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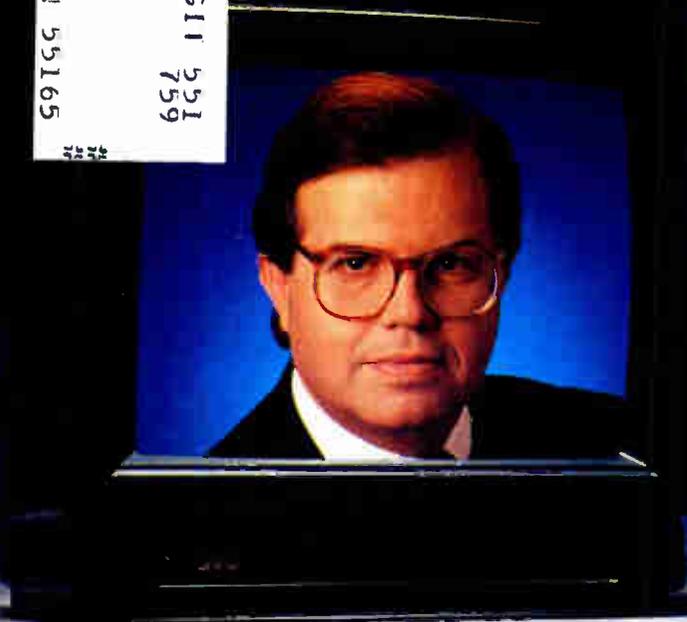
1992 Men of the Year

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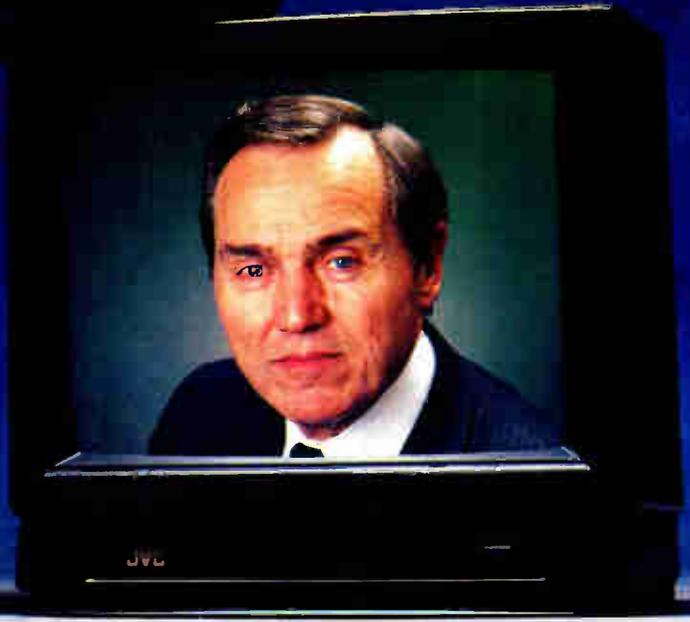
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Ed Horowitz of Viacom



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Men of the Year: Elliot, Horowitz, Miller

32

Three men are in the forefront of bringing digital technologies to cable television. Because of that, they—TCI's Tom Elliot, Viacom's Ed Horowitz and PBS' Howard Miller—were selected as *CED*'s 1992 Men of the Year. *CED* Editor Roger Brown describes the men and their admirable efforts in the realm of digital television.

Special section: Emerging Technologies

An alternate 1 GHz framework

29

The best way to not limit system channel expansion is to consider a 1-GHz rebuild. But how do you get around the distortion products associated with analog transmission that fall above 550 MHz? C-Cor's Colin Horton explains how it can be done in this article that outlines high bandwidth options.

GTE's Cerritos tests close to an end

52

The controversial series of architectural and application tests going on in Cerritos, Calif. are winding down—what has the telco learned, and what is cable's reaction? *CED* Managing Editor Leslie Ellis visited the telco testbed, and cites her findings in this Cerritos update.

Western Show wrapup

60

Digital, digital, digital. Indeed, if last month's Western Show is a portend of things to come, then digital TV is it. *CED*'s Roger Brown, Leslie Ellis, George Sell and contributing author Gary Kim summarize the new products, announcements and technology news from the confab.

In a cable/telco comparison, cable has advantage

80

Recently, the CTPAA hosted a luncheon at which ONI's Andy Paff compared cable television and the telephone companies for the delivery of voice, video and data to the home. Who's on top? At this point, it's clearly cable TV, because of its bandwidth advantages. *CED*'s Leslie Ellis summarizes the event.

Preparing for the dreaded municipal inspection

78

Why is "municipal" spelled as it is, and not "municiple?" Because those officials who come to inspect cable systems for FCC compliance are your *pals*—right? Maybe not, but it's a possibility. Jonathan Kramer of Communications Support Corp. and an expert on FCC compliance testing explains various courses to take to ensure a smooth(er) municipal inspection.



1992 Men of the Year



About the Cover:

1992 Men of the Year: Tom Elliot, Ed Horowitz and Howard Miller.

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Taking a look backward and forward

With the dawning of a new year, it's customary for publishers to spend a little time looking backward or forward in time to remind people of the history they've witnessed over the previous 12 months. Under normal circumstances, I wouldn't fall into this routine, but I truly believe that the 1992-93 era will be remembered as a key time in the evolving cable television industry.

With the advent of cable system segmentation via fiber optics into a cluster of "nodes" that serve anywhere from 500 to 3,000 homes, cable operators now have a way to offer real time two-way interactivity with their subscribers. Because of this segmentation, data collected from thousands of homes can be sent back upstream without significant amounts of distortion.

Consequently, operators have taken a new look at transactional services. Last January, Comcast announced its plan to test video on demand in its Baltimore system and Cox used its cable system in San Diego to send a telephone call from a subscriber's home to FCC Chairman Al Sikes.

Of course, other PCS experiments by cable operators made some history. Cablevision Systems discovered it can hand-off calls between microcell sites at speeds high enough that it could indeed support a call made from an automobile; and Comcast sent a phone call from Philadelphia overseas without ever using a line owned by a telephone company.

The cable industry also had new technical standards and proof-of-performance (POP) requirements placed upon it. After some tough negotiations with the cities, the industry was given some new performance benchmarks and this month the first new POP tests must be completed and filed with the FCC.

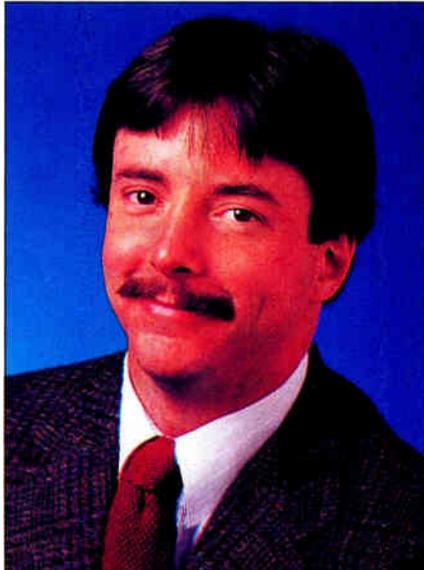
Just recently, Sammons announced an agreement with New Jersey Bell whereby the telco will build a fiber-to-the-curb system and Sammons will use the new plant to deliver its signals. This unique arrangement was the outgrowth of an FCC decision to allow telcos to offer "video dial tone" services.

But the real news of 1992 was the start of the Digital Age. Compression systems were chosen for both the satellite link and the headend-to-home portion of the cable network. A big advertising firm placed an order for a satellite compression system and CableLabs is determining ways to use the technology for national delivery of spot advertising to cable headends.

So much for 1992. What will 1993 hold? Cable operators will begin hearing about how to prepare for digital technology. Plants will have to be tighter and craftsmanship will be key. We'll know which system (or combination of systems) is chosen as an HDTV standard. Competition from telcos will heat up (but the number of cooperative efforts will grow too) and a year from now we'll hear a lot about DBS. The FCC will get into the cable/consumer electronics interface issue and some mud will be flying from both sides.

The past 12 months have been tumultuous; the next 12 will be equally so. Personally, I can't wait.

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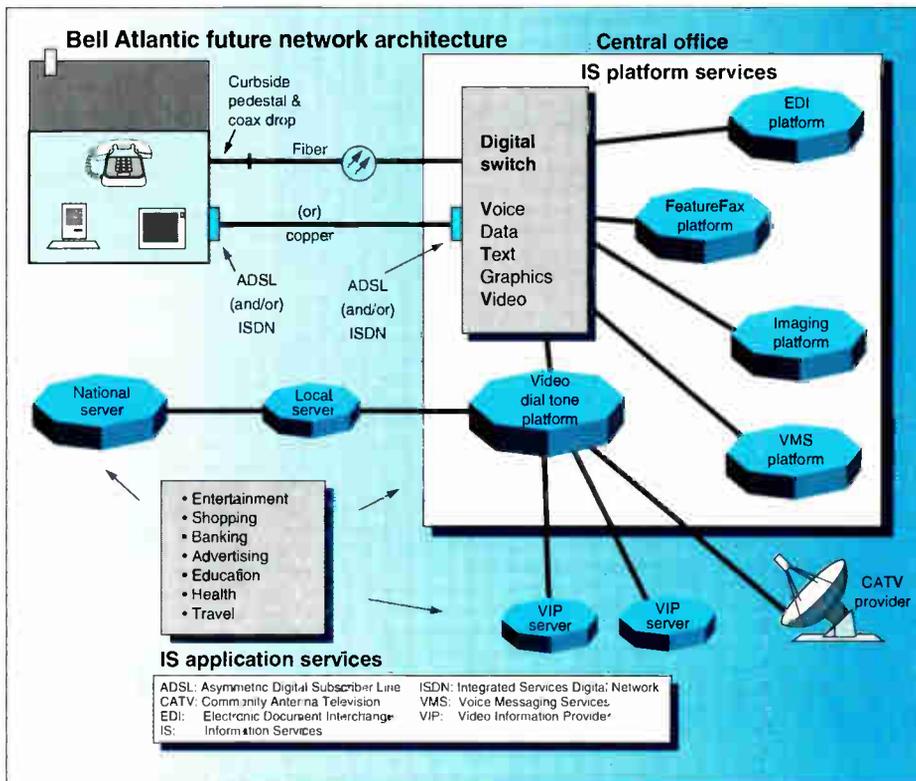


Sammons leases N.J. Bell fiber to distribute cable signals

In an arrangement that takes telco/cable cooperation to new levels, New Jersey Bell announced it has reached an agreement with Sammons Communications to provide the MSO with video signals for 10 years over a new fiber optic network that will be built by the telephone company.

Over the next two years, New Jersey Bell will build a "video dial tone" system using fiber optic technology provided by BroadBand Technologies that will provide telephone service to 11,700 households in three Morris County, N.J. communities: Madison, Florham Park and Chatham Borough. The same network will provide Sammons with digital signal transport and distribution services for more than 8,000 cable TV subscribers in those three communities.

This agreement, the only one of its kind, was made possible by the Federal Communications Commission's recent video dial tone decision, which gave telephone companies the freedom to provide cable TV transport for cable companies and access services to other video information providers.



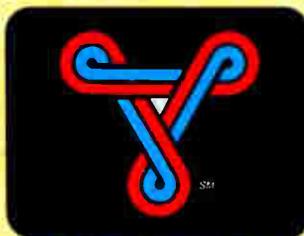
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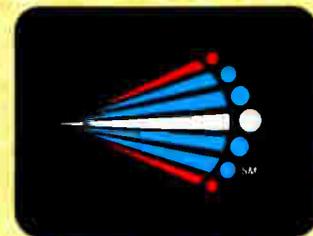


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Syd Fluck, President

Construction of the network will begin in the spring and will be completed in 1994. The system will utilize Broad-Band Technologies' FLX System, a fiber-to-the-curb system that enables the provision of new services such as impulse pay-per-view, on-screen menus and other user-friendly interfaces, unique programming options like a la carte services and part-time premium services, and higher quality and reliability.

New Jersey Bell is a unit of Bell Atlantic, which has publicly stated an aggressive strategy to provide video information to consumers. "Our public telecommunications network has the versatility, capacity and ubiquity needed to meet the information delivery needs of all kinds of information vendors," said James Cullen, president and CEO of New Jersey Bell. "In addition, New Jersey's progressive regulatory environment makes our state an ideal place to seek out these cooperative ventures."

New Jersey Bell recently filed a plan with the state Board of REgulatory Commissioners, called "Opportunity New Jersey" that calls for the accelerated development of an advanced telecommunications network.

DirecTv tests video compression

Cable systems might be the first to benefit from digital video compression, but they sure aren't the only ones counting on the technology to provide more channels. DirecTv, the planned high-power DBS service and a subsidiary of Hughes Communications Inc., demonstrated compression hardware with Thomson Consumer Electronics at the David Sarnoff Research Center in Princeton, N.J.

The live demonstration performed real-time MPEG-compatible compression and decompression via Hughes' SBS 6 satellite. Video images were displayed in a variety of sizes, resolutions and aspect ratios. The hardware performing the compression and decompression are being developed by Thomson Consumer Electronics expressly for Hughes. It is the same team that developed the AD-HDTV hardware as part of the Advanced Television Research Consortium.

The technology will be used by DirecTv and United States Satellite Broadcasting beginning in early 1994 for di-

rect broadcast services to the home. Home reception equipment will be manufactured by Thomson and will cost \$700 for an 18-inch satellite dish, an integrated receiver/decoder and universal remote control.

Program focuses on cable's power

Cable television equipment manufacturers and operators joined forces in Atlanta recently to show how broadband cable networks can be used to link Georgia's hospitals, universities and schools to facilitate video medicine techniques and distance learning.

The four-hour program, held at Atlanta's Inforum/Amphitheater, was sponsored by the Cable Television Association of Georgia. It was organized to show state officials, educators and medical personnel how computer-assisted electronics can be linked via cable systems to examine patients in distant cities or instruct a class located hundreds of miles away.

Ironically, school systems, hospitals and universities can apply for grants under Georgia's brand-new Distance

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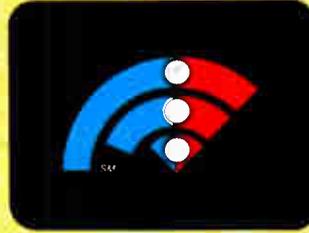
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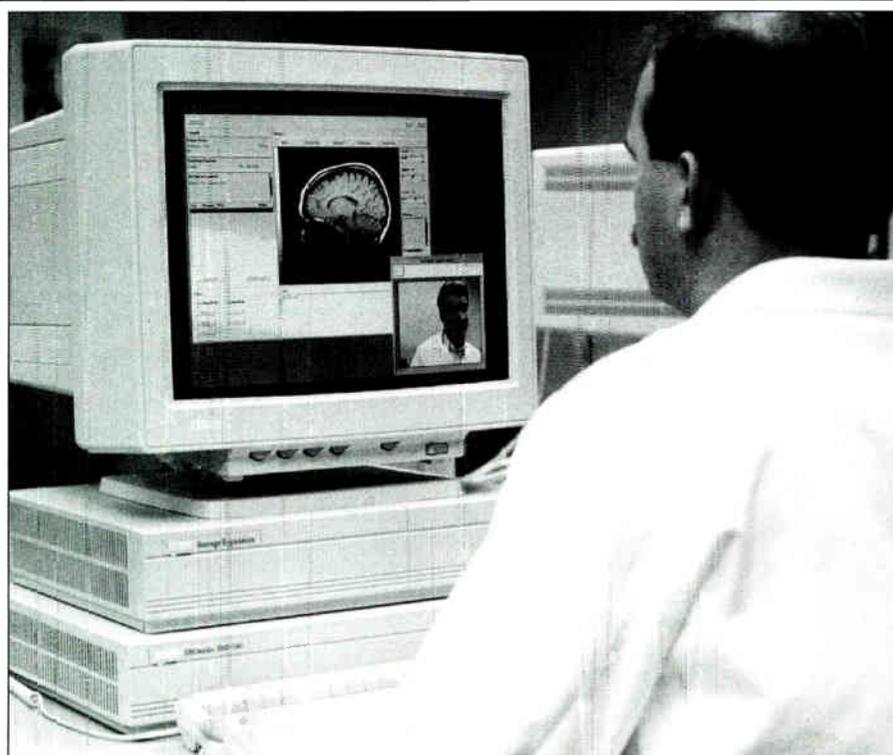
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Medical images are sent over a cable system during the program in Georgia.

Learning and Telemedicine Act, which earmarked \$50 million from telephone company over-earnings to build communications networks linking rural hospitals and schools with urban facilities. The Act "has the potential to revolutionize life in rural Georgia," according to a statement made by Georgia Governor Zell Miller.

Seminar attendees saw how broadband cable systems can transmit high-resolution X-rays, MRI or CAT scans in near real-time instead of the hours it would take over telephone lines. Similarly, educators or students at remote locations could access full-motion video from a computerized library system. At the Inform, attendees could watch a video of an underwater exploration off the Galapagos Islands. The video was transmitted over a broadband cable link from a library at Georgia Tech.

Participants could also view, via satellite, students in elementary schools being given Spanish language instruction by a teacher at a different elementary school. Simultaneously, a local high school media center and student teachers located at West Georgia College observed the distance learning process.

"The cable industry is ready, willing and able to join with state agencies, schools, hospitals and universities to establish this network," promised Floye Hewatt, president of the Cable Television Association of Georgia.

Service Electric buys 750 gear

The first application of Jerrold Communications' high-power distributed feedback laser transmitter will be in a complete rebuild of Service Electric Cable TV's Lehigh Valley, Pa. system. The 2,500-mile rebuild will be based on Jerrold's 750-MHz Starfire transmitter and 750-MHz fiber mini-bridgers.

The rebuild will affect about 85,000 subscribers in the Allentown and Bethlehem, Pa. communities and will use a combination of the fiber to the feeder and fiber backbone architectures. The system presently offers 450 MHz of bandwidth, but will be upgraded to 550 MHz, with electronics capable of offering 110 channels.

According to Jerrold officials, the value of the contract, which includes 1 GHz-capable taps and a prepackaged headend, is approximately \$7 million.

TCI makes offer to mollify utility

Richmond, Ind., could be the site of a TCI pilot program where the MSO allows the local utility to monitor power usage in area homes to help customers save on power bills. The offer from TCI was quid pro quo for keeping Richmond

Power and Light from going into the cable TV business, according to a press report in the Richmond *Palladium-Item*.

The RP&L board voted in October to enter the cable business and go head-to-head with TCI. According to a letter written by the TCI Richmond area manager to the RP&L board, the Advanced Cable Services division of TCI has modeled a method where local utilities can use a fiber optic-based cable system to better gauge customers' demand for power. The system would allow TCI cable customers to turn on their TVs and determine when would be the least expensive time to run certain appliances.

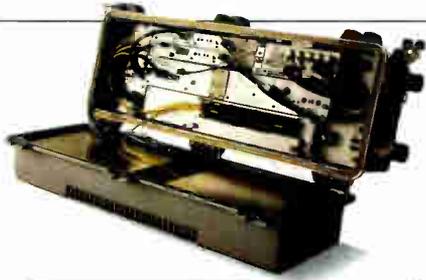
A fiber system could more effectively pinpoint power outages than a typical grid system as well, according to TCI officials. Bob Thomson, TCI senior vice president, told a local Kiwanis Club that if the plan were approved it would be the first time a utility and a cable system have combined for a project of this magnitude.

Jottings

The Northern California chapters of the SCTE are inviting cable system personnel from northern California, Oregon and Nevada to attend the third annual "Vendors Day" Feb. 10-11 at the Holiday Inn in Fairfield, Calif. More than 65 vendors and 400 attendees are expected for the event, which will feature 25 technical training sessions, tabletop product displays and "The Cable Games." For more information, call Steve Allen at (916) 786-8597 . . . **Tektronix**, in conjunction with **Philips Broadband Networks**, is producing the hardware needed to generate the Ghost Canceling Reference signal as an option to its NTSC and digital signal generators. Once installed, the generator will provide a reference signal that can be used to eliminate multipath ghosts . . . **Scientific-Atlanta** demonstrated its ComAlert emergency audio alerting system for cable TV operators during an FCC exhibition in Washington. By using the device, cable operators could send messages from the Emergency Broadcast Service . . . Meanwhile, **S-A's** digital video systems business unit announced the development of a desktop business television system that brings business TV directly to desktop computers via satellite. The DBTV system delivers real-time video and audio to a standard PC and requires a single circuit board, a wireless transmitter, a series of receivers and a keypad. **CEC**

Compiled by Roger Brown

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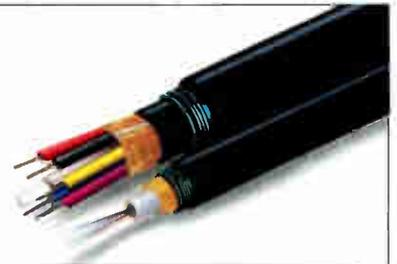
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Safety isn't just a cable operations issue

Cable TV contractors are becoming ever more aware of the importance of regular safety training for their construction and maintenance employees. Indeed, there are few priorities that could be established by top management that would have greater influence on overall company performance.

Safety training impacts workers' health and morale. It strongly affects the quality of the construction product delivered by the company; and is also tied directly to lost-time accidents, equipment damage, and liability exposure for the company. In addition, the safety performance of a construction company can hurt, or improve, public and customer relations.

The absence of an effective safety program in a construction firm will take a high toll in both human suffering and in capital loss. A bad safety record drives up a company's loss ratio, and quickly escalates insurance premiums—which have become one of, if not the greatest, expenses of doing business in construction today.

Finally, the presence of a good safety program helps a firm comply with government rules for the construction industry. Certainly, when the OSHA inspector calls, the contractor will want to have a safety program in place and functioning well.

Commitment and responsibility

Implementation of an *effective* safety program must start with real commitment from the top. The company's highest levels of management must establish the guiding policies, issue a mission statement and put the full weight of management behind the program.

Responsibility for implementation must be clearly delineated up and down the personnel structure. Employees must be made to understand, and directly accept, their safety responsibilities, and the important roles that their actions play in the overall success of

the company.

Recognizing the need for enhanced safety training, the Cable Television Contractors Council (CTCC), in conjunction with the Power and Communication Contractors Association (its parent organization) has developed a comprehensive program for its members. This safety program was designed in conjunction with Texas A&M University's Engineering Extension Service (TEEX).

The group was established in July of this year, and has four central goals, including the development of ways to provide better service cable television systems, an enhanced interchange of ideas among system operators, cable engineers and independent operators, the promotion of higher construction standards within the CATV industry and the dissemination of information on changing market conditions, regulations and business management.

The CTCC held its first meeting at the Atlantic City Cable Show in October of this year. Issues of major concern at the meeting were the growing impact of new technologies on construction and the need for better insurance solutions, particularly as they relate to workman's compensation. Further meetings are scheduled in March 1993 and April 1993 (in conjunction with the SCTE Expo in Orlando, Fla.).

Available safety services

Safety services offered by the Council's program are divided into four segments, as follows:

1. Monthly training materials packets,
2. Safety handbooks for employees,
3. Substance abuse prevention guides, and
4. Safety and training video library directories.

The monthly training packets are safety instructional materials designed for use by a company's own in-house safety coordinator in the training of construction employees. These materials are prepared by TEEX, and the packets cover three broad areas—communications, power and general safety. These

packets are easy to use and contain an array of items. Included are instructional procedures, safety meeting guides and tech tips, chalk talk accident discussions, reproducible handouts and bulletin board materials.

The safety handbooks were developed with the basic safety manual of the American Public Power Association as a beginning. Then, various components were added to tailor the handbooks for specific applications in communications and power construction.

The substance abuse prevention guide is a comprehensive draft package that assists companies in combating employee drug and alcohol abuse in an effective and legal manner. It is a flexible plan to be tailored to each company's individual needs. The package includes applicable laws and rules, operating procedures for supervisors, drug screening format and testing procedures, employee consent forms and certified drug testing laboratories.

The video library directory is a compilation of a multitude of sources for safety and training video films. The directory represents thousands of individual titles, and offers instructions on how each can be purchased or rented.

Safety yields returns

In conclusion, a proper safety program can yield many attractive returns. By putting an effective safety program into place, you can lower the risk of human suffering, improve employee morale, enhance the quality of your construction services, improve customer and public relations, comply with government regulations, control insurance costs and build a defense against criminal and civil lawsuits that might be leveled at your company. In today's construction environment, no communications contractor should be without a well-designed safety program. Unique safety services are available to assist the contractor in implementing just such a program.

Editor's note: *The documents described within this article are available by contacting the author at (800) 542-7222. CED*

By Michael E. Strother, Executive Director, Cable Television Contractors Council

The Great Contest

▼ Can You Find the Battery that's Right for Cable?

Test your cable battery knowledge. Here are four typical batteries now being used for standby powering purposes in the cable industry. Only one battery meets the demanding needs of cable. Can you find the cable battery—and match up the others with their intended uses? If you can (and we promise, it's not hard) you could be the lucky winner of a Macintosh® PowerBook™ 145 or an NEC® Ultra Lite™ SL-20 laptop computer (contest details below).

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UPS—Long 'idle times'; normally room-temperature operation in computer rooms, headends or offices. Lower-cost batteries which are not suited for extreme environments may be used.

Marine—Typical deep-cycle requirement; discharge to "flat" levels frequently; requires phosphoric acid to resist internal stresses. Cranking service common. Low cost, consumer product.

Automotive—Cranking service; use of thin plates to deliver high discharge currents for short period. Typically cycle-charged and low cost. May be sealed or refillable liquid.

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The Bailey Channel

What do you suppose the rock and roll singer really means when he says "57 channels and nothing on?" I, for one, have had times when at bookstores or libraries I have failed to find "something to read," or have visited the local outlet of a major video rental chain that claims to have "over 12,000 titles" and haven't been able to find a single video that I wanted to watch.

On the other hand, there have been times when I would watch absolutely anything or read any written word, no matter how stilted or in what language. I'm sure that you, too, have had these moments. In a doctor's waiting room, for instance, or when wedged into the middle seat between Ms. Chatty and Mr. Jocular during a five-and-a-half-hour flight.

These little moments are a part of everyone's life. However, this amazingly unscientific analysis leads me to think that the problem I'm discussing is not related to the available materials or their content, but to two other factors: attention span and motivation.

Sitting in a darkening living room late on a Sunday afternoon, what's on TV may not be of interest for a variety of reasons. Too tired. Too awake. Too cozy. These are the kinds of things that may change your general state of motivation, even though what's available on the tube would probably be of interest to you at any other time. Alas, if only there

By Wendell Bailey, Vice President, Science and Technology, NCTA

was a channel that carried all the stuff that gets my attention. You know the channel; you probably have one too.

Viewer psychotherapy

With the recent announcement of a 500-channel trial, either the song's lyrics are going to have to change, or a psychologist will be needed to tell us what our customers want. What do 500 channels mean? It's difficult even to conjure the immensity of it. Just consider the issues that 500 channels of service raise.

The telcos have been giving speeches for years about their vision of video on demand, or VOD. By this, they mean "any video any time you want to see it"—and they usually add "there could be tens of thousands of typical programs." But these are just that: programs, not whole channels. After all, the beauty of a channel is that someone else put together a string of programs from a common genre or with a common theme that ties the programming efforts together in some esoteric way. Therefore, viewers, including myself, will be exposed to programs they would never have guessed existed.

I probably could not have conceived of the plot or the central theme, let alone the outline of any given story or documentary. But even in this regard, the industry is changing; we're beginning to look at the marketability of near video on demand, or NVOD. To us, it is the same as a multi-channel, multi-time pay per view scenario, such as Time-Warner's Brooklyn/Queens, N.Y. trial or the VCTV trial happening in Colorado with US West and TCI.

But 500 channels—now, that's a horse of a different color. Even if you use, say, 300 channels for a very rich and elaborate PPV service, that still leaves 200 channels. How does one navigate through a sea of choices with the tools currently available? This whole problem brings into sharper focus the work that CableLabs has been putting into program guides.

High blood pressure and 500 channels

The problem at its simplest is that even now, as we receive no more than a measly 100 channels in some cases, it is very nearly impossible for the average consumer to figure out what is on, where it's on, and when it's on. I can't tell you how many times I have watched a somewhat enjoyable show, and as the last commercial is airing have clicked around the dial only to discover a show of the same type just ending on another channel.

The frustration of these little moments surely cannot be good for my health.

With the work that is being put into cable program guides, there may be hope for my blood pressure yet. If we as an industry can bring three issues together, the possibility exists that 500 channels will be truly welcome.

First, the transmission protocol for the data that describes the programs needs to be standardized. We don't need an exclusive or proprietary standard, just one that describes the issues of field length, headers, descriptors and framing lengths, among others. We all know there will be plenty of bits available with the advent of digital TV.

Next, we need to create a community in which the "middle men" agree on a basic format for putting the necessary information onto the current programs. This same effort needs to be extended to existing products, as well. If we finally arrive at the time where all (or almost all) programs contain data that identifies the title, names of stars, running time and a brief statement of the subject or story, then the era of consumer convenience will be just around the corner.

Program guides

The last piece of this scenario is to have the cable equipment groups and the consumer electronics groups to build the necessary decoders and readers into the proper products. Lest you think that this is not needed, or that it will be a long time before we see it, I offer the following: The Electronic Industries Association (EIA), in its work on closed captioning, has recently asked the FCC to allow the second field of line 21 to be used for program information data that could be captured by closed captioned decoder circuitry which is currently being included in all TV sets larger than 13 inches. In addition, CableLabs has been working for a year on helping to standardize program guide technology. With the recent announcements from program guide companies, it seems the efforts are paying off. One had to be blind, for example, to have not seen all of the on-screen display equipment displayed at the Western Show last month.

In the world of 500 channels, just listing what's on isn't good enough. The effort to inform clearly needs to take a new tack. Whether it's thematic, metaphysical, star related or all of the above, some form of useful information simply must be provided. Then no one will have grounds to say there's nothing to watch on cable TV. **CED**

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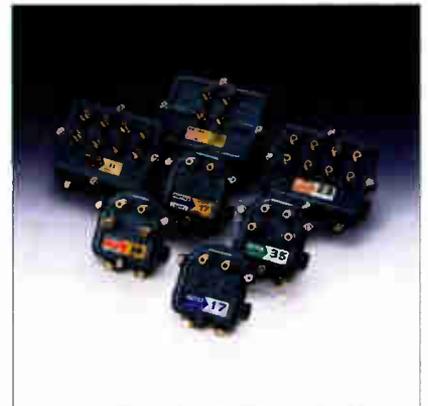
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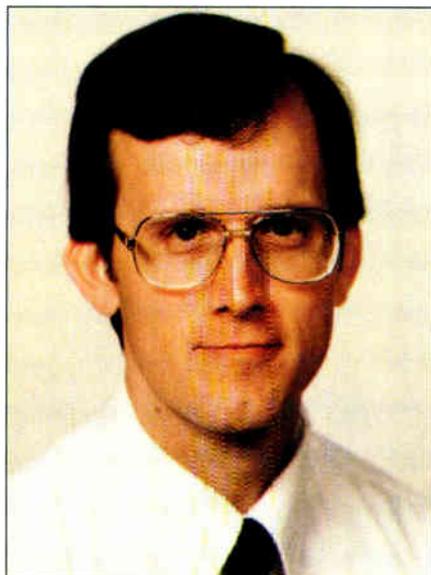
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Set-tops and cable networks

Recently, the implementation of new FCC technical standards has started a controversy surrounding the need to use set-top terminals (STT) when performing system end-of-line proofs of performance and put a renewed focus on the impact the STT has on overall system performance.

Since early last year, the entire industry has been waiting for the FCC's ruling on which performance measurements would require that a STT be used. The industry's concern has primarily been "practical" in nature due to the logistical difficulty in performing such a measurement.

The FCC has since amended and somewhat relaxed its earlier position on the use STTs during the measurement process. Note however, that the requirement has not been eliminated. The industry uproar concerning this issue has placed a new focus on a subject we all are familiar with, but have chosen to ignore.

The fact remains that the STT is a part of our network, and can contribute significantly to the overall performance that our subscribers are paying us to deliver. What, then, is the contribution of a STT to the overall performance of the network?

Answer varies

The answer to this question, of course,

By Chris Bowick, Group Vice President/Technology, Jones Intercable

is dependent upon several variables, including the performance of the rest of the network. Overall system end-of-line carrier-to-noise ratio is probably one of the most important RF specifications that will be directly impacted by the performance of the set-top. Note however, that this impact can be easily calculated.

If we know the performance of our plant, the input signal level to the STT, and the individual performance of the STT, we can easily predict the output C/N of the device by the use of some well-known equations. Or, conversely, because we have control over the signal level available at the input to each STT, and we know from published specifications the STT's approximate or worst-case noise figure, we can determine what that minimum input signal level must be in order to maintain a given C/N out of the device.

Let's say, for example, we have a trunk and distribution system that is providing us with a C/N at the input to the STT of about 46.6 dB. Let's further assume that the absolute minimum C/N performance we need at the output of the STT (C/N_{Total}) is 44 dB. A simple calculation reveals the C/N performance of the STT must be 47.5 dB in order to make this happen:

$$C/N_{Total} = -10 \log (10^{-46.6/10} + 10^{-47.5/10})$$

$$C/N_{Total} = 44 \text{ dB}$$

Note however, that theory dictates that the output C/N performance of the STT is dependent upon both the noise figure of the set-top and the input signal level to the device. If we examine the various manufacturers' specifications for STT noise figure, we'll find that, while they have improved significantly over the years, a "typical" value for boxes currently out in the field might be around 13 dB.

With this level of noise figure performance, and with the requirement that the STT's individual C/N performance must be 47.5 dB in order to maintain our overall system performance at the output of the STT at 44 dB, we can quickly calculate that the input signal level to the STT must be maintained at or above 1.5 dBmV in order to meet our objective. In equation form this becomes:

$$L_i = C/N_{STT} + N_t + N_f$$

$$= 47.5 - 59 + 13$$

$$= 1.5 \text{ dBmV}$$

where:

L_i = Input level in dBmV

N_t = Thermal noise (-59 dBmV in a 75 ohm system at 68 degrees F and 4 MHz)

N_f = Noise figure of the device in dB

Very quickly we realize the trade-off

we face when trying to minimize the contribution of the STT to the overall C/N performance of the system is one of signal level into the STT. The higher the signal level into the STT, the better its output C/N performance. Unfortunately, higher STT input signal levels will force higher tap output signal levels, which has a tendency increase the overall cost of the distribution system.

Contributes to distortion

In addition to increasing the cost of the distribution plant, another factor that must be considered is the impact the additional signal level into the device will have on the overall system's performance relative to non-linear distortions (such as cross-mod, CTB, and second order distortion. Let's face it, the STT is an active device, and as such, will contribute to these distortions.

It's interesting to note however, as Jordan¹ has shown, that at the STT input signal levels typically used (around 0 dBmV), the contribution to system cross-mod, CTB, and second order distortion by the STT is typically insignificant—around 0.1 dB. Decreasing the input signal level into the STT therefore cannot significantly improve the distortion performance out of the STT.

However, we need to be very careful about significantly increasing the input signal level to the STT in order to improve its output C/N performance as distortion performance may suffer significantly. The limiting STT distortion in this case, according to Jordan, will most likely be a trade-off in performance between second order distortion and C/N.

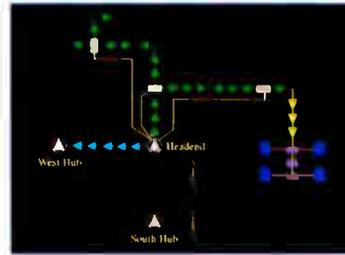
So what can we conclude from all of this? There are certainly no startling revelations in any of the above, as these characteristics have been well known and understood for many years. Recent developments at the FCC, and the requirement that we might actually have to include the STT in some of our proof of performance tests, however, has caused us all to re-think our understanding of the set-top-terminal and its contribution to the overall performance of our networks. If our goal is to provide "total subscriber satisfaction," it only makes sense that we should consider the STT as part of the network and consider its contribution to the system's overall performance. **CEB**

Reference

1. Jordan, Thomas J., "Analysis of Set-Top Terminal Impact of Cable Television System Design," Application Note AN0583-01, Scientific-Atlanta.

NOT ALL CABLE MANUFACTURERS

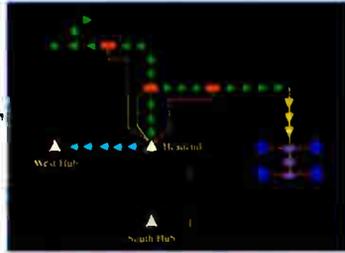
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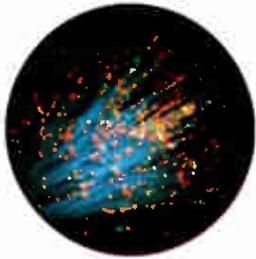


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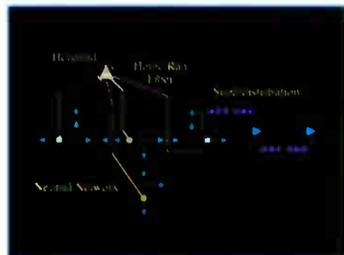
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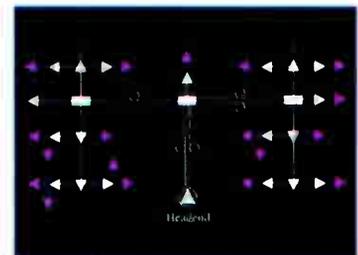
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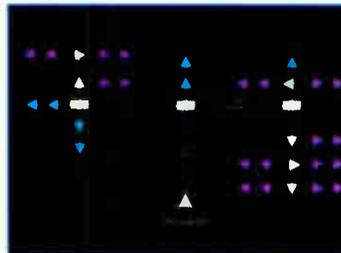
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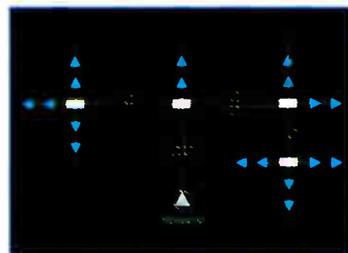
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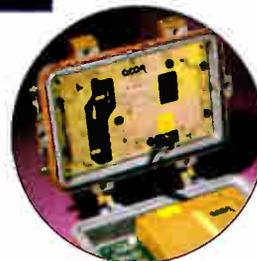
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Digital vs. analog

Those of us who were well into careers with vacuum tubes and radio broadcasting when Dr. William B. Shockley first implemented the junction transistor, have had to struggle these many years with solid-state

physics.

Others whose careers began with ROMs and RAMs, DRAMs and EPROMs, shift registers and microprocessors rather than 6AK5s, 6J7s, 6BQ5s and 807s may find it hard to appreciate the strange behavior of radio frequencies.

DigiCipher and analog HDTV

Today, the digital world is more and more frequently crossing paths with the old, but not yet obsolete analog world. In June 1990, in a move that caught the world by surprise, the VideoCipher division of General Instrument submitted its DigiCipher system to the FCC as a candidate for HDTV.

GI's full digital proposal literally turned the development of HDTV on its head. Japanese engineers had been working since 1970 on their analog MUSE (multiple sub-Nyquist sampling encoding) HDTV system. They had hoped, vainly as it turned out, to have MUSE adopted in 1988 by CCIR as a universal worldwide television standard.

Europeans balked because the 60 Hz field rate conflicted with their 50 Hz power grid; and besides, they hadn't invented it. So, they came up with the

D2-MAC and HD-MAC, advanced versions of the multiplexed analog components technology developed 10 years ago for satellite transmission by the British Independent Broadcasting Authority (IBA).

But, European broadcasters are not at all enthusiastic about HD-MAC which the European community has adopted as a standard; unless, that is, an all-digital system becomes available before 1998. Moreover, many believe that the 16:9 D2-MAC, or some other enhanced definition widescreen system could offer the most marketable benefits of HDTV at much lower cost to both broadcasters and consumers.

Maybe the Europeans will just stand idly by with a "PAL-PLUS," or "DIVINE," or some other analog system while the Americans housebreak the digital system to the realities of life in the consumer marketplace. Remember, BBC stayed with Baird's mechanical disk television until 1936, nearly a decade after Farnsworth's all-electronic image dissector and Zworykin's iconoscope had set the pace in the U.S.

DigiCipher was the "shot heard 'round the world," the opening gun in a television revolution. The corollary prospect of stuffing a lot of TV programs into the spectrum officially reserved for only one could even upstage HDTV itself.

But before digital messages of whatever form can escape from the computer, or signal processor, or LAN, they will have to be transmitted somehow. If the medium is to be either over-the-air broadcast or multichannel coaxial/fiber networks, radio frequency technology cannot be avoided. Carriers and sub-carriers will be required, with modulated amplitude, frequency or phase. Digital messages are likely to encounter strange phenomena on the RF highways, such as phase and amplitude non-linearity, multipath reflections, and intermodulation in the radio frequency transmission path.

It is not at all certain that the transmission part of digital television, whether HDTV or compressed NTSC, has yet been fully investigated under operational conditions. Nor is it clear what will be the cost of correcting transmission-related glitches.

The bottom line is that television will continue its inexorable march toward all-digital formats in the not distant future, but not without some familiar RF bumps in the road. **CED**

By Archer S. Taylor, Senior Engineering Consultant, Malarkey-Taylor Associates Inc.

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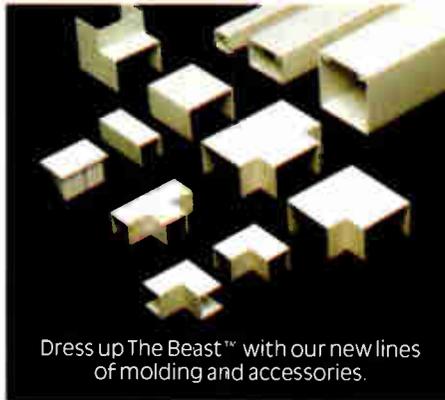
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Benchmarking cable system performance

To stay profitable in an intensely competitive global marketplace, American companies have turned en masse to benchmarking—and now

done, an intensive “activity analysis” must identify a company’s (or an industry’s) key processes, then define ways to measure variations in performance of

the tasks they involve. These are generally known in benchmarking methodology as performance metrics.

For the cable-system benchmarking test now underway, members of CableLabs’ Optimized Systems Operation Task Force worked with Westinghouse Science and Technology Center, an outside

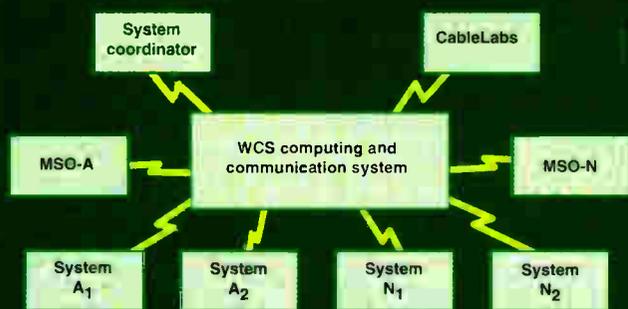
service call, is defined differently among various MSOs.”

As a side benefit, the On-Line Information System (OLIS) created for the test is also being used for inter-MSO •letin board messages and person-to-person electronic mail messaging. This function could be extended to other cable operators should CableLabs-member operators choose to keep the network operating beyond the test period.

To send data upstream, system managers fill in the blanks on a Westinghouse-created electronic form that is contained on a designated in-house PC, then dispatch the data over a value-added network to an electronic mailbox at Westinghouse.

The system is designed so different classes of systems (large or small, classic or newbuild) send their data to different mailboxes. The system coordinator’s computer then aggregates the data for each category and sends a report back to each system (and parent MSO, where desired).

System diagram for CableLabs benchmarking test



the cable industry is joining the party.

Benchmarking—the term was coined at Xerox Corp. in 1979—involves breaking a business up into its individual work processes and measuring a company’s performance in those processes against that of other companies.

In a 1991 survey, 65 percent of Fortune 1,000 companies said they are using the technique. In another survey, 79 percent of responding companies said they think they must use benchmarking in order to survive.

Successful benchmarking projects must be focused in on key, performance-critical processes.

For example, GM focused a benchmarking study on labor-management cooperation, while Holiday Inn analyzed its customer information system and McDonnell Douglas looked at worker training.

Setting up a benchmarking test

Figure 1 summarizes the steps involved in a complete benchmarking implementation. One early step is to partner with companies that follow the same procedures to participate jointly in a mutually beneficial benchmarking program.

Performance of telcos—focusing as it does on customer calls and deployment of service personnel—is often suggested as a good benchmark for cable company performance.

But before any measuring can be

done, an intensive “activity analysis” must identify a company’s (or an industry’s) key processes, then define ways to measure variations in performance of the tasks they involve. These are generally known in benchmarking methodology as performance metrics.

Since October 1992, 31 cable systems have been sending data each month by modem, reporting their performance against the 15 performance yardsticks. The 15, listed in Table 1, focused on five major areas:

- Outage performance
- Repair service
- Installation
- Telephone interaction, and
- Personal productivity.

As illustrated in Figure 2, PC-to-modem links were created through the Westinghouse Computing and Communications System, bringing together the 31 cable systems, the benchmarking system coordinator (at Westinghouse) and CableLabs (the project manager). The MSOs whose systems are in the test also have the option of being linked to the system.

Although some MSOs do benchmarking internally—either via manual reports or through PC networks—this is the first known benchmarking system compiling data across cable company lines.

The MSOs involved had to agree on precise definitions for the 15 critical processes. “Part of the value of this has been in getting the companies together to compare how they define these performance metrics,” said Scott Bachman, CableLabs’ director of technical operations projects, who is overseeing the benchmarking study. “An outage, or a

Steps in a benchmarking process

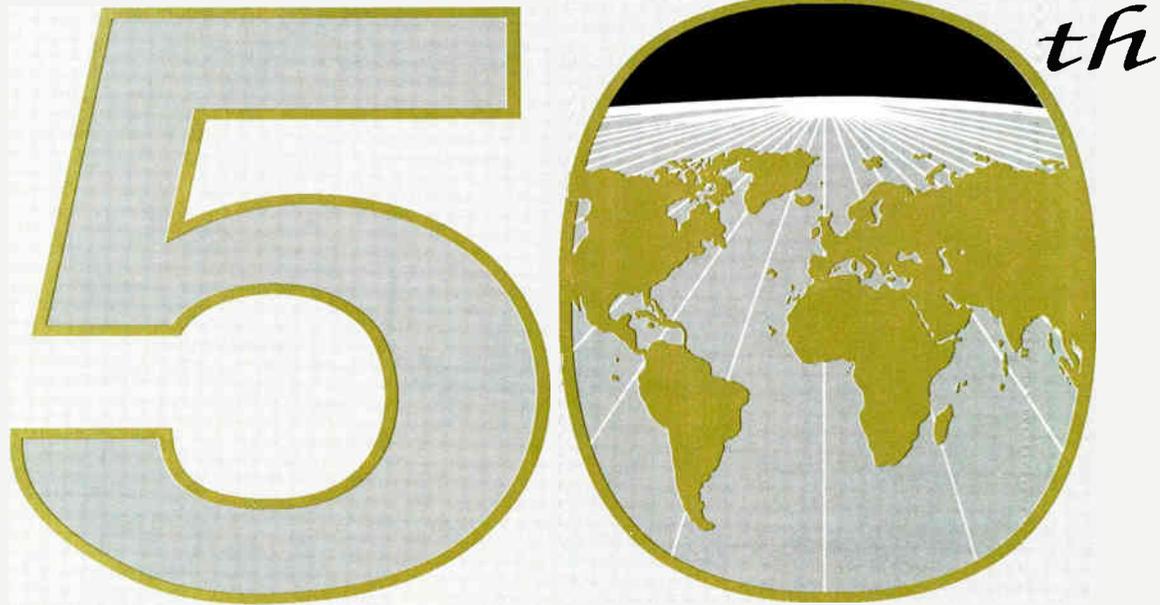


Source: “Benchmarking—Identifying, Analyzing and Adapting Industry’s Best Practices That Lead to Superior Performance. A Strategy for Continuous Quality Improvement”, by George W. Gershelski, 1991

Figure 1

By the CableLabs staff

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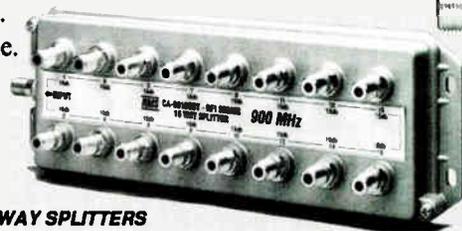
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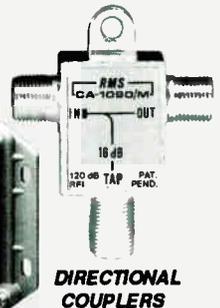
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Here, privacy concerns were paramount, so the system was designed to send each system only the aggregate data by category and that system's numbers so comparisons can be made. No individual cable system can gain access to any other system's individual scores (although MSOs are able to see all the scores for their participating systems).

Beyond data gathering

Debugged and stabilized prior to Oc-

tober 1992, the system will be gathering its usable data through March 1993, said Bachman. But taking a snapshot of processes through performance metrics is only a first step in benchmarking, Bachman stressed.

"In successful benchmarking, the real focus should be on answering the underlying questions: Why did the 'best of class' performers outperform everyone else?"

Various questions might be asked, he said, including: "Do they use a better

computer management system? Do they have better work-time organization? Do they talk to their customers more efficiently and better?"

"If one system is responding to service calls faster, what mechanisms do they use? What hours do they have people on the phones? How well do they do their training?"

This phase is known to benchmarkers as "gap analysis"—sleuthing work to relate the "result gap" that separates the top (or "best of class") performers' benchmark scores from everyone else's to a "practice gap" or "process gap" that is discovered in the methods, technology or materials used.

Continued on page 88

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Performance metrics being used in cable benchmarking test

OUTAGE PERFORMANCE

1. Number of outages per month per mile of plant
2. Outage minutes per month per subscriber
3. Percent of subs with more than two outages in previous 90 days

REPAIR SERVICE

4. Repair service truck rolls per month per sub
5. Percentage of truck rolls for home service that are completed within 24 hours
6. Truck rolls for service needing call-backs as percent of total truck rolls
7. Percent of truck rolls for service repeated (no one home)

INSTALLATION

8. Average number of days from installation order until completion
9. Percent of truck rolls resulting in call-back

TELEPHONE PERFORMANCE

10. Average telephone answer time by a CSR
11. Percent of telephone calls resulting in a busy signal as percent of total number of calls received

PERSONAL PRODUCTIVITY

12. Average number of subscribers per employee
13. Average number of subscribers per CSR employee
14. Average number of subscribers per plant operations employee
15. Average number of subscribers per other support personnel
16. Average number of plant miles per maintenance technician

Table 1

110 channels without boundaries: Why restrict options?

Today the choice of the operating bandwidth of a CATV system is not only driven by the number of standard NTSC (analog) channels that the system requires, but also by the pro-

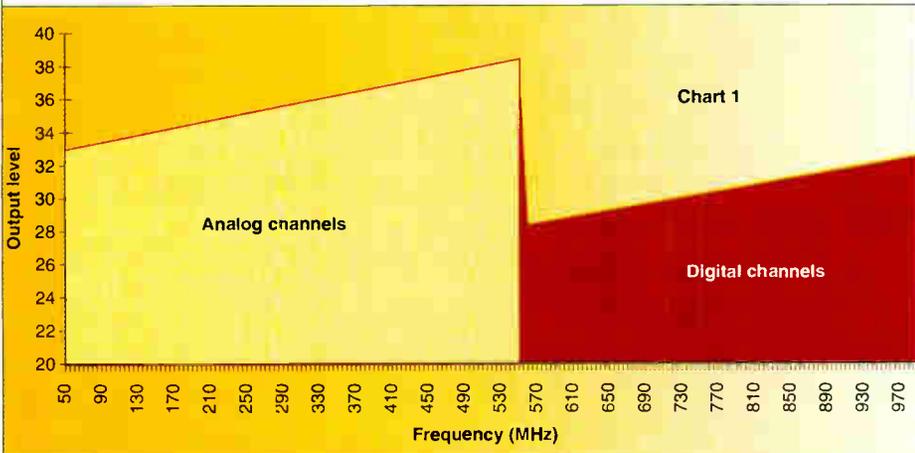
reasons discussed above, (the unknown bandwidth requirements for new digital services) but also because of potential performance limitations of hybrid analog/digital transmission systems.

Hybrid analog/digital transmission

Recent testing has looked at the distortion products generated in a 1-GHz amplifier when the amplifier is loaded with 77 channels in the 50 MHz to 550 MHz band. This testing was based on a projected operating level scheme shown in Chart 1. It was assumed that the digital channels would be carried 10 dB lower than their equivalent video channels.

The distortion products that were measured above 550 MHz, where digital transmissions would be carried in a 750 MHz system were found to be quite significant for almost 100 MHz of bandwidth above 550 MHz. This is illustrated graphically in Chart 2.

The impact of these distortion products on digital signals could be such that some portion of the 100 MHz band above 550 MHz would be unusable for

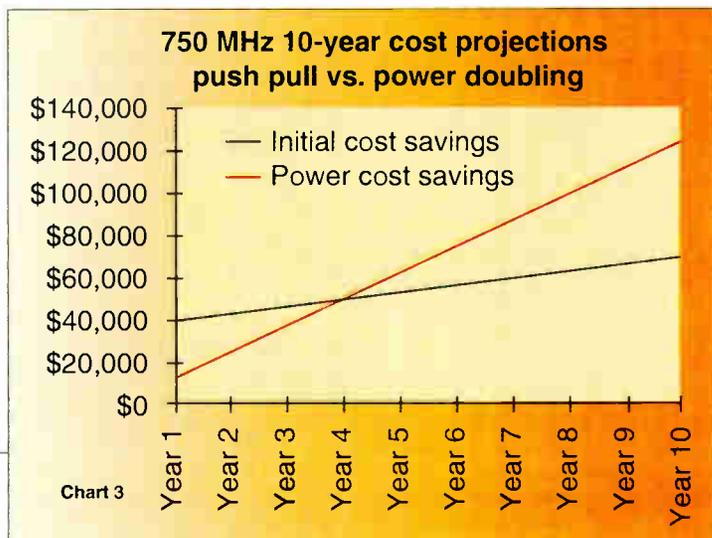
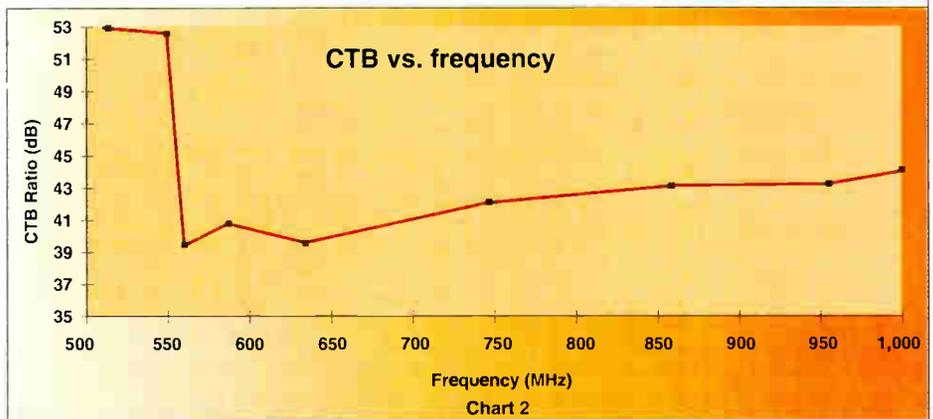


jected bandwidth requirements of future services. These future services may include telephone service, video on demand and multimedia data transmission.

The video-based future services depend on digital compression and the analog transmission of the resulting compressed signals over the RF plant. Because the actual performance of digitally compressed television transmission systems and the resulting increase in channels is undetermined, one can only guess how much bandwidth to allocate for their transmission. A choice of system bandwidth based on analog-only channel loading, or an optimistic projection of digital compression, could quickly become a severe limitation of the channel expansion of a system.

The best way to not limit the channel expansion of a system is to consider a 1-GHz bandwidth. Currently, 1-GHz is the highest bandwidth available in active and passive components. However, not many systems can afford the luxury of building plant that will operate to 1-GHz or above, so they often consider 750 MHz.

Unfortunately, however, 750 MHz systems could severely limit the future potential of a system—not only for the

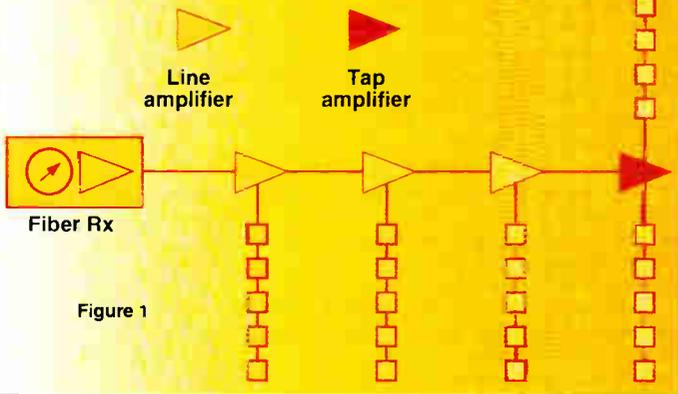


digital signals.

This would, in turn, limit the digital bandwidth of a 77 channel analog-loaded 750 MHz system to 100 MHz, and may not be enough bandwidth to support all of the enhanced services that may be marketed in the next 10 years. Similar distortion perfor-

By Colin J. Horton, Product Manager, C-Cor Electronics

Superdistribution architecture



the ability of the system to carry analog signals to 750 MHz, and digital signals above 750 MHz.

Operating costs

Another advantage of the 1-GHz amplifiers (loaded with 110 channels) is that they achieve comparable performance to power-doubling

tional cost of the 1-GHz system is four years, as shown in Chart 4. The point at which the NPV becomes positive is the point at which the power consumption savings are worth more than the cost savings of the 750 MHz system.

Application

In typical applications, the amplifiers are spaced at 1-GHz to ensure unity gain. However, feeder design can be done taking only frequencies up to 750 MHz into consideration. A pilot carrier located near 1-GHz would be carried to operate the ALC circuitry.

Chart 5 shows a typical channel loading scheme for a 110 analog channel 1-GHz amplifier (referenced to the tap output) is shown. One pilot carrier is carried near 1-GHz to ensure adequate control of levels in the line amplifiers.

Conclusion

Although slightly more expensive to build initially, a 1-GHz system loaded with 110 analog channels provides many long-term advantages.

For example, a 1-GHz system costs less to operate (pays itself back in less than five years), supports 110 channel analog loading, has bandwidth for future transmission of digitally compressed signals, and also has bandwidth to support future services. **CEC**

formance would be expected in a 750 MHz bandpass amplifier.

Solution

The solution to this potential problem lies in a system that utilizes 1-GHz of bandwidth, but is designed for a maximum analog channel loading of 110 channels (50 to 750 MHz). Such a system will allow the typical projection of analog channel loading (110 channels) to be carried without eliminating the future use of digital compression transmission, because an additional 250 MHz of bandwidth capability is available to support future digital signal transmission in the 750 MHz to 1-GHz range.

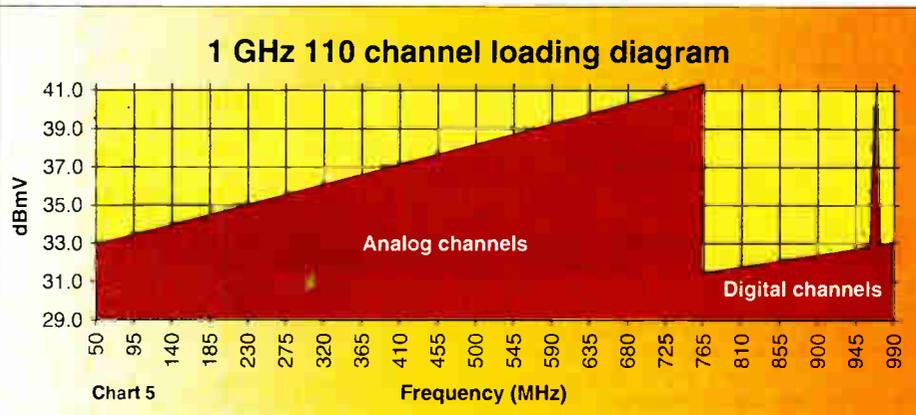
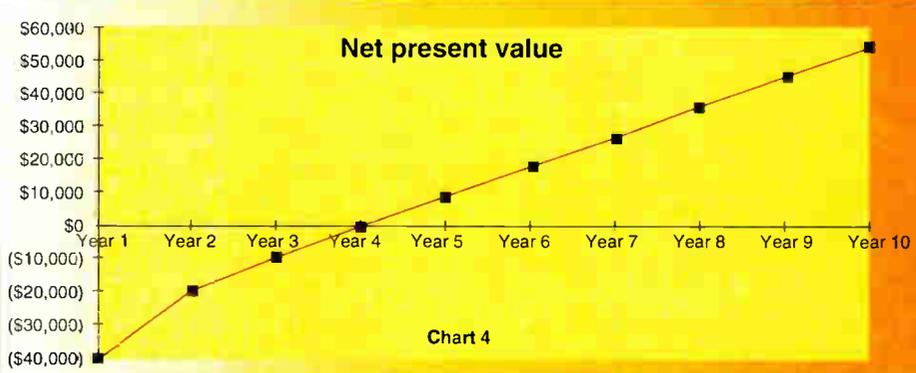
The immediate reaction to a 1-GHz system is that it will cost too much. But the reality of the situation shows that only a small (6%) percentage increase in active usage (over a 750 MHz system) is incurred if the system is designed to a bandwidth of 1-GHz with 110 channels.

To do this, the superdistribution architecture shown in Figure 1 can be combined with 1-GHz line and tap amplifiers. In the figure, line and tap amplifier configurations are optimized for the superdistribution architecture. The superdistribution architecture does not cascade amplifiers with high output levels, but instead cascades relatively low-level output amplifiers with a form of express feeder. Each type of amplifier has special output ports (called tap ports) with high output levels which are used to feed taps.

To ensure operation of the system to 1-GHz, the express portion (trunk) of the system is designed to 1-GHz, so unity gain is maintained between amplifiers. However, the feeder portion of the system is only designed to 750 MHz, taking advantage of the robustness of digitally compressed signals when they are carried on an analog plant. This design approach maximizes the cost effectiveness of the system without compromising

750 MHz amplifiers but utilize only push-pull hybrids. Because of the use of push-pull technology, the power consumption is only 60 percent of that of an equivalent power-doubling 750 MHz amplifier. In a 200 mile system with six amplifiers a mile, (even with an increased 1-GHz amplifier count (six percent), this results in an annual power cost savings of over \$10,000 (based on 10 cents per kilowatt-hour).

The financial implications of this make the 1-GHz bandwidth system even more attractive. Chart 3 illustrates that on a simple straight line payback analysis, the 1-GHz system pays for itself in 5 years. Using a more sophisticated financial analysis tool, Net Present Value (NPV), the payback period for the addi-





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Ushering in the

Elliot, Horowitz and Miller honored as 1992 Men

If revolutions need heroes to bring history alive for future generations, then historians looking back on the digital television revolution will need to include Tom Elliot, Ed Horowitz and Howard Miller in their recollections.

The history books should show how these three disparate men, representing a cable operator, a programmer and a broadcaster, came together to collectively determine the future of television transmission and redefine how information and entertainment programming will be consumed in the future.

It is for these accomplishments that Elliot, vice president of engineering and technology at Tele-Communications Inc. (TCI), Horowitz, senior vice president of Viacom International and chairman and CEO of Viacom Broadcasting, and Miller, senior vice president of broadcast operations, engineering and computer sciences at PBS, were named *CEA* magazine's 1992 Men of the Year.

Elliot, Horowitz and Miller were able to set aside political rivalries and cooperate between industries to define one of 1992's greatest technology prizes—the CableLabs request for proposals (RFP) for a digital video compression system. Although each will deploy technology differently, the inter-industry cooperation "is a harbinger of things to come," said Dr. Richard Green, president of CableLabs, winner of the 1991 *CEA* Man of the Year award and chairman of this year's selection committee.

Early on in the selection process, Green said he determined that the most significant event of 1992 was the implementation of digitally compressed TV signals. But "it was impossible to pick one person's contributions" to the digital compression selection process, Green said, explaining why multiple winners of the award were named. "These are the guys who led the charge to introduce digital technology into cable systems."

The significance of the dawning of the digital era in television shouldn't be downplayed by anyone. Selecting a new, standard method of delivering video signals to the home rivals the development of NTSC signals, along with the addition of color and stereo audio, in long-term importance. It will alter the

way television is consumed, lead to new programming options, put the viewers in control of what they want to watch and promulgate new relationships between computer firms and television entities.

TCI, of course, plans to use digital compression to deliver more programming choices to its subscribers. The nation's largest MSO announced last month it intends to roll out at least one million set-top decompression devices in homes starting in 1994 and is already actively encouraging the programming community to develop new ideas that take advantage of the additional "shelf space."

Elliot calls the new age of television "desktop video" in which people at work will interact and communicate via personal computers offering video, text, graphics and voice services. "I will predict that within five years, when you think of communicating, you will not think of using your telephone—you'll think of your PC." While that sounds like a bold prediction, remember this is the guy who five years ago astounded the world by suggesting we wait for a digital television system (see sidebar, page 50).

Digital TV also means that passive viewers could, for the first time, gain control of the programming—deciding what to watch, when to watch it, whether or not to record it and actually become involved with it, if desired. With hundreds of channel options, programmers can develop new schedules and new interactive programs. Intelligent devices in the home can monitor and "learn" the viewing patterns for every person in the home and suggest a customized viewing schedule for each.

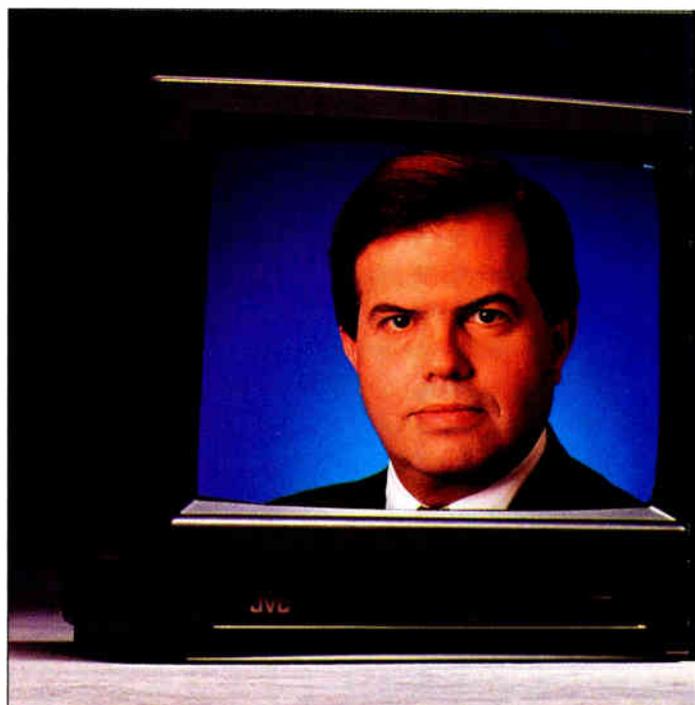
There are a number of companies planning to capitalize on the adoption of digital transmission. Discovery Networks, a partner of TCI, recently announced the development of "Your Choice TV," a re-

mote control ordering system that combines a universal remote control, on-screen navigation and an electronic ordering system that allows viewers to search, buy, view and tape programs offered in a 500-channel system that features digital decompression set-tops. The purpose of the system is to make it simpler for users to control their televisions.

What digital brings

With digital compression technology, Viacom and PBS will both be able to multiplex their present programs, offering dozens of viewing options simultaneously to viewers of cable systems and satellite dishes. PBS plans to link the nation's schools via a massive satellite interconnect that also takes advantage of twisted pair, fiber optics, cable systems and microwave to bring educational television to all corners of the nation.

PBS is even working with other educational entities to foster the educational process, including the Satellite Educational Resources Consortium, which offers live interactive programs to rural students in 25 states, and a "ma-



digital revolution

of the Year for their work on digital compression

for adult education service" that has not yet been announced.

Miller has visions of a 50- to 60-channel service offering educational programming around the clock. "Imagine having access to that wide an array of video enhanced programming in the schools in this country," Miller offers passionately. "Now you know why I want to develop liaisons to cable and others. We can do some really great things here and it's all based upon digital compression technology. It's basically reinventing public television."

With the three different approaches come three very different men. Elliot grew up on a Montana ranch and has lived his life in the West; Horowitz is New York City born, reared and educated; and Miller went to high school in Ohio and then joined the Navy.

Elliot is highly opinionated, meticulous and patriotic; Horowitz is brash, confident and energetic; Miller is ebullient, worldly and tolerant. Elliot likes participatory sports, flying model airplanes and driving fast cars; Horowitz likes to ski, travel to Hawaii and spend time with his family; Miller likes sailing his 37-footer, tinkering with antique cars and traveling the globe.

While these three engineers are all different, they share some traits, too. Each is competitive, brilliant and extremely busy. Each one also understands the importance of digital technology and the profound effect it will have on the future.

Tom Elliot

Elliot has been a fixture at TCI's corporate headquarters since 1980, when he transferred from Western Telecommunications, a common-carrier microwave network operator. Tom was brought to TCI because his ability to track emerging technologies and develop uses for it was seen as a way to win cable franchises throughout the country.

Tom started his career in nuclear instrumentation after graduating from Colorado Technical Institute in 1962. As part of its work, the company blew up nuclear devices and tested nuclear rockets and airplanes.

But his desire to return to Montana caused him to move to Bozeman as assistant chief engineer for Western Microwave, a company co-owned by Bob Magness (the founder of TCI). Later, Elliot became the company's chief engi-

neer and in 1969 moved to Denver to become general manager of Mountain Microwave, a division of Western Microwave.

Western aggressively sought traffic for its network and instituted a rigorous reliability benchmark to become an alternative to the Bell System. In fact, the first non-Bell transmission of network television signals was sent over Western's infrastructure from Denver to Salt Lake City.

Elliot recalls other accomplishments, including: installation of the first fiber for the Air Force; construction of the first transportable earth station that was used to cover a rafting trip taken by President Jimmy Carter; and equipment modification that improved klystron reliability, among others.

After coming to TCI, one of the first things Elliot did was build an experimental, but operational, two-way cable plant in the suburbs of Denver to test services like home shopping, banking, and security. Elliot found that a two-way network was possible, but not practical, for several reasons, including a lack of compatibility between vendors.

That experience led directly to Elliot's efforts to bring some standardiza-

tion to an industry that had always eschewed consensus and thrived on proprietary systems. Perhaps the most famous project Tom took on was the issue of cable sizes. A decade ago, each coaxial cable manufacturer had different specifi-



cations for their different lines of product. This resulted in poor interfaces because connectors wouldn't fit the way they were designed to—especially when cables from different manufacturers were mixed within the same cable plant.

By the mid-1980s, Tom turned his attention and effort to the TCI "on-premise" approach to signal delivery. The company had long avoided deployment of addressable set-top descramblers because they were costly and inherently unfriendly with consumer elec-

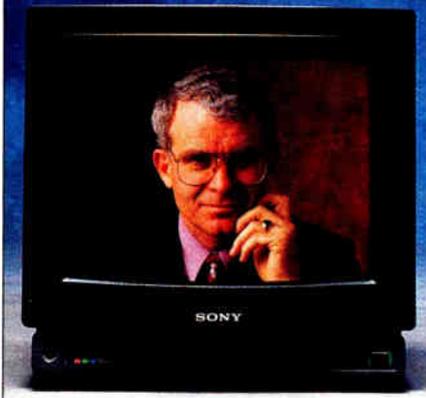
tronics. Instead, Elliot developed a system that served as a point of demarcation between the cable plant and the in-home wiring belonging to the cable subscriber that would one day house addressable traps to control cable service. Although TCI eventually chose not to fully implement the system, the overall concept lives on and is embodied in research by other cable operators as well as equipment suppliers.

A couple of years later, Cable Television Laboratories was established in

Boulder, Colo. Elliot was one of many who helped the consortium get up and running and was the first executive to be "lent" to CableLabs. Tom worked for two years in Boulder as vice president of science and technology and was responsible for starting several basic-level research projects.

For example, Tom contracted with a number of different manufacturers to perform studies on F-connectors, bat-

'CableLabs needed someone with my kind of background, credibility and visibility to get this off the ground'



teries and other unexciting system components to determine if there were ways to use them more effectively.

"CableLabs needed someone with my kind of background, credibility and visibility to get this off the ground," said Elliot. "I think I was able to get the vendors (who are not members of CableLabs) heavily integrated into the process and I think I was largely successful at that."

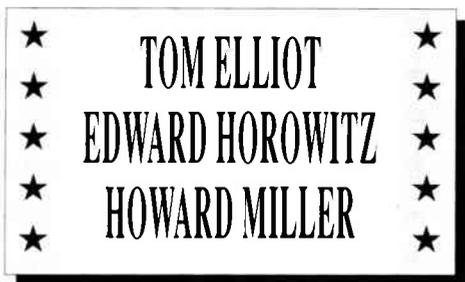
Because he was working on behalf of other cable operators while at CableLabs, Elliot had to alter the way he interfaces with people. Instead of meeting a confrontational Elliot, people found a sounding board—and they appeared to like Elliot's opinions. "What I really enjoyed was the sense of involvement, the sense of people wanting to understand what my thoughts were. And I benefited because I learned an awful lot about

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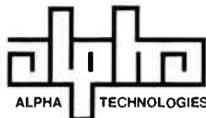
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what their thinking was," he recalls.

At the time Tom was due to return to TCI, the company was preparing to undergo significant change. United Artists, which had already absorbed United Cable, was about to be acquired by TCI—a transaction that would effectively double the subscriber base of the MSO to 10 million customers. Also, fiber optics was being deployed and opened up multi-media, alternate access and video compression markets, telcos wanted to start joint ventures, international franchises

were being let and video on demand looked feasible.

Upon Elliot's return, he jumped into many of these issues because TCI needed "engineering technologists" to see how these markets could play out, and to help formulate deals to open a range of new opportunities.

"That's what my job has evolved into," the 50-year-old father of three boys says now. "I do the front-end work to capture these opportunities for TCI and the cable industry." Although he's been working

80-100 hours a week, Elliot admits his job is "a hell of a lot of fun."

Ed Horowitz

Like Elliot, Horowitz goes back a long way in cable television. But unlike Tom, Ed cut his cable teeth in the summer of 1967 with a part-time job selling cable service door-to-door for TelePrompTer in

A TOAST TO THE TERRIFIC TRIO.

Here's to Tom Elliot, Edward Horowitz and Howard Miller. In your efforts to define the digital era of television, you have *re-defined* the meaning of teamwork.

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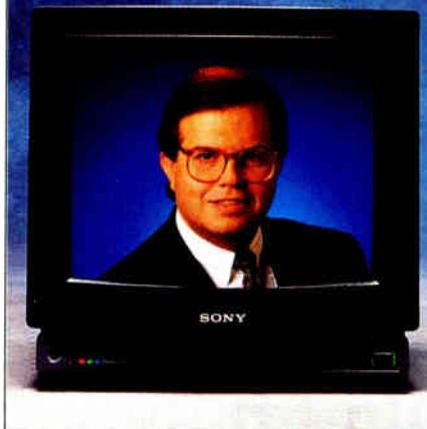
Tom, Ed and Howard, we salute you.

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PHILIPS

I wouldn't trade the sales and marketing period of my life for anything.'



Manhattan. He followed that up the next summer by assisting the sales and engineering departments and then became a full-time TelePrompTer employee after graduating from New York's City College with a bachelor's degree in physics and a minor in electrical engineering.

From 1970 to 1974 Horowitz worked in the East Orange, N.J. cable system (now known as Suburban Cable), where he met industry pioneers Irving Kahn, Peter Gilbert and Bob Bilodeau, among others. His first project was to assist in the installation of the first AML microwave transport system in and around metropolitan New York City.

When McLean Hunter purchased the system in 1974, Ed jumped to Home Box Office, a two-year-old fledgling pay service, where he planned and built a regional microwave network to deliver HBO throughout the Northeast. Be-



the BEST MAN WON.

*We recognize the contributions made by Tom Elliot, Ed Horowitz, and
Howard Miller to the cable television industry and wish them a hearty congratulations
on the winning of CED's Man of the Year Award.*

*Our industry is undergoing fundamental changes demanding the
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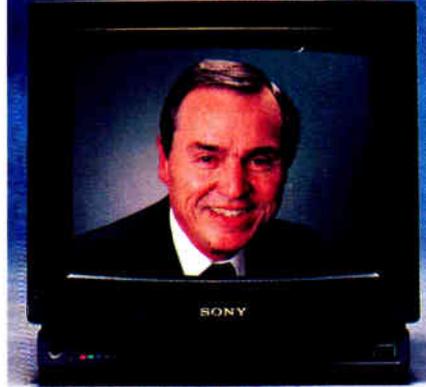
cause the company was so small, everyone wore multiple hats—and Ed was no exception. In addition to his engineering tasks, Horowitz was still active in sales and marketing, too.

In the early days, HBO was sold to cable operators as a value-added programming service. Ed would contact a cable operator, sell HBO to him, then immediately contact a neighboring operator to tell him the system next-door is planning to launch the service. “I could arrange to sign systems up, have the signal delivered, help write a letter for the consumer, then cut and paste together a launch campaign and show up the first day to cut the ribbon with the mayor,” Horowitz recalls.

Gradually, Horowitz moved further away from operations and more into sales and marketing. After HBO was put on Satcom 1 in 1975, the service grew by leaps and bounds—and Ed moved up the sales ranks, holding a variety of management positions and was ultimately named a vice president in charge of the central region of the U.S.

During the late ‘70s, Ed was selected by parent company Time Inc. to attend Columbia University’s master’s degree program for executives, which he completed in 1979.

‘It (HDTV) could have been devastating to the whole American structure.’



Did this technologist feel like a fish out of water, surrounded by sales people? Not at all, says Ed. “I wouldn’t trade the sales and marketing period of my life for anything. It gave me a full understanding of what it takes to launch a business.”

Buried within that statement is some insight to Horowitz’s approach to business and life. Ed’s the type who’s not satisfied knowing just one discipline. For example, at HBO he wanted sales and marketing experience because its real success was negotiating deals with movie studios and packaging it for a good on-air look.

“I’ve always prided myself in being able to look at business not from just one discipline, but in understanding how it exists in the overall context of life,” says Horowitz. At HBO, Ed and the others had no formula to go by for success because there wasn’t one—they were sailing in uncharted waters. “I helped write the textbook and that’s always fun to do.”

After nearly four years in sales and getting “burned out,” Ed left the sales and marketing team in 1980 and went to head up operations, including HBO’s studio on 23rd Street. During that time he negotiated and gained approval from

**Congratulations to
Ed Horowitz, Tom Elliot and Howard Miller
CED Men of the Year 1992**



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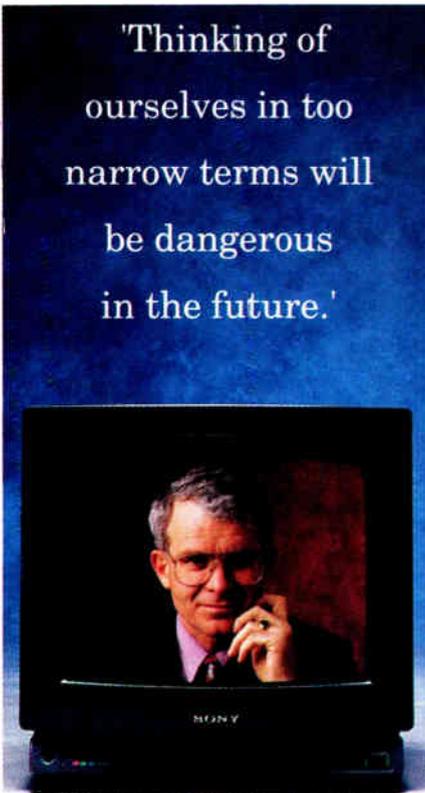
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Hauppauge, Long Island to establish the HBO Communications Center and uplink site.

Throughout the '80s Ed became more involved in the overall coporation. He was named to the executive committee, where he worked with Michael Fuchs, Joe Collins and others to chart the future of HBO. By 1988, HBO was deciding whether to enhance its distribution capabilities or focus more on programming. Fuchs and Ed mutually decided it was time for Ed to move on. "It was like growing up and leaving home," Ed recalls. "I had some trepidation."

After news of Ed's departure hit the street, he received numerous calls from people in the industry—some wishing him well and others offering new opportunities. "I realized my family wasn't HBO, it was the cable industry," he says.

"The decision to join Viacom was both easy and difficult," Ed now says. "It was easy because of the people here, difficult because I had friends I was turning down." His attraction to Viacom was the corporate culture and the people at the top. "Each of them told me that if I was looking for an entrepreneurial environment, I'd found the place. It's been everything I'd hoped for—and more."



At Viacom, Ed wears two large hats: chairman and CEO of a group that owns 14 radio stations and five TV stations; and senior technology officer of the company responsible for keeping abreast of emerging technology that affect Viacom interests.

"I think that if I have a strength, it's being able to see what is out on the technology horizon, separate what is real and what appears to be fiction, and translate them into language marketing, programming and financial people can understand," says Ed.

Howard Miller

The springboard for Howard Miller's professional career was the launch of the first rocket into space by the Soviets in the early 1960s. Immediately, the United States was put on the defensive and space-related appropriations grew dramatically.

Miller, who discovered he loved electronics during his stint in the Navy, joined Martin Marietta about a year after graduating from college. He began by working on nuclear power supplies for satellites and then, after going to work for Westinghouse Astronuclear Lab in 1962, he became involved in the devel-

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opment of a nuclear engine for a craft that was being designed to explore Mars. But as the Vietnam War grew in size, it siphoned off most of the money earmarked for the project, and it was eventually canceled.

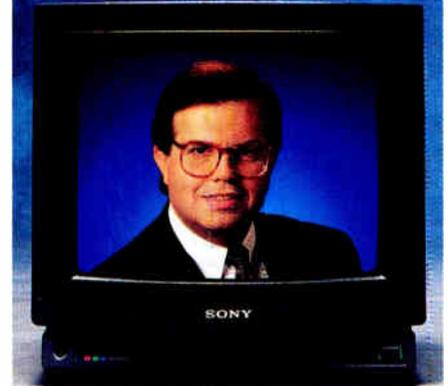
In 1971, Miller was transferred to Westinghouse's transportation division, which had several contracts to design automated people movers for Bay Area Rapid Transit in San Francisco and similar projects for airports in Orlando, Tampa, Atlanta, Seattle and London,

England. "We took mass transit out of the 19th century and put it in the 20th century," recalls Miller.

After a short stint at Westinghouse headquarters, Miller was introduced to the cable industry when the company bought TelePrompTer and he was transferred to Westinghouse Broadcasting and Cable as its vice president of technology and special projects. "I was transferred because they really didn't have any engineers who had been involved in product development," he recalls.

Miller's assignment was to review emerging technologies and determine how they might fit into cable system upgrades and rebuilds. At the time, Group W Cable was spending \$1 million a day seven days a week expanding and upgrading systems, says Miller. But at the same time, the company was plagued by exorbitant convertor failure rates—often running 20 percent out of the box.

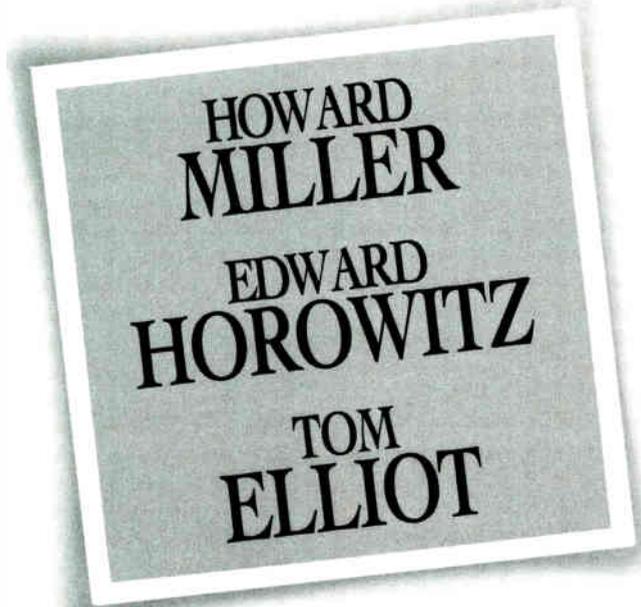
'I'm saddened that when cable will have to compete more than ever, we're still in this Beta vs. VHS war.'



In response, Westinghouse "reverse engineered" every set-top on the market at its R&D lab and shared the knowledge it gained with the manufacturers. Miller says he saw an improvement almost immediately.

But because there were so many convertor manufacturers, the market was extremely fractionalized and cable operators were having problems gaining the attention of the manufacturers when they had problems. "I hate to say this, but when vendors won't respond and you're being harmed by the process, you have to do something," Miller says.

He went to Japan and formed a joint venture with Sanyo to introduce a family of equipment into the marketplace. The purpose wasn't solely to bring Japanese suppliers into the industry, it was to show the big suppliers they were hurting the industry by building

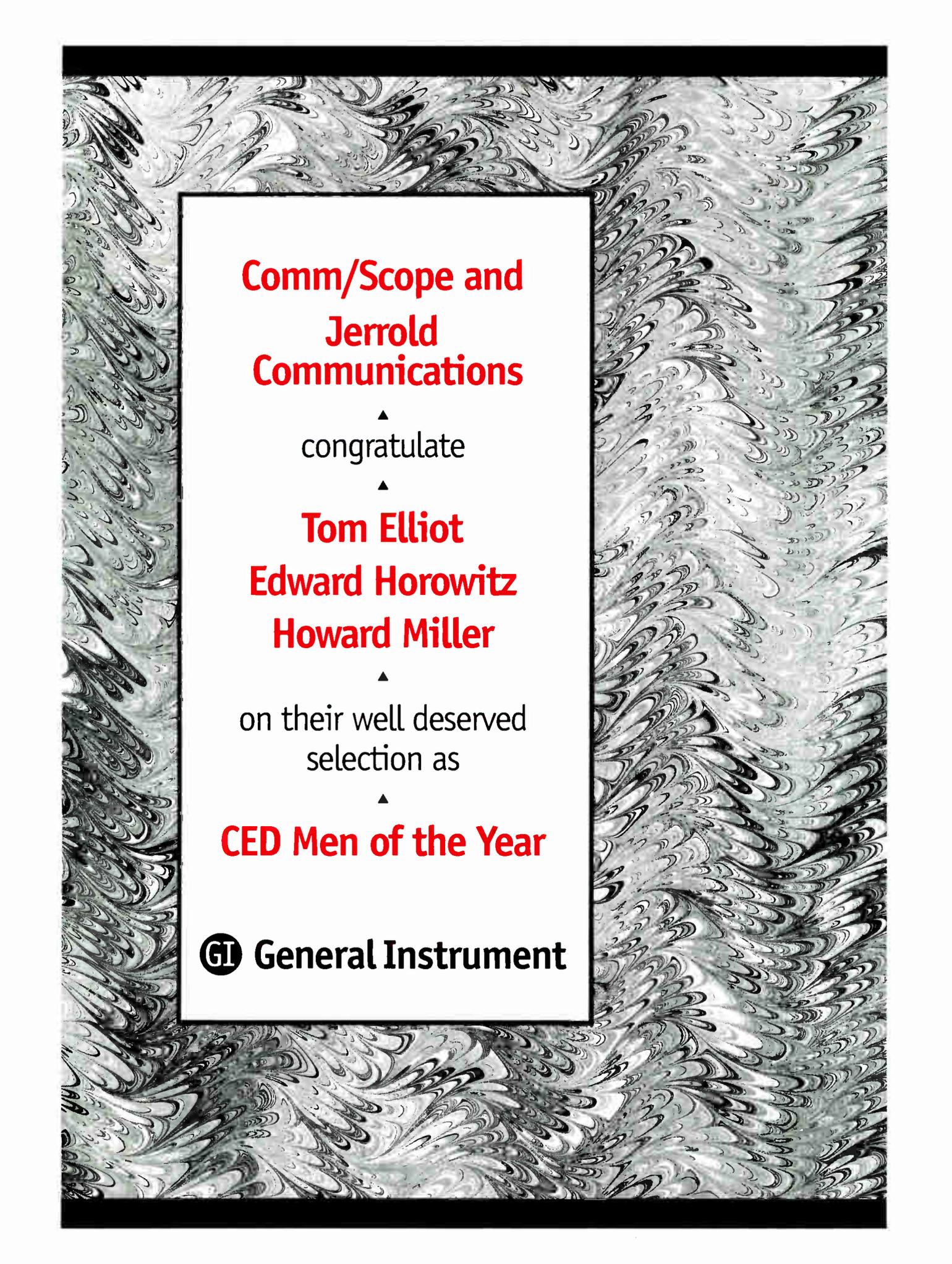


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The background of the entire page is a complex, black and white marbled pattern with swirling, organic shapes. A white rectangular box with a thin black border is centered on the page, containing the main text.

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unreliable products. "We were all being harmed by unreliability and I think they (cable operators) are still paying" for those early problems, Miller adds.

Group W also developed tracking and assignment systems to improve response times for technical crews responding to outages and to reduce the number and length of outages. "We introduced a series of activities to reduce failures," notes Miller. "I think it was fairly successful."

Shortly after coming to Group W, Miller became acquainted with Japan's

high definition television (HDTV) research. He became alarmed because he knew it could have an impact on the future of terrestrial broadcasting in the U.S. He then wrote an article that recommended the FCC restructure its licensing policy to conserve radio frequency spectrum.

Shortly after the article was published, a member of the State Department contacted Miller and asked him to represent the U.S. on international television production issues. It was at that

time Miller met Richard Green, the PBS vice president who was also active on an international standards-making body.

In early 1985 Westinghouse cashed in its cable TV assets, which had doubled in value in just three years, and exited the industry. Miller stayed with Westinghouse and became an executive vice president based in Tokyo, Japan. He was given access much of the basic electronics research underway there and was a liaison for Westerners who wanted to

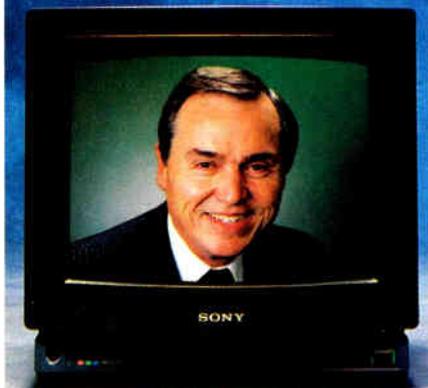
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'You either
lead in this
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world or you
lose out.'



meet with Japanese officials. He also saw the satellite HDTV system Japanese broadcaster NHK was developing.

"I kept sending notes back to everyone I could get to listen to me that there was something going on there they needed to be aware of," Miller recalls. After several attempts, Miller was successful in persuading U.S. officials to view the Japanese research and then open hearings in America on the subject. That resulted in the formation of the FCC Advisory Committee on HDTV.

"Sitting in Japan and watching what was happening, I realized the incredible effect it could have (on broadcast and cable operations)," recalls Howard. "It could have been devastating to the whole American structure."

In 1988, Green was preparing to leave his PBS post to come to CableLabs so he

MEN OF THE YEAR

Congratulations to the team
who defined and pioneered
the age of digital television.

Tom Elliot

Vice President Engineering and Technology, TCI

Edward Horowitz

Senior Vice President, Viacom International
Chairman and CEO, Viacom Broadcasting

Howard Miller

Senior Vice President of Broadcast Operations,
Engineering and Computer Services, PBS

ANTEC

began to search for a successor. He settled on Miller immediately. "Howard has a lot of vision and a lot of capability," says Green. So Green immediately began to lobby Westinghouse to "loan" Miller to PBS, arguing that he would have more clout regarding HDTV from PBS' point of view.

"The more I thought about that, the more I realized it was probably true and that it would be in the national interest to do it," says Miller, 59 and the father of two daughters and one son. "That's probably what made me do it. I used that rationale as my guiding principle."

Bringing Howard to PBS on a loan basis ran into obstacles, but Westinghouse eventually agreed to cut Miller free. Since that time, Miller has relished his tenure at PBS and is proud he's brought broadcast and cable interests together to solve a mutual problem. "I think the era of broadcast as one competitive force and cable as another is over," Miller states. "It's now a question of how we build bridges and relationships."

The first bridge?

As it turns out, the compression project is one of those bridges. Although there is disparity over the absolute need to follow the worldwide MPEG standard, there is consensus that interoperability is crucial.

Elliot and Miller are both optimistic the compression method they've chosen will be fully MPEG-compatible by the time the standard is locked down by the International Standards Organization (ISO) during a meeting in Sydney, Australia in March. However, they're both insistent that they must move forward and implement compression technology within the next 12 months. That puts incredible pressure on MPEG to get its job done without delay.

Elliot just a year ago thought he'd have to select a proprietary system simply because the pictures generated by MPEG compatible systems were inferior to the proprietary ones. But his mind began to change at last year's National Show in Dallas, when MPEG images showed tremendous improvement.

The same is true of Horowitz, who is insistent that his compression system be fully MPEG compatible to avoid a format war similar to the one between VHS and Beta 10 years ago. "The digital operating system should be an open system so that we as operators and programmers can have equipment from a variety of sources for the lowest cost," says Horowitz. "I'm saddened that in an environment where the cable industry will have to compete more than ever

Taking lumps and being proud

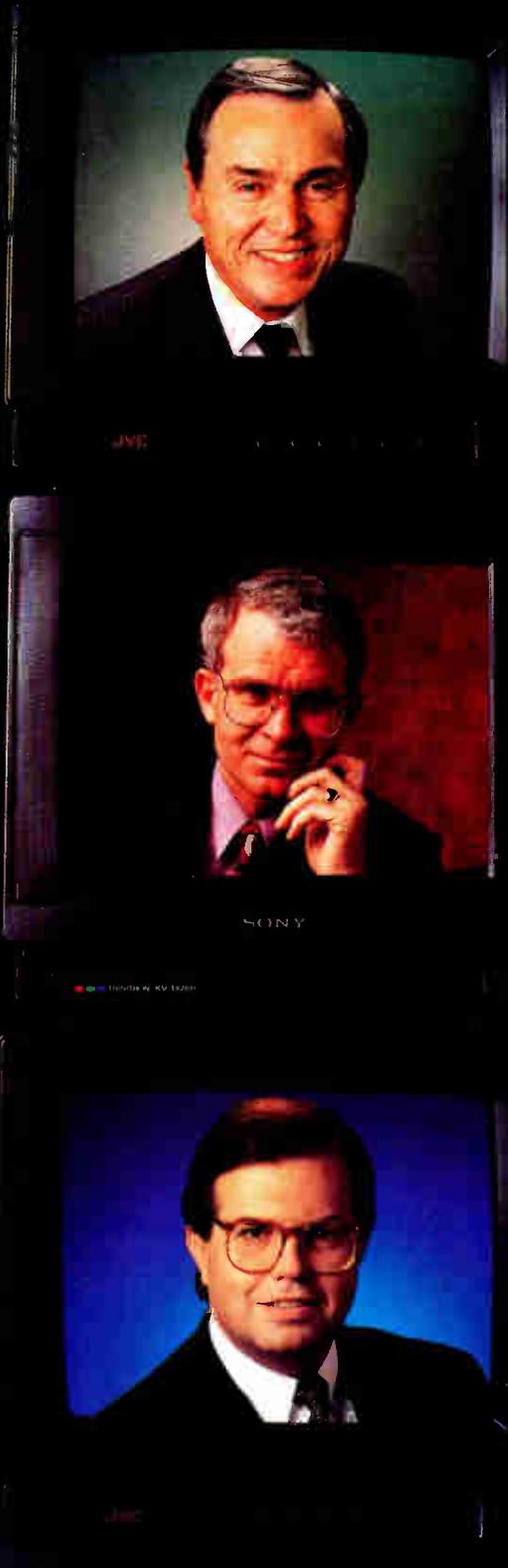
To the casual observer, it might seem as though the three technologists chosen as *CED* magazine's 1992 Men of the Year would be a contentious group. After all, the re-regulation of the cable industry has put relations between cable and broadcasters at a new low. But Elliot, Horowitz and Miller were able to check their weapons at their respective doors and, through Cable Television Laboratories, define a new signal transmission standard for North America.

"This trend toward cooperation at the technology level is important," says Richard Green, president and CEO of CableLabs. "We don't want to build islands anymore."

It might be fair to credit CableLabs and Green for making the standards-setting process work so well. Horowitz chaired the subcommittee that was tasked with setting down a list of performance parameters the winning system would have to adhere to. Elliot devoted the last two years of his life—both personal and professional—to getting this job done. And Miller was bright enough to recognize his needs were precisely the same as the cable industry's and joined the effort. But it was CableLabs that seemed to referee the process up until each entity went its own way to negotiate purchase orders.

"I am really proud of the technical team that worked on this process, including the staff people at TCI, PBS and Viacom," remarks Green. "It was a very effective group." **CED**

Roger Brown



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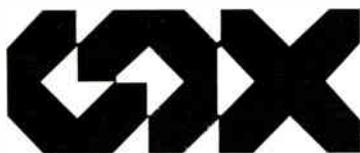
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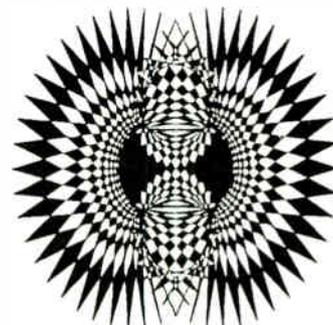
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with corporations and industries that are many times our size that we're still in this Beta vs. VHS war. It's a concept being perpetuated by the manufacturing community and some old-line thinking," Ed continues.

Horowitz says its important for cable operators to act as an industry in this case because in order for cable to compete in the coming years it will have to make high-volume transactions with subscribers. Furthermore, Horowitz says, the cost of the equipment needs to be borne by the consumer in the future and the only way to do that is to build decompression circuitry in televisions and other consumer electronics devices. "The cable industry (must realize) it is more powerful as an industry sector if it has figured out a way to interconnect rather than build walls between one another."

Although Miller and Elliot both prefer an MPEG standard that includes a series of enhancements suggested by General Instrument and AT&T, they are highly optimistic the equipment they're buying will adhere to the standard.

"You get a great sense of energy and commitment from the people running the meetings," Elliot says. "You get the sense this thing is moving along and will come to a rational conclusion."

While Elliot can perhaps justify his assertion that he is the "father of compression," Horowitz and Miller both bought into the need for a digital signal delivery system a long time ago.

During a visit of the Massachusetts Institute of Technology about three years ago, Horowitz wondered if the same compression being applied to HDTV to make it fit in a 6-MHz slot could be brought to bear on NTSC signals. He was told yes.

Miller came to rest on digital compression because it will allow PBS to increase the programming it offers to educators. "There are some industries where you can do very well by being a follower—but this doesn't happen to be one of them," he notes. "You either lead in this telecommunications world or you lose out."

Some cautionary notes

For one, Miller hopes this project isn't the last he'll share with the cable industry. While it seems he may have solved the riddle of delivering more programming nationally via satellite, he says he has to figure out how to "personalize" the last mile of transmission so that local sponsors can be properly credited.

To do that, he's looking to work with the cable industry again. Miller says

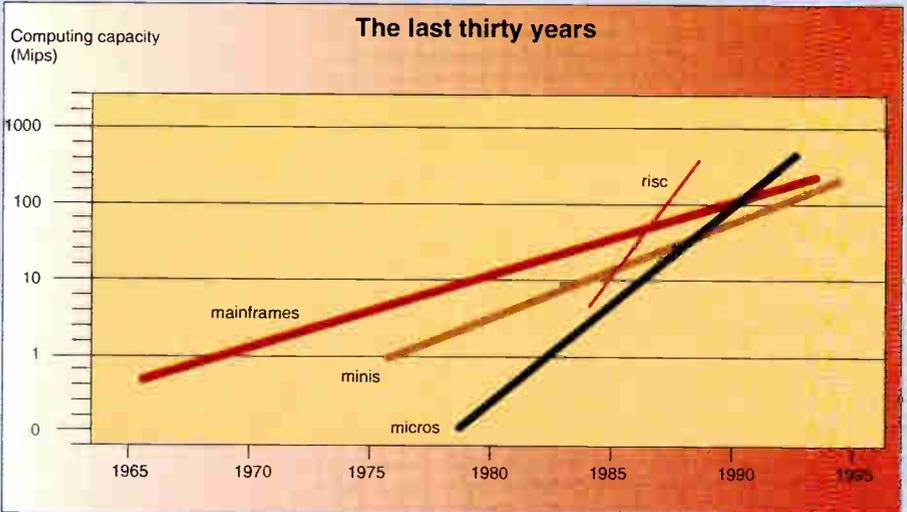
the same technology CableLabs is exploring to use for national delivery of local spot ads "is exactly the same hardware located probably in the same spot." So why not work together on that endeavor?

Anyone who is disturbed by that prospect needs to change their thinking, Miller says. Perhaps the greatest challenge facing both the cable industry and PBS is old-line thinking. "We've entered into an era that almost demands constant change and upgrades and im-

provements," Miller adds. "The industry has not yet come to grips with that."

Elliot agrees. "Thinking of ourselves in too narrow terms will be dangerous in the future," he says. "We need to be thinking of how we participate in the Information Age and what we do to add value with this great new technology coming out. It's going to happen regardless of what we do, so we might as well be leaders."

Let the revolution begin. **CEd**
Roger Brown



No more islands, please

Remember four years ago when John Sie, then a vice president at TCI, came out and publicly said the U.S. should "leapfrog" the analog HDTV proposals then being presented and develop a "process digital" television transmission system and deploy it by the turn of the century?

Sie was blasted by the media, engineers and industry CEOs who wanted to know where he'd come up with such a crazy idea. Tar and feathering seemed like a good alternative for some.

Tom Elliot was the man behind the push to wait for a digital standard. Internally, Elliot had been watching what was happening with digital processors (see chart accompanying this article) and he determined that it wouldn't be long before it would be cost-effective to build a digital TV delivery system.

That notion was set out in comments filed with the FCC in December 1988 and corroborated by consulting engineers Moffet, Larson & Johnson Inc. Those comments practically demanded that the U.S. work to adopt a digital HDTV system:

"An interoperable digitally-processed HDTV broadcast transmission standard for consumer application can revolutionize America's communications infrastructure and can best preserve America's position in computer electronics and related innovative fields," the filing argued.

Although Elliot personally thought it could be done in five years, "we didn't have the nerve to say that, so we said 10 years," recalls Elliot. With TCI now scheduled to roll out digital compression in early 1994 and a digital HDTV standard set to be determined within months, it appears Elliot's own instinct was right on the money.

"I think it's fair to say that if I hadn't done that, within a year it might have been too late," Elliot maintains. "We were at great risk (of losing the standard to an international competitor) at that point. We can take a lot of pride in the fact that we refocused the effort and brought the U.S. to the forefront of the issue. We (the cable industry) can take full credit for that." **CEd**

Roger Brown

1992
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Congratulations

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Cerritos: who benefits and why?

With one year of testing left, what's new?

Just about four years ago, General Telephone of California (GTE) launched a controversial series of tests in Cerritos, Calif., a small suburb of Los Angeles.

What made the tests so litigious, says NCTA spokesperson Peggy Laramie, was a somewhat questionable contractual deal GTE struck with T.L. Robak, the construction company that actually built the fiber/coax plant. Put as simply as possible, considering the NCTA's comments span some 25 pages, the GTE/T.L. Robak deal is viewed as shaky because T.L. Robak owns Apollo Cablevision, the system that won the franchise for the city of Cerritos. In legal terms, that makes Apollo Cablevision a GTE affiliate.

In Cable Act language, that's a big no-no.

To further complicate matters, in 1990 the U.S. Court of Appeals granted an NCTA petition for review of the Cerritos project, and held that the FCC failed to provide a lawful basis in granting GTE a telco/cable cross ownership waiver¹—but still, GTE Cerritos continues to operate without so much as a smack on the hand. "Our point is, what good are (federal) safeguards, if the Commission ignores them?" Laramie asks.

An NCTA document filed with the Commission warns that "such an approach (like the GTE Cerritos/T.L. Robak deal) would allow telephone companies to enter into short-term arrangements with cable TV operators—including financing and

other subsidies—with impunity, knowing that by the time any complaint was resolved, the prohibited affiliation would be terminated."

Indeed, cable engineers are so nettled by the tests, they even argue over the GTE test nomenclature, saying the experiments are not technical in nature. "The whole Cerritos project is a bunch of bull—," says one high-level cable engineer. "They call it technological testing—when it's actually marketing tests."

In the highly publicized arrangement,

work for CATV and telephone. GTE owns the 550 MHz plant; franchise-holder Apollo Cablevision leases 39 channels of it for signal distribution to some 7,500 subscribers. GTE Service Corp., a subsidiary of parent company GTE, leases the remaining 39 channels from the local GTE telephone company for the experiments.

For its part, GTE says the goal of its tests is to compare various transportation mediums. "Our original intent was to compare fiber optic transport facilities for telephony, and then to compare fiber,

coax and copper for doing telephone, video and local data types of services," explains Michael Morrison, manager of advanced testing operations at the GTE testbed.

"On the services side, we knew whatever we'd be working on here in Cerritos would be about five years ahead of mass production. We wanted to make sure we clearly understood and identified the fiber technologies that would support the services our customers will want in the future," Morrison continues. "Operationally, technically and service-wise—the question was, what do we have to do to please the customer?"

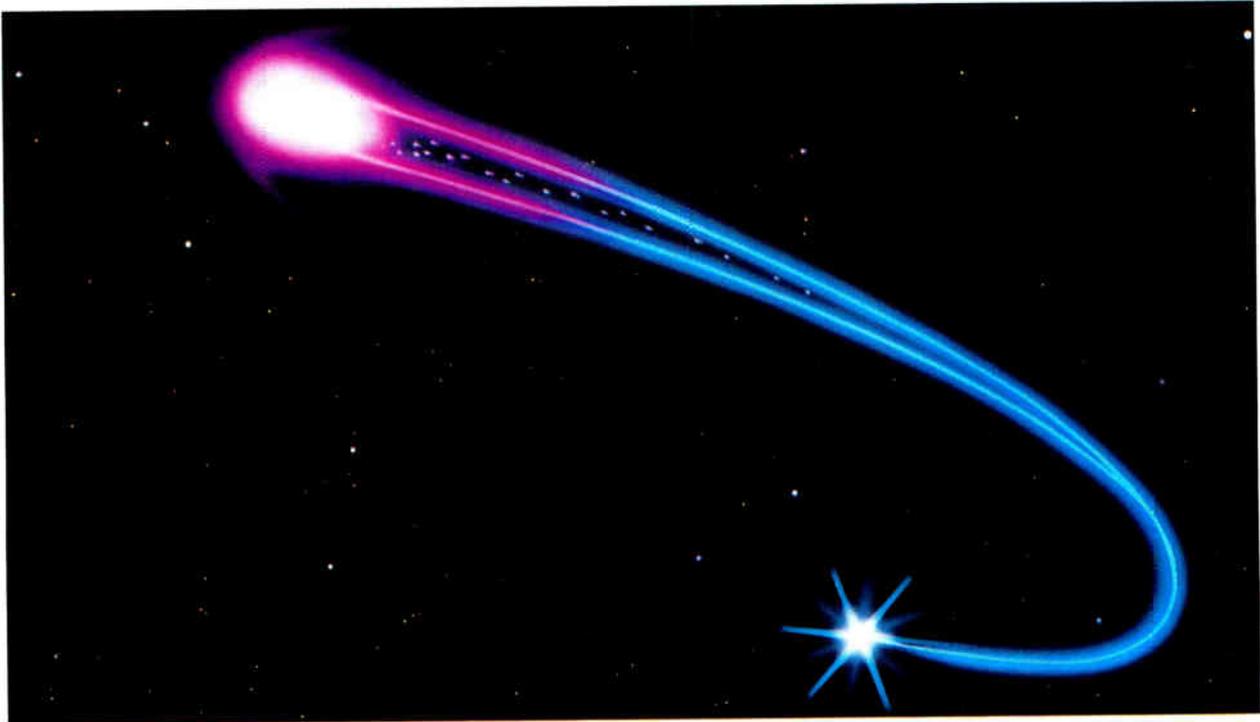
In 1987, GTE established two ad-hoc teams to traverse the world in search of new and consumer-pleasing technologies. Mor-



A prerequisite of the Cerritos project mandated that all distribution plant be installed underground.

GTE struck a deal with the city of Cerritos to build an underground fiber net-

work for CATV and telephone. GTE owns the 550 MHz plant; franchise-holder Apollo Cablevision leases 39 channels of it for signal distribution to some 7,500 subscribers. GTE Service Corp., a subsidiary of parent company GTE, leases the remaining 39 channels from the local GTE telephone company for the experiments.



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erson participated on the team that researched Europe, with stops at Paris, France-based Minitel, a developer of interactive video services, and Munich, Germany for a look at videophone and teletext over fiber.

After it had decided to use single-mode fiber and defined what services were to be included in the tests—real-time video on demand (VOD), 30 channels of near video on demand, POTS (plain old telephone service) over fiber and videophone, among others—GTE started discussions with equipment manufacturers.

“We went to them and said, here’s our vision of the future. We want to add video onto the public switched network. How would you do that?” Morrison explains. “Specifically, we were looking for broadband switches, splice enclosures and optical test equipment.”

Current tests

The bulk of the experiments are taking place in the northeast corner of the horseshoe-shaped town, which GTE has labeled “phase one.” Phases two, three and four are served via a conventional tree-and-branch coaxial network which includes Apollo’s 39 channels

of regular cable service combined with GTE’s 30 channels of near video on demand, which it calls “Center Screen.”

Morrison cites several architectural tests going on in the company’s Phase One area, including a distributed star network which passes roughly 800 homes, a star architecture which passes another 104 homes, and a digital, switched fiber-to-the-curb topology which passes 90 homes. The latter was only recently implemented, Morrison says, so test results aren’t yet available.

“The distributed star, for the most part, is a POTS-only architecture,” Morrison says, “but both it and the star architecture take fiber all the way to the home.” In its star topology tests, GTE is deploying analog video equipment that is switched with two video channels and one voice channel, Morrison says.

The primary benefit of the star architecture, Morrison explains, is the associated flexibility for network customization and service provisioning. “With distributed star networks, (any changes) necessitate a change of electronics at the central office, at the distribution hub and at the home,” Morrison says. “It’s the same thing with fiber-to-the-curb. But with a star architecture, you only have to change the electronics—either at the central office or at the home.”

Interestingly, in one area, GTE has deployed broadband switches which use telephone-like switching methods to

interactive-types of services,” Morrison says.

The other benefit related to the switched broadband architecture, Morrison says, is that it can be comfortably achieved without digital compression. “Compression isn’t necessary with fiber. You can have as many channels as you have sources coming into your switch, without it being compressed,” he explains.

The broadband switches are sized to support the number of customers, which Morrison cites as one of the advantages of being in the telephone business. “Clearly, over the years we’ve learned

how to size our switches. We’re looking at having real-time video in the downstream direction where it’s bursted in segments, so you’re never tying up a channel continuously,” most likely using spread spectrum technologies like CDMA and TDMA, Morrison says.

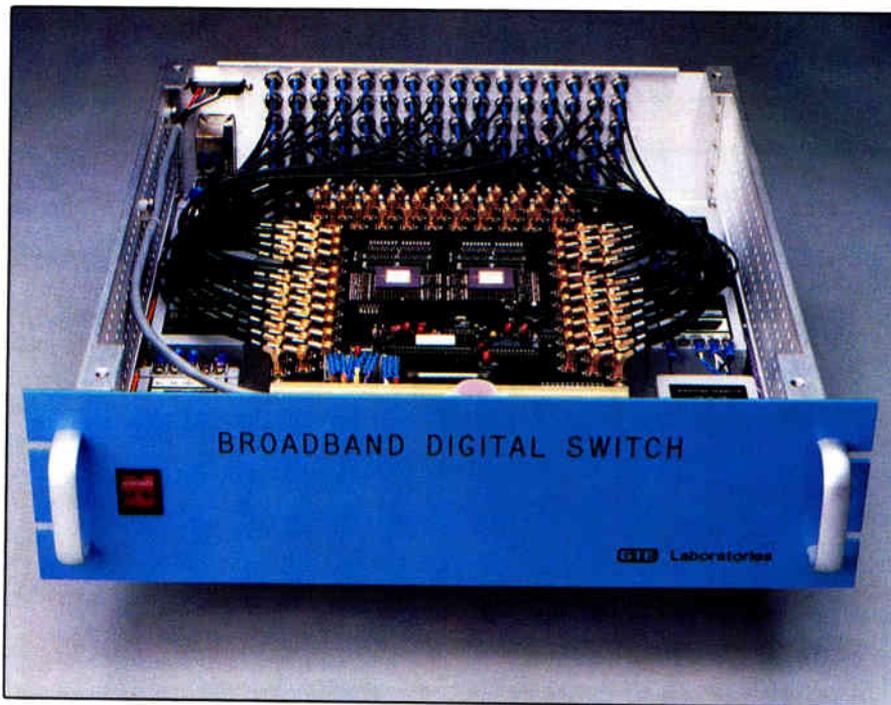
Missing link

GTE’s broadband switch was the “missing link” in providing true VOD services, Morrison submits, because prior to its development there was no real method of viewer

control over program material. The switch, he says, enables fully automated program initiation as well as unattended operator control features such as rewind, play, fast-forward and pause.

Still, though, CATV critics grumble that GTE’s VOD offering is limited, because a staff librarian (in some cases) shuttles and cues tapes from a “short notice” library of titles. Morrison’s counter: “The whole reason for having a person there as opposed to some sort of robot is that a person is far more flexible and cost effective for this test. Why spend \$150,000 on a robot that can do one thing, and one thing only?”

The ultimate solution, he says, is mass digital storage that can be housed on a digital chip, then bursted downstream to the consumer’s set-top box. The program would be uncompressed at the set-top, enabling viewer control fea-



GTE's broadband digital switch—or the telco's answer to switched video.

send video signals to the home. That system, not coincidentally manufactured by GTE Laboratories, is a digital voice and video system that offers video phone, VOD and regular cable TV video to two homes and six schools. (That fact alone has received considerable CATV industry criticism, simply because it falls significantly short of GTE’s original VOD implementation goal, sources say.)

Morrison says the concept of a broadband video switch offers several inherent benefits. “Regular cable is like the waterpipe system—all the channels are there at the house, whether you want them or not. The nice thing about the switched system is you only switch the channels you’re watching at the time. You’re essentially only using the bandwidth you need for one to four channels. That frees up the rest of the bandwidth to do voice, data or



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tures until program completion, at which time it would "disappear."

"Theoretically, we know that's going to happen. It's just that technically, we're not there yet," Morrison says.

Indeed, the broadband switch is essentially the only "new," leading edge technology within the Cerritos project—which is all the more reason cable engineers snoot on GTE's mention of "technical testing." Arguably, however, GTE is doing the best it can given the available products. Case in point: the current lack of mass digital storage devices.

"GTE is an information integrator. That's what Cerritos is all about," Morrison argues. "We're not in the manufacturing business. We're in the business of integrating existing product lines such that they benefit the consumer."

Tests nearly done

It's doubtful that the necessary mass storage devices will be ready for GTE testing before the program expires late this year. According to Morrison, GTE has no plans to continue testing into 1994. What happens after that?

"Those services and technologies that can be folded into our normal businesses will most likely be absorbed into the

regular telephony network," Morrison says. "Apollo Cablevision has first right of refusal (on the testbed and its services), but I think you'll see some of the things close up and stop, like the video on demand."

GTE's "Center Screen" NVOD offering will likely continue, Morrison says, because subscribers have "so fully embraced it."

Much to the chagrin of the NCTA and the CATV industry at large, Morrison says GTE has gained "a lot" of valuable insights from the Cerritos tests. Reports are filed to GTE headquarters regularly, and may even be contributing to existing GTE telephone upgrades.

Fred Rogers, president of Quality RF Services and owner of a small cable system in the Shenandoah Valley region of Virginia, says his local GTE phone company is already putting fiber to the home. "The way I understand it, they're putting in two dark fibers to the home every time they hook up a new customer," Rogers says.

This may be an early indication of the GTE Cerritos test findings, which industry sources say cost in the neighborhood of \$55 million. GTE declined to comment on the actual costs of the project.

Morrison is quick to point out that the CATV industry has already seen some benefit as a direct result of the Cerritos tests. CableData, he says, has released an update of its billing software that includes 30 channels of PPV—triggered by the Cerritos tests. Also, he says the testing contributed to the development of optical test equipment for non-long haul applications.

"So who benefits from this kind of stuff? Certainly we do internally, because the information is going there. (The tests) have helped us further our knowledge of where we should be making our strategic investments for the future," says Morrison, quickly adding "however, the industry as a whole has also benefited from the testing going on here in Cerritos."

But in the eyes of the NCTA and indeed, cable as a whole, that raises another question: *Which industry benefits?* **CEED**

By Leslie Ellis

Reference

1. *Comments of the National Cable Television Association*, filed to the Federal Communications Commission, July 14, 1992.

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sweeping with real-time display. The AT85R/G can be used to perform the new FCC proof tests and up to 100 traces and measurements can be stored in non-volatile memory.

Budco intros marking system

New from Budco is a low-profile marking system, called the "Soilmark System," which identifies cables in areas where marker posts aren't an option. The Soilmark system is impact-resistant, to the point where it can be driven over by lawnmowers. A warning message is permanently imprinted in the device's 7 inch diameter, high visibility orange disc. Standard or customized legends are available.

Also new from Budco: A plastic tubing, called Spiral Wrap, used to protect underground cable from mowers, weed-eaters and other such devices where the drop cable meets a structure, such as a home. The slit tube permits installation of the spiral wrap after the wire is placed, Budco officials say.

C-Cor shows new products

New from C-Cor Electronics is a transformer-less power supply, dubbed the "HE" for "high efficiency," designed for use with the company's existing SF, SP, UHF and 1-GHz lines. "We're hearing operators say that powering is one of their top five expense items, so obviously power efficiency is important," C-Cor's Director of Marketing Steve Day said at a press conference. The new supply lowers the overall ambient temperature inside the housing, thereby extending the life of associated electronics.

Also new from C-Cor is its "Surge Terminator," an AC crowbar device that dissipates power surges associated with lightning, power line faults and over-voltages. The device is compatible with C-Cor's existing 3AG-style fuse clips, and is inserted right on the AC distribution board. It was designed to reduce amplifier damage, equipment failure and outages. Voltage dissipation occurs in less than 60 nanoseconds, Day said at the Show, while noting that C-Cor's difference over other, similar products is its "ownership" of the related power supplies and RF amplifiers.

C-Cor also introduced its Cable Network Manager software, designed to identify cable outages before they actually occur. The software, which is currently available in AM and RF versions, is accessible from anywhere within the system and supports multi-user operation. It runs in a Windows-based environment, and can be manipulated with

a mouse.

Lastly, C-Cor unveiled its E600 and E700 series of line extenders, specifically designed to accommodate fiber optic architectures. "As fiber optic distribution systems mature, the need for a low-cost line extender increases," Day says. The E600 line is available in both power-doubled and push-pull 550 MHz versions, for low or high gain applications. "It saves money over minitrunks or distribution amps," Day says. The E700 line extender features a closed loop automatic gain control (AGC), enabling cascades of four amplifiers. It also includes two-way capability, and is available in power-doubling or push-pull configurations. Both units feature dual-hybrid amplifiers with an optional plug-in interstage equalizer, which smooths carrier-to-noise performance levels consistently at high and low channels.

CableLink

CableLink has designed a new addressable prom programmer to replace the discontinued Jerrold model PR-A programmer. CableLink's PRA-ECH unit is designed for use with an IBM-compatible 256K computer. The new unit offers the features associated with the Jerrold unit, but adds a parallel printer connection, password protection to avoid duplicate addresses, automatic sequential programming and software parameters for parental control and timer options. The unit is priced at \$1,488.

Channelmatic news

Channelmatic Inc. announced that its Adcart random access commercial insertion system and central CompEdit compiling/editing system has been selected for use by the Satellite AdNet interconnect in the Wilkes-Barre/Scranton, Pa. area. Satellite AdNet will use traffic and billing software developed by Unibase.

Comm/Scope intros new products

New from Comm/Scope is a software package called "Spanmaster2" which determines sag and tension parameters required for the construction of aerial plant. The software runs on any IBM or compatible PC, and provides data for any geographical area of the U.S. Also new from Comm/Scope is a new size of coaxial cable—QR-715—which Comm/Scope officials say was designed specifically for fiber-to-the-feeder (FTF) applications. The new, low-cost cable is

applicable for current and future fiber rebuilds and upgrades, the company said.

New signal level meter



ComSonics' new WindowLitePlus signal level meter

ComSonics debuted its new WindowLitePlus signal level meter, different from previous models in that it features a new, modular approach. The first snap-in module is the SnifferLite, which adds leakage detection capabilities to the meter. Also, the new unit features a real-time clock, which enables operators to perform the FCC's 24-hour tests in an unattended fashion. An accompanying software package enables data downloading and reporting. Future modules for the unit may include a printer module, an optical power meter module and a modem module.

Contec expands services

Contec International announced it has expanded its services to include electronic exchange of repair information by converter serial number, using optically scanned bar codes. When defective equipment is sent to Contec for repair, the cable operator optically scans the serial numbers and other pertinent data (such as failure codes) into his or her PC, using Contec-developed software. That information is sent electronically to the Contec location performing the repairs.

Electroline debuts new equipment

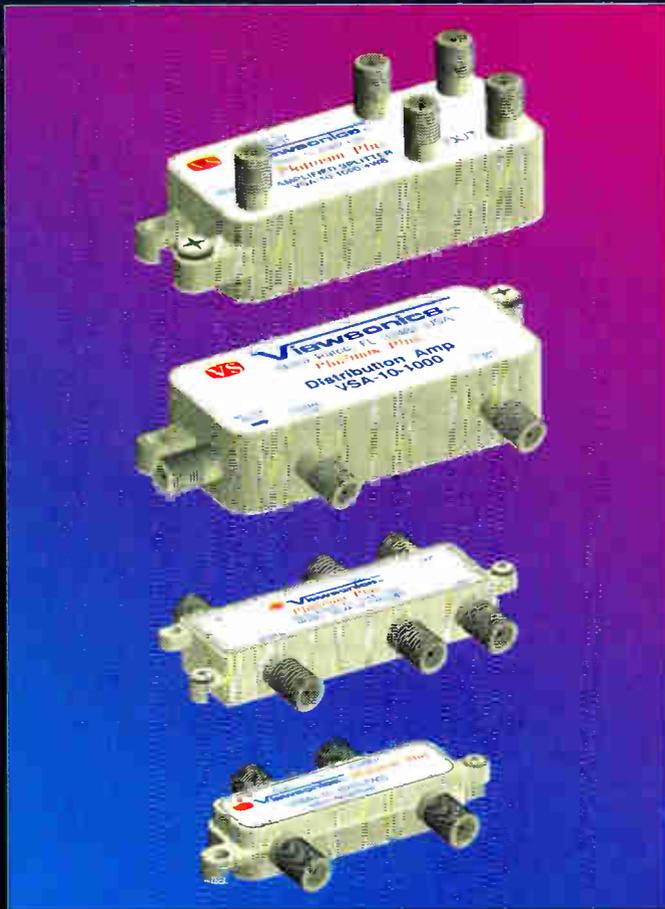
Electroline Equipment Inc. debuted three new products at the Western Show, including a 1-GHz subscriber drop amplifier, a "SuperTap" in 550 MHz, 750 MHz and 1-GHz versions, and a new generation of Multi-Tier Security jamming devices that function to 600 MHz.

The new drop amp offers 13 dB gain and 23 dBmV output per channel. It is powered from the home, boosts levels to feed homes with numerous outlets and will be available next month.

The new SuperTap doubles as a stan-

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dard multi-tap or as an addressable tap via a faceplate change. It is available in two versions: a simple on/off version and two, four, six or eight outputs as well as an on/off "basic only" or "basic plus premium" version in both two and four-port configurations.

Finally, Electroline's 1-GHz addressable system designed for MDUs and resort dwellings and features addressable control of jamming frequencies. According to company officials, a cable system can offer addressable control of several tiers of programming for between \$46 and \$87 per drop.

FM Products

FM Products has introduced a new video insertion processor to help cable techs test their systems and a new video master which automatically adjusts video signals to standardized levels.

The VIP test generator inserts test signals in the vertical blanking interval, allowing tests to take place at any time. The Video Master accepts any video input and produces a standard 1 volt TV signal with 40 IRE units of sync and 100 IRE units of white. It also cancels all low frequency interference and corrects high frequency loss due to cable slope-loss.

FPN, Time-Warner and MCI ink deal

Some 50 homes within Time-Warner's legendary Brooklyn-Queens, N.Y. system will soon participate in an alternate access, telephony-over-cable test. In the agreement, announced at the Show, First Pacific Networks will supply a fully-distributed digital voice switching system to Time-Warner which will provide alternate access to MCI's long distance network.

The intent, said FPN President and CEO James K. Gibby, is for Time-Warner and MCI to tap into the revenues currently being enjoyed by the telcos for long distance access. "Currently, about 48 percent of the telco revenue is passed on to the local telephone companies (for long distance access switching)," Gibby said. "In bypassing the local telephone company, the subscribers will likely save money for long distance calls, and Time-Warner and MCI will make money." The tests are expected to begin later this month and will continue for about six months, Gibby said.

Frequency Products intros amp

Frequency Products has developed a new wideband medium-power microwave amplifier. Dubbed the Com-

mercial Band-Select Amplifier, the new units offer bandwidths wide enough to support C-band satellite, DBS, HDTV, broadcast, Ku-band satellite, PCS, VSAT and wireless data services.

Jerrold adds switch option

Jerrold has announced a new single cable bypass switch and dual-source RF switch, both of which can be installed in the field by the subscriber or a service rep, without opening the convertor. Because the switches are powered by the convertor via the "cable in" port, no additional electrical connections are required, and the A/B buttons on the set-top keypad or handheld remote unit operate the switches.

The single cable bypass switch enables subscribers to watch a basic channel or a trapped premium channel while using a VCR to record a scrambled premium channel. It also allows subscribers to use the remote control units purchased with their cable-ready TV sets. By pushing an A/B button on their convertor, they can tune all clear or authorized channels with their TV remote control. The dual-source RF switch addresses the FCC's "must carry" antenna input requirement, in that a subscriber can switch back and forth between cable and antenna reception by pushing the A/B button.

Lectro intros dual ferro

New from Lectro Products is a dual ferro option that can be installed into the company's Sentry II power supply. The option provides added protection from surges and spikes when the unit is operating in the inverter mode, Lectro officials say, and ensures a low rise time waveform. It can be retrofitted into all existing Sentry II products.

Lindsay is reliable

Lindsay Specialty Products has achieved a 0.998 percent reliability factor in its manufacturing processes, Lindsay officials announced at the show. The new milestone, achieved under the company's "total quality management" system, allows Lindsay to apply for ISO-9000 registration. The ISO series of rules have been endorsed in about 60 countries and spell out how companies should set up quality assurance systems. They were designed in part to assure customers of consistent product output.

Oak changes name to TV/Com

Oak Communications announced at

the Show that it will change its name to TV/Com International. The new name is intended to highlight the company's emphasis on cable and satellite subscriber systems and international activities, said Henk Hanselaar, president and CEO of the company. "We had compelling reasons for changing the name of the company. We wanted to stress that the company is not affiliated with Oak Industries, which sold Oak Communications in August, 1990," Hanselaar said.

ONI announcements

Optical Networks International has announced a spectrum utilization plan called the Cable Loop Carrier-500 that accommodates video compression, analog and digital transmission techniques in a 1 GHz spectrum. The plan enables operators to use existing fiber/coax hybrid networks to provide entertainment video and voice services via one provider, and eliminates the need for two separate networks. The network consists of a headend unit that provides a standard interface to the public switch telephone network, a hub divider and a subscriber unit.

Also, ONI announced five new modules for its Laser Link II transmission line of products. Specifically, ONI has added a return video receiver which uses the 5 MHz to 200 MHz return band; a return video laser that uses a Fabry-Perot transmitter to send four video channels and data; a return data transmitter that also uses a Fabry-Perot transmitter in the 5 MHz to 33 MHz return band; and a feedforward drive amp. The feedforward drive amplifier features 18 dBmV to 20 dBmV input, 22 dB gain and a single output. All of the modules are designed to be incorporated into the Laser Link's shelf assembly.

Also new from ONI: A precision fiber optic stripping kit designed for telecommunications applications, a Fiberpak fiber optic splice enclosure engineered for cable TV applications and its Laser Link II Plus transmitter, designed and manufactured by AT&T. The new transmitter features a highly linear distributed feedback laser than can transmit 80 channels on a single fiber cable over optical links of up to 26 km.

Philips shows multimedia

The first production units of Philips' Vector Video Echo Canceler and a multimedia demonstration delivered over what Philips officials call the "compressed digital highway" were shown.

Continued on page 71

Set tops: the new opportunity

The new digital technology revolution holds the potential for turning set-top terminals from a liability to an opportunity, said Larry Wangberg, president and CEO of Times Mirror Cable Television during a general session on technology at the Western Cable Show.

Wangberg said he has spent more time looking at technology over the last 12 months than he had in the previous five to 10 years and now considers converters to be "an opportunity" in the cable system of the future because it will evolve from an addressable descrambling device to a powerful in-home computer capable of delivering a multitude of new services to the public.

But in order to make those services a reality, the cable industry must embrace worldwide standards for technology, said James Beall, senior vice president of Prodigy Services Co. Otherwise, if the market is fractionalized, media companies will be less likely to take the risk of building a proprietary system, he said.

But can cable hardware and com-

puter hardware be successfully integrated? Not necessarily, cautioned Trip Hawkins, president of 3DO and chairman of Electronic Arts. Why? "Because video and computing (industries) have been so different historically," he said. Nevertheless, now is the perfect time for cable systems to start testing new services, because today's set-top will not be able to adequately deliver multimedia, he noted.

"Multimedia's time hasn't come yet," agreed Beall, "but it looks to me like the convergence (of computers, video and voice services) is about to happen."

Richard Green, president of Cable-Labs, said operators need to put platforms in place that will facilitate new, a la carte services. "We need to go all out" to bring that platform on line, Green admonished.

Indeed, every panelist agreed that technology companies and programmers will have to work in parallel to facilitate and develop new interactive programming that will drive new revenue streams.

Wangberg said operators who used to wait a year or two to add new pro-

grams to their systems because of a shortage of bandwidth will have to adjust their thinking in the next couple of years. "It's a whole new ballgame" now because competition will come from every corner, said Wangberg. "Windows are opening—and closing—much faster than before," he added.

Cable equipment suppliers will play a role by developing terminals that incorporate standards like MPEG (Motion Picture Experts Group) and provide easy interfaces to consumer electronics, said William Johnson, CEO of Scientific-Atlanta. He also said future devices need to have upgrade capabilities to avoid the obsolescence they are plagued with today.

Clearly, cable systems have the early lead in the race to transport multimedia-type services, noted Green. Because of operators' rush to add fiber to their systems, there is more bandwidth available than ever before. "We're leading in digital applications in the home," said Green, citing TCI's decision to implement digital compression to the home as early as 1994. "For the first time, we (cable television providers) will provide digital networking in the home that carries video."

By Roger Brown

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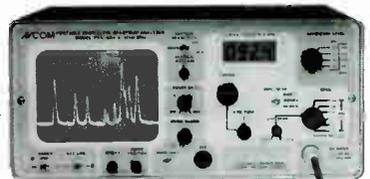
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New numbers: \$4.7 billion lost to pirates

The NCTA's new statistics on signal theft were announced at the Western Show last month—and they're nothing to laugh about. According to Jim Allen, director of the NCTA's Office of Cable Signal Theft, a 1992 survey of 2,700 cable operators in which 771 responses were collected revealed that almost \$5 billion in cable revenues is lost each year to cable thieves. That's up \$2.7 billion from the OCST's last survey, conducted almost three years ago.

"These new numbers add up to \$235 million in unrealized franchise fees—and 24 percent of total industry revenues," Allen revealed during a panel session at the Show.

Why an increase?

Why the big increase? Allen cited several reasons, including the fact that more system operators are paying attention to and documenting each case of signal theft. "The most impressive part of the survey is that 71 percent of the surveyed systems with 50,000 or more subscribers now have

some type of security staff person," Allen said. Other factors contributing to the increase include industry growth, a better response rate to the survey and a better industrywide understanding of the problem.

However, new legislation went into effect last month that upgrades theft of cable services to a felony status. In the new FCC ruling (Sec. 47.553), any person in violation can be fined from \$25,000 to \$50,000. "I'm still amazed at the amount of un-information that's available to subscribers—so many still don't know these (illegal decoder box) purchases are illegal," Allen lamented in the session.

That's not the case in Metrovision's suburban Detroit, Mich. systems, though. Dan Dinsman, regional marketing manager for the company, told session attendees of a program he implemented that has significantly raised subscriber awareness of cable theft. "No document leaves our office without some mention of cable theft and its consequences," Dinsman said. His three-phase program includes an exhaustive subscriber notification pro-

gram that includes commercial spots defining cable theft; an "almost forgiven" program where illegal subscribers can turn themselves in and collect a prize; and a "turn in your neighbor" program.

In one case, Dinsman identified an illegal subscriber who had been stealing cable service for more than five years. Metrovision took the offender to court, demanding \$71,000 in fines and damages. Ultimately, the matter was settled out of court—and Metrovision received \$6,250 in lost revenues.

Asset: Employees

"The most important asset in any signal theft prevention program is your employees," Dinsman said. "They see things and hear things. Last month we had a guy put in jail after two employees found an illegal black box in his home."

In closing, Allen said cooperation is the most effective approach to signal theft. "It's been my experience that a collective approach between operators, programmers and hardware vendors and local authorities is the best way to handle service theft," he said.

By Leslie Ellis

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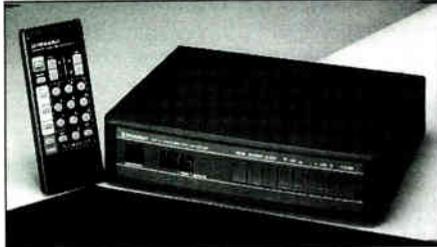
The approach is based on an MPEG standard and carries about 30 Mbps on a 6 MHz channel. It can support telephony, video-phone, CD-quality music and other data services, Philips officials say.

Pico announces drop amp

Pico Products has announced a low noise drop amplifier, the LNDA available in 10 dB and 20 dB models. The amplifier uses Pico's -120 RFI trap housing to ensure moisture resistance. Remote DC-powering is also available and the unit can be located up to 200 feet away from the power source.

Pioneer's box thwarts pirates

New from Pioneer Communications of America is the BA-9000 series convertor, which takes an aggressive stand against



Pioneer's BA-9000 convertor

cable piracy via a digital video scrambling and encrypted data communications platform. Here's how it works: The video signal is converted from an analog to a digital format, scrambled, converted back to analog, then transmitted over the cable plant. At that BA-9000, the authorized signal is reassembled.

The convertor also features second generation near video on demand (NVOD), which have been field-tested in Time-Warner's Brooklyn-Queens, N.Y. system. Other features of the BA-9000 include two-way store and forward capabilities, individual and global messaging and backward-compatibility to existing Pioneer systems.

New standby power supply

Power Guard took the wraps off its new standby power supply at the show. The new unit features a unique battery compartment designed to extend battery life, company officials say. It measures 9 inches by 11 inches and stands 56 inches high, and is mounted on an underground vault which houses the batteries. This allows for cooler battery temperatures, which extends battery life. The system also offers a built-in breaker box that comes pre-wired.

QRF unveils new amps

Quality RF Services has unveiled its Palm Beach series of indoor main-powered amplifiers. The series encompasses headend/laser drivers, one- or two-way multi-dwelling and push-pull drop amps.

Regal has new convertor

Regal Technologies Ltd. introduced a new 550 MHz basic convertor which it says is the smallest full bandwidth con-



Regal's new set-top

vertor in the industry. The unit offers 83 channels which pass separate audio program signals and is fully BTSC compatible. The unit is IR programmable and can be tuned to HRC, IRC and EIA standard frequency allocations.

Riser-Bond

New from Riser-Bond Instruments is its Model 3000 digital TDR cable fault locator. The new TDR features rugged packaging, multiple range settings, a backlit display and auto-off features. Designed for outside plant construction and maintenance, the Model 3000 tests all types of metallic cables, company officials say.

Siecor Corp. expands line

Siecor Corp. announced that it has expanded its smallTALK fiber communicator product line to include a single-mode, point-to-point fiber communication unit with bi-directional operation at 1310 nm and a dynamic range of 30 dB. No headsets are required, Siecor officials said, because the unit operates as a walkie-talkie.

Also new from Siecor are several enhancements to its high precision M90 fusion splicer, including a six-fold speed increase for aligning, cleaning and splicing fibers and calculating splice loss. Siecor officials say the entire process can now

be completed in 10 seconds. Splice losses average 0.02 dB, with return loss measurements typically greater than 60 dB.

Tektronix

Tektronix Inc. introduced a new cable TV sweep system that it claims is the smallest and lightest system on the market. Consisting of a transmitter and receiver, the new system weighs just 28 pounds combined. Because sweep pulses are sent in the vertical blanking interval and are therefore invisible to viewers, the transmitter can run continuously. The receiver's built-in SLM shows the visual and aural carrier of all channels on the system. It can also store up to 63 records in non-volatile memory.

Texscan intros digital ad equipment

New from Texscan is an MPEG-based digital commercial insertion system. The main function of the new system is its ability to perform the video compression and encoding functions in the local ad insertion office. "We designed a sensible upgrade path to the new digital platform by engineering system compatibility with our 190/290 family of commercial insertion products," says John Boland, director of sales and marketing for the company.

Trilogy debuts new cable

New from Trilogy Communications is a 50-ohm version of its air-dielectric coaxial cable that will be targeted toward broadcast antenna systems, voice/data transmission, cellular systems, mobile radio and other applications. The cable design consists of air dielectric contained within hermetically sealed chambers that eliminate water ingress. It is available in 0.500-, 0.750-, and 1-inch sizes.

Triple Crown

Triple Crown Electronics has introduced a new reverse laser transmitter for its Titan series amplifiers. The new TOTX-120 unit accepts RF and data input signals in the 5 MHz to 120 MHz band and modulates them on a 1310-nm laser in the reverse direction. It fits any Titan amp equipped with a fiber housing.

Viewsonics offers locking terminator

New from Viewsonics Inc. is a "Gilbert equivalent" locking terminator, available with or without resistors. View-

sonics officials said the new device is Gilbert-equivalent because it uses the same Gilbert security tool. Also new from Viewsonics is a line of high performance miniature broadband amplifiers with a frequency range of 45 MHz to 1 GHz.

Wavetek, Laser Precision agree

Wavetek Communications announced it has entered the fiber optic test equipment market via an OEM contract with Laser Precision Inc. In the agreement,



Wavetek's FL-513 fault locator

Wavetek will sell a complete line of Laser Precision products under the Wavetek name.

The products include fiber optic power meters, visual fault locators, LED/laser sources and a new fault locator.

Wavetek Communications also announced two new products at the show: Its LineSam II and Lawman software are designed to

aid in the execution of the FCC's 24-hour proof tests. The LineSam II is an enhanced version of the company's LineSam signal analysis meter, while the software, developed in conjunction with AM Communications, uploads and analyzes data from both LineSam and LineSam II units.

Zenith Electronics

Zenith Electronics Corp announced that its HT-2000 baseband addressable descrambler is the industry's first addressable set-top to contain the circuitry to receive and display electronic program guides offered by InSight Telecast Inc. and Prevue Networks Inc. The device can also activate a VCR, allowing one step recording of programs.

Zenith also displayed for the first time its 16-level digital modulation system which allows transmission of data at 43 Mbps through a single 6 MHz channel.

Zenith officials submit that the new system doubles the amount of digital information that can be transmitted on cable TV channels without additional video compression, and is able to send two digital HDTV signals on a single 6

MHz cable channel. The system also doubles the number of digitally compressed standard TV signals on a cable channel. "Most importantly, we can do this using current video compression techniques," says John Bowler, president of Zenith's Cable Products Division.

To achieve the increased capacity, researchers in Zenith's advanced TV and cable laboratories extended the capabilities of the four-level vestigial sideband (4-VSB) modulation and transmission technology developed for the Zenith/AT&T Digital Spectrum Compatible HDTV system.

By quadrupling the number of levels of digital data, officials say, the company has increased the data rate to 43 Mbps from 21 Mbps. The 16-VSB system, which is equivalent to what would be a 256 QAM (quadrature amplitude modulation) is cost-effective and rugged with analog signals as compared to 64-QAM, Zenith officials submit.

Zenith also announced shipment of its phase modulation decoders to ABG Comm., which operates an MMDS system in Lagos, Nigeria. **CED**

Compiled by Roger Brown and Leslie Ellis

Ops losing subs to competition

Discussing the threshold of lost basic penetration that could seriously undermine her system's market position, Cox Cable of Bakersfield General Manager Jill Campbell told Western Show attendees that "once we get to 15 percent, we're going to be dead out there." The 21,000-sub system has lost about 1,000 customers over the last year to competitors, and Campbell said she "can't lose 3,000 customers" to any combination of competitors.

In addition to competition provided by an MMDS operator, Cox's service area also overlaps that of Time Warner Cable. Penetration is about 61 percent in the "Cox-only" portions of Bakersfield and less than that where it competes with Time Warner.

Similarly, Comcast Cablevision of San Bernardino, Calif. has lost about 9,000 customers to Riverside, Calif.-based Cross Country Wireless Cable. Cross Country claims 40,000-plus customers and continues to grow at about 2,000 customers a month, said Comcast of San Bernardino vice president Mike Schenker. Schenker said that although his system was still "viable at 50 percent penetration," a shrinkage in the "20 to 25 percent range" would

be dangerous.

Cablevision of New York City, serving Brooklyn and the Bronx, is still only halfway through construction of its system, passing 1 million homes. Already, though, it competes with an MMDS operator, two private cable operators using 18-GHz microwave to interconnect systems, a single-channel subscription service, a cable TV overbuild in the Bronx, many private cable operators, a 28-GHz cellular TV operator and video dial tone efforts to follow, said Norm Kellogg, Cablevision vice president and general manager.

Extraordinary customer service, customer choice, network reliability, 100-percent addressability and two-way plant are some of the steps these MSO executives believe are essential to fend off the assaults they anticipate ultimately will be a fact of life for every cable TV system in the country.

"We're going to have to watch our service," said Campbell. "That's how they get in." Campbell also said it was foolish to compete on price alone.

But price is an issue. The MMDS operator in Bakersfield offers basic and three premiums for \$29.95. Cox charges about \$45 for an equivalent

package. Still, said Kellogg, it's a losing strategy to battle it out with the competition merely on price. "You have to upgrade and invest," he said. "Capital, expense and commitment are required or these guys will eat our lunch."

Schenker said competition arose because "we never took customer service seriously."

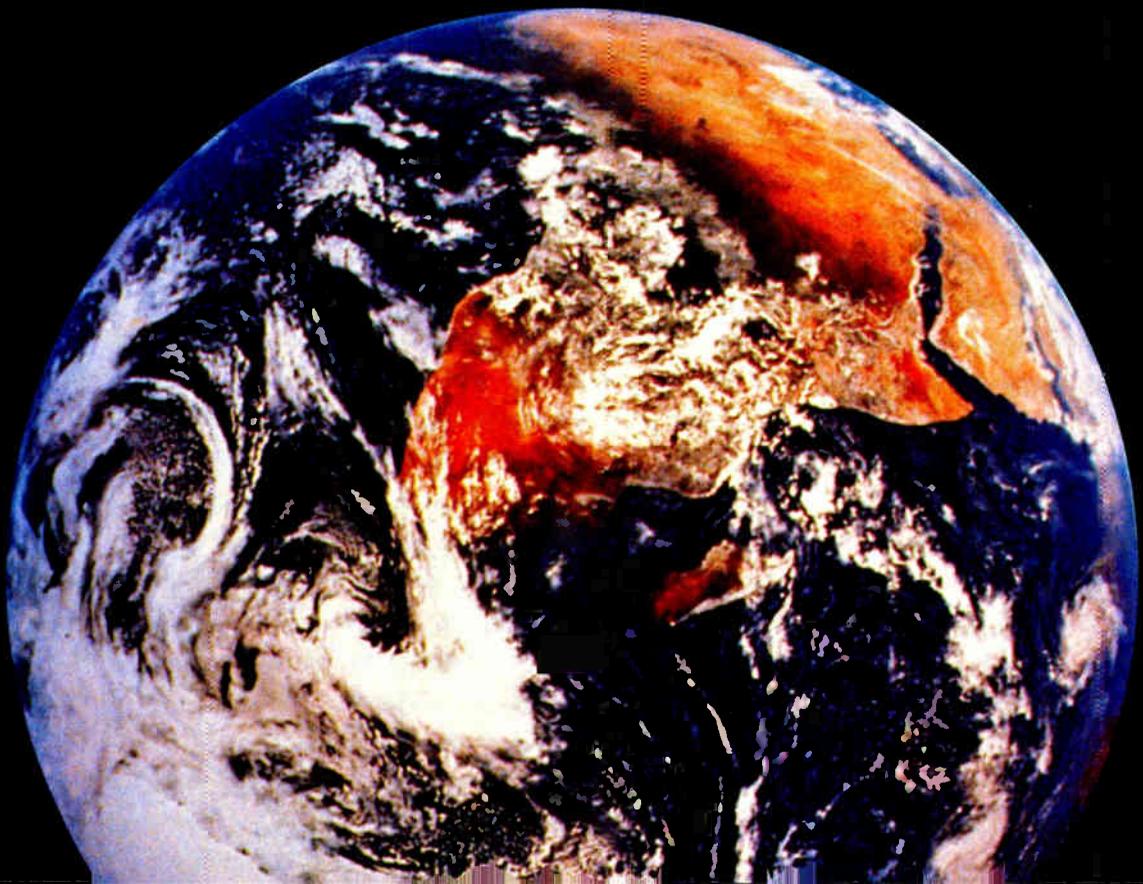
Schenker also suggested the "nickel-and-dime" policies of charging extra for outlets, guides and remotes played a role as well. "It's critical to unbundle channels, segment and provide service at reasonable prices," said Kellogg. "Long-term, that's the strategy, even if there is some short-term erosion."

That's only part of the problem. Basic rates also have dropped, meaning less revenue per basic household. When Cross Country showed up with a \$26.95 basic-plus-two-pays package, Comcast was selling a comparable package at \$43. "We immediately cut our prices" to \$29.95, said Schenker.

Things probably will get worse, however. Campbell's MMDS competition isn't advertising yet. "What's frightening is that we could start seeing some roll-off when that starts," said Campbell. Kellogg said his most-serious competition hadn't begun heavy marketing yet, either.

By Gary Kim

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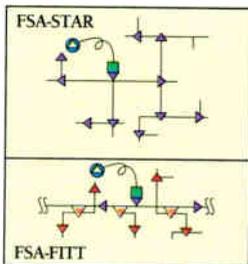


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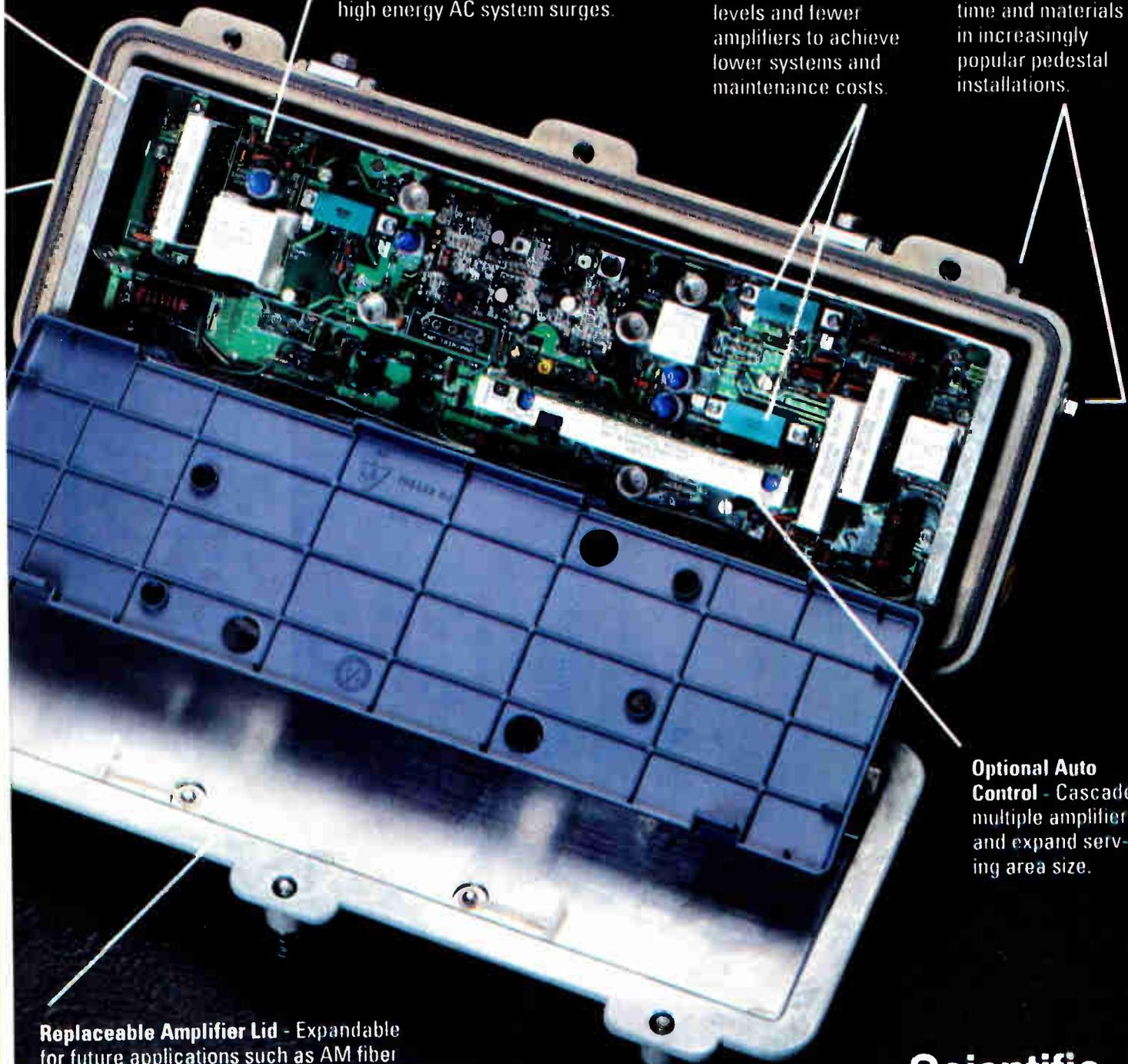
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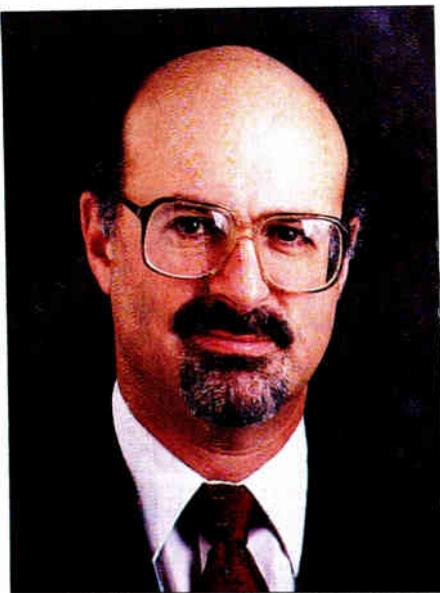
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HDTV: Where does it stand?

We're rolling toward a preliminary decision in late February on an HDTV standard. The test results have been released for all five proponents. All of the proponents have suggested modifications to improve the performance of their systems, but there probably will not be time to test these improvements prior to the February decision.

The FCC's decision on a standard for HDTV (expected in June 1993) will probably ratify the recommendation of the Advisory Committee on Advanced Television Service. That committee will meet in late February to make its recommendation. Its recommendation will be based largely on the analysis of a special panel that will meet in early February to review the test results.

This special panel consists of industry experts who have been active in the Advisory Committee's activities. The cable industry is represented by Wendell Bailey of NCTA, Craig Tanner of CableLabs and Ed Horowitz of Viacom.

Testing

The special panel will have to place its heaviest emphasis on the test results. Each of the five HDTV systems was subjected to about seven weeks of laboratory testing in Alexandria, Va., at the facilities of the Advanced Television

By Jeffrey Krauss, independent telecommunications policy consultant and President of Telecommunications and Technology Policy of Rockville, Md.

Test Center and CableLabs. This was followed by another period of about seven weeks of subjective tests in Canada at the Advanced Television Evaluation Laboratory, which is part of the Canadian Department of Communications.

The testing included picture quality, carrier-to-noise threshold, a large number of interference tests, and a variety of other tests. Some of the tests were designed to explore the performance of the four digital systems, such as how long it takes a picture to appear after a channel change. Two days were set aside to test features that were unique to a particular system, such as the 16-QAM modulation mode of DigiCipher or the High Priority/Standard Priority signal format of Advanced Digital HDTV.

Test results

As I reported earlier, the first system tested was the Japanese Narrow MUSE system. This was the only analog system that was submitted and it performed poorly.

The digital systems were better than Narrow MUSE, but not perfect. Moreover, in my opinion, there was a difference in picture quality between the interlace and progressive systems. The interlace pictures looked better. This is because the progressive systems must do more compression, since they need to compress more picture information into the 6 MHz channel.

Here's why. The two progressive systems (Zenith's Digital Spectrum Compatible HDTV and GI's Channel Compatible DigiCipher) operate at 60 frames per second, with each frame consisting of 720 active lines and 1280 pixels per line. The two interlace systems (DigiCipher and Advanced Digital HDTV) operate at 30 frames per second, two fields per frame, with each frame consisting of 960 active lines of 1408 pixels per line. Multiplying these numbers, you see that the progressive systems must transmit about 55 million pixels per second, while the interlace systems only need to transmit about 41 million pixels per second. The progressive systems must be more complex in order to compress more picture information into the 6 MHz channel.

The progressive systems have another handicap: a shortage of program material to use for "tuning up" the systems. There is plenty of interlace HDTV program material, including some shot using the MUSE system in Japan, for example. But there are only two progressive scan HDTV cameras in the

world, I was told, and they don't work as well as interlace scan cameras.

Improvements

All of the proponents submitted documents in October describing improvements to their system they had already made, or would make if given the time. Most of these improvements were needed to correct specific deficiencies that were noted during the testing.

The two interlace scan systems both did well in most picture quality tests, but both had some problems during testing.

AD-HDTV had the most serious problems of the two interlace systems, partly because the proponent ran out of time and had to substitute simpler components in some cases. For example, the adaptive equalizer only canceled ghosts in the range of ± 4 microseconds, which was less than other proponents; and a less complex "set partition code" rather than a "trellis code" was used in the encoder, which resulted in a loss of about 1.5 dB to 2 dB in coding gain.

The DigiCipher improvements were primarily limited to filters. Use of custom filters in the encoder and the receiver, rather than off-the-shelf filters, would improve the adjacent channel interference properties of the system. In addition, an improvement to the error concealment method was proposed, to make transmission errors less noticeable.

Both the progressive systems had lower picture quality, but claimed that they could improve their picture quality if they had access to more progressively-scanned program material to "train" their systems. Both systems work by creating tables of frequently-appearing patterns, and then sending the pattern number, rather than the pattern itself.

Conclusion

Since each system spent several months in testing, it is clear that retesting of the improvements would delay the decision process at least six months. They cannot be fully retested prior to the February meetings of the special panel and the Advisory Committee. Although there is some pressure to delay these meetings and delay the FCC decision on a standard, the pressures to hold to the existing schedule are stronger. I expect that the special panel and the Advisory Committee will recommend a winner in February based on the test results, and later the improvements for that one system will be tested to make sure they perform as predicted. **CEC**

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