costs to the system of $371,000. Thus the box costs of the hybrid system would run about $304,000 over that of the two-way coax system, while the savings in line electronics would be only $38,400 or $44,400, depending on whether the system went to 300 MHz or 400 MHz.

Of course, there would also be differences in headend costs, but since the system would still be addressable and would need some sort of computer to process incoming videotex traffic as well as to run the addressable computers, the cost difference at the headend might not be all that great. And, of course, the telco would be charging the cable system a monthly premium for use of its private line network.

Implementing pay-per-view

But, where pay-per-view is concerned there's reason to rethink the possibilities in light of new approaches to the problem that could prove far cheaper than anything yet proposed by the BOCs. Basically, the idea is to use the phone lines for the upstream connection, but to do it independently of any joint venturing or box manufacturing involving packet switching protocols. (It also should be noted that since the LADT uses an asynchronous protocol against the CATV synchronous protocol, FCC rules would require the telcos to win a waiver to be able to interface the two systems.)

A number of developments point to the possibility of a very inexpensive approach to two-way interactive service in the small cable system environment. One of the most significant involves the pay-per-view impulse buy technology soon to be announced by a Ft. Lauderdale, Fla., software house, Access Radio. In this type of system there would be no special box in the home, beyond a one-way addressable converter, according to Ray Smithers, a partner in the firm.

The new system is based on software developed by Access Radio for polling-related services developed for broadcast and for cable. So far, one cable operator, Multivisions of Anchorage, Alaska, has employed the "Touch-Vote" system as a way to involve subscribers in the system's program selection and other matters of subscriber interest.

Multivisions allows its subscribers to vote for movie selections on its special movie channel. One-half hour before the "Pick-a-Flick" program, viewers are shown three choices of movies and can vote by dialing a seven-digit number and responding to computer instructions on how to register the choice by touchtone phone. The system's computer tabulates the votes as they come in, and the movie selected most often becomes the evening's fare. The cable system also uses Touch-Vote to get viewer responses on various political and other social questions. It has become especially popular as a tool used by the City Council to keep tabs on the feelings of constituents.

Several major radio stations, including WABC in New York and KGO in San Francisco, use the Touch-Vote system in their talk show programming, Smithers said.

The pay-per-view system, slated to go on the market this month, simply adds computer software that processes touchtone phone choices of pay-per-view programming. According to Smithers, pay-per-view subscribers will be given a number to call by touchtone phone. A synthesized computer voice answers the phone and asks the subscriber to enter his authorization number. After reading this back and verifying its accuracy the computer asks the caller to enter his billing code. If the billing and subscriber code numbers match, the subscriber is asked to enter the event number. As soon as the choice is made, the data is entered into the cable system's billing computer and the subscriber is authorized to receive the programming.

Smithers said computer costs for the system will run about $15,000. In addition, the system needs about 20 incoming dedicated phone lines to handle calls at the rate of 8,000 per hour. Line costs, Smithers said, are $17 per line, which for 20 lines would come to $340 per month. The system's Sperry 30 computer can handle up to 96 incoming lines, he said, which would be ample to handle pay-per-view traffic in a large cable system.

While such a system is a long way from videotex, it would seem to answer the need for impulse pay-per-view at reasonable capital costs. And, of course, there are a number of traditional CATV manufacturers moving to provide impulse pay-per-view capabilities at minimal costs by marrying CATV and telco line technology. Perhaps the furthest along among these efforts is Jerrold's Omnitel, an interactive pay-per-view system employing technology developed by Manitoba Telephone Co. of Canada in conjunction with Jerrold addressable gear.

Obviously, given the foregoing alternatives in pay-per-view networking, the operator looking for an inexpensive way to institute impulse buying doesn't need the telephone company and its LADT packet switching. But the videotex issue is another story and it may well be that even if there is no capital cost savings associated with the hybrid approach versus standard two-way interactive coax, there could be advantages to cable operators in working with telcos to set up videotex transport systems.

Videotex up for grabs

The key question concerns the videotex potential and how badly the telcos want to get involved. Judging from the interest expressed by all of the RHCs interviewed for this article, the telcos have a much more upbeat view of videotex potential than do most cable operators. "Nobody knows for sure how big of a business videotex will be," says Kare Anderson, a member of the Pacific Telesis strategic planning group. "But, obviously, we wouldn't be bidding to build a fiber/coaxial broadband system in Palo Alto (Calif.) if we didn't think it was worth finding out. You don't need the kind of system we've bid there to provide HBO, MTV and the other CATV services."

Indeed, a source requesting anonymity says Pactel isn't waiting any longer than it has to to get into videotex using the broadband mode. "We know there's no sense trying to get this kind of service off the ground unless it's as appealing as the technology allows," the Pactel executive says. "That means we have to have broadband, and if the cable companies don't want to participate we'll find someone who will." Specifically, he mentions multichannel MDS. The RHC is in the final stages of negotiation for development of a hybrid system that would use broadband microwave channels for communications to the subscriber with a telco line serving as the return path, utilizing the packet switching technology.

Educating the public

Telco executives appear to be moved to action on videotex not so much as a result of survey findings in test markets such as Coral Gables, Fla., and Ridgefield, N.J., although results in both communities have encouraged the venturers to push ahead. Instead, they believe the public exposure to videotex in the near-term future is going to drastically alter receptivity to such services. "Home banking is now up and running in 17 states, even though it has cost the banks a bundle and they're using jury-rigged technology employing very costly home components," the Pactel executive states. "And look at what's about to happen with electronic communications centers in shopping malls and other areas."

Indeed, newspaper publishers, shopping center developers, communications companies, hotel chains and a host of other entities see the electronic kiosk offering data on demand free of charge to curious shoppers as an important way to break the public in to using videotex and as a way to gain an edge in exposure over the competition. AT&T has designed a public access terminal that it plans to begin marketing later this year with the intention of getting the public use to the advantages of videotex on a massive scale.

Los Angeles, where the Olympics will be held this summer, will be a major exposure point for videotex, where the electronic kiosks will serve up all kinds of information about Olympic events as well as advertising from a variety of vendors. There is already a business information videotex system up and running at La Guardia Airport in New York, and sometime this month New England Telephone will be inaugurating business information service at Boston's Logan Airport.

These are but a small sampling of developments taking shape this spring, and the telcos sense that such beginnings will completely alter the commercial environment for videotex. They want to be able to get in on the action when it comes, using broadband if at all possible.

Perhaps if the telcos want broadband badly enough, cable operators will find them talking deals that are more attractive than what's been offered so far. Given the ingress problem in the subsplit and given the headache of managing the upstream traffic, it could well be that if videotex takes off the way many observers expect it to, cable operators will find the telco hybrid approach far more appealing than they do now.

Part 2: The idle I-NET

By Clifford B. Schrock
President, C-COR Labs Inc.

In Part 1 of "The idle I-NET," the reader was provided with a methodology for frequency allocation of the various categories of services that might be offered on an institutional broadband network. Equally important with frequency planning are the level planning aspects of setting up an I-NET. Video, data, and voice each have unique requirements of bandwidth and carrier-to-noise ratio for proper performance on the cable. The broadband plant, on the other hand, must be operated carefully in terms of levels to obtain optimum noise and distortion performance for each type of service offered. Part 2 discusses the various parameters involved in level planning and introduces a methodology for establishing a level plan. In addition, the author discusses some financial points to consider when establishing rates for institutional services.

Level planning

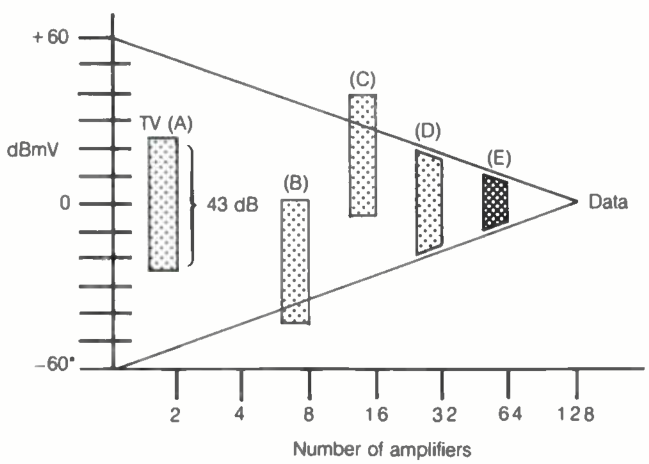
Two basic parameters come into play when establishing the levels for various services: the bandwidth of the service and the carrier-to-noise ratio (C/N) requirement of the modulation used. Fortunately, as more carriers are added to a system, individual carriers are narrower for many services. Many digital signals require much less C/N, and can therefore be carried at lower levels. The net effect is that heavy loading of a broadband network with thousands of carriers is easily accomplished if an understanding is developed early in the planning stages of the relationships of bandwidth and C/N.

Zero carrier reference level

Broadband coax plants are ultimately limited in size because of the additive distortion and noise effects. While modern amplifiers, and the use of special techniques such as feedforward and parallel hybrid devices have produced significant gains over the past years, the coax plant is still limited in "reach" by noise and distortion.

This effect is shown graphically in a chart such as depicted in Figure 1. The total level range normally encountered in modern broadband plants is +60 dBmV maximum (although in many modern designs +45-47 dBmV is the maximum level used in the plant) and approximately –60 dBmV, which is the thermal noise floor across 4 MHz bandwidth. Using a TV picture as an example, it is generally accepted

Figure 1: Noise and distortion additive effect as amplifier cascade increases



*At 4 MHz bandwidth

Figure 2: Power addition effect of multiple carrier

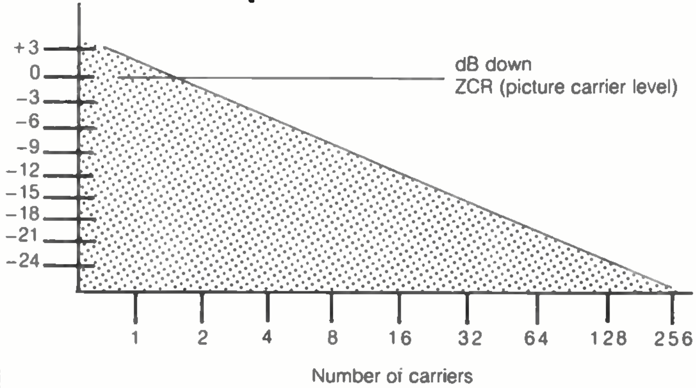
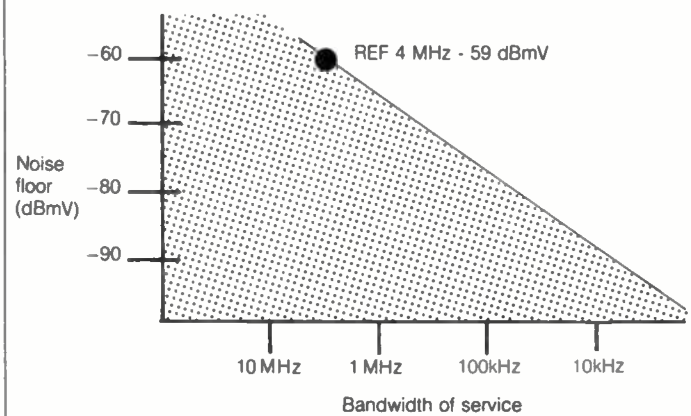


Figure 3: Noise floor reduction with bandwidth reduction



that good video quality will be obtained if the video carrier is at least 43 dB above the noise floor.

At the CRF (or headend) of a broadband system, it is easy to accommodate a TV carrier (as shown in Figure 1, point A). The TV carrier at this point could be carried at any level from approximately –17 dBmV to +60 dBmV and have a C/N of 43 dB or more.

However, as the cascade of amplifiers is increased from the headend, TV and other carriers must be carefully placed in level to carry with optimum C/N to the ends of the system. Signals requiring less C/N than 43 dB for video, such as some data signals (Figure 7, point E) could be carried farther. However, as a general rule the video performance is used to determine plant length or reach and digital signals are simply carried at reduced levels to minimize the distortion effects.

The obvious question is: "How does the operator determine optimum levels for the myriad services potentially offered on a broadband system?"

The starting point is the manufacturer's specification for the video performance of the system. Recommended picture carrier levels for a loaded system are the result of extensive testing by the manufacturer. All other non-video levels on the system can be related to the picture carrier level. Various derations can be applied to the picture carrier level, if, for instance, the plant reach is going to be limited in size, or if carrier loading will be light. For these reasons, the author has invented the term, "zero carrier reference level" or ZCR.

The ZCR should be determined for both the forward and reverse portions of the plant spectrum. Little more on deration of picture carrier level to ZCR will be mentioned in this paper, except to say that, for most citywide I-NETs, ZCR will in effect be picture carrier level as recommended by the manufacturer.

Most digital services that might be carried on a broadband network are narrower than a 6 MHz picture carrier. In the instances of medium speed point-to-point modems, various bandwidths of 25, 80, 96 and 200 kHz are presently available to the industry. In order that revenue potential of a coax be maximized, it is usually necessary to stack many carriers into each 6 MHz slot.

One of the first points to understand is the relationship between numbers of carriers and the total power. Stated another way, it has been found to be prudent to place multiple carriers at reduced levels from an equivalent video carrier so that a power level equal to the video carrier (specified by the manufacturer as picture carrier level) is achieved. The chart in Figure 2 shows the effect of multiple carriers. Basically, every time the number of carriers is doubled, all carriers must be 3 dB lower within the 6 MHz bandwidth to be of equivalent power. For example, if a data carrier spacing of 200 kHz were used, 30 carriers could be fitted into 6 MHz. The chart shows that the data carriers should be carried at least 15 dB below ZCR. For a channel spacing of 25 kHz, the number of carriers would be 240 in 6 MHz, and the carriers should be carried down 24 dB.

To carry the concept farther, it should be apparent that adjustments in level could be made to carry signals higher if the cable were lightly loaded or limited in cascade length.

Relationship of bandwidth to noise floor

The performance of all formats of signals carried on the broadband cable are specified relative to their carrier level above noise. The noise floor is, however, not a single value, but rather, varies with the receiver bandwidth of the modem or demodulation used.

Both Gaussian and impulse noise reduce in ampitude as the receiver bandwidth is decreased. (Various other enhancements of this effect such as threshhold extension, pre-emphasis/de-emphasis, and noise clipping can further reduce noise.) This reduction is quite predictable for Gaussian noise: "For every half-reduction in bandwidth, the noise floor reduces 3 dB." Another way to state this effect and an easy to remember rule of thumb is that for each 10X reduction in bandwidth, the noise floor reduces 10 dB.

Remembering that the noise floor for a TV signal (measured across 4 MHz) is approximately –60 dBmV, a data modem that occupied 40 kHz of bandwidth would have a –80 dBmV noise floor. Difficult as it may be to grasp, it is possible to run data modems satisfactorily at levels where the data carrier would be below the video noise floor. This can, however, be easily demonstrated using a spectrum analyzer by noting that a carrier may be invisible due to the noise floor when measured using a 3 MHz resolution bandwidth, yet, as the bandwidth is reduced to 30 kHz, for example, another 20 dB of range becomes visible at the lower level of the display.

Figure 3 graphically depicts the noise floor reduction as bandwidth is decreased. A significant factor in level planning involves understanding this effect and utilizing the lowest amplitudes for carriers of varying bandwidths (plus margin for minor variations in the cable).

Digital vs. analog C/N requirements

Level planning is not possible without an understanding of the actual C/N requirement of the different forms of signals carried on a broadband plant. The largest difference exists between the requirements for analog transmission versus digital transmission. Without these two broad categories, individual requirements vary widely.

Figure 4 shows a graphic representation of some typical analog and digital signals. The reader will note that analog signals such as TV video, FM stereo and TV (FM sound), and telephone require significantly larger C/N ratios than digital transmission. Bit error rate (BER) in a digital signal is related to the C/N ratio of the system through which the data passes. In a simple two-level, digital system of equal bandwidth, the chart shown in Figure 5 shows the typical performance capability.

Other more complex digital signals such as multi-level or phase encoded data (QPSK, QASK, etc.), which is often used to reduce the bandwidth of the signal, increases the C/N requirement for the signal.

The broadband system operator should determine the C/N requirement for various services and modems to develop a complete level plan. Margin should be added to each signal to allow for system variance or degration to the degree necessary to ensure the level of service required.

Figure 4: Amplitude requirements of various digital and analog signals

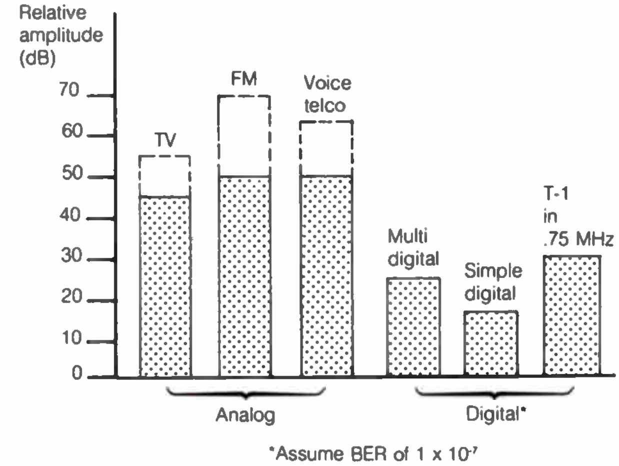
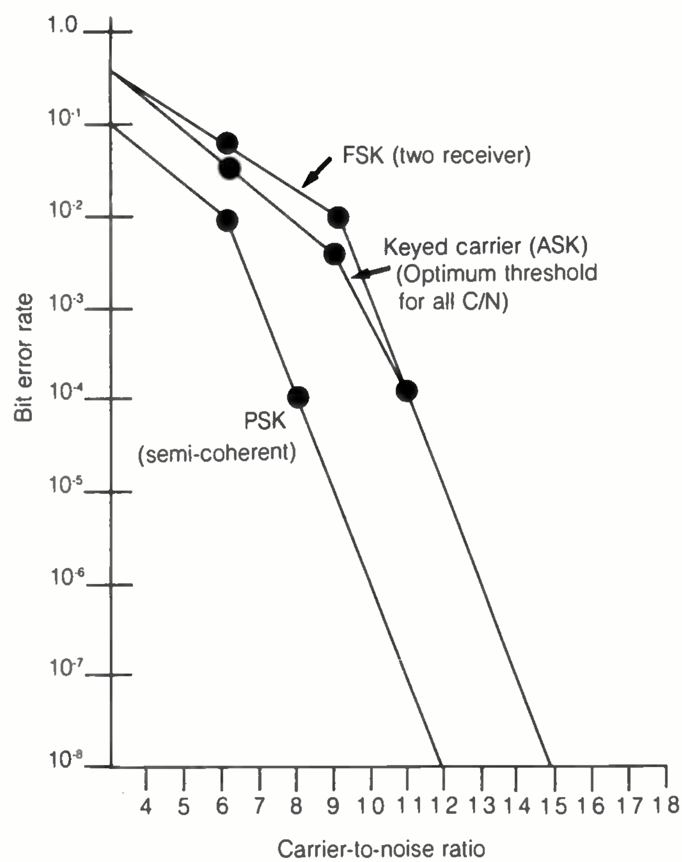


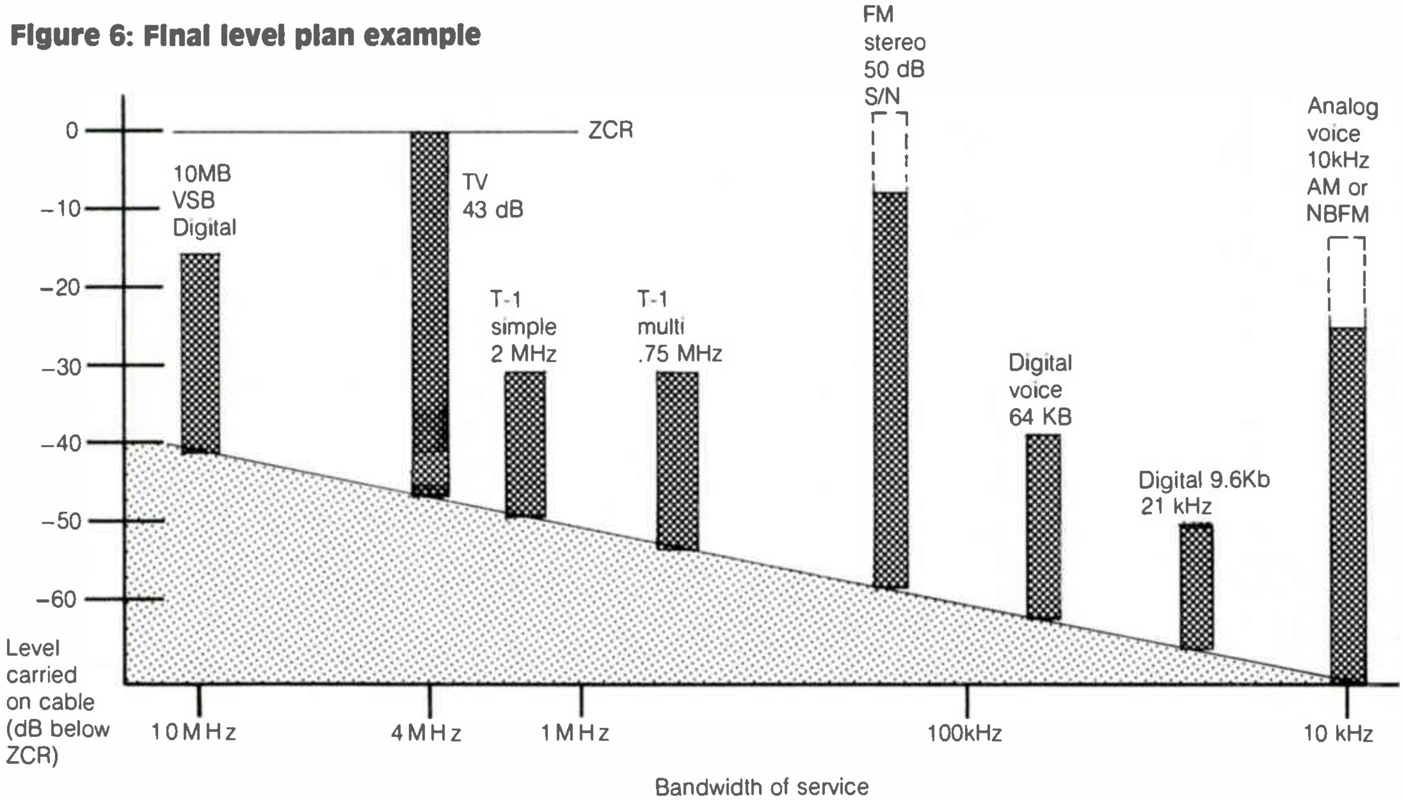
Figure 5: BER of various modulation formats



Developing a level plan

Developing a system level plan consists of integrating all of the data presented earlier in this article into one complete picture or plan. The author has found it most helpful to develop a chart such as shown in Figure 6. A chart should be developed for each direction on the broadband cable, starting first with the known (measured or calculated)

Figure 6: Final level plan example



C/N at the maximum amplifier cascade in the system.

In many systems, the return path will offer more limited C/N capability and may, in fact, preclude the use of some analog signals from broad area coverage. The level graph should be constructed so that the ZCR to noise floor (C/N for video) at 4 MHz is equal to the known system figures. Then, other services should be overlayed on the chart in their correct bandwidth position and C/N amplitude. Margin may then be added to various services to ensure that system variations do not upset critical services.

Financial considerations

Many I-NET operators are at somewhat of a loss when confronted with the task of pricing commercial service on the network. Pricing can be derived by calculating the bandwidth used for a service and the time of usage (particularly for video and non-point-to-point services). One of the problems with this pricing method is that a user operating over a short distance occupies frequencies on the entire network. To be competitive with other available carriers, pricing must include a distance factor.

The author recommends that pricing therefore be derived using the formula:

$$\frac{\text{Cost of system}}{\text{Fraction of bandwidth}} \times 2 = \text{Base cost of service}$$

Base cost of service should then be divided by the plant life (recommended 10 or 15 years maximum!), then by 12 to obtain a rate per month.

With base rate per month derived, mileage is the next item to deal with. The author recommends that the base rate apply to one mile or less. Above one mile, an additional 5 percent per mile should be added. For instance, a 10-mile circuit would cost a user an additional 50 percent above base rate.

The final factor is time usage. In video services, for instance, a user may only need a circuit for a few hours a month. If the circuit (frequency band) can be rented to other users on a schedule, then an hourly rate can be derived. The hourly rate, however, cannot be substantially lower than the dedicated circuit rate. The author recommends that an hourly rate between 1/10 and 1/30th of the base rate per month be used.

Two pricing examples are shown below. Assume a $5 million I-NET in a medium size town. Assume a high split system with 30 TV channels (6 MHz) usable in each direction. Plant life is projected at 10 years.

1. A video user requires one channel for hourly usage. (Estimated five hours per month.)

$$\text{Base rate} = \frac{\$5 \text{ million}}{30^*} \times 2 = \$333{,}333$$

*Use of forward and reverse channel are required for customer to originate at any location in city.

$$\text{Base rate per month} = \frac{333{,}333}{10 \times 12} = \$2777/\text{month}$$

$$\text{Hourly rate} = \frac{2777}{10} = \$280/\text{hour}$$

Note that the rate is actually for two channels (one each direction) so that customer could originate anywhere in system to entire system.

2. Data user, 9600 baud, six-mile distance. (Assume 25 kHz spacing, therefore, a total of 100 kHz is required including forward and reverse.)

$$\text{Base rate} = \frac{\$5 \text{ million}}{3600} \times 2 = \$2777$$

$$\text{Base rate per month} = \frac{2777}{10 \times 30} = \$9.25$$

Mileage 6 miles = 30% x $9.25 = $12.03/month

Note that it should be readily evident that this price is ridiculously low and should be increased by a factor of x10 to bring it in line with standard phone offered rates.

The two examples shown above have hopefully provided the reader with both a direction in pricing and a realization that the I-NET can offer services at incredible price advantages over other mediums. The author recommends that, in the end, the operator should price according to the market.

SCTE takes Nashville by storm

Country music takes back seat to annual Cable-Tec Expo

The Opryland Hotel in Nashville, Tenn., was an ideal springboard for the recent highly successful Society of Cable Television Engineers' Cable-Tec Expo '84 and Spring Reliability Conference held March 4-7. More than 1,000 attendees descended upon this soft-spoken Southern city to do something that's rare in the engineering community—attend a coordinated, productive and useful all-technical convention/trade show.

In addition to a number of diversified seminars, repeated three times daily, close to 100 exhibitors featured products and/or mini-seminars on the exhibit floor itself.

The Opryland Hotel was a superb choice for the show. Aside from fine restaurants, saloons and shops, the hotel was approximately 2½-3 acres in size. Hotel accommodations were excellent and conducive to many after-hours problem-solving ideas and resolving day-to-day system problems.

The SCTE kicked off Expo '84 by convening its annual Spring Reliability Conference on Sunday, March 4. The conference, targeted towards upper management officials, is an annual forum for technical personnel to present technical papers and discuss engineering methodology with their peers.

The Reliability Conference featured industry experts like Bob Vogel, John Kurkpinski, Jim Chiddix, Robert Luff, Anthony Wechselberger, Norm Weinhouse, Gary Stanton, Cliff Schrock, Jim Crocker and Bob Dickinson.

Technical sessions during the conference covered encryption, signal leakage and system reliability, satellite reliability, teletext and data communications. (The May issue of *Communications Technology* will feature all of the papers presented.)

The keynote speaker at the luncheon was Wendell Bailey, vice president of Science and Technology for the National Cable Television Association. The message he imparted to the audience concerned the plight of the engineer—no recognition. "Engineers founded the cable TV business," he emphasized, "and engineers have been the innovators." Bailey's advice to engineers was clear. "We must improve the day-to-day operations . . . that means service, reliability, ingress and egress. We must also lead the way," he stressed, "in providing future services."

Bailey's concern regarding a lack of recognition for engineers was quickly put to rest. Tom Polis, president of the SCTE, presented the President's Award to Bailey on behalf of the NCTA Science and Technology Department.

The Member-of-the-Year award was also presented during the luncheon to David Franklin of Adelphia Communications. Franklin was the driving force in spearheading SCTE's BCT/BCE Program. The recipient of this prestigious award is selected by SCTE's Board of Directors for outstanding contributions towards achieving the Society's goals.

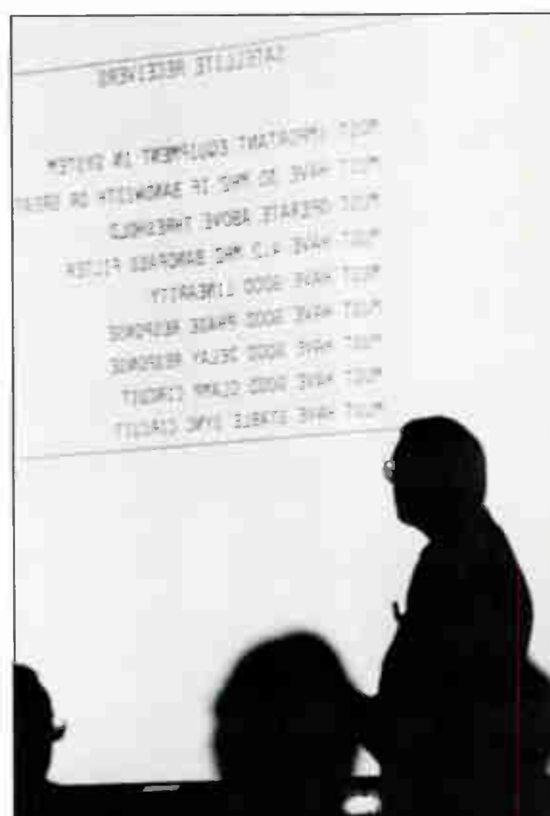
The day following the Spring Conference, March 5, the Cable-Tec Expo was in full-swing. The show was arranged so that the exhibit floor would be open only when the seminars were concluded, providing an uncluttered atmosphere for attendees and exhibitors as well.

Seminar topics ranged from fundamentals to "soft" high tech, and classroom activity was constant. Panel speakers presented well thought-out seminars and many problems were solved during the question-and-answer periods.

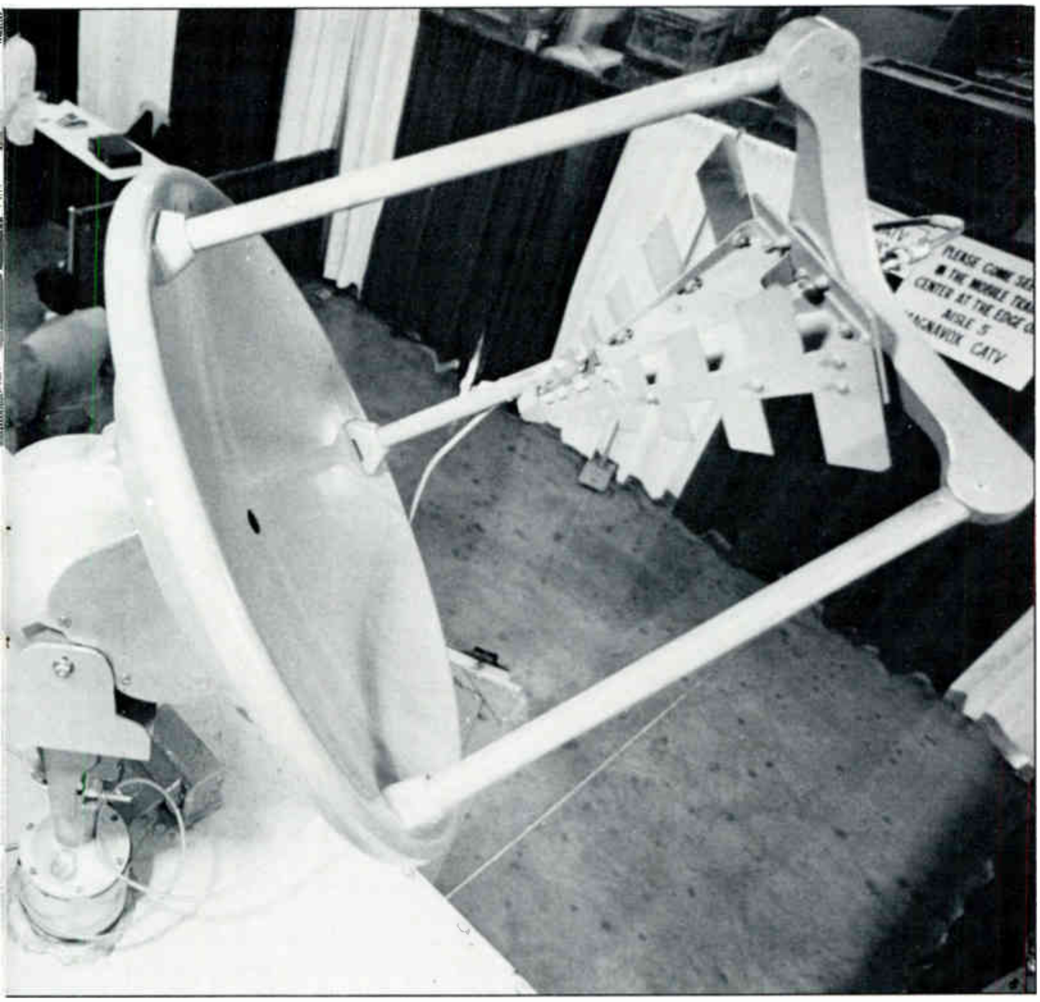
TVRO maintenance

A seminar on TVRO Maintenance was presented by Jim Grabenstein of Microdyne, a 20+ year veteran of the cable industry. Key points he emphasized were to *understand* the product and keep good records.

Grabenstein suggested aligning the earth station dish at least once a year by using a power meter and marking the position of



Gary Stanton directs the teletext session of the Reliability Conference.



Rob Stuehrk

Bob Luff, United Artists Cablesystems, and Chris Papas, FCC electronics engineer, peer through the access panel atop the FCC inspection van, while SCTE Vice President Steve Cox checks in a convention goer.

alignment. He also suggested measuring the diameter of the antenna in two directions. The focal length measurement, according to Grabenstein, should also be taken and recorded for future comparison.

Other advice regarding TVRO maintenance included keeping fiberglass dishes painted, either with latex or a gel coat with UV inhibitors. While discussion varied from session to session, other topics covered included terrestrial interference, de-icing and dual feeds.

Digital Primer

Another highly touted seminar was a Digital Primer by Sal Yorks of Magnavox. Attendees at this session tried to nibble a bit of a byte of the basics, binary serial bit stream that Yorks expounded at about a 50 baud rate. By the very end of the seminar, everyone was ASCII(ing) how many words had been hex(ed) into their very own memories.

In addition to explaining some of the terms used above, Yorks also covered the basics of TDM, FDM, modems and various data carriers and their potential applications to cable.

Rob Stuehrk

FCC compliance

The seminar on FCC Compliance also had a high level of activity. The session was led by Cliff Paul, formerly chief of the FCC's microwave division, and Chris Papas of the FCC's Field Operations Bureau.

Both Paul and Papas stressed FCC crackdowns on violations in cable systems. "The FCC," said Paul, "is going to get tough." Regarding the rules on SMATV, Paul stated, "We don't know what's going to happen to SMATV's."

Advice given by Papas was, "Your biggest priority is leakage. I think the best preventive maintenance for cable systems," he added, "is to check for signal leakage."

Papas commented that "cable systems don't know how to deal with the public." He urged more communication with all concerned.

Test equipment

The Test Equipment seminar, conducted by Ron Adamson of Texscan, covered various setups of test gear commonly used to track the performance of cable television systems. Sweep setups were discussed for the high level sweep systems. Carrier-to-noise measurements were outlined including the importance of a bandpass filter in the test setup, and factoring in the IF correction factor of the particular meter or analyzer in use. Also covered were hum, cross-mod and signal leakage measurement setups.

Using and maintaining feedforward

The session on Using and Maintaining Feedforward was well presented by Ron Soloman of General Instrument. Soloman outlined the history of feedforward design dating back to its invention in 1924 by a Bell Labs' engineer for the linearization of audio amplifiers.

Soloman noted that in today's common cable amp design, the feedforward amp is typically 1-1½ dB higher in noise figure than a conventional amp for which you get higher output (longer cascadeability) and generally better distortion characteristics.

A good amount of time was spent detailing the procedures for detecting a single stage failure in a feedforward amplifier. This appears to be an area deserving careful consideration for anyone using or planning to use feedforward. The desirability of various options was considered: complete feedforward rebuild; partial feedforward rebuild; or only some amps at the head of the system being replaced or used in basic system design.

Inside the ARRL

Inside the ARRL was a session promoting peace between amateur radio operators and cable system operators. The speaker for this seminar was Hugh Turnbull of the Amateur Radio Relay League (ARRL). Turnbull came to the Cable-Tec Expo to try to continue the dialogue with amateur radio operators and cable system engineers to mutually co-exist without interference to either party. For the amateur community he pointed out, RFI (radio frequency interference) is an old, old story. It's an area the amateur's have had to continually

President's Award recipient Wendell Bailey (l) and Member of the Year Dave Franklin (r) pose with Tom Polis.

monitor in order to preserve the small frequency bands reserved for their use. Interestingly enough, quite a few of the cable engineers there were hams themselves. As a result of cooperative meetings between the NCTA and ARRL, local hams have been encouraged to bring problems to the attention of the hams' local cable system first. The systems, in turn, have been encouraged to do everything in their power to determine the cause and resolve the problems of RFI. Of particular concern is the amateur 2 meter band into which channel E falls.

One suggestion to open the dialogue further was for cable engineers to volunteer to speak at local amateur clubs to outline the cable system accessibility to the hams.

Construction practices: Aerial and underground

The seminar on Construction Practices: Aerial and Underground was conducted under the tutelage of Tom Polis, Communications Construction Group. The first half of the session was devoted to standards of construction as related to highway clearance, railroad crossings, utility poles, etc.

Polis stressed the need for safety in construction. He cited various potential safety hazards and solutions. "One of the major problems," he emphasized, "is the lack of understanding of codes (NEC and OSHA rules)."

Jim Stilwell, a veteran of the CATV industry who has long expounded on the subject of grounding and bonding, augmented the seminar by addressing questions dealing with grounding.

Elements of system design

Elements of System Design was a seminar hosted by Sally Kinsman of Kinsman Design and Tom Robinson of Magnavox. This panel featured the necessary ingredients required to design a cable system, new and rebuild system specifications, make-ready and strand mapping. The speakers also outlined rules and design parameters to follow.

Jim Grabenstein on TVRO Maintenance.

Amplifier fundamentals

The session on Amplifier Fundamentals, by Norman Friedrich of C-COR, provided a basic overview of the factors involved in cable system structure. He then related that basis to the design choices that manufacturers routinely must make when trying to design amplifiers. Topics covered included gain and slope controls, pads and equalizers, hybrids, interstage equalizations and controls, and basic design parameters.

The seminar attendees were downright enthusiastic about the sessions. "There were some seminars I attended that I didn't initially know much about," stated Larry Flaherty, quality control engineer for Rogers UA Cablesystems. "However, I learned a lot by the time the seminars were over."

Richard Covell of C-COR said he attended some seminars which were basic "but there was new information I could use."

Booth traffic

While floor traffic was light, it was continually active. Many manufacturers not only had booths, but mini-seminars as well: Jerrold Electronics, Quality RF, Magnavox, Communications Construction and the FCC inspection van.

While many companies used small booths at Expo '84, many vendors commented that they will increase their booth size next year and show more equipment. "I would say that our (C-COR) booth had probably as much traffic as we had at even the National Show," said Covell, "as far as people who were actually interested in our products and how they worked."

Fred Rogers of Quality RF commented, "We had extremely good activity at our booth and workstation. This is the kind of show," he emphasized, "that is really tailored to our type of company."

Jim Emerson of AM Cable/E-Com Division said he recently wrote his sales report on the Expo with several good leads, "half of which are absolutely sterling."

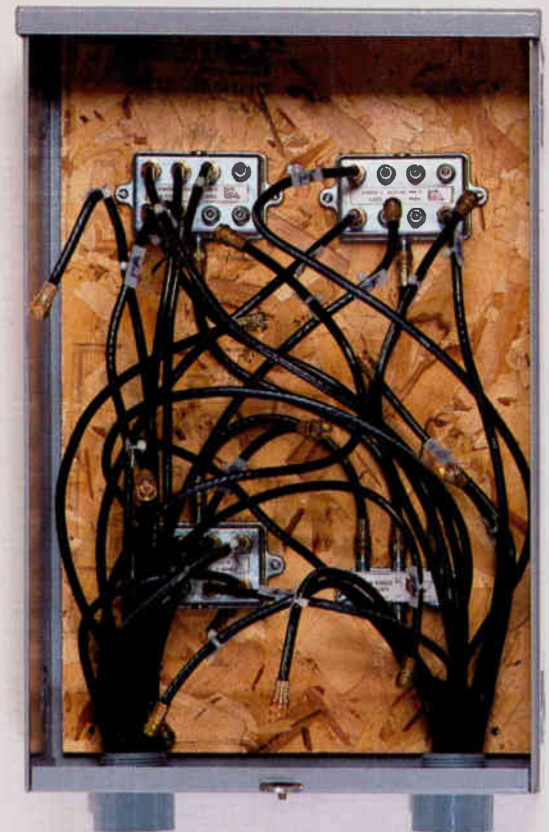
Chris Papas (FCC electronics engineer) also manned the FCC inspection van. "I was very pleased with the Cable-Tec Expo," he stated. "My only complaint," Papas conceded, "was that I had too much work to do, too many people to talk to."

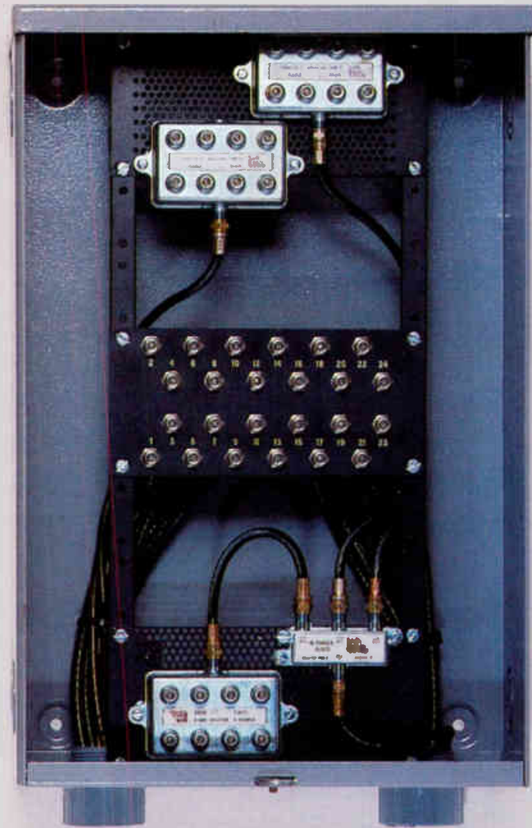
CT also asked Bob Luff for his comments on the show. "The Expo was excellent! Anybody who wasn't there," Luff stressed, "really missed it. As a vp of engineering of one operating company, I wish we had more attendance by the technical personnel. The hands-on training," he continued, "and exposure to the major hardware suppliers was second to none. Next year, in Washington (D.C.)," he added, "we will be there in force."

At the end of the Expo, *CT* queried Tom Polis about his reaction to the convention/trade show. "We may not have had the quantity of people that we wanted, but we certainly had the quality. I think the show was very positive. The Expo," he noted, "represented the SCTE very well, and we picked up a lot of new members. The board of directors," he added, "were well pleased with the outcome of the show."

An informal concensus from vendors and attendees gave the Expo a satisfaction rating between 80-90 percent. All indications are that next year's Expo will be even better.

Messed Up. Dressed Up.





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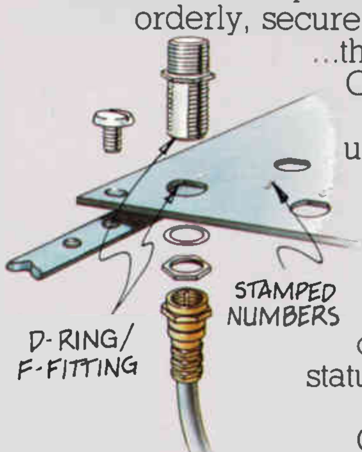

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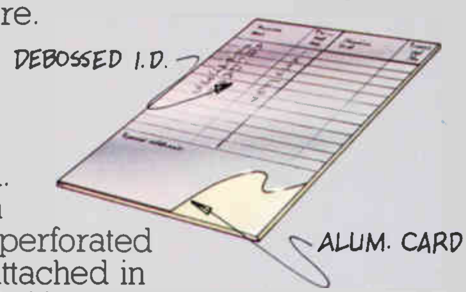

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All hybrids not created equal

Composite triple beat, carrier-to-noise generally accepted as limiting parameters in 20 or more channel systems

By Quality RF Services
Fred Rogers, Ernie Cantelmo, Bradley Mayo, Rob Lego, Monte Errington

In an effort to give Society of Cable Television Engineers members a "hands on" look at composite triple beat (CTB) measurements, a test station operated by Quality RF Services was available at the Cable-Tec Expo held in Nashville, March 5-7. Lab quality equipment also was compared to the new Wavetek 1880 system analyzer with favorable (exactly the same) results for CTB measurements. The Wavetek 1880 was supplied courtesy of SCTE senior member John Weeks of ComSe Sales.

Responding to a question by Ed Hassler Jr., director of engineering for Armstrong Utilities Inc., hybrids were tested for worse case CTB

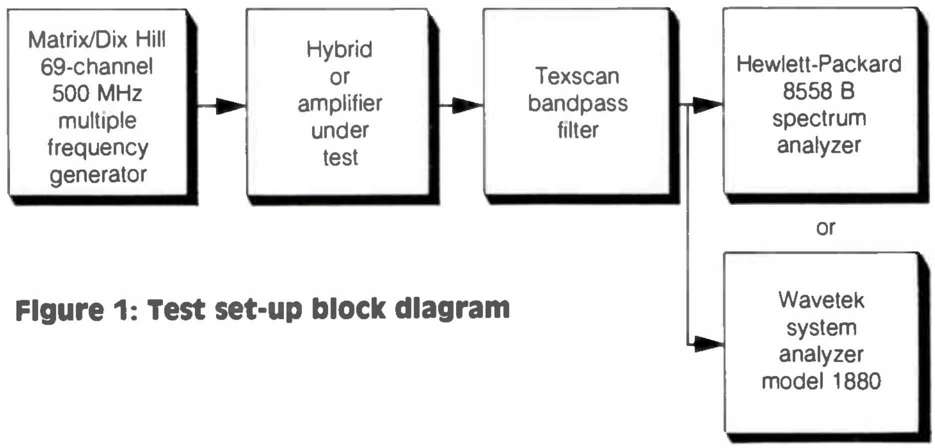
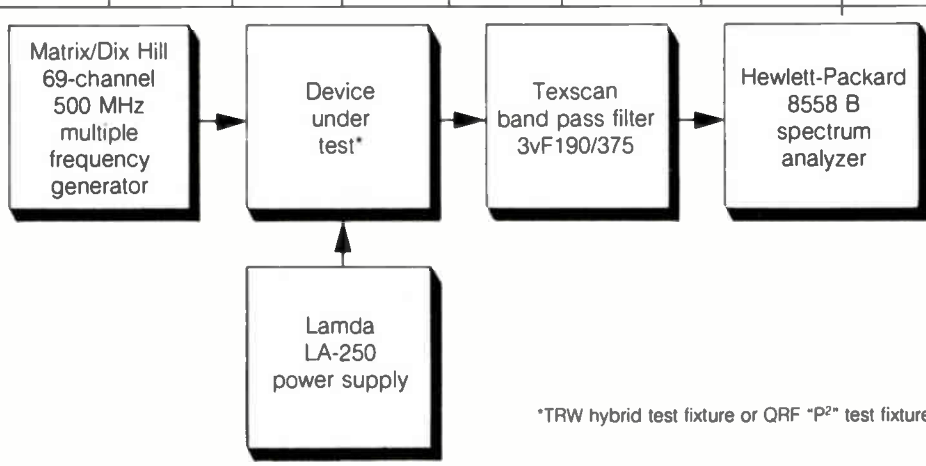


Figure 1: Test set-up block diagram

Figure 2: Hybrid test results
Channel loading vs. composite triple beat

Level	**Hybrid**	**20 channel**	**25 channel**	**30 channel**	**35 channel**	**40 channel**	**45 channel**	**50 channel**	**55 channel**
48 dBmV flat level	34 dB/300 MHz 7-pin Hybrid	−68 dB@ Ch.11	−64 dB@ Ch.11 −63 dB@ Ch.M	−60 dB@ Ch.11 −58 dB@ Ch.Q	−58 dB@ Ch.11 −56 dB@ Ch.W	−56 dB@ Ch.11 −53 dB@ 325.25 MHz			
48 dBmV flat level	34 dB/400 MHz 7-pin Hybrid	−66 dB@ Ch.11	−64 dB@ Ch.11 −64 dB@ Ch.M	−62 dB@ Ch.11 −60 dB@ Ch.Q	−60 dB@ Ch.11 −59 dB@ Ch.W	−58 dB@ Ch.11 −55 dB@ 325.25 MHz	−57 dB@ Ch.11 −53 dB@ 355.25 MHz	−56 dB@ Ch.11 −50 dB@ 385.25 MHz	−54 dB@ Ch.11 −44 dB@ 415.25 MHz
48 dBmV flat level	34 dB/450 MHz 7-pin Hybrid	−68 dB@ Ch.11	−62 dB@ Ch.11 −64 dB@ Ch.M	−60 dB@ Ch.11 −62 dB@ Ch.Q	−58 dB@ Ch.11 −62 dB@ Ch.W	−58 dB@ Ch.11 −60 dB@ 325.25 MHz	−57 dB@ Ch.11 −57 dB@ 355.25 MHz	−56 dB@ Ch.11 −56 dB@ 385.25 MHz	−54 dB@ Ch.11 −52 dB@ 415.25 MHz
48 dBmV flat level	34 dB/400 MHz 7-pin Power Parallel "P²"	−71 dB@ Ch.11	−70 dB@ Ch.11 −71 dB@ Ch.M	−69 dB@ Ch.11 −70 dB@ Ch.Q	−68 dB@ Ch.11 −68 dB@ Ch.W	−67 dB@ Ch.11 −66 dB@ 325.25 MHz	−65 dB@ Ch.11 −65 dB@ 355.25 MHz	−64 dB@ Ch.11 −64 dB@ 385.25 MHz	−64 dB@ Ch.11 −62 dB@ 415.25 MHz



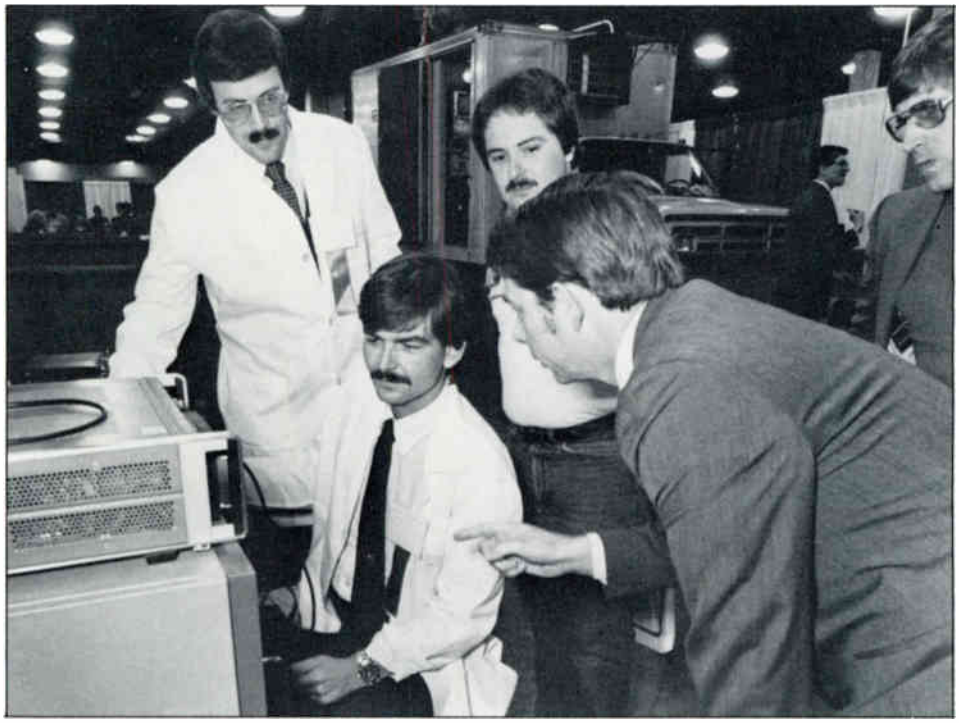
*TRW hybrid test fixture or QRF "P²" test fixture measurements at the middle and highest frequency channel under test.

The test results (see Figure 2) indicated that middle channels are the worse case measurement *only* when the hybrid is well below its maximum channel loading. Anytime a hybrid becomes loaded with channels to the manufacturers' maximum specifications, the highest channel becomes the worst case reading.

Typical hybrids were randomly selected from Quality RF Services inventory for CTB measurements. Hybrids with known problems were also included in the test results in Figure 3.

As can be seen by the test results, all hybrids (in fact most) are not equal and every hybrid *must* be tested to ensure proper operation. It is also possible to select "super hybrids" for special applications.

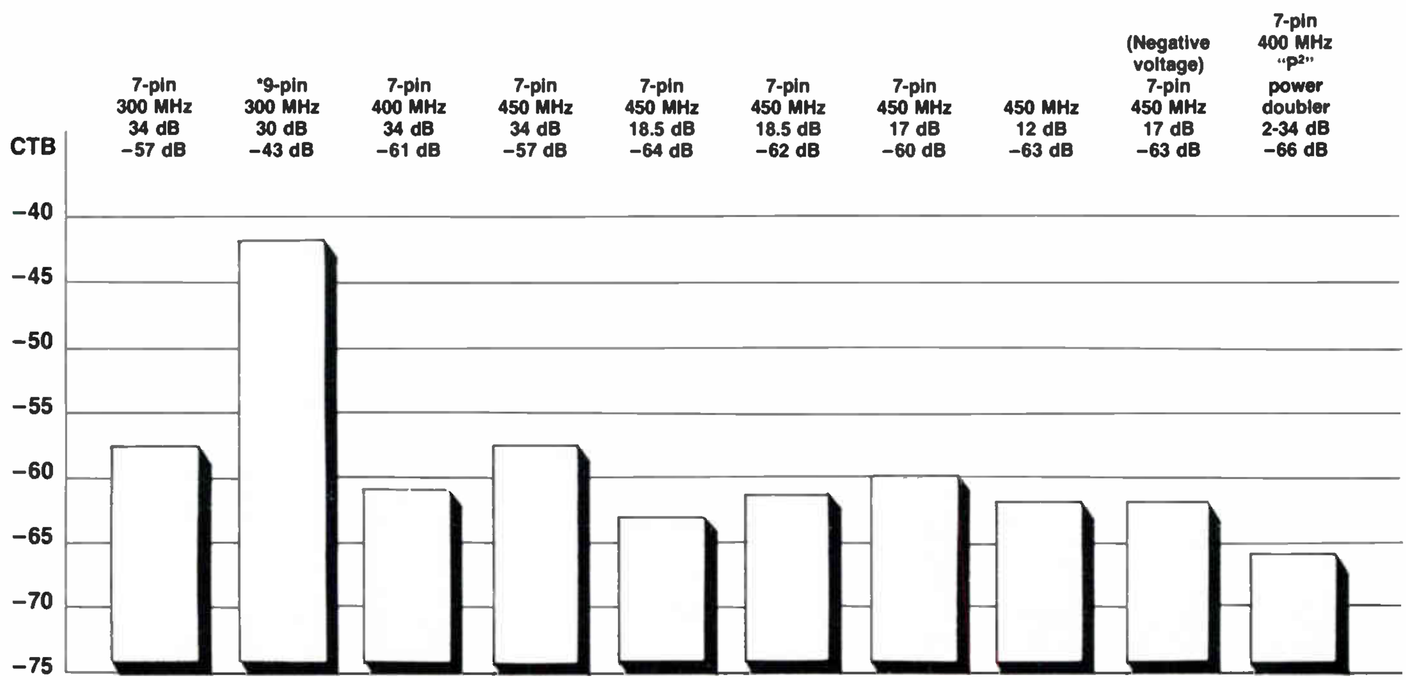
Dave Mathews, vice president of engineering, and Dennis Carter, maintenance supervisor for Cablevision of Baton Rouge, La., supplied several operational amplifiers for CTB measurements. To everyone's pleasure, the amplifiers passed with flying colors. Maybe that's why Cablevision has such an excellent system!



The function of the frequency generator is explained by Quality RF personnel.

Figure 3: Hybrid testing results

Composite triple beat (All levels at 48 dBmV flat 35 channels)



*This hybrid will be rejected and returned to the original manufacturer for credit.

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Technical Handbook for CATV systems

Chapter 1: Decibels and dBmV

The following is the first chapter of the "Technical Handbook for CATV Systems" by Ken Simons. Each monthly issue of "Communications Technology" will feature another installment of this excellent technical primer.

By Ken Simons
Cable Television Consultant

The need for dB expressions

As the television signal progresses through a CATV system from the antenna through miles of cable and dozens of amplifiers, it undergoes many changes in power level before it is finally delivered to the subscriber's receiver. The power is very low at the beginning of the system, coming out of the antenna with a power level in the neighborhood of 0.0000000001 watt and increasing to around 0.0001 watt at the outputs of the distribution amplifiers. The wide range of power levels and all those zeroes (especially when you start doing calculations) make this a pretty cumbersome method to work with. There's a much better one, however, which utilizes elements known as decibels (abbreviated "dB") and decibel-millivolts (or "dBmV"). Restating the unwieldy quantities we used above in this method's terms, the antenna power would be expressed simply as "–20 dBmV" and the amplifier outputs as "+40 dBmV." The whole range between the two would then be expressed by numbers between –20 and +40. There is nothing mysterious about dBs and dBmVs. They show how basic mathematics is applied to create a simpler way of analyzing systems.

Decibels start with logarithms

Most secretaries would feel right at home with logarithms, which are really just a shorthand method of writing large or small numbers. You learned in school that the number 100 can be written as 10 x 10 or 10^2. That doesn't save much time. But if you have to write the number 100,000,000, or 10 multiplied by itself eight times, it's quicker to write it as 10^8. Or if you are faced with 0.00000001 (which is 1/100,000,000 or $1/10^8$), it's just 10^{-8}.

All the numbers you put in this form, 10^2, 10^{-8} or even 10^{77} have one thing in common, the "base" number of 10. The idea of logarithms is to use this fact to carry our shorthand one step further. We don't bother writing the 10 at all. We just write the exponent—the power to which 10 is raised to get the number—and call it a logarithm or "log" for short. The logarithm for our old friend 100,000,000 or 10^8, is 8. To remind us that it is 10 that is raised to the power of the logarithm, the log is referred to as log to the base 10, abbreviated $\log_{10}$. So, logarithm to the base 10 of 100,000,000, written $\log_{10}$ 100,000,000, is 8. Remembering that 1/100 or 0.01 = 10^{-2} then $\log_{10} 0.01 = -2$, and so on, as you can see from the following Table A of examples.

Table A

Number	In terms of power of 10	Logarithm (to base 10)
10,000,000,000	10^{10}	10
1,000,000,000	10^9	9
100,000,000	10^8	8
10,000,000	10^7	7
and so on down to		
10	10	1
1	10^0	0
0.1	10^{-1}	–1
0.01	10^{-2}	–2
down to very small numbers like		
0.000,000,000,1	10^{-10}	–10

The bel and the decibel

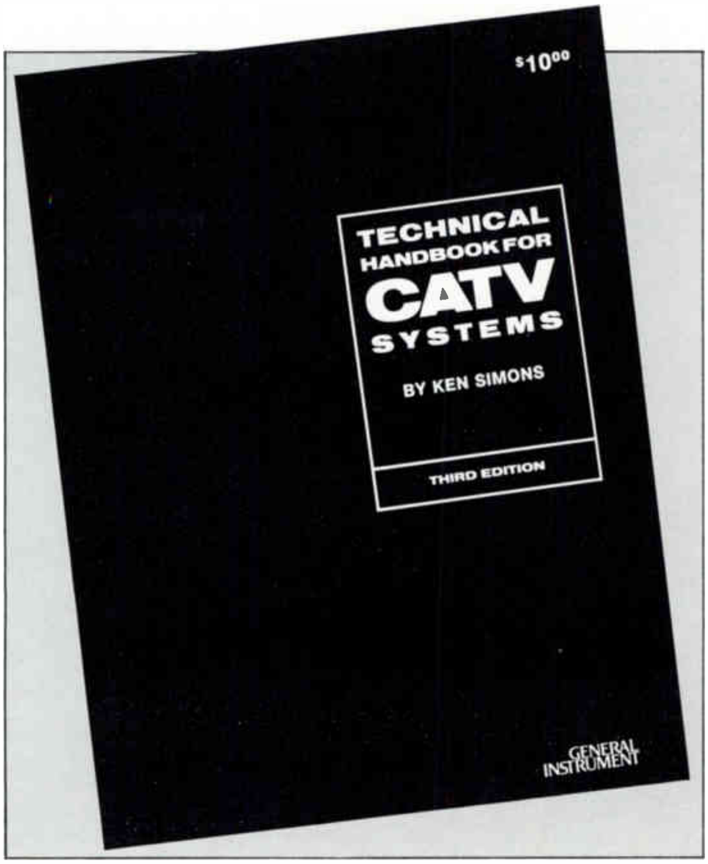
When telephones were first put into use it was discovered that the longer the wires between two phones, the weaker the signal arriving at the receiving end became. The convenient and obvious method for expressing how much the signal has weakened was to do so in terms of a length of "standard" cable. Just as 110 volts means a quantity 110 times a standard of one volt, the telephone people would refer to a weakening of a signal as being some number of times that which would occur in a mile of this standard cable.

As time went by, the telephone people further discovered that 10 miles of the standard cable reduced the signal power by a factor of approximately 10 times. They set up this amount of attenuation (decrease), namely 10 to 1 power loss, as a unit. They called it a "bel," inspired by the name of their company's famous founder. Mathematically, they defined the bel in logarithmic terms since it described signal attenuation in logarithmic rather than simply linear terms. The formula is:

$$\text{Loss (in bels)} = \log_{10} \frac{\text{input power}}{\text{output power}}$$

When input power = 10x output power, this becomes a loss (in bels) = $\log_{10} 10 = 1$; in other words, a loss of 1 bel corresponds to a reduction of 10:1 in power.

Just as a farad was discovered to be too large for practical use, so that most capacitors are measured in microfarads or picofarads, the bel was found to be too clumsy. The unit which came into use was the



one-tenth-of-a-bel or "decibel" (abbreviated "dB"). Adjusting our formula to read in decibels, we find that:

$$\text{Loss in decibels} = 10 \log_{10} \frac{\text{input power}}{\text{output power}}$$

A decibel then was the attenuation caused by a mile of the standard phone cable. The important feature to remember about a dB is that it is an expression of a ratio between two levels—an input and an output. We've originally stated this as a ratio between two power levels, but it can be used for voltage or current levels as well. Assuming the input and output impedances are the same, we can convert the formula directly:

Since Power $= \frac{E^2}{R}$,

$$\frac{\text{input power}}{\text{output power}} = \frac{(\text{input voltage})^2}{(\text{output voltage})^2}$$

We know that:

$\log_{10} (\text{any number})^2 = 2 \log_{10} (\text{that number})$.

For example, $\log_{10} (27)^2 = 2 \log_{10} 27$. So

$$\log_{10} \frac{(\text{input voltage})^2}{(\text{output voltage})^2} = 2 \log_{10} \frac{\text{input voltage}}{\text{output voltage}};$$

and since loss in dB =

$$10 \log_{10} \frac{\text{input power}}{\text{output power}} = 10 \log_{10} \frac{(\text{input voltage})^2}{(\text{output voltage})^2}$$

then loss in dB =

$$10 \left(2 \log_{10} \frac{\text{input voltage}}{\text{output voltage}}\right) = 20 \log_{10} \frac{\text{input voltage}}{\text{output voltage}}$$

and similarly for current ratios.

How this works out for a range of voltage and power ratios can be seen in Table B. (The two voltages must be measured at the same impedance level.)

Table B

Input power / Output power	Loss in dB	Input voltage / Output voltage
10,000,000,000	100	100,000
100,000,000	80	10,000
1,000,000	60	1,000
10,000	40	100
100	20	10
1	0	1

The dB can also be used to express gain, the opposite of loss. The formula becomes:

$$\text{Gain (in dB)} = 10 \log_{10} \frac{\text{output power}}{\text{input power}},$$

or, for voltage:

$$\text{Gain (in dB)} = 20 \log_{10} \frac{\text{output voltage}}{\text{input voltage}}$$

and again, similarly for current.

The dBmV

Power levels at various points in a CATV system are of primary importance, forming the technical basis of system operation. The antenna output must be high enough to provide noise-free pictures. The amplifier output must be held to optimum level for minimum system noise and cross-mod. To express levels (as contrasted with power ratios), a standard reference level is needed so the dB ratio of the power at any point in the system to this standard level can be computed. Early in the history of CATV systems the power corresponding to an RMS (root mean square; explained later in this chapter) voltage of 1 millivolt across 75 ohms was chosen as the reference. This is approximately the input required for a noise-free picture on an ordinary receiver, so its use provides dB levels indicating approximately how much attenuation is allowable between the point in question and the receiver.

The level at any point in the system expressed in dBs above the 1 millivolt/75-ohm standard is said to be the level in decibel-millivolts or dBmV. In other words: voltage level (in dBmV) =

$$20 \log_{10} \frac{\text{voltage in millivolts at that point}}{\text{standard level (1 millivolt)}}$$

when the voltage is measured at the 75-ohm impedance level.

Simplified, this reads:

dBmV = 20 $\log_{10}$ (voltage in millivolts) at 75 ohms impedance.

Table C shows the dBmV levels in a 75-ohm system corresponding to decade multiples of 1 microvolt.

Table C

RMS voltage across 75 ohms	dBmV
1 volt	+60
100 millivolts	+40
10 "	+20
1 "	0
100 microvolts	-20
10 "	-40
1 "	-60

Tables D and E can be used to find the voltage for any integral number of dBmV. Follow the applicable rule.

For positive dBmV:
1. Subtract from the given level that multiple of 20 dB giving a level within the range of Table D.
2. Multiply the voltage found opposite that level by the multiple of 10 corresponding to the dBs subtracted:

If you subtract	Multiply millivolts from Table D by
20 dB	10
40 dB	100
60 dB	1,000
80 dB	10,000

For example: Given +78 dBmV.
1. Subtract 60 dB giving +18 dBmV. Corresponding voltage is 7.94 millivolts.
2. Multiply by 1,000 (corresponding to the 60 dB added). Voltage corresponding to +78 dBmV is 7.94 x 1,000 = 7,940 millivolts or 7.94 volts.

Table D
For +dBmV

dBmV	Millivolts	dBmV	Millivolts
0	1.00	+10	3.16
+1	1.12	+11	3.55
+2	1.26	+12	3.98
+3	1.41	+13	4.47
+4	1.59	+14	5.01
+5	1.78	+15	5.62
+6	2.00	+16	6.31
+7	2.24	+17	7.08
+8	2.51	+18	7.94
+9	2.82	+19	8.91
+10	3.16	+20	10.00

For negative dBmV:
1. Add to the given level that multiple of 20 dB giving a level within the range of Table E.
2. Divide the voltage found opposite that level by the multiple of 10 corresponding to the dBs added:

If you add	Divide microvolts from Table E by
20 dB	10
40 dB	100

For example: Given -59 dBmV.
1. Add 40 dB, giving -19 dBmV. Corresponding voltage is 112 microvolts.
2. Divide by 100 (corresponding to the 40 dB added) giving 1.12 microvolts.

Table E
For -dBmV

dBmV	Microvolts	dBmV	Microvolts
0	1000	-10	316
-1	891	-11	282
-2	794	-12	251
-3	708	-13	224
-4	631	-14	200
-5	562	-15	178
-6	501	-16	159
-7	447	-17	141
-8	398	-18	126
-9	355	-19	112
-10	316	-20	100

Conversion tables
Chapter XI contains Tables V3, V4, V5 and V6 which allow more accurate conversion between dBmV and voltages than the example Table E above. In addition, other tables and charts are given for converting between decibel expressions and related electrical quantities. How those tables were derived and how to use them is explained in the following chapters.

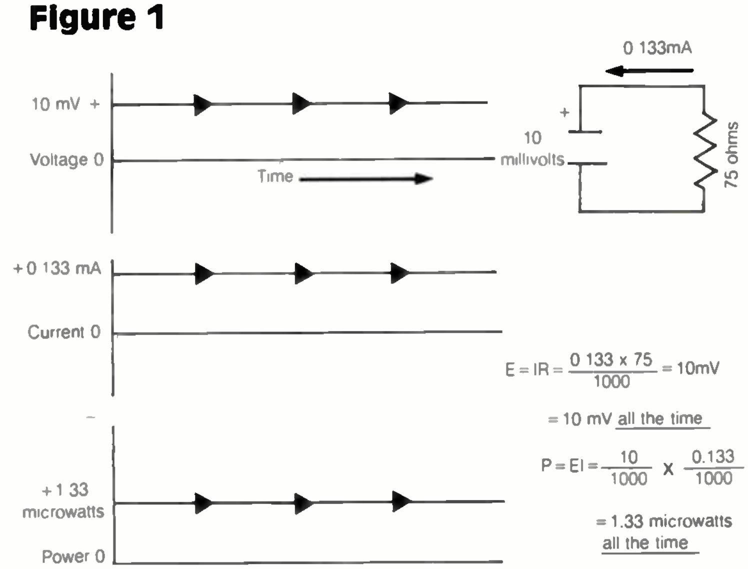
Signal voltage in CATV systems

We know that when we speak of a picture level of, say, +20 dBmV, we mean that the voltage is 20 dB above one-millivolt-across-75-ohms, or 10 millivolts. But what exacty do we mean by that?

An actual picture signal is a high frequency sinusoidal carrier modulated with video information. Its peak amplitude varies all the time. Does our 10 millivolts refer to average voltage, peak voltage, effective voltage or what?

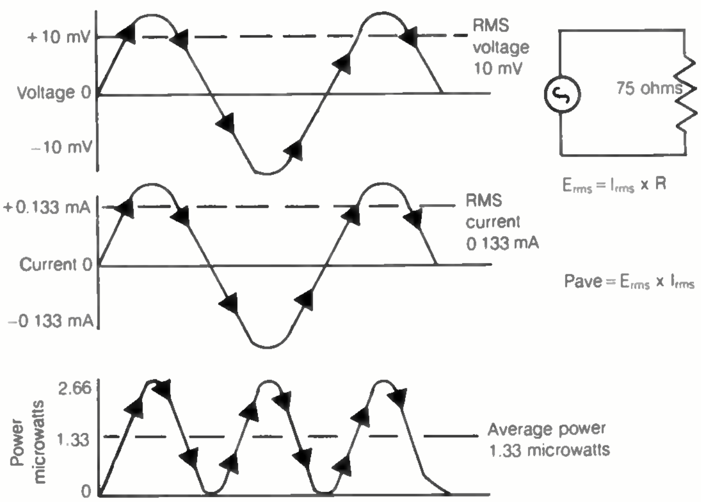
A quick review of some fundamentals may help to understand. Consider the relationships in a simple dc circuit as shown in Figure 1.

Figure 1



In a dc circuit like this everything is easy, because all the quantities are constant. The voltage is 10 millivolts (all the time), the current is 0.133 mA (all the time) and the power is constant. There is no difficulty agreeing on what each quantity means in this situation.

When the voltage and current vary with time there is need for explanation. What kind of voltage is meant? Consider a circuit, similar to that in Figure 1, but with sine-wave ac voltage and current as shown in Figure 2.

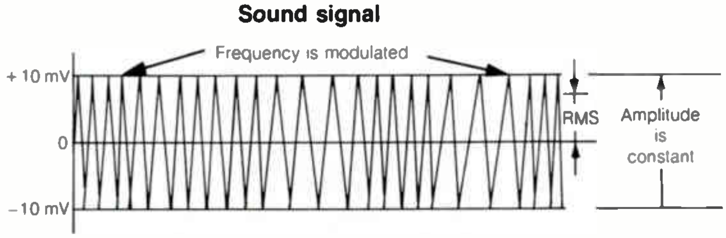


Since the voltage, current and power are varying all the time, they can be expressed or measured by a single number only after there is agreement as to what that number means in reference to the varying quantities. In the case of sine-wave ac, "RMS" voltage and current are generally used. The RMS quantities are the effective quantities. An ac voltage of 10 millivolts RMS will have the same "effect," that is, it will cause the same average power loss in a resistor, as a 10 mV dc voltage. Although the actual voltage in the above circuit reaches plus and minus peaks of 14.14 millivolts, 10 millivolts describes its "effect." The current goes to plus and minus 0.188 mA, but its heating effect is the same as that of a dc current of 0.133 mA. The power reaches 2.66 microwatts but the average power is 1.33 microwatts. Using RMS quantities simplifies calculations by making the product of RMS volts times RMS amps. equal to average watts. *(Note that, for a constant amplitude sine-wave voltage or current, the RMS value is always 0.707 x the peak voltage or current.)*

Voltage measurement of the TV sound signal

The TV sound signal is frequency-modulated. This means that it shows up in the CATV system as a high-frequency sine-wave ac voltage with constant amplitude, and with a frequency that is varied above and below the center frequency at an audio rate. Figure 3 illustrates this. Since the amplitude is constant, the sound signal is measured in terms of the RMS voltage present, just like a c-w signal, its effective voltage being 0.707 x the peak voltage.

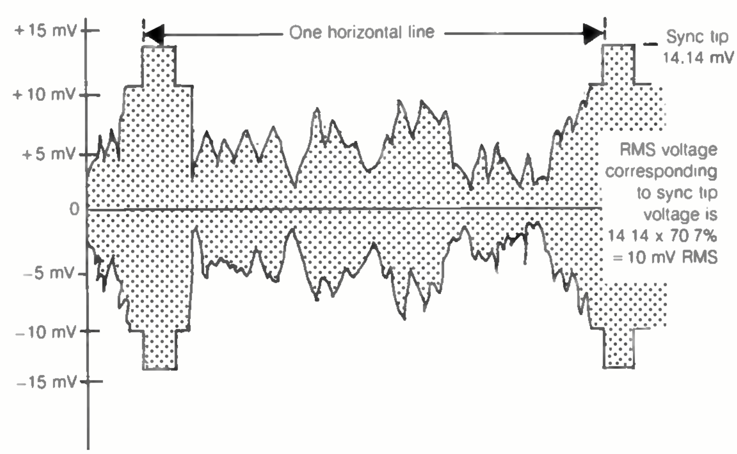
Figure 3



Voltage measurement of the TV picture signal

The TV picture signal in a CATV system is amplitude-modulated. It shows up as a high-frequency sine-wave ac voltage with constant frequency, but with amplitude varied by the picture information. At the end of each horizontal line it goes to full amplitude during the sync pulse, as shown in Figure 4.

Figure 4



When the picture is viewed like this, with the oscilloscope timed to show one horizontal line, the individual cycles of sine-wave variation are not seen because there are so many of them. During one horizontal sync pulse the voltage of a Channel 6 TV signal, for example, goes through more than 400 cycles. As the camera scans, the part of the signal between sync pulses constantly changes in amplitude to spell out the picture information. The only part of the signal that does not change in amplitude is the pedestal and the sync pulse. For this reason, signal strength measurements for a modulated TV picture signal are always referred to the sync level. The statement "the pix level is +20 dBmV" or "there is 10 millivolts of picture signal" means that the amplitude of the ac voltage during the sync pulse is the same as the amplitude of an unmodulated 10-millivolt RMS signal. Another way of saying the same thing is: "a modulated TV picture signal is measured in terms of 0.707 times its instantaneous peak value" (which peak occurs at the maximum of each cycle during the sync pulse).

Field strength meter calibration

Field strength meters for CATV are generally calibrated so they read the RMS voltage and the dBmV level of the signal to which they are tuned. In the calibration procedure of Jerrold Models 704-B and 727 the instruments are adjusted to read correctly on an accurately measured c-w signal. Since the detector which drives the indicating meter responds only approximately to the peak of the signal (even though the meter indicates RMS) the indication is slightly low when a TV picture carrier is tuned in. This error is usually quite small, in the order of 1 dB or less, depending on how close the detector comes to responding to true peak voltage.

This chapter of the "Technical Handbook for CATV Systems" is being reprinted courtesy of the General Instrument Corp.'s Jerrold Division. To obtain one complete copy of the "Technical Handbook," send $10.00 plus $1.50 for postage and handling to: Technical Handbook Order, Customer Service Department, General Instrument/Jerrold Division, 2200 Byberry Rd., Hatboro, Pa. 19040. Jerrold customers may place orders with their customer service representative. (Make checks payable to General Instrument/Jerrold Division.)

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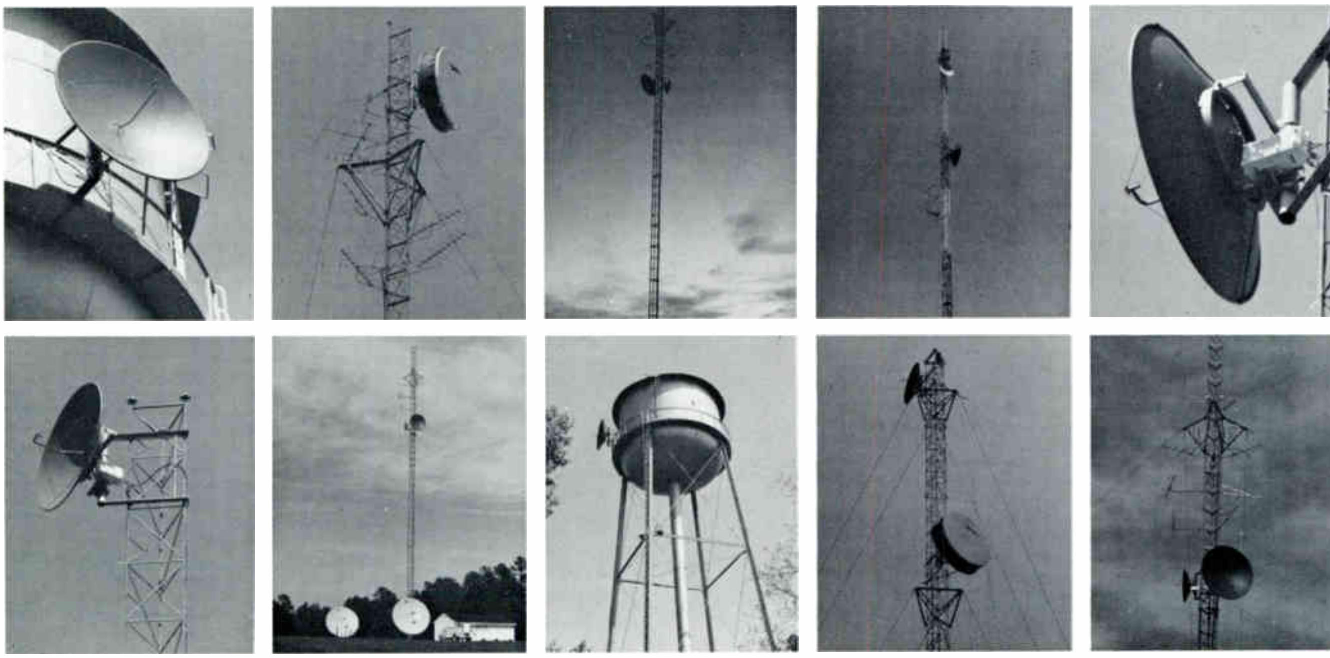

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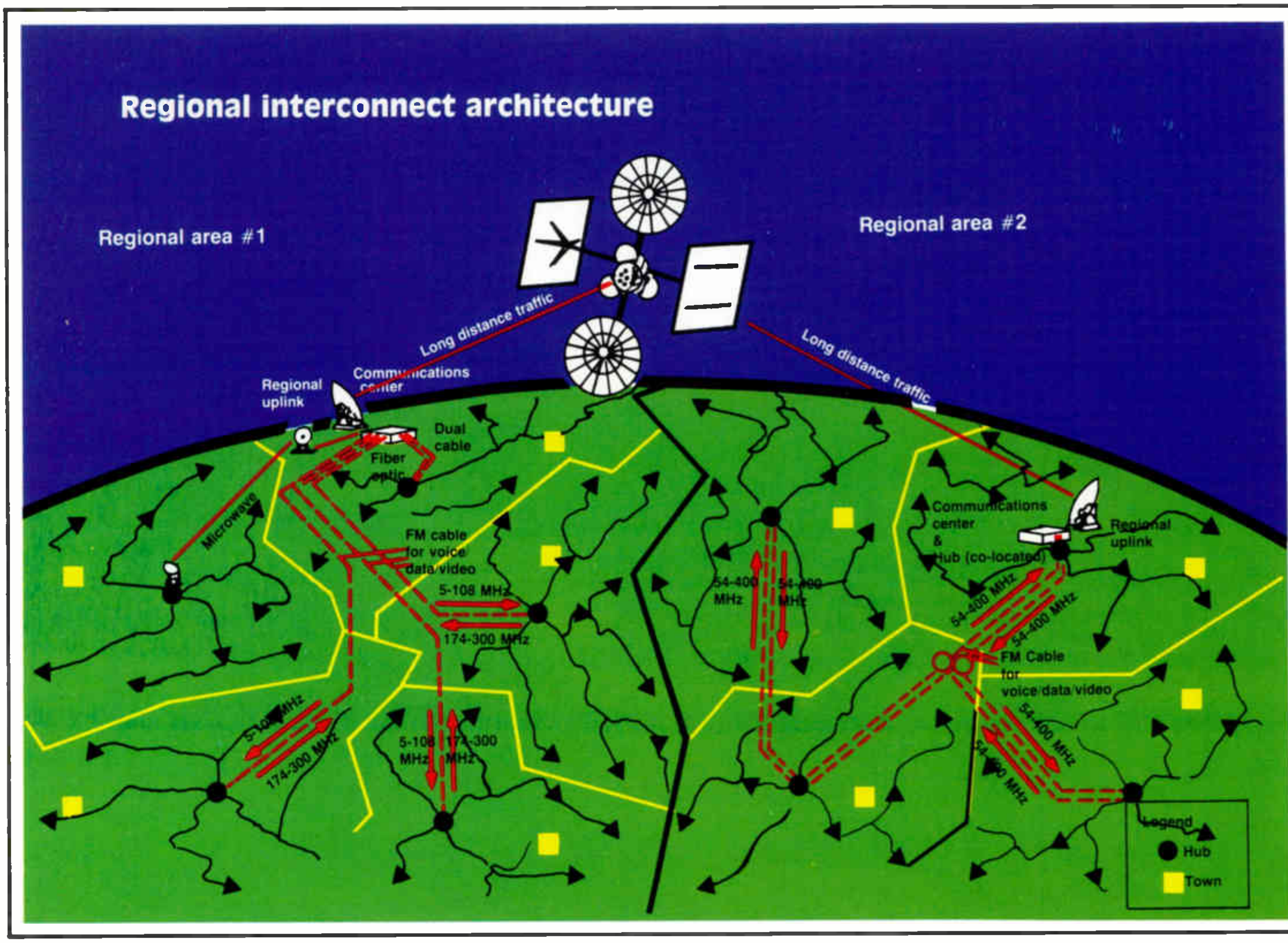


Ernest Tunmann and Tele-Engineering Corp

Digital termination systems will provide the regional interconnect, while cable system hubs are the collecting and routing point for local broadband transmissions.

Data communications—The time is now

With local and metropolitan area network markets utilizing coax, CATV could be an easy shoe-in

The vision of the cable industry must go beyond providing quality programming and entertainment (for homes in the metropolitan area). The potential markets that are in the making will be lost opportunities if the response of operators is one of hesitation. The wisest man in the world, divinely inspired, once said: "The plans of the diligent lead surely to advantage, but everyone who is hasty comes surely to poverty." The present is the time to act, to prepare plans to gain the advantage. So is the state of the CATV industry, with respect to the data transmission market.

By Michael A. Radigan
Pioneer Communications of America Inc

The divestiture of AT&T has opened up new opportunities and is making local bypass economically feasible. New ventures in digital termination systems will necessitate broadband facilities. The office of the future, which is here today, is demanding voice, data and video transmission systems. These and other consumer markets are becoming reality very quickly.

Those poised to meet the needs are moving now. Hardware designs are enhancing the telco's data services, computer manufacturers are making efforts to bypass telephone lines with their own high capacity data communication networks, and large communication distributors are out to provide point-to-point communication links for corporate voice-data requirements.

Where will CATV get its share of the data communication marketplace from, and how can the cable operator gain the advantage over his competitor?

Corporate communications market

There are two potential markets available to the CATV industry. Foremost is the corporate communications needs, which require local and long distance, in-house, high-speed data transmission capabilities. The local needs comprise up to 25 percent of the total office communications.

Presently, the most economical way to make this exchange of data is through telcos. But the limitations of this medium are manifold and will, in this present state, fall short of the requirement to provide low cost, high-speed data communication reliably.

Coaxial cable's greater bandwidth enables high data transmission speeds at lower bit error rates. Efficiency of bandwidth use can enable the CATV system to offer a higher quality link at a cost attractive to the user. This advantage will be much more significant as

the telco's rates increase due to the divestiture. In addition, the capability of providing voice and video, as well as data, sets the cable operator apart from all other competitors.

The proposed digital termination systems (DTS), which will compete to offer a bypass option, also are focusing on data transmissions alone and will not tap the lucrative voice/video market. (All the major long distance carriers are in competition to meet the data communication needs of corporations using DTS.) DTS will actually open up greater opportunities for the CATV industry to provide the local distribution network needed to link their customers to the earth stations.

While DTS will primarily provide the city-to-city communication network through microwave and uplinks, this option is over a year away from meeting its expected potential. The need, however, presently exists for metro data communications and will increase as more institutions and corporations implement local area networks (LANs). CATV only needs to extend itself to be in a commanding position as the demand becomes greater.

Data and ancilliary services

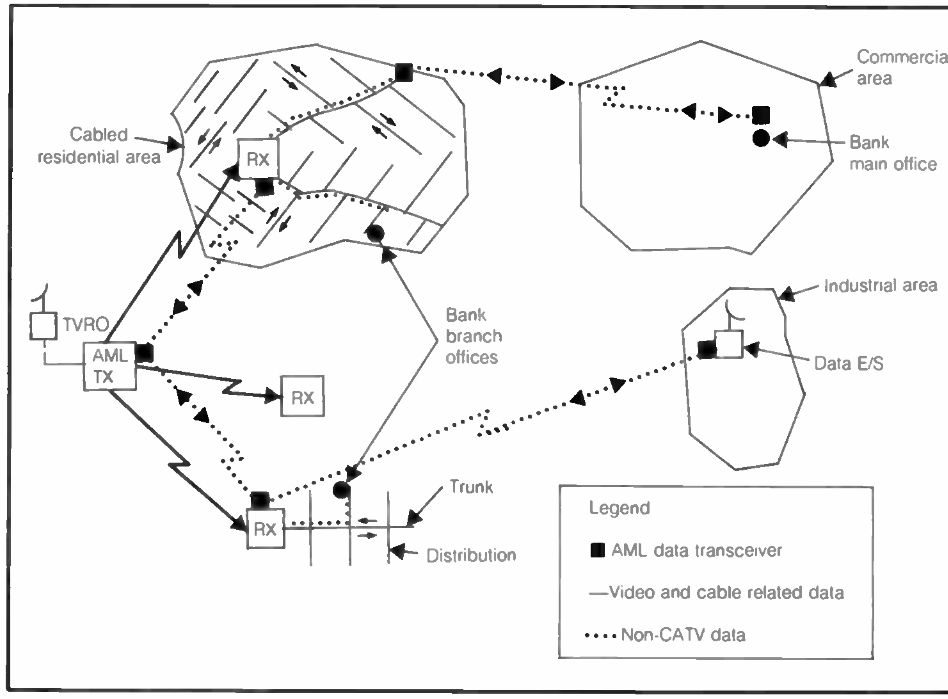
The second market, less developed but emerging, is data and ancilliary services to the CATV subscriber. Although the present demand for enhanced services is not as strong as entertainment (programming), the potential is great and the future promises to be bright.

The micro computer, which revolutionized the intelligence of office terminals and thus the corporate network, is about to do the same for the metropolitan network. Already time-sharing services and information providers are tapping households via phone lines. Consumers are demanding services that were previously developed for corporations.

Many pilot systems have been testing other ancilliary services (electronic mail, shopping at home, etc.) with positive results. Others, such as Cox's Cableguard Security System and Warner Amex Security, have been operating over longer periods of time with great success. Yet very few have considered implementing complete data communications capabilities, creating a metropolitan network where each node (subscriber) has the potential to communicate with any other node (subscriber) in the network (CATV plant).

The tree topology of the cable plant makes this type of communication possible. The technology is developed and products are available to transform the cable plant into a giant bus. This project seems to have great potential in future years but is only "blue sky" at present. Yet after careful consideration, such networks cannot be written off. The mentality of the CATV industry must be altered to see the practicality of such a venture.

The demand for reliable, cost efficient data communications will require the CATV operator to invest in upgrading the plant to meet the data communication requirements. A superior product will be the result and a share of the market inevitable. Data transmission service can be a revenue providing venture that will rival entertainment services.



Hughes Aircraft Co., Microwave Communications Products

The cable TV industry must be prepared to provide data services to both the industrial and residential customers.

Metropolitan cable systems are in a position to be forerunners in data communications services. The practical steps needed for data communications must be part of an overall strategy to tap both markets. The advantage can only be gained if the industry expands its vision and formulates plans to initiate action.

The next issue will address these practical measures; specifically the technology required to implement a system that will enable complete data communications, a metropolitan area network.

The Federal Communications Commission: All you need to know and much more

The following material on the FCC is designed as an introduction to the Commission and its practices. It is by no means all inclusive, but does cover several areas of interest: Subpart K of the FCC Rules covering technical standards for cable systems, a partial index by subject to the Rules, how the Rules are made and an organizational chart for the FCC. Next month's issue of "Communications Technology" will include a short true and false quiz on the FCC—so be prepared.

FCC Rules Subpart K

§ 76.601 Performance tests

(a) The operator of each cable television system shall be responsible for insuring that each such system is designed, installed, and operated in a manner that fully complies with the provisions of this subpart. Each system operator shall be prepared to show, on request by an authorized representative of the Commission, that the system does, in fact, comply with the Rules.

(b) The operator of each cable television system shall maintain at its local office a current listing of the cable television channels which that cable television system delivers to its subscribers and the station or stations whose signals are delivered on each Class I cable television channel.

(c) The operator of each cable television system shall conduct complete performance tests of that system at least once each calendar year (at intervals not to exceed 14 months) and shall maintain the resulting test data on file at the operator's local business office for at least five (5) years. It shall be made available for inspection by the Commission on request. The performance tests shall be directed at determining the extent to which the system complies with all the technical standards set forth in § 76.605. The tests shall be made on each Class I cable television channel specified pursuant to paragraph (b) of this section, and shall include measurements made at no less than three widely separated points within each mechanically continuous set of cables within the cable television system. Within each mechanically continuous set of cables, at least one measurement point shall be representative of terminals most distant from the system input in terms of cable distance. The measurements may be taken at convenient monitoring points in the cable network: *Provided*, That data shall be included to relate the measured performance to the system performance as would be viewed from a nearby subscriber terminal. A description of instruments and procedures and a statement of the qualifications of the person performing the tests shall be included.

(d) Successful completion of the performance tests required by paragraph (c) of this section does not relieve the system of the obligation to comply with all pertinent technical standards at all subscriber terminals. Additional tests, repeat tests, or tests involving specified subscriber terminals may be required by the Commission in order to secure compliance with the technical standards.

(e) [Reserved]

(f) The provisions of paragraphs (b) and (c) of this section shall not apply to any cable television system having fewer than 1000 subscribers: *Provided, however*, That any cable television system using any frequency spectrum other than that allocated to over-the-air television and FM broadcasting (as described in §§73.603 and 73.210) is required to conduct all tests, measurements, and monitoring of radiation and signal leakage that are required by this subpart.

NOTE—Requirements for performing tests to determine compliance with the standards of § 76.605(a)(9), insofar as it relates to the ratio of visual signal level to any undesired co-channel television signal, and (a)(10) are hereby suspended for all cable television systems, pending further action by the Commission.

§ 76.605 Technical standards

(a) The following requirements apply to the performance of a cable television system as measured at any subscriber terminal with a matched termination, and to each of the Class I cable television channels in the system:

(1) The frequency boundaries of cable television channels delivered to subscriber terminals shall conform to those set forth in § 73.603(a) of this chapter: *Provided, however*, That on special application including an adequate showing of public interest, other channel arrangements may be approved.

(2) If no frequency converter is supplied to the subscriber the visual carrier frequency shall be maintained 1.25 MHz ±25 kHz above the lower frequency boundary of the cable television channel. If a frequency converter is supplied to the subscriber by the cable television system, the following requirement shall be applied at the interface between the converter and the subscriber's terminal equipment: when the visual carrier at the output of the converter has been tuned to a frequency 1.25 MHz above the lower frequency boundary of the cable television channel with the converter stabilized at an ambient temperature between 20°C and 25°C, the frequency of the visual carrier shall not vary more than ±250 kHz for a period of at least three hours, during which period the ambient temperature may vary ±5°C about the initial ambient temperature.

NOTE—A relaxed frequency tolerance will be permitted when both of the following conditions are met: (a) the signal is received by means of a television broadcast translator station, and (b) the cable television system carries signals on neither an upper nor a lower channel adjacent in frequency to the channel on which the translator signal is carried. In such cases, the visual carrier frequency shall be maintained 1.25 MHz ±(25+T) kHz above the lower frequency boundary of the cable television channel, where T is the frequency tolerance in kHz allowed the television broadcast translator station pursuant to § 74.761 of this chapter.

(3) The aural center frequency of the aural carrier shall be 4.5 MHz ±1 kHz above the frequency of the visual carrier.

(4) The visual signal level, across a terminating impedance which correctly matches the internal impedance of the cable system as viewed from the subscriber terminals, shall be not less than the following appropriate value:

Internal impedance:	Visual signal level:
75 ohms	1 millivolt
300 ohms	2 millivolts

(At other impedance values, the minimum visual signal level shall be $\sqrt{0.0133\ Z}$ millivolts, where Z is the appropriate impedance value.)

(5) The visual signal level on each channel shall not vary more than 12 decibels within any 24-hour period and shall be maintained within:

(i) 3 decibels of the visual signal level of any visual carrier within 6 MHz nominal frequency separation, and

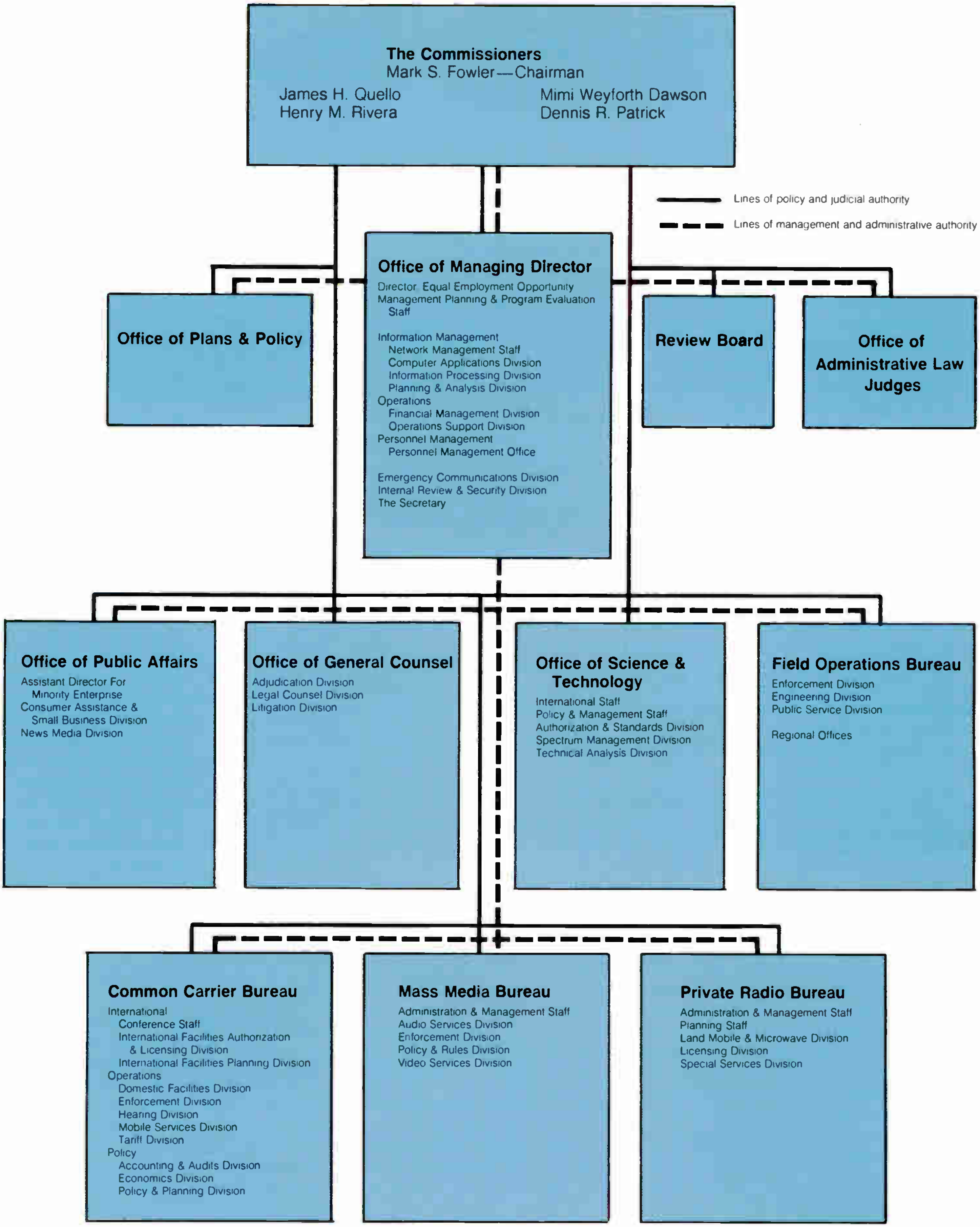
(ii) 12 decibels of the visual signal level on any other channel, and

(iii) A maximum level such that signal degradation due to overload in the subscriber's receiver does not occur.

(6) The rms voltage of the aural signal shall be maintained between 13 and 17 decibels below the associated visual signal level; except that, if the cable television system carries signals on neither an upper nor a lower channel adjacent to the first channel, the rms voltage of the aural signal shall be maintained between 7 and 17 decibels below the associated visual signal level.

(7) The peak-to-peak variation in visual signal level caused by undesired low frequency disturbances (hum or repetitive transients) generated within the system, or by inadequate low fre-

FCC organizational chart



quency response, shall not exceed 5 percent of the visual signal level.

(8) The amplitude characteristic shall be within a range of ±2 decibels from 0.75 to 5.0 MHz above the lower boundary frequency of the cable television channel, referenced to the average of the highest and lowest amplitudes within these frequency boundaries.

(9) The ratio of visual signal level to system noise, and of visual signal level to any undesired co-channel television signal operating on proper offset assignment, shall not be less than 36 decibels. This requirement is applicable to:

(i) Each signal which is delivered by a cable television system to subscribers within the predicted Grade B contour for that signal, or

(ii) Each signal which is first picked up within its predicted Grade B contour, or

(iii) Each signal which is first received by the cable television system by direct video feed from a television broadcast station.

(10) The ratio of visual signal level to the rms amplitude of any coherent disturbances such as intermodulation products or discrete-frequency interfering signals not operating on proper offset assignments shall not be less than 46 decibels.

(11) The terminal isolation provided each subscriber shall be not less than 18 decibels, but in any event, shall be sufficient to prevent reflections caused by open-circuited or short-circuited subscriber terminals from producing visible picture impairments at any other subscriber terminal.

(12) As an exception to the general provision requiring measurements to be made at subscriber terminals, and without regard to the class of cable television channel involved, radiation from a cable television system shall be measured in accordance with procedures outlined in § 76.609(h), and shall be limited as follows:

Frequencies	Radiation limit (microvolts/meter)	Distance (feet)
Up to and including 54 MHz	15	100
Over 54 up to and including 216 MHz	20	10
Over 216 MHz	15	100

(b) Cable television systems distributing signals by using multiple cable techniques or specialized receiving devices and which, because of their basic design, cannot comply with one or more of the technical standards set forth in paragraph (a) of this section, may be permitted to operate provided that an adequate showing is made which establishes that the public interest is benefited. In such instances the Commission may prescribe special technical requirements to ensure that subscribers to such cable television systems are provided with a good quality of service.

§ 76.609 Measurements

(a) Measurements made to demonstrate conformity with the performance requirements set forth in §§ 76.601 and 76.605 shall be made under conditions which reflect system performance during normal operations, including the effect of any microwave relay operated in the Cable Television Relay Service (CARS) intervening between pickup antenna and the cable distribution network. Amplifiers shall be operated at normal gains, either by the insertion of appropriate signals or by manual adjustment. Special signs inserted in a cable television channel for measurement purposes should be operated at levels approximating those used for normal operation. Pilot tones, auxiliary or substitute signals, and non-television signals normally carried on the cable television system should be operated at normal levels to the extent possible. Some exemplary, but not mandatory, measurement procedures are set forth in this section.

(b) When it may be necessary to remove the television signal normally carried on a cable television channel in order to facilitate a performance measurement, it will be permissible to disconnect the antenna which serves the channel under measurement and to substitute therefore a matching resistance termination. Other antennas and inputs should remain connected and normal signal levels should be maintained on other channels.

(c) As may be necessary to ensure satisfactory service to a subscriber, the Commission may require additional tests to demonstrate system performance or may specify the use of different test procedures.

(d) The frequency response of a cable television channel may be determined by one of the following methods, as appropriate:

(1) By using a swept frequency or a manually variable signal generator at the sending end and a calibrated attenuator and frequency-selective voltmeter at the subscriber terminal; or

(2) By using a multiburst generator and modulator at the sending end and a demodulator and oscilloscope display at the subscriber terminal.

(e) System noise may be measured using a frequency-selective voltmeter (field strength meter) which has been suitably calibrated to indicate rms noise or average power level and which has a known bandwidth. With the system operating at normal level and with a properly matched resistive termination substituted for the antenna, noise power indications at the subscriber terminal are taken in successive increments of frequency equal to the bandwidth of the frequency-selective voltmeter, summing the power indications to obtain the total noise power present over a 4 MHz band centered within the cable television channel. If it is established that the noise level is constant within this bandwidth, a single measurement may be taken which is corrected by an appropriate factor representing the ratio of 4 MHz to the noise bandwidth of the frequency-selective voltmeter. If an amplifier is inserted between the frequency-selective voltmeter and the subscriber terminal in order to facilitate this measurement, it should have a bandwidth of at least 4 MHz and appropriate corrections must be made to account for its gain and noise figure. Alternatively, measurements made in accordance with the NCTA standard on noise measurement (NCTA Standard 005-0669) may be employed.

(f) The amplitude of discrete frequency interfering signals within a cable television channel may be determined with either a spectrum analyzer or with a frequency-selective voltmeter (field strength meter), which instruments have been calibrated for adequate accuracy. If calibration accuracy is in doubt, measurements may be referenced to a calibrated signal generator, or a calibrated variable attenuator, substituted at the point of measurement. If an amplifier is used between the subscriber terminal and the measuring instrument, appropriate corrections must be made to account for its gain.

(g) Annual measurements of terminal isolation are not required when either (1) the manufacturer's specifications for coupler directivity or (2) laboratory measurements on a representative sample of the couplers, plus an allowance for the attenuation of drop cables, indicate that the requirements of § 76.605(a)(11) are met.

(h) Measurements to determine the field strength of radio frequency energy radiated by cable television systems shall be made in accordance with standard engineering procedures. Measurements made on frequencies above 25 MHz shall include the following:

(1) A field strength meter of adequate accuracy using a horizontal dipole antenna shall be employed.

(2) Field strength shall be expressed in terms of the rms value of synchronizing peak for each cable television channel for which radiation can be measured.

(3) The dipole antenna shall be placed 10 feet above the ground and positioned directly below the system components. Where such placement results in a separation of less than 10 feet between the center of the dipole antenna and the system components, the dipole shall be repositioned to provide a separation of 10 feet.

(4) The horizontal dipole antenna shall be rotated about a vertical axis and the maximum meter reading shall be used.

(5) Measurements shall be made where other conductors are 10 or more feet away from the measuring antenna.

(i) Annual measurements of frequency stability of set top converters, when such converters are supplied by the cable television operator, are not required when either of the following indicates that

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1701 FORTUNE DR. • SAN JOSE, CA 95131 • (408) 262-0541 the requirements of § 76.605(a)(2) are met: (1) manufacturer's specifications based on a representative sample of the converters, or (2) laboratory tests performed by or for the cable television system operator on a representative sample of the converters. Proof of performance tests for frequency stability will not be required for converters ordered from the manufacturer prior to September 6, 1977.

§ 76.610 Operation in the frequency bands 108-136 and 225-400 MHz

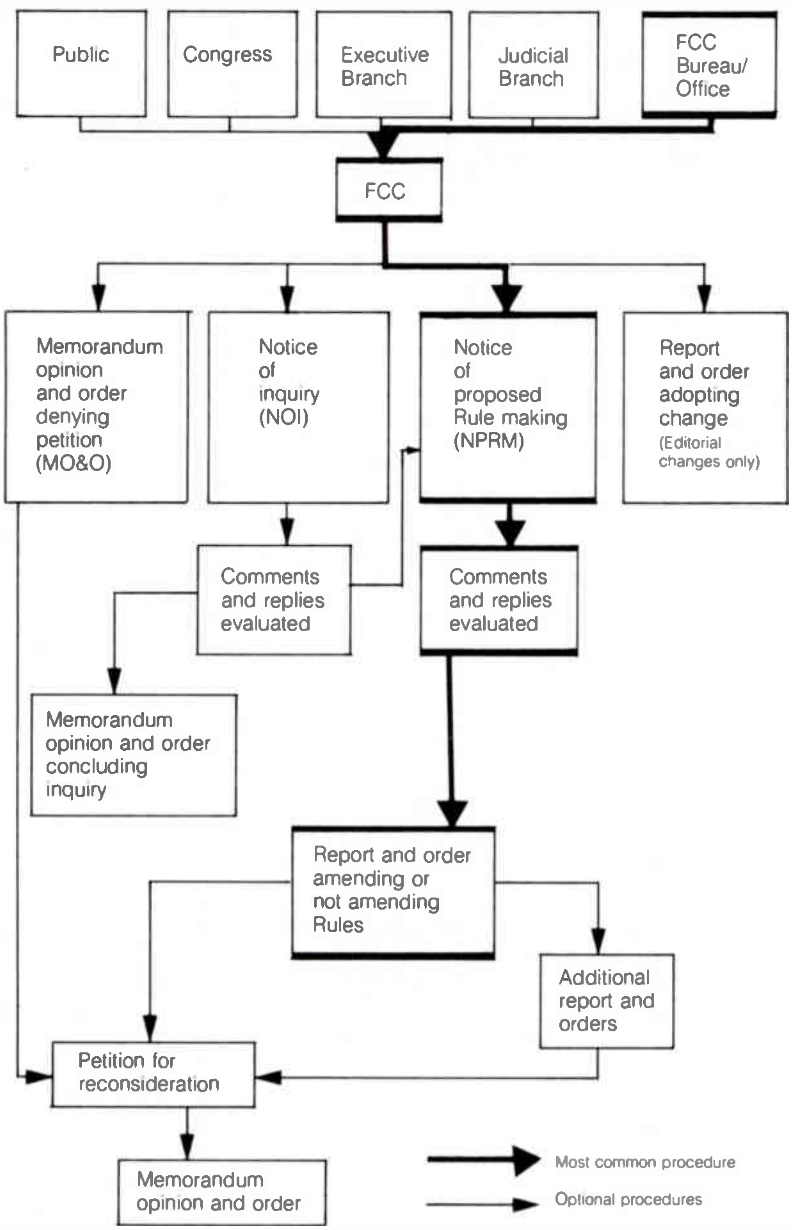
All cable television systems transmitting carriers or other signal components capable of delivering peak power equal to or greater than 10^{5} watts at any point in the cable system in the frequency bands 108-136 and 225-400 MHz for any purpose are subject to the following requirements:

(a) The operator of the cable system shall notify the Commission annually of all signals carried in these bands, noting the type of information carried by the signal (television, aural, or pilot carrier and system control, etc). The timely filing of FCC Form 325, Schedule 2, will meet this requirement.

(b) The operator of the cable system shall notify the Commission of proposed use of any new frequency or frequencies in these bands. Notification shall include carrier and subcarrier frequencies, types of modulation, and maximum peak power occurring at any location in the cable distribution system. No system shall commence use of any frequency or frequencies in these bands without prior Commission authorization.

(c) The operator of the cable system shall maintain at its local office a current listing of all signals carried in these bands, noting carrier and subcarrier frequencies, types of modulation, and maxi-

How FCC Rules are made



*This brief account of how Rules are made at the FCC merely highlights the major components of the process. For details, contact the Dockets Branch.

**This chart was prepared with the assistance of staff members from several Bureaus and Offices, particularly Sharon Briley.

Steps:

1. Initiation of action. Suggestions for changes to the FCC Rules and Regulations can come from sources outside of the Commission either by formal petition, legislation, court decision, or informal suggestion. In addition, a bureau/office within the FCC can initiate a Rule making proceeding on its own.

2. Bureau/office evaluation. When a petition for Rule making is received, it is sent to the appropriate bureau(s)/office(s) for evaluation. If a bureau/office decides a particular petition is meritorious, it can request that dockets assign a Rule making (RM) number to the petition. A similar request is made when a bureau/office decides to initiate a Rule making procedure on its own. A weekly notice is issued listing all accepted petitions for Rule making; the public has 30 days to submit comments. The bureau/office then has the option of generating an agenda item requesting one of four actions by the Commission. If an NOI or NPRM is issued, a docket is instituted, and a docket number is assigned.

3. Possible commission actions. Major changes to the Rules are presented to the public as either an NOI or NPRM. The Commission will issue an NOI when it is simply asking for information on a broad subject or trying to generate ideas on a given topic; an NPRM is issued when there is a specific change to the Rules being proposed. If an NOI is issued, it must be followed by either an NPRM or an MO&O concluding the inquiry.

4. Comments & replies evaluated. When an NOI or NPRM has been issued, the public is given the opportunity to comment initially, and then respond to the comments that are made. When the Commission does not receive sufficient comments to make a decision, a further NOI or NPRM may be issued, again calling for comments and replies. It may be determined that an oral argument before the Commission is needed to provide an opportunity for the public to testify before the Commission, as well as for the bureau(s)/office(s) to present diverse opinions concerning the proposed Rule change.

5. Report and order issued. A report and order is issued by the Commission stating the new or amended Rule, or stating that the Rules will not be changed. The proceeding may be terminated in whole or in part.

6. Additional report and orders issued. The Commission may issue additional report and orders in the docket.

7. Reconsideration given. Petitions for reconsideration may be filed by the public within 30 days; they are reviewed by the appropriate bureau(s)/office(s) and/or by the Commission.

8. Modifications possible. As a result of its review of a petition for reconsideration, the Commission may issue a MO&O modifying its initial decision or denying the petition for reconsideration.

mum peak power which occurs at any location within the cable distribution system.

(d) The operator of the system shall provide for regular monitoring of the cable system for signal leakage covering all portions of the cable system at least once each calendar year. Monitoring equipment and procedures shall be adequate to detect leakage sources which produce field strengths in these bands of 20 microvolts per meter at a distance of 3 meters. The operator shall maintain a log showing the date on which the leakage was eliminated, and the probable cause of the leakage. The log shall be kept on file for a period of two (2) years, and shall be made available to authorized representatives of the Commission on request.

(e) All carrier signals or signal components capable of delivering peak power equal to or greater than 10^{-5} watts must be operated at frequencies offset from aeronautical radio services operated by Commission licensees or by the United States Government or its agencies within 111 km (60 nautical miles) of any portion of the cable system, as given in paragraph (f) of this section. (The limit of 111 km may be increased by the Commission in cases of "extended service volumes" as defined by the Federal Aviation Administration or other federal government agency for low altitude radio navigation or communication services.) If an operator of a cable system is notified by the Commission that a change in operation of an aeronautical radio service will place the cable system in conflict with any of the offset criteria, the cable system operator is responsible for eliminating such conflict within 30 days of notification.

(f) A minimum frequency offset between the nominal carrier frequency of an aeronautical radio service qualifying under paragraph (e) of this section and the nominal frequency of any cable system carrier or signal component capable of delivering peak power equal to or greater than 10^{-5} watts shall be maintained or exceeded at all times. The minimum frequency offsets are as follows:

Frequencies:	Minimum frequency offsets
108-118 MHz	(50 + [T]) kHz
328.6-335.4 MHz	
118-136 MHz	
225-328.6 MHz	(100 + [T]) kHz
335.4-400 MHz	

In this table, [T] is the absolute value of the frequency tolerance of the cable television signal. The actual frequency tolerance will depend on the equipment and operating procedures of the cable system, but in no case shall the frequency tolerance *T* exceed ± 25 kHz in the bands 108-136 and 225-400 MHz.

§ 76.611 Operating near certain aeronautical and marine emergency radio frequencies

The transmission of carriers or other signal components capable of delivering peak power equal to or greater than 10^{-5} watts at any point in a cable television system is prohibited within 100 kHz of the frequency 121.5 MHz, and is prohibited within 50 kHz of the two frequencies 156.8 MHz and 243.0 MHz.

§ 76.613 Interference from a cable television system

(a) Harmful interference is any emission, radiation or induction which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radiocommunication service operating in accordance with this chapter.

(b) The operator of a cable television system that causes harmful interference shall promptly take appropriate measures to eliminate the harmful interference.

(c) If harmful interference to radio communications involving the safety of life and protection of property cannot be promptly eliminated by the application of suitable techniques, operation of the offending cable television system or appropriate elements thereof shall immediately be suspended upon notification by the engineer in charge (EIC) of the Commission's local field office, and shall not be resumed until the interference has been eliminated to the satisfaction of the EIC. When authorized by the EIC, short test operations may be made during the period of suspended operation to check the efficacy of remedial measures.

(d) The cable television system operator may be required by the EIC to prepare and submit a report regarding the cause(s) of the interference, corrective measures planned or taken, and the efficacy of the remedial measures.

§ 76.617 Responsibility for receiver-generated interference

Interference generated by a radio or television receiver shall be the responsibility of the receiver operator in accordance with the provisions of Part 15, Subpart C, of this chapter: *Provided, however*, That the operator of a cable television system to which the receiver is connected shall be responsible for the suppression of receiver-generated interference that is distributed by the system when the interfering signals are introduced into the system at the receiver.

Partial index by subject to FCC Rules for cable systems

Since Rules are subject to periodic revisions, listings should be checked with recent Rule changes as they occur. This is not a complete listing of all Rules to which systems may be subject.

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Copy of every application for a certificate of compliance or alternative notification to add television signals filed pursuant to 76.11(a) (on file 15 years)	76.305(a)(2)
Copy of every petition for special relief declaratory ruling or issuance of a cease and desist order or an order to show cause (on file 15 years)	76.305(a)(3)
Copy of every form 325 (on file 2 years)	76.305(a)(4)
Copy of any application for transfer of control of a CARS station (on file for length of authorization)	76.305(a)(6)
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76.95(d) - Network program nonduplication private agreements (on file length of contract)
76.205(c) - Origination cablecasts by candidates for public office (on file 2 years)
76.221(f) - Sponsorship identification (on file 2 years)
76.311(j) - EEO (on file 5 years with exception of program statement which is on file until superseded)

Copy of every show cause order, cease and desist order, declaratory ruling issued by commission pertaining to system (on file 15 years)	76.305(a)(8)
Copy of every registration statement filed pursuant to 76.12	76.305(a)(9)

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Prohibition of carriers near certain aeronautical and marine emergency frequencies	76.611
Harmful interference from a cable system	76.613

Cable assemblies

Gilbert Engineering recently introduced a new line of cable assemblies for the satellite signal receiving industry. The RG 214 and RG 213 cable assemblies employ the highest quality Mil Spec cable, according to the company, and are terminated with a custom designed Gilbert type "N" connector, to provide the most reliable electrical and mechanical performance for earth station and TVRO installations.

The RG 214 assemblies are 50 ohm and are 100 percent electrically tested (swept) to 4 GHz, while the 50 ohm RG 213 assemblies are tested to 2 GHz. The assemblies are available in any length. The attached ⅝" crimp ring provides the necessary cable retention, strain relief and shielding. The all brass construction and bright acid tin plating improves both mechanical performance and resistance to corrosion. The connector's slim design allows easy application of shrink tubing.

The cable is RG-214/U MIL-C-17E with the center conductor being 7/.0196" silver covered copper. The dielectric is solid polyethylene, the shield—two each—is 96 percent braid and is silver covered copper. The jacket (black) is made of polyvinylchloride.

For further information, contact Gilbert Customer Service, P.O. Box 23189, Phoenix, Ariz. 85063, (800) 528-5567.

Microwave systems

M/A-COM MVS Inc. announced the availability of portable microwave systems in the 2 and 2.5 GHz bands for local origination programming. The basic system consists of a small portable transmitter designed for tripod, bucket truck or mast mounting. Camera and microphone outputs are connected directly to the transmitter control unit. This same type of equipment is currently in widespread use by broadcast TV for ENG and special events coverage.

At the central receive site the Omnipole™ antenna picks up the signal, while its LNA output feeds directly to the receiver, easily accommodating ranges of up to 20 miles. This low-cost, light weight, low wind-load antenna is easily mounted on tower or roof-top locations for operator-free 360° coverage. Longer range needs can be met with steerable, directional central receive antenna systems.

For more information, contact M/A-COM MVS Inc., 63 Third Ave., Burlington, Mass. 01803, (617) 272-3100.

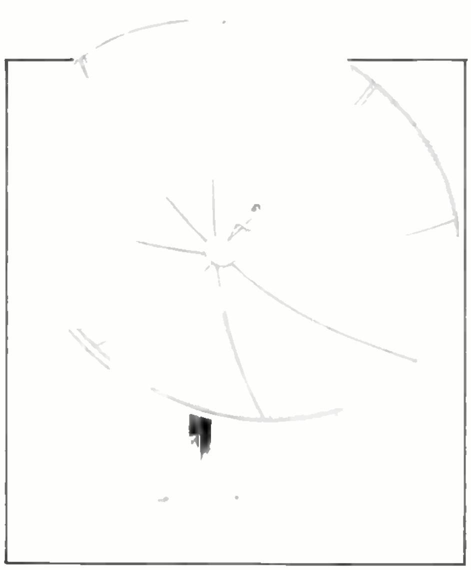
Feedforward amps

Scientific-Atlanta Inc., introduced its Series 6800 feedforward amplifiers with field interchangeable gain blocks for ease of maintenance. These feedforward gain blocks permit on-line testing and replacement, virtually eliminating the need for returning modules to the factory for repair. In addition, the new amplifiers are compatible with existing trunk housing that can be easily upgraded for feedforward.

Feedforward amplifier benefits include distortion improvement of 18 dB to 20 dB over standard push-pull electronics and expanded bandwidths up to 550 MHz. Applications for feedforward products include new-builds and upgrades.

Included in the new feedforward product line are trunks, bridgers and distribution amplifiers. The power supply has built-in positive transient and short circuit protection. Trunks are available with 22, 26 or 30 dB gain. Distribution amplifiers are available with 32 dB gain or 30 dB gain with optional AGC.

For additional information, contact Scientific-Atlanta Inc., One Technology Pkwy., Box 105600, Atlanta, Ga. 30348, (404) 441-4000.



Perforated satellite dish

Winegard Co. is now offering a new 10-foot perforated aluminum satellite TV antenna. The Model SC-1018 antenna delivers 39.5 dB gain to provide quality reception in most parts of the continental U.S. It complies with FCC 2-degree spacing requirements, with a beamwidth (at −3 dBi test points) of 1.6 degrees. (All specifications were compiled from actual test results at the McDonnell-Douglas test range in St. Louis.)

More durable than standard expanded-metal mesh dishes, Winegard's .040-gauge perforated aluminum unit also uses extruded aluminum in its eight support ribs and rim for extra strength. Though rugged, the dish is lightweight (just 92 pounds) and is designed for quick set-up. Shipped in four quarters, the dish can be assembled by two men in 20 minutes, according to the company.

The antenna features Winegard's exclusive anodized finish and is equipped with a heavy-duty, pedestal-type polar mount. Wind survival is rated at 125 mph.

The antenna will be available for April delivery in one of two complete Winegard packages—the SC-5020 or SC-5020S (motorized) system. The packages include the 10-foot antenna, Model SC-7035 or SC-7035S receiver, 100-degree LNA, Polarotor, 150′ cable (and SC-7700S satellite selector and 150′ cable with motorized version). The SC-1018 dish is also available separately.

For complete specs, contact Winegard Co., 3000 Kirkwood St., P.O. Box 1007, Burlington, Iowa 52601, (319) 753-0121.

Headend electronics

Headend equipment recently acquired from RCA by the Catel Division of United Scientific Corp. is now available from CWY Electronics.

Products available include the HSP-1 signal processor line, a totally modular expandable processor with phase locking, substitution carriers, AGC covering channels 2 through 13, standard UHF 24 through 83, sub-low channels T7 through T11 and cable channels 14 through 36 (A-W).

Other products available from CWY include the color television modulator CTM 20, a microcomputer-controlled modulator with extensive control and monitoring capabilities. The CTM 20 is totally modular, with options for multiple audio and video inputs and switching, internal message generators, complete scrambler interface, bar graph modulation indicators and self-test mode.

Also available are the color television demodulator CTD 10 and color television modulator CTM 11, both of which cover all channels from 2 through 13, 14 through 83, T7 through T11 and cable channels 14 through 36 (A-W).

For complete details, contact CWY Electronics, P.O. Box 4519, Lafayette, Ind. 47903, (800) 428-7596; in Indiana, (800) 382-7526.

Directional coupler

Macom Industries/OEM Enterprises announced a new four-port directional coupler in a diecast case with a convenient side entry and vertical ports. The model DC4 is available in six isolations (8, 12, 16, 20, 24 and 30 dB), covers the frequencies from 5 to 900 MHz with CATV quality specifications and is two-way compatible.

The anti-corrosion chromate finish and over 90 dB RF shielding make the DC4 ideal for all applications, according to the manufacturer. The units are available from stock.

For more information, contact Macom Industries/OEM Enterprises, 8230 Haskell Ave., Van Nuys, Calif. 91406, (800) 421-6511 or (818) 786-1335.

Klystron tubes

A new long-life klystron with a design life in excess of 10 years—as much as three times current design life—has been introduced by Hughes Aircraft Co.'s microwave communications products for its AML signal distribution systems.

The new amplifier tube is available as an option on all new AML systems and may be retrofitted to existing systems. Key to the long-life klystron, according to Hughes, was the development of a method of reducing the work function of the cathode, thus allowing operation at lower temperatures. The technology employed in this advance was the outgrowth of Hughes' work in the design, development and production of traveling-wave tubes used in space communications.

Supporting its introduction of the long-life klystron, Hughes is providing a five-year warranty—three years unconditional and two years pro-rated—to all purchasers.

For additional information, contact Hughes Microwave Communications Products, P.O. Box 2999, Torrance, Calif. 90509, (213) 517-6233.

Attenuator pads

RMS Electronics Inc. introduced a new line of male/female "mini-sized" fixed attenuator pads, models FAP-3, FAP-6, FAP-10 and FAP-20. The units are designed for use with set-top converters, and a must for use where large quantities are required, according to the firm.

The attenuation values, which are 3 dB, 6 dB, 10 dB and 20 dB respectively, are Mylar-labeled around housings. Each attenuator pad is equipped with an F-59 male "F" connector on one side and an F-61A female "F" terminal on the other.

For complete details, contact RMS Electronics Inc., 50 Antin Pl., Bronx, N.Y. 10462, (212) 892-6700 or (212) 892-1000.

Video receiver

Microdyne Corp.'s 24-channel 1100 LPR satellite TV receiver now is available with automatic polarity switching and remote tuning control. This new option makes it even more economical for small cable television and SMATV operations to improve their programming flexibility, according to the company, and to make the most of a limited number of receivers through transponder time-sharing.

The remote tuning is accomplished through a rear panel mounted binary coded decimal (bdc) terminal that accepts switching instructions from a computer or any standard switching device. Dual RF inputs (one for each polarity) assure that the proper polarity is selected for each channel.

Designated the 1100 LPR (R), this receiver is the latest addition to Microdyne's full line of uplink and downlink equipment for the broadcast and cable television markets.

Full specifications are available from Microdyne Corp., P.O. Box 7213, Ocala, Fla. 32672, (904) 687-4633.

Character generator

Mycro-Tek's Mycro-Vision® Max, a low-cost, high-resolution character generator, will make its debut at the National Association of Broadcasters convention at the end of this month in Las Vegas, Nev.

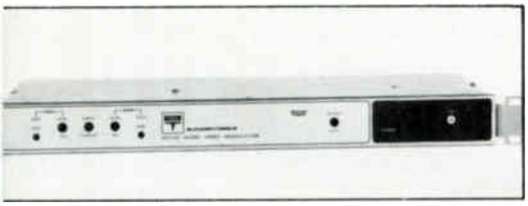
Max, a stand-alone device with a built-in keyboard, is a technological step ahead of other character generators in its price range, according to the company, because it utilizes non-volatile RAM storage. A built-in, product-life battery provides power for memory, so Max retains stored pages if power is interrupted. This backup memory gives Max portability as well as safety. The user can store pages, power Max off, move it to another location, and power up again without losing pages.

Max has a standard 32K memory allowing 120 pages (eight lines, 32 characters per line) of storage. Two separate high-resolution fonts for text and graphics are standard. Both fonts can be displayed in four separate styles: single height/single width, single height/double width, double height/single width or double height/double width.

Two wire service feeds can be captured by Max. At the time of purchase, customers can specify their wire service choices from any of the following: AP Cable News, UPI, Reuters, NOAA Weather Wire, Dow Jones Financial News Wire, Dow Jones/NYSE stock ticker, or American Stock Exchange ticker.

Other standard features on Max include: real-time clock for time and calendar display; main and auxiliary loop sequencing; up to four user-definable regions, with region separators user-definable by size and color; eight background colors and eight character colors; and display modes in three speeds of roll, print, crawl and splash.

For more information, contact the Mycro-Tek video sales department, P.O. Box 47068, Wichita, Kan. 67201, (800) 835-2055.



Audio/video modulator

The MAVM, available from Blonder-Tongue Laboratories Inc., is an all solid-state heterodyne audio/video modulator that provides a modulated visual and aural RF carrier output on any single VHF (2-13), midband (A-1) or superband (J-W) channel. The modulator can be used to put sound and color video on any unused channel of a closed circuit MATV or SMATV system. The heterodyne conversion system, which is employed, ensures optimum vestigial sideband selectivity for adjacent channel color systems.

IF loop-thru capability in the MAVM supplies a padded IF output before channel conversion. This feature provides the capability to replace standard internally generated IF and "all call" capability. The MAVM has a field replaceable heterodyne converter board that permits service personnel to change channels in the field. The unit accepts standard polarity (sync negative) of 0.7-2.5Vp-p level from video sources such as a satellite receiver, TV camera, video tape recorder or TV demodulator. All level controls and modulation indicators are located on the front panel for ease of operation.

For further information, contact Blonder-Tongue Labs, 1 Jake Brown Rd., Old Bridge, N.J. 08857, (201) 679-4000.

Analog noise reduction

Wegener Communications, has recently introduced a product for analog noise reduction: Panda™ II. Capable of delivering quality previously associated only with digital transmission systems, the satellite transmission systems utilizing Panda II can deliver compact disc programming via satellite with its 90 dB dynamic range perfectly intact.

Panda™ II is suitable for use on any of Wegener's transmission schemes: subcarrier, SCPC and Band Edge SCPC, making this product available to virtually any program supplier.

For more details, contact Wegener Communications, 150 Technology Park, Norcross, GA 30092, (404) 448-7288.

Waveguide components

Microflect Co.'s new *Component Catalog*, No. CC184, supercedes the *Waveguide Support Systems Catalog*, No. WS681A, and has been expanded to include many new state-of-the-art components for waveguide support, tower accessories and tower hardware needs.

Over 500 new items have been added, making this illustrated, 52-page catalog into a comprehensive sourcebook for unique and hard-to-find components. Each catalog comes with a separate, published price list.

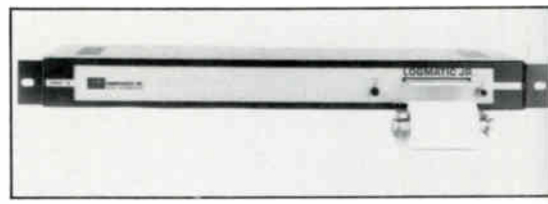
Contact: Microflect Co. Inc., P.O. Box 12985, Salem, Ore. 97309-0985, (503) 363-9267.

Headend rack

CWY Electronics has introduced a new headend rack priced as much as 25 percent below competitive headend racks, according to the company. The new racks are easy to assemble and may be shipped United Parcel Service, knocked down, in two packages.

Constructed of 11-gauge HRPO-1008 formed steel, the headend rack has a standard ASA 61 grey baked enamel finish. Panel rails are drilled and tapped for 10-32 screws on EIA/RETMA rack spacing of .50" to 1.25".

For more information, contact CWY Electronics, P.O. Box 4519, Lafayette, Ind. 47903, (812) 448-2525.



Logging system

The Logmatic Jr., available from Channelmatic Inc., is a fully automatic four-channel commercial insert logging system that provides the operator with a printout of the time, date and channel of any commercial insert along with encoded advertiser and spot information.

A built-in, real-time clock furnishes the time and date information, while advertiser and spot identification are read from DTMF data previously added to the unused channel 1 audio track of the commercial videotape.

The unit uses standard 2.25 inch wide thermal calculator tape for printout, features built-in clock memory battery backup, and the whole system only takes up 1.75 inches of rack space. Logmatic Jr. is compatible with any commercially available insert system and is in stock for immediate delivery.

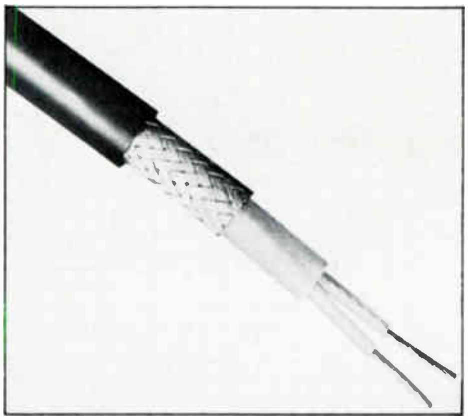
For product information, contact Channelmatic Inc., 821 Tavern Rd., Alpine, Calif. 92001, (619) 445-2691.

Tester/signal generator

Lemco Tool Corp. has introduced Cable-Tec as the first continuity tester/signal generator designed for the cable industry. Designed by an installer, for installers, Cable-Tec is 100 percent accurate, guaranteeing installers quality workmanship, according to the firm.

Cable-Tec consists of two parts, the "beacon" and the "beeper." Used alone, the beacon unit is a continuity tester; used with the beeper, Cable-Tec becomes a signal generator. The beacon has a push-on sleeve for easy, one hand operation. Its bright red LED lights up to indicate shorts, splitters or other self grounding devices in the line. The beeper is used with the beacon to confirm clean lines and identify specific lines at the lock-box. Its audible tone sounds only when a circuit is made with the beacon. No other line will give this result. Both units can be used with any coaxial drop cable.

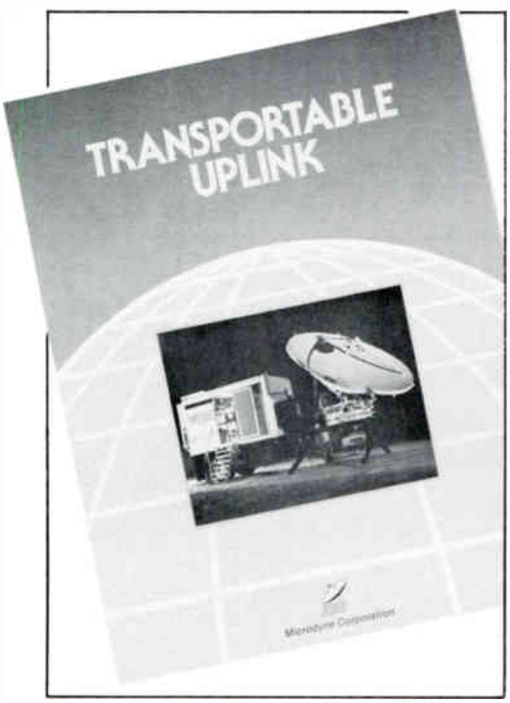
For addition information, contact Lemco Tool Corp., R.D. #2, Box 330A, Cogan Station, Pa. 17728, (800) 233-8713; in Pennsylvania, (717) 494-0620.



Computer cable

Belden Electronic Wire and Cable has introduced a two-conductor, 100 ohm twinax computer cable with a high density black polyethylene jacket and flooding compound for direct burial. Designated as Belden 9815, the cable's two conductors are 20 AWG (7 x 28); one is tinned copper, the other is bare copper to provide easy circuit identification. The tinned copper braid provides 95 percent coverage. Nominal capacitance is 15.5 pF/ft. This cable has the same electrical properties as Belden 9207, except that it is suitable for direct burial.

For additional information, contact Director, Marketing Communications, Belden, 2000 S. Batavia Ave., Geneva, Ill. 60134, (312) 232-8900.



Transportable uplink

A six-page, three-color brochure describing Microdyne's new Ku- or C-band transportable satellite uplink system is now available. A complete description of the uplink and its capabilities are provided, along with full specifications and a list of options.

The transportable uplink is a completely self-contained broadcast studio that allows broadcasters to cover news, sports or other special events with a minimum of preparation time and without reliance on conventional land lines or external electrical power.

A free copy of the brochure may be obtained by writing on company letterhead to: Transportable Uplink Brochure, Microdyne Corp., P.O. Box 7213, Ocala, Fla. 32672.

CRT transistors

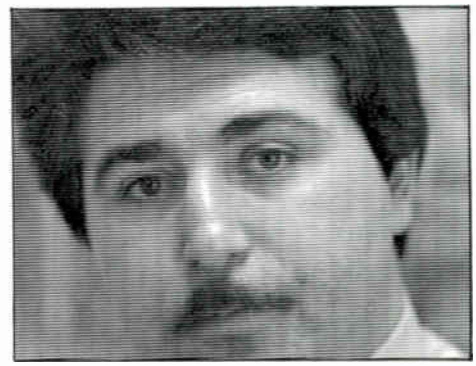
A new series of CRT video driver transistors for ultra-high resolution video graphics (CAD/CAM, CAE, medical and other applications) are now available from the TRW RF Devices Division. These bipolar transistors combine high breakdowns (120 volts) with low output capacitance ((2pf) and high speed (f_m)2 GHz (@ 80 mA) for applications requiring horizontal resolution of 550 pixels or more at high scan rates (100 MHz + video bandwidth).

These CRT drivers are exceptionally rugged to withstand large amounts of current in BV_{cbo} or BV_{ces} modes, and incorporate a reliable all-gold monometallic metallization system. The transistors are available in three packages: TO-39 (LT1839), TO-117 (LT1817) and TO-220 (LT1820).

For more information contact Dan Brayton, TRW RF Devices Division, 14520 Aviation Blvd., Lawndale, Calif. 90260, (213) 536-0888.

Aerial cable blocks... Why, where, and how many!

By Anthony J. DeNigris
President, Nationwide CATV Services Inc



One of the most commonly debated points during an aerial build is the topic of cable blocks, commonly termed rollers. Their usage, or lack thereof, has been an area of controversy that has caused many a project engineer and site supervisor to storm out of a meeting in different directions. In reviewing specifications from numerous cable operators, it becomes very obvious that there exists much uncertainty over this issue. Engineers and construction personnel all agree on the necessity for rollers in aerial builds. However, differences develop when it comes to implementing the specifications of quantity and positioning of blocks along a run of cable.

The why...

Basically, cable blocks are used for two functions. First, they are used to support coaxial cable lines as they are being placed along a previously stranded pole line. Second, they are also used in situations where multiple cables are being placed, serving as guides and separators for each cable, which results in a finished product of a very uniform, alligned appearance after the lashing operation takes place.

Expanding further on the function of support, it should be brought to light that as well as holding the cables up, and out of the danger zone or hazard causing situations ("high and dry" so to speak), the proper use of rollers greatly decreases the pulling tension on the overall run as the cables are being placed.

Needless to say, the lack of sufficient quantities of these blocks, or the mis-positioning of them, can result in not only the apparent hazards of having cable hanging too low over sidewalks, driveways, streets, etc., but as cables sag of their own weight between rollers—example, one roller at each pole with none in between—they may change shape from round to oval as they pass through the roller. The cables may even kink if the sag is extreme. Should such a situation be allowed to happen, the electrical characteristics of the cable will change and system performance will be affected. It also should be noted that slight ovaling of a cable cannot be readily discerned. Thus, because of today's demands in signal and frequency performance, this situation should be stringently guarded against.

The where...

In determining the placement locations of rollers along an aerial run, the controversy lumbers on. Some engineers insist upon a roller, naturally at every pole, with intermediate rollers placed no further than 35 feet apart along the entire run. Others say "every 50 feed apart," and some will accept one roller at the pole and one mid-span, regardless of the span length. Naturally, the construction crews would like it if they could get away with *none* at mid-span, because they would save time and increase production—so they think! The truth is that when rollers are properly placed, everyone benefits. The system benefits in the ultimate realization of a quality finished product and a safety conscious build along the way. The crews benefit because the pulling-out and lashing operations run smoother, faster and with less problems.

It is the express opinion of this author that the positioning of cable blocks as a *specification* cannot be "cut and dry." It has to be considered—the number of cables placed at one time, their weight and size, the span distances, the overall length of the run and, most of all, how much braking tension is applied to the reels at the set-up are the combined factors that will determine placement positioning and naturally, the quantity of rollers used in the run.

The optimum situation would have no sag in a cable pull by placing rollers in close proximity to one another, but this of course is highly impracticable. Bearing this is mind, and encompassing the previously mentioned factors, the cable blocks should be placed so that the distance the cable sags away from the strand should be no more than 15 percent of the distance between the blocks, and in no case should the distance between blocks exceed 50 feet. It is certain that the rollers should be placed at the input of the pole so that the cable does not brush against any existing utility hardware, and in some cases a block at each side of the pole may be required.

Sideline...

Looking back a bit, we must be aware that one problem is usually caused by, or causes another. Previously mentioned in the example with no mid-span rollers, ovaling is shown to take place. But, when the lashing operation happens, any time the existing sag is too extreme, a compound problem can take place. The risk of the lasher flattening-out the bottom side of the cable as it lashes is tremendous. This occurs when the angle of the cable coming up and out of the sag, and into a lashed bundle is such that the radius of the cable cannot be maintained. The pressure on the front roller of the lasher ends up severely reshaping the cable, usually into a very flattened state. Then, the system really has problems. And it can all be avoided.

Next: A comprehensive look at splicing and some of the pitfalls to be avoided, when we examine: "What's under the heat shrink."

Pay me now, or later

By John T. Kurpinski
Cable Services Co

The purpose of this article is not to tell how to construct a cable system, nor what design or equipment to use, it is to point out some common things we all know but maybe tend to overlook at times. For clarification, everything will apply to new-builds, rebuilds and extensions.

Electronics

Everyone has their favorite brand of equipment and most of the manufacturers are producing good reliable gear. Depending upon your status (MSO, independent), your cost will vary. So it is up to you to decide the most cost effective method of designing a system.

What do you really need? Do you need a dual 550 MHz system, with all that channel capacity, full two-way return and status monitoring, or a nice single-trunk, single-feeder system at 450 MHz, spaced for future two-way. Count up all the available programming from all the satellites, add in all your off-airs, throw in what's really required and needed by your franchise as far as access and local origination, then talk to your marketing people and manager. You'll be surprised what kind of system you don't have to build.

Do you use feedforward, push-pull or power doubling? Each of these technologies has something going for it on its own merit. Try a combination of two or more, even all three in the same design to reduce the overall electronics. This, in conjunction with using and trying different sizes and dielectrics of cables, can greatly reduce the cascade of amplifiers.

Cable

Other than gold and silver, aluminum should be considered as a precious metal. In the past few years, the cable manufacturers have really come up with a lot of different sizes, dielectrics, bonding methods, etc., thereby improving attenuation. As mentioned above, vary the cable size on trunk and feeder in conjunction with your choice of electronics. Also try the new air dielectric and low-loss foam cables. If you choose your cable properly, you might pay a little more for it, but that could pay off in a cost savings in electronics that results in less system maintenance, reduced power bills, fewer employees, etc.

Design

I'll be brief here because much was covered previously. You have selected what type of cable and electronics you're going to use, and the decision of who will do the design has been made. Whether or not you've decided to design a system in-house, let the equipment manufacturer do it, or go to an outside design firm, try and use terminating bridger amps and line extenders rather than trunk amps. Remember, feeder cable and electronics are cheaper than trunk cable and electronics.

Connectors

Not much to say here other than a good rule of thumb is to use the PIN type connectors on all actives and the feed-through type on all passives. Having to open up a trunk station to get the cable out because you used a feed-through type connector saved you some money up front, but how much did it cost in troubleshooting time, outage time and subscriber good will?

Strand and hardware

The only way to save money here is to be a tough negotiator. All the strand is off-shore and though the quality of imported hardware is improving, it's still not up to domestic quality. It's a "pay me now, or pay me later" situation.

Power supplies

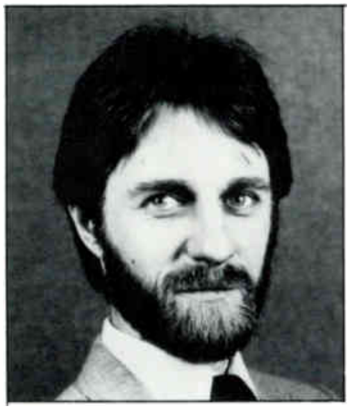
Check power supplies for reliability and pay particular attention to efficiency. All are pretty reliable but look for the most efficient. Electric bills for system powering are going up, and are a large part of a system's overhead expense. Also look into the method your local power company is billing you. Do they take the manufacturer's maximum published rating for the supply multiplied by the number of supplies in the system, or actually field measure a few supplies and bill on an average? You could save or lose money just by the way you're being billed.

Construction

If you don't have sufficient staff to accomplish your project (design department, purchasing, engineering, construction, etc.), it could be to your advantage to go full turnkey and pay a little more up front for material and labor to save money in the long run by reducing overhead and ensuring that subscriber revenues come in sooner. Sure it might cost more but just think of all the things you can let someone else worry about. If you do have a good internal staff, then choose a good reputable contractor. Remember, cheapest is not always the best when it comes to constructing a cable system. Again—pay me now, or pay me later.

I hope this brief overview has jogged some of your memories and perhaps makes you re-think your next project.

Tallentire



Fuller

Anixter Microsat, a unit of Anixter Communications, announced the following promotions in Western Canada. **Bill Tallentire** has been appointed Western regional sales manager. He will be responsible for CATV sales in Saskatchewan, Alberta and British Columbia, and will be based in Burnaby, British Columbia. **Kevin Fuller**, who will be in the Pickering, Ontario, office, has assumed responsibilities for inside sales and customer service for Western Canada. Contact: 4711 Golf Rd., One Concourse Plaza, Skokie, Ill. 60076, (312) 677-2600.

General Instrument Corp. recently announced two key appointments involving divisions in its Broadband Communications Group. **Hal Krisbergh** has been promoted to vice president and general manager of the Jerrold Subscriber Systems Division. He had been group director of business development for GI's Broadband Communications Groups since 1981. He replaces Timothy daSilva who resigned to pursue other interests. **William Flaherty** was promoted to the newly created position of vice president and general manager, administration and Far East Broadband Group operations. He will be responsible for Far Eastern manufacturing operations for both the Jerrold Subscriber Systems and Satellite Systems Divisions. Flaherty had been vice president of operations for Jerrold Subscriber Systems Division. Contact 2200 Byberry Rd., Hatboro, Pa. 19040, (215) 674-4800. Also, **John Tamblyn** has been named vice president of administration for **General Instrument of Canada Ltd.** He will be responsible for central and administrative services for the Satellite Systems Division and Jerrold Canada. Contact: 70 Wingold Ave., Toronto, Ontario M6B 1P5, Canada, (416) 789-7831.

TRW Electronic Components Group announced that **Jim Simmons** has been appointed manager for the Pacific Northwest territory, replacing its former sales representative, N.R. Schultz Co. Simmons had been serving as TRW/ECG territory manager for the Southeast sales area. Contact: 7000 S.W. Hampton St., Suite 214, Tigard, Ore. 97223, (503) 620-5032.

Straus

Dr. Thomas Straus has rejoined **Hughes Aircraft Co.**'s microwave communications products as chief scientist, with responsibility for directing advanced engineering programs. Straus was previously chief scientist for Ku-band and SCPC equipment product lines at the Hughes space and communications group. Contact: P.O. Box 2999, Torrance, Calif. 90509, (213) 517-6233.

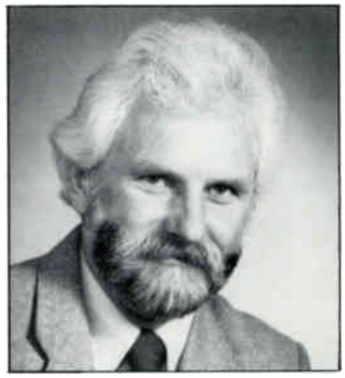
Freeland

Leininger

Howard Freeland has been named an account representative for **Magnavox CATV Systems Inc.**, responsible for the Southwest region—Texas, Arkansas, Oklahoma and Louisiana. Before joining Magnavox, Freeland was national sales manager for Gardiner Communications. **John Leininger** also was named an account representative for Magnavox. His territory will include Ohio, Indiana, Michigan and Illinois. Leininger held the position of sales representative for Oak Industries before coming to Magnavox. Contact: 100 Fairgrounds Dr., Manlius, N.Y. 13104, (315) 682-9105.

Donald Pisarcik has been hired by **C-COR Electronics Inc.** as vice president, sales and marketing. He will be responsible for the company's overall marketing and sales effort, including sales, service, administration, promotions, advertising and systems design and engineering. Pisarcik comes to C-COR from Burnup & Sims where he most recently was director of marketing for the Cable Products Group. C-COR announced the recent promotion of **Carolyn Stebbins** to supervisor, systems design. In her new position, Stebbins will coordinate the design, drafting and bill-of-materials functions of the system design department, including customer interface and project coordination. Stebbins joined C-COR in 1980 as a bill-of-materials clerk and was promoted to bill-of-materials coordinator two years ago. Contact: 60 Decibel Rd., State College, Pa. 16801, (814) 238-2461.

Cable TV Supply Co. Inc., a subsidiary of Cable TV Industries, has named **Stephen Brazil** director of sales for its Atlanta-based Startron Systems electronics division. Brazil, a 15-year veteran of the cable TV and communications industries, most recently was Eastern regional sales manager for a subsidiary of General Instrument Corp., Century III Electronics. Contact: 5342 Morse Dr., Decatur, Ga. 30035, (404) 981-9220.



Rosenow

BE&K Communications Inc. announced that **R. Fritz Rosenow** was elected vice president-Western operations. Before joining BE&K, Rosenow had been operations manager for American Television and Communications. Contact: 2949 Carreen Ct., Tracey, Calif. 95376, (209) 835-2458.

JVC Co. of America has established a sales engineer program in an effort to better serve customers. Each JVC regional office—in Elmwood Park, N.J.; Compton, Calif.; Elk Grove Village, Ill.; and Houston, Texas—will add a sales engineer for complete technical support. The first region to be manned with a sales engineer was the West Coast. **Juan Martinez**, initially with JVC's service department, has been appointed to the position. Martinez, who has been with JVC for three and one-half years, will troubleshoot for customers and the sales staff, assist dealers in distress, service equipment at trade shows and try to detect technical difficulties before they occur. Contact: 41 Slater Dr., Elmwood Park, N.J. 07407, (201) 794-3900.

Browning

Brad Cable Electronics Inc. announced the recent hiring of **Bill Browning** as a regional sales representative. Browning comes to Brad Cable from PTS Corp. with approximately three years of experience in the CATV industry. Contact: 1023 State St., P.O. Box 739, Schnectady, N.Y. 12301, (800) 382-BRAD.

Brown

TOCOM Inc. announced two recent changes in the company's staff. **Richard Brown** has been named manager of business planning for the manufacturer of interactive cable communications systems. He was formerly a financial analyst with AirBorn for the development of financial forecasting systems, corporate cost analysis and business planning. **Dan Olson** has been promoted to the position of Northern regional sales manager at TOCOM's Londonderry, N.H., office. Olson had served most recently as district sales manager of the office. Contact: 3301 Royalty Row, Irving, Texas 75062, (214) 438-7691.

Green

CableBus Systems Corp. announced the appointment of **George Green** as president and chief executive officer. Green, who assumed his new responsibilities last month, is a former vice president, operations, for the company. He replaced Karl Hoffmann, who served as president since Sept. 1, 1982, and will continue to play an active role in the development of the corporation as a salaried consultant and member of the board. Contact: 7869 S.W. Nimbus Ave., Beaverton, Ore. 97005, (503) 643-3329.

Mead

Pico Products Inc. has named **James Mead** as district sales manager for the Great Lakes region. Mead was previously manager of Pico's inside sales group. In his new position, he will have sales responsibility for OTAS addressable systems as well as Pico's standard products. Contact: 103 Commerce Blvd., Liverpool, N.Y. 13088, (315) 451-7700.

CALENDAR

April

April 6-7: Annual Spring Iowa Technical Seminar, **Heritage Communications**, University Inn, Ames, Iowa. Contact Jean Hamilton, (515) 245-7585.

April 10-11: Videotape editing seminar, **JVC Co. of America** and **Convergence Corp.**, Denver. Contact Caren Tauber, (212) 244-5225.

April 10-11: Alabama Cable Television Association spring meeting. Madison Hotel, Montgomery. Contact (205) 288-1821.

April 10-12: Jerrold technical seminar, Dallas. Contact Kathy Stangl, (215) 674-4800.

April 11-13: Magnavox CATV training seminar, Albuquerque, N.M. Contact Laurie Mancini, (800) 448-5171.

April 16-18: Videotex '84, **London Online Inc.**, Chicago. Contact Sally Summers, (212) 279-8890.

April 16-18: Magnavox CATV training seminar, Albuquerque, N.M. Contact Laurie Mancini (800) 448-5171.

April 17: Southern California Cable Association operations seminar, Los Angeles Airport Hilton. Contact (213) 684-7024.

April 17-18: Videotape editing seminar, **JVC Co. of America** and **Convergence Corp.**, Miami. Contact Caren Tauber, (212) 244-5225.

April 17-19: C-COR Electronics Inc. technical seminar, Columbus, Ohio. Contact Deb Cree, (814) 238-2461.

April 18-20: Community Antenna Television Association basic technical training seminar, Best Western Airport Inn, Seattle. Contact (305) 562-7847.

April 23-25: Louisiana Association of Cable Television Operators convention, Baton Rouge Hilton. Contact (504) 928-5604.

April 23-25: National Satellite Cable Association and **Eagan & Associates** PC/SMATV workshop, Chicago. Contact Larry Hannon, (904) 237-6106.

May

May 5-9: EUROCAST '84, **Telsat** and **Satelliten Rundfunk**, Swiss Industrial Fair, Basel, Switzerland. Contact Mark Voss, (713) 463-0502.

May 8-10: Jerrold technical seminar, Boston. Contact Kathy Stangl, (215) 674-4800.

May 9-11: Magnavox CATV training seminar, Rapid City, S.D. Contact Laurie Mancini, (800) 448-5171; in New York, (800) 522-7464.

May 9-11: Community Antenna Television Association advanced technical training seminar, Best Western Monticello Motor Lodge, Bellmawr, N.J. Contact (305) 562-7847.

May 14-16: Magnavox CATV training seminar, Rapid City, S.D. Contact Laurie Mancini, (800) 448-5717; in New York, (800) 522-7464.

May 15-17: C-COR Electronics Inc. technical seminar, San Francisco. Contact Deb Cree, (814) 238-2461.

May 15-18: International exhibition of telecommunications, radio and information technology. **Communications '84**, National Exhibition Centre, Birmingham, England. Contact (201) 652-7070.

May 17-18: TeleStrategies Inc. seminar on "Telephone Bypass Technologies and Economics," Grand Hyatt, New York. Contact (703) 734-7050.

May 31-June 1: "Satellite Communications" seminar, **TeleStrategies Inc.**, Stouffer's National Center, Washington. Contact (703) 734-7050.

June

June 3-6: National Cable Television Association annual convention, Las Vegas (Nev.) Convention Center. Contact (202) 775-3629.

June 10-15: Northeast Cable Television Technical Seminar, **New York State Commission on Cable Television**, Camp Topridge, Saranac Lake, N.Y. Contact Bob Levy, (518) 474-1324.

June 11-14: Canadian Cable Television Association annual convention, Capital Congress Center, Ottawa. Contact (613) 232-2631.

June 13-15: Community Antenna Television Association basic technical training seminar, Best Western Arlington Inn, Arlington Heights, Ill. Contact (305) 562-7847.

June 19-21: Jerrold technical seminar, Kansas City, Mo. Contact Kathy Stangl, (215) 674-4800.

July

July 9-12: National Computer Conference, **American Federation of Information Processing Societies, Association for Computing Machinery, Data Processing Management Association, IEEE Computer Society** and **Society for Computer Simulation**, Las Vegas (Nev.) Convention Center. Contact Ann-Marie Bartels or Marty Byrne, (703) 620-8926.

July 10-12: Jerrold technical seminar, Williamsport, Pa. Contact Kathy Stangl, (215) 674-4800.

July 10-12: Cable '84, **Online Conferences Ltd.**, Wembley Conference Centre, London. Contact Online in England, 01-868-4466.

July 11-13: Magnavox CATV training seminar, Portland, Ore. Contact Laurie Mancini, (800) 448-5171; in New York, (800) 522-7464.

July 15-19: Community Antenna Television Association annual convention, CCOS-84, Tan-Tar-A Resort, Lake of the Ozarks, Osage Beach, Mo. Contact Celeste Nelson, (405) 947-7664.

July 16-18: Magnavox CATV training seminar, Portland, Ore. Contact Laurie Mancini, (800) 448-5171; in New York, (800) 522-7464.

Planning ahead

June 3-6: National Cable Television Association annual convention, Las Vegas (Nev.) Convention Center.

June 11-14: Canadian Cable Television Association annual convention, Capital Congress Center, Ottawa.

July 15-19: Community Antenna Television Association annual convention, CCOS-84, Tan-Tar-A Resort, Osage Beach, Mo.

Sept. 6-8: Southern Cable Television Association annual convention, Eastern Show, Georgia World Congress Center, Atlanta.

Dec. 5-7: California Cable Television Association annual convention, Western Show, Anaheim (Calif.) Convention Center.

AD INDEX

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Surprise FCC signal leakage action

By Bob Luff
Vice President, Engineering, United Artists Cablesystems Corp.

The Federal Communications Commission just delivered at press time a devastating decision to the CATV industry. In a surprise decision in the nearly forgotten Signal Leakage Proceeding (General Docket 84-4-1) the commission will require CATV, MATV and SMATV systems to universally vacate the so-called Midband Aeronautical Frequencies (108-136 MHz; Channels A-C) within 60 days and certify by documented independent engineering surveys that system signal leakage levels meet or exceed the commission's existing signal leakage requirements on 136-172 MHz or be subject to summary orders to cease and desist operation on those frequencies as well. The full text of the commission's landmark decision will not be available for several weeks pending "staff editorials."

Key industry sources close to the commission's activities in Washington, D.C., knew of the scheduled meeting but had no idea that the commission deliberations would lead to such "devastating action."

An FCC source revealed, too, his "surprise" of the commission's decision. He stated that the new Mass Media Bureau (formally the Cable and Broadcast bureaus) had routinely brought up the long-pending signal leakage document to the commission for "advice and direction." There, the spokesman said an innocent question from the bench inquiring as to the status of recent cable TV signal leakage performance triggered what eventually led to the equivalent of a commission "rage" over the CATV industry's continued ignorance of perhaps the most important technical FCC cable regulation. A senior staffer at the meeting indicated that, in hindsight, the commission had acted quite predictably. Signal leakage equates to interference to the commission. The commission's Charter—the Communications Act of 1934—as amended, leaves little latitude to the appointed commissioners. The FCC is charged to sacredly guard against any "unnecessary, spurious or unwanted interference" that could interfere with the "full and orderly" use of radio spectrum. Cable's six-year long interference hiatus was bound to come to a crushing halt sooner or later. Even near misses with sacred aeronautical spectrum didn't jolt the industry into concern.

Understandably, attorneys representing many of the major CATV companies located in Washington did not anticipate that a warn-out technical proceeding agenda discussion item could explode into the mess it has.

What to do

Attorneys advise that the rules could not take effect until at least 60 days after publication in the Federal Register, and the National Cable Television Association as well as the larger CATV companies will certainly appeal the decision.

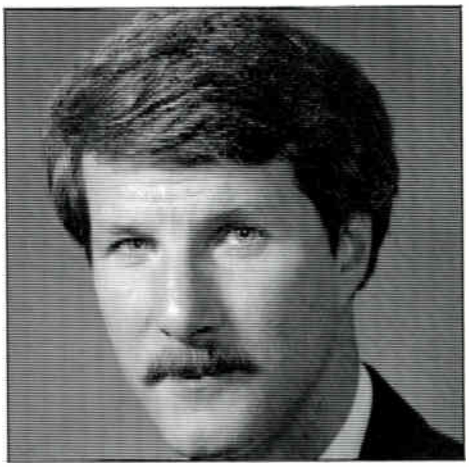
In the meantime, however, companies will be advised that they must prepare for the unlikely event that the commission will hold fast. This means that engineering departments will have to prepare accurate reports on their systems' signal leakage levels. Unfortunately, many systems are still not knowledgeable of proper leakage survey techniques or may have inadequate equipment to respond in such short time. Once these levels are finally known, depending on the results, plans will then have to be made to squeeze as many valuable signals after "must carrys" in the remaining useable spectrum as possible. City councils must be notified of the unavoidable action. And lastly, while not a legal issue, systems will undoubtedly be forced to recast their budgets as a result of lost pay channels and the general downturn in expected penetration. Undoubtedly, staff will be trimmed and some of the first may well be those that were responsible—knowingly or unknowingly. Certainly, chief engineers and managers, if they survive, will have many explanations to make.

If we only had done...

In retrospect, one veteran operator asked how could we let this happen? Didn't we see what was coming? The signal leakage rules went into effect over six years ago, and the only change since then is that we have nearly doubled the miles of excuses. Few systems really keep a functional leak log as required or have any priority given to a signal leakage program. If there is a program at all, it is always first to be gutted when short staffed or when a vehicle is down. I guess the incentives weren't working in favor of this issue. Managers and chief engineers get paid for profits, not expenses with "invisible returns."

It is such a shame because just a month's worth of lost revenues of a single pay channel or tier, if it should come to that, would have more than paid for all the signal leakage equipment and proper training and all of the time and materials to have corrected even the worst condition systems a year ago.

Perhaps the worst problem is that company personnel from corporate executives to system technicians and installers are going to be shocked when the true leakage performance of their systems is uncovered. For years, no one has really wanted to know anything about leakage except, "It's okay, isn't it?" And for



years, the managers and chief engineers have cowed in requesting more funds (more than zero) to properly address the growing signal leakage problems associated with keeping pace with growth in plant miles and recent channel expansions into the more touchy midband and "electronic-only" upgrades that pump higher levels into old cracked cables and out-of-date connectors. Constantly tight budgets year after year, without any specific funds earmarked "Signal Leakage," have widened the gap of make believe from top to bottom and the reality of today's substandard performance in a critical area governed by a 6-year-old and more and more strictly enforced cardinal regulation: Do not interfere with other users of the radio spectrum, especially those involved with safety of life operations such as aeronautical (108-136 MHz); government, police, fire, ambulance, amateur (136-172 MHz and 214-512 MHz).

We all have to ask ourselves: If we had another chance, would we do it differently? Would we purchase from the Superintendent of Documents, U.S. Printing Office, a current set of the commission's rules and read the section "Addressing Signal Leakage" more carefully? Would we have followed up on any points not fully understood quickly either directly with the commission's staff or industry associations and begun immediately in 1978 (six years ago) to train system staff, establish procedures, purchase needed equipment, establish a separate line item in the budget for signal leakage, develop a means to monitor, independent from those involved, performance and be prepared to take necessary action if performance falls below the commission's rules for whatever reason?

If we had done all this in 1978 or even 1984, it's hard to believe we would be in the mess we are in today. *April Fool*—or is it? Let's all work harder to keep this from being a serious joke again next April.

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