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THE COMMUNICATIONS ENGINEERING & DESIGN  
 MAGAZINE OF BROADBAND COMMUNICATIONS

**Has wireless  
 video found the  
 formula for success?**

Vertical text on the left edge of the page, including "JUN 2000" and "Broadband 2000".



**B R O A D B A N D**



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**W**hen it comes to creating a standard protocol for data communications over cable TV networks, everyone dutifully agrees that it's the right thing to do. To a person, no one wants to perpetuate the proprietary and isolationist approaches that were followed with set-tops

that now make it impossible to transport a home terminal from one location to another. But that doesn't mean people aren't looking for an unfair advantage.

First, a little history: After years of going it alone, the cable industry only recently has begun to embrace standards. Long-timers will say they never disliked standards, they just didn't have any use for them. Prior to a couple of years ago, each cable system was designed and constructed as an island unto itself; outside of providing an NTSC signal to the TVs, there were no existing standards to adhere to.

But now, as cable operators strive to become key players in the nation's information infrastructure, the mindset has changed. Engineers and CEOs alike see the wisdom of adhering to accepted standards as a way to ensure interconnection outside of their sphere of influence. Influential organizations such as DAVIC and VESA enjoyed some level of participation from the cable industry, although they were primarily created by other industries. And within the past year, the SCTE has been accepted as a standards-setting organization by the American National Standards Institute. This designation will allow the industry to actually create some specific standards that apply to the businesses cable operators expect to be in.

Oddly enough, however, after being bashed repeatedly over the years for not adhering to standards, some equipment manufacturers are taking the industry to task for taking the initiative to finally create some.

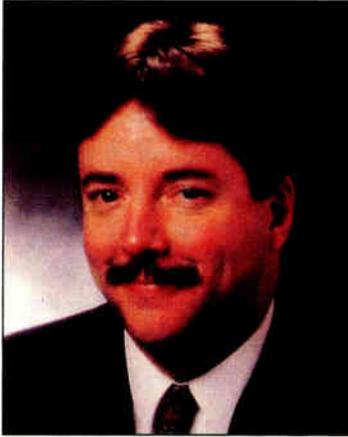
Specifically, insiders say the MCNS consortium continues to be lobbied by companies that want their specific approaches chosen as the standard. "These guys are amazing—the same companies that have historically chastised us for not having standards are now beating us up," the insider says. "Each company wants us to adopt their specific approach."

Ever since the idea of a data transport standard was announced last December, I've been skeptical about its chances. There are simply too many companies with their own vested interests for the process to go smoothly. All it would take now is for one to break ranks, and the whole effort could be wasted.

We're all impatient for new, high-speed modems. Those of us who connect to the Internet, whether for fun or for work, detest the long connect and image transfer times offered by telephone networks. And the MSOs need new sources of revenue to compete in the new telecom world.

But this one effort by cable operators to develop a standard that works over their networks shouldn't be hurried. The manufacturers would be wise to adopt a cooperative stance and work toward defining the best technical approach, and not follow their own quixotic agendas. It will pay off in spades, and purchase orders for millions of units will follow.

Roger Brown  
Editor



## Standards are great, unless it's not mine...



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# Others Don't Remotely Come Close

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Photo by Spenser Rowell, FPG International

## 40 LMDS formula awaits approval

By Michael Lafferty

The natives are getting restless, waiting for the FCC to give life to local multipoint distribution services (LMDS), which hold promise for wireless interactivity. If the delay continues, will international operators beat the U.S. to the punch?

## FEATURES

### 28 Optimizing fiber availability

By John Chamberlain, Norscan, and Jerry Patton, Antec

The lion's share of the fiber optic cable deployed by the cable television industry has been placed in the most hostile environment imaginable: the local loop. Preventive maintenance and cost-effective emergency restoration are key to conquering the fiber jungle.

### 46 Designing an LMDS system

By Douglas A. Gray, Hewlett-Packard Company

Cost-effective LMDS (local multipoint distribution services) systems at 28 GHz can be engineered to provide broadband, two-way services to the home. The challenge lies in developing accurate models to predict coverage rates as a function of link margins, antenna heights, obstacles and hub radius, says the author.

### 58 MMDS gets boost from telcos, digital

By Dana Cervenka

Multichannel Multipoint Distribution Service (MMDS), a wireless cable offering that has been around for awhile, is starting to look a lot more threatening to wireline cable operators. Not only are several MMDS operators poised to go digital soon, but many are also receiving a leg up from telephone companies.

### 64 Wheeling and dealing in Nashville

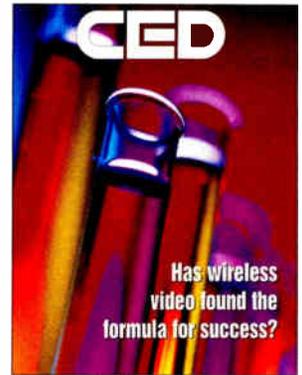
By CED staff

Thousands of the industry's technical personnel flocked to Nashville for this year's Cable-Tec Expo. Here's a roundup of hot new product releases, contract announcements and honorees at this year's show.

### 79 Telecom Perspective

By Fred Dawson

Innovators in the narrowband Internet environment are raising the bar on acceptable levels of graphics sophistication and the potential for real social interaction online. Broadband services providers thus will face additional challenges in designing a first-generation system for high-speed data.



#### About the Cover

Illustration by Malcolm Fielding, FPG International



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*Texscan MSI's digital ad insertion system. See page 88 for this month's product roundup.*

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*By Roger Brown*

After years of proprietary approaches, the cable industry is finally beginning to take cautious steps toward establishing standards. As for a data standard, companies are all for it—as long as *their* technology is the one chosen.

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*By Dana Cervenka*

Patrick McConnell, a former wireline cable guy, has gone wireless, as director of advanced technology and governmental affairs with American Telecasting Inc., the nation's largest MMDS operator.

**20 Frontline**

*By Wendell Bailey, NCTA*

From the IRS to a ceiling fan company, Bailey details recent customer service nightmares. What can the industry learn from those who do it wrong, and those who do it right?

**22 Farmer's Market**

*By Jim Farmer, Antec Technology Center*

Farmer continues his series on mastering the spectrum analyzer by tackling digital signals.

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*By Jeffrey Krauss, Telecommunications and Technology Policy*

The Universal Service Fund, essentially created to provide affordable phone service in high-cost areas of operation, is a broken system, says Krauss. Competition, though, could fix it.

**98 In The Loop**

*By Thomas Robinson, River Oaks Communications*

As local governments around the country build advanced networks to connect the public to information and facilities, possibilities for public/private partnerships are sprouting.

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*Compiled by Roger Brown*

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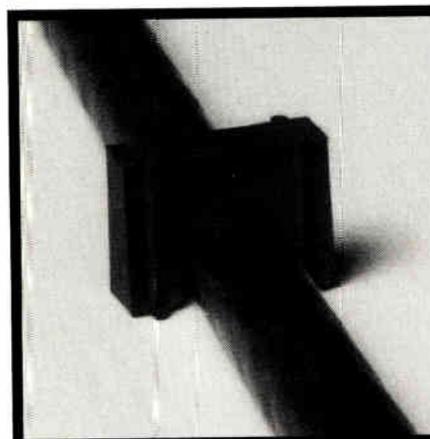
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## TCI orders LANcity modems; Cox, Comcast added to @Home

The chicken may have finally hatched last month, as Tele-Communications Inc. committed to spend nearly \$18 million to purchase 30,000 LANcity cable modems to deliver the @Home on-line service to its customers, beginning later this year.

Under the contract, TCI will deploy LANcity's third-generation Personal (LCP) cable modem in several of its @Home launch sites.

@Home, which had a well-documented problem getting its test in Sunnyvale, Calif. up and running, is now in a beta test stage there and plans to launch service in TCI's San Francisco Bay Area system, as well as Chicago and Hartford, later this year, according to Dede Moreland, director of Internet services at TCI.

In addition, @Home received a major shot in the arm in early June when Comcast Corp. and Cox Communications signed on as strategic investors in the on-line service. In that deal, Cox, Comcast and Kleiner Perkins Caufield & Byers will each own about 14 percent of the venture, with TCI owning about 45 percent. Cox and Comcast will also each have a seat on the board of directors of @Home.

Prior to the agreement with LANcity, TCI had announced its intent to purchase 200,000 CyberSurfr modems from Motorola. Moreland said that agreement is still in place, but remains as a letter of intent, not a firm contract. "TCI's strategy has always been to use multiple modem manufacturers," Moreland said. Moreland refused to speculate on when TCI would be deploying Motorola equipment, however.

The \$18 million figure comes from LANcity's published \$595 list price for its cable modem. It is unknown if TCI negotiated a lower per-unit price from LANcity in exchange for the contract to purchase equipment. The LANcity modem transports data at speeds up to 10 megabits per second in both directions.

In a related announcement, LANcity has unveiled a networking diagnostic tool that will allow cable operators to proactively diagnose problems before they become apparent to subscribers. Scheduled for release in November of this year, LANcity's "CABLEview" essentially replaces a spectrum analyzer and signal generator and detects common cable TV plant problems.

The \$4,995 software package, which

requires an IBM compatible PC with a Pentium processor running Microsoft Windows 95, allows each LANcity modem to serve as a diagnostic probe, providing RF channel characterization from the headend all the way to the home. Information gathered includes transmit and receive power levels, in-channel group delay, tilt and microreflection information to help diagnose problems caused by amplifier and fiber node degradations, loose connections, broken grounds and impedance mismatches.

Finally, LANcity officials announced that it will also be supplying an unspecified number of modems to Adelphia Communications for deployment in the MSO's Toms River, N.J. system, which is being held up as the company's flagship system. In May, Adelphia announced that the system will soon offer high-speed Internet access and data transport, local telephony, paging, digital audio and games over the \$33 million hybrid fiber/coax rebuild that is nearing completion.

Adelphia already has two other unspecified data launch sites planned, according to Rouzbeh Yassini, president and CEO of LANcity. The contract announced last month is for 500 units.

Adelphia also chose to use telephony-over-cable equipment supplied by Tellabs to begin offering local telephone service in its 11-state service area, beginning this autumn. Adelphia hopes to offer service to up to 1 million of its customers within the next three years. It is presently negotiating a three-year supply contract with Tellabs with a value of up to \$50 million, according to Tellabs executives.

Tellabs, meanwhile, has teamed with Euristix of Dublin, Ireland to develop a network management system for its CableSpan 2000 cable telephony product. The new system is designed to improve carriers' service quality and service-activation processes. Euristix was chosen because of its track record in network management and its ability to comply with established international standards, Tellabs officials said.

### H-P named in suit over software system

Hewlett-Packard Inc. has been named in a \$100 million lawsuit filed on behalf of New Century Communications that alleges that H-P breached a joint venture agreement and pirated

New Century's cable TV network management and diagnostic software program.

According to a press release issued by a law firm that represents New Century's interests, H-P is being targeted as a result of its acquisition of CaLan Inc. back in 1994. The suit alleges that CaLan "sold itself" to Hewlett-Packard on the value of an ambitious network management and diagnostic software called Galaxy, which New Century had been developing under an "exclusive, joint venture" with CaLan.

The suit further argues that several months after it acquired CaLan, H-P asserted that it was the sole owner of all software rights to the Galaxy product and ordered New Century to cease all further work on the product.

Since then, H-P has debuted portions of a larger network management and diagnostic product—which New Century says is based largely on the same architecture, technology and programming techniques that were used in the Galaxy product.

The 64-page complaint specifically names Sydney Fluck, former president of CaLan, a long-time cable industry participant and a former NCTA Vanguard Award winner. All told, 14 separate counts are contained in the complaint, ranging from breach of fiduciary duty involving a joint venture agreement to tortious interference and deceit, as well as conflict over intellectual property rights.

According to the suit, the Galaxy product was born out of an agreement between Fluck and New Century. A "strategic alliance" reportedly stipulated that New Century absorb the development costs in exchange for 25 percent of all net profits derived from any product containing elements of Galaxy.

However, after receiving initial assurances from Fluck that the H-P buyout of CaLan would not affect Galaxy, H-P later "did everything it could to pretend New Century didn't exist, while still milking the company's expertise on the Galaxy product," said Jay Spievack, a partner in the New York office of Anderson Kill Olick & Oshinsky, which represents New Century in the suit.

Sometime later, H-P then asserted it owned all rights to the software and asked New Century to suspend any further work on the product, according to the filing.

The complaint, which demands a jury trial, was filed in the U.S. District Court for the Eastern District of Pennsylvania because New Century is a division of Computer Aid Inc. of Allentown, Pa.

Hewlett-Packard officials could not be reached for comment before press time for a response to the allegations.

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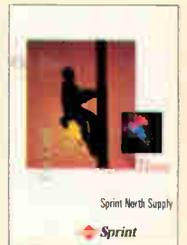
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## CompuServe, Microsoft ink strategic alliance

CompuServe Inc. and Microsoft Corp. forged a far-reaching strategic alliance that includes a comprehensive technological partnership as well as marketing, distribution and commercial opportunities.

Under the agreement, CompuServe will deploy Microsoft's new platform for commercial Internet services, code-named "Normandy," in its suite of on-line services, including the CompuServe Information Service, WOW! and SPRYNET, CompuServe's Internet-only service. CompuServe becomes the first major on-line provider to license the Normandy technologies—a platform solution designed specifically for Internet service providers and commercial Web publishers. This agreement is the first major step in the evolution of CompuServe's services from proprietary to open standards technology.

The agreement will enable CompuServe to evolve the technological underpinnings of its services from proprietary architecture to Internet-based technology. It will allow users with a CompuServe membership and a Web browser to access unique, value-added services. In addition, CompuServe and Microsoft agreed to collaborate on future commercial ventures.

The Normandy platform that CompuServe is licensing is built on the Microsoft Windows NT Server operating system and is integrated with the Microsoft Internet Information Server. This open platform technology is an advanced set of software tools used for delivering interactive services and creating, managing and distributing content. It enables the creation of Internet services. The technologies are the major components needed to run a commercial, fee-based service, including value-added mail, forum areas, chat, news, indexing and other content management services.

Normandy offers the power to support tens of thousands of concurrent users; the scalability to support millions of users per day; the openness to work with applications and extensions developed by Internet developers; and graphical tools that provide easy, highly automated setup and administration.

Along with the platform licensing announcement, CompuServe and Microsoft agreed to offer access to both the CompuServe Information Service and WOW! on Microsoft's Windows 95 desktop operating system.

Recently, CompuServe announced its new

technology initiative to embrace open standard Internet technology; focus its development resources on creating value-added services instead of proprietary systems; and launch a world-class suite of fee-based services using open standards technology.

By taking advantage of externally developed technologies such as the Normandy platform, CompuServe hopes to decrease time to market, cut development costs, and more effectively deliver leading-edge information products and services to its members.

## Sybase, BellSouth launch interactive TV trial in Ga.

Sybase Inc. and BellSouth Corporation have begun the first phase of an interactive television trial using Sybase Intermedia technology in the Atlanta, Ga. area. The software will be used to author, deliver and manage interactive services for 80 channels of basic analog and premium digital cable programming. As the trial progresses, additional interactive services, such as video-on-demand and parental designated authorization features, will be integrated into the system.

The working relationship between BellSouth and Sybase began in late 1994. Since then, the two companies have been working together to develop the foundation for successful implementation of new interactive services. In a phased approach, BellSouth will steadily increase the trial's service area during the coming year, eventually reaching about 8,000 homes in Chamblee, Ga. and northern DeKalb County.

In addition, Sybase Professional Services has been working with BellSouth to help design the software architecture and support the authoring capabilities of the interactive service applications. This group also constructed the interface to the service billing systems and assisted in the design and development of the navigator that will be used to operate the interactive services.

Sybase has also provided technology for several telecommunications companies' interactive television trials in Asia and Europe as well. Sybase has also partnered with leading interactive television hardware and software vendors, including Scientific-Atlanta, Power TV, Hewlett-Packard and CableData, to provide potential customers with an integrated, interactive multimedia architecture for the mass market.

The Sybase Intermedia product family is designed to provide a modular, end-to-end system for authoring, delivering and managing

interactive multimedia applications, content and services. It consists of: New Media Studio, an object-oriented, multimedia authoring environment for developing visual, intuitive applications; Interplay, a software player designed to allow interactive multimedia applications to be played on low-cost, low-memory hardware devices such as television set-top boxes and personal computers; and Intermedia Server, a server based on Sybase SQL Server technology that allows information on multimedia objects (such as names and locations of movies) to be stored and managed. Intermedia Server also provides routing of requests to and from various components, including back-end systems used for billing.

## S-A acquires new site for campus

Scientific-Atlanta Inc. has acquired approximately 300 acres of land in Gwinnett County, Ga., which it plans to use to consolidate its Atlanta area operations into one campus facility. The property is located at Highway 316 and Sugarloaf Parkway. Terms of the purchase were not disclosed.

All of the company's operations in Gwinnett County and its corporate headquarters, which currently occupy 17 separate facilities, will eventually be consolidated at the new site in a campus setting. Site planning and development will start this year, and occupancy will be phased in over several years. S-A will work with its landlords over the two- to nine-year period of its current leases as the company transitions to its new campus.

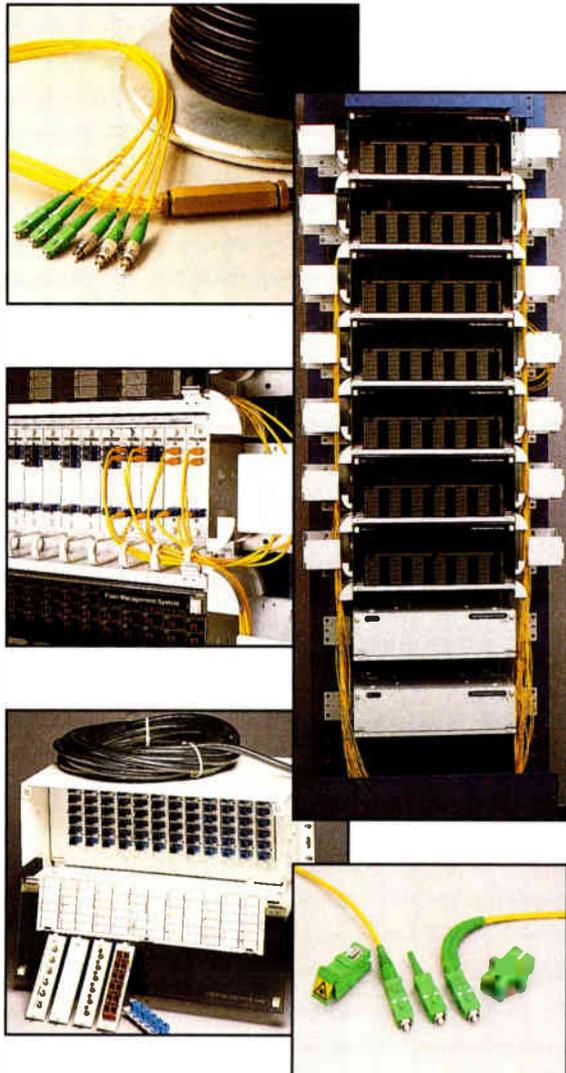
The campus will consist of a number of buildings that will house research and development, sales, marketing, executive and administrative functions.

The campus site is large enough to allow room for future expansion as the need arises. The company anticipates that the new campus will increase productivity and efficiency through the design and construction of buildings in close proximity to each other and built according to the requirements of the company's operations.

In making the announcement, Harvey A. Wagner, chief financial officer, said, "Although we will continue to meet our customers' needs through our global manufacturing capabilities, we believe that state-of-the-art facilities in Gwinnett County will enhance our ability to meet those needs. We looked at a number of sites in the area and selected the Sugarloaf Parkway site for its superior location and proximity to our employee base.

# Is Your Network

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"We want to be prepared to satisfy demand for our products in the years ahead by meeting ambitious cost, quality and customer support objectives. Our Gwinnett campus will be a key element in that strategy."

Gwinnett County Commission Chairman Wayne Hill said, "The announcement verifies the county's prominence as a center of technology firms. Gwinnett County is home to nearly 500 high-tech companies. Scientific-Atlanta's decision to make a long-term commitment here is a real affirmation of our efforts to draw and hold such companies in Gwinnett."

### Novell adds name to CableLabs IT Forum

Novell Inc. will participate in the CableLabs Cable/Information Technology Convergence Forum as part of the company's strategic plan to play a major role in the integration of cable industry technologies with telecommunications and networking. In addition, through its participation, Novell will gain access to strategic relationships—assisting in the development of products for emerging home and business networks.

The Forum will provide Novell the opportunity to research new solutions for consumer network expansion using Novell Embedded Systems Technology (NEST), which enables users to network intelligent devices, such as TV set-top boxes, smart homes and office products, allowing them to more easily share information and work cooperatively.

Novell joins more than 75 members, including 3Com, Bay Networks, Cisco Systems, Motorola and Unisys in the CableLabs group. CableLabs created the Convergence Forum in late 1995 as a vehicle to educate companies in the information technology industry about cable networks and the cable industry through conferences, technology demonstrations and newsletters.

In two unrelated announcements, CableLabs will assist Canadian MSO Rogers Cablesystems in establishing a television equipment test laboratory in Toronto later this summer. The facility will be managed by Brian James, former director of advanced television testing for CableLabs.

The new facility, which will be called the Technical Advisory Committee Test Centre, is being created to evaluate currently available, off-the-shelf equipment from cable suppliers with an eye toward determining if the hardware meets established specifications.

The testing processes used to evaluate

equipment will follow a "well-disciplined process," said Nick Hamilton-Piercy, senior vice president of engineering and technology at Rogers. The testing is voluntary, and vendors will be notified of the type of equipment that will be evaluated and asked if they would like their equipment to be included in the process.

CableLabs member companies will be determining the evaluations that will take place and their priority. Members are currently being polled to find out what tests they want performed.

But the flow of information won't be just in one direction, according to James. "While we certainly will be evaluating equipment independently in our facility, we also are hoping to work with MSOs to use their test information on products," he said. "That way, equipment of interest to all member companies would be evaluated only once, rather than a number of times at different MSOs."

And finally, CableLabs and the California Cable Television Association have issued a request for proposals for CableNET '96, a showcase of technology and applications for hybrid fiber/coax networks that will be on display during the Western Cable Show in Anaheim, December 11-13. Responses to the RFP are due July 3.

The RFP specifically seeks applications, hardware and software that are either under technology or market trial or are no more than one year away from deployment. Areas of interest include cable telephony, high-speed data, Internet access and Internet applications, interactive TV, telecommuting, advanced TV and electronic commerce.

### Jottings

Where is all that fiber going? We're not entirely sure, but it seems the world can't get enough of the stuff. Consequently, **Corning Inc.** plans to build a second U.S. fiber manufacturing facility somewhere in the Southeast. Corning currently produces its fiber in Wilmington, N.C. in the largest fiber-producing plant in the world. Construction of the new facility is slated to commence in early 1997, with initial production set for 1999 . . .

**Motorola's** Communication and Advanced Consumer Technologies Group has licensed Macrovision's pay-per-view copy protection technology and will integrate it into Motorola integrated circuits for cable TV set-tops, DBS receivers and the DVD and other markets. Motorola hopes to maximize content quality and security for program content providers by embedding the technology at the chip level . . . **Continental Cablevision** plans to deploy in its

Western Region Scientific-Atlanta advanced analog set-tops that feature StarSight Telecast's electronic program guide. Continental will initially deploy boxes under Continental's brand name "SmartGuide" in Stockton, Fresno and Los Angeles, Calif. In July, the deployment area will expand to Palm Desert, Corona and Cypress. Next year, the full StarSight product will be offered as an upgrade service. Continental will use the feature as a marketing tool to the 911,000 customers it has in the region . . . Speaking of **StarSight**, the company recently unveiled "Electronic N.E.W.S.," an information-on-demand subscription service. The service will offer current headlines on politics, business, current events, sports and weather and will be available by the end of 1996, according to company executives . . . In the cable modem wars, **Philips Broadband Networks** has been conspicuously quiet. But all that has changed now that Philips has teamed with Hybrid Networks to deploy cable modem systems throughout the world. Philips' Australian R&D lab has already developed a high-capacity server complex using Philips software integrated with Netscape, Oracle and Cabletron. Hybrid's asymmetric technology will be used to complete the system . . .

**CommScope** has acquired the assets of Teledyne's Thermatics unit, a wire and cable manufacturer specializing in high temperature cables, for \$18 million. CommScope will integrate the Thermatics unit into its Network Cable operations, which makes coax, multiconductor and fiber cable for the LAN and other markets, including aerospace, automotive, industrial and appliance applications . . . **GTE's** interactive Main Street technology has been sold to a consortium of six Canadian companies and will be used in the UBI Home Electronic Highway project that will offer multimedia and transactional services to cable subscribers across Canada. GTE will team with Videoway Communications to provide hardware and software for the system. UBI will be using Main Street's digital media servers, while the GEN 3 convertor technology will be incorporated into the set-top along with Videoway's technology . . . **ADC Telecommunications** has signed on with China Telecom, the national telecommunications provider, to participate in the first HFC trial in China, which is being undertaken to increase voice, video and data services in that country. ADC will provide its Homeworx HFC equipment for the trial in Harbin City that is set to start this fall . . . Time Warner Cable in Bakersfield, Calif. will use 750 MHz, 90-volt, 13-amp amplifiers from **C-Cor Electronics** in its three-year rebuild that will ultimately pass about 140,000 homes . . . **CED**

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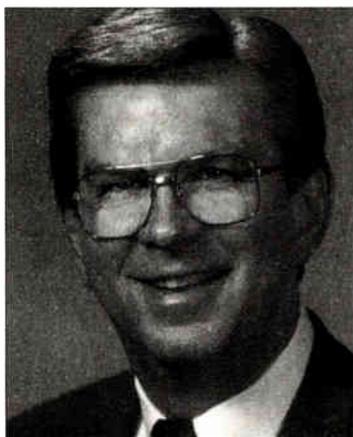
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## Wireline cable guy goes wireless



Patrick McConnell

It was 1988, and Pat McConnell was preparing to hook up his first cable subscriber at People's Cable Inc., a company he co-founded in Lakeland, Fla. But he took a

little detour to attend a private cable trade show in Denver, and as a result, got completely sidetracked. During the course of a seminar on wireless cable, McConnell, as he sat in the audience, became intrigued by the possibilities—so intrigued that he took one of the conference speakers to dinner, where he learned about the lower investment per subscriber that characterizes wireless, as compared to wireline cable. That knowledge enticed him to head back to Lakeland to begin assembling the licenses to use the frequencies needed to launch a wireless cable service. And they say people only go to trade shows to play golf.

Cut to the present, and McConnell now serves as director of advanced technology and governmental affairs with American Telecasting Inc., the nation's largest MMDS operator, a position he took on when he merged People's Cable (and its wireless operation) into the company in 1994. And separate from his work with ATI, he also holds wireless licenses as president of McConnell Communications.

Wearing his regulatory hat,

McConnell brings hands-on experience to his evaluation of pending regulation that affects the wireless industry, and of course, he lobbies for wireless causes at the FCC. One issue he's watching closely concerns the definition of a demarcation point for in-home wiring: the wireless cable industry, for obvious reasons, would like access to those wires.

And on another front, McConnell helped establish a taskforce about 18 months ago to develop a petition, currently in front of the FCC, to allow wireless cable systems to go digital. He is hopeful that the Commission will rule favorably, and soon.

McConnell believes that digital technology will give wireless cable operators a significant boost in their ability to compete with other delivery systems. "The wireless industry will be a full competitor in video, voice and data," he predicts. In fact, American Telecasting will begin testing the digital waters late this summer, or early this fall, when it initiates a digital MMDS trial in Lakeland with about 50 homes.

McConnell's job also entails evaluating technology and figuring out what to implement next. "I typically take pieces of technology from other industries and put them together in ways they have never been (combined) before," explains McConnell, an electrical engineer by education. "I take off-the-shelf stuff and try to reconfigure it."

### Five long years

It has been a circuitous route leading McConnell to the wireless industry, though. In 1973, not too long after graduating from the University of Florida, he co-founded Polk Cablevision, a cable system in the suburbs of Lakeland, as well as TRI-MAC Construction, a cable TV construction firm. After he had constructed, operated and eventually sold six cable systems, he eventually left the industry 10 years later, in '83. That proved to be a bit of a misstep. In his own words, "After five *long* years in the computer, land development and radio station development business" he went back to the cable industry and had his fateful trade show dinner. "I went back to dance with them who brung me," he notes.

In the wireless cable community, he has reached out to a number of trade groups and associations. McConnell founded the Wireless Cable Operators' Committee of the WCAI and has served as its chairman and its co-chairman since its founding. His work with that committee earned him the President's Award in 1994. "We were all learning the nuances (of wireless cable) on our own," he recalls, "and it occurred to me that if we could get behind closed doors and talk about how we were all dealing with those issues, we could save each other a lot of money."

He's also a past director of CATA for the southeastern United States and past committee chairman of the Florida Cable Television Association.

### A scout, a sailor and a squeezer

McConnell has been just as active in his hometown of Lakeland. He has worked with the Rotary Club, the United Way and the SPCA. He and his wife, Kaye, also play host to a number of fundraising events. And then there's that line on his bio sheet describing him as a past "squeezer" for the Greater Lakeland Area Chamber of Commerce. Is this a juice thing?

Well, not exactly, but Florida does have a reputation as the citrus capital of the world, and Lakeland, capitalizing on that reputation, nicknamed its membership recruitment force "squeezers" (it's not what you think).

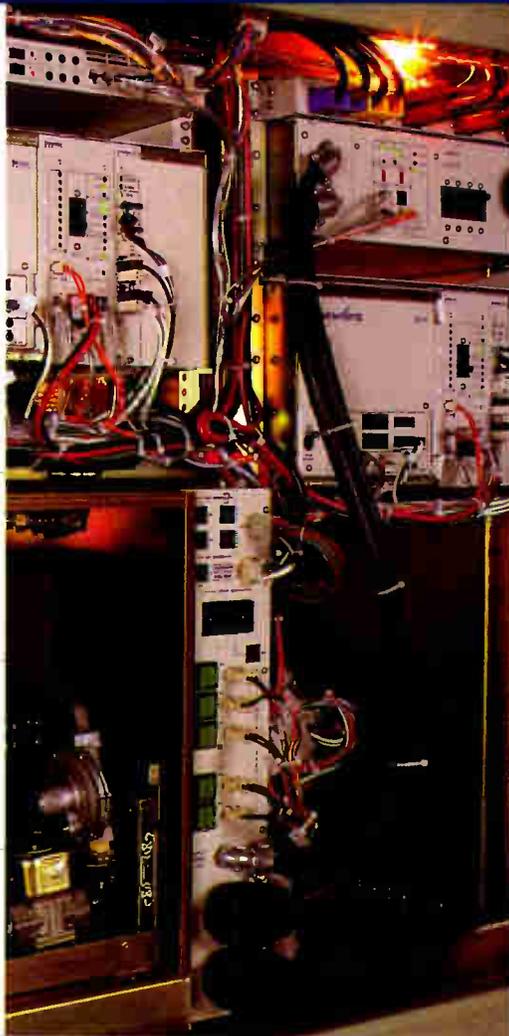
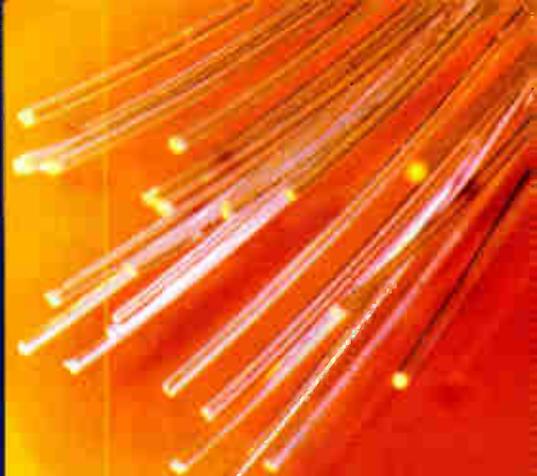
Other pursuits McConnell enjoys include sailing the light jade green waters of the Gulf of Mexico on his Hobie Cat, and investing time in scouting activities with his 13-year-old son, Michael. "I am an Eagle Scout, and I'm the son of an Eagle Scout," he notes. With a desire to see his son move up the ranks of the Boy Scouts of America, McConnell focuses on the character-building aspects of the organization: "If you think about the scout oath and the scout law, those are some pretty powerful words."

From the certainty of scouting to the uncertainty of telecommunications, McConnell characterizes this as a "crazy" time for the industry, with lots of activity.

"It isn't like cable, where a few well-established operators control the entire industry," he explains. "The wireless industry is very entrepreneurial—but it is growing up."

—Dana Cervenka

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# Getting the customer to those who can help



By Wendell Bailey,  
VP of Science  
and Technology, NCTA

The cable television industry has been doing a lot of work over the past couple of years to correct and, where needed, improve its reputation for customer service. We have been hammered for years by anecdotal tales of missed appointments, muddy boots and torn-up flower gardens. We all know that some of these tales were true, and some of the criticism was justified. A recent survey, however, has shown that our reputation has begun to improve. This change has several factors that have influenced its direction. First, the cable industry universally embraced the idea of "Customer Service Guarantees." This program has been widely deployed by our industry, and it is starting to make a difference. Second, every one of us understands that we are eyeball-to-eyeball with actual competition for our customers' business and loyalty. That's the good news. The bad news is that while most of the industry's customer contact troops know about these programs, only about 20 percent of our customers know that we have made these commitments to service.

When I first became aware of the success and shortcomings of our efforts to improve service, several recent personal service anecdotes seemed custom-made to help me illustrate my thoughts.

Recently, I had a ceiling fan malfunction. A call to the well-known manufacturer got me (after the obligatory disembodied voice response system) to a live person who told me that I would have to call one of the service centers that was in my geographic area. A number was given, and digits were dialed. The person who answered this call (after the obligatory audio response system menu was correctly manipulated) admitted that his company did service this product, but it took him more than 30 minutes to determine what I needed.

It took several more minutes before an offer to repair was forthcoming, and a price was stated. I never was convinced that they really knew what I wanted. In frustration, I called back to the manufacturer and eventually tricked the condescending voice thing to transfer me to the "technical department." There I spoke with a man who immediately grasped what I needed and asked about the purchase date of the fan. Thinking that this was to determine whether or not the fan was out of warranty, I confessed that the unit was several years old and was surely not covered, but in any case, I was willing to pay for the necessary pieces. Much to my surprise, the engineer told me that on that particular unit, the piece I was trying to replace was no longer used. A new type of part was used instead, and company policy was to replace redesigned subsystems as if

they were still in warranty, regardless of their age. The part arrived by overnight package, and my fan was back on-line in minutes.

The second service anecdote concerns the most convoluted government agency known, the IRS. An acquaintance of mine told me that he had received a notice of fines and interest incurred for his 1995 taxes because of non-payment. He promptly called the post office to have the numbers on his mail receipt checked, because he had in his possession proof that he had sent in his taxes. He also called the IRS number in Washington to see what he could find out. He listened to it ring for well over 10 minutes. When his call was finally answered he was, you guessed it, connected to a machine that told him periodically to just hang in there. After an additional 30 minutes, the recording abruptly changed and said, "All agents are busy; please call back later," and he was summarily disconnected.

After several more attempts, he finally reached a human who told him that he would be transferred to the correct department, and then disconnected him instead. After several similar adventures, he finally was talking to a person who said that she could check on his problem on her computer, and she asked for his Social Security number. Seconds later, she told him that his taxes had been received, and had subsequently been selected for an audit. While his forms were in the hands of the auditors, his taxes were technically unpaid. Now the point of this story is not the perversity of the tax code, but service.

## Organizing resources

In both of the cases that I have recounted, the failure to help the customer in a timely manner was directly related to the fact that the person who was competent and equipped to help was difficult to get to. The companies involved all were able to give an answer, once the right person had the problem in hand. It would seem that the effort to provide good customer service in any industry or company depends not just on having talented people with a commitment to service, but also, on how these resources are organized.

In my previous life, I worked on a private line test-board. The technicians on that board answered incoming calls from customers directly. There was no one to take a message and ask the customer what they wanted to talk about except for the testman who answered the call. This person was, coincidentally, the one person who knew what the customer was talking about when he told him that the circuit sounded like a windstorm. This was also the person who could say, "hold a minute," and in that minute, replace a faulty piece and restore the customer's service. Know that it did not always work like this, but it had been designed to do exactly that: put the customer together with someone who could directly help as early in the contact as possible.

I think that there is a clue here. Those of you on the frontline will have to determine if I'm right. **CED**

## Have a comment?

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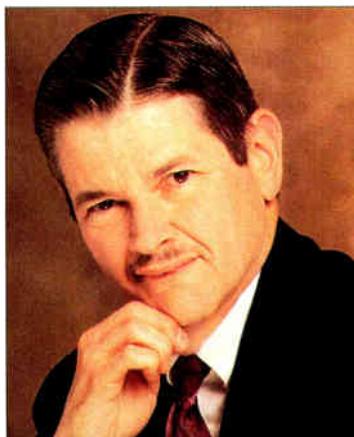
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# Measuring signal level: The next saga



By Jim Farmer,  
Chief Technical Officer,  
Antec Technology Center

Master using your spectrum analyzer to measure analog TV signals, and they throw digital signals at you. Look at a digital signal, and you won't see a picture carrier and a sound carrier. In fact, you won't be able to find the carrier, because it is rarely transmitted. Huh??

First, we have to look at the way we see a digital signal on a spectrum analyzer. The figure illustrates this. Recall that all we normally measure with a spectrum analyzer is the frequency (horizontal scale) vs. the amplitude, or level, of what is at that frequency. What we would see if we properly tuned the analyzer to most digital signals is the trace called "occupied bandwidth (real signal)." The signal is of essentially constant amplitude at all frequencies within the bandwidth it occupies (occasionally, this may not be true, such as with some FSK modulation). That is, the ENERGY PER UNIT BANDWIDTH is constant. In common cable television terms, we might talk, for instance, of a signal amplitude of +2 dBmV per megahertz. However, if we measured a signal of that amplitude, we would not expect the trace to fall at the +2 dBmV amplitude. If we measure it with a power meter (the ultimate digital signal level authority), we'd see yet some other reading. Again I say, Huh???

Well, the problem is that the spectrum analyzer doesn't usually measure the entire signal at once. To understand what the analyzer "sees," we must consider again what we are setting with the bandwidth controls of the spectrum analyzer. Pull out your copy of *CED* for March 1996 and look again at the block diagram on page 22. We can affect the bandwidth the spectrum analyzer "sees" by adjusting the IF bandwidth, F1. The detector responds to the energy in the bandwidth it "sees" through filter F1. Typically, we set F1 such that the bandwidth seen by the analyzer is less than the occupied bandwidth of the signal, to reject adjacent channel signals. The actual response of filter F1 is shown in the figure on this page as the "Actual analyzer passband response."

Now, in order to figure out how much of the signal energy the detector will "see," we must introduce the concept of the "noise bandwidth" of filter F1. The real response of F1 is as shown—sort of a gradual rise in response, followed by a gradual fall (some analyzers use a more rectangular shape). The exact amount of energy coupled to the detector is not clear from looking at this response. Thus, enter the concept of noise bandwidth. This is the bandwidth that F2 would have to have, if that response was perfectly rectangular (sharp sides and flat top), AND it let through the same amount of energy as does the real filter. What is the relation between the actual passband response and the

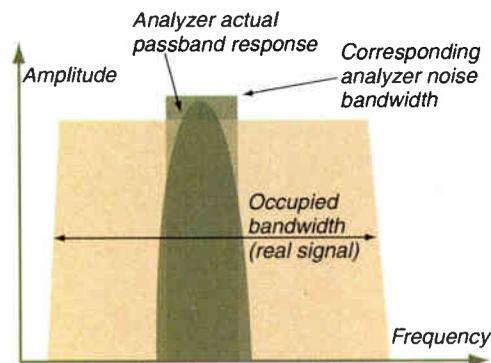
noise bandwidth? Only your analyzer manufacturer knows. Fortunately, he will tell you if you ask him, or for that matter, he will tell you if you read the manual.

The next step is to correct the reading we get for the occupied bandwidth of the signal. Usually, the signal has equal energy for each increment of bandwidth, so the correction factor involves comparing the occupied bandwidth with the measurement, or noise, bandwidth. The correction is proportional to the ratio of the two, and because it is the power that is constant per unit bandwidth, the correction factor is 10 times the log of the ratio of occupied bandwidth to noise bandwidth.

Thus, read a certain signal level on the analyzer. Then look at the resolution bandwidth used to make the measurement. Consulting the manufacturer's literature, determine the corresponding noise bandwidth. Look at the analyzer to see how much bandwidth the entire signal took (remember that the bandwidth of the analyzer filter may widen the observed occupied bandwidth). Then go to your calculator and make the following computation:

$$Actual\_level = (Measured\_level) + 10LOG\left(\frac{Occupied\_bandwidth}{Noise\_bandwidth}\right) + detector\_factor$$

This detector factor is sort of a fudge factor the analyzer manufacturer has determined for the particular instrument type you are using. It is there because the detector in the analyzer doesn't necessarily respond to the AVERAGE power in the bandwidth the detector



sees. The detector may respond more to peak voltage, or something else, and the manufacturer has determined how many decibels to add or subtract to correct for a true power reading.

Some analyzers have a "noise marker" mode, in which the analyzer does the work for you. Unfortunately, while digital signals are much like noise, and can be measured about the same way, the statistics of amplitude occupancy with time are not quite the same. This throws off the noise marker. It is not a good idea to use the noise marker for measuring digital signals, and the detector factor shown above may not be the same for noise and digital signals. Again, talk to your analyzer manufacturer. **CED**

Thanks to my good friend Rex Bullinger of H-P for contributing very useful information.

### Have a comment?

Contact Jim via e-mail at:  
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# Universal telephone service as a weapon



*By Jeffrey Krauss, serving the universal interest and President of Telecommunications and Technology Policy*

In 1983, the FCC established a Universal Service Fund to subsidize local telephone companies that operate in high cost areas, so that telephone service would be affordable even in these areas. The funds are hidden in the access charges that long distance carriers pay for the use of local telephone channels. This system was intended for a regime of monopoly local phone service, but the 1996 Telecommunications Act has ended that regime. The current system is broken: it fails to target the neediest subscribers, it rewards inefficient phone companies and it is inconsistent with the goal of competition for local phone service. Recognizing these problems, Congress told the FCC to fix them. But the incumbent monopoly local phone companies are resisting change.

The Universal Service Fund is a pot of nearly \$1 billion dollars that is collected as a tax from telephone ratepayers; the funds are disbursed to local phone companies that can show they have costs that are substantially above average. The subsidy funds go to high-cost phone companies, not directly to needy subscribers. As such, the subsidies diminish these companies' incentives to become more efficient and lower their costs.

The money comes in part from hidden fees within the access charges that are paid by long distance carriers for the use of local channels supplied by the local phone companies. This is one reason access charges are so high. The Fund is administered by the National Exchange Carrier Association. The FCC has no real responsibility to make sure that the funds are disbursed to those who really need them.

The new law requires the FCC to adopt changes to the universal service support mechanisms within 15 months. These new rules will decide which services should be supported, who should receive the subsidies and how this program will work in the new competitive regime.

Today, the monopoly local exchange carriers are the only ones eligible to receive subsidies from the Universal Service Fund, not competing carriers. But in the future, the FCC believes that any competing carrier should be eligible to receive these funds. The problem is how to decide who gets them. One solution is to set up an auction and let them bid against one another. The carrier that is willing to provide service with the lowest amount of subsidy per line wins the auction and gets the subsidy funds. I didn't make that up; it's in the FCC proposal. But it sounds like a good idea to me. Of course, the incumbent local exchange carriers hate it.

One major problem with these universal service subsidies is not that customers in high cost areas receive them, it's that somebody must pay them. Because these subsidies are paid by the long distance companies that

use the local channels supplied by local telcos, it creates incentives for long distance companies and other entrants to build their own local channels. It creates this incentive even if the local phone company is the most efficient supplier of this service. It creates the incentive for entry by inefficient competitors, who may have higher costs but can nonetheless undercut the price charged by the local phone company because they don't have the subsidy burden.

The FCC should not protect local exchange carriers against fair competition from new local communications service providers. But it may feel that they should be protected against unfair competition, where the incumbent telco bears the burden of subsidies, while the new entrant does not. This was exactly the situation in the late 1970s: AT&T's long distance charges included subsidies to cover local phone service, while MCI did not pay these subsidies. The FCC created access charges to level the playing field for long distance competition, but built new subsidies into those access charges to benefit high cost areas. In a competitive local exchange marketplace, those subsidies now have to be revised.

But these universal service subsidies should not be used to protect incumbents in high cost areas against more efficient new entrants. If local phone service can be provided more efficiently in these areas by new wireless or cable-based carriers, the high cost incumbent telcos might not survive. Too bad. Universal service policies should not be used to protect those guys against more efficient competitors.

## Targeted subsidies

Here's another problem with the current Universal Service Fund. It creates broad subsidy flows that, while supporting some who need the subsidies, also support many who do not. Today, heavy phone users subsidize light users, and urban users subsidize rural users. Never mind that the rural estates of northern Virginia are owned by some of the wealthiest people in the world. Never mind that the lowest telephone penetration rates are in low income urban areas. The urban poor of Richmond subsidize the riding stables of Middleburg.

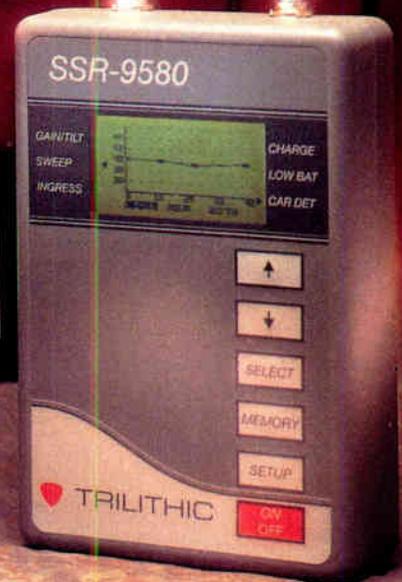
Will lowering the price of phone service in high cost but wealthy rural areas result in increased penetration? Nobody asks if the benefits of the current policies are received by those, and only those, who need them.

Competition can help. If suppliers of phone service are allowed to compete for the subsidies, it would create the incentive to provide subsidies only to those with the greatest need. The incumbent local phone companies are fighting these changes. They'll try to show how competition will harm, rather than benefit, universal service. Never mind that competition usually results in more efficient, lower cost service to all customers. The FCC faces a challenge as it tries to promote both competition and universal service, both requirements of the new telecommunications law. The incumbents can be expected to use every tactic they can to slow or limit competition, and universal service will be one of their weapons. **CED**

**Have a comment?**  
Contact Jeff via e-mail at:  
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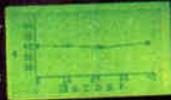


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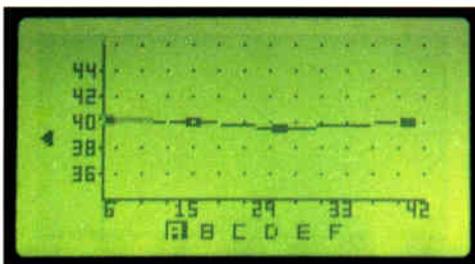
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# Technology can prevent interactive Armageddon

Your "In Perspective" column ("Stirring the sleeping giant," *CED*, 4/96, p.4) was right on the mark—cable MSOs must protect their industry from competition. Technology is available today to prevent interactive TV's Armageddon.

Indeed, the cable industry is ready for "video-on-demand" and "prime time" without expensive set-top convertors and without "over engineering." And the vision that consumers can "view what they want, when they want it," is realistic. Your point that digital is not dead is well taken. Technology is available that incorporates both digital and analog. Thanks for the most interesting article. The only missing item was the immediate need for the cable TV industry to provide two-way applications.

As a cable pioneer who helped design the first system in Lansford, Pa., and who spent almost 50 years in the industry, I am anxious for the cable industry to compete. The Telecommunications Act of 1996 makes it imperative that cable companies protect their systems from AT&T, the Baby Bells and direct satellite service by adding other potentially lucrative services.

Cable operators can maintain their existing systems and add several hundred channels of interactive video-on-demand sports, movies, education, health care and shopping; two-way megabit computer capability with privacy and security of service; full-motion desktop video-conferencing; and wireless telephony.

The industry today has problems with this vital upgrade. Dual cable trunk and feeders cannot deliver basic and monthly tiers of channels, plus hundreds of channels of interactive services—and surely cannot provide two-way capability. Distribution of more than a half-dozen pay-per-view services is presently prohibitively expensive with current set-top convertors.

Cable systems must install, in addition to existing trunk and feeder cables, a two-way, dual fiber link interconnecting the headend with switching control centers located in medical, educational and government buildings, as well as apartments, business offices and police stations. It is from these facilities that low-cost, two-way services will be provided.

This optical fiber trunk link would be supplemented by a low-cost distribution system

that uses Buss patented Remote Switching and Processing Convertors to allocate three channels per subscriber on a coaxial feeder cable. Dedicated RSPCs assign the first channel for interactive video, the second for subscriber remote control signals plus high-speed digital computer transmissions, and the third channel is for two-way video or computer applications.

This system, whereby each subscriber uses his own set-top convertor, complies with the desire of the Federal Communications Commission that customers should be allowed to access the cable and connectors in their homes and to own their own set-top terminals. It also eliminates any problem of interference with aeronautical signals, as that spectrum is not used.

The cable industry can lead the nation with interactive and two-way services.

**Vic Nicholson  
Buss Inc.  
Bethesda, Md.**

## Lenfest isn't waiting

Your (April 1996) "In Perspective" made me want to let you know where the Lenfest Group (Suburban Cable TV Co. Inc.) is headed when it comes to VOD and NVOD. We are currently in the design and implementation stages for a digital video-on-demand project. In fact, most of the equipment was due to be delivered by the beginning of July.

We have many new technologies, like RF modems, OTNs, 750-MHz, two-way plant, The Sega Channel, 150+ fiber optic nodes, 90-volt power supplies, etc., in our 120,000-subscriber system. We have school districts that are very aggressive in technology, and we have built private fiber networks with Racal Datacom 100 Mbps multiplexors and have connected other school districts with Zenith RF modems.

I always say, "You name it, we have it." We even had John Malone (president and CEO of Tele-Communications Inc.) and Brendan Clouston (executive vice president of TCI) down to talk about our upcoming digital project, which is going to be a real challenge.

So, to close, your last paragraph makes me wonder what insight you have into the telco

"giants" waking up and taking over. I always say to my department employees that once I see HFC (networks) being constructed, I'm getting the resume ready.

**Keith Boyd  
Suburban Cable TV Co. Inc.  
Wallingford, Pa.**

## Smoke-filled rooms

Thank you so much for the fine tribute to Larry ("A tribute to Larry: He was one of a kind," *Farmer's Market*, *CED*, 5/96, p.22). It brings back a lot of great memories and adds a few anecdotes of things that I did not know or had forgotten.

The cigar method for making things work reminds me of another "cigar method" Larry once confessed to. Cigar Method #2 was designed to get a group of engineers who could not agree on some phase of work on a project to come to a workable consensus.

It consisted of getting the group together in his office, closing the door, lighting up and smoking one cigar after another until everyone was willing to compromise (and probably accept Larry's original suggestions) in order to end the meeting and get out of that "smoke-filled" room. (Jim Farmer) may remember some of those meetings without having fully appreciated the "method" involved.

If extra copies of the *CED* issue with the article are still available, I would like to get more copies for me to send to the children. I'm sure each one would enjoy having a copy.

**Anne Clayton  
Lawrenceville, Ga.**

## Hey, it's Keay, not Hay

Thanks for the article on Canadian Cable Labs ("Making arcane R&D pay off in a big way," *CED*, 5/96, p.92), which I have just read.

It contains, however, a serious error. I think the RAD concept is neat, but I am not, and never claimed to be, an originator of it. I'm sure the person whom you were interviewing was referring to Roger "Keay" (pronounced "Kay").

George Hart was another key player, and I believe the others are mentioned as inventors in the patent claim.

**Roger Hay  
A.D. Little  
Toronto, Ont. Canada**

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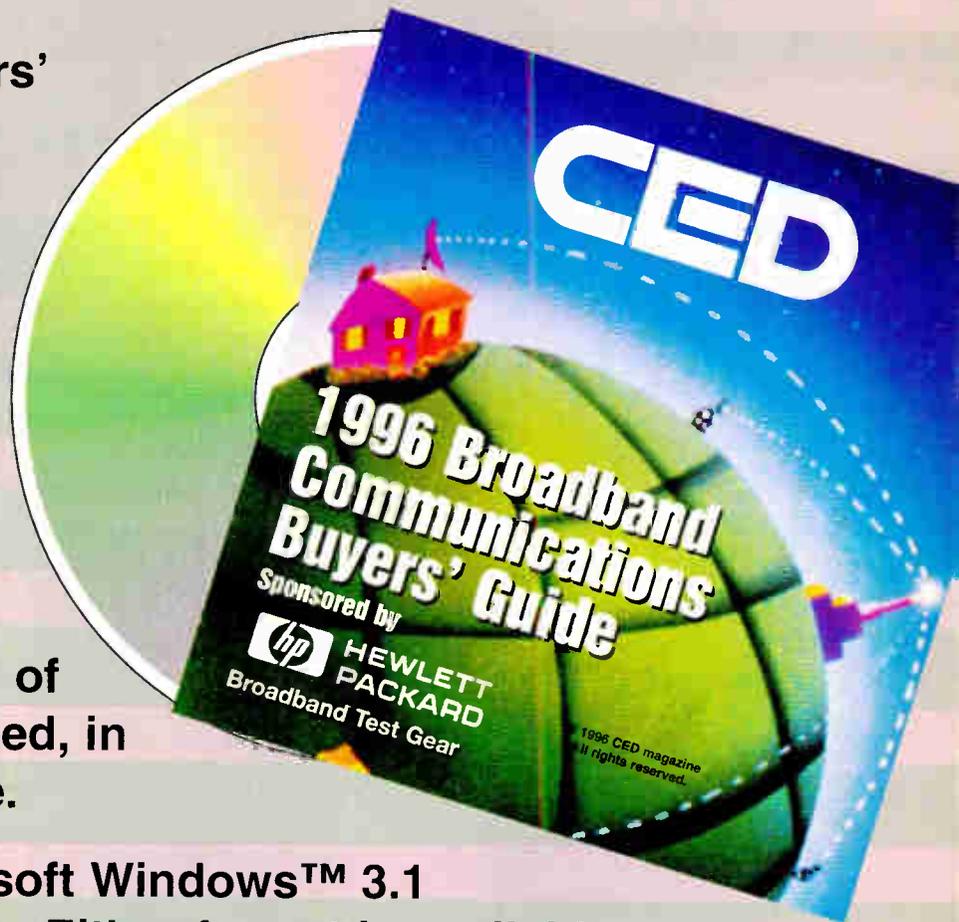
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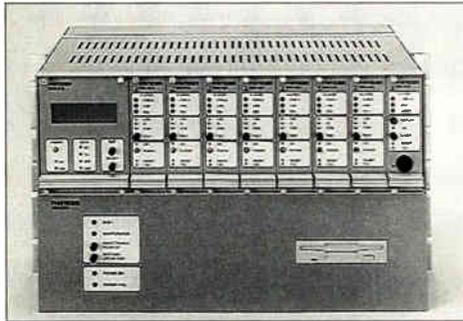
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per hour, depending upon which cable gets cut. Based on hybrid/fiber coax (HFC) type fiber system designs, the average length of fiber cable carries service for 25,000 subscribers. Therefore, the average cable outage will result in lost revenue of \$1,000 per hour.

Sources differ on the average mean time to repair for a fiber optic cable. The reports referenced in this article show the average meantime to repair to be anywhere between five and 11 hours. For this analysis, seven hours is used as an average time to repair or outage time for a fiber optic cable.

Based on the information presented above, a monitoring system which eliminates three outages per year, seven hours in duration, would *recover an average of \$21,000 per 1,000 miles per year, or as much as \$168,000 per 1,000 miles per year for AM plant.*

As a side note, the most recent FCC and Bellcore



**Figure 3. Norscan preventive maintenance equipment.**

reports show an increase in the rate of fiber outages through the last four years.

Although not included in the report analysis, it can be surmised that this increase is due to the fact that the fiber in telephony systems is being installed closer to the "local loop." The "local loop" has always been known

as the harshest environment for outside plant equipment, including cable. Although not reported, the number of outages per 1,000 miles in a cable TV fiber distribution system may be higher due to the fact it is also installed in this harsher environment.

✓ Preventive maintenance telephony service revenue recovery. Lost revenue estimates for telephony service outages run \$2,500 to \$25,000 per minute for a fiber cable cut. The cost depends upon the transmission rates and fiber count of the cable.

According to the previous analysis, a monitoring system which eliminates three outages per year, seven hours or 420 minutes in duration, *would recover between \$3.2 million and \$31.2 million per 1,000 miles per year.*

Upon first glance, the difference between cable TV and telephony revenue recovery seems unbelievable. Based on the analysis above, cable TV lost revenue is an average \$17 per minute and telephony lost revenue is a minimum of \$2,500 per minute. The difference is due to the price of bandwidth provided and where the fiber cable is physically located in the system.

The average price of a 4 kHz (64 Kbit) long distance call is on the order of 15 cents per minute and, as shown above, the average price of 300 MHz broadband video service to an individual cable TV subscriber is .07 cents per minute. The discrepancy in lost revenue between the two industries is due to the dis-

crepancy in the price of bandwidth provided. Due to the lower bandwidth requirements of telephony service, a larger revenue stream can be allocated to any given fiber cable.

In addition, most of the fiber cable in the cable TV industry is located in the local loop with a low subscriber per fiber density. Most of the fiber installed in the telephone network is for high-speed interoffice and long distance business, where the subscriber, and therefore revenue, per fiber density is much higher.

"Time is money" was never more true than when applied to reducing the time of a fiber cable outage. As shown by the rates of lost telephony revenue above, a minimum of \$2,500 per minute can be saved for every minute sooner the cable can be restored. The preventive maintenance monitoring systems described can also quickly determine what section of the line the cut is located in, eliminating precious minutes of down time.

### Maximizing availability by decreasing MTTR

The other way to maximize fiber availability is to decrease mean time to repair. Once a network is down, the quickest possible recovery is required to maximize availability and revenue recovery.

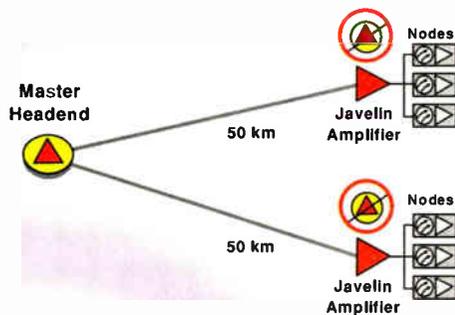
✓ Planned emergency restoration. The key consideration for reducing MTTR is creating a comprehensive emergency restoration plan. Much of the plan can be worked out during system design; however, a complete plan cannot be laid out until you know your resources (people, equipment, etc.) and have the "as built" plant records of your system. The restoration plan should have seven components: 1) Facilities management, 2) Team, 3) Training, 4) Equipment, 5) Action plan, 6) Fire drills and 7) Continuous process improvements.

1) Facilities management. One of the most important steps that can be taken to ensure lower MTTR is the accurate documentation of your system. A structured process for accurate documentation, at a minimum, should include:

- 1) confirmation with as built,
- 2) cable routing,
- 3) fiber routing,
- 4) optical losses,
- 5) sheath condition,
- 6) splice location,
- 7) sheath lengths,
- 8) cable lengths and markings,
- 9) fiber to cable length ratio, and
- 10) system performance parameters.

Although this list appears to be rigorous, the "up front" work more than pays for itself in the case of an emergency restoration, plant upgrade or reconfiguration. Although the ideal case is to collect this information during the build, in most cases, this database will be developed long after the plant is in place. To record the database after the plant is built, an "as built walk-out" is recommended in order to take a true inventory of your outside plant.

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**A good practice includes the physical labeling of transmitters, patch panels and jumpers**

One strategy is to log your fiber plant by "segment." Each transition in the fiber cable (i.e. patch panel, splice cabinet, splice closure, optical receiver, etc.) should be identified as a "transition point," the cable sheath footage documented, and the "transition point" given a name and location. Each "segment" is then identified by the two "transition points" which it is located between. For each segment, the cable type, manufacturer, install date, fiber count, segment length, slack points, origination, destination and type of information being carried should be recorded.

Updating the database should be centralized in order to eliminate confusion. One or two people or an outside firm should be responsible for updating the database. A "change of plant" form and a procedure for filling it out should be implemented. All personnel associated with the plant should have access to the "change of plant" forms and be trained to fill them out. Anytime a perceived change in plant is completed or noted this form should be filled out and forwarded to the person or group responsible for maintaining the database.

Although the database can be kept manually, it is recommended that a computer database be used due to the amount of information, and the large number of cross references and frequent changes required.

In the case of a fiber cable cut, MTTR can be greatly decreased by simply being prepared. Not only is a good accurate database of utmost importance, but emergency restoration time can be greatly decreased by knowing where the tools required for an emergency restoration are located. This list should include excess cable reels, keys for entry into buildings, and all the materials and equipment required to perform the restoration.

In addition, a good practice includes the physical labeling of transmitters, patch panels and jumpers. Many an hour has been lost in an emergency situation due to tracking the problem from the incorrect origination point.

2) The team. A restoration team should have seven members; five located at the fiber restoration site and one person each at the optical termination points of the run, usually the headend and a node. The five at the restoration site should consist of two teams of two performing the splicing, and one to review the as built records and keep radio contact with the personnel located at the termination points.

3) Training. The restoration personnel must be trained to access the "as built" database. This training may include use of laptop computers to access the database via computer modem.

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Formal hands-on training courses should be held for the restoration crew a minimum of twice per year. Additional training can be achieved through "fire drills" which are discussed later. The use of the test equipment, splicing equipment, and fiber optic cable

**It has been shown that the use of mass fusion splicing greatly reduces restoration time**

splice preparation should be reviewed in this yearly training. At one major MSO, it was found that "an additional 20 to 30 minutes could be shaved from overall restoration time" had proper proce-

dures been used. <sup>6</sup>

4) Equipment. The amount and type of equipment needed is dependent on a variety of factors including geography, climate, system size and number of fiber technicians.

If a system is large, with high density areas that are far from one another, spare fiber reels (i.e., 1 km in length) should be strategically positioned to reduce travel time. Reels could be placed in satellite offices, warehouses, or storage sheds.

Test equipment should include an OTDR (1310 and 1550 nm), optical power meters, voltmeter and appropriate fiber jumpers to accommodate all possible connections and test equipment.

The minimum materials and equipment available to every restoration group should include either a fusion splicer or mechanical splicing kit, a reel of cable with both ends prepped, and an emergency restoration tool kit that is never accessed except in the case of an emergency restoration. These kits are commercially available in assembled form, or they can be assembled to match a particular system's needs.

Tools include a razor knife, pliers, side cutters, buffer tube scoring tools, seam ripper, rags, gel removing solution, a set of standard screwdrivers and nutdrivers, alcohol wipes, fiber coating stripper, cleaver, protection sleeves, compressed air, tweezers, etc.

It has been shown that the use of mass fusion splicing greatly reduces restoration time.<sup>4</sup> In this study, both cable type (ribbon vs. loose tube) and mass fusion vs. single fusion splicing were evaluated. The data shows that ribbon cable always takes less

time regardless of fusion method, but more importantly, mass fusion splicing greatly reduces splicing time, regardless of cable type. Based on the cost analysis in the previous section, if one hour can be saved in an emergency restoration of a toll line, between \$150,000 and \$1.5 million can be recovered in lost revenue from one restoration, if mass fusion splicing is used.

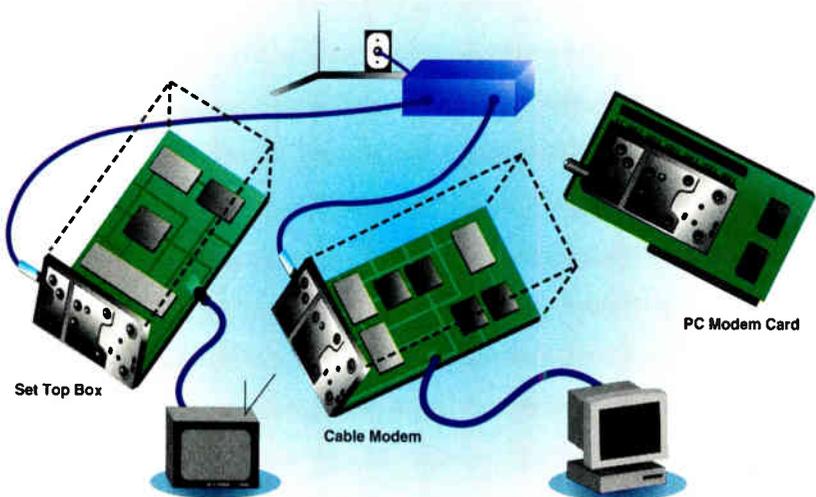
Mechanical mass splicing kits are also

available. Mechanical mass splicing requires roughly the same time as mass fusion and delivers a mean insertion loss of less than 0.1 dB.

5) Action plan. First and foremost, safety should not be forgotten in the haste of an emergency restoration. Because they cannot always be found in an emergency, marker cones, vests and gloves should all be stored with the emergency equipment and tool kit.

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Written procedures on how to proceed should also be kept with the emergency equipment so that they are easy to find. In addition, written procedures are a good idea so that nothing is forgotten due to the expediency of the restoration.

An action plan should be developed that includes who to call and when. A comprehensive list should be made available that includes phone numbers, pager numbers, and an escalation procedure for your own restoration personnel, as well as other utilities and contractors. An escalation procedure should include who to call when the first options can't be reached.

Phone numbers of the emergency team members and escalation procedure members should be documented on laminated cards and kept on hand by all team members.

After restoration is complete, a "change of plant" form should be filled out and forwarded to the appropriate personnel for logging the modifications to the network.

6) Fire drills. Performing "fire drills" is a training issue, but this is so critically important that they should be focused on as a separate issue. In the words of one cable TV operator, "Until we started simulations, nothing we had in place was even close to what we needed."<sup>6</sup>

Fire drills should be conducted once per quarter. The more realistic the drill, the better the training. A well-planned surprise fire drill is one of the best ways to train your personnel for an emergency restoration. Staged calls from a customer base can be placed so that the "cut" can be isolated. An actual cable can be laid out with a cut, and the crew should repair it and be timed. The "team" should be allowed to proceed on their own with no help from management.

As a goal, every drill should have a better time than the previous. In order to perform surprise drills, be sure to notify management at high levels, due to the fact the team's daily routine will be disrupted.

7) Continual process improvement. After a restoration "fire drill" or any actual emergency restoration, a meeting should be held with everyone involved in the

restoration to discuss what should be done to make the process better next time.

Some things that have been learned in the past from documented fire drills include the need for having rain suits and tents for inclement weather, an awareness of those technicians not familiar with preparation of all types of cable, the importance of having lighting available, and what can be gained from better documentation of splicing priorities.

After each post restoration meeting, the data from the drill or restoration should be recorded, and changes should be implemented as soon as possible.

### Summary

As the cable TV industry deploys more fiber optic cable and becomes a competitive part of the telecommunications industry, quality of service, system reliability and availability become important issues not only to compete, but to survive.

In addition, the cable TV industry knows the importance that customer satisfaction has in the telecommunications business due to the lessons learned in coaxial cable outside plant over the past 10 years.

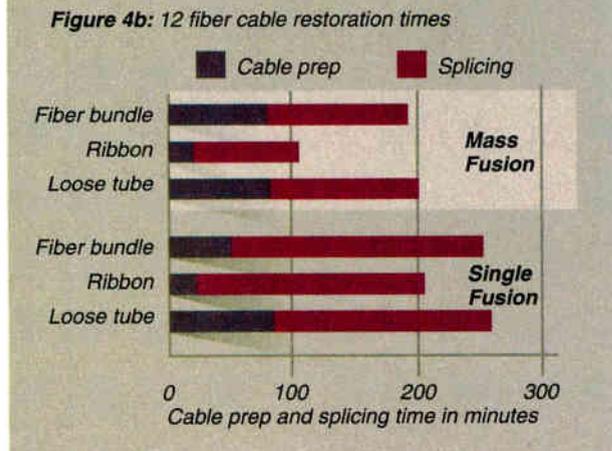
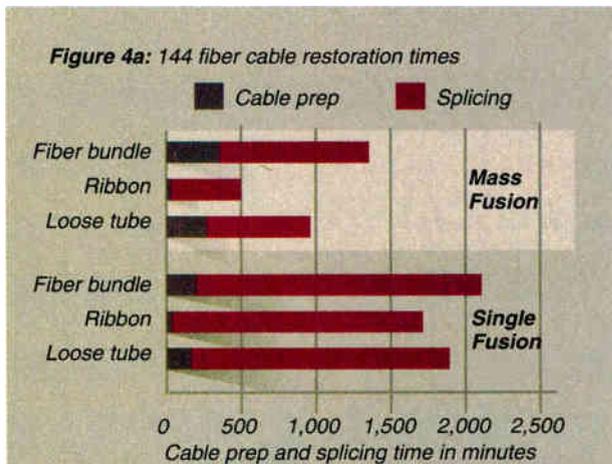
In order to compete effectively, the industry must embrace preventive maintenance and emergency restoration techniques.

It has been shown that by implementing tone location programs, preventive maintenance systems, accurate outside plant databases and tools for decreased restoration time, not only can cable TV networks maximize fiber cable availability, but can also save money, recover lost revenue and make aerially deployed cable more reliable than buried cable. **CED**

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*Editor's note: This article is derived from a paper presented at SCTE Cable-Tec Expo '96 and is reprinted with permission. See the Cable-Tec Expo '96 Proceedings Manual, pp. 113-120.*



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# LMDS formula awaits approval

**FCC postponements  
frustrate wireless  
proponents**



*By Michael Lafferty*

**I**t's been half a decade since the first "magic" LMDS formula was pioneered and deployed in New York City. Yet, by many accounts, the much anticipated roll out of local multipoint distribution services (LMDS) has been frustrated and frozen in a virtual cryogenic regulatory stasis at the Federal Communications Commission (FCC) ever since.

Some villagers—potential LMDS service providers, equipment manufacturers and various advocacy groups—seem almost ready to storm the FCC castle to force the foot-dragging bureaucrats into giving LMDS the regulatory jolt it needs to finally come to life.

While no torches have been fired up yet, the anticipation and anxiety is building for those who both hail and harangue this new competitive force in broadband communications.

### **The first LMDS solution**

The secret to LMDS' potential success can be found at the cellular level.

While there are some general similarities, such as the wireless transport of signals, between LMDS and MMDS (multichannel multipoint distribution service), there are some important differences that have a lot of

people chomping at the bit to get involved in LMDS deployment. LMDS' higher frequency (in the 28 GHz range) and its relatively massive available bandwidth (1000 MHz) makes it the two-way, interactive darling that MMDS (in the 2.5 GHz range with less than 200 MHz of bandwidth) is not (see Figure 1).

The propagation characteristics of the LMDS 28 GHz band dictate that the system must operate in smaller "cells" with a three to six mile radius, as opposed to MMDS that can range up to 35 miles. And, while the higher frequency LMDS signals have to deal with rain refraction, they retain coherency through multiple reflections better than their MMDS brethren, thereby making them better for two-way communications.

The commercial viability of LMDS was first demonstrated in 1991 when the FCC opened the 27.5 - 30 GHz Ka-band frequency (commonly referred to as the 28 GHz band) up for broadband telecommunications applications. Prior to this time these Ka band frequencies had been used sparingly, even though they've been available for point-to-point, microwave-radio, common-carrier use since 1959.

In 1991 the FCC waived its existing rules for the



SPENSER ROWELL/PG INTERNATIONAL

While Bossard's specific approach is certainly not the last word in LMDS technology, the broadband potential of the service and its relatively low deployment costs (see story on page 46) are attracting more and more attention worldwide.

### LMDS force continues to expand

Two of the newest entrants in the LMDS equipment field are Hewlett-Packard Company (H-P) and Stanford Telecommunications Inc. who recently signed a memorandum of understanding to mutually develop a prototype system for a fully interactive, all-digital platform that would enable rapid deployment of low-cost, high-quality LMDS technology. The operative word, says Doug Gray, program manager for H-P's Wireless Systems Group, is "low-cost."

"When you start to compare all the ways you can put in a broadband infrastructure, wireless looks pretty good from a cost point of view. The disadvantage that a lot of these other technologies have, say like HFC, is that you've got to lay all that coax in as if everybody is going to be a customer. So you've got all that money that you've spent up front.

"Whereas with wireless, you've got to get the infrastructure out into the neighborhood. But you don't have to cover that so-called "last mile" until you actually have a customer. And then you provide them with the CPE, the antenna unit and the modem. But you're getting revenues to pay for that. So, it's a big, big difference in the upfront costs."

Interest from potential LMDS operators has inundated another recent market entrant, Texas Instruments Inc. (TI). Carlton O'Neal, the director of business development, marketing and product management for TI's Communications and Electronic Systems, says interest in its MultiPoint LMDS system, from both domestic and international operators, continues to grow unabated.

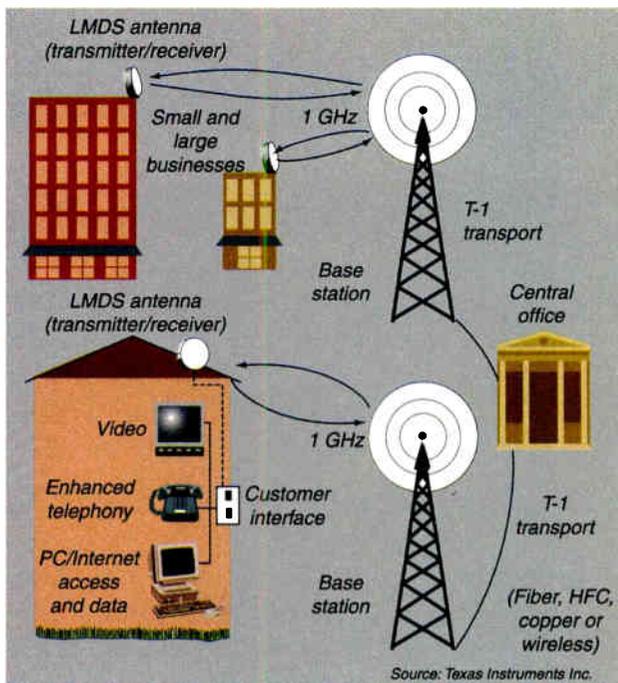
"I have two nightmares about this," O'Neal jokingly complains. "One nightmare is the U.S. (market) is going to take off. The other nightmare is the international market is going to take off. We could do a trial in 30 or 60 days with somebody if we thought it made

spectrum and granted a little-known company, CellularVision USA, a Pioneer's Preference and the exclusive rights to provide LMDS service to 3.2 million households in the 11,000 square mile New York Primary Metropolitan Statistical Area (PMSA). CellularVision got the go ahead, in part, on its claims that it had ways to overcome two major high-frequency transmission problems.

Bernard Bossard, the company's chief technical officer, knew the propagation characteristics of signals in this high-frequency range demanded a number of relatively small cells to generate transmissions that would be unaffected by rainfall. At the same time, he also realized he had to prevent signal interference in adjacent cells, while reusing the same frequency in each cell to reap the commercial benefits of utilizing all the spectrum allotted.

His answer was a patented cross-polarization technique that permits reuse of 1000 MHz in all LMDS cells without interference. In addition, to prevent any multi-path interference, which may occur when 28 GHz signals bounce off buildings and other solid structures, Bossard developed a patented narrow beam width dissemination technique.

**Figure 1:** High-speed data, enhanced telephony and multimedia video via LMDS wireless infrastructure



Source: Texas Instruments Inc.

sense. But that's not our plan.

"We've had many, many customers come in who've gone to demos and seen our equipment and talked with us about supporting them through the auction. We really have been maxing out our ability of showing people what we're doing and how the equipment works."

O'Neal says interest has come from four basic sectors in the United States and abroad: telcos, cable companies, entrepreneurs and

government entities. He says it's impossible to pick one sector that is higher than the others in level of interest or in number of requests for information. O'Neal reports the underlying appeal of LMDS remains the same, no matter what their ultimate goal is in pursuing the technology. "It's the fastest way to get to market for broadband technology. It's the same thing everybody is looking at it for, the fast deployment of large amounts of bandwidth.

That's what excites anybody."

### Pressure reaching critical mass

One of the earliest FCC disputes about LMDS revolved around the spectrum itself. Basically, the fight came down to two interest groups. LMDS proponents wanted official recognition and dedicated spectrum to do their thing in the 28 GHz band. Fixed satellite service (FSS) interests (e.g., AT&T, Lockheed Martin, Hughes Communications, etc.) wanted to boot LMDS into the 40 GHz region.

Finally, in July 1995, the FCC issued its Third Notice of Proposed Rulemaking. The notice essentially segmented the spectrum (see Figure 2) so that it would be shared by both interests. It seems to have finally sunken in that it's probably the best they will be able to do. Just before press time, CellularVision, AT&T, Motorola, General Electric, Hughes Communications and Teledesic Corporation announced they had agreed to bury the spectrum segmentation hatchet and stop fighting each other over the shared spectrum plan.

The only fly in this soothing spectrum ointment may be yet another government agency, NASA. In late April, the space agency turned down the FCC request to share 150 MHz of its Ka-band spectrum (29.1 - 29.25 GHz) with LMDS. What happens next is unclear.

Barring a detailed and potentially painful budgetary talk with Vice President Gore suggested by one LMDS proponent, NASA should do what it's supposed to do, says another observer. "In theory, NASA is holding a pretty broad spectrum that's worth a lot of money. And NASA's mission is, of course, important. But NASA's objective is to commercialize new pioneering frequencies. Once it accomplishes that, it should move on."

### The bidding starts at...

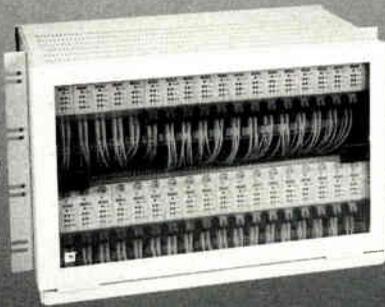
As the market grows more excited about its two-way broadband interactivity, particular interest is being focused on the auction rules themselves. The situation is further complicated, observers say, by the increasing utilization of Ka-band spectrum and implementation of LMDS broadband wireless technology abroad.

New ex parte pleas, especially in light of the 1996 telecom bill, appear to have put the kibosh on a much-anticipated (albeit skeptically viewed) late-summer auction. The decidedly pro-competition language of the recently passed telecommunications legislation has put a new wrinkle in FCC deliberations and given LMDS start ups added ammunition in their appeals for a truly competitive auction process.

In a recently filed ex parte plea to the FCC filed by WebCel Communications Inc., the

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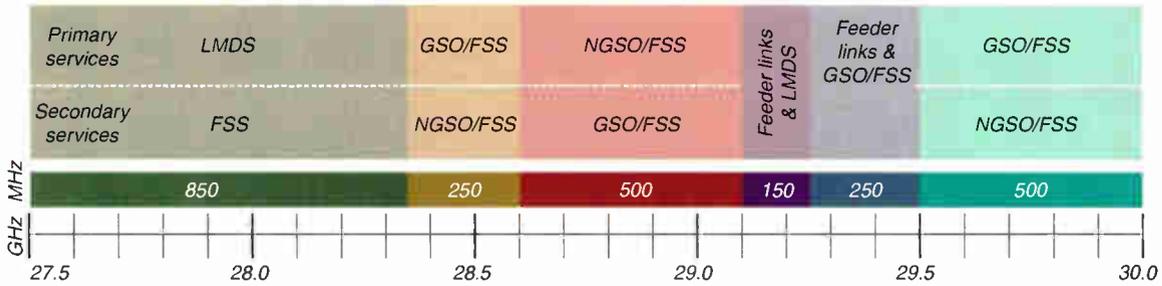


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Commission was urged to "include necessary safeguards to avoid outright takeover of another potential competitor and anticompetitive abuses" by local telcos and cable operators which WebCel believes "have substantial economic incentives to forestall deployment of

It also suggests "buy-out" prohibitions "that preclude a LEC or MSO from acquiring an LMDS licensee until effective, facilities-based competition exists." Finally, WebCel asks the FCC for licensing regulations "that preclude LECs and MSOs from

Figure 2: The FCC's proposed 28 GHz band segmentation plan\*  
 (\*FSS-Fixed satellite service; GSO-Geostationary satellite operations; NGSO-Non-geostationary satellite operations)



investing in Designated Entities (DEs), or other preferred 'entrepreneur' auction participants, who bid for LMDS spectrum within the same monopoly service territories."

David Mallof, WebCel's president, says the FCC need only look to the north in Canada where wireless

LMDS as a direct substitute for their facilities-based, monopoly networks."

WebCel suggests three regulations regarding MSOs and telcos. First, it recommends rules that preclude LECs and MSOs "from bidding for LMDS spectrum until there is effective, facilities-based competition for local exchange services and cable television services, respectively, within each of their local service areas."

Ka-band services recently got a competitive shot in the arm. "I've had the disappointment," says Mallof, "to hear the FCC worry that maybe if the big old RBOCs aren't there, there won't be enough bidding. Canada had the good common sense and strength of conviction on a policy basis to exclude the provincial Bell Canada's and the MSOs for the first couple of rounds of LMDS.

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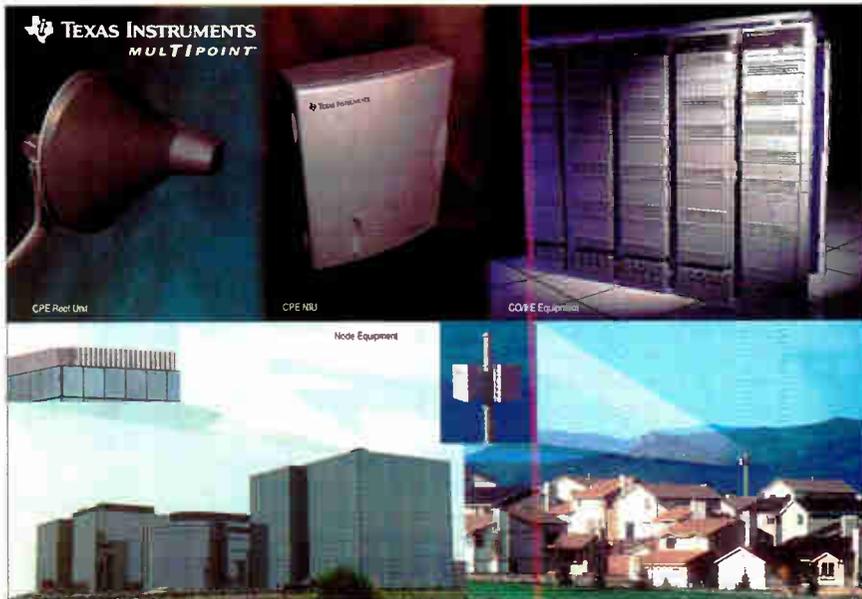
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"The first set of licenses have been applied for as of May 15. And out of nowhere, 14 of what appear to be very viable partnerships and companies came out of Canada. The capital markets are hungry to invest directly in telecommunications here. So the presence of the MSOs and the RBOCs is not an essential for LMDS to succeed."

The overseas competition for LMDS product has some vendors worried as well. "These guys," says TI's O'Neal, "come from all over the world, and I'm talking everything from underprivileged countries that don't have any infrastructure, all the way up to the most sophisticated countries in the world infrastructure-wise. They are saying, 'We want your production. We can keep you as busy as you want to be over the next five years.'

"Of course, a lot of that's talk, too, and I appreciate how international business is sometimes conducted. But it also speaks to the pressure the whole 28 GHz industry is under, and if the U.S. is going to wait on it, it's going to be the net loser.

"We've done everything. We've trooped our executives up there to Washington and talked to people in the Senate and the House. We've done everything we could to say, 'Get on with it!' If the FCC screws around much longer, our factory is going to be full of international orders. I think the FCC's got to step to the plate here."



So, perhaps it is true that equipment vendors have found the magic formula for LMDS success. But until those vendors are given permission to sell the solution, the technology will be just another competition wannabe. **CED**

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# Broadband wireless

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# access systems at 28 GHz

Figure 1: Expected FCC allocation for LMDS. 850 MHz would be used for downstream channels (hub to CPE) and 150 MHz for upstream channels.

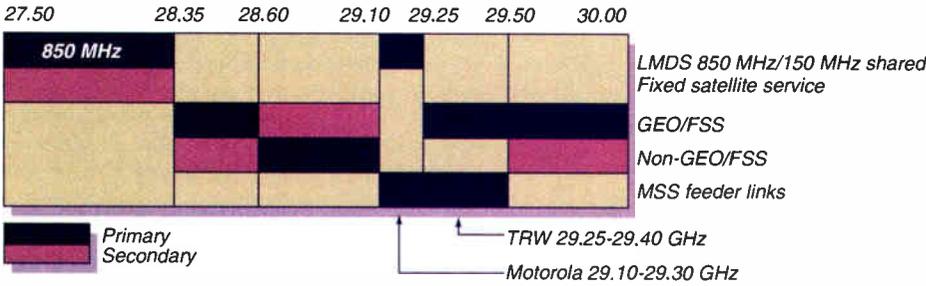


Figure 2: Hub uses four 90-degree sector antennas to get omnidirectional coverage

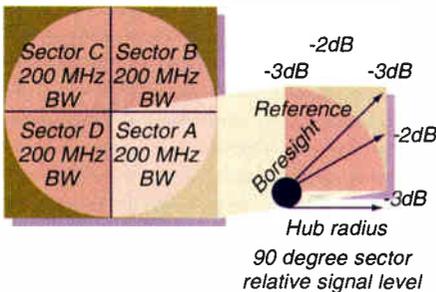
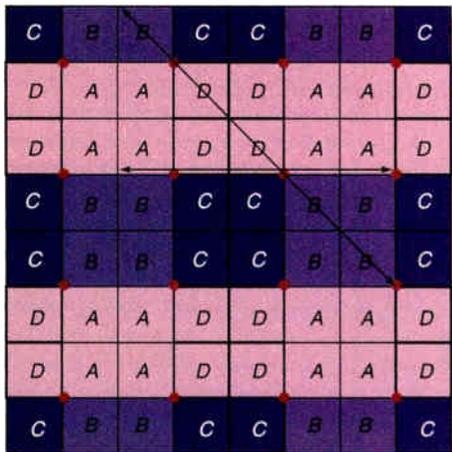


Figure 3: One of several layout plans that will provide a 5 x R separation for cell-to-cell interference



By Douglas A. Gray, Manager, Wireless Systems Department, Hewlett-Packard Company, Microwave and Communications Group

The advantages of wireless local access over competing broadband delivery systems is the significantly lower infrastructure cost and the time to market. The technology exists today to develop solid-state hardware to economically deploy Local Multipoint Distribution Systems (LMDS) at 28 GHz. In addition to low infrastructure costs, the key to successful deployment lies in the ability to manufacture customer premises equipment at low cost.

At these high frequencies it is well understood that line-of-sight or "near" line-of-sight is necessary to assure coverage. Nevertheless, obstacles and other path impairments will be encountered in most environments. The challenge to the system designer is to engineer an LMDS system in such a way as to maximize household coverage. This entails some trade-offs in infrastructure cost.

Typically, Multichannel Multipoint Distribution Service (MMDS) is considered a one-way or broadcast type of service. Although some limited upstream capability is possible, given the number of subscribers per hub and the limited bandwidth that is generally available, true interactive services are simply not feasible. More will be said later about MMDS and how it can complement LMDS systems.

### LMDS in the United States

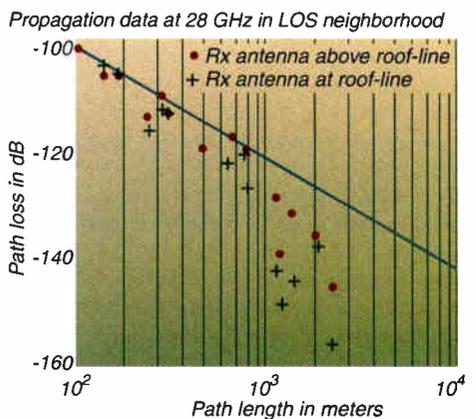
Although a final rulemaking from the FCC is still forthcoming, it is anticipated that the band allocation that will be made for LMDS systems in the United States will be close to that shown in Figure 1. The 150-MHz band from 29.1 GHz to 29.25 GHz may get reduced to 125 MHz and get shifted to 29.4 GHz to 29.5 GHz in order to better facilitate sharing with satellite interests, but the 850 MHz allocation from 27.5-28.35 GHz is unlikely to change. In any case, the above changes are not significant. What is significant is the fact that a licensee will have access to approximately 1 GHz of spectrum over a fairly large geographical area.

The above bands will typically be used to provide asymmetric services, with the 850 MHz for downstream (hub to subscriber) services and the 150 MHz (or 125 MHz) used for upstream (subscriber to hub) services. The planned segmentation of the band enables full duplex operation with easily realizable filters to achieve the isolation required between transmit and receive signals in both the hub and CPE transceivers. The FCC is expected to issue a final ruling in the third quarter of this year, followed by license auctions by the end of the year.

### System architecture

LMDS systems will be, in most cases, a microcellular configuration with cell sizes ranging (on the average) from 0.5 km to 2.0 km.

Figure 4: Summary of propagation data taken in a typical suburban California neighborhood



The cell size that can be achieved in any given environment is dependent on a number of variables, many of which will be touched on in following paragraphs. One of the most important variables is the power levels that can be achieved in the customer premises equipment (CPE) for a reasonable cost. This power level, of course, determines the upstream link margin. When the various alternatives for network

architecture were considered, it was concluded that a 90-degree sectorized hub (or base station) configuration represented the best compromise between hub electronics costs, link margin, frequency reuse and cell-to-cell interference. (See Figure 2.) Antennas with fan-shaped beams can be designed with gains, compared to an isotropic radiator, of 14 to 16 dBi. It is quite reasonable to assume a square for the cell since the locus of points of equal signal strength do indeed come closer to approximating a square than they do a circle.

Subscriber unit antennas can be designed with beamwidths in the range of 2 to 4 degrees that are relatively small and low cost. By allocating one-quarter of the available spectrum to each of the four sectors, multiple cells can be laid out in such a way that potential interferers will be separated by 5 radii while achieving a frequency reuse of one. This is shown in Figure 3.

It is possible to achieve 4x frequency reuse by using alternating vertical and horizontal polarizations, but propagation tests indicate that this could only be counted on to provide sufficient isolation in relatively benign propagation environments. In most environments, some depolarization will occur, so the more conservative approach is to depend on frequency diversity rather than polarization diversity. The key microwave component requirements are summarized in Table 1.

In order to maximize the system channel capacity, one would naturally want to utilize high efficiency modulation methods such as 16-QAM or 64-QAM. However, to maximize system robustness, we have chosen to concentrate, at least initially, on a QPSK system, but anticipate migration to 16-QAM systems in the future as improved microwave components become available. There will also be environments that would be suitable for 16-QAM systems with today's technology; however, with low initial take rates that are to be expected in this emerging market, the extra capacity is not really needed at the present time.

A comparison of the modulation efficiencies for the more popular digital modulation formats is shown in Table 2, along with the minimum carrier-to-noise ratio required to achieve a bit error rate of  $10^{-6}$ . The modulation formats

with higher modulation efficiencies also require additional back-off in the transmitter power amplifier to account for peak-to-average power differences, and phase noise also plays a more significant role. The former decreases the

excess link margin, and the latter increases costs.

## Link budget

Using the component specifications in Table 1, an analysis of the link budget can be done for a QPSK system design. This is shown in Table 3 for the downstream direction for a 1 km path length. In Figures 4 and 5, the "excess" link margin is shown for both the downstream and upstream directions as a function of path length for the 0.1 and 0.01

percent rainfall levels for Region D3. The crossover points are also shown for Region E, which includes all of the continental United States. Region D3 excludes the state of Florida and portions of other southern states in the United States which are prone to tropical rainfall conditions. 28 GHz LMDS systems deployed in these areas, which are less than 10 percent of the geographical area of the United States, would have to be engineered with smaller cell sizes than that required in the rest of the United States.

The link budget analysis considers only free space path loss and rainfall. This is generally acceptable for relatively short path lengths and true line-of-sight conditions. Excess link margin is necessary to cover the excess path losses because of obstacles, diffraction, time varying fades, etc.

A relatively high percentage of households in a hub service area can be "covered," even if they are not truly in line-of-sight to the hub, if "excess" link margins can be maintained at 20 dB or more. Figure 7 shows the effect of link margin on coverage and impact of hub antenna height. Subscriber antennas are always assumed to be at or near the household roof-line, a mounting arrangement assumed to be most acceptable to the homeowner. The averages

**Table 1: Key microwave components**

<b>Hub antenna</b>	Azimuth: 90 degrees Elevation: 5-7 degrees Gain: 14-16 dBi
<b>Hub power amplifier</b>	>30 dBm at 1 dB gain compression System Tx goal 1 watt at antenna
<b>Subscriber unit (CPE) antenna</b>	Beamwidth: 3-4 degrees Gain: 35 dBi
<b>Subscriber unit power amplifier</b>	>20 dBm at 1 dB gain compression System Tx goal 100 mw at antenna
<b>Hub &amp; subscriber unit low noise amplifier</b>	Noise figure: ~4 dB System noise figure: 6 dB

**Table 2: Modulation efficiency and required carrier-to-noise ratio**

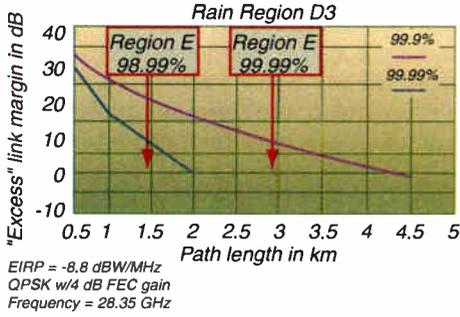
Modulation	Efficiency in bits/Hz (alpha = 0.3)	Required C/N for BER = $10^{-6}$
QPSK	~1.6	-14 dB
8PSK	~2.5	-19 dB
16-QAM	~3.2	-21 dB
64-QAM	~5.0	-27 dB

**Table 3: Link budget analysis for downstream direction**

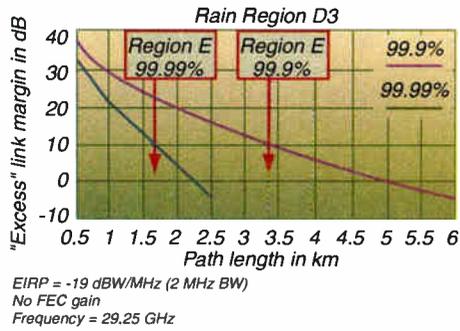
Frequency	GHz	28.35
Amplifier power @ 1 dB gain compression	watts	1
Amplifier power @ 1 dB gain compression	dBW	0
Power back-off	dB	3
Amplifier BW	MHz	120
Power spectral density	dBW/MHz	-23.79
Transmit antenna gain	dBi	15
EIRP	dBW/MHz	-8.79
Path length	km	1
Path loss	dB	121.49
Band edge allowance	dB	-3
Rainfall allowance	dB/km	3.8
Receive antenna gain	dBi	35
Minimum received power	dBW/MHz	-102.08
Receiver noise figure	dB	6
Thermal noise power	dBW/MHz	-138
C/N at max. rainfall	dB	35.92
C/N for BER = $10^{-6}$	dB	14
Link margin w/o FEC @ max. rainfall	dB	21.92
FEC gain	dB	4
Link margin with FEC @ max. rainfall	dB	25.92

# ◆ DESIGNING LMDS SYSTEMS

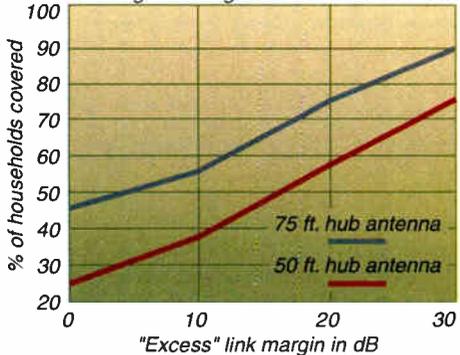
**Figure 5:** "Excess" downstream link margin



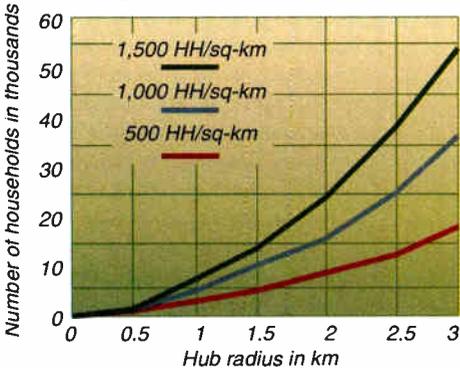
**Figure 6:** "Excess" upstream link margin



**Figure 7:** Average coverage from a single hub based on data taken in a typical Calif. suburb with moderate tree density. Average coverage for a 1 km hub radius.



**Figure 8:** Number of households as a function of hub radius. Cell doesn't have to be very large to pass a large number of homes.



shown in Figure 7 are a summary of data taken in the San Francisco Bay Area. (As there is considerable spread from area to area dependent on the characteristics of the environment, it cannot be assumed to represent all possible areas where one might deploy an LMDS system.) In the future, more data will be collected to help generate models that will more precisely provide the type of information presented in Figure 7.

Household densities will also vary from area to area, but many suburban neighborhoods will fall within the range of densities used to generate the information shown in Figure 8. Most of the data was collected in suburban areas having densities of about 1,000 households per square kilometer. As can be seen in Figure 8, it is not necessary to have a very large cell size to "pass" a significant number of homes.

Figure 9 takes into account the fact that the link margin decreases with increased hub radius. It also shows the marked effect of different antenna heights. The coverage in Figure 9 is for a single hub. In an actual system deployment, in which each subscriber has potential access to one of four hubs, the coverage can be expected to be somewhat higher.

## LMDS capacity

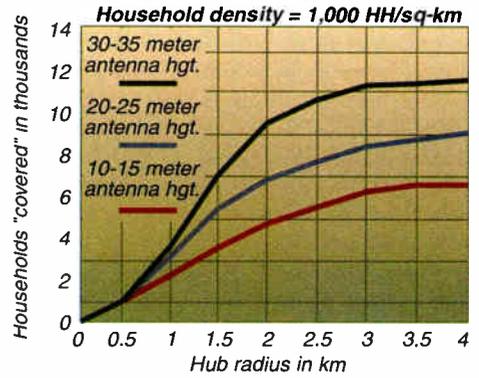
The spectrum that is anticipated to be allocated for LMDS in the United States, coupled with the relatively small cell sizes dictated by propagation characteristics at 28 GHz, provides considerable downstream and upstream capacity on a per-subscriber basis. Assuming the most robust modulation format, QPSK, and a conservative 1x frequency reuse factor, the total downstream data rate is greater than 1.5 Gigabits per second, and the upstream data rate is greater than 200 megabits per second.

This is shown in Figures 10 and 11 on a per-subscriber basis vs. the product of the "take" and "demand." Take is defined as the number of actual customers divided by the total households covered.

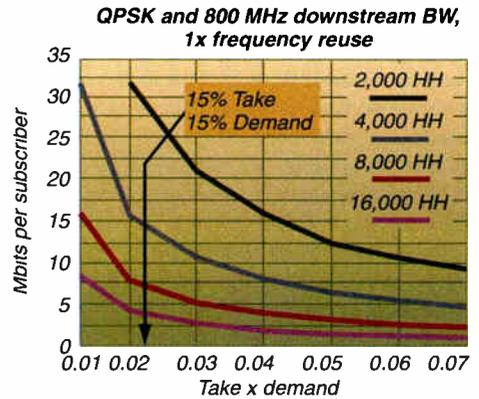
With 15 percent "take" and a 15 percent "peak demand," and a hub of 8,000 "covered" households, each household could have simultaneous access to approximately 7 megabits per second (Mbps) in the downstream direction and approximately 1 Mbps in the upstream direction.

With solid-state components readily available with present-day technology, an LMDS system can be designed to provide the subscriber with as much as 52 Mbps downstream and as much as 3 Mbps upstream. These maximum average rates can be accessed

**Figure 9:** Total households "covered." Graph takes into account decreasing link margin with increasing hub radius.



**Figure 10:** Downstream capacity in Mbps/subscriber based on "take" and "demand."



when the demand is low and would decrease as the demand increased. For data access, the requirements are quite "bursty" in nature, so at any point in time the demand for high data rate would be low, giving the subscriber access to these maximum rates for complex file transfers. Movies on demand typically require 3 to 4 Mbps; therefore, even at a relatively high peak demand of 15 percent, each household would be able to access two channels simultaneously, assuming a 15 percent take.

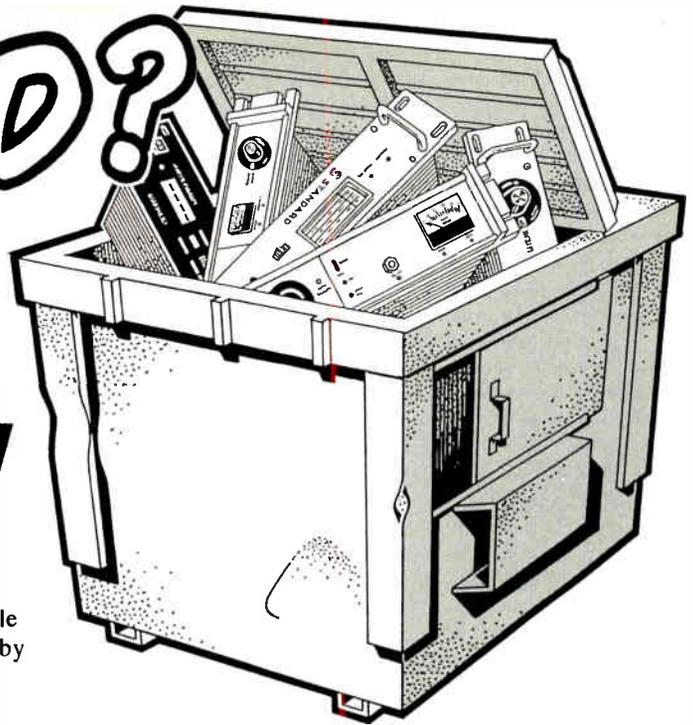
As the "take" increases with time, additional capacity can be obtained by adding hubs, thus reducing the hub size and subsequently the number of households "passed" per hub. This also has the effect of increasing the percentage of households covered, thus providing the services to a larger total number of households.

## LMDS system costs

I will not attempt to do a detailed cost comparison of broadband, two-way, wired systems such as hybrid fiber/coax (HFC) or fiber-to-

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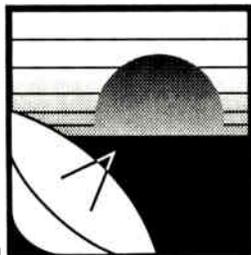
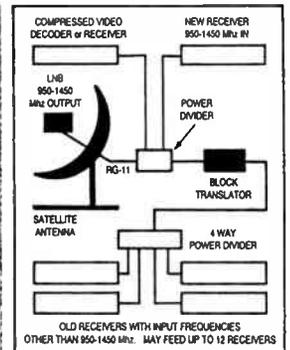
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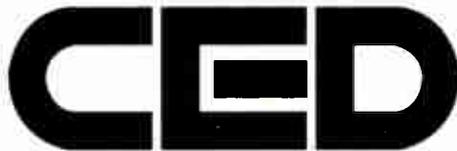


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the-curb (FTTC) with LMDS because there are so many variables that will differ between service areas. There is general agreement, however, that the infrastructure cost of a wireless distribution system will be significantly less than that of a wired distribution system designed to provide the same services, particularly at low take-rates. Where there may not be unanimity is on just what that cost difference is and at what take-rate does the crossover occur.

The cost advantage for wireless systems

Figure 11: Upstream capacity in Mbits/subscriber

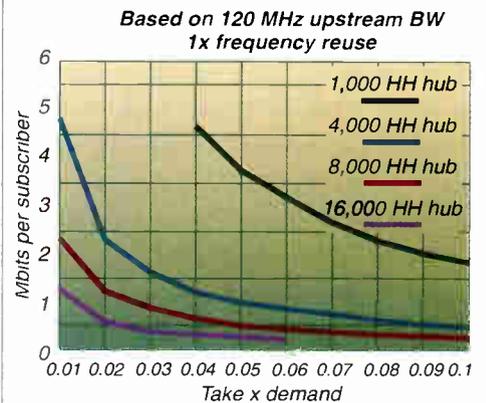
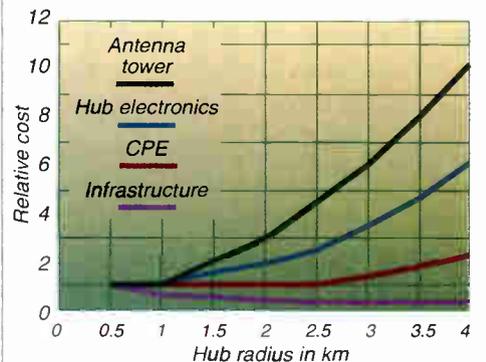


Figure 12: Relative LMDS deployment costs referenced to a 0.5 km hub radius



results from the fact that one has only to deploy a system up to the point of the hub or base station. At that point no further investment is required until households passed actually become customers.

Only then does the service provider have to invest in and install the customer premises equipment. With a "wired" system, the neighborhood must be wired as if everyone will eventually be a customer. There is, therefore, a larger initial outlay for a wired system before anyone actually becomes a paying customer.

It has already been seen how cell sizes can affect the number of homes that can be covered in any given service area. And, although

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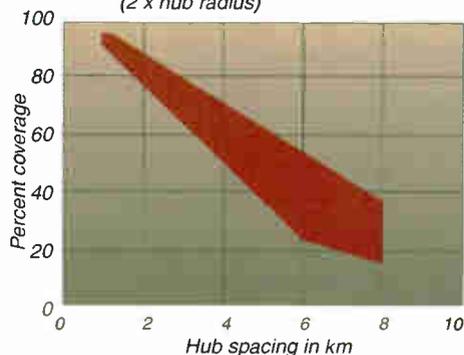
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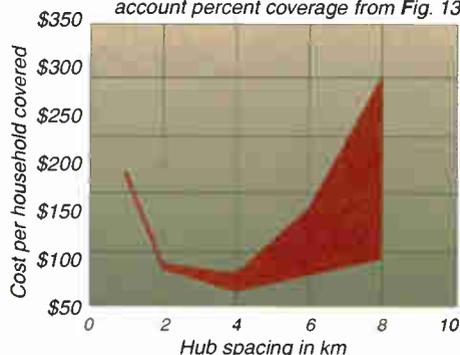
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## ◆ DESIGNING LMDS SYSTEMS

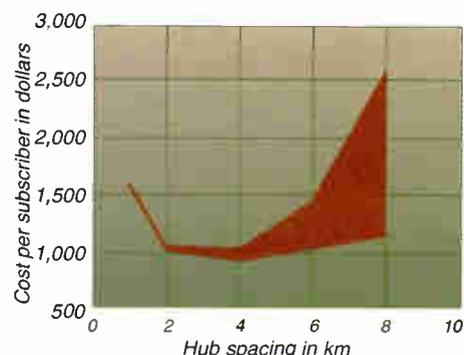
**Figure 13:** Percentage of households covered as a function of hub spacing (2 x hub radius)



**Figure 14:** Cost per household covered, includes feeder & hub costs and takes into account percent coverage from Fig. 13



**Figure 15:** Cost per subscriber for a 15% "take" rate excluding home modem



the exact values will vary depending on the demographics and environmental factors in the area in question. The trends will be quite similar. Obviously, costs will also vary with cell size. In Figure 12, a typical LMDS system is broken down into four components that are of interest to determining an optimum cell size. Cost differences relative to a hub radius of 0.5 km are plotted. These relative costs assume that the system is being engineered to provide a reasonably high coverage

rate. Figure 13 depicts what is considered reasonable and has some spread in the data to reflect the variation one might expect for different environments.

Table 4 summarizes some of the factors used to generate the plots in Figure 12.

Figure 14 displays the cost per household covered based on some assumptions about the size of the service area, headend costs and the cost of a broadband feeder or backbone network. Figure 14 also assumes the

coverage percentages shown in Figure 13. Based on a different set of assumptions for different deployment scenarios, the vertical scale in Figure 14 can be expected to vary. It would be reasonable to assume, however, that the shape will be fairly consistent from case to case.

The cost per subscriber shown in Figure 15 assumes a CPE cost, including installation, of approximately \$500. The cost of a modem is not included in this example. The results of

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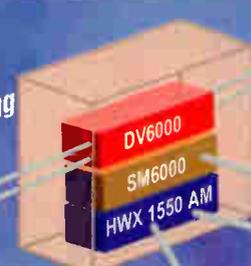
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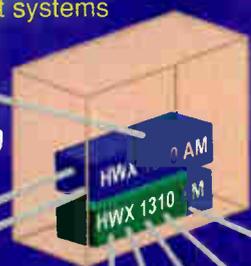
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this exercise indicate that from an economic point of view, the optimum hub radius is about 2 km. It also indicates that, for increased coverage, the cost penalty for a hub radius of 1 km is not significant.

### MMDS vs. LMDS

After years of little activity, at least in the United States, MMDS is now getting a great deal of attention. Using conventional AM-VSB formats, the band allocated in the United States for MMDS will enable 33 channels to be transmitted.

This has generally not been sufficient to successfully compete with cable TV systems that are offering 70 to 100 channels. Therefore, MMDS had been limited to applications in areas where cable TV was not

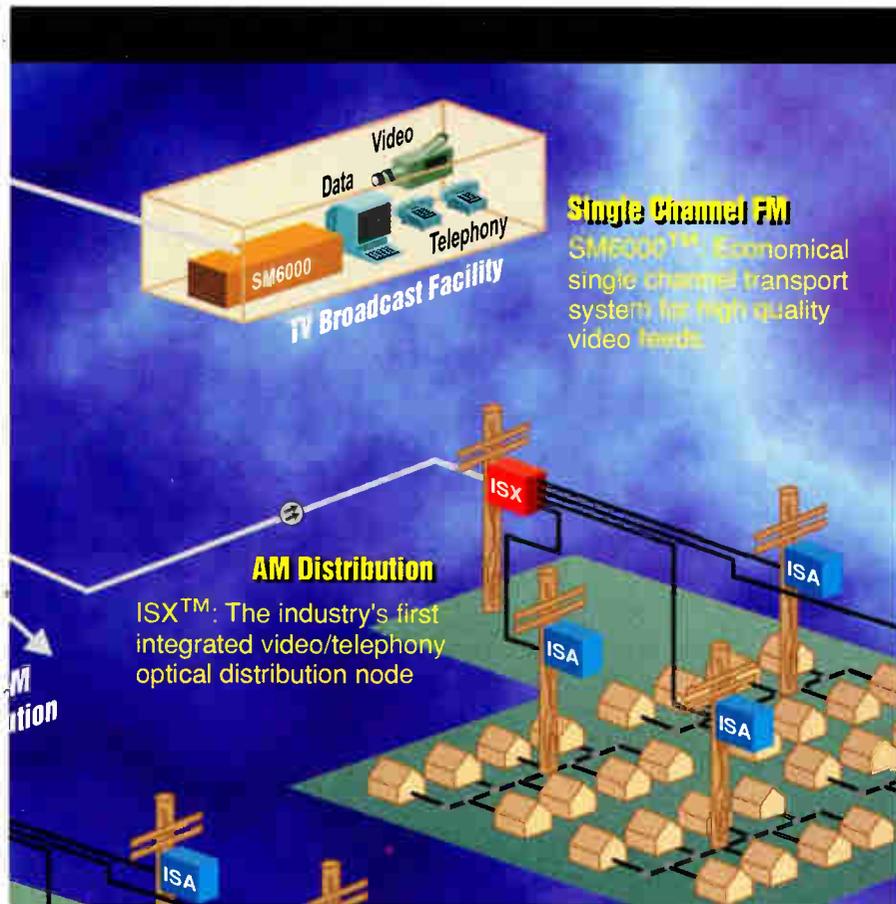
readily available.

Recently, however, much attention has been directed toward digital formats for MMDS systems, which, if successful, should result in 100 channels or more using MPEG-2 com-

pression and 64-QAM. That, coupled with the fact that local programming can also be offered, puts MMDS in direct competition with cable TV systems for broadcast video services. Just how MMDS relates to LMDS is summarized in Table 5.

The available bandwidth for LMDS systems, combined with the smaller cell sizes, will enable service providers to offer truly interactive services. MMDS, on the other hand, provides an extremely cost-effective way to offer video broadcast services but has little or no upstream bandwidth avail-

	Hub radius	Cost related factors
<b>Hub</b>	0.5-1.5 km	Increase hub antenna height to achieve higher percentage of households covered Cost impact: Higher antenna tower & installation cost
	1.5-2.5 km	Continue to increase hub antenna height and increase number of sectors from 4 to 8 to 16 Cost impact: Additional hub transceivers
	2.5-4.0 km	Decrease hub amplifier BW to increase power spectral density Cost impact: Additional transceiver amplifiers
<b>CPE</b>	0.5-2.5 km	No changes required
	2.5-4.0 km	Increased transmitter power & higher antenna gain Cost impact: Higher amplifier cost and higher installation cost
<b>Infrastructure</b>	0.5-4.0 km	Increasing cell size reduces number of hubs required Cost impact: Lower infrastructure cost due to fewer hubs



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## ◆ DESIGNING LMDS SYSTEMS

Table 5

	MMDS	LMDS
<b>Frequency</b>	Approximately 2.5 GHz in U.S.	27.5-28.35 GHz & 29.10-29.25 GHz
<b>Bandwidth available</b>	Approximately 200 MHz	1000 MHz
<b>Path loss</b>	130 dB at 30 km	121 dB at 1 km
<b>Rainfall attenuation</b>	Negligible	3.8 dB/km Region D3 99.9%
<b>Hub radius</b>	20 to 50 km	1 to 2 km
<b>Tower height</b>	60 - 70 meters	20 - 30 meters
<b>Average number of households passed</b>	1 million to 2 million+	4,000 to 16,000
<b>Line of sight required</b>	Yes	Yes
<b>Downstream capacity</b>	64-QAM, 1 Gbps (100+ video channels)	QPSK, 1.5 Gbps
<b>Upstream capacity</b>	Could use phone lines for PPV services	QPSK, 200 Mbps
<b>Services offered</b>	Broadcast video services including PPV. Interactive services impractical due to # of households and limited BW.	Broadband, two-way for data access and interactive video services. Broadcast video and telephony are also possible.

delivery systems in that it provides a comparable number of channels along with local programming.

Because of the higher frequency and microcellular configuration, LMDS will have a higher infrastructure cost than MMDS, but in order to provide broadband interactive services, it is the preferred delivery system. Once the infrastructure cost is justified on the basis of two-way services, broadcast services can also be provided with little incremental cost.

It would be quite safe to conclude that LMDS and MMDS are indeed complementary. It would not be unreasonable for both systems to coexist in the same service area, operated by the same or different service providers, with MMDS providing broadcast services and LMDS providing broadband interactive services.

### Conclusion

Cost-effective LMDS systems at 28 GHz can be engineered, using the system architecture described, to provide broadband, two-way services to the home. Based on measurements taken in typical California suburban neighborhoods, a system utilizing a QPSK modulation format results in a robust system capable of achieving a high penetration in the presence of propagation impairments typically encountered.

Although it is believed that measurements to date can be extrapolated to other environments, the challenge remains to develop models that can be used to more accurately predict coverage rates as a function of link margins, antenna heights, obstacles, hub radius, etc. These models will be essential to properly engineer LMDS systems.

Other approaches for increasing coverage, such as the use of strategically placed reflectors or repeaters, have not been discussed. These are additional tools that the LMDS system designer can work with to deploy an optimal system taking into consideration the tradeoffs between system cost and high household coverage.

MMDS provides a low-cost alternative for broadcast-only types of services. In this way, it is a complementary technology to LMDS. Perhaps a business opportunity lies in a combined low-cost MMDS receiver/LMDS transceiver for the home. There is no reason why the home modem could not be shared between the two delivery systems. **CED**

*Editor's note: This paper was derived from a technical paper delivered at Wireless Cable Europe in February 1996.*

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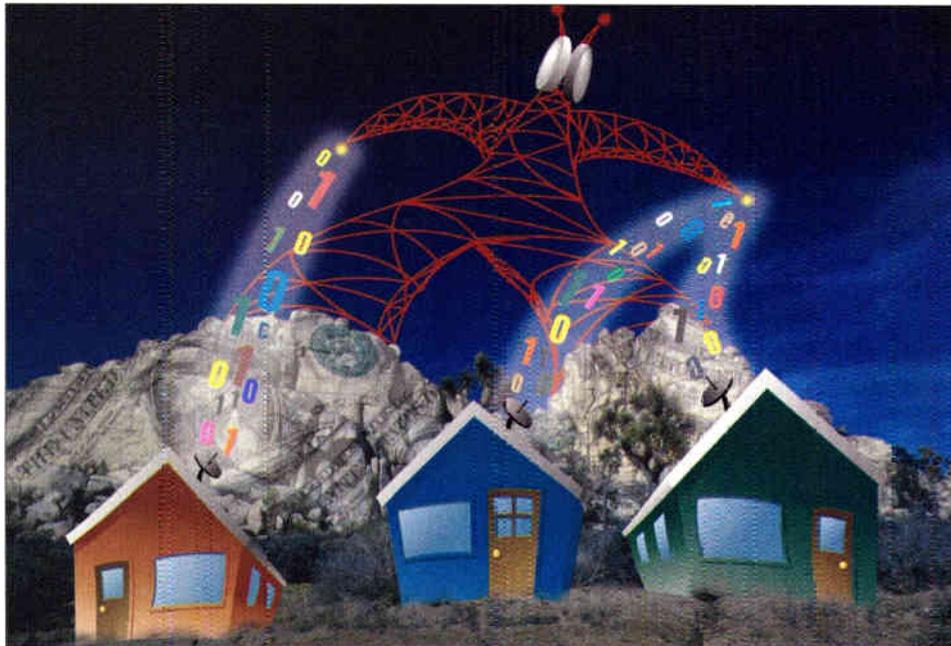
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# MMDS standing tall

## Wireless poised to offer more channels, CD-quality audio on digital technology, RBOC \$\$



By Dana Cervenka

Historically, wireless cable service (known as MMDS) hasn't posed enough of a competitive threat to keep wireline cable operators up at night—but that's about to change. Soon, MSO execs may be haunted by nightmares of giant microwave towers, sporting coats-of-arms with the letters RBOC, as they trample everything in their path. Breathing new life into the service that Multichannel Multipoint Distribution Service (MMDS) operators offer are two major factors: the conversion to digital technology, and backing from an unexpected source, Regional Bell Operating Companies.

Case in point: In fulfillment of a deal with Nynex and Bell Atlantic, CAI Wireless Systems Inc., an MMDS operator focused on the mid-Atlantic and northeastern United States, recently finished construction of the first digital wireless cable system on the Eastern seaboard, in Hampton Roads, Va., and has turned over that system to its partners for testing, as well as the core transmission facilities for a system in Boston.

The agreement covers 13 markets, encompassing 12 million line-of-sight homes, where CAI Wireless will design, construct and maintain the digital networks, while leasing the spectrum it holds licenses for to its telco partners. For their part, Bell Atlantic and Nynex are developing the marketing strategies for those same markets, packaging the services, setting price points, and handling the servicing of their customers, including customer premise equipment installation and service.

Consider how quickly the digital MMDS systems can be constructed. For the Hampton Roads system, CAI officials report that it took only three months to build the system from scratch, reaching 550,000 households. In Boston, it took the operator about six months to go from ground zero to a network that covers in excess of one million households.

Meanwhile, down south, BellSouth Corp. announced in late May that the company had purchased the rights to wireless cable licenses in the New Orleans market, licenses that were formerly owned by Continental Wireless Cable Television Inc., a San Diego-based company.

BellSouth bought the rights to use the licenses at auction for \$12 million.

According to a statement issued by the company, BellSouth will begin delivery of digital MMDS to customers in that market sometime in the middle of 1997, and will provide more than 100 channels. Programming will be provided by the Americast joint venture, composed of The Walt Disney Company, GTE, Ameritech, SBC Communications and BellSouth.

BellSouth will be taking on incumbent cable operator Cox Communications in New Orleans.

But digital MMDS is only one of the technologies the company is looking into for video delivery. "Looking several years down the road, at what we have done in our nine-state region, it will be something of a mosaic," says BellSouth spokesperson Kevin Doyle, a pattern which may include DBS, in addition to the company's HFC networks which are under construction.

Meanwhile, on the West Coast, Pacific Telesis has also thrown its hat in the MMDS ring: PacTel has purchased one wireless operator outright, and is in the process of purchasing two more. The company purchased Cross Country Wireless Inc. to gain access to the company's spectrum in the counties of Los Angeles and Orange, as well as in Riverside and San Diego. To gain access to MMDS licenses and rights in northern California, Pacific Telesis has announced it will acquire V\*TV, an operator which is composed of Bay Area Cablevision Inc. and Wireless Holdings Inc. Between the two of them, Bay Area and Wireless actually have licenses not only in San Francisco, but also in San Diego, in Victorville, Calif., and in Seattle and Spokane, Wash., as well as Tampa, Fla. and Greenville, S.C. Once the acquisitions are completed, PacTel will have access to about 9 million line-of-sight homes, according to corporate spokesperson Craig Watts.

"Wireless cable gives us a much faster entry into the video marketplace, at a time when we need to diversify our revenue stream," explains Watts, "because of the full bore competition that is stirring up California on a number of telecom fronts." In the L.A./Orange County market alone, there are already more than 15 video providers (see map, page 63). And while PacTel is proceeding with the buildout of a hybrid fiber/coax network in California, which currently passes about 350,000 homes, there is still a great deal of work that needs to be done in that arena, as for mainly "political" reasons, the network is taking a lot longer to build than the company

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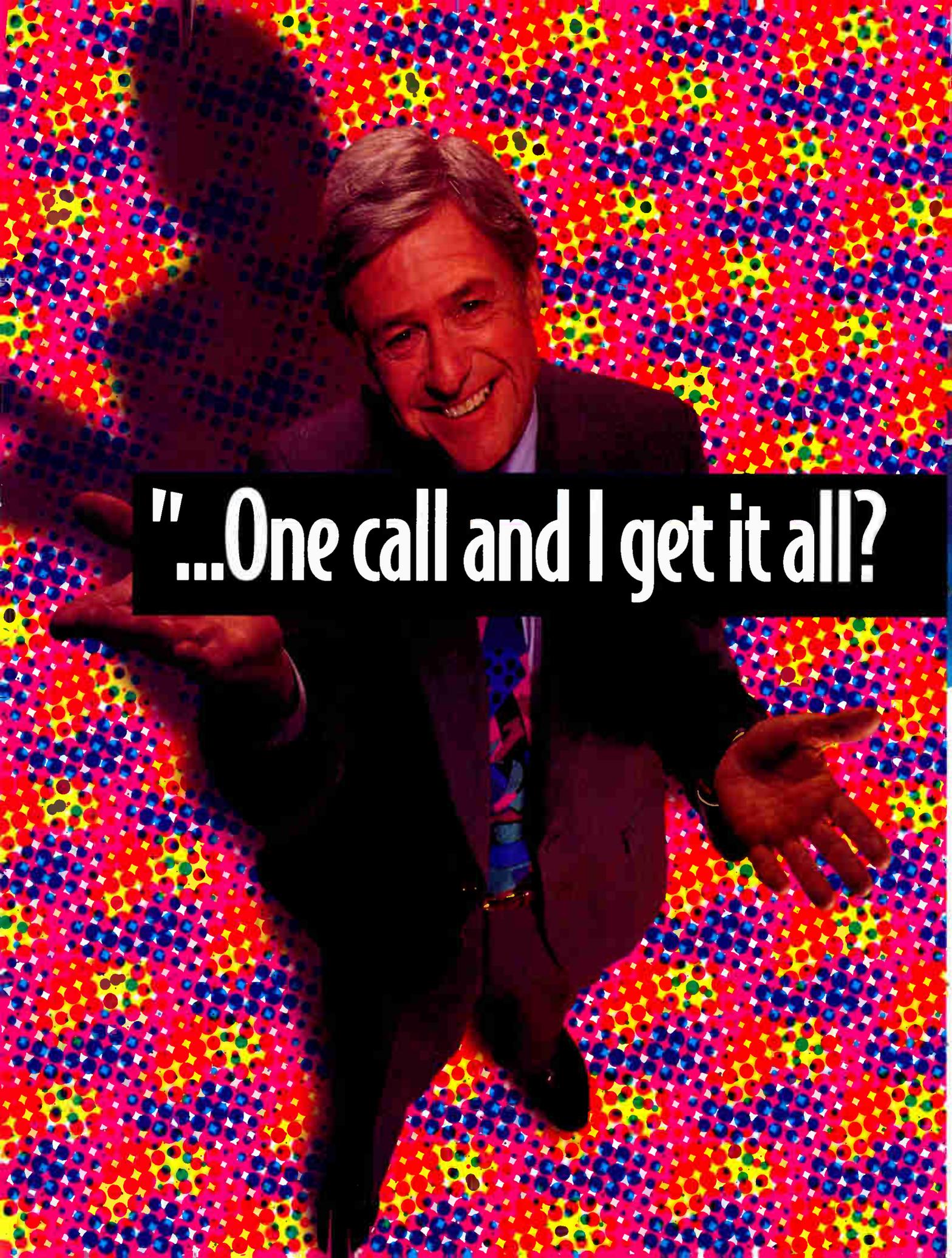
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had anticipated, says Watts. Of the 350,000 homes passed, only about 1,300 have actually been connected for a technology trial in San Jose.

When PacTel's wireless video systems go commercial, projected to be sometime in early 1997, the company says that it will be able to offer more than 100 channels of digital television to, initially, about 5 million homes in California.

Currently, the operator is testing digital MMDS service at a newly-constructed head-end in a community within the greater Los Angeles area. Plans call for adding customers on to the digital wireless service in a beta test this fall, and then rolling out commercial service in the first quarter of 1997 in the Los Angeles/Orange County area. To cover the L.A. basin, the operator has constructed its headend on the floor of the valley, where the content is digitally encoded and then sent, utilizing ATM switching, over fiber optic cable to a transmitter at the top of Mt. Wilson, which in turn sends the transmission via microwave carrier back down to the valley's floor.

PacTel expects to begin receiving its portion of the TeleTV set-tops, produced by Thomson Consumer Electronics, in August, which will enable the full beta test of the system this fall. "The total cost per home of antennas, down-converters, wiring, etc., we expect to be about \$125 initially," notes Watts, plus about \$300 for each set-top.

American Telecasting, the nation's largest MMDS provider, plans to begin a digital MMDS test late this summer or early this fall in Lakeland, Fla. with 50 homes, after it demonstrates the end-to-end system at the Wireless Cable Show this month in Denver. Originally, the test was slated to begin in the fourth quarter of last year; however, like so many other digital trials, it was delayed.

The Lakeland trial will mark the company's first deployment of a digital wireless set-top, developed by Zenith in conjunction with Divicom.

On another front, American Telecasting has plans to turn up a digital system in Fresno, Calif. within the next couple of months, which will utilize equipment supplied by Decathlon, including a real-time encoding system to solve some educational programming challenges.

### A quick fix?

Many of the telcos have publicly stated that wireless cable will enable them to get into the video marketplace quickly, to put their faces in front of consumers to build brand recognition.

As for digital MMDS, the technology will offer CD-quality audio, digital-quality pictures, and a greater number of channels to choose from, all of which should appeal to so-called early adopters. As Zenith Network Systems president William Luehrs puts it, "It's a system that allows you to skim. You can go into a market and knock off the most attractive

10 percent of subscribers, and once you have established a video entertainment foothold, then you can go into certain pockets of that market and wire them up... I remember one guy using an expression: 'I can rob a few gas stations on my way to the bank'."

But what happens long-term, when the telcos' high-capacity, broadband networks are ready? There has been some speculation in the industry that these wireless networks are simply a stop-gap measure for the telcos, to be abandoned in favor of their full service, hybrid fiber/coax networks, once they are built out.

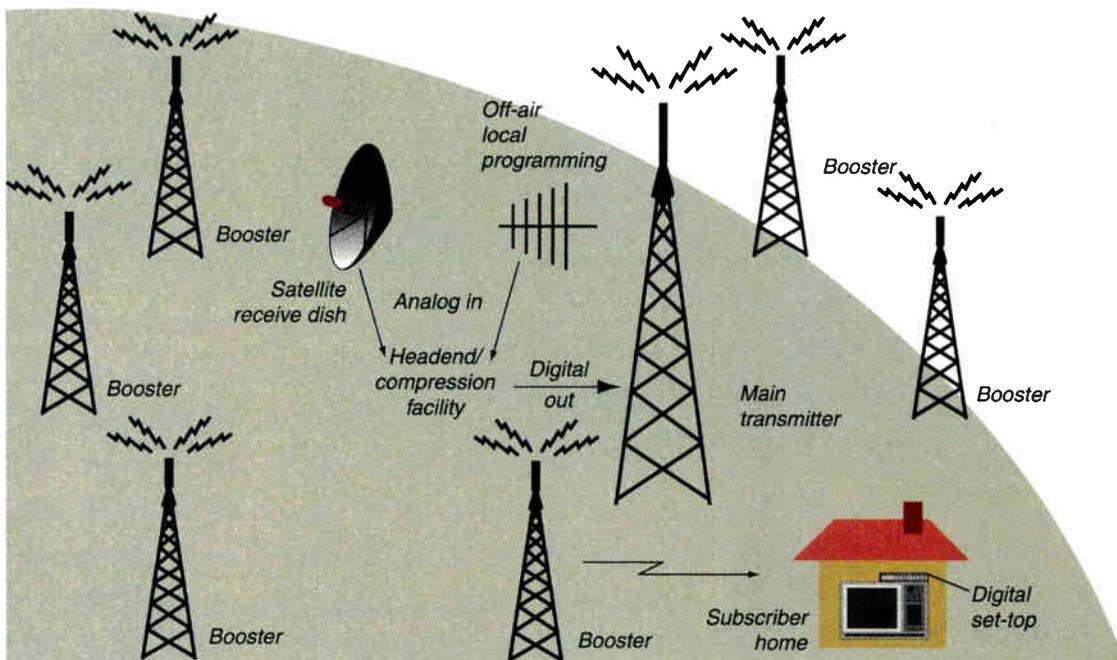
But the rise of one technology won't signal the demise of the other, says PacTel spokesperson Craig Watts. "We don't think that this is a short-term solution that will then become obsolete when you get the wired network built out," says Watts. "We anticipate that the wireless network will be up and running in the same communities where we have built our wired network, or HFC network. There may be differences in pricing structure; there may be differences in packaging... If you have both networks operating in the same community, you can tailor the services to one technology or another."

In fact, PacTel is evaluating different combinations of both wired and wireless technologies to serve the same market. Because interactive MMDS on a two-way microwave platform is still off in the future, the telco is toying with using a phone line augmented with ISDN, or even XDSL, for the upstream path, and plans to conduct a field test late this summer using XDSL.

That anyone would use the words "interim strategy" to describe the telcos' dealings in MMDS makes CAI Wireless president John Prisco cringe. "I define interim as 15 years to permanent," he notes, "because there will be a portion of the market that DBS serves, a portion that switched digital video serves, and a larger portion of the market that wireless cable serves... In most markets, you can't argue with a business that has low entry costs, and capital that tracks with revenue, and that is what MMDS does."

MMDS operators are eyeing services beyond digital video, though. On its

Figure 1: CAI Wireless Systems Inc.'s digital MMDS system



own initiative, CAI Wireless is developing an Internet strategy, says Prisco. The operator has already started testing an Internet-access product in Washington, D.C. in conjunction with National Digital Network, an Internet provider holding MMDS channels in the top 25 markets. Hybrid Networks is supplying the

Washington; Churchill Elementary School of McLean, Va., and a number of other area schools; and the law firm of Rini, Coarn & Lancellota. The transmitter is located at George Washington University.

"The value in our company is in the spectrum, and there are many different revenue

Prices for a commercial data service will be competitive with ISDN, he says.

### Not created equally

Wireless cable service has had a reputation, deserved or not, of being vulnerable to weather, as well as propagation problems in areas of dense foliage and hilly terrain. Most MMDS systems operate at 2.5 GHz, which is relatively immune to rain fade: the wavelength at 2.5 GHz is much larger than a raindrop. Regardless, digital technology will enhance the coverage of MMDS systems, even in areas of dense foliage.

In addition, because some digital systems are built around a main transmitter and a number of boosters (see Figure 1) which regenerate the signal and rebroadcast it, customers no longer have to be in a direct line-of-sight to that main transmitter—there are many boosters to choose from. That means that the large antennas of analog systems can be replaced by smaller ones.

But digital is a double-edged sword: quality is great, but unlike an analog picture, which can be viewed until it reaches a high level of degradation, digital signals drop off entirely, once they get below the threshold. "You want to have a robust transmission medium," says Luehrs, "so our most important work took place in modulation. It's why we pioneered VSB. We have also done considerable testing in QAM, as the market will be interested in having QAM solutions. (We) have to make sure the modulation is scalable."

In addition, the FCC has yet to approve standards for digital MMDS operations.

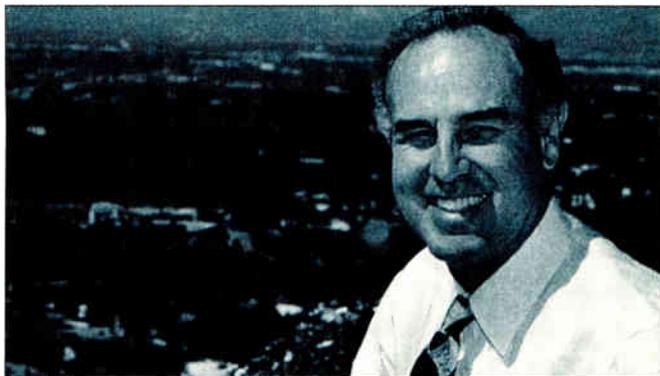
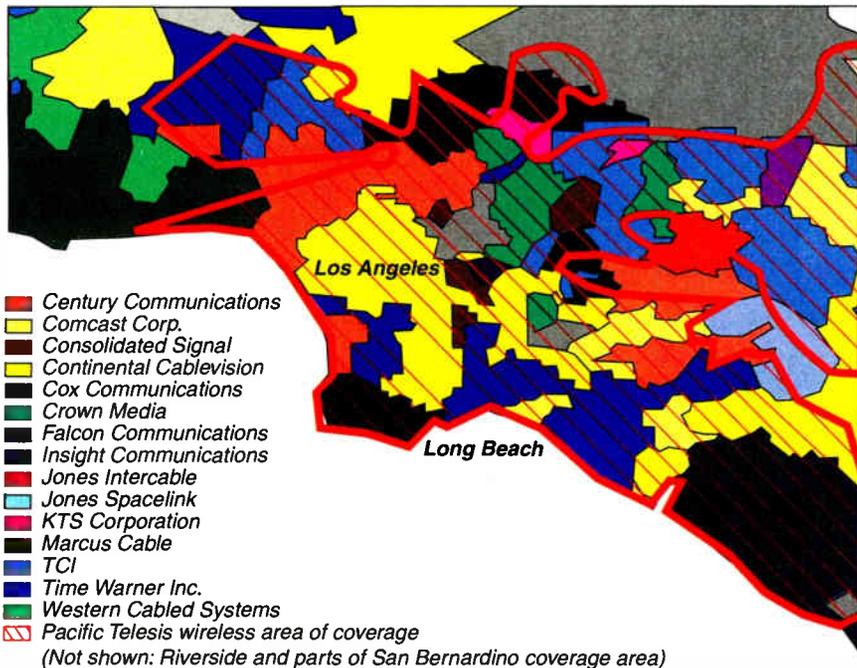
On the two-way front, equipment providers and operators are already thinking about technologies to prepare for the day when they may want to provide full-blown wireless interactivity.

Stanford Telecommunications Inc. is hinting that the company would like to leverage the technology it is developing for an interactive, all-digital platform for LMDS (Local Multipoint Distribution Service), in conjunction with Hewlett-Packard, into an interactive offering for MMDS as well. (See "Cover Story," page 40.)

Stanford Telecom's Horen Chen, vice president of wireless broadband products, explains that the LMDS package contains a MAC layer (medium access control) protocol which has been accepted by DAVIC. That protocol, which is required to manage network entry for two-way LMDS, could be used for MMDS as well.

So it seems that cable operators have yet another serious market competitor to deal with, as they prepare to launch digital service. Maybe those nightmares will propel them toward digital service a little faster. **CED**

**Figure 2: Los Angeles area**  
Pacific Telesis wireless digital TV over existing cable coverage



Above, the map depicts what PacTel is up against in the L.A./Orange county market as it launches digital MMDS. Left, Pacific Telesis CEO Phil Quigley views the potential Los Angeles MMDS market from his company's transmitter site atop Mt. Wilson.

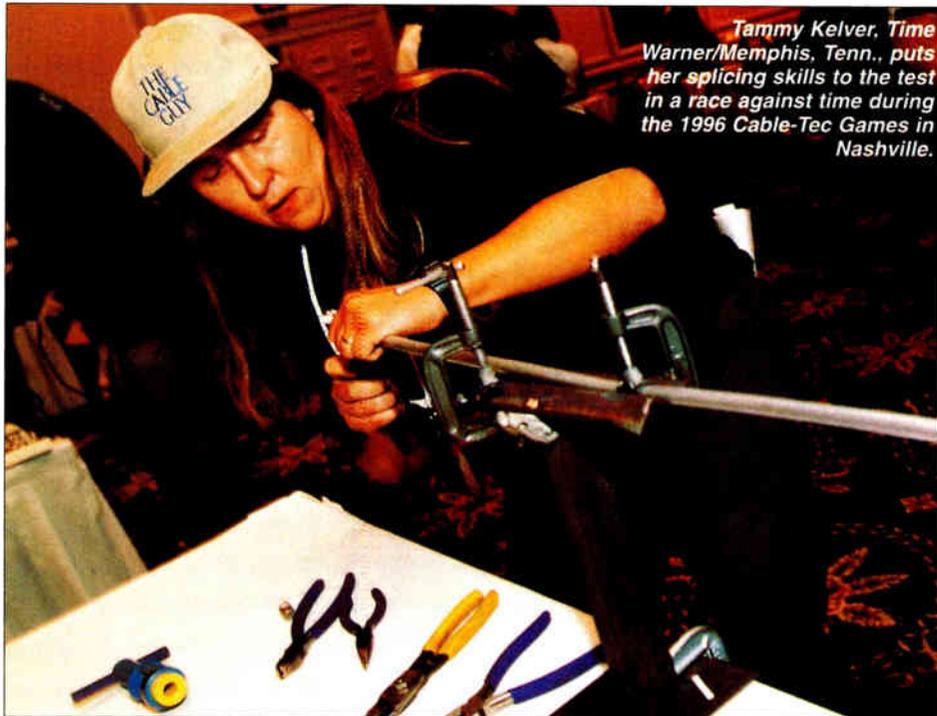
modems for the service, which is capable of a data rate of 10 Mbps; by the end of the year, according to CAI, the data rate should triple, hitting 27 Mbps as the modem technology matures. By comparison, current T-1 modems deliver data at 1.5 Mbps.

For the upstream, CAI's system utilizes the telephone return.

Trial participants include both government and educational entities: The Navy Computer and Telecommunications Station in

opportunities associated with having control of that spectrum," says Prisco. "The key to the company's competitive advantage is the cost of our infrastructure. In order for us to cover upwards of 75 to 80 percent of any market, we will spend about \$10 for each line-of-sight household."

As for whether its telco partners are interested in its Internet strategy, Prisco says, "It will be deployed in our market. It may be deployed in theirs, but that's their decision."



Tammy Kelter, Time Warner/Memphis, Tenn., puts her splicing skills to the test in a race against time during the 1996 Cable-Tec Games in Nashville.

ALL PHOTOGRAPHY BY PENTON HOGE

# Wheeling, dealing, and working in Nashville

SCTE's Cable-Tec Expo provides thousands of attendees with practical broadband knowledge

By CED staff

With technology still driving the cable TV industry, all eyes last month were firmly riveted on Nashville, Tenn., where the Society of Cable Telecommunications Engineers gathered for its 20th annual engineering conference and 14th annual Cable-Tec Expo. What the 7,200-plus attendees took home was new information about fiber optics and other video transport mechanisms, as well as data transport and return spectrum information.

Still firmly entrenched as cable's "working" show, the Expo was short on blockbuster announcements, but long on pragmatic information that directly relates to broadband system operations.

## Test equipment

There were myriad announcements of new and improved test equipment, especially equipment designed for technicians to view and test

the integrity of cable system return paths.

A new spectrum analyzer from Hewlett-Packard, which comes out of H-P's acquisition of CaLan Inc. two years ago, includes measurement capabilities for ingress, impulse noise and digital signal power density—all important areas to watch when delivering two-way, interactive services like telephony and high-speed data.

The new analyzer system consists of a portable field unit, the HP CaLan 3010R, and a rack-mounted headend unit, the HP CaLan 3010H. When ingress crops up in the upstream path, the system instantly senses it, alerts the field technician that ingress is present, then transmits a display of the ingress pattern. The headend unit, priced at \$5,950, can support up to six field units. Each field unit is also priced at \$5,950. The system will be available this summer.

Trilithic Inc.'s new Windows-compatible "TriSetup" software eases the configuration of

its Tricorder line of leakage detection gear, so that field technicians can set parameters like leakage frequencies, learned channel plans and user memories from a personal computer.

With the new software, techs can assemble a configuration that meets system requirements, then download those parameters to the Tricorder. Multiple configurations can be saved to a disk for later use. Also, users can upload a configuration from one Tricorder to configure a second.

ComSonics Inc. debuted its "VideoWindow" digital multimeter, which performs 45 separate tests and has an automatic FCC test and "VITS finder" for testing differential phase, gain and CLDI measurements, executives said. The handheld meter weighs just under two pounds and features a backlit screen for viewing tests, including color bars, multibursts, subcarrier leakage and others.

Wavetek Corp. has added a new ingress scan feature to the reverse (sub) band option (MSSUB) of its MicroStealth MS1300 SLM and its CLI-1450 combination leakage and SLM. An installer can use either one of these meters to perform a "go/no-go" test of all signal levels during an installation.

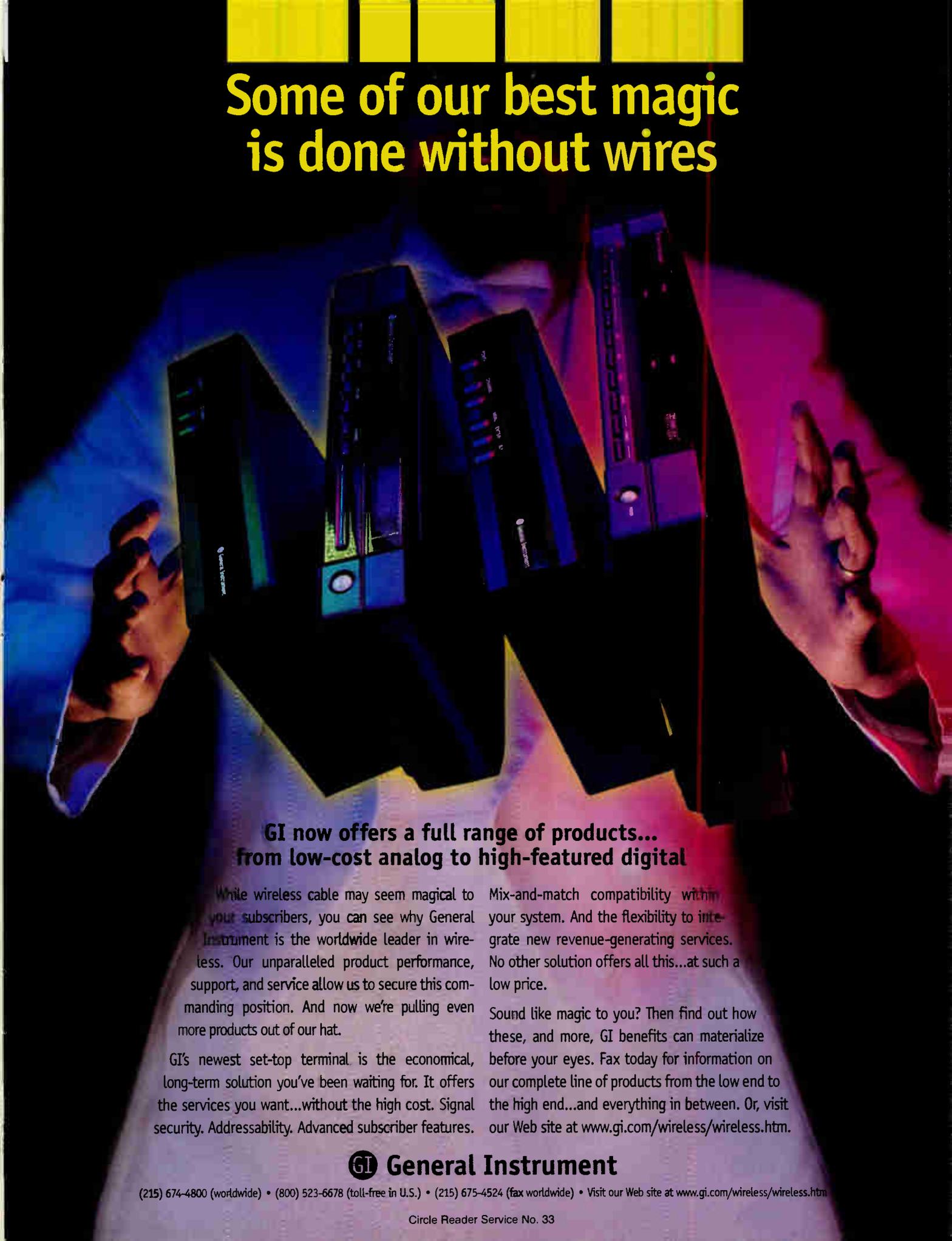
Once the installation is complete, the tech connects the meter to the tap end of the drop, and by pushing a button, produces ingress signals in the reverse band. A user-programmable limit can be set for simple identification of problem drops. To check for intermittent ingress, the meter can be set in the peak hold mode to catch transient signals.

Wavetek also introduced its remote monitoring package, CMS 1000, for cable system headends and hub sites. The new system is comprised of PC-based central monitoring software and remote monitoring units. Working together, the 3SM remote headend performance monitoring unit and the software offer a package that provides extensive RF signal measurement and analysis capability, as well as the ability to monitor and control up to 200 remote headends or hub sites.

Sencore introduced two new digital signal level meters, the SL754D "Channelizer" and the SL755D "Director." The Channelizer allows users to tune to any cable channel or frequency from 5-860 MHz, including sub-band channels. In addition, it provides a pilot test for easy system balancing and alignment. The Director, which is designed for MMDS operators and has a tuning range of 50-860 MHz, provides an easy-to-use antenna peaking bar graph for convenient antenna alignment.

Fox Electronics introduced test equipment designed to troubleshoot local commercial insertion systems. The equipment enables the

# Some of our best magic is done without wires

A person in a dark suit is shown from the chest up, holding several General Instrument set-top boxes. The person's hands are visible, one on the left and one on the right, gripping the boxes. The boxes are of various models, some with screens and buttons. The background is dark with some blue and purple lighting. At the top of the page, there are five vertical yellow bars of varying heights.

## GI now offers a full range of products... from low-cost analog to high-featured digital

While wireless cable may seem magical to your subscribers, you can see why General Instrument is the worldwide leader in wireless. Our unparalleled product performance, support, and service allow us to secure this commanding position. And now we're pulling even more products out of our hat.

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## TCI's Babcock, Cox Communications, take home top SCTE awards



**SCTE President Bill Riker (left) and Diana Riley, senior account manager, Jerry Conn Associates, congratulate Dr. Walter Ciciora on his induction into the SCTE Hall of Fame.**

*By Roger Brown and Michael Lafferty*

**A**lan Babcock, director of training at TCI Central, was presented with the SCTE's highest personal honor, the coveted Member of the Year award, during the annual awards luncheon.

Babcock, who has been a member of SCTE for 11 years and previously directed training efforts at ATC before it became Time Warner Cable, was stunned when his name was called. "It's not often I'm left speechless, but I really didn't know what to say," Babcock said afterward.

Babcock was selected for the honor based on his commitment to training in general and the Society in particular. He is presently chairman of the SCTE's Training Committee, which oversees certification of members, and participates in numerous seminars on training. In addition, he has had several articles published in the industry's trade publications.

"This is quite an honor," said Babcock, "but most of the credit should go to the committee members I've worked with."

Meanwhile, the Chairman's Award went to Cox Communications in honor of that compa-

ny's efforts to foster technical excellence while building the technological foundation for the future. Via videotape, Cox President and CEO James Robbins accepted the award, given by SCTE chairman John Vartanian, on behalf of all Cox employees. "We've been working hard to build the technical platform that will be the foundation of our future," he said.

With more than 30 Cox employees serving as SCTE officers at both the local and national levels, Robbins said Cox is truly committed to advancing the goals of the Society.

Other prestigious awards went to cable veterans Dr. Walter Ciciora, who was added to the SCTE Hall of Fame, and Ted Hartson, who became just the fourth SCTE member to be elevated to Fellow status.

"The best recognition comes from people you hold in high regard and for whom you have respect for," said Ciciora during his acceptance comments. "I certainly hold the SCTE in high regard." Ciciora joins Cliff Paul, Len Ecker, Rex Porter, Jim Stilwell, Dave Willis, Steve Bell, Jim Grabenstein, Alex Best, Ron Cotten, Bill Grant and Hartson on the list of persons inducted into the Hall of Fame.

Hartson, who recently resigned his execu-

tive post at Post Newsweek Cable to venture into the consulting business, put his name alongside Ron Hranac, David Large and Archer Taylor as the Society's only Fellow members, an honor bestowed only at the pleasure of the board of directors. "This is a humbling experience," said the effervescent Hartson. Looking back over his long and storied tenure, he recalled that it "was only going to be a part-time job." Instead, it turned into a career.

Meanwhile, General Instrument presented a four-year merit scholarship to Joshua Butters, the son of E. Alan Butters, international CATV product manager for Gilbert Engineering, in honor of Milton Jerrold Schapp, the founder of Jerrold Electronics. The new memorial scholarship will be presented every year to a deserving high school student to honor the memory of Schapp. Butters carries a 3.98 grade point average at Chandler High School in Chandler, Ariz. and plans to attend the University of Arizona, where he will major in mechanical engineering.

During the presentation, Geoff Roman of General Instrument recalled that Schapp was an able entrepreneur, leader, inventor and humanitarian. Pointing to Butters' academic record, civic commitment and athleticism, Roman said he was pleased to present the \$5,000 per year scholarship.

Finally, A.J. Genova of Continental Cablevision of Pompano Beach, Fla. received a first place award in the Field Operations Award competition for designing a return path tester for in-home wiring that can be manufactured for about \$30. Kevin Smith of Bailey Cable and David Herman of Time Warner Cable took second and third place, respectively.

On the day prior to the annual Engineering Conference, John Vartanian of Viewer's Choice was re-elected to serve another term as chairman of the Society of Cable Telecommunications Engineers' board of directors during its annual election. Vartanian will now serve a second year as chair, but will relinquish the post next year to another board member as the Society's bylaws only allow a chairman to sit for two years consecutively.

Joining Vartanian as officers of the board are: eastern vice chairman, Hugh McCarley of Cox Communications; western vice chairman, Patrick O'Hare of Viacom Cable; secretary, Norrie Bush of TCI of Southern Washington; treasurer, Larry Stiffelman of CommScope; and additional member of the executive committee, Wendell Bailey of NCTA.

In addition to these officers, the board consists of Steve Johnson of Time Warner Cable;

M.J. Jackson of Gilbert Engineering; Robert Schaeffer of Star Cablevision Group; James Kuhns of Ameritech; Steve Christopher of Augat Communications; Maggie Fitzgerald of DAVI Communications; Dennis Quinter of Berks Cable; Ron Hranac of Coaxial International; and Wendell Woody of Sprint.

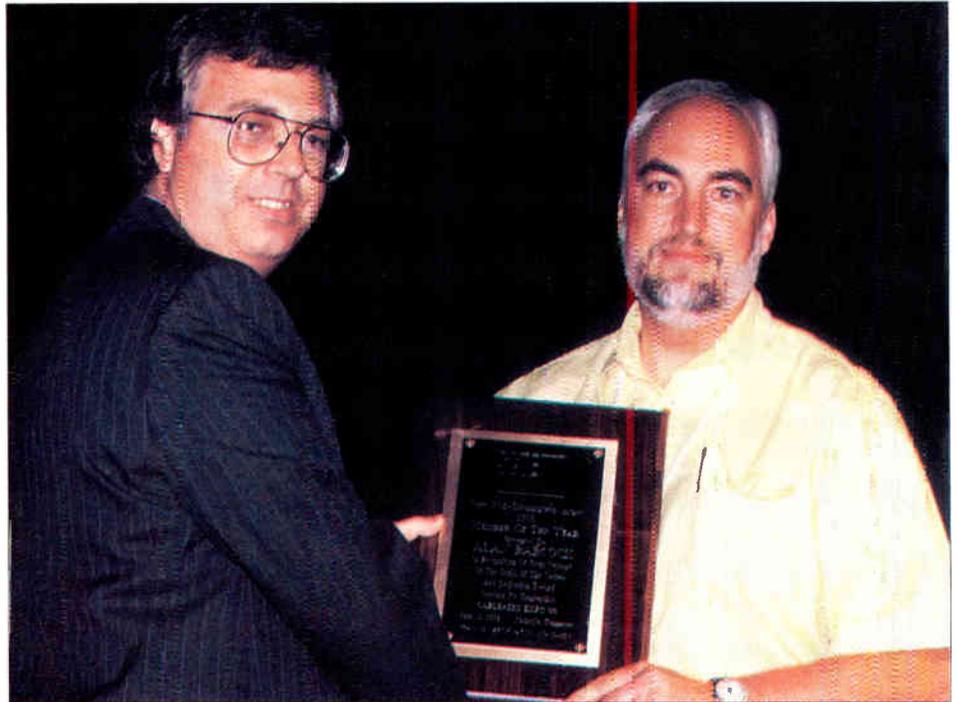
### The real cable guys and gals compete

Contestants in this year's 1996 Cable-Tec Games seemed to have the best of both worlds during nearly four hours of competition in Nashville.

On the fun-and-games level, they got to bounce around in complimentary hats and t-shirts emblazoned with Columbia Pictures' feature film, "The Cable Guy" logo. On a more down-to-earth level, they got to show much of what it takes to be a real cable man or woman in today's changing industry.

The annual contest drew approximately 30 contestants representing small, medium and large operators from around the country. That diversity was also reflected in the boisterous crowd that viewed the action as participants displayed varying levels of expertise in a variety of areas.

While contestants were split up into four-person teams to track through the five events, all scores were based on individual efforts. According to Barry Smith, a Texscan Corp. account executive and one of the event's organizers, the one-on-one competition levels the field so that teams with "experts" in each spe-



**SCTE President Bill Riker presents Alan Babcock, director of training at TCI Central, with the Society's highest personal honor, the Member of the Year award. As part of his commitment to continuing technical education, Babcock chairs the SCTE Training Committee.**

cific area can't dominate competition.

The five competitive events included the always popular Cable Jeopardy, where contestants matched their cable wits and knowledge; Go Fetch, where participants scrambled against the clock to find 10 specific components in a box filled with a whole pile of cable

paraphernalia; Trunk/Feeder Cable Splicing, where the slicing and dicing of fingers is always a danger when racing against time; as well as signal level metering and OTDR.

Besides first, second and third place winners in each individual event, overall winners were also named. This year's overall first place winner was Lee Summers with Time Warner in Memphis, Tenn. Other overall winners included: second place: Doug Hamilton, Paragon Cable, Prescott, Ariz.; and third place: Daniel Kowal, Charter Communications, Clarksville, Tenn.

Individual event winners included:

OTDR and Splicing (same winners in two events)—1st: Doug Hamilton, Paragon Cable, Prescott, Ariz.; 2nd: Daniel Kowal, Charter Communications, Clarksville, Tenn.; and 3rd: Jimmy Smith, Lakewood Cablevision, Onalaska, Texas.

Go Fetch—1st: Steve Dyché, NPG Cablevision, St. Joseph, Mo.; 2nd: Steve Strouth, Time Warner, Cincinnati, Ohio; and 3rd: Tom Saylor, Technology Services, Troy, Idaho.

Signal Level Metering—1st: Mayla Zubik, Time Warner, Memphis, Tenn.; 2nd: Mark Hood, Friendship Cable, Sibley, La.; and 3rd: Tom Saylor, Technology Services, Troy, Idaho.

Cable Jeopardy—1st: Tom Saylor, Technology Services, Troy, Idaho; 2nd: Steve Georgia, TCI, Boulder, Colo.; and 3rd: Lee Summers, Time Warner, Memphis, Tenn.



**Ted Hartson, alias Dr. Strangeleak, and only the fourth member to be elevated to SCTE Fellow status, congratulates A.J. Genova of Continental Cablevision of Pompano Beach, Fla. on winning the Field Operations Award for designing a return path tester.**

## ◇ SCTE WRAP-UP

user to locate problems while eliminating the need to swap equipment from another channel, or to wait for network cue tone transmissions. The system can also be used to encode and verify tones recorded onto videotapes in an edit suite and to set headend video and audio levels.

Applied Instruments Inc. has added a spectrum analyzer to its line of telecom instruments; three models are available: 1 GHz, 1 GHz with tracking generator and 550 MHz. Each model includes a scanwidth selector to adjust the frequency display width and a 4-digit numeric LED readout that can selectively display either the center or marker frequency. The units also feature 75 ohm input impedance and a built-in calibration standard.

Phasecom Inc. added two new products to its reverse channel spectrum organizer family. With the new P4143, the product is available in two configurations—one for European applications and the other for use in the U.S. Installed in a fiber node, the device uses frequency division multiplexing to increase the capacity of the reverse fiber by a factor of four, without any upconversion techniques. Thus, the product can save cable operators

money by reducing the number of upstream fibers, reserving capacity for additional downstream communication.

Sadelco Inc. announced the Minimax 800 Signal Level Meter, which is designed to reduce training time and improve system performance. Features include digital tuning, digital readouts and an autoranging attenuator. A built-in automatic calibrator facilitates measurements on all channels in a variety of weather conditions.

Fotec Inc. introduced a new fiber optic power meter, the FOtest'R CATV. The unit uses a new design that allows the measurement of high power levels (up to +26 dBm), simplifies the product design and reduces the cost, according to the company. The meter facilitates testing of cable TV transmission networks, and also acts as a safety measure for techs as they handle systems having high optical power levels that can damage their eyes.

### Headend equipment

Innovations in headend equipment, from ad insertion gear to MPEG transmission systems, were also on display in Nashville. Axicom demonstrated the ADvantage digital ad inser-

tion system, designed for small- to medium-sized cable television operators who are looking to replace analog insertion equipment.

The hardware portion of the system is built with off-the-shelf components and is configured to be fully redundant and fault tolerant. A software-centric system, ADvantage uses a concept called "dynamic channels," which allows valuable system resources to be shared by more than one channel. Cable operators can also set priorities for the system to prevent network avail conflicts from occurring.

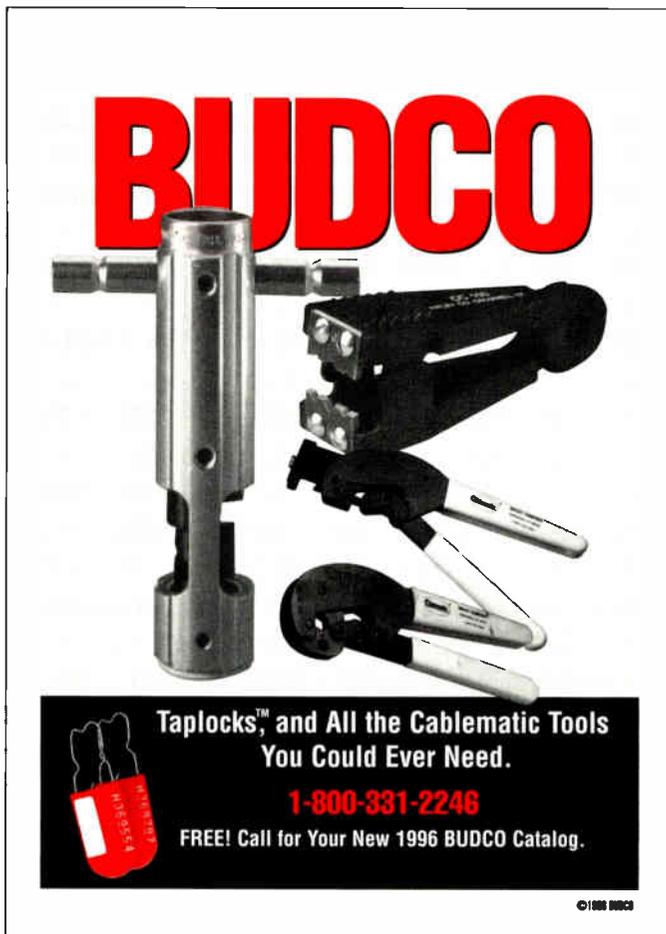
ADC Video Systems debuted a low-cost MPEG video transmission system that supports both MPEG-1 and MPEG-2 encoding and decoding. It can be used for a wide variety of point-to-point and point-to-multipoint applications, including broadcast production, distance learning, videoconferencing and ATM video server access. The company also displayed its 10 gigabit-per-second DV6000 system that wavelength division multiplexes four 2.4 Gbps signals over a single fiber and demonstrated a system running at 20 Gbps, providing 128 channels of video for point-to-point applications.

Video Data Systems announced the release of the Series 800 Micro Playback System and ViDStar, a graphics video billboard and super controller for automated video presentation applications. The Series 800 allows the user to add automatic playback from an industrial-quality VCR to an alphanumeric display, which provides a new dimension of live video and audio to a message channel. A fully automatic playback system and events controller, ViDStar is capable of controlling up to 56 tape decks and eight switchers from a single unit with its built-in Adam Link software.

Vela Research Inc. unveiled a new, four-channel MPEG-2 decoder. The decoder boards, designed for ad insertion and near-video-on-demand, offer low-cost-per-channel solutions for cable and broadcast, allowing insertion from a server in analog streams, according to the company.

The NVOD board is designed for enhanced pay-per-view, training or hospitality delivery services. The ad insertion board is designed with a genlock input to allow locking the video output to an external video source. A 2x1 video/audio switch for passing the genlock video and stereo inputs to the output provides a switch for environments such as ad insertion which require passing a network feed.

Cable operators can upgrade their old satellite receivers with Dawn Satellite's new line of block translators and downconvertors. Dawn's block translators, which can feed signals to 12 separate receivers each, allow older generation



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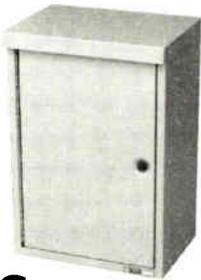
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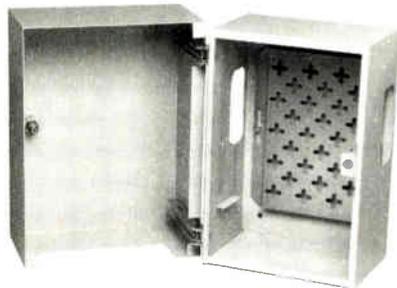
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## ◆ SCTE WRAP-UP

receivers to be "mixed" with newer models, including new digital receivers.

Matrox Video Products Group announced its QMPEG-2, a four-channel, PCI-bus MPEG-2 audio/video decoder board designed for OEMs and systems integrators of MPEG-2 video servers. The board is a solution for economical delivery of MPEG-2 material for commercial insertion, video-on-demand, interactive television systems, financial information networks, distance learning and other professional media applications.

### Emergency alert products

And in preparation for the regulatory requirement that cable operators must install emergency alert capabilities by July 1997, a number of vendors displayed wares designed to help operators comply. The R.L. Drake Company debuted its VM2550A frequency agile modulator, which executives described as a unit equipped with expanded channel capacity and designed to provide reliable operation in a densely crowded cable environment.

The company also offered the VM2552A BTSC vestigial sideband stereo modulator, which accepts video and audio baseband signals from a satellite receiver or similar audio/video equipment. The VM2552A is also designed to be EAS ready with alternate composite IF inputs.

And finally, Drake announced the VM2450A agile modulator. Synthesized operation provides frequency agility from 54 to 450 MHz, allowing front panel selection of any standard cable TV channel from 2 to 61, and 95-99. The unit also features EAS compatibility.

CADCO Systems Inc. introduced two new cable emergency warning systems. The first is a programmable, all-channel audio and video override triggered by an emergency warning receiver/decoder. The new IF switched warning system is called the "Twister." The second system is a retrofit for the existing CADCO CEAS System. The retrofit uses the same emergency warning receiver/decoder as the Twister, but enables video messaging to be added to the original CEAS.

Albrit Technologies is now offering a full range of EAS products, including its "Cable Envoy" addressable messaging system. The Envoy provides individual channel messaging of all emergency alert advisories which can be received from any standard EAS encoder/decoder. Cable Envoy displays alerts as crawl messages, together with an audio override, and provides full details on selected channels. For systems with budget constraints, the Envoy can be used with an IF modulator to interrupt programming and provide alerts.

### Transmission and distribution

New equipment to better manage both signal transmission and the plant itself was also on display. New from Scientific-Atlanta Inc. are two subscriber drop products—the Multimedia Stretch Tap and a 1 GHz drop amplifier. The Stretch Tap handles power-passing applications, including future network-powered telephony, with "improved RF performance," an executive said. The drop amp provides local drop amplification and splitting capabilities needed for interactive services.

Electroline Equipment Inc. announced its new Addressable Drop Extender (ADEX) tap, which features built-in monitoring. ADEX, which uses a twisted-pair wire interface to return alarm signals whenever the internal power supply, power amplifier or addressable functions of the tap are compromised, automatically pinpoints failure locations for rapid repair.

Electroline also introduced its two-port "Compact Addressable Tap," a device that allows operators to use standard traps with the tap, instead of being limited to proprietary filtering methods. This option can be used to support basic channel tiering, temporary pay-per-view events or control of premium services in systems where set-tops cannot be cost justified. The unit offers tap port on/off control and is also available in a 90-volt configuration.

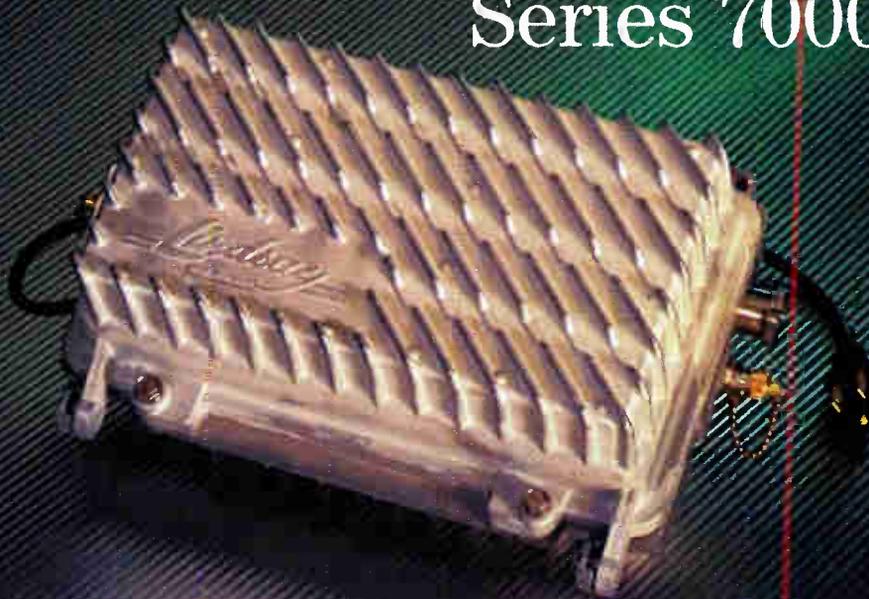
Antronix and TVC Inc. have introduced a new dual compartment, multi-tap housing for use in advanced networks and in traditional high-density plant. The product features uninterruptible signal and power (USP) and both vertical or horizontal mounting capability. Backward compatibility with the Milenium MGT series multi-tap allows an operator to use existing tap plates in new upgrades and mix standard video plates with plates capable of twisted pair or "F" port powering.

Trilogy Communications Inc. introduced a new drop cable exclusively designed for the wireless and microwave television industries. The cable is messengered with a built-in antenna discharge ground wire, which eliminates the need for a separate ground system. The cable meets all NEC guidelines for static electricity protection.

Quality R.F. Services Inc. (QRF) introduced two new replacement line extender modules (550 and 750 MHz) for Jerrold JLE, JLC, JLP, JLX and Pathmaker PAL housings. The modules are offered with integral two-way filters and accept a transistor return amplifier from QRF. Also, QRF unveiled a new two-way, hybrid distribution amplifier. This indoor amp has integral diplex filters and accepts an optional transistor return amplifier. It is also available in 750 MHz.

# Creating the New Standard for System Symmetry

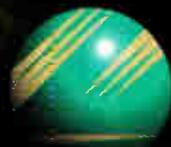
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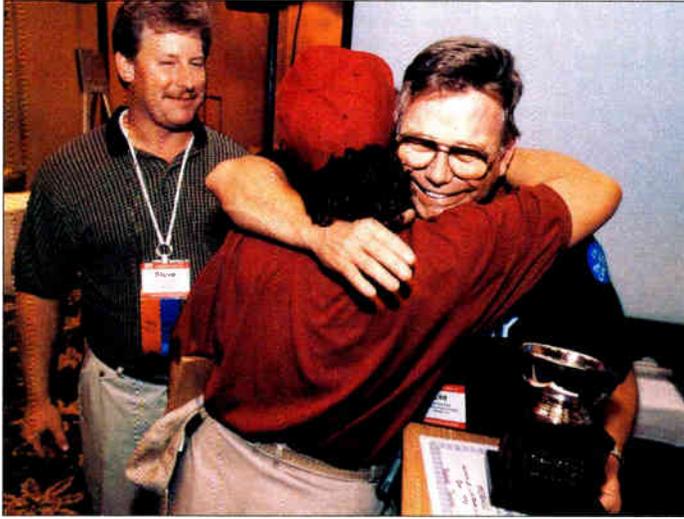
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**Lee Summers (right), Time Warner/Memphis, Tenn., the Cable-Tec Games' overall winner, gets a congratulatory hug from co-worker and co-competitor Mayla Zubik (center) as Steve Christopher (left) of Augat Communication Products Inc. looks on.**

Operators seeking protection from return path noise emanating from homes are the target market for a new high-pass filter with surge suppression made by Cable Innovations Inc. The DSPS-15DF takes any over-voltage directly off the coaxial center conductor and "zaps it to the ground instantaneously, before any damage can occur to cable line or subscriber electronics," said Larry Filson, president of Cable Innovations.

Augat LRC introduced KSFAS, a KS female adapter which facilitates the splicing of cable, including different sizes/types of cable, with the use of pin connectors. Its auto-seize feature provides a positive interface for pin connectors. The company also introduced its Flexible Cable Adapter for interconnecting equipment and/or cable in confined applications. The adapter features Augat LRC's patented Snap-N-Seal design to ensure environmental and RF integrity.

Triple Crown Electronics displayed its new IMX Series single hybrid indoor MDU amplifiers. The new amplifiers are available in a range of gains and bandwidths, in both push-pull and power doubled technologies, and can be configured for either one-way or bi-directional operation. The LEs are based on ultra-small size design which provides a full-function amplifier on a wall-mount platform. The line extenders also feature power doubling, add-on active or passive two-way operation and switching power supplies.

Qintar Inc. introduced the 1996 RAMP Series of house amplifiers with an active return path. The new line is offered in either 10 dB or 20 dB of gain.

And finally, RMS Electronics introduced a

new 16-way splitter/combiner for MDUs that can also be used as a headend combiner. The low-profile device offers frequency response of better than +/-1 dB across the 5-1,000 MHz passband and RFI of better than -120 dB.

### Fiber optics

Perhaps the biggest news at the Expo was the resurgence in interest in 1550 nm optical equipment. The Synchronous Group, which has pioneered the 1550 product path, launched its new modu-

lar fiber optic transmission system, called Antares. Designed to provide higher end-of-the-line performance with minimum fiber use, Antares includes a new externally modulated transmitter module and a companion erbium doped fiber amplifier.

With Antares, operators can configure a dual transmitter system, with each 750 MHz transmitter carrying up to 40 analog channels. The output of the dual EMS transmitters is combined in a dense wave division multiplexer module and amplified by the EDFA. The entire signal is carried over a single fiber to the receiving station.

In conjunction with the new Antares system, Synchronous has also introduced a new optical receiver, DLH-DWR, which can be integrated into the company's distributed lightwave hub product. Both the Antares system and the optical receiver will be available in the fourth quarter.

General Instrument debuted "Megastar," a family of 1550-nm transmission gear aimed at the cable industry and hybrid fiber/coax networks. GI will be offering transmitters and optical amplifiers with output powers of 13 dBm and 17 dBm to support differing network applications. A proprietary Stimulated Brillouin Scattering suppression method allows a single fiber to transport video over 65 kilometers.

Antec Corp. also got in on the act with its "Laser Link 1550," designed for headend consolidation and hub interconnects in HFC networks. Laser Link 1550 consists of two transmitters and four Erbium-doped fiber amplifiers. Both transmitters provide dual outputs, and an enhanced iteration provides improved noise and distortion performance over 65 kilometer links.

ATX Telecom introduced the Javelin 1550

series 40 Trunk EDFA. Based on 980-nm pump technology, this high-performance device offers low noise and an output power range of +13 dBm to +15.5 dBm to allow future upgrades of architectures such as narrowband wave division multiplexing.

New from Preformed Line Products is the Coyote Cross-Connect Closure, which allows users to splice up to 96 single fiber splices and cross connect up to 48 pigtailed in the same closure. Users can choose various connectors (FCPC, ST, SC), and pigtailed can be supplied by PLP or the end user. The closure is waterproof and airtight and can be placed in an aerial, underground, handhole or building application.

FONS (Fiber Optic Network Solutions) has begun manufacturing SC, FC and ST single-mode and multimode connectors. The company has developed a proprietary process and technology to improve return loss specifications (back reflection) on physical contact singlemode mated connectors. FONS manufactures cable assemblies having typical backreflection yields of <-55dB for PC, <-60 dB for Super PC and -70 dB for angle-polished connectors (APC).

Harmonic Lightwaves Inc. introduced its new HLS 1000 series of splitters for fiber management. The HLS 1000 line enables system operators to drive up to 16 multiple receivers from a single, high-powered transmitter. The splitters can be custom made for each application, and each unit is individually tested and labeled with its measured loss.

Harmonic also announced the HLP 1000, a fiber/component management platform that provides access and modularity in a rack-mount unit. With removable front and rear doors, and top and bottom fiber access, the HLP 1000 is designed to hold up to 72 ports for fiber distribution and 72 splices.

GC Technologies has added a fiber switch module to its fiber monitoring and test system to allow users to provide redundant fiber switching in critical data paths. The product, named FiberSTAT, is a real-time fiber monitoring and test system that monitors power levels and allows front-panel test access without disrupting traffic. FiberSTAT can monitor anywhere from two to 72 fibers and losses as low as 0.1 dB can trigger an alarm, if the user wishes. The unit can switch to a different source in less than 20 ms.

Ortel Corp. debuted uncooled distributed feedback (DFB) lasers for return communications that offer performance levels unattainable with conventional Fabry-Perot lasers at prices significantly lower than forward path DFB lasers. Ortel's lasers use a proprietary new high temperature DFB chip design, which minimizes the variation in chip performance

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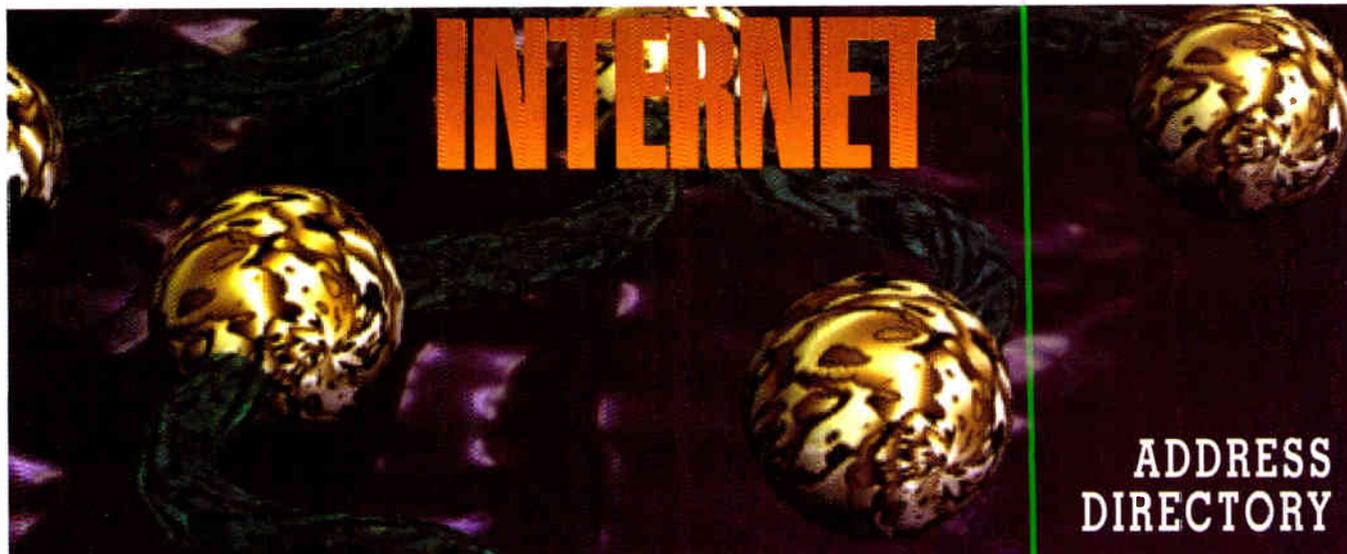
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# CED

THE PREMIER MAGAZINE OF BROADBAND COMMUNICATIONS

## ◆ SCTE WRAP-UP

over wide temperature ranges.

Augat Broadband featured its new upgradeable optical node. The MegaFlex offers four high-level outputs, each output capable of being configured with optional bridge switching. The four optical receivers and four return transmitters (if desired) can be implemented either as primary or redundant units.

Antec also announced a new family of 750 MHz-capable Laser Link II, 1310 nm optical transmitters. The line includes nine different varieties of laser transmitters, all of which are backwards compatible with the current Laser Link II products, as well as a new fiber splice enclosure and a fiber management system.

Norscan Inc. introduced a line of fiber optic cable outside plant protection equipment for offices, and field splice points to protect personnel and electronics from high voltages caused by lightning or power lines. The equipment reduces all levels of 60 Hz voltages.

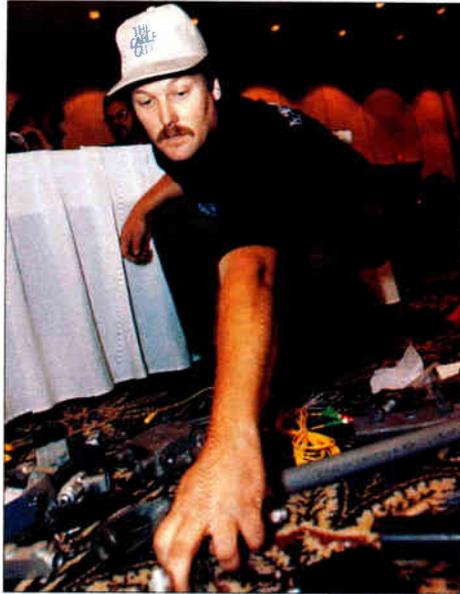
The 2745 Sheath Grounding Unit (SGU) offers protection as well as easy access to the cable armor and earth ground at splice points in below-grade housing. The company's plant protection equipment is compatible with rack-mounted long-range tone location systems.

Alcoa Fujikura Ltd. unveiled a new, automatic core alignment fiber splicer (FSM-30S), that uses a direct core monitoring Profile Alignment System to achieve ultra low loss and highly accurate splice loss estimation regardless of fiber quality or age. The splicer automatically aligns the fibers and inspects cleave quality.

CADIX International Inc. announced the availability of its new Fiber Design and Management software which executes the design, creates the splice connections and manages the fiber data from headend to the terminated destination. Various plant architectures may be accommodated, and assigned fiber counts to the fiber sheaths produces graphical displays in a splice chart that enables the user to efficiently splice entire buffer tubes, as well as individual fibers to the pre-defined color code.

Broadband Networks Inc. introduced two new fiber optic products and a new switching and scheduling software program. The Transport 3000 Series is a line of high-performance transmitters, receivers and modulation electronics designed to provide FM quality at AM costs. Video personality modules allow the network to be configured to deliver up to 16 channels per fiber. The products support video and 10 Mbps data delivery and will operate over a range of 25 dB of optical loss.

Noyes Fiber Systems introduced the TurboTest 500 series of fiber optic test sets. Designed specifically for high fiber count systems, the sets measure both bi-directional end-



**Bob Cherry, Paragon Cable, sorts through a pile of cable components searching for 10 specific objects during the Cable-Tec Games' Go Fetch competition.**

to-end and optical return loss simultaneously, reducing test time. Results are stored and later downloaded to a PC or printer for complete documentation, in 1310 and 1550 nm testing. The unit also includes a full-time dedicated voice port for 40 dB of full duplex communications on separate fiber.

### Powering

New from Alpha Technologies Inc. is its "Genasys" line of power supplies, designed to serve as a core component of the company's integrated, multi-redundant powering system. Genasys is designed to meet centralized node power requirements from 1530 watts to 8000 watts, executives said, and features uninterrupted power, user-selectable output voltages, modularity and a variety of enclosure packaging systems. The system can be configured with primary and secondary utility grid inputs, standby batteries and an integrated engine generator.

New from Exide Electronics/Lectro Products Inc. is a new family of "ZTT" node powering products, designed to meet centralized powering requirements. Features of the new system include the housing of up to four rack-mounted 60- or 90-volt power modules, up to 12 batteries and a modular generator cabinet that works via natural gas or liquid propane fuel, executives said.

The four ZTTs can deliver either 5.4 kilowatts, if all four are engaged, or 4 kilowatts if the fourth ZTT is provisioned in a "hot standby" configuration.

Power Guard has introduced a new 90-volt

uninterruptible common ferro. The UCF is the middle product in the family of power supplies that can provide 60- to 90-volt power. The other products are a basic non-standby ferro and a switched technology Unity Wave supply. The UCF power supplies power levels of 60-, 72- or 87 output volts, and can be expanded as the cable system's services increase. The units are available in several battery configurations, including: three, six, nine, 12 and quad batteries. A three-battery string provides backup power for about one hour under full load, while a six-battery string offers about three hours of backup.

Performance Cable TV Products exhibited its newly-developed Magnum UPS at Expo. The centralized powering system is designed to provide either 60 V or 90 V RMS operating from a true on-line UPS, charger and a bank of batteries. The enclosure is capable of handling up to 12 batteries for extended run times.

### Equipment enclosures

Hennessy Products announced an expandable environmental cabinet, the M-UCN, which features a modular design, is constructed of aluminum and meets Bellcore specs. Cabinet modules can be added when needed. The modules can be transported in elevators, making the M-UCN suited for rooftop applications. Cabinets are available with air conditioning, AC power distribution, remote monitoring and battery drawers.

Secure It Specialists introduced new security devices for cable operators who experience J-box vandalism and signal theft. The new J-Vault add-on theft-deterrent device and the J-Box enhanced security lid are designed to fit existing junction box enclosures. Installation can normally be performed in about 20 minutes without interrupting cable service.

Channell Commercial has announced two additional locking mechanisms for its enclosures. A threaded bushing for Diversified Systems is available, as is a 216B lock as a version of Self-Lock. The company has also announced the availability of the new 600 Series Heat Dissipation Covers (HDC) for the Signature Series Pedestal Enclosure (SPH) line. The covers will be available initially on the SPH1010, the SPH1212 and the SPH1432 pedestals for active equipment and are designed to exceed the heat dissipation capabilities of its earlier 500 series covers.

### Status monitoring, element managers

Norscan Inc. has announced the CMS 2000, which continuously monitors the integrity of the fiber optic outside cable plant and provides early warning of any damage by using the cable armor as a detection element. A fully loaded sys-



## ◆ SCTE WRAP-UP

Integration Technologies Inc. and Smallworld Systems Inc. will jointly develop advanced network design and database management capabilities, so that cable MSOs can design inside and outside plant using detailed network information. The system will link into other operational support systems, executives said.

Cox Cable Communications will use pedestal enclosures made by Channell Commercial Corp., through a contract that makes Channell its primary supplier over the next two years. An option for a third year extension is also in the contract, executives said. The contract is valued at approximately \$3 million per year. The product line Cox will use is Channell's Signature Pedestal Housing (SPH) line, which will be deployed throughout Cox cable systems nationwide in upgrades and newbuilds, for active and passive gear.

Continental Cablevision of Chicago is delivering near-video-on-demand services digitally, now that a Texscan MSI 3200DS digital ad insertion system has been installed there to play back infomercials. Continental officials said the move to digital was necessitated when the company increased its service to cover six

residential zones.

The Texscan system consists of the 3200DS server, the Prizm switch controller and a system control computer. Spot files are accessed, decoded and streamed in real time from the server to the controller with no restriction in segment length, allowing for playback of movies or infomercials. The switch controller also adds fault tolerance and routing control functions.

Amphenol Fiber Optic Products has announced that it has reached an agreement with Ando Corporation for joint marketing of a select portion of Ando's fiber optic test and measurement products in the United States. In this agreement between two ISO 9001 certified companies, Amphenol becomes the exclusive supplier of Ando's mini-OTDRs, power meters, light sources and fiber optic talk sets.

Alpha Technologies will be constructing a new, two-story, 36,000-square-foot building to house business and operation management functions, as well as allow expansion of the company's engineering, research and development and training facilities. Construction is slated to be completed in early fall of 1996. In addition, the company has opened a new,

25,000-square-foot manufacturing facility in Atlanta that will house final assembly operations for Alpha's power systems and provide space for a regional sales office and customer service center. And finally, Alpha was recently given ISO 9001 certification, after just six months of preparation time.

Cable Technologies International has inked an agreement with L.G. Precision (Goldstar) to distribute the company's line of test and measurement equipment. Goldstar offers a line of scopes, multimeters, counters and more, according to Pete Morse, president of Cable Technologies.

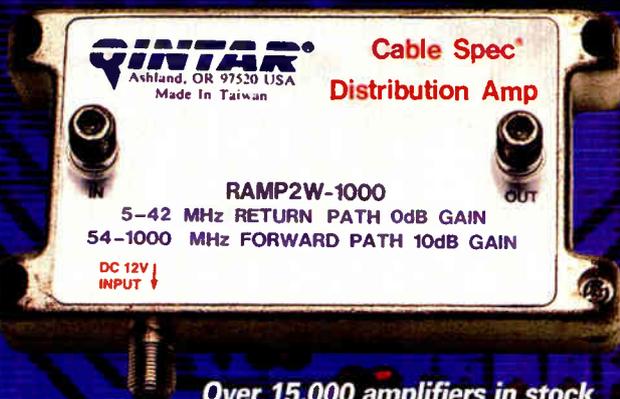
And CCMS Inc.'s beta tests of its "Novar" ad traffic and billing system within Tele-Communication Inc.'s Greenville, S.C. system are complete, executives said, with installations soon to follow. Novar is a fifth-generation software system that features dynamic spot scheduling, a Windows-compatible interface, open architecture databases and compatibility with both digital and analog hardware systems. CCMS will install the system to full functionality in Syracuse, N.Y. and in Pittsburgh, Pa. next month, executives said. **CED**

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# Narrowband on road to high-tech social scene

## Challenges to broadband data

By Fred Dawson

**A** growing band of innovators in multimedia entertainment is driving changes in the Internet environment that represent major new challenges to strategists in the high-speed data services arena.

Where on-line content to date has been largely defined by the bandwidth limitations and latency factors



**A screen shot from The ImagiNation Network Inc.'s CyberPark Internet-accessible 3D virtual world illustrates the possibilities of shared interactive experiences.**

*Editor's note: This article is a companion piece to "More questions than answers for data," in the June issue, page 122.*

of Web links, providers of on-line multiplayer games and other content tied to community interaction are using new means, including optical storage, high-speed servers and fiber backbones and advanced software tools, to transform the narrowband Web environment into a 3-D graphics arena supporting endless varieties of socially engaging and commercially viable interactions.

The possibilities have taken the electronics entertainment industry by storm in recent months, forcing many of the leading players to reorient themselves at warp speed. "We thought we were on the ragged edge of 'too early' when we got started, and then, bang, everybody

was there," says Richard Garriot, senior vice president and director of development for Origin Systems Inc., which is soon to launch an on-line multiplayer version of its popular Ultima CD game.

With some 10 million people jumping in to surf the Internet in the U.S. while the video game industry was waiting for interactive TV to take off, the on-line phenomenon has proven that what wins in the marketplace is what appeals to people's social instincts, even if "it's an incredibly crude technology," says Trip Hawkins, chairman and CEO of The 3DO Co. "We have to sit up and take notice and realize if we start to make things that work in that environment and that tap into this interest in socializing, this fundamental interest in the emotional connection of community participation, there's never going to be anything like it that we've seen before."

Hawkins gets no argument from Tom Kalinske, president and CEO of Sega Corp. "I think (the Internet) is the biggest factor impacting our business," he says. "The benefit of on-line, Internet play is that you're now engaged in social play, not just playing against the computer or a piece of software."

"I think the new platform of next year isn't about Sony and Nintendo; it's about being on-line," adds Gilman Louie, chairman of software supplier Spectrum Holobyte/MicroProse. "On-line (game) services are really going to begin to explode over the next 24 months."

While no one is happy with the level of bandwidth now available for Internet access, the breakthrough this year is that a growing number of players have found ways to reduce latency to the point that fast-action game playing is now possible through the Web, much as it has been through proprietary local area network extensions that have been the primary proving grounds for multiplayer games over the past two years. Moreover, with support from CD, and soon, DVD (digital video disk) storage, extremely complex, three-dimensional virtual reality environments are becoming part of the Web community environment, complete with voice communications.

"High-speed access would be great for us, but we can't afford to wait for that to happen," says Dean DeBiase, president and CEO of The ImagiNation Network Inc., the soon-to-be spun off on-line subsidiary of AT&T. "We're creating a platform for community game playing over the Internet today that offers many of the advantages people talk about when they discuss broadband access."

INN, with plans to launch its CyberPark Internet service this summer, has created a three-dimensional virtual community environment that marries on-line feedback with CD-stored images and audio to provide users click-on access to multiplayer games, local chat and information sites and other products built around shared interactive experiences. The on-screen environment, populated with avatars reflecting individual user selections of body types, gender and clothing, allows people to spontaneously set up gameplaying situations with each other, or choose other options on a pay-per-use basis.

While INN does not support fast-action games at this

**'Realistically,  
cable modems  
are about  
three years off  
before people  
can get excited  
about them'**

point, it does support a wide range of commercial options for content providers and advertisers who choose to offer products over its platform. For example, the system can keep track of individuals' "comings and goings" in the CyberPark environment to the point that an advertiser will know exactly how many people have entered a space where the firm's wares are promoted, or a game producer will know how long a particular player has played.

Many of the new Web-based content providers are focusing on games, as opposed to INN's focus on a multi-use environment, with some achieving action speeds that support the types of games now played on single-player or two-player consoles or CD-ROM systems. But even these providers are looking beyond the simple game paradigm to a multitude of applications that will exploit the community implications of virtual reality environments on-line.

"The technology we're creating to support interactive games over the Internet will drive tremendous changes in our social fabric that will rival changes that occurred with the telephone and air travel," says Kristin Asleson, vice president of marketing for MPath Interactive, a Cupertino, Calif.-based startup which last month became the first provider to offer fast-action, multiplayer games over the Internet.

MPath's capabilities spell changes in the narrowband Web environment that, like INN's and others' CD-supported graphics-rich support systems, raise the bar on what consumers might expect from someone charging \$40 a month for broadband access. MPath is combining proprietary software with network support from PSINet to establish low-latency connections for fast-action community games such as Command & Conquer, a search-and-destroy game that has sold some 800,000 units in CD format worldwide. Players in the on-line version will be able to communicate with each other by voice as well as text, if they have a SoundBlaster card and a microphone, Asleson says.

"It's a very rich featured environment in which you want people to be able to communicate with each other as much as possible," Asleson explains, noting the company's latency of 150 milliseconds between a player's action and the appearance onscreen of another player's reaction is the lowest in the business so far. "We have servers all across the country so that we can scale up very easily, as well as offer people a great gameplaying experience no matter where they are."

"Low latency is there," Louie says, noting that with response times of between 150 and 350 milliseconds, emerging multiplayer game services over the Internet "do really great simulation games and can do all the strategy games."

Developers welcome the advent of the cable modem, but they're skeptical of how big a role it can play over the next two years as the on-line multiplayer game business takes off. "Realistically, (cable modems) are about three years off before people can get really excited about them," Louie says, in reference to the time it might take to build a mass market for high-speed data. "Cable companies need to be able to solve the problem of how to get

one region to be able to talk to another regional provider. Until they're able to do that, it's just going to be a mess."

This inter-regional connectivity requires the uniformity of technical approaches to high-speed data that is the goal of Multimedia Cable Network System (MCNS), the venture founded by Tele-Communications Inc., Time Warner Cable, Cox Communications Inc. and Comcast Corp., with new support from additional MSOs. While MCNS hopes to complete a first suite of protocols by early fall, there are signs that the fast-paced events surrounding Web use are making it hard for the venture to define a first-generation system.

"We're hearing a lot of talk about video streaming as opposed to bursty data communications," says one senior manufacturing executive. "People are going to have to make up their minds and stick to a gameplan, or they'll never get services off the ground."

Video streaming, possibly with use of asynchronous transfer mode running over the MPEG-2 transport layer, would be one way to accommodate a much richer environment and faster game playing than anything that even MPath can come up with. But it would still require cable industry support for legacy systems, especially since those systems have DVD to look forward to as a video-enhancing technology for on-line game playing that promises to jerk the narrowband Web environment to still higher levels of functionality.

"We're very, very excited from both the hardware and software sides of the opportunity and plan to play a big role in DVD," says Emiel Petrone, senior vice president of Philips Media, which is also rolling out set-top players by year's end, with DVD-ROM to follow in the second quarter of '97. "There's no question but that we see a convergence between the TV and the PC, and we see DVD as a fundamental feature of this new environment."

### **Quality benchmark goes up**

DVD, with 4.7 gigabytes of storage capacity in first-generation systems, and going to over 8 GB within two years, represents a new benchmark in digital programming, says Richard Prodan, senior vice president and CTO at Cable Television Laboratories. "DVD offers very high quality, full resolution pictures and is going to be the leading MPEG storage technology," he says.

As a result, Prodan cautions against settling for any digital system in cable that doesn't measure up to what consumers are likely to expect once they become accustomed to using DVD. "You have to be careful in looking at low-bit rate compression, because the benchmark for acceptable quality is going up," he notes.

DVD also brings a double-sided access capability that supports implementation of interactive adjuncts to stored movies and other content, notes Craig Eggers, director of marketing for Toshiba America Consumer Products, which plans to have DVD set-tops on sale by October, with DVD-ROM hitting the stores a month or two later. "With the double-sided format, you can put Batman Forever on one side, and on the other side, an imbedded navigation system that supports Web browsing through the TV set or the playing

of on-line games with other people," he says.

With many game developers already using CD-ROM technology to combine high-level multimedia graphics with on-line interactivity, the electronic entertainment industry views DVD as the means to break through to much richer, video-enhanced 3-D environments in the on-line game environment, which, in turn, could help expand the consumer market for high-speed data services over broadband networks, if the high-speed data protocols are in synch across a large market base. Combined with the movie playback features, these capabilities offer the electronic entertainment industry the breakthrough to mass market penetration it has been looking for, says Hawkins.

"When you look at the consumer market, you have to realize that, worldwide, there are about 350 million color television households, and of that number, maybe 250 million have VCRs," Hawkins notes. "But in the history of computers and video games, no more than 50 million of those homes have ever had either a computer or video game at one time, which means we've never gotten to mass penetration levels."

That will change with the introduction of low-cost means to access the Internet and proliferation of DVD at ever lower prices, Hawkins says, noting that two-thirds of the people who say they're interested in purchasing low-cost Internet boxes come from the 58 million households who say they have no interest in buying PCs. "The same thing applies to DVD players," he adds, citing research by Alexander & Associates and others.

DVD, like game consoles, qualifies as a "premium toy" across this demographic, but with the advantage of broader appeal, Hawkins says. "This industry will... become a major force in the consumer electronics market when you can combine all three of those sources of demand in the same kinds of products in the home," he says, in reference to DVD, the Internet and games.

The backward compatibility of DVD with CD means a bridge will develop that adds consumer benefits in the game category for DVD even before many games that are designed specifically for DVD are on the market, notes Brad Crystal, director of on-line sales for game developer Activision Inc. "DVD-ROM delivers on the unfulfilled promise of CD-ROM," he says. "Games and other software titles can be much more rich from a software standpoint. Multiple CD-ROM titles can be consolidated in DVD-ROM, with no transition from one game to the next."

Crystal adds: "DVD-ROM supports eight times faster access speeds than CD-ROM, making it much more arcade like, which is what we're striving for. It allows (developers) to retain their investment in past formats."

CD storage, tied to on-line access, already in use in the CD-ROM environment for PC display, is moving to the TV display platform ahead of DVD, potentially broadening the interactive multimedia appeal to people who don't own PCs. Unlike activities tied to low-graphics quality Web browsing through the TV set-top, such as those supported by the new company WorldGate Inc. and by Zenith Electronics, these alter-

native approaches bring CD-stored graphics into play to create a rich, 3-D graphics environment for on-line game playing over the TV set.

A case in point is the set-top CD-online service developed by Philips Electronics, which allows Web service developers to link their programs to media played on TV sets from the firm's CD-i platform. Now offered in the U.K. and the Netherlands, the service will soon be in beta testing in the U.S., with rollouts slated for this summer, says John Gray, president of Philips Media Systems. "Our target is to offer the entire Internet browser package, including the CD-i player, for under \$700," Gray says, adding that existing CD-i machines equipped with digital video cartridges will be upgradable to Web access capability "for under \$200."

With software built into the platform that translates Web graphics into NTSC-compatible display format, Philips is betting that the marriage of access to the Internet and the availability of a local video storage medium will set off a chain reaction, starting with the added appeal of Web browsing capabilities over the TV and leading to development of interactive content that uses the CD to enhance graphic and audio richness.

Philips will provide automatic dial-up connectivity, click-on browsing commands for accessing popular Web sites and other ease-of-use features for customers, who will pay as little as \$10 per month for the service. Gray says the company is close to a deal with either a large telecom firm or a smaller Internet networking company to establish local points of presence nationwide.

### Lowering the cost of entry

Sega of America, with plans for Sega Saturn Netlink, is another entrant looking to combine game-playing with Web browsing via the TV, in effect moving ahead of the network computer initiatives of Oracle Corp. and others to lower the cost of entry for consumers seeking Web access. The firm's new modem and game console package, priced at under \$540, will access the Web through network facilities supplied by Concentric Network Corp., which will charge users \$19.95 for unlimited access.

Concentric, which is also supplying low-latency connectivity for multiplayer game operations of Total Entertainment Network, Interactive Creations Inc., Engage Games Online, OnLive! and others, represents another facet of developments that are raising the performance standards in the narrowband Web environment. High-speed backbone bypasses of long distance links to Internet national access points are benefitting the low-speed local access environment just as much as they are providing support for local broadband distribution.

As long as high-speed access providers can ensure the global social connectivity is maintained in this fast-moving environment, they'll be in a position to provide whatever types of services content providers dream up. But that means maintaining compatibility with the ever-more powerful narrowband environment and its evolving optical platform support systems, both through the PC and the TV. It's a lot to keep track of. **CED**

**Philips is close to completing a deal to establish local points of presence nationwide**

JULY

Trade shows

**1-2 Fiberworks: Compressed Video: Concepts and Transmission (CVCT)**, produced by Antec. Location: Antec Training Center, Denver, Colo. Call (800) FIBER ME for more information.

**8 Broadband Network Overview**, produced by General Instrument. Location: Toronto, Canada. Call Lisa Nagel at (215) 830-5678.

**8-12 Broadband Communications Network Design**, produced by General Instrument. Location: Toronto, Canada. Call Lisa Nagel at (215) 830-5678.

**9-13 Fiber Optic Training**, produced by The Light Brigade Inc. Location: Houston, Texas. Call Pam Wooten (800) 451-7128.

**10-11 Cable Telephony '96**, produced by ICM Conferences. Location: The Radisson Hotel & Suites, Chicago, Ill. Call (312) 540-3010.

**15-16 SCTE Regional Training Seminar**. Topic: Introduction to Data Communications. Location: Seattle, Wash. Call SCTE headquarters (610) 363-6888.

**July**  
**10-12 Wireless Cable '96**. Location: Denver, Colo. Call the Wireless Cable Association Convention Services office at (202) 452-7823.

**August**  
**20-22 Great Lakes Cable Expo**. Location: Indiana Convention Center, Indianapolis, Ind. Call (317) 845-8100.

**25-28 Rocky Mountain Expo 1996**. Location: Snowmass, Colo. Call the Colorado Cable Television Association at (303) 863-0084.

**September**  
**23-25 The 1996 Eastern Show**, produced by the SCTA. Location: Atlanta, Ga. Call (404) 252-2454; or use FastFax for information (888) 814-0303.

**September/October**  
**9/30-10/2 Convergence** magazine's Digital Television & Internet Conference & Expo. Location: San Jose Convention Center, San Jose, Calif. Call Fax-on-demand at (800) 488-1396, or Gary Lemons at (303) 393-7449.

**15-16 Object Technology in Telecommunications: The Strategic Approach to Object Orientation**. Location: Arlington Park Hilton and Conference Center. Call (312) 540-3860.

**15-18 Fiber Optic Training**, produced by The Light Brigade Inc. Location: New Orleans, La. Call Pam Wooten (800) 451-7128.

**22-25 Fiber Optic Training**, produced by The Light Brigade Inc. Location: Seattle, Wash. Call Pam Wooten (800) 451-7128.

**23-25 FiberBase Product Training**, produced by ADC Telecommunications Inc. Location: ADC corporate headquarters, Minneapolis, Minn. Call (800) 366-3891, ext. 2040.

**30-31 Operational Support Systems**, produced by ICM Conferences Inc. Location: The Radisson Hotel, Chicago, Ill. Call (312) 540-3854.

AUGUST

**6-8 Fiberworks: Digital Networks Training (DNT)**, produced by Antec. Location: Antec Training Center, Denver, Colo. Call (800) FIBER ME.

**6-9 Fiber Optic Training**, produced by The Light Brigade. Location: Chicago, Ill. Call Pam Wooten (800) 451-7128.

**12 Broadband Network Overview**, produced by General Instrument. Location: Hatboro, Pa. Call Lisa Nagel at (215) 830-5678, or fax (215) 830-5602.

**12-13 SCTE Regional Training Seminar**. Topic: Introduction to Telephony. Location: Jackson, Miss. Call SCTE headquarters (610) 363-6888.

**12-16 Broadband Communications Network Design**, produced by General Instrument. Location: Hatboro, Pa. Call Lisa Nagel (215) 830-5678 for more information.

**13-14 Activating and Troubleshooting the HFC Return Path**, produced by Scientific-Atlanta Institute. Location: Atlanta. Call (800) 722-2009, press "3," to register.

**14-16 SCTE Regional Training Seminar**. Topic: Technology for Technicians II. Location: Jackson, Miss. Call (610) 363-6888.

**18-20 Heart of America SCTE Chapter, Technical Seminar**. Location: Tan-Tar-A Resort, Lake Ozark, Mo. Call David Clark (913) 599-5900 for more information.

**19-22 Fiber Optic Training**, produced by The Light Brigade Inc. Location: Idaho Falls, Idaho. Call Pam Wooten (800) 451-7128.

**26-29 Hands-On Fiber Optic Installation for Outside Plant Applications**. Produced by Siecor Engineering Services Training. Location: Hickory, N.C. Call Lynn Earle at (704) 327-5539, or Phyllis Townsend at (704) 327-5560.

**27-30 Fiber Optic Training**, produced by The Light Brigade. Location: Helena, Mont. Call Pam Wooten (800) 451-7128.

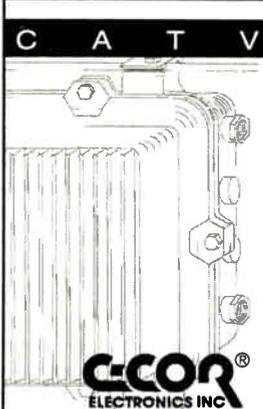
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## The issue: Set-top boxes

Half of 1996 has come and gone and still the cable industry hasn't deployed digital set-tops in any meaningful quantity. Instead, there's a resurgence of interest

in analog boxes and the new services they can support. This month, we'd like your thoughts on digital vs. analog set-top boxes.



## The questions:

1. Does your system presently use addressable set-top descramblers?

- Yes       No       Don't know

2. How old are the set-tops you presently use in your system, on average?

- Less than 1 year       1-3 years  
 4-7 years       7+ years

3. Is your system going to use the new "advanced analog" set-tops (such as GI's CFT2200 or S-A's 8600x)?

- Yes       No       Don't know

4. If so, what new features do you think are most important to consumers?

- Program guides       On-screen messaging  
 Virtual channels       Other

5. Do you think Congress should standardize digital set-tops so that consumers can buy them at retail outlets?

- Yes       No       Don't know

6. Do you plan to roll out digital set-tops to consumers when they become available later this year?

- Yes       No       Don't know

7. If so, how soon do you expect to begin deploying new digital set-tops to subscribers on your system?

- In next 6 months       Next year       1998 or later

8. Several companies are working to allow Internet access via set-tops instead of personal computers. Are you interested in providing such a service?

- Yes       No       Don't know

9. Are you at all concerned that competitors like DBS, the telcos and MMDS operators will have digital equipment in the field before the cable TV industry does?

- Yes       No       Don't know

### Your comments:

## Fax us at 303-393-6654

Make a copy of this page and fax it back to us at the number above, or mail it to *CED*, 600 South Cherry Street, Suite 400, Denver, Colo. 80222.

\*Every month, we'll pick one response from those we receive and award \$50. See official rules below.

Names won't be published if you request your name to be withheld, but fill out the name and job information to ensure that only one response per person is tabulated.

**Your name and title**

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**System name:**

---

**Location:**

**Your MSO:**

---

**Your job function:**

**Daytime phone #:**

**Official rules:** No survey response necessary. Enter by returning the completed survey via fax or mail to the locations indicated above, or print the words "CED Return Path" on a 3"x5" card and mail it along with your name, address, daytime phone number and signature. To be eligible for the drawing, entry forms must be received by 5 p.m. on August 31, 1996. CED is not responsible for lost or misdirected mail. One entry per person. Forms mutilated, illegible or not in compliance with these rules shall be considered ineligible in the sole discretion of the judges. Odds of winning depend on the number of entries received. A random drawing from eligible entries will be held on or about September 1, 1996. Winner will be required to provide his/her social security number and proof of identification and is solely responsible for all federal, state and local taxes incurred. Prize is not transferable to any other person. Sweepstakes participants agree to waive any and all claims of liability

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**RESULTS**

Cable systems are immensely interested in providing data services over their networks, and the systems should have no difficulty carrying such traffic, according to the respondents of a survey on the subject.

Furthermore, providing such services is a good way to compete with the local telco, which is saddled with copper plant that cannot offer data transfer at speeds anywhere near what a cable system can offer.

Nearly three out of four systems have been approached by local governments or schools to offer such services, while more than half of the systems have attempted to market such services to their customers by deploying or testing RF cable modems.

Less than half of those who responded, however, are presently subscribing to an on-line service, and of those, only about half sign on and surf the Internet more than three times a week.

*Congratulations to James Humphreys of Cablevision in Riverhead, N.Y., who won \$50 for his entry. To qualify for a future cash drawing, fill out the questionnaire on the previous page and send it in!*

# The issue: High-speed data

Tremendous interest in the Internet has propelled the cable industry on a quest to develop a standardized, high-speed data modem that will leapfrog any

deployable technology the telcos have in their arsenals. This questionnaire asked for your views on the subject.

## The results:

1. Are you personally presently subscribing to a commercial on-line service such as Prodigy or America Online?

Yes <b>40%</b>	No <b>53%</b>	Don't know <b>7%</b>
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2. How often do you sign on and surf the Internet?

Daily <b>11%</b>	2-3 times/week <b>44%</b>
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Once a week <b>11%</b>	Monthly <b>33%</b>
---------------------------	-----------------------

3. Does your cable TV system have any interest in providing data services over the cable network?

Yes <b>87%</b>	No <b>0%</b>	Don't know <b>13%</b>
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4. Has your system tested or deployed RF "cable modems" to allow this access to occur?

Yes <b>47%</b>	No <b>40%</b>	Don't know <b>13%</b>
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5. Does the local telco offer ISDN services in your franchise area?

Yes <b>27%</b>	No <b>33%</b>	Don't know <b>40%</b>
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6. Has your system been approached by local government, schools or anyone else to offer high-speed data communications?

Yes <b>73%</b>	No <b>13%</b>	Don't know <b>13%</b>
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7. Has your system actively tried to market such services to anyone?

Yes <b>53%</b>	No <b>40%</b>	Don't know <b>7%</b>
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8. Do you think datacom provision is a good way to compete with the local telco?

Yes <b>80%</b>	No <b>7%</b>	Don't know <b>13%</b>
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9. Do you think your system is technically capable of sending high-speed data?

Yes <b>93%</b>	No <b>0%</b>	Don't know <b>7%</b>
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10. How much would your system be willing to pay for cable modems?

Under \$200 <b>13%</b>	\$200-\$500 <b>87%</b>	Over \$500 <b>0%</b>
---------------------------	---------------------------	-------------------------

### Your comments:

"In rural America, where 'geographical' disadvantages exist, this becomes an enhancement to a way of life and gives customers access to technology that normally is offered to metro areas."

— Scott Walter, *Midwest Cablevision, Redwood Falls, Minn.*

"Test subscribers love this service. We haven't seen truck chasing like this in years."

— Jack Burton, *Cablevision Lightpath, Long Island, N.Y.*

"We have about 30 cable modems in and running, and we're trapping out the 5-30 MHz band for all non-modem subs."

— Steve Faulkner, *Suburban Cable, Wallingford, Pa.*

"We have formed a partnership with the local phone company to provide full Internet access and data transfer and have hooked up schools, libraries and businesses."

— Darryl Reccek, *Service Electric Cable, Pa.*

**Cable Advertising installs digital insertion**

SALT LAKE CITY, Utah—Cable Advertising of San Antonio has installed the 3200DS Digital Ad Insertion System from Texscan MSI, a division of TSX Corp. The 3200DS provides 36 channels of insertion from a single headend.

The system consists of a 3200DS server, an intelligent PRIZM matrix switch controller and a system control computer. In addition, the system features fully compliant MPEG-2 encoding, no spot length restrictions and central control software that updates schedules, retrieves logs and monitors the system's status on a zone and channel specific basis. Unlimited spot segment length provides a platform to support infomercials, L.O., NVOD and VOD applications, in addition to commercial insertion.

**PacBell taps Artel Video for convention**

MARLBOROUGH, Mass.—Artel Video Systems Inc. will be the primary provider of video transport equipment at the Republican National Convention in San Diego this August. Artel will supply Pacific Bell, the convention's local and exclusive communications provider, with video transport equipment that will be used to provision broadcast-quality video service to all of the broadcasters.

The Artel equipment specified, the SL4000 multi-channel and the DL1200 single-channel transport systems, will be housed in three semi-tractor-trailers custom-designed by PacBell for the event. Most of the video feeds from the convention center will pass through the Artel equipment in the trailers and will be transported through a Pacific Bell video operations center to local area TV and cable distributors, as well as to the RNC's long distance provider, AT&T, for transmission to national and international networks and broadcasters.

**HP animates TMO Web site**

PALO ALTO, Calif.—Hewlett-Packard Company's Test and Measurement Organization (TMO) World Wide Web site now features animation and interactivity to enhance its application notes. In addition to being able to view abstracts of application notes and then order the full, printed versions, customers can download the full text of many of TMO's notes in electronic form. The animation illustrates technical product information such as wave frequency and amplitude.

Viewers can stop the animation and zoom in to see intricate detail. Because the mathematical models are interactive, users can adjust parameters in real-time by clicking and dragging any objects in the graph; or, they can change parameters by clicking and dragging "sliders."

In order to access the interactive notes, users must be working in the Windows 95, Windows NT, Power Macintosh or Unix system operating environments and must be running a Java-enabled Web browser such as Netscape. Adobe Acrobat Reader 2.0 and QuickTime, both of which can be downloaded free from the Internet, are also required to download the full electronic text of the notes and view the animated graphs.

The TMO Web site now contains a complete list and description of TMO service and support programs including hardware support, software support, application consulting and training, and solution-engineering and manufacturing-process consulting. Web surfers will also find the latest edition of the TMO Education Catalog for the United States.

The address of the TMO directory under HP's home page is <http://www.hp.com/go/tmdir>. Information about HP and its products can be found on the World Wide Web at <http://www.hp.com>.

**Cox branch purchases Nortel codecs**

LOS ANGELES—CableRep Advertising, the cable advertising arm of Cox Communications Inc., has agreed to purchase fiber optic equipment and DV-MPEG-2 digital codecs from Northern Telecom (Nortel) to bring selected video content to and from its master control site in Phoenix, Ariz. CableRep will use the video transport system to deliver commercials for television insertion, to carry headline news inserts and to acquire sports programming from satellite feeds or from live sports venues in the Phoenix area for ASPN (All Sports Network) programming.

The new codecs are being manufactured on behalf of Nortel by NUKO Information Systems of California. The CableRep installation will include Nortel's S/DMS TransportNode OC-48 in a ring configuration to provide terrestrial transport of video content encoded and decoded by the new codecs.

**Intel, BroadBand in telco Internet task**

RESEARCH TRIANGLE PARK, N.C.—Intel Corp. and BroadBand Technologies Inc. have announced a joint effort enabling telephone companies to deliver Internet access to computer users via high-speed, residential fiber-to-the-curb (FTTC) connections. The companies will work together to develop technology that allows PCs to access the Internet and the World Wide Web at accelerated speeds, as compared to standard telephone modems.

The companies will develop technology for PC interface cards that will support two-way

Internet and World Wide Web access. Under the agreement, Intel will design and develop hardware and software technology to enable home PCs to use new fiber-to-the-curb networks which are being tested by phone companies for accessing the Internet and other on-line services. Intel will license the technology to BroadBand Technologies, which intends to offer PC interface cards along with its Fiber Loop Access (FLX) System.

**Lucent wins \$35 million fiber contract**

MORRISTOWN, N.J.—Lucent Technologies has been awarded a \$35 million contract to provide WorldCom Inc. with TrueWave single-mode optical fiber and fiber optic cable for deployment in the company's nationwide long distance network.

Lucent will provide more than 2,000 route miles of fiber optic cable for two network segments WorldCom Inc. plans to deploy this year in the United States.

The first span will extend 1,114 route miles from near Joplin, Mo. to Cleveland, passing through locations in and near St. Louis; Indianapolis; Cincinnati; Dayton, Ohio and Columbus, Ohio. The second link will span 1,075 route miles from Salt Lake City to Portland, Ore. and Seattle.

Bell Laboratories developed TrueWave fiber, which was used in an experiment conducted last February to transmit one terabit per second, or a trillion bits of data per second.

FITEL, a Lucent Technologies manufacturing joint venture based in Carrollton, Ga., will manufacture and supply the loose-tube fiber cable for the projects.

**OmniBox demos interactive TV**

STAMFORD, Conn.—OmniBox Inc. has announced the successful demonstration of its interactive set-top box on the 150-channel Quantum network of Time Warner Cable of New York City, concluded late last year.

In the Time Warner demo, held in Queens, N.Y., OmniBox successfully demonstrated that four channels of digital programming could be broadcast over one standard analog cable channel without affecting the broadcast quality of the programming on the adjacent analog channels.

The new interactive set-tops and real-time digital video encoders are slated to be available for shipment in the second quarter of 1997 at about \$300 per box, and \$10,000 per digital video channel.

The technology utilizes a proprietary, real-time video compression technique, and can provide a simultaneous mix of analog and digital channels, as well as access to transactional and interactive services. **CEC**

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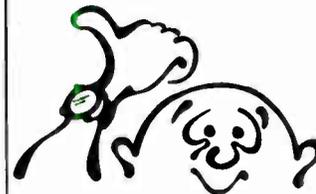


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## Coaxial cables for wireless

HICKORY, N.C.—CommScope, a division of General Instrument, has introduced Cell Reach, a line of patented, high performance, low-loss, 50-ohm coaxial cables designed specifically for wireless transmission systems.



CommScope's Cell Reach coaxial cable

Cell Reach is manufactured with a patented process combining a smooth-wall, copper outer conductor and a high-strength, closed micro-cell foam dielectric. The cable is triple bonded (center conductor to foam dielectric, dielectric to outer conductor, and outer conductor to jacket) which provides electrical and mechanical stability, low VSWR and eliminates water migration. The product is backed with a 10-year warranty, according to CommScope.

Circle Reader Service number 51

## Software enhancement

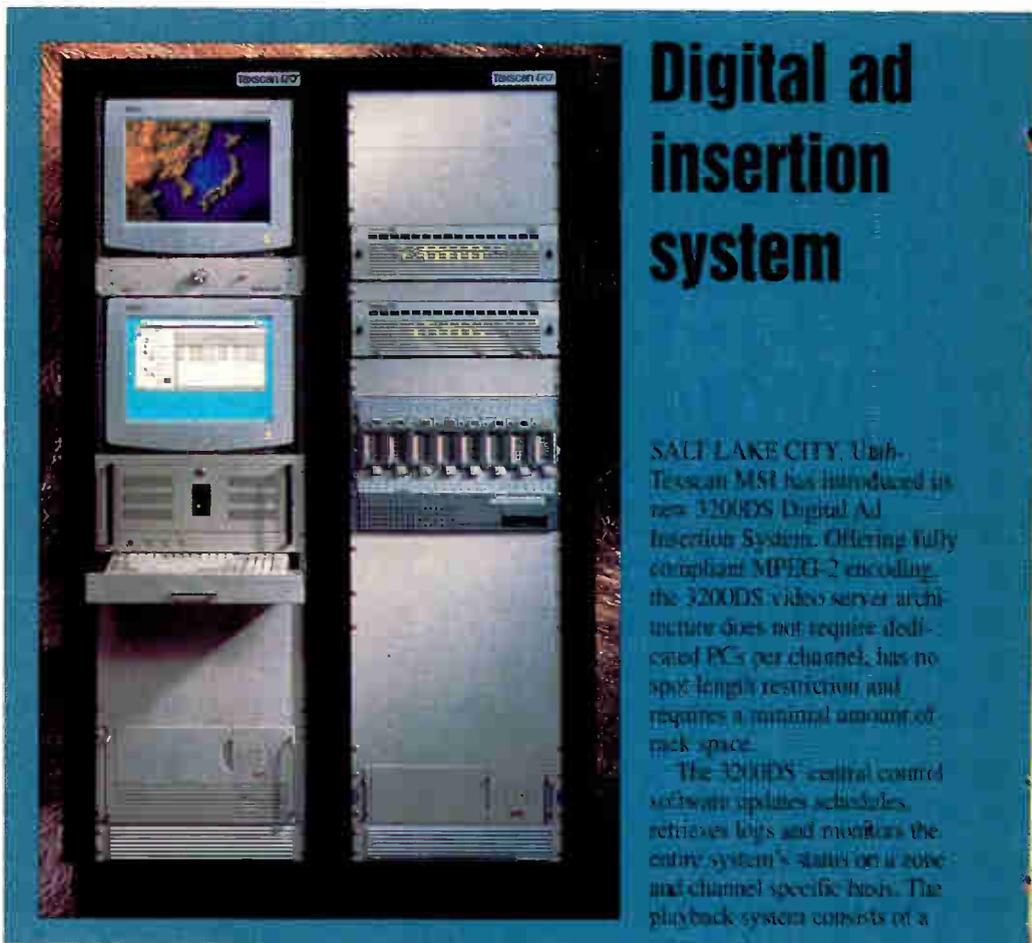
LINCOLN, Neb.—Riser-Bond Instruments has announced Wave-View for Windows software for the Model 1205C and 1205T Time Domain Reflectometer, cable fault locators.

Designed to run on a PC, Wave-View provides "unlimited" waveform storage and post-storage waveform manipulation, according to the company. The software displays the TDR's function keys, allowing the user to increase the vertical gain, zoom in and out, adjust the cursors and change the VOP. The software package can also be used as a classroom training aid.

Circle Reader Service number 52

## High-power DFB

SAANICHTON, B.C.—SDL Optics Inc. has introduced a 30 mW distributed feedback (DFB) semiconductor laser for fiber optic transmission systems operating in the 1550 nm wavelength range. A single source can be split to serve a greater number of branches in a broadcast transmission system. Low relative intensity noise and narrow linewidth allow the laser to transmit over longer distances without additional amplification.

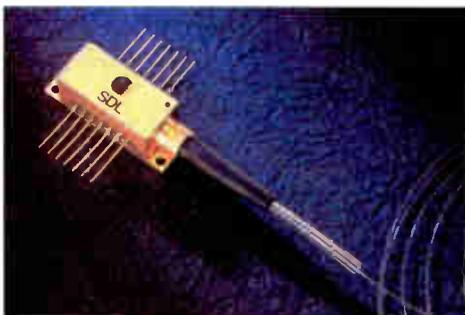


## Digital ad insertion system

SALT LAKE CITY, Utah—Telescan MSI has introduced its new 3200DS Digital Ad Insertion System. Offering fully compliant MPEG-2 encoding, the 3200DS video server architecture does not require dedicated PCs per channel, has no spot length restriction and requires a minimal amount of rack space.

The 3200DS central control software updates schedules, retrieves logs and monitors the entire system's status on a 2000 and channel specific basis. The playback system consists of a

The laser is designed for continuous-wave operation with modulation supplied by an external modulator. In addition, the laser is offered in a 14-pin butterfly package with



SDL's 1550 nm DFB laser

polarization maintaining singlemode fiber for maximum compatibility with common external modulation schemes.

Circle Reader Service number 53

## Fiber management system

LISLE, Ill.—Amphenol Fiber Optic Products has announced the availability of its new 948 Series Fiber Management System. The panels are preloaded with Amphenol components,

including adapters, splice trays, couplers and cable assemblies. A line of racks and inner bay units is also available for cable management.

Amphenol has also launched its new 948 Series Coupler Panels, which provide a convenient location for incorporating optical splitters, tap couplers and wavelength division multiplexers (WDMs) at the fiber distribution frame. The enclosures mount on 19-inch or 23-inch racks and are available in two sizes to accommodate from eight to 12 modular coupler cartridges. The cartridges consist of the company's couplers, terminated with its connectors and bulk-head adapters. The adapters are placed at an angle on the cartridges to increase the bend radius of the patch cords exiting the enclosure, while the cartridges are mounted horizontally to prevent interference with patch cords during removal or insertion of additional cartridges.

Circle Reader Service number 54

## Wireless transmitter

BURLINGTON, Mass.—Lasertron has announced a high-dynamic range, low-noise laser transmitter for wireless systems. The QLXS1300-213 transmits multiple RF channels between wireless system antennas and base stations, microcell donor sites, or repeaters. The

### Texscan MSI's 3200DS Digital Ad Insertion System

3200DS server, an intelligent PRIZM matrix switch controller and a system control computer.

The server features multiple level, fault tolerant protection including RAID level 5, and is scalable to stream 32 MPEG-2 decoded outputs in real-time. The central control server and headend servers can be scaled to 500 GB.

Spot transfer can be by any TCP/IP using frame relay, dedicated T-1, FDDI, or by DLT for sneakernet operation. Unlimited spot segment length provides an ideal platform to support, in addition to commercial insertion, informercials, L.O., NVOD and VOD applications.

Circle Reader Service number 50

low-noise transmitter enables fiber optic links that can exceed distances of 25 km.

The integration of a low-noise amplifier with a linear, telecom-grade, optically-isolated DFB laser module enables spurious-free dynamic performance, >80 dB, according to the company. The transmitter delivers a typical low-noise figure of 5.5 dB, vs. the traditional figure of ~45 dB for similar units. The unit can incorporate an AMPs or GSM ceramic filter to eliminate unwanted out-of-band RF signals.

Circle Reader Service number 55

## Raceway product/systems

CLEVELAND, Ohio—Carlson Telecom Systems



Carlson Telecom Systems' Plenum-Gard

is offering a variety of raceway products and systems, including Plenum-Gard, a low-smoke, low-flame propagation, non-metallic flexible corrugated raceway for use in the management of plenum cable. The UL listed product is available in 3/4-, 1-, 1-1/4-, 1-1/2- and 2-inch diameters along with a complete line of fittings, and is

also supplied with pull tape pre-installed to facilitate installation.

Riser-Gard is a non-metallic flexible raceway for cable protection and management in riser applications. Available in 3/4- through 2-inch sizes, Riser-Gard is also supplied with pre-installed pull tape. Optic-Gard PE solidwall is a polyethylene raceway system available in direct bury and innerduct rated raceways, with ropes or tapes pre-installed.

Intra-Gard is a 3-, 4- or 6-way multiple innerduct cable management raceway system in which each 20-foot section can be assembled by applying solvent cement and inserting the spigot end into a bell end of the raceway. The system also features fixed and flexible elbows, termination kits and accessories.

Multi-Gard is a three or four multiple-celled cable management/protection raceway system used in outside plant direct burial applications. It comes in 20-foot sections with 3-1.5- or 4-1.2-inch pre-installed, PVC silicone lined innerducts coupled by a gasketed coupling body. A new gasket system allows contractors to install cable using high air pressure jetting machines, as well as traditional cable pulling installations.

Circle Reader Service number 56

## Analyzer enhancement

BEAVERTON, Ore.—Tektronix Inc. announced the addition of digital channel RF measurements to its portable 2715 Cable TV Spectrum Analyzer. The 2715's new digital TV channel RF measurements include digital channel averaged power, desired-to-undesired signal power ratio, digital channel triple band and second



Tektronix' 2715 Cable TV Spectrum Analyzer

order distortions and adjacent channel leakage.

In addition, a new companion PC Windows software package simplifies channel table setup, creation of downloadable measurement programs and data collection.

Circle Reader Service number 57

## Vertical cable management

TINLEY PARK, Ill.—Panduit Corporation has introduced the Panduit Vertical Cable Management System that can be used to keep all types of cables organized in a variety of multi-

dia applications including UTP, ScTP, coax and fiber optic cables. The system, which is specifically designed for Category 5 and fiber optic cable applications where proper cable bend radius is required, can be mounted to the sides of standard EIA 19-inch racks or between two adjacent racks.

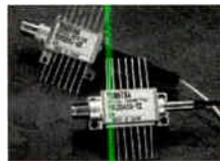
System features include specially engineered duct fingers that hold cables in place, yet may be easily removed for precise cable routing. The duct fingers have rounded edges to protect cables and installers' hands, and a removable cover snaps off the duct so that cables are accessible.

Circle Reader Service number 58

## Laser diodes

SAN JOSE, Calif.—Toshiba America Electronics Components Inc. announced a new line-up in its transmitter and receiver communication laser diode family. The new roster includes five transmitters and four receivers.

The new transmitter modules operate at bit rates from 622 Mbps to 10 Gbps, respectively. Its new receiver modules operate at bit rates from 622 Mbps to 5 Gbps, respectively.



Toshiba's laser diodes

The TOLD321S-TXS1 (622 Mbps)

transmitter has a built-in driver IC and an automatic optical power function that gives designers the flexibility of transmitting through single or multimode fiber. Its receiver module, TOPD323-RXS1, features a built-in 3R function and a sensitivity rate of -29 dBm.

The 10 Gbps transmitter module, the TOLD347S-TX, has a built-in automatic optical power and temperature control function. The 5 Gbps receiver module, the TOPD351-RX, includes a HEMT front-end amplifier.

Circle Reader Service number 59

## Fault locator

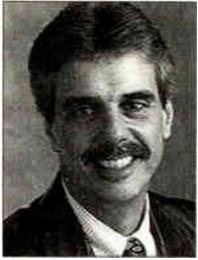
PORTLAND, Ore.—Radarc Engineers Inc. has unveiled its new Arc Reflection Radar fault locator (Model 1557) that is used with thumpers connected to an arc reflection filter to pre-locate high resistance faults on buried primary power cables. The digital radar unit has a freeze-frame feature that captures and holds the fault trace at the instant of the thump, then displays both the reference and thump waveforms. The distance in feet to the fault is also displayed on the 4-3/4 x 3-1/2-inch screen. The locator requires a lower voltage level for thumping which reduces stress on cable insulation.

Model 1557 plugs into most arc reflection filters and is a direct replacement for analog and older arc reflection radars that do not have memory capability.

Circle Reader Service number 60

# People on the move

**Ken Ballschmieder** was recently named Test Engineer of the Year for 1996 by *Test and Measurement World*. Ballschmieder is test engineering manager for Philips Broadband Networks Inc., which he joined in 1988. The award is one of the highest professional honors in the test engineering field, with the winner selected from an international pool of



**K. Ballschmieder**

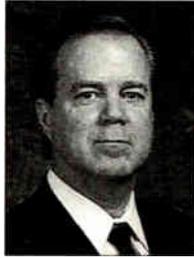
nominees, representing leading electronics firms worldwide. In addition to designing and directing several major Philips' test system designs, Ballschmieder initiated and directed the company's multi-million dollar Factory Test

Automation project which substantially upgraded Philips' test capabilities. He is currently working with Hewlett-Packard to develop open, short and load "F" connector standards that meet Philips' requirements and will be promoted for full industry acceptance when completed.

**Dr. Bobbi L. Kamil** has been appointed president of The National Cable Television Center and Museum, which is in the process of moving to the campus of the University of Denver. Formerly, Dr. Kamil was executive director of Cable In The Classroom for six years, where she oversaw the expansion of the program to more than 74,000 classrooms connected to cable through 32 different cable networks. Winner of the 1995 Vanguard Award for Leadership, Dr. Kamil headed marketing and distribution efforts for the Corporation for Public Broadcasting's Annenberg/CPB project prior to her Classroom position.

Lasertron has announced a number of recent promotions, including **Dr. J. Jim Hsieh** to chairman, **D. Westervelt Davis** to president, **Dale Flanders** to vice president of engineering and **Evan Sanders** to director of sales. Dr. Hsieh, one of the company's founders, moved from his former position as president to reflect his increased day-to-day involvement with Lasertron's joint venture in China—Wuhun Telecommunications Devices Co. Davis was previously Lasertron's vice president, chief operating officer since 1994. Flanders, a 12-year Lasertron veteran, moved from his former position as director of engineering, while Sanders has been promoted from his previous position as Lasertron's sales manager.

**James Steenbergen** has been named president and chief executive officer at Amati Communications Corp. Prior to joining Amati, Steenbergen held the same positions at SRX, a



**J. Steenbergen**

Dallas, Texas-based telecommunications firm. Before SRX, he held a variety of senior management positions with such firms as Optilink Corp., Forum Systems and Granger Associates. Amati has also appointed **Dr.**

**James Hood** as vice president of engineering. Dr. Hood has more than 29 years of engineering, manufacturing, sales and senior management experience in the telecommunications industry, both domestically and internationally.

Thomas & Betts Corp. announced **Neil Parker** has been appointed president of its Electrical Components Division. Parker joined T&B in July 1992 as general manager of Canadian operations and had served as president of Canadian operations since July 1995. Prior to joining T&B, Parker was vice president and general manager of GE Lighting, Canada.

TCI Communications Inc., an operating unit of Tele-Communications Inc., has named **Colleen Abdoulah** to the newly-created position of vice president of marketing for the company's digital television business unit. In her new position, Abdoulah will be responsible for the product development and market implementation of all digital cable video products into the consumer and commercial marketplace. Previously, Abdoulah had served as vice president of marketing and new business development for TCI's core cable business.

**Larry Dickmander** has been promoted to vice president of sales at Dantel Inc., a telecommunications alarm and monitoring equipment manufacturer. Dickmander joined Dantel eight years ago and served as a sales representative, most recently concentrating on the eastern half of the United States.



**L. Dickmander**

**Norman P. Sutterer** has been elected corporate vice president at



**A. Taylor**

Lamson & Sessions. Sutterer will also continue as vice president of Carlon Telecom Systems, an L&S business unit, where he has served for two years. Meanwhile, ACT Communications Inc. has announced **Alan Taylor** has joined the company as its director of sales. An 18-year telecommunications professional, Taylor was an account manager for several major OEM customers with AT&T's former Network Systems Division prior to his ACT appointment.

StarSight Telecast Inc. recently announced three management promotions and the hiring of a new staff member. **Dan Donnelly**, formerly central region director, has been promoted to senior director of cable sales and marketing. **Molly King**, previously product definition manager, has assumed new duties as StarSight's director of program management for the cable and telecommunications industries. **Robin Whitman**, StarSight's former associate marketing manager, has been named cable account manager. StarSight's newest addition is **Joe Stretesky**, who joins the company as the director of cable sales and marketing for the West. Previously, Stretesky had served as western regional director for the Playboy Entertainment Group.

Continental Cablevision Inc. has named **Thom O'Grady** as manager of communications projects where he will coordinate a variety of projects involving public affairs, community relations initiatives and Cable In The Classroom. For the past five years, O'Grady had served as corporate public relations manager for Colony Communications Inc. in Rhode Island.

Augat Communications Products Inc. recently announced two additions to its management staff. They include **Dan Trayler**, who has been appointed national sales manager. Prior to this new position, Trayler had worked with ADC Telecommunications and C-COR Electronics. Augat has also named **Roy Schultz** as broadband product manager. Schultz was formerly with Philips Electronics.

**Mark Ostlund**, formerly with Broadcast Television Systems Inc., has been named strategic business planning manager for Hewlett-Packard's Video Communications Division. Ostlund will direct business planning, overall product positioning, evaluation of markets and identification of long-term strategic opportunities for HP's broadcast business. **CED**

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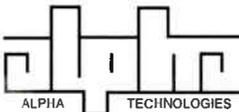
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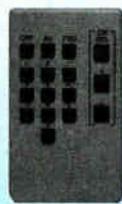
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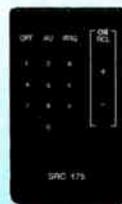
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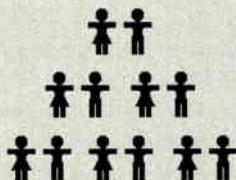
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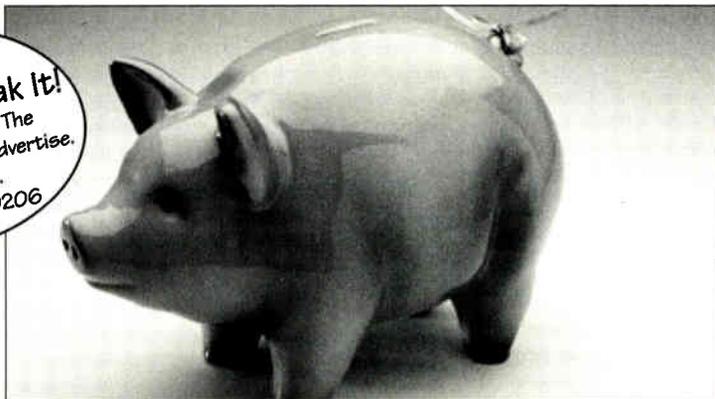
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# Road work continues on the public I-way



By Thomas G. Robinson,  
Director of Regulatory  
Affairs and Technology  
Development, River Oaks  
Communications Corp.

Most of us have heard the phrase, "There are many ways to skin a cat." Hopefully, most of us have never tried any of these ways, although it has always amazed me that people either are feline fanciers or cat haters, and knowing a few members of the cat haters (a.k.a. "felineophobes") group, I would not put it past any one of them, in their younger, wilder days, to have attempted a catskinectomy. The point of all this, though, is not to talk about the literal meaning of the phrase, but rather the analogous meaning that there are a number of ways to accomplish a given task or reach a needed goal. Such is the case with the continuing construction of critical portions of the public I-Way.

For example, New York City's Institutional Network (I-Net), profiled in this column in November 1995, continues to connect all kinds of public facilities, from fire stations to administrative centers to public schools, largely through fiber lines provided as part of cable and competitive access provider (CAP) franchise agreements. On a different note, in the Austin, Texas metropolitan area, installation of the Greater Austin Area Telecommunications Network (GAATN) is nearing completion by Southwestern Bell Telephone BDS/LAN, under contract with the GAATN Authority. Each entity participating in GAATN, however, retains ownership and use of dedicated fibers within the bundles being installed. Participants in GAATN include various government and educational entities like the City of Austin, the State of Texas General Services Commission, the Austin Independent School District (AISD) and the University of Texas at Austin. The network will connect more than 300 sites via about 280 miles of singlemode fiber.

GAATN is composed of 10 rings, utilizing a north and south "super ring" topology, with eight sub rings. Four of the rings are routed through AISD for central administration and telephone switching purposes. The multiple ring topology provides complete redundancy for GAATN participant communications.

A new factor concerning GAATN is the potential ability to gateway participant communications into the residential and business community network being pursued by CSW Communications. Such interconnection opens up opportunities to expand applications like interactive learning, telecommuting and electronic town meetings.

Another approach is exhibited by Montgomery County, Maryland's Fibernet project. Fibernet will ultimately employ about 550 miles of fiber optic cable throughout the suburban Washington, D.C. jurisdiction. It will link all manner of public, public-oriented and public gathering places and facilities, including hospitals, libraries, community services organizations and even

Metro subway stops. Many applications will be facilitated, ranging from public information kiosks, to traffic control and monitoring (a critical need, as can be attested by those who have experienced Washington Beltway traffic jams) to the public schools' Global Access computer learning project. Montgomery County plans to build and maintain the network itself, estimated at a cost of about \$65 million over 20 years. County estimates, though, indicate a savings of 10 times that figure over otherwise leasing fiber lines from private companies.

## Standardized protocols and equipment

Still yet another twist on building public networks is Philadelphia's CityNet. Two years ago, Philadelphia was operating under an older style, terminal-to-mainframe, point-to-point, "turf-oriented" computing environment. Today, the city has moved to a dynamic, redundant, multiple ring fiber-based, client/server architecture that serves a multitude of uses and users. In Philadelphia's case, the fiber optic backbone and network connections are provided by Bell Atlantic through a negotiated tariff, approved at the state level.

As it was investigating CityNet development options, the city determined that several of its major problems with the environment at that time included a lack of network operating standards, inconsistent internal and outside vendor support and a lack of a clear-cut, designated authority to manage citywide networking functions. To remedy this, the city invested overall process development and control authority in the Mayor's Office of Information Systems (MOIS) and mandated a citywide, integrated network architecture that would be developed using standardized protocols and equipment. For example, the city determined that all boundary nodes connected to the fiber ring would be router-based, with routers provided by one vendor. LAN networking would be Ethernet-based, with access feeder hubs also provided by the same vendor.

What CityNet ultimately became is a more than 80-mile, diversely routed, four fiber, dual rotating ring network that supports 100 LANs which network several thousand PCs; more than 75 T-1 circuits; several thousand terminal-to-mainframe circuits and a number of other systems. It has several levels of integrated proactive network management, Sonet upgrade capabilities and expansion potential to ATM transmission.

The right networking answer for any given city—whether it's a system like GAATN, Fibernet, CityNet or some other iteration—is going to depend on its individual networking needs, internal capabilities and external provider climate. With the public-private partnerships being developed, though, it would make sense for the cable industry to look at what Southwestern Bell, CSW Communications and Bell Atlantic have forged with the jurisdictions indicated in these examples.

Who knows? As local governments and cable providers both look to advance their networks, they might be able to skin a few cats—er...accomplish a few objectives—together. **CED**

## Have a comment?

Contact Tom via e-mail at:  
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