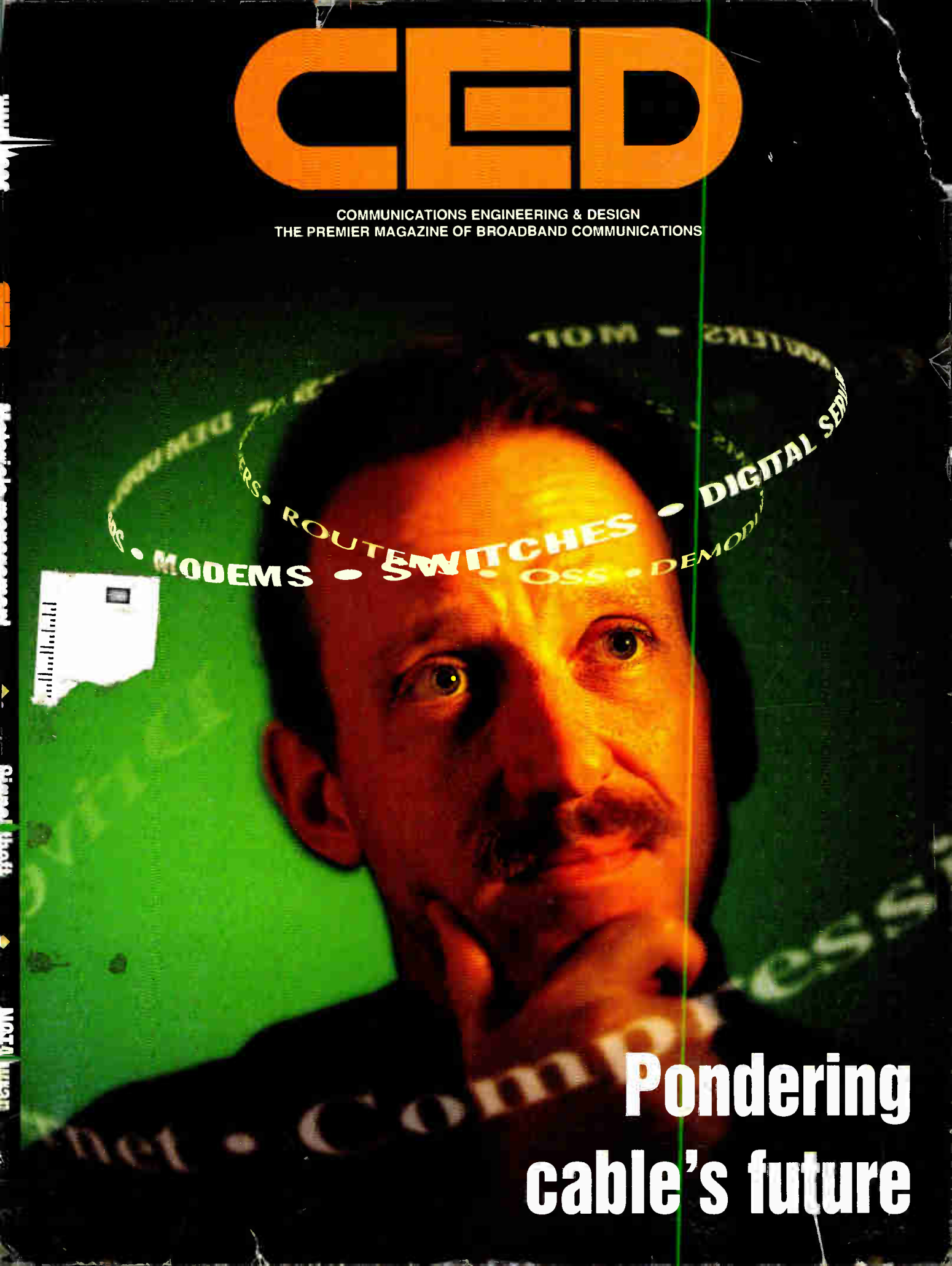
CED

COMMUNICATIONS ENGINEERING & DESIGN
THE PREMIER MAGAZINE OF BROADBAND COMMUNICATIONS



Pondering cable's future

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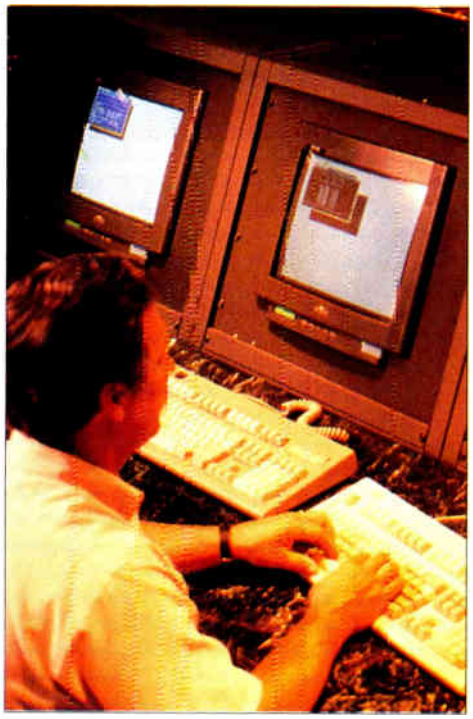
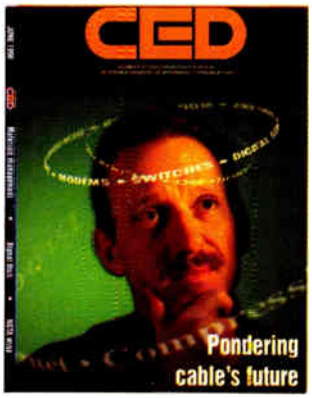
Contents



Features



About the Cover

Photo by Andrew Yates

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Circle Reader Service No. 3

Contents

Columns

Departments

Reader Service

Products

Is ingress making your return path a road to nowhere?

Ingress is the major roadblock to getting your return path up and running. Fortunately, there's the new HP CaLan Sweep/Ingress Analyzer. It's the only test gear that allows you to quickly and accurately troubleshoot your system, regardless of the presence of ingress.

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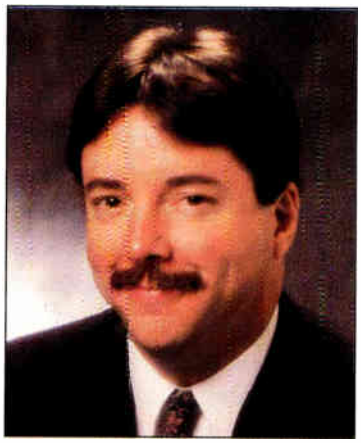

Of missed deadlines and the media

In its struggle for acceptance and attention from the nation's popular press, the cable TV industry has long felt snubbed, misunderstood, picked upon and treated as a second-class citizen. Industry leaders often fretted that their cash-strapped colleagues could never afford a proper level of high-powered Washington lobbyists (to ensure that policy was pro-cable TV whenever possible) or the necessary amount of marketing clout that large staffs and PR agencies provide.

Instead, the industry chose to tout the incredible potential of its network. To blunt the full-court media press campaigns put on by telephone companies and, more recently, competitors like DirecTv, the cable industry responded with the Full Service Network, high-speed cable modems, interactivity, 500 channels and other differentiating services that capitalized on the hybrid fiber/coax network architecture and the vast capacity the network holds.

Lo and behold, the strategy worked. As the general press has become more savvy about Internet access, chat groups and e-mail, the potential of high-speed data transfer over a cable network was not lost on it. The same was true for interactive, digital TV and telephony–suddenly, cable systems were going high-tech with cool new services, and newspapers around the country covered the story.

The cable industry found out just how fickle the news media can be, however. As deadlines came and went without product or services being launched, or when projects took longer than anticipated, the circling sharks turned hostile and began nipping at the operators' heels.

Indeed, cable's nose has been bloodied in recent weeks by the media and on Wall Street by observers who are losing patience with the industry's "promise everything and deliver nothing" track record of late. Not only is the 500-channel world late, but services like @Home are struggling to get off the ground.

Perhaps the industry erred in assigning deadlines and launch dates that were hopeful at best. Reporters are good at remembering deadlines and quick to castigate anyone who misses one. Never mind that software is often 12 months later than planned, or that these new networks require incredible amounts of system integration–those are mere details used to validate excuses. Meanwhile, missed deadlines, like rate hikes, make for screaming headlines.

What the industry needs to learn, if it hasn't already, is how to balance its messages. Certainly it must continue to flaunt its ability to compete with all comers, or investors will bail out in droves and put the industry into a deep economic tailspin. But it should perhaps cease its practice of assigning too-aggressive deadlines to product roll-outs.

My colleagues in the press corps might shoot me for saying this, but maybe the time has come for the industry to do its research and development away from the media spotlight and save its high-profile announcements for products that have progressed past the "brochureware" stage. If you don't have a working prototype or a demo unit, you don't have anything. Stop telling the media what you want to do and start showing us you're actually doing it.

The media sword can swing both ways, and no one can control its direction. The industry apparently is learning that lesson the hard way.

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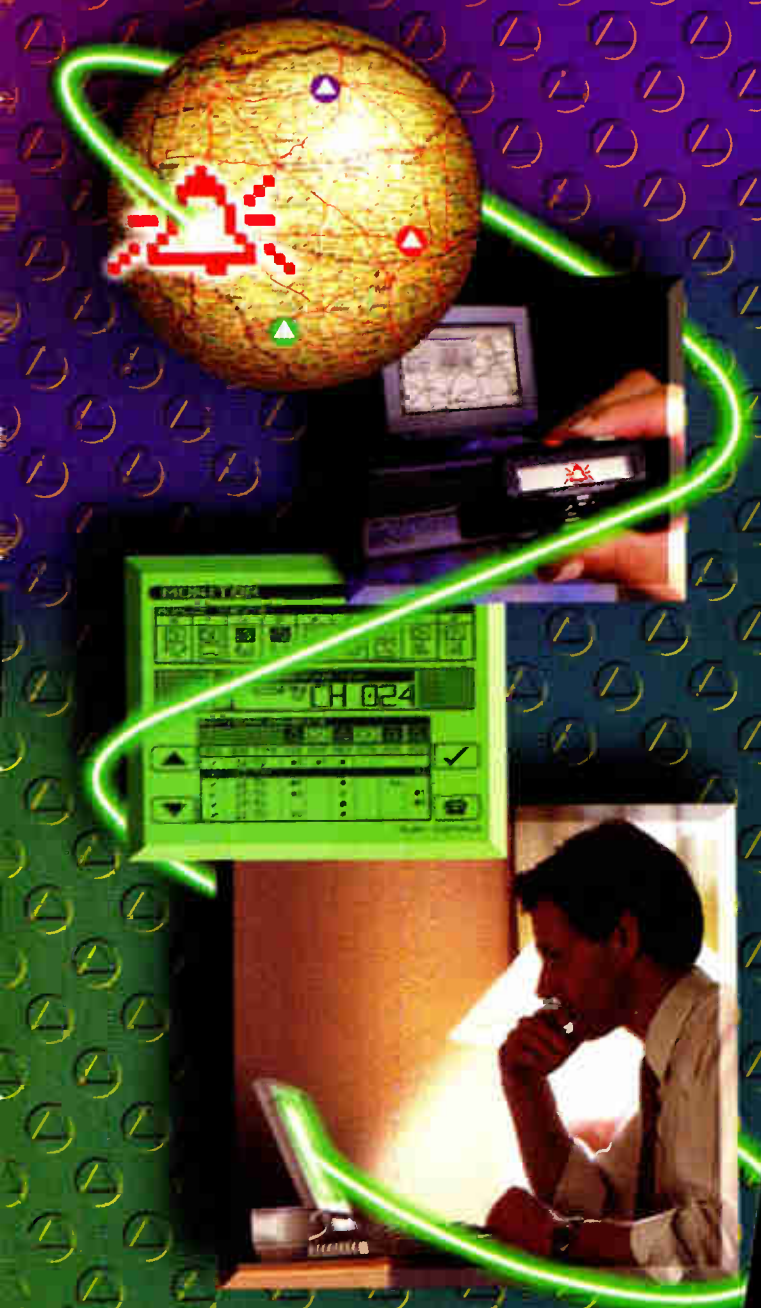

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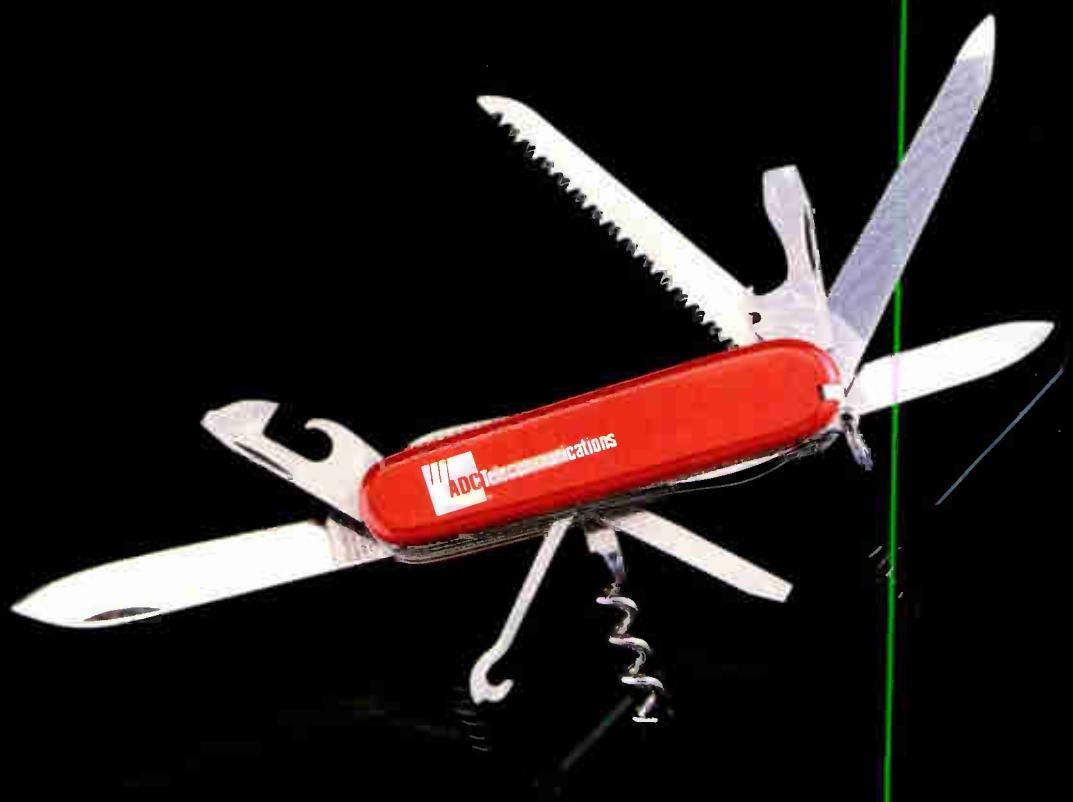

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Anstrom to address SCTE annual confab; new board to be sworn in

The Society of Cable Television Engineers will be addressed by NCTA President and CEO Decker Anstrom, during the annual SCTE Engineering Conference on June 10. Anstrom will speak to the audience about new opportunities that the new Telecom Act made possible. He is also scheduled to discuss the importance of technical excellence in the future as the industry moves to provide new, additional services. As the industry heads in this direction, the need for well-trained service personnel will be paramount, Anstrom will note.

In other SCTE news, the official results of the Board of Directors election are in, and the following people will be added to the Board:

✔Ron Hranac of Coaxial International defeated Alan Babcock and Bruce Weintraub and will serve as an at-large director, representing the entire United States. Hranac has served on the Board previously and served two terms as the Society's chairman;

✔Norrie Bush of TCI of Southern Washington beat Pat Bacon and Ted Chesley and will represent the states of Washington, Oregon, Idaho, Montana and Alaska (region 3);

✔M.J. Jackson of Gilbert Engineering defeated John Green and will represent the states of Oklahoma and Texas (region 4);

✔Larry Stiffelman of CommScope beat Dick Beard and will represent Illinois, Iowa, Kansas, Missouri and Nebraska (region 5);

✔Jim Kuhns of Ameritech will represent Indiana, Michigan and Ohio. He defeated J. David Giesy and Bob Jackson;

✔Steve Christopher of Augat defeated Ken Wright and will represent region 8 SCTE members in Alabama, Arkansas, Louisiana, Mississippi and Tennessee;

✔Maggie Fitzgerald of DVI Communications will represent region 10, which consists of members in Kentucky, North Carolina, Virginia and West Virginia. She beat out Bruce Carlson for that seat; and

✔Region 12 (New England) will be represented by John Vartanian of Viewer's Choice, who defeated William Grant. Vartanian is the current SCTE chairman.

These people will join at-large directors Wendell Woody of Sprint/North Supply and Wendell Bailey of NCTA, as well as regional directors Patrick O'Hare of Viacom Cable, Steve Johnson of Time Warner Cable, Robert Schaeffer of Star Cablevision, Hugh McCarley of Cox Communications and Dennis Quinter of TWC Berks Cable.

Wave sets suppliers for data access trial

En Technology has licensed its Cybercast System to Wave Interactive Network (WIN) for its planned CablePC Project, which will provide high-speed consumer access to multimedia content on a pay-per-use basis.

Wave has partnered with the Palo Alto Cable Co-op, where a 100-unit test of En's TVModem will begin later this summer. Palo Alto Cable Co-op will provide a video channel and related customer services to support the distribution and installation of the TVModems, while several content managers and suppliers, including the William Morris Agency and Simon & Schuster Interactive, will also participate.

En's Cybercast technology transmits data to personal computers using a portion of an analog TV channel, whether it's received over the air, via cable, a satellite or pre-recorded videotape. It operates at speeds of up to 2 Mbps.

The WIN network was designed to give consumers a way to access large quantities of information without new infrastructure investments. The company intends to provide access to movies, CD-ROMs, Web pages and other information, while charging only for the content they actually use. In addition to the En technology, WIN is also using the WaveMeter and WaveNet to deliver its products and services securely to the user.

MCI deploys QWDM to increase capacity

MCI Communications Corp. has deployed a new fiber optic technology that will enable it to quadruple its network capacity without adding fiber optic lines.

The technology, known as Four-Wavelength Wave Division Multiplexing (4WL-WDM or Quad-WDM), allows a single fiber to accommodate four light signals instead of one, by routing them at different wavelengths through the use of narrowband wave division multiplexing equipment.

Currently, MCI's backbone network operates at 2.5 gigabits per second. Using Quad-WDM, that same fiber's capacity rises to 10 gigabits, enough capacity to carry 64,500 simultaneous transmissions over the hair-thin strand.

The additional bandwidth provided through Quad-WDM will allow MCI to offer an array of multimedia applications, including those developed through its MCI HyperMedia product line. One of the first applications is a service for the television broadcast industry, currently being tested by NBC, which enables affiliates to access video content on-demand through servers based in MCI's intelligent network.

The development of this technology came through a collaboration between MCI and Optical Corporation of America (OCA) of Marlborough, Mass., which provides the 4WL-WDM device under a recently placed production order.

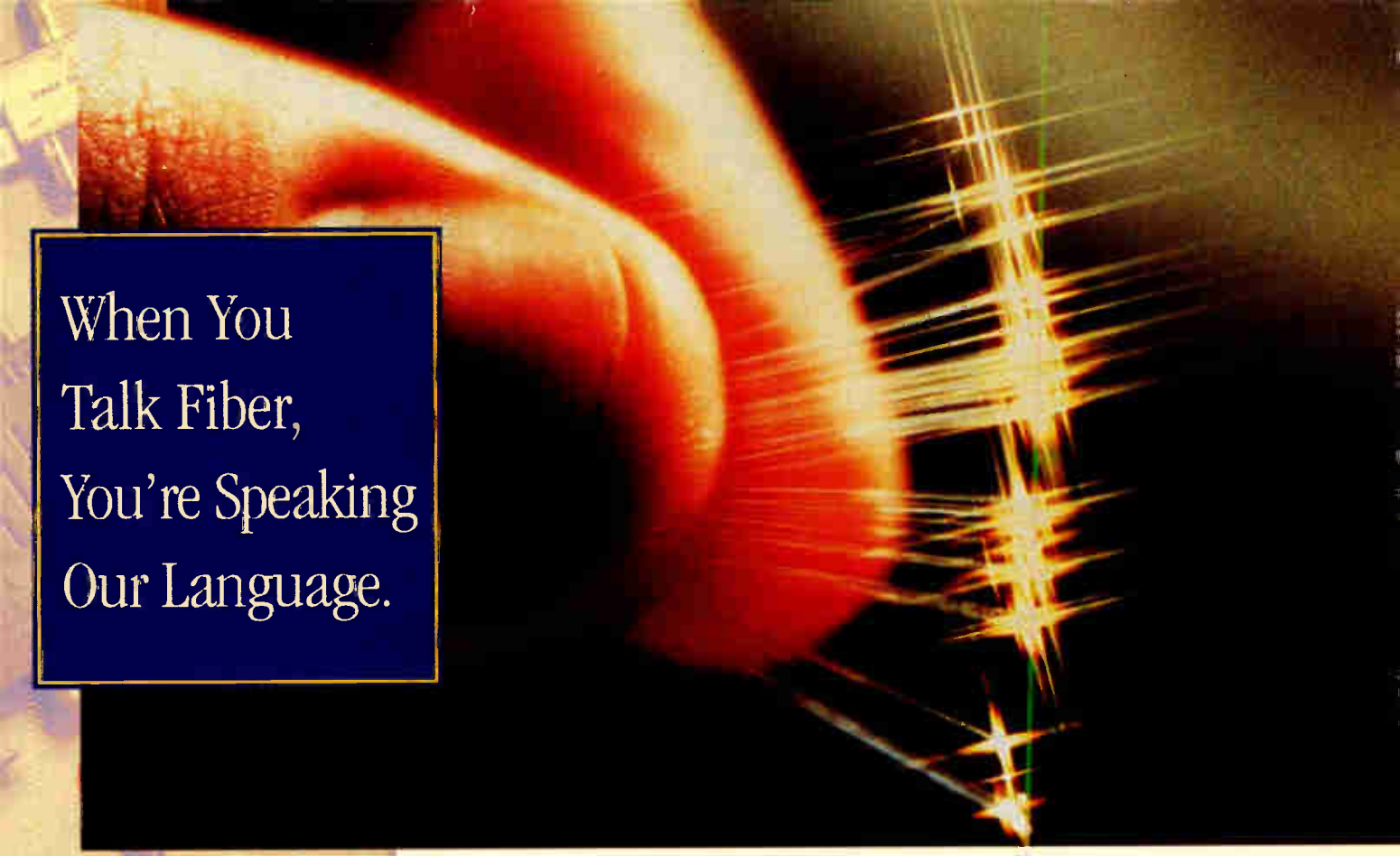
With the new Quad-WDM method, light waves can be transmitted in both directions over a single fiber. For instance, two signals are sent through a single fiber at the 1533 and 1541 nanometers to their destination, where they are separated and sent to receivers. At the opposite end, two signals are transmitted back at 1549 nm and 1557 nm. Transmitting two wavelengths in each direction effectively increases the total capacity from 2.5 gigabits to 10 gigabits on a single fiber.

The OCA WDM units utilize a patented MicroPlasma coating process to produce Environmentally Stable Filters which reduce interference and allow the devices to perform in a totally passive mode. The technology will be deployed in the third quarter of 1996 on a network route between Washington, D.C. and Richmond, Va., and other projects will soon follow.

CAI Wireless goes digital in Boston and Va.

CAI Wireless Systems Inc. has constructed the first digital wireless cable television system on the Eastern seaboard, in the Hampton Roads area of Virginia, and also completed construction of the core transmission facility of its digital wireless cable television system in Boston, comprised of a main transmitter and booster. The balance of the Boston transmission system is expected to be completed this spring.

The Hampton Roads system and the Boston facility have been delivered for testing to Bell Atlantic Corporation and Nynex Corporation, respectively, in connection with their strategic relationship with CAI. The two projects are the first in major markets being built by CAI pursuant to that strategic relationship. The two regional Bell operating companies (RBOCs) have previously announced plans to market



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their own digital programming to consumers in markets in their respective operating territories beginning with selected markets during the fourth quarter of 1996. Tele-TV, a joint venture of Nynex, Bell Atlantic and Pacific Telesis, is creating the technology platform and providing programming for digital television services. Upon successful testing of the completed systems, CAI's digital wireless delivery networks will be available to transport Bell Atlantic and Nynex's programming in Hampton Roads and Boston.

CAI's digital wireless cable networks use MMDS technology and are designed to work with television set-top convertor boxes manufactured by Thomson Consumer Electronics for Tele-TV.

"MMDS is the cornerstone of our entry into video," said Ed Grebow, president of Tele-TV, responsible for designing the technology for the joint venture. "For as long as cable remains analog and limited in its offerings and quality, we have an opportunity to win customers to Tele-TV."

CAI currently operates six wireless cable systems in New York City, Rochester and Albany, N.Y.; Philadelphia; Washington, D.C.; and Norfolk/Virginia Beach, Va. In addition, CAI has a portfolio of wireless cable channel rights in eight additional markets, including Long Island, Buffalo and Syracuse, N.Y., Providence, R.I., Hartford, Conn., Baltimore and Pittsburgh.

Two utilities team with TCI, Microsoft

Brooklyn Union is joining Pacific Gas & Electric Co., the nation's largest investor-owned energy utility, Tele-Communications Inc. and software giant Microsoft Corporation, in a test of energy information services known as "EIS." Using these services, customers in Brooklyn Union's territory will be able to monitor and manage their household energy consumption using their home personal computers.

As an affiliate member of the EIS trial, Brooklyn Union will join a team that now includes eight energy utilities and their respective cable partners, representing both U.S. and overseas interests. Landis & Gyr, a provider of energy efficiency and building optimization, will be the principal provider of energy information-and-control equipment. Andersen Consulting has been named the integrator for the affiliate program. This group of participants makes the EIS trial the most advanced of its kind in the world today, introducing services that could alter the way customers receive energy, information and value-added services from their utility companies.

The primary focus of the EIS trial is market research. In a trial currently being conducted in Walnut Creek, Calif., PG&E's software is linked to a wireless remote control and a television set-top provided by TCI. Microsoft's multimedia operating system connects the interactive services to a television interface. In the second phase of the trial, targeted for installation late this year, Brooklyn Union will connect customers via a PC/Internet interface. Using either of these modes, utility customers can easily access energy consumption data; customize schedules to control lighting, heating and air conditioning; and view energy costs for selected appliances or the entire house. Trial participants will measure consumer interest in these and related energy services.

The current EIS test is expected to reach into 1,000 homes throughout the San Francisco Bay Area, and it is expected that Brooklyn Union will conduct a similar test of at least 100 homes in its territory. Market-research results will be pooled with all of the other trial participants to provide a broad demographic (and climatic) base of data on which to refine the energy products and services currently being developed.

"This is an exciting step for Brooklyn Union into an energy future that is arriving very fast," said Brooklyn Union Chairman and Chief Executive Officer Robert B. Catell. "In this age of energy deregulation, we are becoming a new kind of company that will offer a wide range of services to an expanding base of customers. This alliance with leading-edge companies in this state-of-the-art project can help speed our advance, as well as improve efficiency and save costs."

Other energy utilities whose participation was announced include: KN Energy, an integrated natural gas-services company with operations in eight Midwestern and Western states; Nebraska Public Power District, a public corporation and political subdivision of the State of Nebraska; Orange and Rockland Utilities Inc., which serves electric and gas customers in southeastern New York State, northern New Jersey and northeastern Pennsylvania; Pacific Enterprises Companies, a Los Angeles-based utility holding company whose principal subsidiary is Southern California Gas Company, the nation's largest natural gas distribution utility; PowerGen PLC (United Kingdom), one of the world's major private-sector power-generation companies; and Vattenfall, Europe's sixth-largest power supplier and the leading energy group in the Nordic region.

Meanwhile, in a separate announcement, Florida Power Corp. and Scientific-Atlanta said they will team to pilot a two-way interactive energy services management system later this year. The pilot, which will consist of 1,000 homes and businesses, will allow the company to offer remote meter reading, outage detection, meter tampering detection and remote connects/disconnects. In addition, the two-way system will allow testing of load management and real-time pricing services.

Panasonic will debut digital set-top in '96

ComStream Corp. and Matsushita Electric Ltd. have reached an agreement to develop and produce digital TV set-top products under the Panasonic brand name. The agreement brings ComStream's expertise at conceptualizing, designing and producing video transmission systems and marries it with Matsushita's high-volume manufacturing capabilities and digital TV designs. According to company officials, the deal was done in order to capitalize on the "escalating global demand" for digital TV services.

Manufacturing of the new set-top, which will receive and decode digital signals from satellites, cable headends and MMDS offices, will begin later this year at Matsushita's facility in Wales. Panasonic brand units will be released throughout the first year of the agreement, while ComStream maintains the right to manufacture products under OEM agreements.

ComStream has already supplied more than 1 million demodulator subsystems to Thomson Consumer Electronics for its Digital Satellite System set-top, which is marketed under the RCA brand name.

GI inks DC-II deal with VueScan Inc.

General Instrument Corporation and Itochu International Inc., the parent company of VueScan Inc., have penned an agreement to distribute GI's next generation MPEG-2 commercial satellite receiving products throughout North and South America, excluding Mexico.

Itochu International recently formed the Itochu Cable Services Group, which combines four existing division companies–VueScan, Cable TV Supply Co., Kelly Cable Services and DX Communications. VueScan is currently the world's largest distributor of GI's products, including those manufactured by its

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CommScope division, maker of coaxial cable, as well as other GI branded digital television products. The division also is an authorized GI repair facility for South America. Kelly Cable Services is an authorized GI repair facility for North America.

The deal is seen as a big win by VueScan officials, who took that contract away from Tele-Wire Supply, the distributor and supplier owned by Antec.

VueScan currently distributes a number of other GI products offered by the GI Communications Division, Eastern Operations, based in Hatboro, Pa. It will now take on the DSR-4400, the company's MPEG-2 commercial digital integrated receiver/decoder, within about 90 days. Other IRDs, including the DSR-4000 and the DSR-4500, GI's commercial NTSC IRD, will be available from VueScan this summer.

Itochu International is the North American subsidiary of Japan's Itochu Corp., a $186 billion trading and information conglomerate. Itochu, a Japanese soga shosha (general trading company), is among the world's five largest companies.

GI's next generation of MPEG-2 technology supercedes GI's first generation digital compression system technology, first used commercially in 1993, which is now employed to provide more than 500 channels of programming.

Cox slated to test Ericsson ATM gear

Ericsson Inc.'s efforts to get into the integrated service delivery market were given an added shot in the arm recently with the announcement that Cox Communications will test an integrated, switched, multi-service ATM network in Oklahoma City, Okla. using products developed by Ericsson.

The trial of integrated voice, video, data and interactive services is intended to verify the technical and commercial feasibility of such a switched network, focusing on real-life services and applications that can be deployed across a large customer base. Participants in the trial will have access to telephony services, cable programs, Internet and private data networks. The trial will also encompass digital interactive services such as video-on-demand, and could include an energy management interface that would allow the local power company to monitor and control power usage.

For the trial, Ericsson will provide headend equipment used for service multiplexing, including an ATM switch, as well as network interface units and the necessary interfaces and gateways for the other services.

Cox officials are looking forward to determining how ATM and other emerging technologies could be integrated and used in a cable TV environment when new services, including telephony and high-speed data, are brought on-line. "We believe ATM switched access could be advantageous for the evolution toward the multi-service network," said David Woodrow, senior vice president of broadband services for Cox, in a statement.

US West to take "fiber to the farm"

Who says rural telephone customers won't be able to access new, advanced services like video and Internet access?

US West has chosen E/O Networks as its primary vendor of equipment for rural access applications, and deployment of E/O's FDS-1 fiber optic product is scheduled to begin immediately in Buffalo, Wyo. E/O officials said that, assuming successful operation in Buffalo, the number of installations could grow dramatically throughout the 14-state US West territory.

E/O's product, which has been dubbed "Fiber to the farm," supports all traditional telephony services and allows the addition of broadcast video and high-speed data services at incremental costs. Although the system is based on fiber optic networks, customers can also deploy it over existing copper plant and migrate to fiber in the future.

DSC to integrate Aware modems in products

DSC Communications and Aware Inc. have signed an agreement to integrate Aware's HFC modem technology into DSC's Mediaspan product line. Under the agreement, Aware will develop hardware and software that facilitates the use of its modem technology in Mediaspan, which delivers telephony and data over networks.

The Aware modem is based on Discrete Wavelet Multi-Tone technology, and the chipsets were developed as the result of an Aware/Analog Devices development partnership. The modem works by dividing the transmission bandwidth into hundreds of subchannels that are independent and spectrally isolated. DSC officials believe the approach will allow the company to offer the fullest capacity over the Mediaspan product while minimizing cost.

DSC's Mediaspan product utilizes the company's Litespan-2000 next-generation access platform, which has been deployed by six of the seven regional Bell operating companies.

DSC is a designer, developer, manufacturer and marketer of digital switching, transmission, access and private network system products for the telecom market. Aware provides last-mile technology for broadband communications and high-speed access to the Internet.

Jottings

Lucent Technologies has debuted "Inferno," a software package that supports highly interactive networked applications like e-mail, work-at-home capabilities, video games and pay-per-view TV over virtually any network type. The software requires "minimal" hardware and uses less than a megabyte of memory. Lucent will begin licensing the software immediately to MSOs, telcos, content providers, manufacturers and applications developers . . . Got your free earth station antenna yet? **Hughes Communications** is giving away antennas to cable operators who want to receive Viacom network programming that is available on the new Galaxy IX satellite, beginning this month. The bird will carry west coast feeds of The Movie Channel, Nickelodeon, MTV and Showtime, in addition to the east coast feed of Sundance. Viacom network affiliates are given vouchers for a new antenna. A multi-beam option will allow systems to also receive programming from the adjacent Galaxy V satellite. Check out http://www.hcisat.com/gss/antenna/index.html for info . . . **TCI Telephony Services** has filed with the public utility commissions in Connecticut, California and Illinois to provide wireline telephone services by the end of the year in West Hartford, Conn., the San Franciso Bay area and in Arlington Heights, Ill. The company said it is still pursuing its joint venture with Sprint to provide similar services in addition to pursuing its own strategy . . . Speaking of TCI, the company's system in Tulsa, Okla. was the first to debut Digital Sneak Preview, the first MPEG-2 based programming made available over a cable network. The new digital service will promote major movie titles, and hosted segments will sell viewers on critically aclaimed movies . . . Two-way cable comes to China: In what is believed to be the first application of a 750-MHz, two-way HFC network in China, **Scientific-Atlanta** will be supplying a complete system to Shanghai Petrochemical and Shanghai TV Development General Corp. for the SPC chemical complex and a nearby community of 30,000 homes. The system is also set to become a multimedia test site for high-speed data, telephony over cable and interactive video services . . . . CED

Woo: The SCTE's bridge to standards

Ted Woo was dog-tired. Tired of driving 180 miles to work at the beginning of the week, and 180 miles home at the end of it. The commute from Exton, Pa., where he lived on the weekends, to State College, Pa., home base of his employer, C-Cor Electronics, was clearly taking its toll. But SCTE President Bill Riker took him away from all that, and now, Woo is carving out a niche in a brand-new position as the SCTE's director of standards. "Bill saved me six hours of driving every week; 11 gallons of gasoline each way; and a $5 toll," notes Woo.

Ted Woo, Ph.D.

The relationship is paying off for both parties: since Woo joined the SCTE in January, he has done everything from hopping a train to Washington at a moment's notice to explain the cable technical community's position to the FCC, to working on new standards, to the glamorous job of helping the society move to its new headquarters. What's it like moving from the world of manufacturing to working full-time for a trade association? "I would describe it as an immense degree of freedom, and ample opportunity for creativity," says Woo. "Working for manufacturers, my concentration was on pushing products out the door as fast as possible."

Essentially, Woo's main task at the SCTE is functioning as the direct interface with the American National Standards Institute (ANSI), now that the society has been accepted by ANSI as a Standards Developing Organization. One of the first standards on the SCTE's menu governs the ubiquitous "F" connector.

Woo explains that ideas for new standards will be put forth both by individuals, and by organizations or committees; then, a specific subcommittee within the SCTE's engineering committee will examine the idea; finally, ANSI will take about 60 days for public review of the proposed standard, and at the end of that time, ANSI's executive standards board will vote on it.

Woo will also tackle standards that have grown old and moldy with time, updating them to reflect current practices and expanded technical knowledge, and submitting them to the SCTE's engineering committee for approval.

Other projects on deck for Dr. Woo:

✔Creating a computer database containing information on cable TV equipment manufacturers, distributors and MSOs.

✔"Documentation management," or answering inquiries from SCTE members on everything from how to install cable onto a telephone pole to managing the conversion from analog to digital transmission. Woo's goal is to respond to all requests within 24 hours.

✔Acting as a liaison to organizations like the EIA.

✔Teaching educational sessions on fiber optics and telecommunications as part of the SCTE's regional seminars.

A life in engineering

Fresh out of the U.S. Air Force in 1973, Woo embarked on his engineering career with General Electric, where he designed the fan blades for gas and steam turbines, used in jet engines and power plants. When he went to GE, Woo had a B.S. in math and a B.S. in physics; by the time he left the company, he had earned a master's degree and a doctorate in mechanical engineering as well.

Next, he served a seven-year stint with Northern Telecom (now Nortel) as manager of interconnect. "My job was to ensure that the company's production process would make printed circuit boards capable of lasting a lifetime," explains Woo. Building on his experience in electronics and telecommunications at Northern Telecom, Woo went on to C-Cor Electronics, where he served as manager of mechanical engineering. "I was responsible for the design of everything you can physically touch," he notes. While at C-Cor, Dr. Woo brought the surface mount technology he had learned at Northern Telecom into the fold, leading the company to achieve the Bellcore standard for cleanliness, then on to achieving ISO 9001 and 9002 certification.

In lieu of dessert...

The commute to C-Cor's headquarters in State College wasn't all bad; Woo has two kids in college there, and kept an apartment in the area to serve as their home away from home. Wife Gloria, though, was back in Exton, working and caring for their youngest child, a ninth-grader, which prompted Woo to give up his lengthy commutes.

Though both the Woos were born in China, and lived a mere five blocks apart, it was not until they immigrated to the U.S. that they met. Woo's father brought his family to Iowa when Ted was only 16 years old–his father worked as a professor at the University of Iowa, and later, became department chairman. It is from his father that Woo has inherited the lasting desire to learn, and to teach. Having served as an adjunct professor at Penn State University from 1991 to 1995, he taught one course a week, usually "Microelectronics Materials," to grad students. As Woo explains, "I had nothing to do after dinner, so I taught a course."

His hobby, as he says most poetically, is "promoting the creative mind," helping people who want to learn. "I am very pleased when I see my graduate students go on to do research, or teach in other universities," says Woo. "I am quite happy to see my children find jobs and go off to grad school. In one word, my hobby is research. I encourage my children to find answers. Maybe you never find the ultimate answer, but your drive toward that direction is honorable." Who could be better suited to preserving standards of technical knowledge for future generations? CED

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Taking newcomers under our wing

By Wendell Bailey, VP of Science and Technology, NCTA

Having just returned from the National Cable Television Association's 45th annual show in Los Angeles, I, for one, needed a break. The number of exhibitors that were must-see appointments and the sessions in both the technical and management tracks that called to me were almost (but not quite) overwhelming.

Just in case you haven't heard all the statistics, let me mention but a few: approximately 32,000 attendees, more than 400 exhibitors, many of them new programming services; several hundred thousand square feet of exhibit floor; and more sore feet than you could count.

Who were all these people? Where did they come from? Where do they think we're all going?

Lest I give you the impression that the NCTA is the only place where this type of growth is taking place, just look at the membership rolls of the Society of Cable Television Engineers. That organization, under the leadership of its president and board of directors, has grown to 15,000 members–a huge increase over the last few years. Other groups, such as the CTAM, CTPAA, Cable in the Classroom, WICT, CATA, SBCA and more have also experienced the impact of the changing dynamics of the telecommunications industry.

My first thought, when I actually took a moment to think about it, was to wonder about all of those people who were at the Show in L.A.: were they telephone guys and gals coming to see how the cable industry worked? Surely, some of the increase in traffic is based on that, but it is also apparent that other industries contributed to the crowds as well.

The computer industry sent more than a few, as did the creative types who normally toil in studios and edit suites on behalf of program buyers everywhere. More than a handful of visitors from the former Soviet Union spent time in the area of new program services.

Peeling the onion

It seems that the changes we see in our lives work themselves out in layers. First, the technologies begin to change, then the legislation tries to craft rules that encompass those new possibilities, then, it would appear, the people begin to move. I don't mean that they move in the sense that they change companies, although that, too, does take place. I mean that they "move" by beginning the mental hard work that moves them from one type of endeavor to another.

One can see the manifestation of this metamorphosis in committee meetings, too. First, people sit there, saying nothing. Then they tentatively offer suggestions. Finally, they begin to become part of the process that actually works on an issue on an equal basis with the other committee members. At least, that's how the best newcomers do it. The worst ones come to your committee meeting for the first time and start by questioning why the group does something a certain way instead of a different way. They show no remorse when it is pointed out that that item has already been discussed long ago–that those issues have already been put on the table and taken off.

If, in fact, the currents of change that are sweeping through the industry are arriving in layers, then the next one will consist of the "new enterprises" that the first three layers were preparing for. One does not have to look very hard to see the evidence of that wave of change. Changes in companies are creating new and exciting possibilities for new service offerings, creating new opportunities and introducing us all to our new co-workers and colleagues. How will we (and more specifically, you, the reader) handle this most personal change that is beginning to assail us?

I know more than one MSO engineer who has told me that he views these newcomers with the same trepidation that they have for their next visit to the dentist. They bluntly admit that they don't like to teach people from the "other side" how "this side" of the competitive battlefield operates. Given their druthers, these people would prefer to just see their competitors go away.

On the other hand, even more engineers have told me stories about things they have learned while teaching a newcomer how the cable TV side of the world works. They have also mentioned that they have come to trust and respect these people, too.

Look for the attributes

Of the two ways to look at the world we're headed toward, I would cast my fates with the latter one. Once before, I had to make that choice. But then, I was the one moving into a new industry and trying to find out where the comfort station was. After 15 years in the telephone business, the NCTA recruited me to the cable side. Like everyone with a new job, I went through those awful first couple of weeks alternately wondering what I had gotten myself into, and when the new company was going to figure out that I was in way over my head–and toss me out.

Luckily for me, several highly-placed and well-respected cable engineers took me in and held my hand through those tough, early weeks. No one is claiming that everyone is happy that those guys gave me a chance, but all things considered, I think it has worked out for the best.

So, if you get a chance to work with some of the new people that you might have seen in Los Angeles or at an SCTE meeting, think about it this way: we have plenty of room in this industry for people who have a high degree of talent, coupled with desire. If you can help by bringing people with those attributes to the cable television industry, you will have done everyone a favor. You might have also made a friend in the process. CED

Have a comment?
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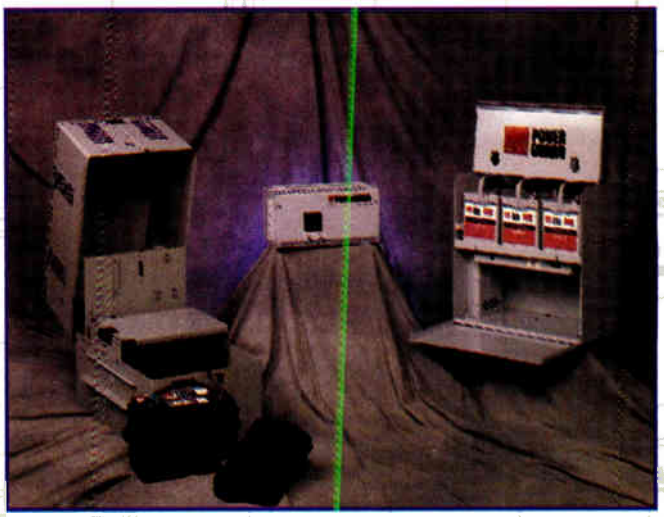

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Circle Reader Service No. 12

Signal level on a cable plant: The first case

By Jim Farmer,
Chief Technical Officer,
Antec Technology Center

I received encouragement for the spectrum analyzer articles I wrote a few months ago, so I'm going to beat that horse a few more times. ("The beatings will continue until morale improves.") This series on analyzers was initiated when my friend Brunswick's headend tech, Coverdell, had trouble using his new spectrum analyzer (February 1996 issue). You may want to refer back to *CED*, March 1996, page 20, for a block diagram of a spectrum analyzer. This time, we apply the spectrum analyzer to the real problem of looking at signal level on a cable plant.

We know that the picture carrier is located 1.25 MHz above the low edge of the channel. The color subcarrier is 3.58 MHz higher, and the sound carrier is 4.5 MHz higher, than is the video carrier. We are not slighting the PAL and SECAM people overseas, who use different sets of frequencies. In the best legalese I can muster, "When NTSC frequencies are referred to, the reference shall be taken to mean those frequencies on which NTSC carriers are placed, and shall be taken to mean, just as generally, the corresponding frequencies on which corresponding carriers and subcarriers are placed in the various PAL and SECAM formats, just as if those standards were referred to explicitly." Whew!

When you measure a picture carrier strength, or amplitude, what are you really measuring? TV signals are amplitude modulated. This means that the signal level is constantly changing as the video changes. By the NTSC standard, the maximum amplitude of the signal occurs during sync pulses. Sync is that part of the signal which tells the TV when to reset the scanning electron beam from the right side of the picture tube, back to the left side (horizontal sync) or from bottom to top (vertical sync). Next is the blanking level, which is slightly blacker than black and is there for historical reasons. Black is a slightly lower amplitude (70.3 percent carrier amplitude), and white is the lowest amplitude, where the carrier is only 12.5 percent of its maximum amplitude. We can talk about THE amplitude of the signal even though its amplitude is continuously changing, because the sync is transmitted at a constant amplitude regardless of the level of any other part of the signal. A device that measures the amplitude of the signal does so by effectively peak detecting the signal and reporting that as the "level."

Note the picture carrier is always changing level as dictated by the picture and sync information it is carrying. When the signal changes, "sidebands" are generated. The discipline within mathematics is called the "Fourier transform," after the French mathematician who first developed it. This is true for the baseband signal, which occupies frequencies from near 0, up to 4.2 MHz. These frequencies in the baseband signal transfer to the RF carrier, each frequency in the baseband signal resulting in a pair of sidebands separated from the carrier by their baseband frequency. If it weren't for the use of a special "vestigial sideband" filter, the RF signal (video only) would occupy a band equal to twice the maximum baseband frequency, or 8.4 MHz.

Right now you are probably asking, "What does this have to do with the price of tea in China, or with measuring the amplitude of a signal?" If we want to measure the amplitude of a modulated RF signal, we must couple enough energy to the vertical deflection plates of the analyzer to accurately reproduce the sync tip level. We don't have to reproduce the entire waveform, but we do have to reproduce enough of the sync that it can reach its maximum amplitude. Two adjustments on the analyzer affect the bandwidth over which the signal is measured. Refer back to the block diagram published earlier. The IF bandpass filter, F1, must be set wide enough to couple the energy required to let the carrier amplitude reach its maximum in the 4.7 microseconds of a horizontal sync tip. Depending on the spectrum analyzer, this adjustment may be called the "IF bandwidth," or the "resolution." The word "resolution" is used because the narrower the bandwidth, the better the analyzer can "resolve," or separate, two signals (but if the resolution bandwidth is too narrow, you won't be able to read the amplitude of a modulated signal).

The trouble with preset filters

After the signal is detected in the log amplifier and detector, it passes to a low pass filter F2, which can also be used to mess up the measurement. Some analyzers call this the "baseband filter," or "smoothing." Other names are used. At this filter, there is a signal having the amplitude modulation of the TV waveform (as much as got past F1), plus modulation imposed by the spectrum analyzer sweeping through the signal. If F2 doesn't let enough of the waveform through, you will not display an accurate enough waveform on the CRT, so you will not measure an accurate signal level.

From experience, you really need to set the bandwidths of both filters to at least 300 kHz in order to measure the signal strength of a TV signal. A lot of analyzers try to make life easier by setting F1 and F2 automatically. Unfortunately, despite the good intentions, this makes life more complex. The manufacturer doesn't know what you intend to measure, so he sets up the filter bandwidth so that you could make a good reading on a CW signal. You cannot measure a modulated TV signal with those settings, though!

Try measuring CW signals and TV signals with different resolution and baseband bandwidths some time. Play with the filter adjustments, as well as with sweep time, and see how the apparent amplitude changes. The highest amplitude is probably correct. Measuring digital signal levels involves a whole bunch of other concerns, which we'll cover another time. CED

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Reed Hundt and the chilling of HDTV

By Jeffrey Krauss, high definition anticipant and President of Telecommunications and Technology Policy

FCC Chairman Reed Hundt is dragging his heels on HDTV, and that's bad for the country and for video industries like cable TV, broadcasting and TV set manufacturers. He claims he wants to let the marketplace make the decisions. But there's a chicken-and-egg problem. In this case, we'd all be better off by having the FCC, not the marketplace, decide to go ahead with HDTV. Otherwise, we risk losing our lead in this technology to other countries. Remember VCRs?

Testing of the Grand Alliance Digital HDTV system was completed last summer. The test results showed that the HDTV system performed very well. The FCC's Advisory Committee on Advanced Television Service submitted the report of the testing to the FCC, and voted itself out of business. The Advanced Television Systems Committee (ATSC) took up the task of documenting the technical specifications, and that work was largely completed earlier this year. You can download the HDTV specifications from the ATSC's web site, at http://atsc.org.

Also last fall, the FCC announced that it would have three separate proceedings on HDTV, one to look at policy issues, one on technical standards, and one to assign specific TV channels to broadcasters in each city. The first proceeding is well along. It deals with must-carry issues and whether broadcasters must devote some minimum amount of time to transmissions in high definition, as opposed to transmitting multiple standard definition channels. Comments were submitted last November, and reply comments were delayed until January because of the government shutdown.

The FCC was forced to delay its channel assignment proceeding, because the broadcasters got hung up in the Congressional budget debate over auctioning the TV spectrum. (See "Broadcasters must repent," June '95.)

But there was no reason to hold up the technical standards proceeding. The FCC should have started that in January, and it could have adopted HDTV technical standards by September.

The broadcasters got themselves into Congressional trouble last year by saying they wanted to use their new digital channel for multiple standard definition video (SDTV) programs, not necessarily for HDTV. The FCC chairman agreed with them. He thinks that broadcasters should have the freedom to use that 6 MHz channel for any service that the marketplace wants—SDTV, mobile, paging, whatever. Maybe even HDTV. He isn't opposed to HDTV, but he is opposed to having the government require HDTV as a mandatory rule.

Not only that, but he's opposed to the FCC even adopting a technical standard for digital television. Some have argued that Hundt is doing this to protect the Hughes DirecTv DBS service, because DirecTv uses a digital video compression method that does not comply with the ATSC standard. Hundt's former law firm represents Hughes.

Anyway, Hundt is in the minority. Right now he is one of four FCC commissioners. The other three are in favor of HDTV, and are in favor of adopting HDTV standards.

But the FCC chairman is enormously powerful within the agency. He sets the agenda. He decides when issues will be decided, when proposed rules will be adopted, and when to bury an issue if he doesn't quite have the votes. But at three-to-one against him, he doesn't have the votes to bury HDTV.

The chicken-and-egg problem

In general, I like the idea that the marketplace should make decisions, rather than the government. Particularly in cable TV standards, the technology is changing so fast that detailed government technical standards might freeze the technology and stifle innovation. But mandatory standards do bring benefits. They eliminate confusion in the marketplace. They provide consumers with the certainty that the device they buy will work with the service and won't quickly become obsolete.

There is a chicken-and-egg problem with HDTV. Broadcasters won't want to spend the money on HDTV transmitters and programming until consumers have the HDTV receivers to view the programming. And consumers won't want to buy the new TV sets until there is programming to watch. And if consumers don't want to buy, then TV manufacturers don't want to build receivers.

Consumers will be able to buy convertors, boxes that receive digital video broadcasts and display the video on an analog TV set. That's exactly what a DirecTv DSS box is, a digital-to-analog convertor box. But those boxes only receive SDTV, not HDTV. A proliferation of those convertor boxes, to receive digital SDTV broadcasts, could dissuade consumers from buying the more expensive big screen HDTV receivers.

Right now, there is uncertainty in the video marketplace. Will broadcasters do any HDTV broadcasting? FCC adoption of an HDTV standard, coupled with a requirement that at least a few hours a week of broadcasting must be in the HDTV format, will go far toward reducing that uncertainty.

Perhaps this uncertainty might hurt broadcasting, but maybe it's good for cable TV. Maybe cable programmers like HBO can deliver HDTV programming, even if broadcasters do not. Wrong. TV manufacturers won't have enough incentive to start delivery of HDTV receivers if broadcasters opt out. Consumers will be less likely to buy an HDTV receiver if only cable programmers, not broadcasters, are delivering HDTV.

So let's get going, FCC. Adopt the Grand Alliance standard, assign the channels, and let's get started. Bring some certainty to an uncertain market. Otherwise, we'll see foreign companies take the lead away from the U.S. companies that pioneered digital HDTV. CED

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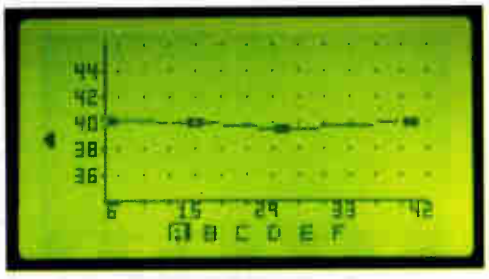

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Don't get clipped on the info highway

Tackling signal degradation caused by laser clipping

By Donald Raskin, Principal Engineer; Dean Stoneback, Staff Engineer; John Chrostowski, Lead Engineer; and Rudy Menna, Staff Engineer; Transmission Network Systems, General Instrument Communications Division

What causes clipping in cable TV systems?

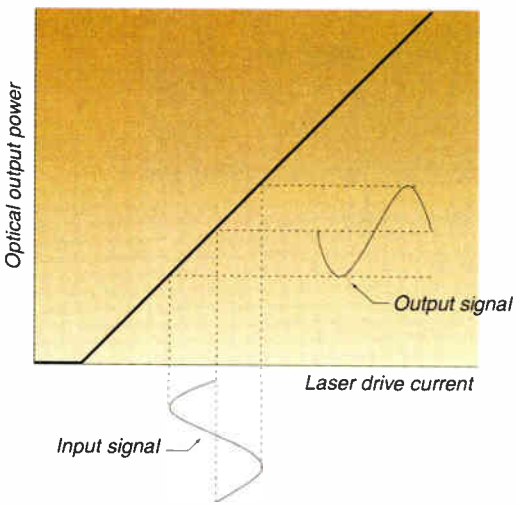
When an applied electrical signal amplitude goes beyond the level capability of a device, we say that the signal is "clipped" by that device. A simple, but extreme example would be an AC signal applied to a circuit through a diode. In that case, the diode would clip 100 percent of one polarity of the AC current signal. In cable television systems, laser transmitters cause more subtle clipping of the RF signal when the amplitude of the composite signal exceeds either the bias current, in the case of a directly modulated semiconductor laser, or the modulation limits for an external modulator (ex-mod) in a 1550 nm or YAG solid state transmitter. This is shown graphically for a DFB laser and an ex-mod in Figures 1 and 2, respectively. Keep in mind that these diagrams are somewhat misleading because of their over-simplification of the highly complicated signal that is applied to a cable TV analog laser. In a real cable TV transmitter, clipping is supposed to occur only when all of the many individual signal amplitudes "line up." Fortunately, with properly designed equipment in modern high-channel-count systems, statistical averaging works to make this a relatively rare event.

RF amplifiers can cause clipping, as well, when the input signal exceeds the bias of transistor elements. In nearly all cases this is not a problem in cable TV, since the RF levels that cause noticeable clipping would already be significantly beyond the distortion limits of the amplifier. Recently, however, two changes in cable TV operations and technology have raised questions about the importance of amplifier clipping: (1) the much greater signal loading of return systems has driven the RF levels at return node amplifiers close to clipping limits, and (2) the desire to use GaAs amplifiers has encouraged the use of lower bias voltages (e.g., +12 VDC, rather than the traditional +24 volts). We have found situations in which clipping can be a problem in the return amplifiers. On the other hand, our initial investigation of 12V amplifiers does not indicate reasons for concern.

Acknowledgments

The authors wish to thank Dr. Henry Blauvelt of Ortel Corp. and Dr. James Farina of Photonic Applications, Inc. for insights into the clipping of DFB and ex-mod transmitters, respectively. Dr. Blauvelt was a key contributor in the development of the quantitative clipping test for DFBs. The skillful assistance of Vipul Rathod, Mark McCusker, Albert Bachman and David Mascaro of General Instrument in obtaining the data was invaluable.

Figure 1a: DFB laser in linear operation

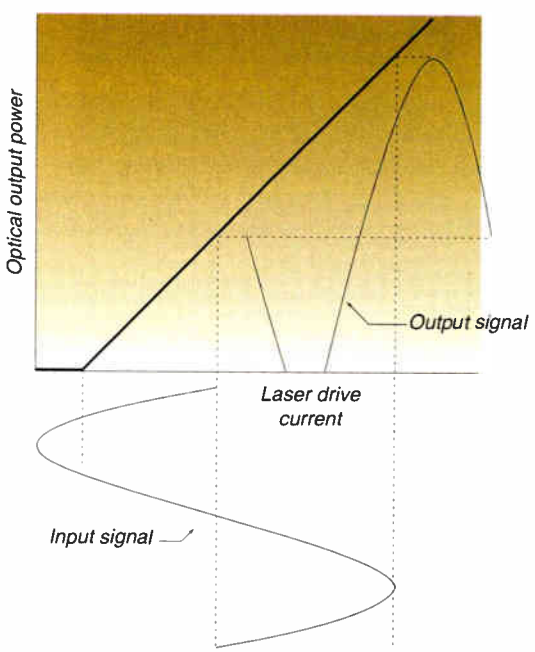


Effects of clipping

From Figures 1 and 2, one can see that DFB lasers cause clipping only in the downward direction, whereas the ex-mod clips bidirectionally. We can understand the effect of this difference by imagining the clipped output signal as the sum of an unaffected ("pure") signal and an error signal (Figures 3 and 4). For a sinewave input, the error signal in the DFB case is an even function, while that of the ex-mod is odd. This means that the clipping events will show up on a spectrum analyzer at the CSO beat frequencies for a DFB and at the CTB beats for an ex-mod. Based on this discussion, it is possible to think of clipping as a random series of short-duration distortion events.

Typically the forward clipping events last for about 100 microseconds, or about 11/2 horizontal television scan lines. Clipping events in DFB laser transmitters appear as dark or light horizontal flashes on a TV screen. These are easily seen in a display of a medium brightness flat field (~ 50 IRE), which is how we made subjective evaluations of analog clipping. In the ex-mod

Figure 1b: DFB laser in clipping



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Clipping events in DFB laser transmitters appear as dark or light horizontal flashes on a TV screen

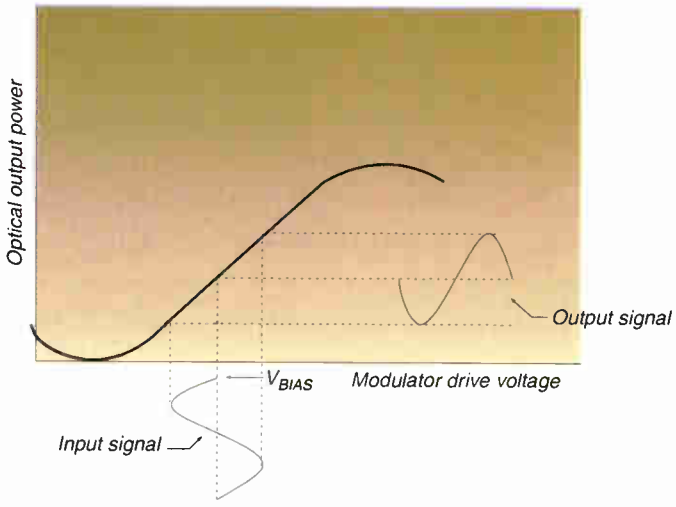
transmitter case, analog clipping shows up as random "busy-ness" on a flat field TV display. RF amplifier clipping would manifest itself in a similar way, since it is bi-directional.

Clearly these clipping events also have the capability of interrupting the flow of digital data, hence to cause errors. We have used uncorrected bit error rate (BER) measurements to determine the severity of clipping on these signals.

Forward path testing

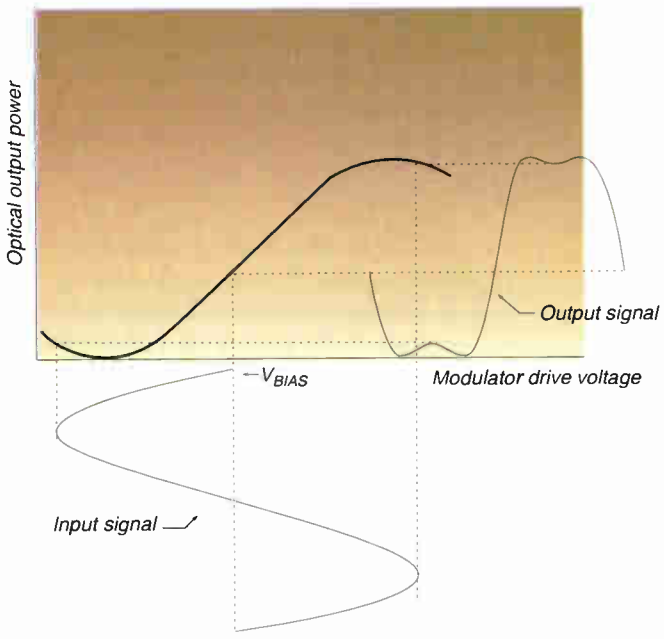
DFB lasers. Over the past three years, we have found that the subjective picture quality of signals transmitted over fiber by high quality DFB analog transmitters is limited by clipping in the lasers, rather than by the traditional second and third order distortions. As noted above, this clipping shows up as annoying horizontal flashes in a picture. Because of the obvious need for a quantitative test to determine when a laser is operating properly, we examined a number of approaches. Ultimately a time domain measurement was found that correlated well with the flat field tests: a spectrum analyzer is set at zero span on a mid-frequency

Figure 2a: Externally-modulated signal in linear operation



CSO beat frequency at resolution and video bandwidths of 30 kHz and is allowed to make a single sweep of 30 sec duration. The display will show a rough baseline with several distinct peaks due to clipping (Figure 5). We have found that the amplitude of the highest peak is not a good indicator of subjective picture quality. The height of the *tenth highest peak*, however, turns out to be a very

Figure 2b: *Externally-modulated signal in clipping*



good indicator of clipping quality: if the tenth highest peak measures greater than -45 dBc. we observe noticeable clipping in the picture.

Tables 1 and 2 give the results of a number of different tests of forward laser transmitters carrying 77 analog channels from 50 to 550 MHz and 200 MHz of simulated digital loading (including one channel of 64-QAM or 256-QAM) from 550 to 750 MHz. These show the effects of different operating levels and of relative levels of digital to analog. The column "CSO Clip" in Table 1 gives the result of the time domain test described above. As stated above for DFBs: (a) there are no measured clips at the CTB points and (b) CSO clip numbers larger than -45 dBc are reliable indicators of observable video clipping. Interestingly, for the digital signals, if we define (somewhat arbitrarily) the acceptable level of uncorrected BERs as being $<10^{-9}$, then clipping appears to become unacceptable for the digital at essentially the same laser operating point as for the analog. (That statement applies only if the digital levels are set within 0 to 10 dB

Clipping events also have the capability of interrupting the flow of digital data

The amplitude of the highest peak is not a good indicator of subjective picture quality

below the analog.) Since the 10^{-9} criterion is likely to be very conservative for error-corrected forward signals, it appears that digital signals in the forward path will generally not be limited by clipping.

Notice that the laser input level that gives acceptable analog clipping performance is approximately 2 dB less than the level that gives a CTB of 65 and a CSO of 62. We have found that this is generally the case.

As a further test, the fiber link was connected to the peak-to-RMS ratio measurement system described in Appendix 1. This system allows a measurement of the peak-to-RMS ratio of the device being tested. The maximum ratio observable is about 15 dB. At nominal levels, the laser's ratio was about 14 dB. When the drive level was increased by 1 and 2 dB, the ratio decreased to 13 and 12 dB, respectively. The histogram clearly showed that only one side of the waveform was clipping. This is expected with a directly modulated DFB. The ratio of the other side of the waveform remained at 14 dB.

Externally-modulated transmitters

Limited tests of a 1550 nm ex-mod transmitter (Table 2) indicate that clipping exceeds test criteria at about the same drive level as does distortion. Note that the clips occur at the triple-beat frequency, as expected. All three drive conditions give tenth-clip-event heights equal or greater than -45 dB. Again the clipping manifests itself as a "busy" picture, rather than as one with horizontal streaks.

RF amplifiers

We have confirmed the expectation that clipping degradation is highly unlikely for conventional push-pull and power-doubled hybrid amplifiers in a wide range of normal operating points. The test setup is described in Appendix 1. The multiple carrier generator was inserted into a 750 MHz power doubled amplifier. The output voltages can be predicted as follows:

For an output level of +44 dBmV per channel for 110 channels into 75 ohms, the RMS value will be:

$$RMS_{110} = 10^{\left(\frac{44}{20}\right)} * \sqrt{110/1000} = 1.66 \text{ volts}$$

and assuming a peak-to-RMS ratio of 14.8 dB, the peak value will be:

$$PEAK_{110} = 10^{\left(\frac{14.8}{20}\right)} * 1.66 = 9.1 \text{ volts}$$

The peak-to-RMS ratio remained constant at 14 to 15 dB until levels were increased to more than +52

Figure 3: *Decomposition of DFB clipping*

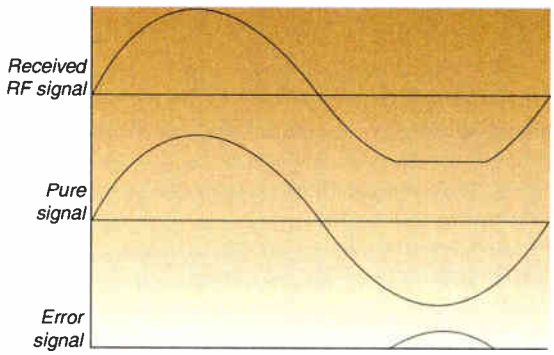


Figure 4: *Decomposition of external-modulator clipping*

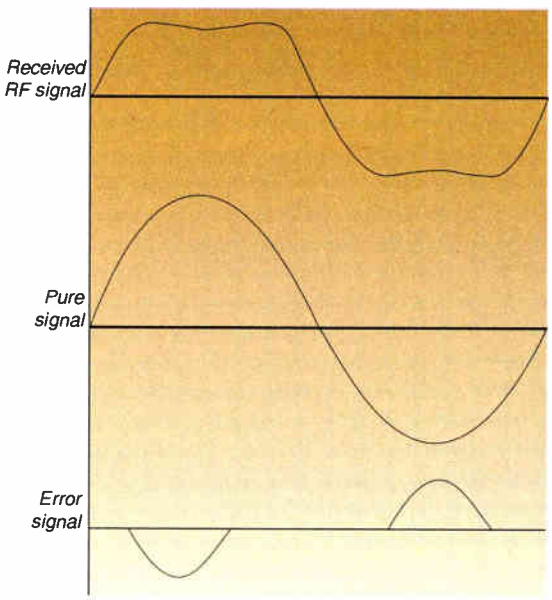


Table 1: *Directly modulated DFB*

	Subjective clipping			Mid frequency				High frequency			
Drive level	Ch 36 (Mid freq.)	Ch 77 (High freq.)	BER (64 QAM)	CSO Clip	CSO	CTB	C/N	CSO Clip	CSO	CTB	C/N
CW Loading; Noise & digital 10 dB down:											
Nom	Very visible	Very visible	1.60E-06	-36	78	65.3	52.0	-34.5	62.5	64.9	53.2
-2	None	None	3.00E-10	-49.8	79	72.4	50.0	-46.2	65.5	71.1	51.1
CW Loading; Noise & digital 5 dB down:											
Nom	Visible	Visible	1.30E-08	-39.6	78	66.5	51.3	-34.5	62.9	66.2	51.8
-1	Barely visible	Barely visible	>4E-10	-45.6				-42.7			
-2	None	None	>4E-10	-50.4	78.5	73.7	49.6	-51.5	66.1	72.1	50.2

Note: Drive level is reference to the "nominal" setting. Nominal refers to the level which is automatically chosen by the transmitter's AGC circuit to match the factory calibrated operation point.

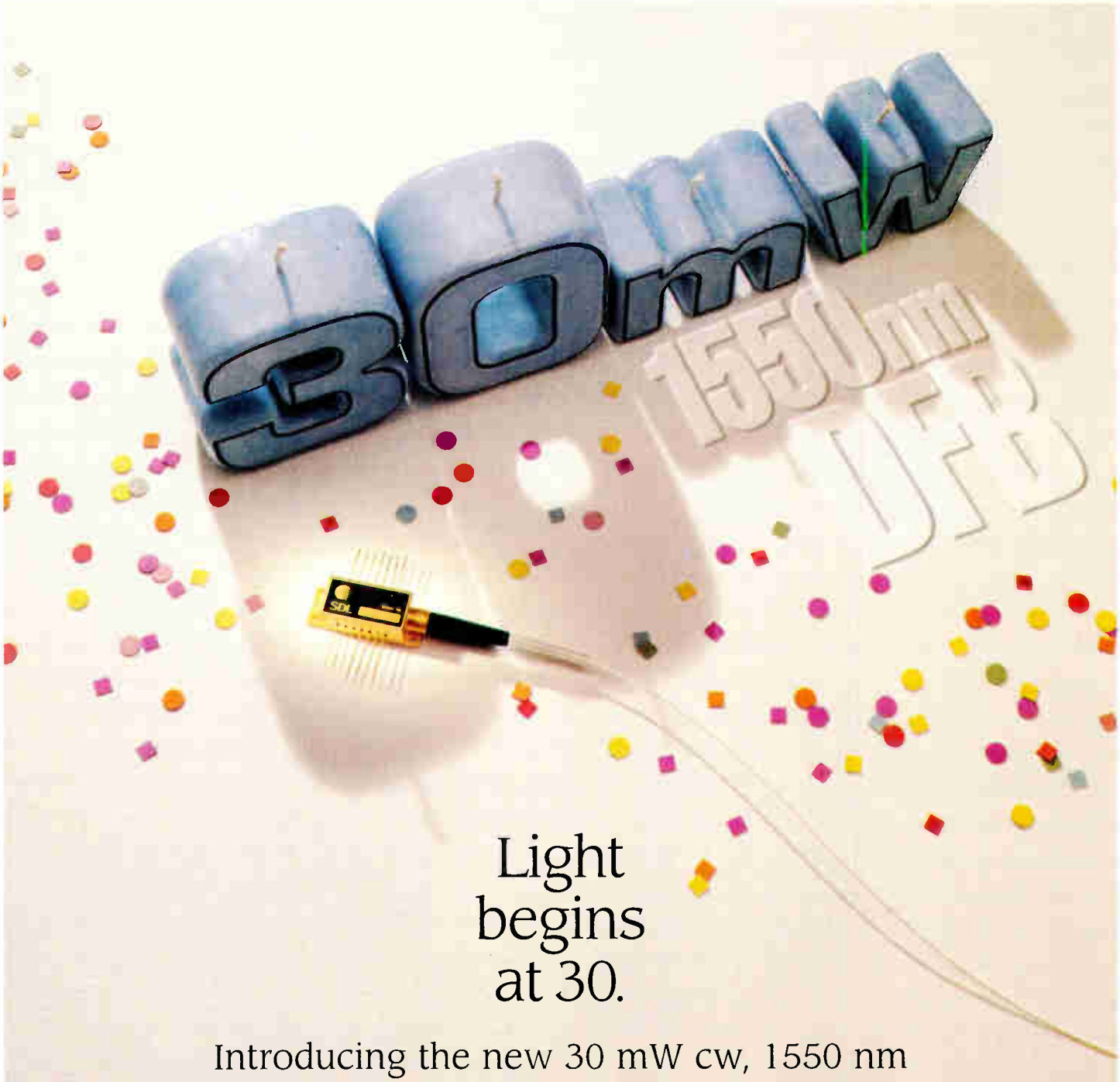


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Table 2: External modulation

	Subjective clipping			Mid frequency			High frequency			
Drive level	Ch 36 (Mid freq.)	Ch 77 (High freq.)	BER (64 QAM)	CSO	CTB	C/N	CTB Clip	CSO	CTB	C/N
Nom	None	None	1 E-09	-67.7	-64.8	49.9	-45.5	-66	-64.8	48.4
+1	None	Some CTB	3 E-09	-68.2	-62.7	50.2	-40.5	-66.4	-63.1	48.8
+2	-	-	-	-	-	-	-37	-	-62	-

Clipping degradation is highly unlikely for conventional push-pull and power-doubled hybrid amplifers

dBmV per channel at the amplifier's output. The CTB was an unacceptable -55 dBc at +51 dBmV output. At +55 dBmV the peak-to-RMS ratio decreased to about 12.5 dB. The calculated peak voltage at this level exceeds the 24 volt supply, so it is no surprise that the peaks are clipping. The conclusion is that the amplifier does not clip until the CTB is intolerably bad.

As a further confirmation, a 12 volt amplifier was tested at +44 dBmV output per channel for 110 channels. The peak-to-RMS ratio was 14.9 dB, which is taken to signify that there was no clipping of the output.

Return path testing

QPSK digital. The effect of clipping on an HFC communications network is not limited to the forward path. Both the amplifiers and lasers in the return path can adversely affect the performance of digital signals if they are being operated too far into clipping. To investigate this phenomena, various components were loaded with a signal consisting of a real QPSK signal and filtered noise, all at a constant-power-per-Hz loading, to yield a total bandwidth of 35 MHz. In order to measure the amount of Composite Intermodulation Noise (CIN), there was a 50 dB notch in the middle of the noise. The depth of this notch directly correlates to the CNR of the link for any system that is loaded on a constant-power-per-Hz basis[1]. The CNR was compared to the average Bit Error Rate (BER) for various drive conditions. A typical result is shown in Table 3. Note that throughout this paper, BERs are measured with no error correction.

The RMS-to-peak ratios for various types of modulation and for noise are given in Appendix 2. The Peak OMI in Table 3 is calculated with an assumed average ratio of 11 dB. Note that the laser is always very far into clipping. However, the BER does not get bad until the CNR degrades. Essentially, the limiting factor here is distortion, not clipping. The table demonstrates that a measurement of CNR should be sufficient for predicting BER, with no special consideration needed for clipping.

A common problem with the return path is the exis-

Table 3: QPSK at various OMI

dB relative to 35%	RMS OMI (%)	Peak OMI (%)	CNR (dB)	BER
_	35	124	44	$<1*10^{-9}$
3	49	174	36	$<1*10^{-9}$
6	70	248	27	$<1*10^{-9}$
9	99	351	19	$<1*10^{-9}$
10	111	394	-	$2*10^{-2}$

Figure 5a: Clipping test passing

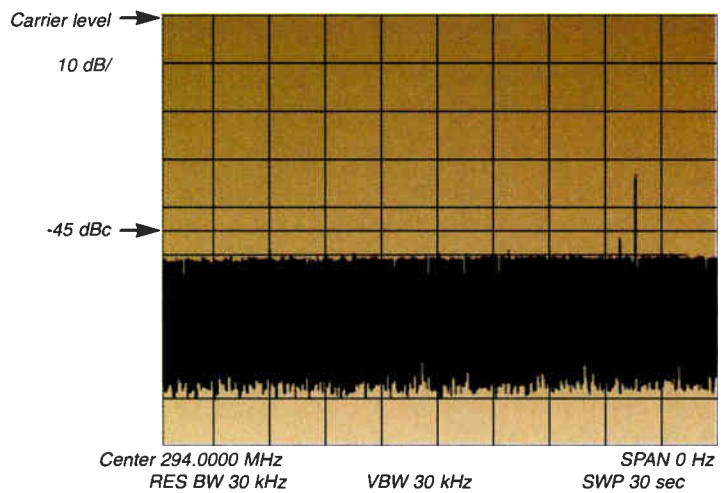
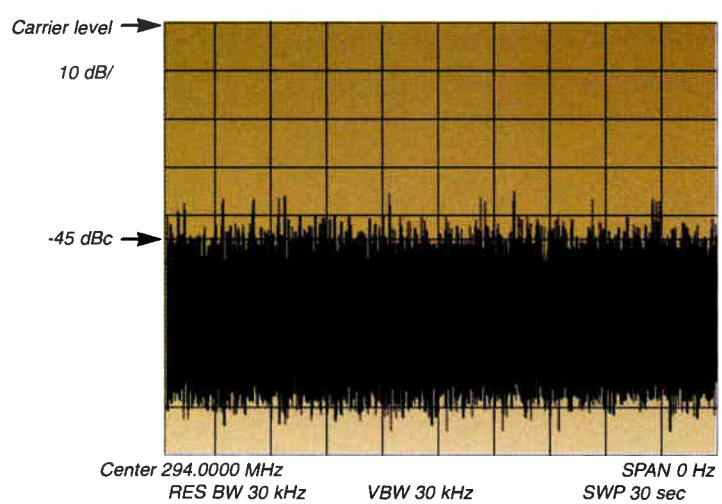


Figure 5b: Clipping test failing



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tence of large interferers (ingress). To determine how much interference can be tolerated, a CW interferer was injected into the laser along with the QPSK and noise payload discussed previously. The result is that, once again, the CNR is a good representation of the achievable BER. As the CW level was increased, the CNR would go down (due to an increase in CIN), and eventually, so would the BER. However, if the interferer was injected at a much higher frequency (such as 100 MHz) where the spectrum of the beats with this carrier did not fall on top of the QPSK signal, the CNR did not degrade and neither did the BER. This was true even with the CW at an OMI of 350 percent. This clearly indicates that clipping is not directly a threat.

n-QAM digital. The QPSK tests described above were repeated for 16-QAM and 64-QAM in an effort to determine the effect of clipping on amplitude-dependent signals. The data in Table 4 shows only slight differences between the drive-level dependence of the QPSK and 16-QAM data streams, which may be attributable to measurement error. The 64-QAM is somewhat more sensitive, due to its higher carrier to noise requirement. However, for a given BER, the higher order QAM modulation formats require a higher CNR as the laser is driven into clipping. This is most likely due to the amplitude component in n-QAM which does not exist in QPSK.

Table 4: Required CNR to obtain 10^{-6} BER

	QPSK	16-QAM	64-QAM
Direct	23	24	28
Laser overdrive	19	23-28	35-39
Amplifier overdrive	21	25	40

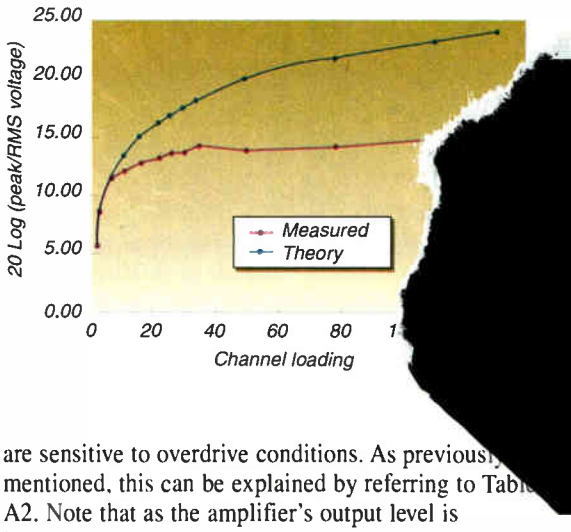
The data given in Table 4 has a several dB margin of error because the actual modulation signal was at 44 MHz, whereas the CNR was measured at 22 MHz. Nevertheless, some trends are evident. The term "overdrive" refers to a signal which is higher in amplitude than the recommended operating level of the device. The drive levels were increased until the BER degraded to 10^{-6}. Both QPSK and 16-QAM are relatively unaffected by either the laser or the amplifier overdrive. The 64-QAM, however, requires an increased CNR for equivalent performance when passed through a device that is being overdriven. This can be explained by the peak-to-RMS data given in Appendix 2. At a BER of 10^{-6}, the laser is 3 dB above nominal and the hybrid is at +67 dBmV total power out. Table A2 demonstrates that at these levels, the peak-to-RMS ratio is being compressed. This compression is likely to cause errors in the amplitude component of the 64-QAM signal. Similarly, 64-QAM is not as immune as QPSK to large out-of-band CW interference (such as the 100 MHz CW carrier at 350 percent OMI mentioned in the previous paragraph).

Table 5: BER and CNR vs. output level for return path hybrid

Total output power (dBmV)	CNR	QPSK BER	16-QAM BER	64-QAM BER
45	>50	$<10^{-9}$	$<10^{-9}$	$<10^{-9}$
65	48	$<10^{-9}$	$<10^{-9}$	$<10^{-9}$
68	39	$<10^{-9}$	$<10^{-9}$	$2*10^{-6}$
73	24	$<10^{-9}$	$1*10^{-6}$	
75	21	$1*10^{-2}$		

Amplifiers. The ability of return path amplifiers to handle large amounts of high-level data was tested. The tests conducted were very similar to those described above for return path lasers. Table 4 indicates that 64-QAM signals

Figure 6: dB ratio of peak/RMS voltage vs. channel loading



are sensitive to overdrive conditions. As previously mentioned, this can be explained by referring to Table A2. Note that as the amplifier's output level is increased above 65 dBmV total power, the peak-to-RMS ratio decreases. Regardless of whether this is due to compression or clipping, the result is that some of the amplitude information gets compressed.

In order to determine how high the output levels should be in return path amplifiers, the output level was compared to CNR and BER. Table 5 shows performance for a 25 dB gain hybrid return path amplifier when subjected to overload.

A fully loaded return path will have a total energy of approximately 60 dBmV at the output of an amplifier. Table 5 demonstrates that at levels of approximately +65 dBmV, the amplifier is getting close to affecting BERs of higher order modulations. Since CIN is dominated by third order distortion which cascades on a 20*log factor, one must be careful not to use amplifiers with inadequate distortion performance.

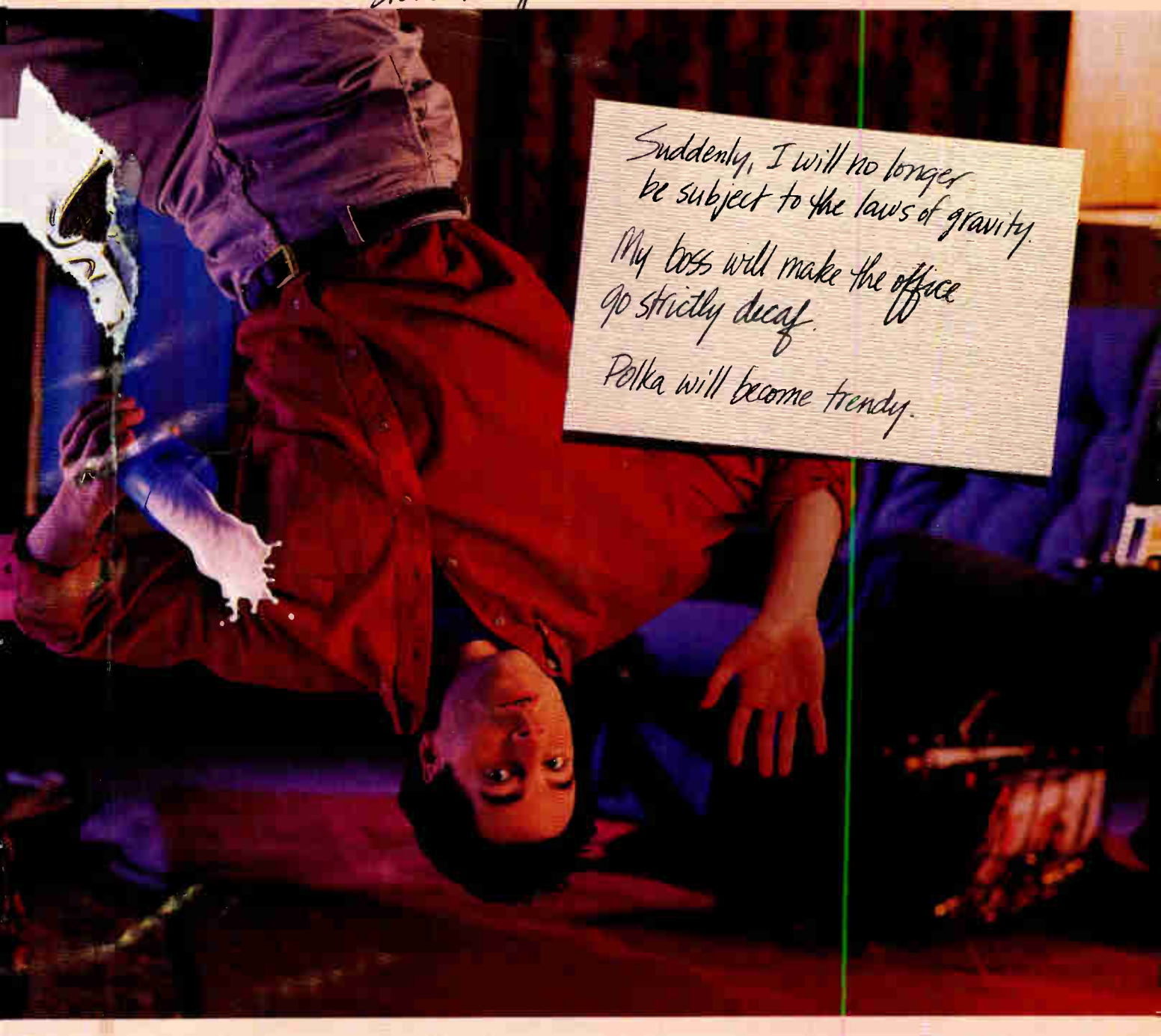
We have determined that the upper drive level limit for forward analog DFB transmitters is determined by clipping, rather than by the conventional distortions. We have defined a simple quantitative test that correlates well with subjective evaluations, and we are proposing that it be considered for general use by the industry. Within practical limits, it is likely that digital signals carried along with analog will not be limited by clipping (that is, not before the analog signals themselves will be impaired by clipping). We have found that clipping is less immediately noticeable in externally-modulated transmitters, and that it does not appear to be a performance-limiting problem in forward RF amplifiers.

In the return path, signal levels into Fabry-Perot lasers are limited mainly by CIN and not by clipping. The upper limit for DFB lasers is no higher than that of FPs. The limits for 16-QAM digital signals do not appear to be any tighter than those for QPSK. 64-QAM signals, however, appear to be somewhat clipping sensitive. CED

Appendices

Appendix 1: RMS vs. peak. A test method was

THE FEARS OF *Steve Kinger*, CATV NETWORK ENGINEER



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devised which would allow a measurement of the peak-to-RMS ratio of muticarrier signals. Our evaluations consisted of a multiple carrier generator which produced up to 130 independent CW carriers and a high-speed (35 GHz) sampling oscilloscope. First, a baseline was established by measuring the output of the carrier generator directly. The output of the generator was connected to the scope, and the level was adjusted to maximize the dynamic range of the scope. The scope was set to free run at a rate of 500 kHz, and the timebase was 100 ps/div. Several million samples were allowed to accumulate in the infinite persistence mode (about 20 minutes). Since the scope was free running at a very high acquisition rate, the distribution of dots which accumulated on the display represented the distribution of voltages present in the composite signal. A histogram was then obtained from the scope and relevant points were recorded. This was done for many different channel loadings from 2 to 130 channels. In each case, the value of the highest and lowest points were recorded, as well as the values for the mean, and one, two, and three standard deviations. The ratio of the peak value to the RMS value was calculated in each case. The results are compared to the theoretical values in Figure 6.

Note that the theory predicts a continuous increase in peak-to-RMS ratio as the number of channels grows. However, the test results indicate that the ratio levels out between 14 and 15 dB. We believe that the reason the peak-to-RMS ratio does not continue to increase as predicted has to do with noise in the system. In particular, the phase noise and frequency stability of the CW generator are likely fluctuating enough to prevent any more precise coherent adding of the carrier phases.

Appendix 2: Peak-to-RMS ratios for various signals. Table A2 summarizes the peak-to-RMS ratio for some common signals.

Table A2: Measured peak-to-RMS ratios

Type of signal	Peak-to-RMS ratio (dB)
CW signal	3.2
Unfiltered noise (5-1000 MHz)	7.8
Filtered noise (5-40 MHz)	13.5
Modem Brand "A"	
QPSK @ 10 MB/sec	9.2
16-QAM @ 20 MB/sec	11.3
64-QAM @ 30 MB/sec	10.2
Modem Brand "B"	
QPSK @ 256 kB/sec	6.7
QPSK @ 2 MB/sec	6.6
Laser with filtered noise loading	
35% RMS OMI	13.8
62% RMS OMI	9.2
78% RMS OMI	7.8
Hybrid with filtered noise loading	
+45 dBmV total RMS power	13.5
+65 dBmV total RMS power	12.4
+70 dBmV total RMS power	9.6
Hybrid with CW loading	
+45 dBmV total RMS power	3.2
+65 dBmV total RMS power	3.2
+70 dBmV total RMS power	3.2
+75 dBmV total RMS power	3.0

1. D. Stoneback and W. Beck, "Designing the Return System for Full Digital Services" SCTE Conference on Emerging Technologies, San Francisco, CA, January 1996.

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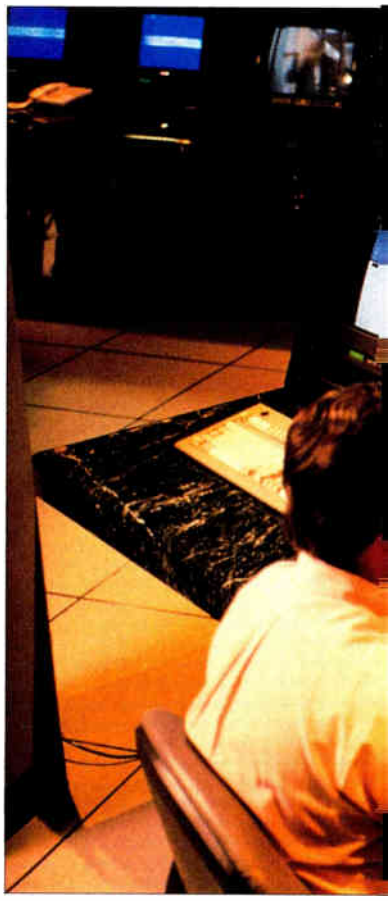


By Michael Lafferty

Computers have changed the way people work, play and even create and the cable industry is certainly no exception. Yet, as the 20th century careens toward its inevitable conclusion, computer hardware and software applications have finally vaulted over the last bastion of hardwire, creating fundamental changes in headend design and operations.

And cable headends, as well as the people who design and run them, will never be the same.

As a result, cable engineers are faced with vast array of new issues, technologies and pressures to design and build headends that will work now and a decade from now, when many predict the transition from analog to digital will be largely complete. (Take that, like all other broadband predictions over the last few years, with a handful of salt.) Yet in a technological atmosphere where today's computer advance is literally left in the dust by tomorrow's newest product announcement, many cable pros are initially confused, if not cowed, by the daunting challenge of bringing their headend operations and personnel into the computer age.

Of course, American ingenuity just loves a challenge and cable professionals have never been accused of being dullards, especially when there's lots of new revenues to be realized.

The Alexandria model

Many believe the headend of the future first coalesced in Alexandria, Va. late last year. That's where Jones Intercable launched the nation's first passive, 750 MHz HFC network– a $35 million, fiber optic cable system with a backbone consisting of 10 fiber loops of counter-rotating signals. The system, which boasts "self-healing" capabilities, features 500 fiber nodes, each monitored 24 hours a day and backed up by its own power supply. Each fiber ring contains between 120 and 180 fibers, which mean nearly 3,000 fiber terminations at Jones' showcase headend.

The plant itself covers just 28 square miles and passes 73,000 homes, MDUs and businesses. Nearly 40,000 subscribers are served by the system. Of course, the fact that Alexandria is one of the premier suburbs of the nation's capital and home to any number of the nation's legislators and staff doesn't hurt either.

The Alexandria operation was recently folded into a cluster of area operations and renamed Jones Communications. The new name, says the company, "signifies Jones' emergence as a comprehensive telecommunications company capable of providing a full slate of entertainment, information and communications services to its customers."

Jones Communications' headend facility in Alexandria, Va. is considered by many to be state-of-the-art.

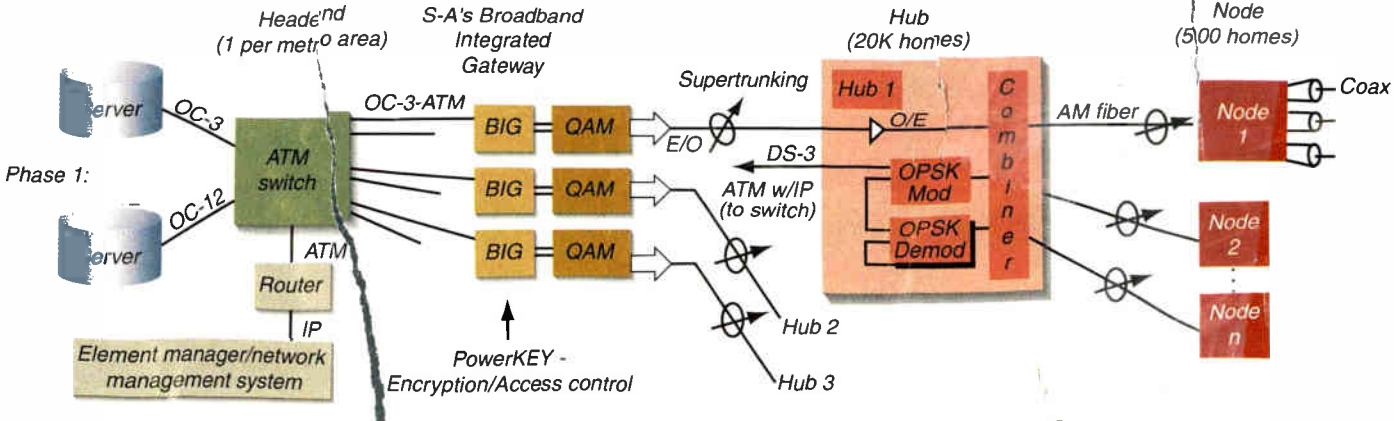
When designing a headend, the things you take for granted are the things that "kill you"

Much of Jones' claim to telecommunications fame is being generated from the hands-on experience it's getting through the Alexandria headend.

The headend itself features 88 Barco modulators and related headend equipment, including an expanded version of the company's Remote Control and Diagnostic System (RCDS). The RCDS Open System Architecture (ROSA) allows Jones personnel network-wide monitoring and control capabilities (of Barco and non-Barco network equipment) through a PC interface. The system continuously checks headend performance, generating status information, minor and major alarms and automatically switches to backup modulators based on preset parameters.

Barco, a relative newcomer to the American market, but a 25-year cable in the international marketplace, is a firm believer in microprocessor controlled headend equipment. George Walter, Barco product group manager, points out such computer control, for instance, in the case of their modulators, allows for "everything you can

Figure 1: *Scientific-Atlanta Inc.'s view of future headend consolidation*



do on the front panel, you can do a hundred miles away on a keyboard and PC."

This remote control capability, which features automatic backups that are on-line within milliseconds of detected error or failure and contacts repair personnel at the same time automatically, all without interruption of service, is crucial to cable success and consumer confidence, says Walter. "For the consumer to really rely upon the cable operator for interactive services, telephony, even security, operators are really going to have to beef up consumer confidence. One of the ways they can do that is to present headends like the Jones facility and say, 'Here are all our fail-safe mechanisms.'"

Since the Alexandria facility officially debuted in October of last year, Jones has been steadily making its case to its subscribers. The company is currently providing telephony services, albeit in a limited capacity, through shared-tenant (MDU) services and have filed with state regulators to provide residential phone service as well.

A recently completed cable modem trial, featuring LANcity modems, has "delighted" customers and led to the start of a commercial rollout of the service. The next headend/network hurdle is near video on demand. "Right now," reports Wayne Davis, Jones' senior director of technical operations, "we're in the process of sorting out the digital technology that we'll deploy."

Davis says the past six months have taught everyone involved in the project a lot. "When you convert over to a new network and you've advertised it's a new network and it's the future," says Davis, "man, you'd better do it right the first time. And we've learned that painfully."

He says when designing or rebuilding a headend facility the things you take for granted, the things you've been "doing for a hundred years," are often the things "that are going to kill you." He likens his experience to the ill-fated United Flight 232 where one damaged hydraulic line defeated all the other hydraulics in the aircraft. Being able to recognize such "common points of failure" is absolutely crucial to an operation that's offering lifeline services like telephony, as well as video and data communications.

"We found that in thinking through a system (you have to) find those common points of failure," says Davis. "And, I mean we designed redundant paths throughout the network. But for us, the common point of failure turned out to be, and we learned a valuable lesson from this, off-air transmission. In order to get the best picture quality, the antennas are at a different location and we transport those (signals) in.

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It was a point a failure in that there was not a redundant path for those signals."

A transitional mix

The costly transition from analog to digital is putting budgetary pressures on a whole range of products and services (real and proposed) in the cable plant. But the fact that it isn't going to happen overnight has finally settled in after the initial euphoria of information superhighway hype of just a few years ago.

"The first thing they (customers) tell us is that the headend of the future will have both digital and analog," says Peter van der Gracht, vice president and general manager for Scientific-Atlanta's CATV and Telco Worldwide Analog Headend Products division. "The model that seems to be coming out is that the lower frequency band will be used for the analog broadcast part of cable TV, sort of plain old cable TV, and then the higher frequency components will be used for the digital channels. And together that allows the cable operator to provide service to different types of customers."

"And that's going to go, we think, a long way into the future," chimes in Larry Grunewald, S-A's product director for digital video compression and subscriber products division. "As long as you've got TV sets out there that are cable ready and people who don't necessarily need a high tier, it's going to be hard for cable operators to provide a digital-only type of service. So we think as long as we're going to be around that you're going to have the analog-digital mix."

Peter van der Gracht

Larry Grunewald

As a result, van der Gracht and Grunewald note this is "giving rise really to two headends of the future." (See Figure 1.) They describe the first as a "source" or "traditional" headend, or what others have called a "regional" or "super" headend. These headends consist of antenna farms (or are directly linked to off-site farms), source materials and all the new (i.e., digital) technologies. The second, "hub" headend is further down into the plant, and in S-A's thinking, could serve as many as 20,000 homes.

While Grunewald explains many customers have a growing understanding of the equipment needs in the traditional or super headend, there's some question about what's needed at the hub headends, because, says van der Gracht, "The customers want to be able to operate those hub headends either unattended or at least only 9 to 5, Monday through Friday, rather than 24 hours a day, seven days a week." That means increasing technical capabilities at the super headend and "very sophisticated status monitoring and control capability" at the hub, he continues. The efficiencies of such unmanned, computer-controlled hub sites becomes even more critical as the pricey deployment of digital technology begins in earnest.

Yet many, like Clayton Doré, director of

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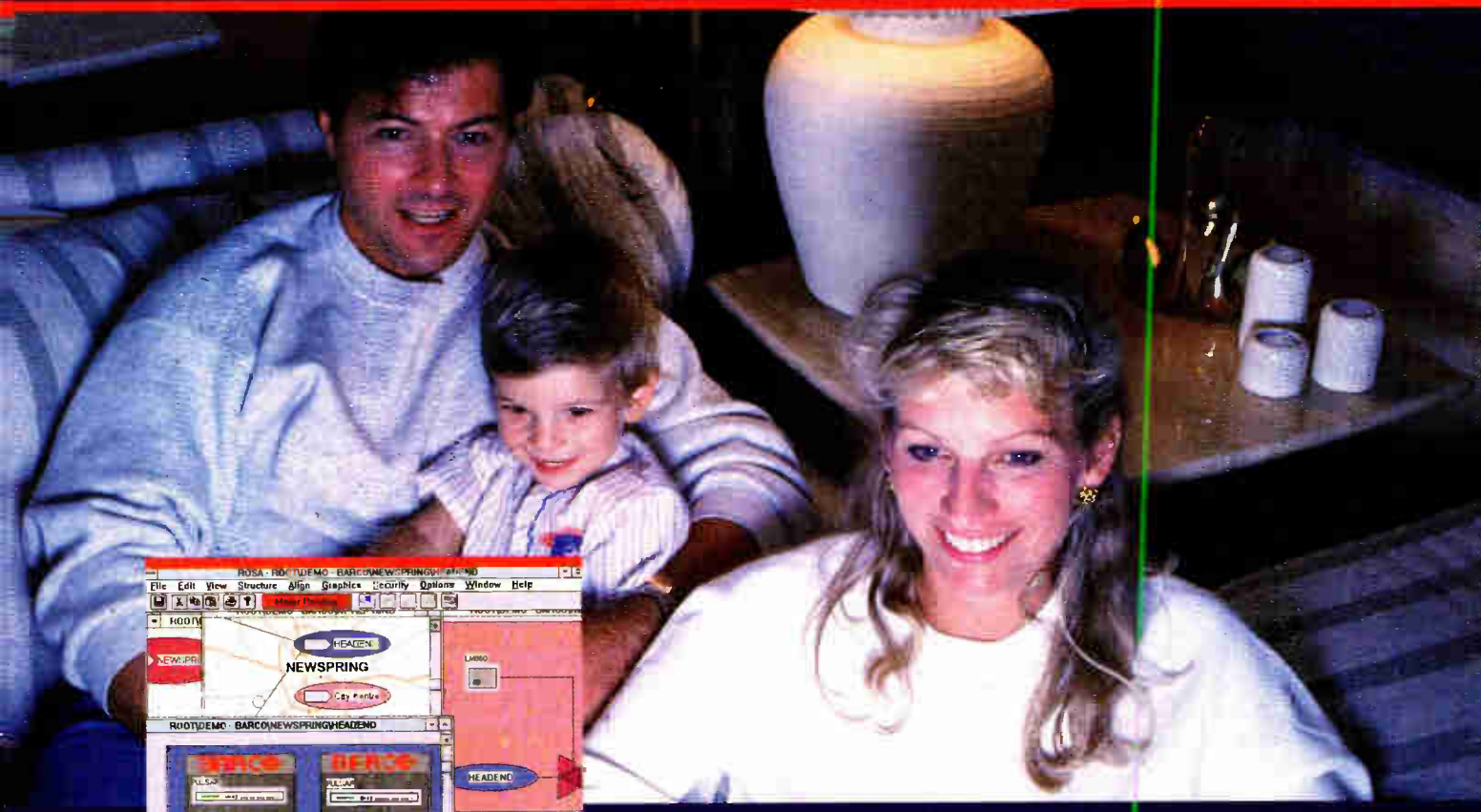

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sales and marketing for Standard Communications, realize "not every headend in the country is going to be a master headend. And not every headend in the country is going to support 1 GHz. worth of bandwidth.

"We actually see probably 60 percent of the systems in this country aren't built past 450 MHz. And they are still going to have to continue to support and upgrade and offer new services out of those facilities."

Vendors like Standard have begun to develop headend equipment that meets those needs - that's self-monitoring, self-detecting and features automated fault detection and alarms, independent of computer software. The company recently completed release of its Stratum Series–an 80-channel broadcast quality distribution system fully housed in a single, six-foot high rack.

Utilizing NAM550 frequency modulators, each modulator is a self-aligning, slide-out module. The self-healing backup system ensures no down time during transmission and requires no external computer or human intervention. If a failure is detected within a rack, the backplane automatically routes all I/O signals from the faulty modulator to the next back-up modulator on the stand-by daisy chain.

The impact of change

While the Alexandria facility is the first of its kind, it's certainly not the last word in headend and network design. Many operators, eschewing the one-size-fits-all mentality, are striking out on their own, or directing individual systems within their organizations, to develop the facilities they need to take them into the future. Along the way, common themes are addressed, while often, surprising difficulties pop up and are overcome.

Dennis Carter, headend engineer at TCI of Louisiana in Baton Rouge, recently went through the process after he was asked to design a headend that would take his 100,000 subscriber system, one of the first to deploy fiber "years and years ago," into the 21st century. Never one to wait around when there's work to be done, he began sketching out ideas in the sand of a Florida beach during his vacation.

At its most basic, the design project began by determining the space required. Given that the technology is a fast-moving target, that the potential services to be offered are at best vaguely outlined by even the most knowledgeable in the industry and that there are budgetary sinkholes at every turn, this was no easy task.

Originally, Carter thought he would double the space that he figured he would need. He continued to look at the problem and weigh conflicting needs. "You don't want to overbuild a headend," says Carter, "because it's going to take so damn much money to keep it cooled and everything. But then you can't undersize it, because if you have to add on to it, you have critical electronics or maybe 10 or 15 fiber patch bays that you can't have all the dust and dirt flying around when you're trying to expand your facility."

In the end, he nearly tripled the space he thought he needed–and he's glad he did. "We came on line with this headend in November with 21 racks of equipment," explains Carter. "And since November we've added seven 23-inch racks of fiber patch bays, two racks of digital equipment, three racks of demod stuff, and I'm adding two more racks of scrambling/interface equipment. And I had to add 180 combined audio/video DAs, plus three

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racks of digital equipment because we're fixing to digitally tie in another one of TCI's systems about 40 miles away. I had no idea I was going to need all this additional equipment."

No breaks allowed

Carter readily admits that down time, whether it's planned or not, has to be a thing of the past in cable's broadband future. And, while high-tech electronics bring many advantages and efficiencies, he also notes it's less forgiving if its power source is impaired in any way. Calling himself "a back-up kind of guy," he feels his plan for providing "cleaner" power has been successful.

"What I did with the power is that I took my electrical panel coming in and sub-divided it. I put anything that would put harmonics on computers or other equipment, like fluorescent lighting, power switching transformers, air conditioners, etc., on one panel. Then I have another panel for my electronics. That panel goes into a UPS which buffers my incoming.

"Then I said, 'OK, that's fine, but we're going to backup both of these panels with two separate generators.' And now, not only do I have the two generators, but I also have a transfer switch between the generators so that if my electronic generator doesn't crank, then my air conditioning generator does and switches over to keep my electronics up. And then it pages me to let me know my generator didn't crank and I need to come in and look at it."

Carter also notes that when dealing with fiber and lasers, grounding becomes a big issue as well. This is doubly true in Louisiana, with its penchant for lightning storms. Carter installed a raised, anti-dissipative floor, which disperses static electricity to extensive ground grids he had installed below.

However, Carter reports the raised floor didn't work with a UPS unit he had installed on it. Once the unit settled and compressed the glue bond that had at first acted as a shock absorber, it began vibrating. Situated close to his optical patch bays, this proved to be a problem. While FM was of no concern, he notes, once "you get into AM, those connectors move just the slightest bit and they'll cause all kinds of reflections and distortions." The UPS unit was relocated.

Planning for people

The rising complexity of headend equipment, especially with the rising dominance of computer technology in headend operations and systems management, is having an impact on people too. Steve Pearse, Time Warner Communication's former senior vice president of operations and information services, puts it succinctly. "It's not just simple RF equipment anymore. It's very sophisticated. Very soon the cable industry, as a whole, will be managing the world's largest and most sophisticated computer and data network in the world, bar none."

Pearse believes for some, "a real painful shift in technical expertise" will take place. He thinks many cable industry professionals are "totally unprepared" for the computer center expertise they'll need in the not-too-distant future. These "new" disciplines include systems management, router management, congestion control, CPU utilization and DASD (an IBM term that stands for direct access storage device, i.e., memory and hard drive) utilization.

And it doesn't stop there. "The critical factors for the headend of the future," says Pearse, "are going to be things like sizing for

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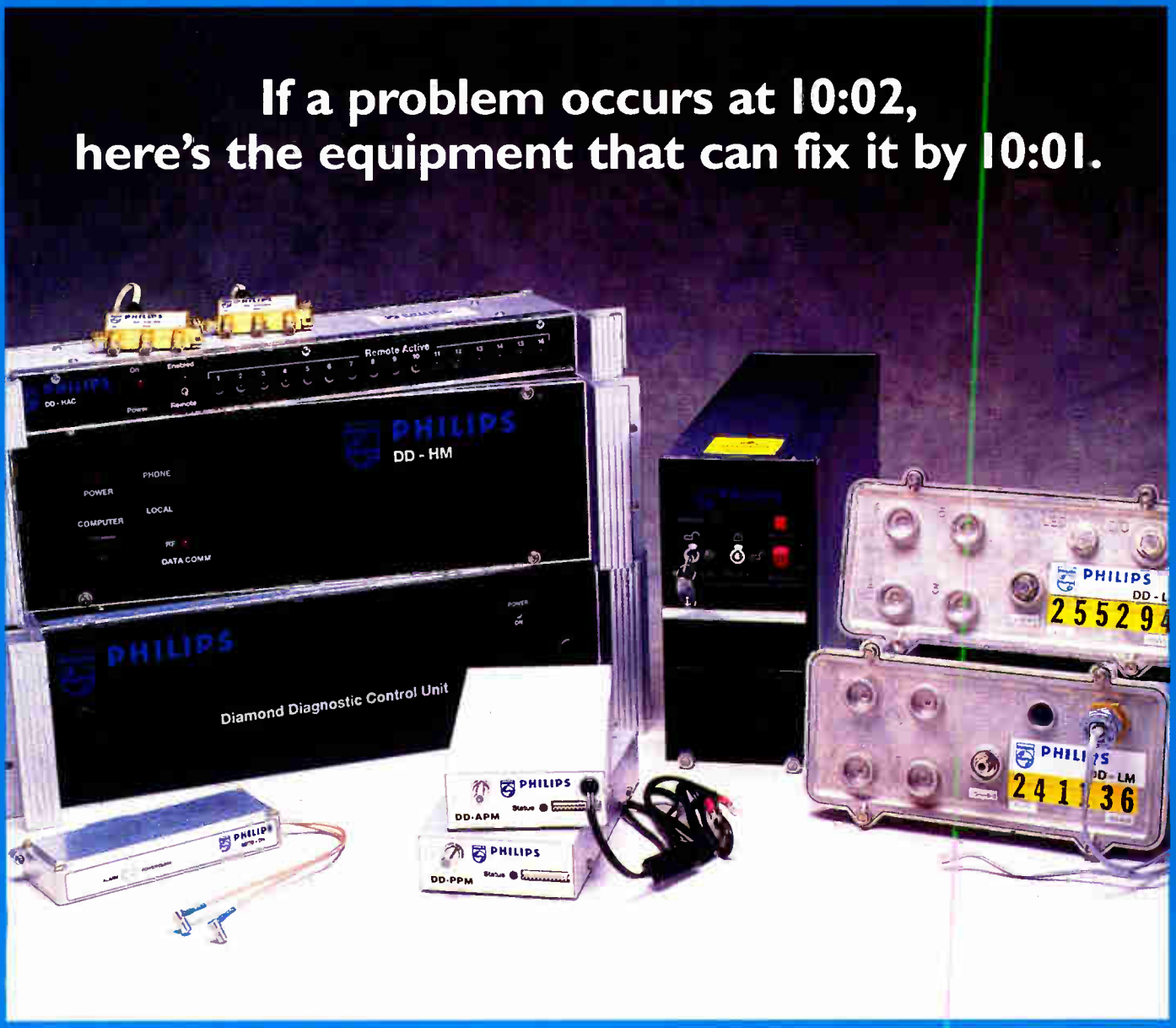

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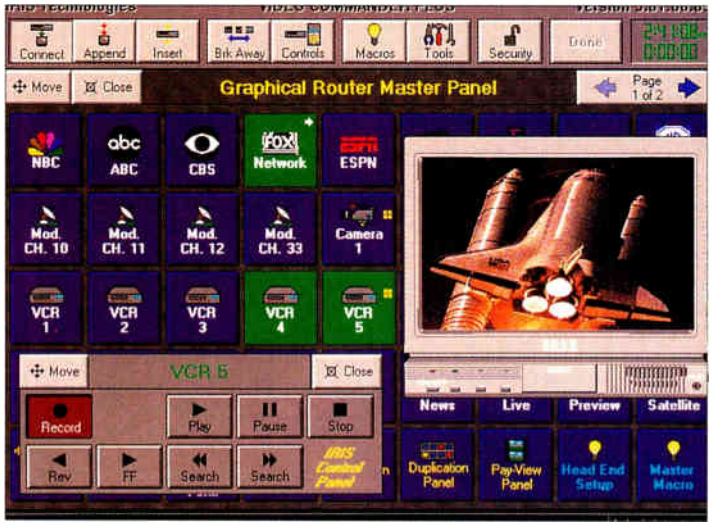
peak load, (which) is a concept we're not as familiar with today when we engineer a headend. This is a much more difficult science.

"You've got to be able to size your equipment for peak load now based on random and variable demand loads throughout your distribution plant. If everybody starts banging on one movie at the same time, you're going to need a lot bigger digital switching capacity, routing capacity and disk load.

"The same is true for the Internet. If everybody jumps on the Internet at the same time and you find your performance really plummeting in your fiber nodes, then you may have to look at adding more equipment,



Video Commander puts monitoring and control at your fingertips.

more lasers and splitting your laser feeds. Plus, you're going to need to look at beefier routers, beefier servers in your headend. This is stuff that is the lifeblood of today's Internet service providers (ISPs) and it's not easy. It's very difficult."

The complexity is the problem, the issue," continues Pearse. "If you tend to it now, you drive complexity out. If you ignore it and let things grow independently, like silos, you're in big trouble. You're basically in the same trouble RBOCs are in today. Telephone companies today typically have 500 computer support systems running the company. They don't talk to each other. It's a killer."

The accepted standard interfaces in the computer world are starting to show up in equipment and systems designed for broadband communications, as well. Industry vendors are also employing user-friendly interfaces for the technicians in the headend. The increasing deployment of GUI-based (graphic user interface, i.e., point-and-click or touch-screen icons and pull down menus) applications in the headend will go a long way in easing the transition to the computerized headend.

TCI's Carter sites himself as perfect example, saying he's "not a real computer whiz by a long shot." He surrounds himself with those who do have computer "smarts" and he searches out those products that make the high-tech transition and his increasingly complex job easier.

One of the handiest high-tech tools he's found so far is Iris Technologies' Video Commander Visual Routing Software & Module System, a PC-based visual monitor and control system that can be used on site or accessed via modem. Carter claims it's "the heart of the system." The Visual Routing System (See figure above), which is also being used in Jones' Alexandria facility, is so easy to learn, says Carter, that "my wife could be routing in 15 minutes."

A hardwire veteran in good standing, Carter's goal with the assistance of devices like the Iris product, is to wire something one time and

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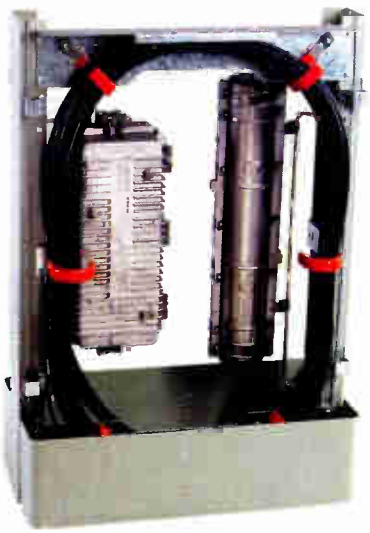

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never have to rewire it again. His most dramatic enthusiasm for the user-friendly device comes when he details the time it used to take to act out a cable technician's nightmare–the much-dreaded channel change.

"I remember one year we did a channel change for 16 channels." says Carter. "Stereo insertion, scrambling and everything else. Three of us prewired for three weeks. When we actually did the change, it took all three of us more than 27 hours straight to do it.

"I did a six-channel change this past New Years. It took 30 minutes to program it on the Video Commander. And to implement it, we weren't even there. We told the VC scheduler here's the smart switch, the smart switch is going to show the new channel lineup. I want you to go to this new channel lineup at 3 o'clock in the morning. At five or ten seconds after 3 a.m., our channel change was done."

A headend wish list

As new products are introduced at the various trade shows and roll off the production lines, the growing list of potential new services operators are eyeing for future deployment continue to spur on cable planners and vendors alike. The physical convergence of video, telephony and data communication services in the headend of the future is particularly intriguing.

Stephen Dukes, vice president of technology at TCI Technology Ventures, thinks it's only a matter of time and money before the three core services converge in one switch. "I think our challenge is to try to figure out how we can integrate switching fabric to minimize our cost and to be able to fit it all in the headend. We're contemplating various forms that can be integrated, including potentially using ATM.

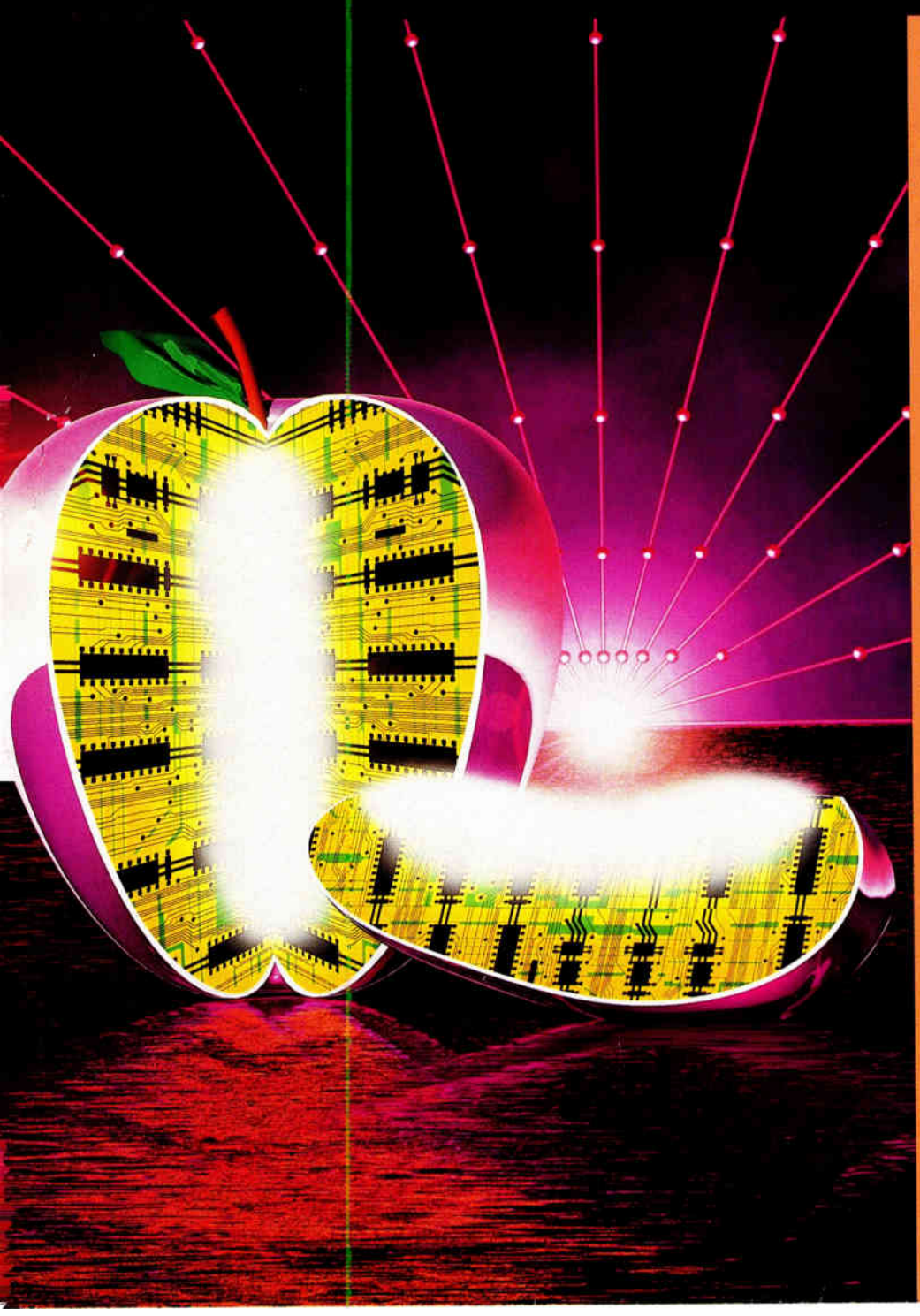
"We think there are switching fabrics that can support more than one application. As an example, we think they can probably support video and data. And if the standards groups can ever figure out how to support the voice piece, likely that could be supported as well.

"That's what we really need right now to get started. But on the other hand it's not available. That switching fabric that supports multiple service types is not necessarily available today at a price point we can support."

Dukes, and others as well, believe economics and strategy will also push operators to interconnect their central headends in the future. The cost of multi-million dollar switches, whether they're able to handle one or more types of service, may preclude their purchase by only the most heavily bankrolled operators. There's a strong economic case to be made for sharing the cost, especially when the expense is used to attract and retain customers and fight mutual competitors.

The cable industry can also expect to undergo the open interface and standards drive the computer industry eventually underwent as a matter of mutual survival. In fact, S-A's Grunewald says the effort has already started. "Our customers are saying, 'Well, we've got ATM switches, we've got servers, we've got analog headend equipment, we've got digital headend equipment and each of you guys have a different management system to these things.' There's a lot of pressure on us to build some type of common platform so that it can then go into master headend or network controller that can monitor even all the way out to the set-tops. And that is something that is still a little ways away, but it is a part of the future that we're going to see." CED

SONET Automatic Protection Switching



Today, service providers are preparing for convergence in the telecommunications industry. To survive this turbulence, they must offer the highest quality service at competitive prices. SONET (Synchronous Optical NETwork) technology enables them to increase network performance and minimize capital and operations expenditures while providing new revenue generating services.

Beyond defining the interconnection standard for optical interfaces between vendors, SONET standards allow service providers to offer "high availability service offerings" on survivable networks, via Automatic Protection Switching (APS), Unidirectional Path Switched Rings (UPSR) or Bidirectional Line Switched Rings (BLSR).

The SONET APS scheme provides a definition by which optical equipment can provide switching between working and protect fibers in a multi-vendor environment. The following chart provides a tutorial of SONET APS and the different network architectures service providers may choose as they integrate the benefits of SONET into their network.

SONET A

Introduction

The Sonet Automatic Protection Switching scheme utilizes two bytes of the Sonet overhead payload, K1 and K2, to implement a bit-oriented protocol for time-critical switching operation. All signals (N x STS-1) are switched simultaneously. Protection covers the multiplexer/optics units from the point, at or before, where the Line BIP-8 byte (B2) is inserted (referred to from here on as the "head-end") to the point, at or beyond, where it is terminated (referred to as the "tail-end").

Definition of terms

Unidirectional switching

A failure detected by one Line Terminating Equipment (LTE) of an APS system results in the switching of traffic from the corresponding working channel to the protection channel of that same LTE.

Bidirectional switching

A failure detected by one LTE of an APS system results in the switching of traffic from the corresponding working channel to the protection channel of both LTEs.

Non-revertive switching

A switch to the protection channel is maintained even after the working channel has recovered from the failure that caused the switch.

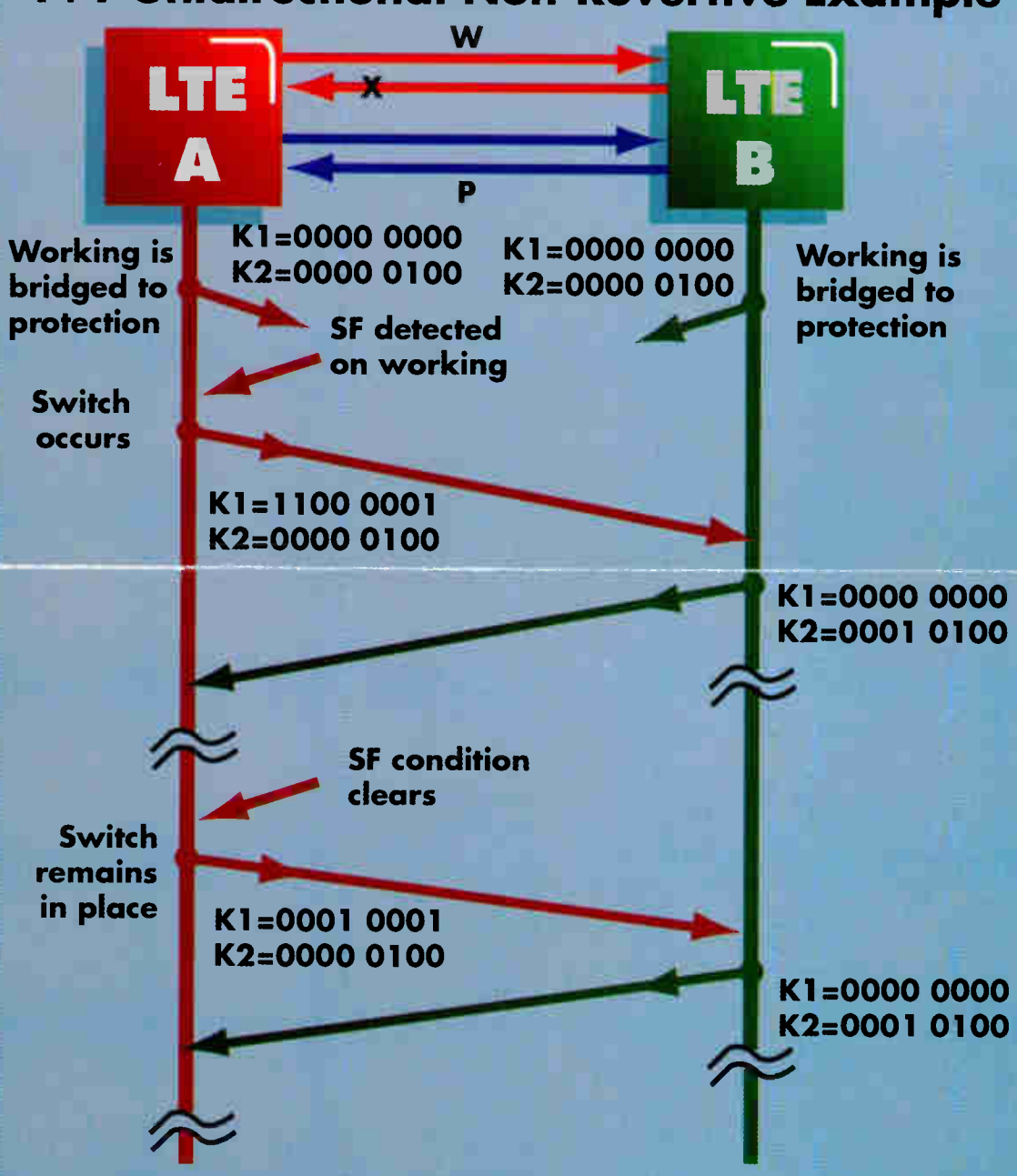
Revertive switching

Traffic is switched back to the working channel when the working channel has recovered from the failure that caused the switch.

Definition of Architectures

SONET APS supports two network architectures. 1+1 (pronounced "one plus one") and 1:n ("one for n"). The choice of network architecture is dependent upon the network provider's needs.

1+1 Unidirectional Non-Revertive Example



1+1 architecture

A 1+1 protection switch architecture is defined as an architecture where the head-end signal is permanently bridged to working and protection equipment such that the same payload is transmitted identically to both the tail-end working and protection equipment.

The 1+1 architecture supports both unidirectional and bidirectional switching. The default operation shall be unidirectional switching. Additionally, the 1+1 architecture supports both revertive and non-revertive switching. The default operation shall be non-revertive switching.

1:n architecture

A 1:n protection switch architecture is defined as an architecture where any of n working channels can be bridged to a single protection channel. Permissible values of n are from 1 to 14. A 1:1 architecture is defined as a 1:n architecture where n=1.

When the protection channel is not in use, it shall be provided with a signal containing valid transport overhead for carriage of the APS bytes and Line BIP-8. This may be achieved by bridging a working channel to the protection channel or by transmitting a low-priority signal onto the protection channel. When a low-priority signal is used, this is referred to as extra traffic. Extra traffic is indicated through the use of channel number 15 on the transmitted K1 byte.

The 1:n architecture supports both unidirectional and bidirectional switching. The default operation shall be bidirectional switching. The 1:n architecture only supports revertive switching.

Interoperability between 1+1 and 1:1 architectures

LTEs utilizing a 1:1 architecture can be interconnected to LTEs utilizing the 1+1 architecture. If the LTEs determine that a mismatch exists (through the transmitted and received K2 byte, bit 5), the 1:1 LTE shall operate as a 1+1 LTE. However, it shall continue to transmit the 1:1 indication on byte K2.

Definition of switch requests

Lockout of protection

This prevents any of the working channels from accessing the protection channel. If any working channel traffic is already on protection, this command shall cause traffic to switch back to the working channel.

Forced switch of working to protection

This function transfers the working channel to the protection channel regardless of the state of the protection channel, unless the protection channel is satisfying an equal or higher priority request.

Forced switch c

This function transf
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request.

Signal Fail (SF)

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system to be equivale
low priority SF can b

1:n Bidire

Signal Degrade

A soft failure cause
the threshold is an eq
architectures a high a

Manual switch

This transfers the w
operating fault-free a

Manual switch

This transfers the pr
operating fault-free a

Exerciser

Exercises the protoc
to, but not including, t

No Request

Indicates that there

witching

Table 2: Byte K1 (bits 5-8) channel requesting switch action

Channel number	Function
0	Protection channel requesting switch action, or no pending switch requests.
1-14 (0001-1110)	Number of the working channel requesting switch action.
15 (1111)	Extra traffic channel requesting switch action. (Not valid for 1+1)

Table 3: Byte K2 functions

Bits	Function
1-4	Indicates the channel number that is received on bits 5-8 on byte K1.
5	1 = Provisioned for 1:n mode 0 = Provisioned for 1+1 mode
6-8	111 = Line AIS 110 = Line FERF 101 = Provisioned for bidirectional switching 100 = Provisioned for unidirectional switching 011 [Reserved for future use for 010 other protection switching 001 operations, e.g., nested 000 switching]

Switch clearing procedures

When a failure clears on the channel which is being protected, the LTE checks for any other pending switch requests. If any other switch requests are present, the K1 byte is loaded with the highest priority pending condition and the number of the channel requesting use of the protection channel.

If no other switch requests are present and the system is revertive, the K1 byte is loaded with the Wait-to-Restore (WTR) condition code. This is utilized to prevent potential chattering of the protection switch as a result of an intermittent failure. The Wait to Restore interval is a configurable period of time (typically between 0 and 12 minutes). If the Wait to Restore interval expires, and the working channel remains fault-free, then the K1 byte is loaded with the No Request condition code and the protection channel (0000).

If no other switch requests are present, and the system is non-revertive, the K1 byte is loaded with the Do Not Revert (DNR) condition code. This will cause the switch to remain in place until a higher priority event causes it to revert.

rotection S

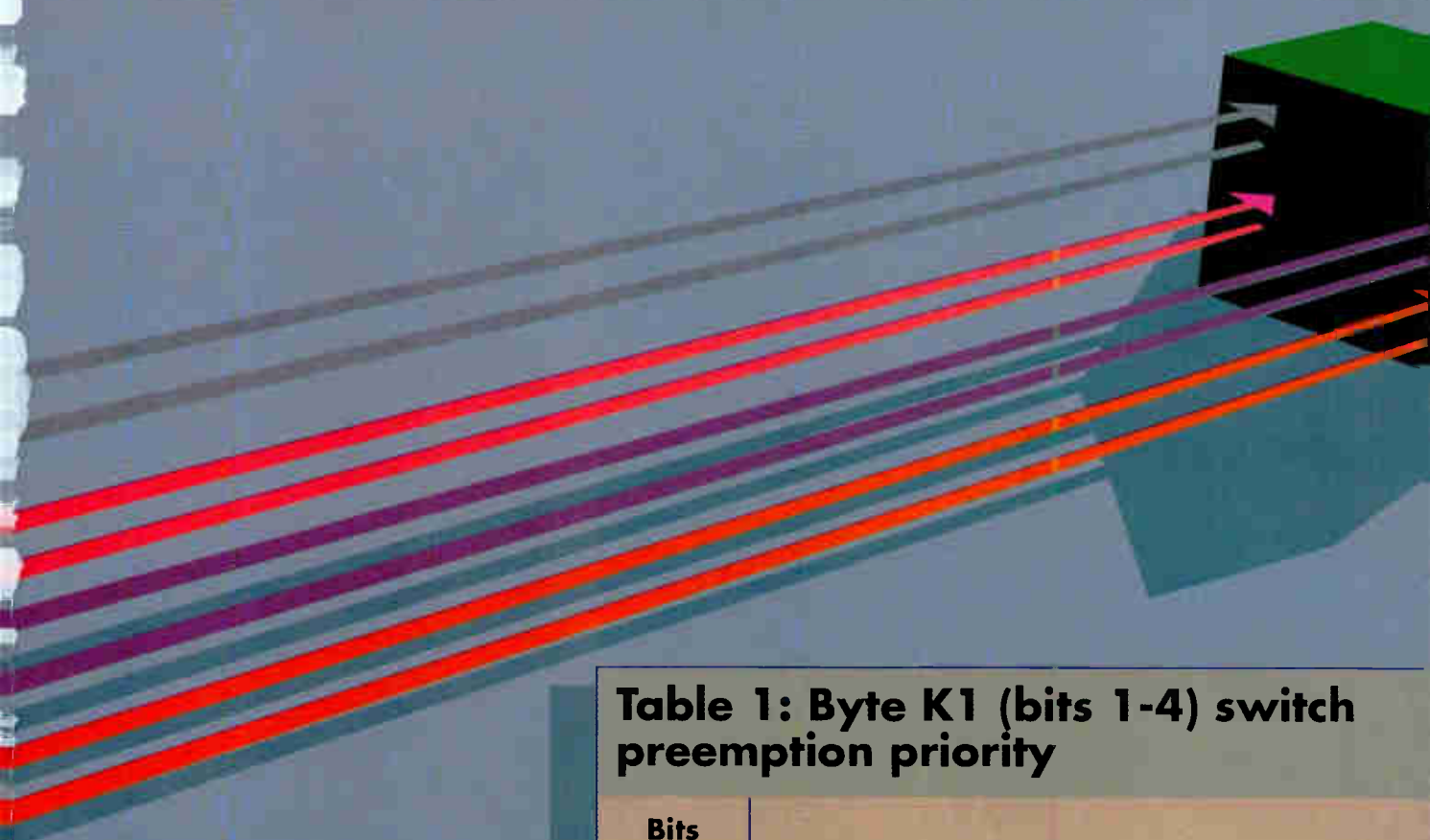


Table 1: Byte K1 (bits 1-4) switch preemption priority

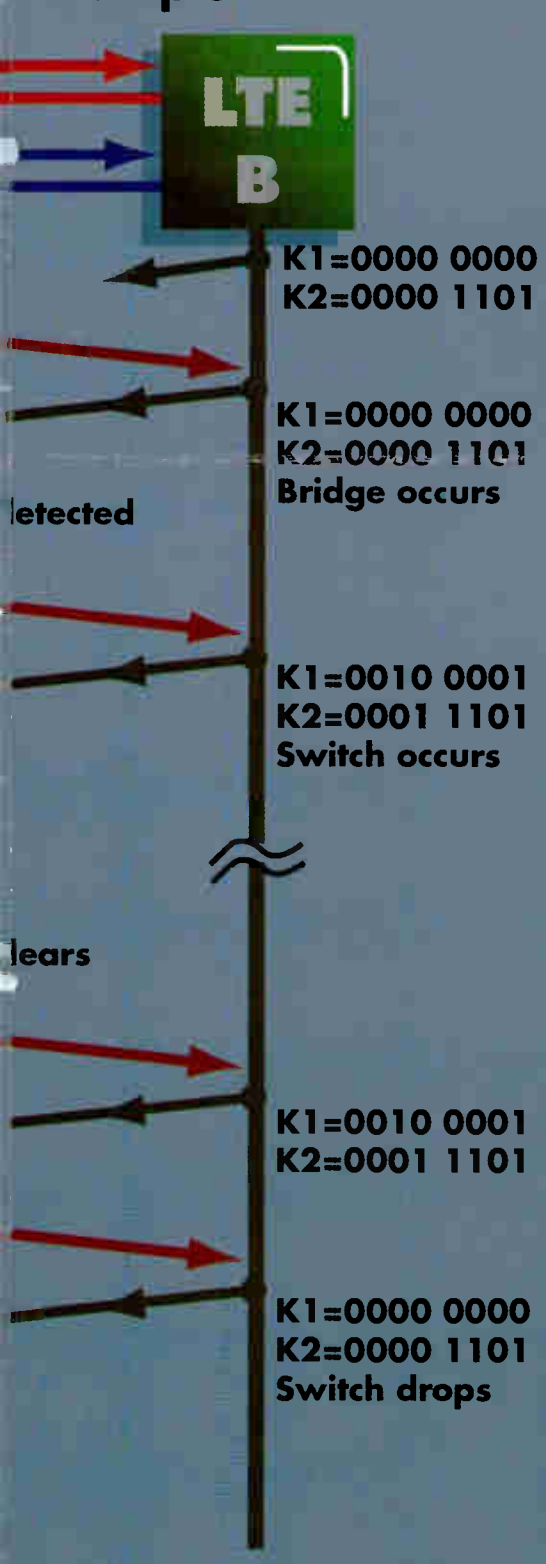
Bits 1-4	Condition
1111	Lockout of protection
1110	Forced switch
1101	Signal fail - high priority (not used in 1+1)
1100	Signal fail - low priority
1011	Signal degrade - high priority (not used in
1010	Signal degrade - low priority
1001	(not used)
1000	Manual switch
0111	(not used)
0110	Wait-to-restore (revertive only)
0101	(not used)
0100	Exerciser
0011	(not used)
0010	Reverse request (bidirectional only)
0001	Do not revert (nonrevertive only)
0000	No request

NOTES

1. The Lockout of Protection switch priority shall only with the protection channel requesting switch action (byte K1=0000).

2. The Exceriser function may not exist for certain prc switching systems.

e Interoperating With Example



letected

lears

2

end is accomplished via the APS channel, which , K1 and K2. The APS controllers at the LTEs use wledgments for protection switch actions. channel. Valid K1 and K2 bytes can be they cannot be the basis for initiating switch n the protection channel, they must be received

hannel for a switch action. Bits 1 through 4 are are used to indicate which channel is making the

ons performed at the LTE, as well as the peration. Bits 1 through 4 are set to the value of icates the provisioned switch architecture. Bits 6 e (unidirectional or bidirectional). For non-APS DI-L. (See Table 3).

status (i.e., unidirectional or bidirectional) through Es indicate the same directional provisioning (i.e., e of switching shall be provided. When there is a unidirectional switching and the other indicates the default for that architecture. If an LTE stops

receiving an indication of the other LTE's directional provisioning status, then t to operate as though the other LTE has maintained its previous directional pro

Handling of switch requests

When a failure is detected or a switch command is received at the tail-end compares the priority of this new condition with the priority of the channel (if protection. If the new request is higher priority, then the K1 byte is loaded witl corresponding to that condition and the number of the channel requesting use channel.

For bidirectional systems, requests can also be received from the head-end the head-end request is of higher priority, then the K1 byte is loaded with the and the number of the channel requesting use of the protection channel.

The priority of a request is determined by its bit code, as shown in Table 1. request is a Lockout, and the lowest priority request is No Request. The followi this priority scheme: For all configurations except 1+1 unidirectional systems, working to protection request will be overridden by a failure of the protection failure or K1 or K2 byte failure).

In the case where there are multiple switch requests, the following rules sha failure or command having the far-end acknowledgment received by the near priority; 2. If requests of equal priority occur before an acknowledgment has l far-end (i.e., simultaneously), then the lowest channel number takes priority. Ir identical simultaneous (i.e., prior to receiving confirmation of a switch reques at both ends, then both ends shall transmit the identical K1 bytes and perform function.

Control of the bridge

For 1+1 architectures, the working channel is always bridged to the protect

For 1:n architectures, the channel whose number is indicated in the receive bridged to the protection channel unless the request is invalid.

Control of the switch

This section describes how the LTE determines from which channel to select t

For all architectures except 1+1 unidirectional, if there is a match of bits 5 t K1 byte and bits 1 to 4 of the received K2 byte, the indicated channel shall be protection channel, unless one of the following is true (in which case the switch released position): 1. If the match is for the protection channel (i.e., 0000); 2. unidirectional and the transmitted K1 byte indicates an Exerciser request (i.e., is bidirectional and the transmitted K1 byte or the received K1 byte indicate a

For the 1+1 unidirectional architecture, the working channel shall be selecte channel if channel number 1 (0001) is indicated on bits 5 to 8 of the transmitt

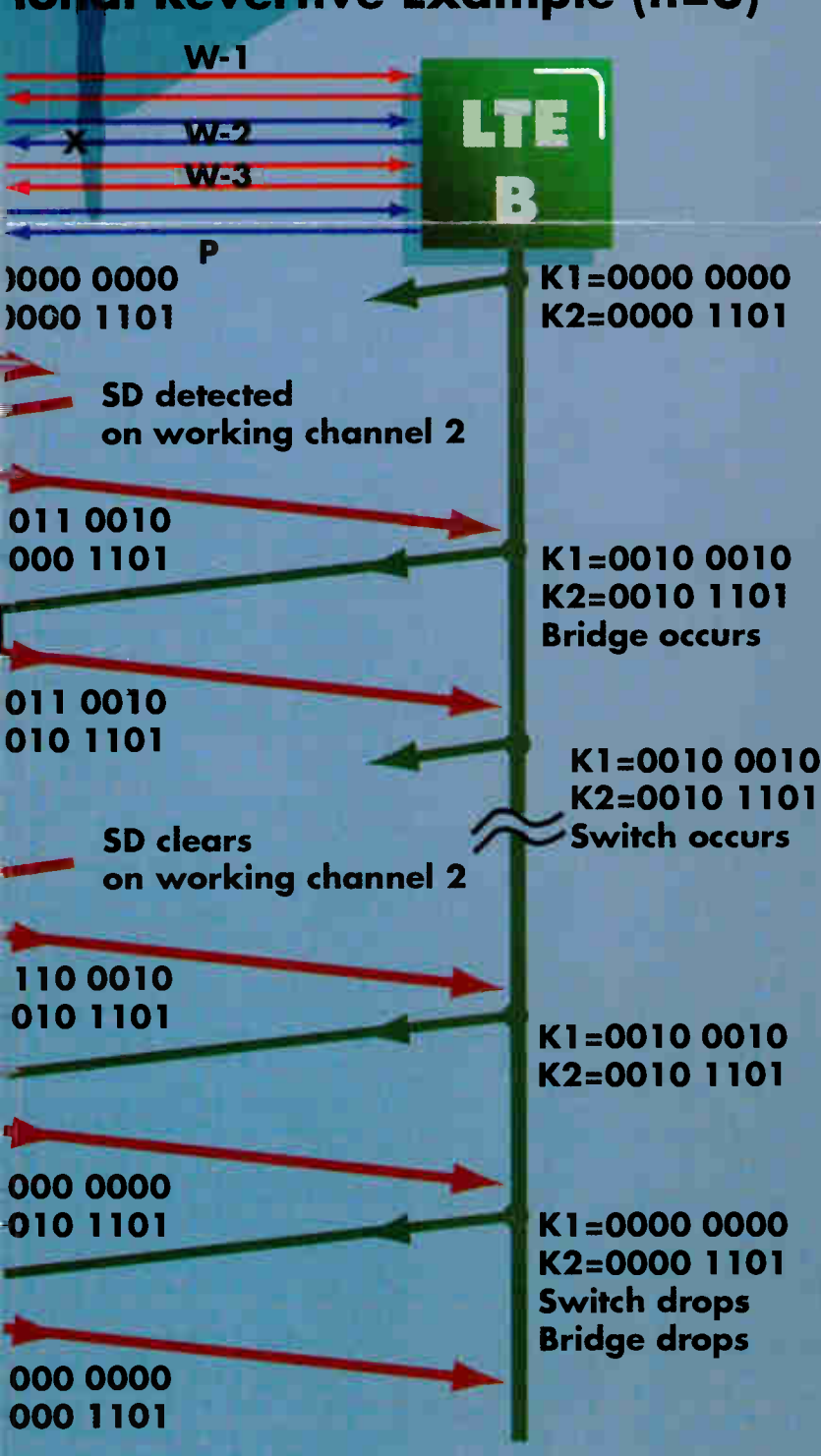
utomatic P

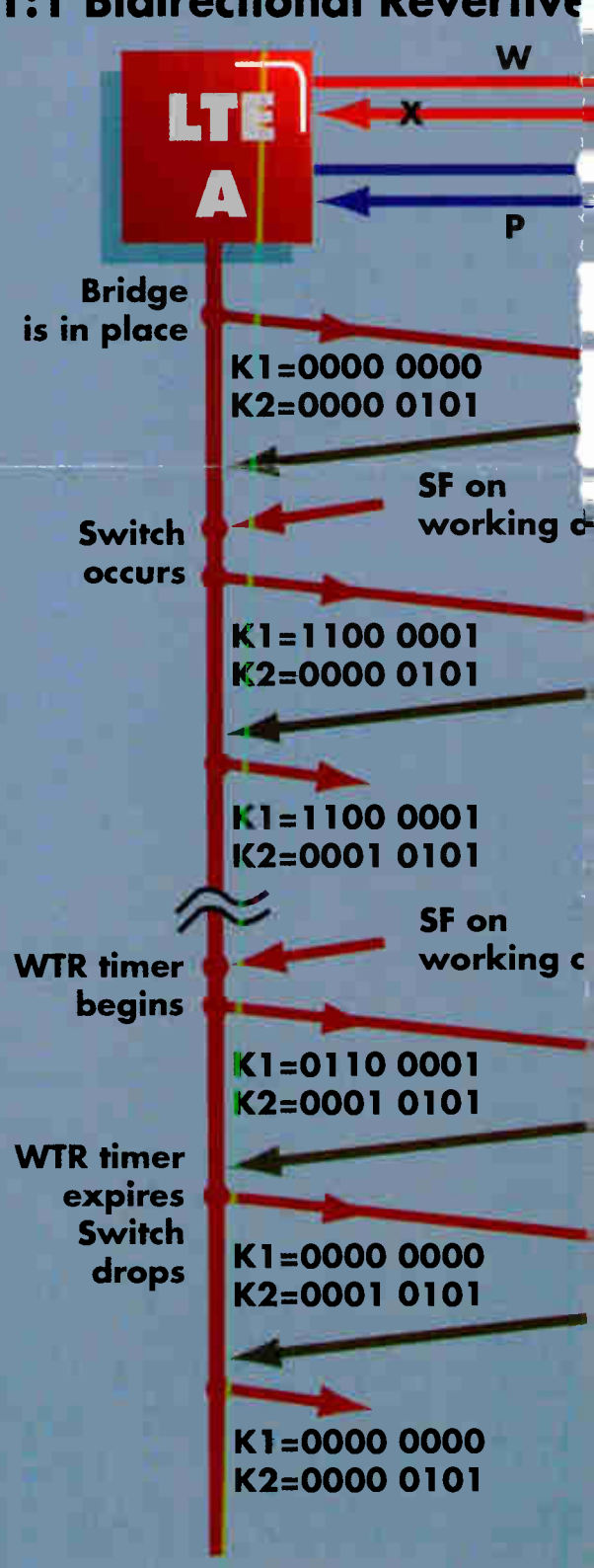
protection to working
the protection channel back to the working channel regardless of the state
unless the protection channel is satisfying an equal or higher priority

by loss of signal, loss of OC-N frame within an optical signal, Line AIS or
le hard failure (e.g. stuck bit) or a BER that exceeds a pre-specified value.
define the threshold is an equipment issue, but is typically in the range of
ted failure of the received K1 or K2 bytes is considered by the protection
o a Signal Fail of the protection channel. For 1:n architectures, a high and
efined.

1+1 Bidirectional Revertiv
1:1 Bidirectional Revertive

ional Revertive Example (n=3)





Usage of bytes K1 and K

Communication between the head-end and tail
consists of two bytes of the SONET Line Overhead
the APS channel to exchange requests and ackno

The APS channel is valid only on the protection
transmitted on the working channel(s) as well, but
actions. Before accepting the APS bytes as valid c
identically in three successive frames.

The K1 byte is used to indicate a request by a c
used to indicate a request, while bits 5 through 8
request. (See Table 1 and Table 2).

The K2 byte is used to indicate the bridging act
provisioned switch architecture, and the mode of
bits 5 through 8 of the received K1 byte. Bit 5 ind
through 8 indicate the provisioned switching mod
uses, bits 6 through 8 can also indicate AIS-L or R

Unidirectional vs. Bidirectional Systems

Both LTEs indicate their directional provisioning
bits 6-8 of the transmitted K2 byte. When both LTI
both unidirectional or both bidirectional), that typ
mismatch between the two LTEs (i.e., one indicates
bidirectional switching), then the system shall use

5D)
by a BER exceeding a pre-selected threshold. The specific BER used to define
ɔment issue, but is typically in the range of 10^{-5} to 10^{-9}. For 1:n
l low priority SD can be defined.

working to protection
king channel to the protection channel only if the protection channel is
is not satisfying an equal or higher priority request.

protection to working
ection channel to the working channel only if the working channel is
the protection channel is not satisfying an equal or higher priority request.

l for a protection switch of the specified channel. This represents all steps up
e actual switch of traffic to the protection channel.

re no pending switch requests for the protection channel.

Whither the small cable system operator?

Will they be squeezed out of existence?

By Roger Brown

The passage of the Telecom Reform Act has dramatically changed the structure of the communications industry. Suddenly, everybody can get into everyone else's business. The bill's advocates hope the new lack of regulation will allow unfettered competition, which should be good for consumers by driving down prices. Opponents claim little will change under the new law, with the exception that more power will be consolidated into fewer hands.

Regardless, the landscape has already begun to change. If the proposed mergers take place, today's seven Regional Bell Holding Companies (RBOCs) will shrink to five. And at least one top-10 MSO will soon disappear under the US West umbrella.

But how might this affect operators of small cable systems? Will it drive them out of business, or give them an opportunity to shine by being different than the impersonal communications giants?

To find out, we asked three different network providers who operate in smaller areas what they think about the future, competition and their competitive edge. The cast includes: Pete Smith, vice president of engineering at Rifkin & Assoc., a Denver-based MSO that has 340,000 subscribers spread over 80 headends; Bill Bauer, an active member of CableLabs and owner of Windbreak Cable in Gering, Neb., who has 230 subscribers in two rural towns; and Ken Wright, chief technical officer for InterMedia Partners, a six-year-old company with 700,000 subscribers that is beginning to cluster, and grow.

What follows is an edited transcript of their comments.

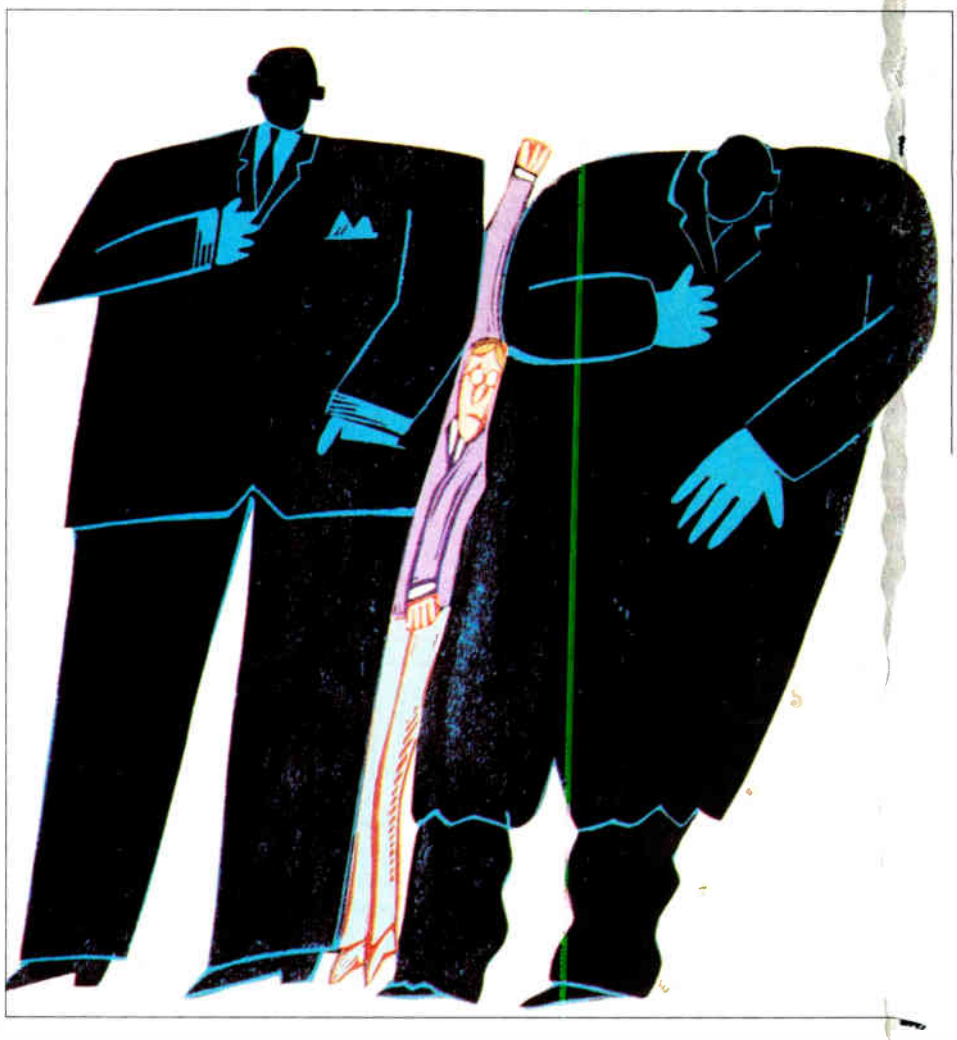
CED: Describe how you and your company feel about the future as a small operator going toe-to-toe with big telecommunications giants. Is that prospect daunting, or are you looking forward to the challenge?

Smith: I have doubts as to whether in the short term that we'll be going toe-to-toe with the telecommunications giants. We operate generally in smaller markets, and I just don't see (the RBOCs) coming into the smaller markets wanting to make a big splash. They're competing in the big markets like Atlanta, Washington, D.C. and Omaha.

That buys us more time to understand the technologies involved and to watch other people develop their businesses, and to use their good ideas. But do I feel comfortable going up against them? You never like to have competition where you didn't befor but I think by the time it happens, we'll well-prepared to do it.

Bauer: The Telecommunications Ac not had a big effect on me because we already headed down the paths we're o how do we compete toe-to-toe? That's easy one: we know our small systems b than the large companies do. With the pa sage of the Telecom Bill, the bigger com nies are going to try to get out of having provide service to small communities. That puts us in a prime position to take over those responsibilities.

Wright: I think we look forward to the challenge, and I say that for two reasons. First, as we look at all this emerging competition, we need to remember it also means there's a lot of emerging opportunity. We've been in this narrow niche of video entertainment for so long, but there are a lot of new opportunities for us to diversify our revenue streams. As you diversify your business, you make your-



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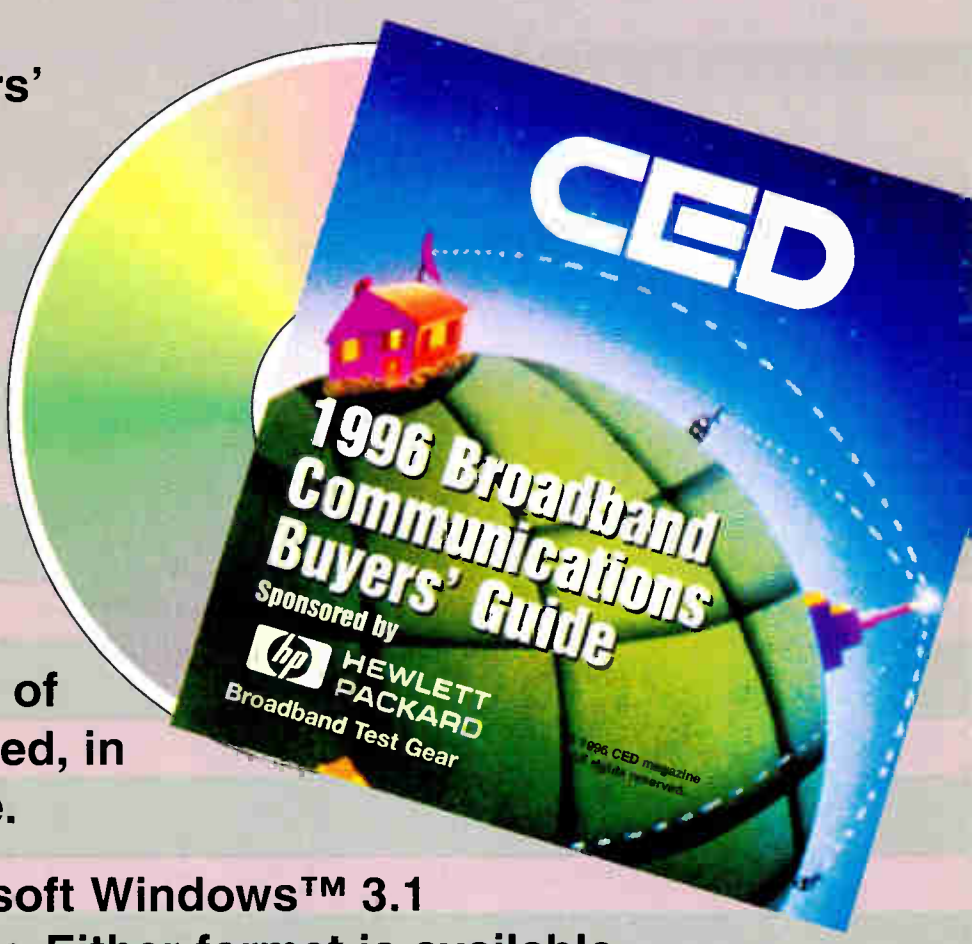

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self less vulnerable to competition. It's daunting to have big people coming after your business but we're seeing the door open to diversification.

Secondly, there's been a lot of talk about how smaller operations are quicker to respond and quicker to act than big companies, but from my vantage point, it's true. There's a reason why everyone says that. In our company, we literally have a handful of people who are strategists and decision-makers. We can pull those people together all in one place at one time, brainstorm, make a decision and begin to implement it all within a few days' time. I see it happen every day in a company our size.

We're also a little different than other operators our size in that we have little geographic spread. We are clustering aggressively through buying and trading systems to where we're concentrated within a four contiguous-state area in the Southeast. In mid-Tennessee, we will soon have 300,000 subs clustered contiguously.

Smith: Am I confident that I'm 100 percent ready to compete with a huge RBOC on telephony services? No, and I suspect anybody for Time Warner, TCI or anybody else would have to admit they're not comfortable doing that yet. That's why people are taking their time and trying to understand the technology, the marketing needs, customer service needs, personnel needs–all the issues that go with a new business. This is not like adding HBO to your system. It's not an ancillary product that's the same or similar to your other products.

By the time those guys come in and want to compete with me, who knows, maybe I'll already be doing a lot of the things they want to offer. Maybe I'll already be in the data networking or telephony business. I may be ready before they come to town and may already have customers that they'll have to try to take away from me.

CED: What will it take to compete with such mega companies? What special advantages do you have?

Bauer: Our big advantage is that we can do things locally. We're much more tuned into what the local people want and how they want it. I think I have the advantage over any competition. In fact, I'm out looking for more systems to buy. I work with the phone companies on a regular basis, so I know what their limitations are. They have a mindset that is 50 years old and that's based on creating more expenses so they can go to a higher rate base. They know one thing–they do it well, but they only know one thing. That does not exist in the cable industry–we're used to working long hours and doing everything on nothing.

Smith: You have to have reasonable amounts of money, that's for certain. You'll have to hire or train personnel for the business you're planning on being in. If we're talking about telephony, for instance, we would view it as a separate product line. We're going to have to work on billing systems because none of the ones we have are capable of transaction-based billing. We'll have to work on lots of hardware issues related to reliability and powering. We don't anticipate being the ones to solve them. We'll watch other people solve them and pick the elegant solution that best fits our needs.

"I think I have the advantage over any competition. I'm looking for more systems to buy."

If I'm competing against a big multimedia company, they have some attributes, but so do we, and they tend to offset. They've got lots of money and research behind them, but they don't have the ability to move as quickly as we do; they don't have the flexibility that we do. Bigger organizations tend to have more rigid rules, while in smaller companies, the people are often more empowered and able to meet the customer's needs. The lack of willingness to bend the rules will drive more people to smaller companies.

Wright: Because cable's pockets aren't deep, we've learned to be more strategic with our resources, whether it's capital, time, staffing or whatever. We tend to be more efficient because we've operated with lean resources vs. someone who has operated with a guaranteed rate of return. It's hard (for competitors) to segue to an efficient, competitive mindset. I personally have seen examples of that kind of thinking from some of the new entrants. I see a lot of dabbling, trialing and experimenting that seems incredibly wasteful of both time and capital.

Smith: I don't think you'll see a lot of competition on price. The business community has learned that's not the way to compete. The cellular industry is a classic example of that. Prices are virtually identical in most markets.

I also don't think in a competitive environment that one person gets killed along the way. It's a battle, but does anyone actually win? One comes up with a great idea and gets more subscribers, and then the next guy steals the idea and gets some subscribers back. So there's an ebb and flow.

CED: Can the industry afford to build the kind of network it will take to compete?

Wright: The short answer is yes. To realize that, you just have to look at all the upgrades that are going on. We are spending the money and rolling out the technology. Because we've had to watch our pennies over the years, we're less likely to overspend on technology. In a competitive environment, you have to be efficient so the rate the market will bear gives you a return on investment, and that's been cable's experience throughout its history. That's an entirely different mindset (for the telcos). I think we have the money, but more importantly, we have the savvy to spend that money so that we get a return on our investment.

Smith: A lot of things will take capital, but hopefully, I'll only have to spend a reasonable amount to get in the business and then just add more as I gain subscribers. So that even in smaller markets I'll be OK. Or maybe if it does take a large capital investment to get in, I can share resources with other operators. There's nothing to say that even a big multimedia company that is operating in a large market adjacent to us wouldn't be willing to sell us switch space, for example. That happens in the telephone business right now. There are a lot of little guys out there who don't have a switch, and they rent space from folks with excess capacity.

You can also do things without deploying all that capital upfront. So, being smart about how you do it, when you do it, where you do it and what you're doing, is probably the most important thing.

Bauer: You can't do it (in the) standard ways. The infrastructure costs are just too high, so you have to find unique, innovative ways. One thing we've been looking at is providing alternate access to route a long distance call from a customer to a carrier. That is an easy business for us to get into because we don't have to change phone numbers or get into billing.

We have the parts and pieces to most of it up and running, but we're not quite there yet. The minimum headend cost for a telephone-over-cable system is $150,000. You can't do that in a small system. I've asked (the equipment manufacturers) if they can make it scalable, and they say no. So it's just not cost-effective at all. Everything we do has to be done differently, but unfortunately, major

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equipment manufacturers don't look at small systems as an opportunity.

CED: What are the keys to success in an open marketplace?

Wright: Number one has to be a focus on the customer. Consumers are expecting more and more. The focus on the customer is paramount. That means we have to be responsive to customer needs, and we have to anticipate those needs. It also speaks to the quality and reliability of the product. There's been a lot of focus on the quality and reliability of our signals and customer perception, and there's been a lot of effort put forth on that.

There's been a lot of cable bashing and bad press about our customer service over the years, and I think it's important to say that cable has been listening and improving. Try calling other utilities or a government agency and put a stopwatch to the wait time. Then call your cable company. We're aware of what it will take to succeed in a competitive environment, and we're not just sitting back wringing our hands. We're getting there.

There also needs to be a focus on the employees because they are the ones who make it happen. That means we have to give the proper level of training and motivation.

CED: So what's your vision of the future? Do large media conglomerates control the marketplace and everyone else is a small company–much like the telephone industry is now?

Smith: I expect there will be consolidation. Big companies will cluster and control the large markets, but I still think there's a place . . . for smaller operators that have marketing savvy and availability of capital.

Wright: It only makes sense that the cable industry will go much like the telephone industry did–from a lot of independent, standalone operations to a small number of large companies. There will always be small operations in the outlying areas, but the whole move toward consolidation will continue. The whole world is headed that way. Cable will be no exception.

Bauer: I think in the near term there will be several large companies and lots of small ones. I think we're beginning to see the pendulum move in a different direction. These companies are getting bigger and bigger. Soon, they fall just from the weight of the overhead. I hate to use TCI as an example, but it hasn't been able to deliver on much of anything it has announced. It has a corporate structure that is making decisions without any knowledge of what's going on out in the field. There are people today who want to launch Internet access, but because they (TCI) made a big commitment to launch @Home and buy all these modems, they've tied the hands of the people in the field. You'll see the same thing happen with many of the telcos when they go

"Call other utilities and put a stopwatch to the wait time. Then call your cable company."

the ISDN and ADSL path. They'll spend tremendous amounts of money to do it in one place, but can't duplicate it elsewhere.

CED: What's the big technological challenge that must be overcome in order to compete?

Smith: Doing it right.

Wright: I think it's the same thing as our strength–the network, our legacy. It has incredible bandwidth, but there is the issue of the return path. A lot of talented minds are focusing on fixing that, and we're doing a lot of the right things but we still have a ways to go. We know what needs to be done, that's the good news, and we're doing it. We are upgrading almost every network we have, and all of them are being done as active two-way plant.

CED: What are you doing to explore new services like telephony and high-speed data? Are you being aggressive in those areas, or are you on the sidelines watching for now?

Bauer: We will launch Internet access in a 100-sub system next week (middle of May). We've been working with Hughes on a delivery system that goes over satellite. So we have a satellite downlink that is a shared 12 Mbps and an upstream VSAT link. That is what we're launching. We come to the headend and go to a full blown proxy server with private IP addressing. And from the headend on, it looks like any cable system, but it's much simpler.

We're looking at total headend costs, with software and modem launch equipment, of $15,000 to $17,000. And the modems are $375 (Bauer will use Zenith's 4 Mbps HomeWorks modems).

In fact, we're spinning off another company that will offer this to other small operators as a turnkey system instead of them having to come up to speed on servers, IP addressing, etc. We'll do all that and provide all the support. The learning curve is so steep right now. I've been at it for four years, and I still don't know what I'm doing.

I've been working closely with (other small system operators, like) Buford Cablevision, who has 150,000 subscribers spread out over 232 headends; TeleMedia, which has 400,000 subs in small systems; and Summit Cable in Washington state.

Big systems won't drive the boat, although they'd like to. They won't get to deploying real services quick enough. Look at how long the Orlando project and ECNet in Phoenix have been operational. ECNet has just 50 customers. What's the holdup?

Smith: We're not standing on the sidelines. We've hired a "new business" person with the charge to help us get in those businesses. Data is well above the telephony business as a priority right now, but there are a lot of areas within the telephone business that can be lucrative and are available for competition without taking on full residential telephony. We're looking into that.

There's also the video networking and basic telecom carriage business. Some of that business might now be in the telco's basket that I could take on and maybe provide an upgrade to their service. There's a wide variety of things that can be done without taking on the whole shooting match.

The data networking business does not have to be data just to the PC. It could also be providing data services for governments, businesses and school districts. In fact, taking on

those pieces and doing shared tenant services is a nice, graceful way of getting in the business, learning about it and solving a lot of the problems before you decide to launch bigger services.

Wright: We are not waiting in the wings or holding back. We are installing cable modems for a trial and are talking to a lot of other operators about doing several things. We are also partnered in a competitive access operation in one of our markets and are looking at that in other markets.

CED: So, when do you start to compete?

Bauer: If we can get off our backsides and realize we have the advantage here, we can own the data world lock, stock and barrel. What you're about to see is a groundswell of small operators who are going to move into data. You'll see more data customers brought on by small systems than you ever will by the big MSOs, because they have a complex problem: how do you service 100,000 customers? That's a big headache. Forget about the cable plant, the network is the problem. Whereas a small system with one or two DOS computers running Windows NT can get up and running in a week. It's very simple and it works quite well.

Wright: Bill is absolutely right that there is good opportunity in small systems. It is easier to engineer a small system, but it's also true that for people in rural areas who want access to the Internet or to dial into America Online, it's quite often a long distance call. You (small operators) could be the only one on a local basis to offer access to stuff people are only reading about.

"We plan to be here for awhile and don't believe you need 5 million subscribers to survive"

From a traffic engineering perspective, in a large system we address that with node sizes, so it's not like we are without hope. We just have to adjust our fiber networks to make them like a lot of small systems.

Smith: To be a little glib, we'll compete when the time is right, when we feel comfortable and understand the rules of the competition. One of the dangers here is picking on someone and causing more damage than good. Hitler picked on some people and eventually he picked on the wrong folks and got kicked. I think you need to be careful about who you want as your enemies. The fact that you're a smaller cable operator doesn't mean you're not a successful operator or that you're not doing well financially, or that there isn't good long-term promise for you. It just means you're a smaller operator. Don't necessarily believe everything you read: you don't have to be in all these other businesses to survive. I think you pick your targets and do it right when you decide to do something.

We plan to be here for awhile and don't believe you need 5 million subs to survive. We think you can survive at our size, or even substantially smaller than our size, if you do your job right. CED

Becoming maestros in materials management

MSOs regain control of their inventory

By Dana Cervenka

Explosive growth by acquisition and merger, system upgrades, rebuilds and the deployment of new technologies and services, have all combined to create inventory management headaches for cable operators. Coupled with competitive pressures to be first-to-market with new services, inventory management problems are costing operators money, time, efficiency and public relations points, in the eyes of their customers.

Charles Alfonso, regional purchasing manager for Comcast Corp., details a symptom of the problem his techs and installers faced at the local level.

"Before, a warehouse guy went along the shelves, and if he saw an empty hole, that's what he ordered," says Alfonso. "Then he had four weeks lead-time to get the product in. And in the meantime, (an installer) put black snakes across a customer's white carpet, because he didn't have any white cable. And then he had to go back on a second service call to replace the cable when we received it."

The problem can be quite severe. Often, MSOs have inventory in the field that is "invisible," says George Moore, senior vice president of Materials Management and Business Development, with Antec. "They have no idea where it is, or how much they have."

In response, companies like Antec–whose clients include Tele-Communications Inc. (TCI), Cox Communications and Continental Cablevision–and Sprint/North Supply–which works with companies like Comcast, MediaOne, SNET and BellSouth–have worked with their customers to develop different levels of "materials management" programs, or programs which encompass a range of inventory control solutions, from ordering to warehousing and distribution.

"General industry figures reveal that materials management programs save between 20 and 30 percent of total process costs," says Janet Burton, national market manager–CATV, Sprint North Supply, a figure which includes the cost of inventory, provisioning, and delivering equipment to the end user.

Service trucks as warehouses

The range of available programs out there runs the gamut. Comcast has contracted with Sprint/North Supply to manage its inventory at the individual vehicle level: essentially, each of the MSO's service trucks functions as a mini-warehouse. Focused on 10 systems, five in Connecticut and five in California, the program has set a standard vehicle inventory for each of 400 installer trucks, which is then

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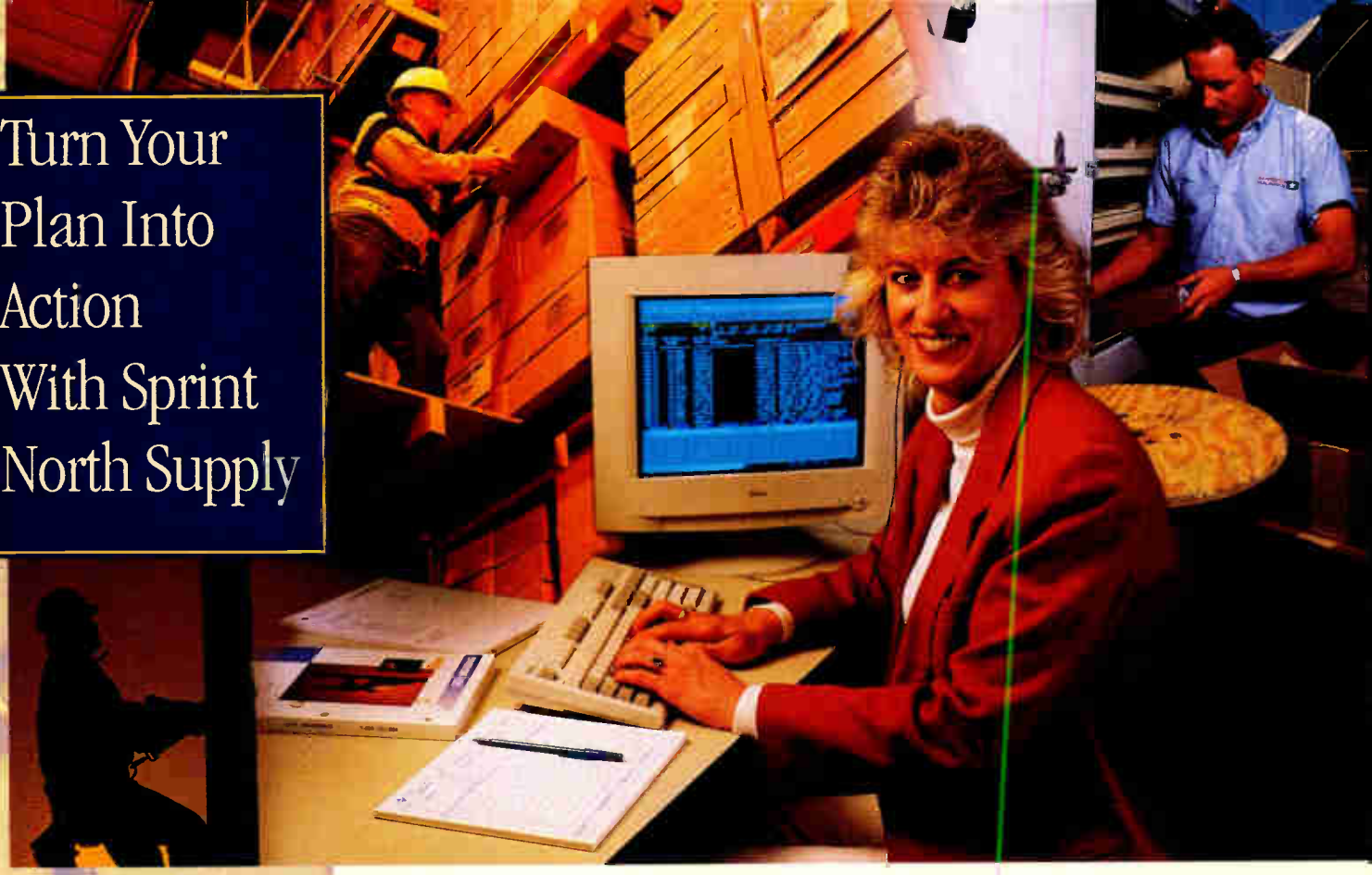

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restocked by Sprint/North Supply. Each driver keeps a paper log of the equipment and materials used on a daily basis, which a CSR will, in turn, key into a computer to generate a customer bill. Simultaneously, the information rolls into a purchase order, which is faxed to Sprint/North Supply. After Sprint loads the information into its computer, a pick order is sent to one of its warehouses, where personnel then pack and ship the order for each truck.

The paper-based system will not last for long, though. Comcast's Alfonso reports that his company and Sprint are developing a software package to tie together the MSO's mainframes, where the work order and purchase order information reside, with Sprint's computer system. "The only way to become more cost-effective is by automating the process, and removing the human element as much as possible," notes Alfonso, who adds that the process should be automated in about six months. Though the current program has been operational for about nine months, Alfonso says he can already document the pay-offs. "Today, the total warehouse space we need is much less than half of what it was nine months ago," he explains. "Basically, the program is based on the principle of using one piece, and getting one piece back." The program has also increased installer efficiency, eliminating the downtime spent each morning as they waited for their material orders to be filled at the warehouse, or the wasted time they spent on rendezvous with other installers in the field who discovered they were missing pieces of equipment.

As a byproduct of setting up the program, Comcast standardized its materials list, so that purchasing managers were not buying the same item from a number of different sources.

Alfonso worked with Sprint/North Supply to develop "management exception reports," generated by the latter, which help each technical manager at the system level become aware of any potential problem areas.

If an installer is consuming an incredible amount of drop cable, the report will flag it

"We all know reports as nothing but data dumps of information, that you have to go through after consuming five bottles of aspirin, looking for a needle in a haystack," he says. The management exception reports, however, focus on very targeted data. Comcast has established a set of parameters, by item and by installer, whereby, if an item or a specific truck falls outside of the range of the preset parameters, it's considered to be an exception—either an installer is using too much of a certain item, or too little. Although some variance is legitimate, notes Alfonso, if an installer is consuming incredible amounts of drop cable, for example, the report will flag it, and the technical manager can then research the variance. The reports track by month, and also, year to date, which helps the MSO with its materials forecasts and with managing contractor usage of its inventory.

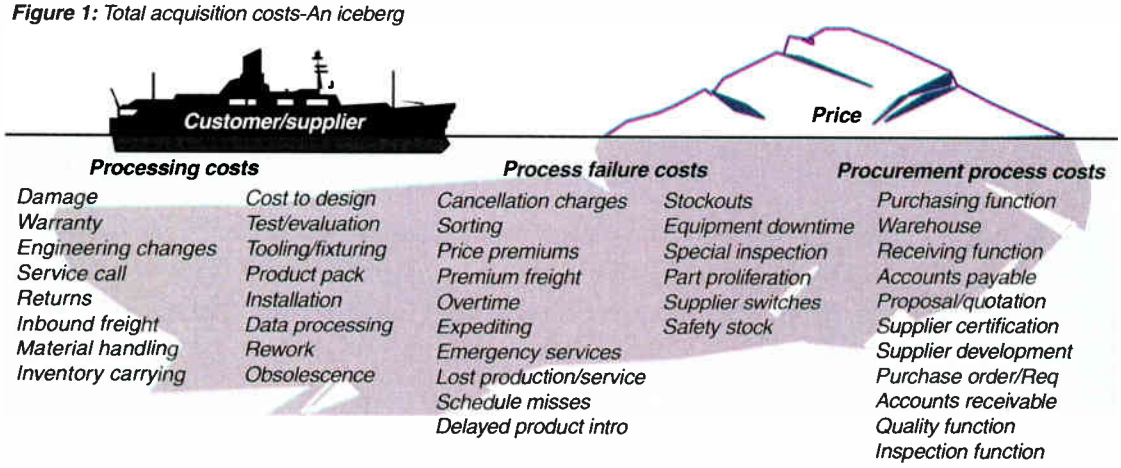
Though Alfonso declined to reveal the actual dollar amount, in the program's present incarnation, Comcast pays Sprint/North Supply a slight service fee, per item, for the materials management service.

For its part, Sprint/North Supply runs the materials management program from 11 distribution centers strategically located throughout the United States. In addition to the program with Comcast, the company runs a broader program with Southern New England Telephone (SNET) for full materials management: Sprint established a distribution center for the operator.

Having been involved in some form of the discipline since the AT&T divestiture, Sprint/North Supply has a long history in coordinating materials management programs for the telco industry.

The company's most sophisticated offering is dubbed "EF&I," or Engineer, Furnish & Install, says Bill Winslow, market manager–PND. Within the context of that service, the company handles the collection of product from multiple vendors, does the engineering, and finally, the installation of the actual equipment.

Figure 1: Total acquisition costs-An iceberg



Source: TAB Associates Inc.

Reducing lead-times

Other materials management programs can be task-specific, or fully integrated solutions. Among Antec's first forays into the materials management business were programs set up for Cox and Continental as a subset of some major construction programs the MSOs had undertaken. Antec packaged equipment up by node, sending it out on a "just-in-time" delivery basis.

More recently, the company has established an integrated materials management program for TCI, including the creation of new distribution centers in Dallas, Chicago, Seattle and Raleigh, which are staffed by both Antec and TCI personnel. The facilities are dedicated to TCI, which holds the leases on the buildings.

The TCI project actually started out as pilot programs set up in Mt. Prospect, Ill., and South Bend, Ind., which defined the scope of the management challenge: inventory was reorganized and then logged into a computer system so that it could be tracked.

"Because of TCI's decentralized nature, at warehouses in some systems, they had very sophisticated PC-based software to track inventory," says Antec's Moore; "in other cases, they were using a manual system to track what they had in place." The goal of the two partners was to bring together the disparate systems, making the inventory "visible" to all of the MSO's systems.

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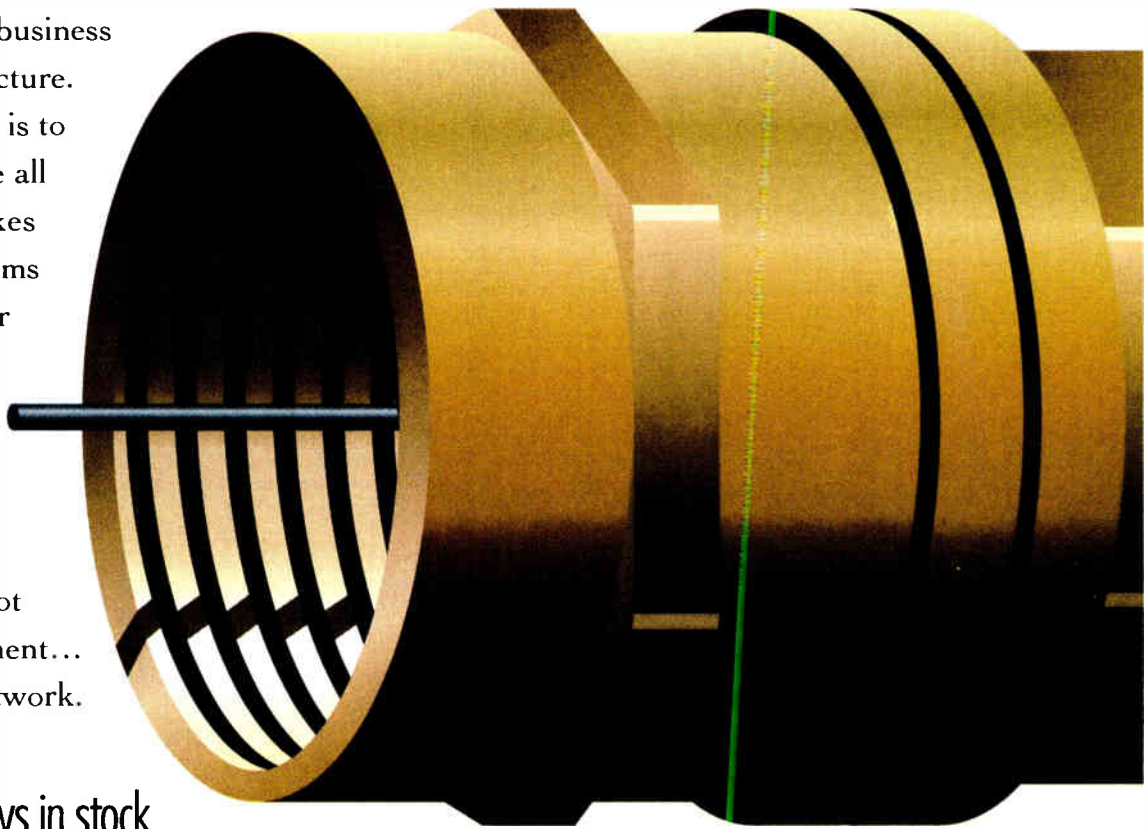

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Industry vendors have their own reasons for wanting to see these programs work; being able to better forecast demand and avoid extended lead-times caused by decentralized purchasing. In the case of companies like TCI, "When you are one of the leading cable operators, if there is a one-week lead-time to buy taps, and you want to buy a million taps, that lead time increases to three months," notes Moore.

The fee structure tends to mirror the service provided. "If they are doing a piecemeal roll-out of new products and services, a situation like that would perhaps dictate a per-unit fee," says Moore. "Or in the case of TCI, where we have set up a distribution system for them that is co-managed by our people and their people, we have constructed a flat-fee structure."

As part of its materials management program, Antec also offers an excess recovery program, assisting operators with disposing of unused equipment that may be obsolete, because of technological turnover. Options include redeployment in other systems around the country, or sell-offs, and in some cases, the company will take back product for a stocking fee.

Antec's Senior VP of Materials Management, George Moore

Inventory recovery will become even more important in the future, says Moore, as companies are forced to swap out older equipment with the latest generation, such as replacing analog set-tops with digital boxes, and then refurbishing and redeploying the older technology to other sites, or recalling it.

What has TCI gained from its new distribution system? For one, reducing the time between product request, to equipment delivery. "Historically, TCI's cycles from the time a system put in a request for product could be anywhere from a month to two months," says Moore. "We are now down to less than 14 days in that whole cycle, with a goal of about seven days."

Shopping around

In the process of selecting a partner for materials management, operators should look at a number of factors, says Moore, including the degree of similarity in corporate cultures, the service provider's level of in-house expertise, its degree of flexibility, and the existence of any specific capabilities, such as an information management system, that an operator could leverage to its advantage.

Sprint's Winslow adds that operators should judge their potential partners on their ability to maintain high levels of accuracy in the delivery of product, and in addition, on their willingness to deliver a high level of service.

And in fact, the cable industry is making great strides in its ability to better control its inventory, says Burton.

"TCI, Jones Intercable and Cox have all set up centralized distribution centers in the last year. And what we see happening. . . is a movement toward greater standardization. They are signing some national contracts with vendors" to meet their needs. And with any luck, the days of guys searching warehouse shelves for empty spaces to fill will be over. CED

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Execs spinning their wheels, waiting for modems

Operators search for working modems at Cable '96

By CED *staff*

Anyone who made the trek to Los Angeles last month for the National Cable Show and visited only the hardware booths could have easily mistaken this "cable TV" show for a "computer" show like Comdex. While certainly not as massive as a Comdex, the NCTA show did set a record for number of registrants (more than 30,000), and the clear focus was on high-speed data delivery and little else.

Of course, this being the cable industry, there had to be some split of opinions. While everyone was discussing ways to implement high-speed data, two distinct thoughts regarding the tricky upstream path broke out. As it stands today, the industry is bifurcated between using the noise-prone RF return spectrum or starting with a telephone-based return and migrating to RF at a later date.

Once an area championed by General Instrument, the idea of using a telephone return mechanism to speed entry into the data game by operators of one-way networks gained several new proponents, including Zenith and Motorola.

Still another approach emerged at the show. WorldGate President Hal Krisbergh (former president of General Instrument's Communications Division) stood out like a sore thumb in rival Scientific-Atlanta's booth, where he espoused the virtues of Web browsing and sending e-mail through advanced analog set-tops via the vertical blanking interval.

By the time the show closed, attendees were left wondering what the 30,000 people did with themselves, and few came away with more than they showed up with. While everyone was talking high-speed data modems, only Motorola joined Zenith and LANcity with equipment that has progressed beyond demonstration units. That fact has left cable industry leaders frustrated that they cannot capitalize on the market opportunity sooner.

To help speed the process along and to propel cable operators into the high-speed data market without rebuilding their networks with two-way capability, Zenith Electronics Corp. has teamed with U.S. Robotics to develop a cable modem that uses the cable network in the downstream, and the telephone for upstream communication.

Zenith can configure its existing HomeWorks Universal cable modems to work with USR's Total Control Enterprise Network Hub simply by making some software changes, according to Bill Luehrs, president of Zenith Networks Systems. Because it entails only a software upgrade, Zenith expects to have working units available within 60 days or so.

When a customer signs on to the system, the computer's resident telephone modem automatically dials up access to the U.S. Robotics equipment in the headend and stays connected for the duration of the session.

Depending on modem speeds and other configuration issues, the U.S. Robotics equipment can be added to a cable system for $30,000 to $50,000, which provides capability for 48 simultaneous analog calls and more than 100 digital calls, said Ross Manire, senior VP and general manager of U.S. Robotics' corporate/systems division.

Terayon Corp., which two months ago detailed a plan to develop specialized, single-chip CDMA (code division multiple access) silicon for use in upstream applications like telephony and high-speed data, displayed a prototype cable modem at the show.

To facilitate its entry into the cable modem race, Terayon will partner with networking giant Cisco Systems Corp. for routers and inter-networking expertise. Specifically, Terayon and Cisco will work together to define an interface for the connection between headend "concentrators," which collect and condense incoming bit streams from in-home cable modems, and headend routers.

Terayon's modem is dynamically configurable to send selectable throughput speeds of up to 10 Megabits-per-second in both the upstream and downstream directions. That's

PHOTO BY JIM KLEINBERG, THE STOCK MARKET

important in situations where an operator needs to support a variety of computing applications, including video conferencing, dedicated T-1 access at 1.5 Mbps, or more asymmetrical Web-browsing situations, executives said.

"I know this comment will draw a lot of contradiction, but I'm willing to say very confidently that asymmetrical-only cable modems will not scale in the real world," said Dr. Zaki Rakib, chief executive officer of Terayon, explaining that all existing private networks–Ethernet, token ring, FDDI and others–currently support "only symmetrical" technologies.

Terayon plans to have its new modem, called "TeraPro," available for at least two MSO field trials by October. Beyond that, the manufacturer plans to have production volumes out the door by the first quarter of next year, priced "competitively," at $500 or less, said Jacob Tanz, VP of marketing and business development for Terayon.

Shortly after the Show, Terayon announced the addition of two key personnel to the company. Dennis Picker, formerly director of Motorola's Cable Data Products division, has joined Terayon as vice president of engineering, while Dr. Masuma Ahmed has joined the company as director of technical marketing. Ahmed came from CableLabs, where she worked on data modem technical standards.

Meanwhile, Phasecom Inc. launched its P446 Cable Modem for T-1 applications, which enables full duplex, bi-directional data transmission at 1.544 Mbps. The T-1 Cable Modem units work together with Phasecom's Network Management System at an operator's headend. Applications for the technology include private data networking, LAN-to-LAN connectivity and T-1 telephony.

The cable modems are actually comprised of a broadband modem and a control modem. The T-1 broadband modem uses QPSK modulation to convert the signal received from the customer's T-1 transmitting device into an RF signal for transmission over the cable network. In the reverse direction, it demodulates the RF signal into a T-1 signal for the customer's T-1 receiving device. A control modem within the unit provides the local network management functionality. It is used to establish a separate and independent channel for out-of-band signaling between the network management system at the headend and each cable modem.

Hybrid Networks Inc. staged demonstrations of its new generation of cable modem data transport solutions, the Hybrid Access System Series 2000 (HAS 2000). Slated for customer shipment this summer, the cable modem system is comprised of components that can be installed on one-way cable systems today, and later upgraded to handle two-way data transmission. HAS 2000 supports multiple services, speeds and protocols in a single Point of Presence (PoP) server, according to the company.

Based on a client/server architecture, the HAS 2000 includes all the hardware and software required to provide TCP/IP networking over a broadband cable network. PoP servers connect to a cable headend, and a cable modem connects to a local area network (LAN) or directly to a PC. HAS 2000 provides personal computer users access to the Internet at 30 Mbps, a speed that's almost 350 times the speed of the fastest conventional telephone modem, according to Hybrid. In addition, Hybrid cable modems use standard Ethernet adapters.

Pioneer New Media Technologies Inc. and its Cable Group unveiled its new SPEED Station cable modem and DiscBank commercial insertion system at the National Show.

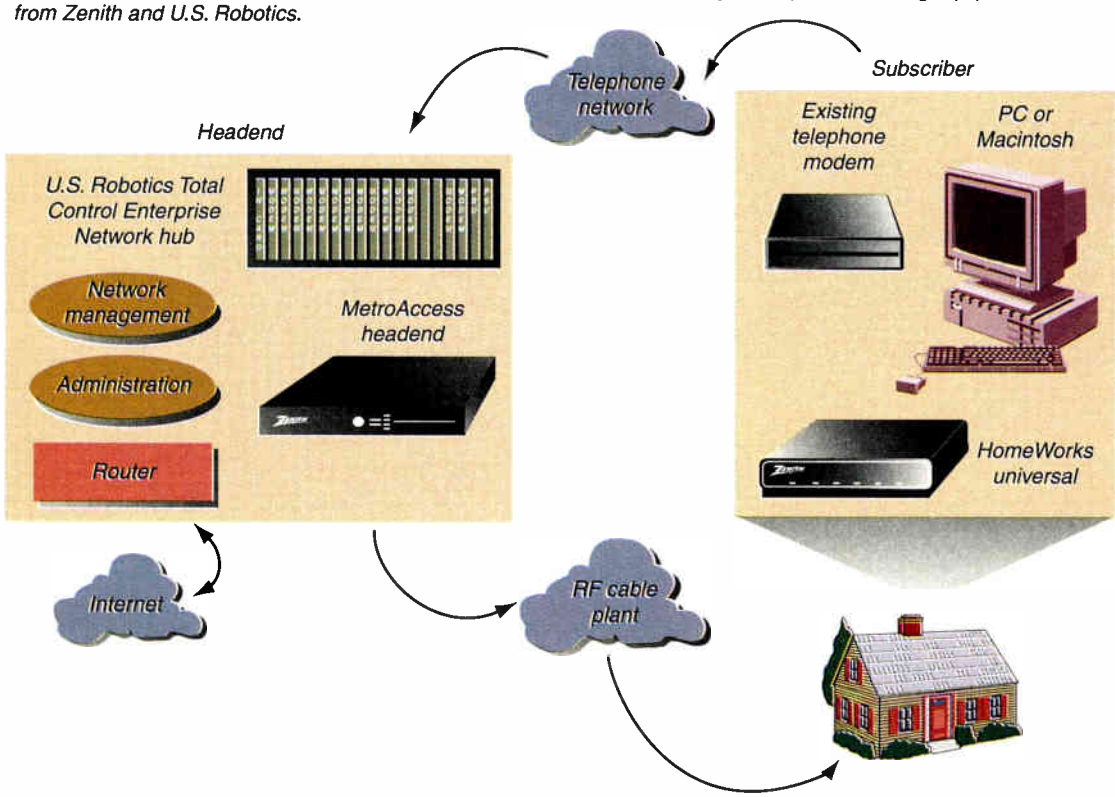
Meanwhile, the ebullient Krisbergh drew crowds to S-A's booth, where he was showing how a set-top like S-A's 8600x can be used to browse the Web and send e-mail messages with a wireless keyboard through a service called "TV Online." The process uses eight lines of the VBI and operates at 100 kilobits per second in the downstream direction and 20 kbps upstream.

While the TV is not optimized for computer images (TV pictures are interlaced, while computers use progressive scanning), the graphics are considered by many to be acceptable. In areas where it's difficult to read, the system has a "zoom" feature to increase the size of the image.

Krisbergh says he plans to field test the system later this year and roll it out commercially next year. The service can also be delivered over set-tops manufactured by General Instrument and Pioneer with some modification, he said.

But WorldGate wasn't alone in its idea. Wink Communications demonstrated Internet extensions to its set-top software, which is being integrated into GI boxes and has been licensed to S-A as well. The scalable software can be used in one-way, two-way and store-and-forward configurations.

Figure 1: *A network solution for data modem communications over one-way cable plants, utilizing equipment from Zenith and U.S. Robotics.*



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For those with one-way systems, the Wink Internet Studio converts Internet content into Wink's Interactive Communicating Applications Protocol (ICAP) for broadcast to viewers. In the two-way domain, the Wink Internet Gateway converts Web, newsgroup, chat and e-mail content written in all major Internet protocols, including HTTP, HTML, SMTP, NNTP and IRC, to ICAP.

And finally, two weeks after the Show, Zenith announced a Web browsing and e-mail capability for a family of interactive TV receivers called NetVision. The company will work with Diba Inc. to develop a "module" that will be built into the TV to allow a range of services, including Web browsing, e-mail, and later, Java terminal applications.

The NetVision receivers will have a 28.8 kbps modem and an Ethernet port built in, while an optional wireless keyboard will be made available at additional cost. Product will be introduced for this year's Christmas buying season, and this feature is expected to add $400 to $600 to the price of the TV.

The Diba software has a special algorithm designed to make the graphic presentation pleasing, according to Tom Sorensen at Zenith. The system will offer about 4 Megabytes of memory to display the Internet information.

While much of the NCTA show talk revolved around a variety of future modem orders and deployments, LANcity announced that it now has more than 20,000 subscribers on-line at more than 250 operational sites worldwide. This includes sites from California to Maine, as well as Europe, South America and Australia.

Meanwhile, LANcity also introduced quality of service (QoS) provisioning for its family of data modems. QoS enables operators to allocate bandwidth upstream and downstream so that they can establish a multi-tiered modem service structure (e.g., commercial, residential, work-at-home, etc.) and charge accordingly.

And there was no shortage of information regarding business relationships as everyone scrambles to get their share of any profits to be made over data delivery. In the realm of data standards, Arthur D. Little has been selected by the MCNS group of cable MSOs and CableLabs to assist in the creation of international specifications for high-speed data transfer over cable TV networks. The announcement confirmed earlier press reports naming A.D. Little as the consulting company of choice. The MCNS group–consisting of TCI, Time Warner Cable, Comcast and Cox Communications–along with Rogers Cablesystems, Continental Cablevision and CableLabs, are working to establish open specifications that allow cable modems to work in any system, in any location. Such a specification would allow the modems to be sold at retail outlets.

Honing a strategy to leverage its interactive TV software for use in high-speed data applications, Microsoft Corp. announced it will supply Time Warner Cable, Comcast Corp.

Terayon Corp.'s TeraPro modem should be available for MSO field trials by October.

and two international cable operators with Internet browsers and associated software.

The contracts are a major win for Microsoft, said Craig Mundie, senior vice president of Microsoft's consumer platforms division, noting Microsoft's ongoing challenge to gain on leading Internet browser software-maker Netscape Communications Corp.

Time Warner will deploy Microsoft's Internet Explorer as the browser packaged with its LineRunner high-speed data deployments, and is continuing to work with Microsoft to determine whether or not to use Windows NT-based servers for future deployments, Mundie said.

Comcast will follow a similar approach. "This is further proof that the computer industry shares our immense enthusiasm for high-speed data via cable," said Steve Craddock, vice president of new media development for the MSO.

Singapore Cablevision and Compagnie Generale de Videocommunication will also integrate Microsoft's software into their cable networks for high-speed data applications, Mundie said.

In a related announcement, Microsoft used the convention to announce partnerships with 25 cable modem manufacturers, system integrators and installation experts, as part of its new "public networks platform." "The real goal was to assemble a group of companies who can provide turnkey installation, systems integration and support, as well as cable modems themselves," said Mundie. Among the cable modem participants: Com21 Corp., General Instrument Corp., Motorola Inc., Scientific-Atlanta Inc. and Zenith Electronics Corp.

Microsoft is already testing cable modems from several participating manufacturers in its Redmond, Wash. laboratory.

Motorola executives said they plan to collaborate with Microsoft to integrate Microsoft's Windows NT-based servers with Motorola's CyberSurfr line, and on the development of future on-line multimedia services like electronic commerce, video conferencing and interactive games. The companies will also work together on joint marketing and promotion, said Jim Phillips, VP/GM of Motorola's Multimedia Group.

Cascade Communications Inc. and Motorola's Multimedia and Information Systems Group announced their intention to jointly market and develop interoperable capabilities that allow cable operators to deliver high-speed data communications. The two companies will work on integrating Motorola's CyberSurfr modem with Cascade's multiservice switches, which carry an estimated 70 percent of Internet traffic.

Singapore Cablevision has initiated a trial of cable modem technology, using Digital Equipment Corp as its key systems integrator, and Microsoft Corp. as a provider of NT servers and content from its Microsoft Network online service.

Motorola Inc. will provide an initial 100 of its CyberSurfr modems, through a deal announced at the show.

Last month, the trial was scheduled to expand to 100 households, with a potential of scaling into a deployment to as many as 240,000 homes over the next five years, considering that 30 percent of Singapore's 800,000 residents own PCs. Singapore Cablevision is reportedly adding about 5,000 homes/week to its 750 MHz, two-way system there, according to sources familiar with the system.

Wave Interactive Network will use high-speed cable data modems manufactured by Com21 to provide software and other content to users in the Palo Alto Cable Co-op trial. Wave's CablePC Project plans to deliver a wide collection of software titles, including games, interactive multimedia, business applications and head-to-head network gaming on a pay-per-use format.

Com21 and Wave will share testing information for the 100-site Palo Alto, Calif. trial and, pending results of the two-month trial, Com21 will consider embedding Wave's proprietary billing and selection technology as a standard cable modem feature.

Wave officials said that use of the Com21

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modems can reduce the amount of server infrastructure required by delivering commonly used data simultaneously. In addition to using the Com21 modems, Wave will also use CD-ROMs and data broadcast delivery methods.

Convergence Systems Inc. signed a multi-year partnership/resale agreement with GridNet International Inc., and now plans to use that deal to provide high capacity Internet backbone connections to cable operators. Executives with CSI called the arrangement a "previously missing link for a cable thrust into Internet access" with a connection to a backbone capable of carrying bursty, LAN-like cable modem traffic.

"This is the first time an Internet Access Backbone has been put together for cable operators to tap the lucrative Internet access business and offer customers the unique speed cable can bring," said David Ames, chairman and CEO of CSI. GridNet is a joint venture partnership with Wiltel Data Services, which is a subsidiary of LDDS WorldCom.

And General Instrument Corp. used ATMnet, a San Diego-based provider of high-speed communications bandwidth and services, to provide Internet connectivity for GI's SURFboard ATM network demonstration at the show. The SURFboard network, which is undergoing testing, will be commercially available in 1997. ATMnet is the first network service provider to build its Internet backbone using ATM (asynchronous transfer mode) technology over OC-3c speeds (155 Mbps).

In the content arena, BadCo. showed off its new "NeighborNet" localized content system. Using NeighborNet, cable operators seeking to provide local content to cable modem customers can create and manage a community of interests on the World Wide Web that is geographically specific to that MSO's area, executives said.

NeighborNet consists of three software elements: an administrative module that lets the local info provider create and monitor Web site activity and track network activity; a client software model that is distributed to local businesses, schools or other groups so they can modify local web pages easily; and a server module to churn the client information into HTML (Hypertext Markup Language) and post it to the correct Web server.

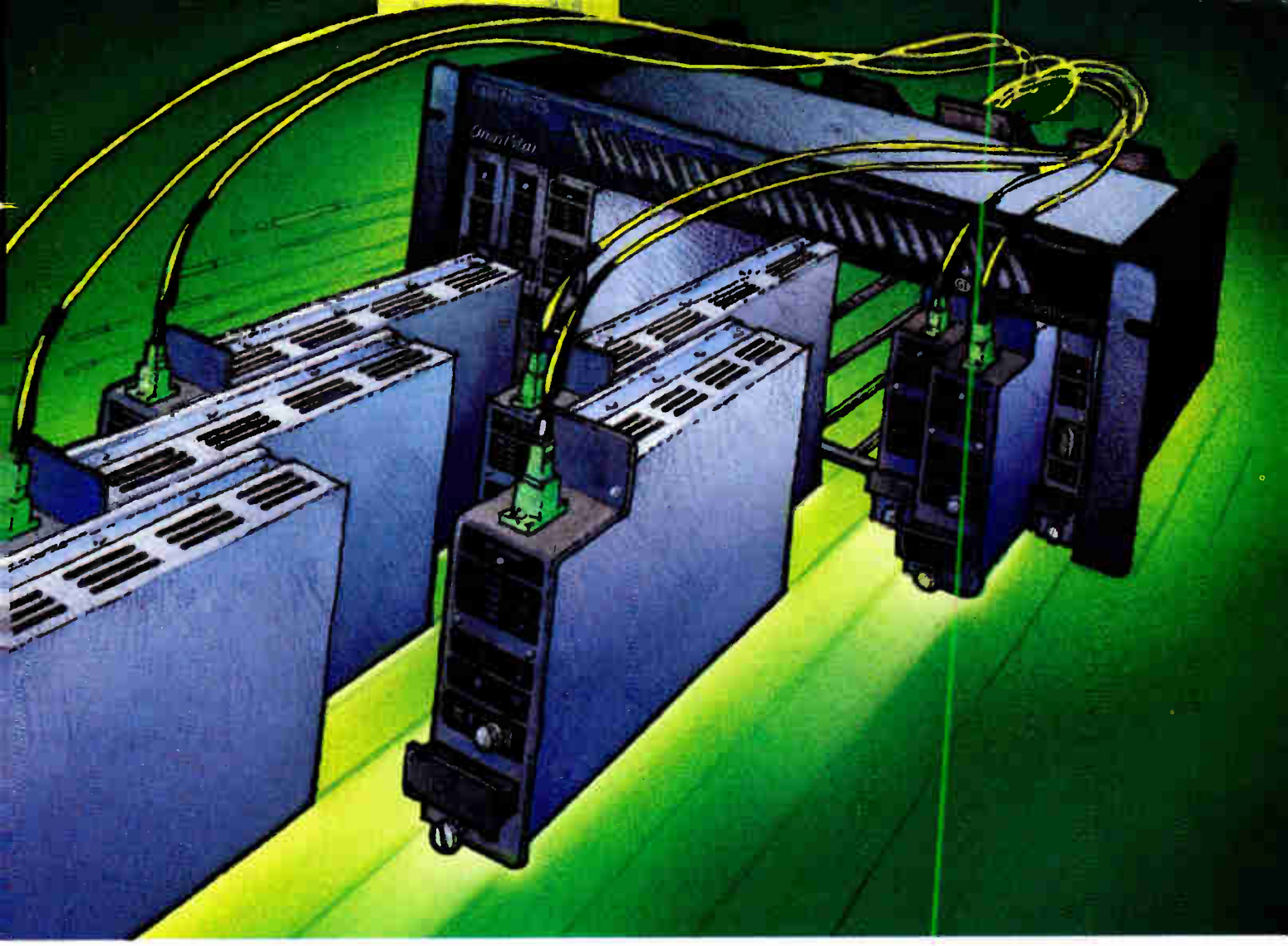
BadCo also plans to maintain a global server that will connect regional NeighborNet sites into a dynamic network, providing an opportunity for national advertising links and information access, executives said.

Set-top news: Is it digital, yet?

Tele-Communications Inc., Cox Cable Communications, Comcast Corp. and Charter Communications will buy a combined 2 million digital set-tops from General Instrument Corp., in moves that put meat on the skeletal letters of intent that were signed by those operators three years ago.

In a press briefing at the show, Ed Breen, president of GI's Communications Division, said that "we have finally birthed the elephant," referring to the three-year DigiCipher development period that has been riddled with delays and set-backs.

Specifically, TCI will kickoff the 1996 launch on October 20 in Hartford, Conn., said Camille Jayne, senior VP of TCI's digital video business unit. Cox and Comcast will follow with orders for 350,000 and 300,000 terminals, respectively, that will be installed over the next three years.



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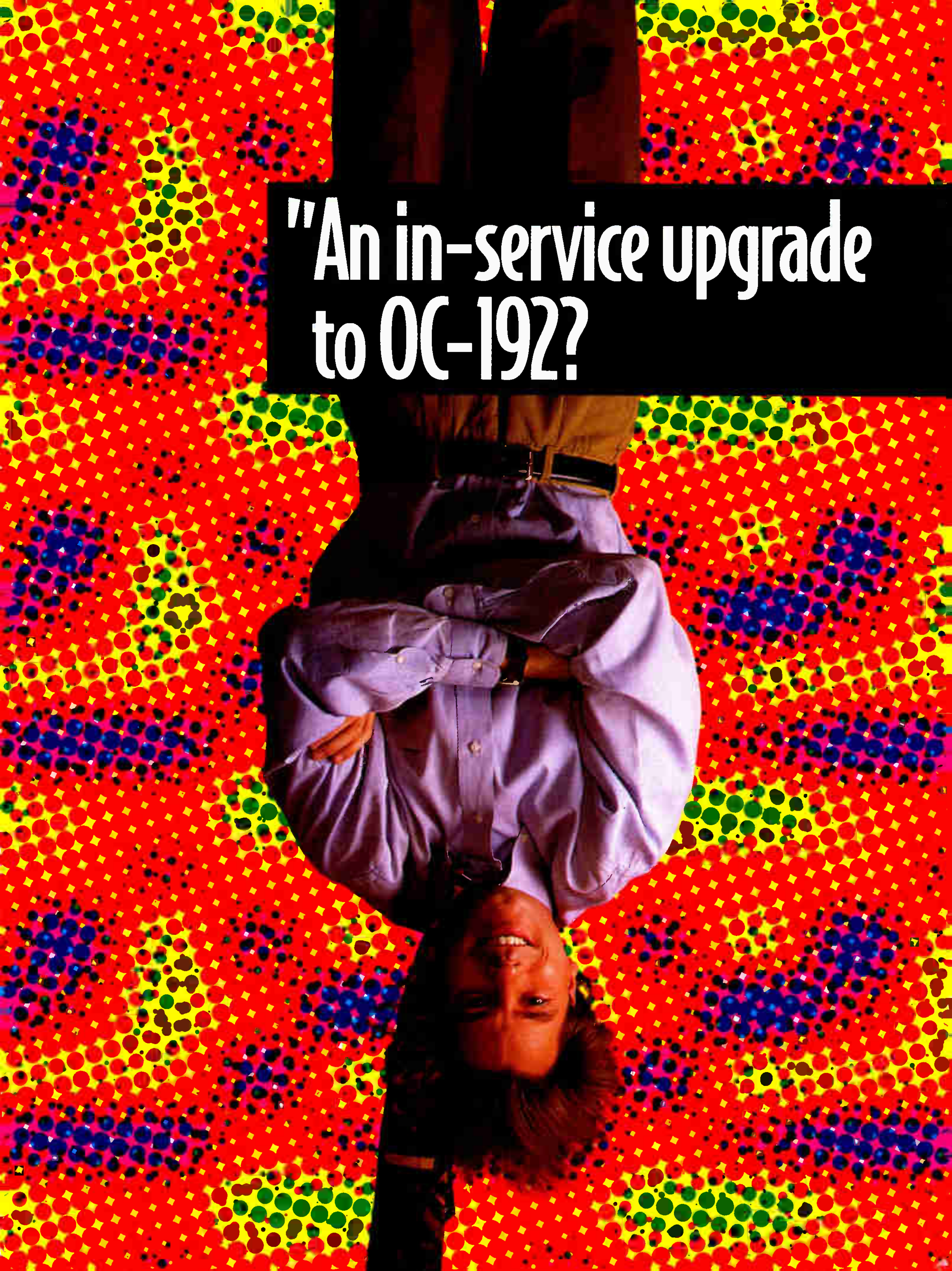
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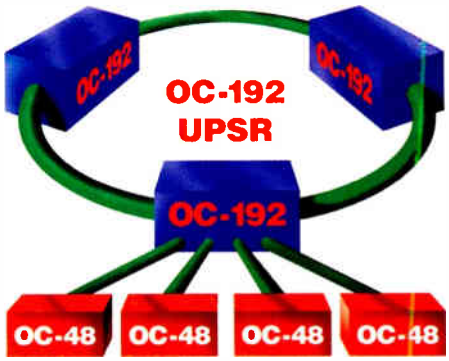

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The FLASH system also delivers full access and routing of all 192 individual signals within the STS-192 bandwidth, including hairpinning between tributaries. The wavelength-division multiplexing option doubles your effective transmission capacity. And the integrated pre- and post-amplifiers will eliminate the need to buy a separate piece of equipment.

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Supports multiple SONET ring configurations.

The FLASH-192 system is highly flexible. In addition to UPSR configurations, it will support two- and four-fiber bidirectional line-switched ring (BLSR) architectures, as well as virtual ring applications. With the FLASH-192 system, SONET survivability isn't sacrificed.

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Cox's Alex Best, senior vice president of engineering, said the MSO will pay $150 million for its 350,000 boxes, equating to a per-box price of roughly $430. That price may or may not rise closer to deployment, after the MSOs decide whether or not they'll stuff the boxes with the extra megabyte of random access memory needed to decode the B-frame portion of the MPEG-2 digital bit stream.

Most operators are still undecided on that issue, saying they'll make that choice "closer to deployment." TCI and Cox said they're not entirely convinced of B-frame value, given the additional memory costs, while Comcast executives said they're leaning toward the use of B-frames.

But there was also news of further digital delays. Hewlett-Packard Corp. has put an indefinite hold on the development of its DigCipher-based Kayak digital set-top terminal, saying it has gone as far as it can go without certain missing components from General Instrument Corp. and without more interest from cable MSOs.

In a press briefing, H-P executives said that Kayak units definitely won't be available this year, as previously planned, and may not be available next year, either. However, at this point, the company is still committed to building the units, said Casey Sheldon, brand manager for H-P's home products division.

"We've always said that we'll lag GI by about 12 weeks, based on the licensing agreement–but instead, we're going to wait and see" what happens from a volume deployment perspective, said Sheldon.

Bill Hahn, operations manager of H-P's Interactive Broadband Products Division, said that network infrastructure elements–including headend gear from GI and associated services from Tele-Communications Inc., "are rolling out slower than we expected."

Sheldon was quick to point out that the Kayak decision doesn't in any way reflect on H-P's industrywide plans for digital video equipment, describing Kayak as a first-generation product specifically configured for DigiCipher-II applications.

"Frankly, we feel we've gone as far as we can go. The volumes aren't there that are required by vendors to continue," Sheldon said. H-P did respond to Time Warner Cable's recent "Pegasus" request for proposal, but "not with a DigiCipher-based proposal," she said.

Scientific-Atlanta Inc. announced the formation of partnerships with three formidable consumer electronics firms–Thomson Consumer Electronics, Pioneer Electric Corp. and Toshiba Corp.–to secure its place as a front-runner in the group of set-top requests for proposals (RFPs) from cable MSOs and telcos.

The four-way S-A/ Thomson/Pioneer/Toshiba deal is a result of the companies' responses to at least one RFP, issued by Time Warner Cable two months ago. It wasn't clear whether S-A and its partners were also collaborating on RFPs put forth recently by the americast and Tele-TV telco consortiums, but industry sources called that premise "a logical supposition."

Among the announcements is one in which S-A licensed its PowerKey conditional access system, digital set-top microprocessing chips that handle MPEG-2 and DAVIC standards, and PowerTV Inc.'s operating system to Toshiba and Pioneer, through a memo of understanding. S-A is a majority owner of PowerTV.

Thomson, the manufacturer which locked up the $1 billion MMDS set-top order from TeleTV and which is providing direct-to-home receiver equipment for DirecTv, announced a similar memo of understanding with S-A. That deal will likely mean that S-A supplies headend hardware and software, including MPEG-2 encoders, broadband integrated gateways, QPSK modulators and demodulators, and a digital network control system. Also included will be S-A's software suite of PowerKEY and PowerTV, through a memo of understanding that is still being negotiated, sources said.

General Instrument Corp. will fold individualized programming applications made by ACTV Inc. into its digital set-top terminals, for no additional cost to operators, the companies said. ACTV's technology works by letting viewers alter camera angles, call up statistics, isolate an individual player or character for more information, or call for instant replays.

It is already being tested with Prime Sports in Los Angeles, on Ventura County Cablevision's system, ACTV executives said.

In the GI deal, described in a press statement as a "memo of understanding," ACTV and its partner, the David Sarnoff Research Center, will develop with GI the software that allows GI to implement ACTV's programming technology.

Mitsubishi and Microware teamed up to showcase "user-friendly" Internet access devices during the show. Following last year's announcement that Mitsubishi would use Sun Microsystems' Java to create digital networked products, Mitsubishi demonstrated the first in a planned series of Java and Microware OS-9 based technology via digital TVs and set-tops.

The products feature OS-9 with X Windows

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and Motif interface to the Java environment on a desktop platform. Future products will integrate DAVID's multiple application user interface to the Java application for digital TVs.

Seeking to recharge its set-top box sales to cable TV and other network operators, Zenith Electronics Corp. has licensed digital video compression and signal processing technologies from Divicom Inc. and will develop a new digital set-top for wired and wireless networks. A prototype of Zenith's new box was on display for the first time, along with Divicom's working set-top.

The new set-top will feature Divicom's MPEG-2, DVB-compliant chip set and quadrature amplitude modulation (QAM). Previously, Zenith had built its digital set-top around vestigial sideband (VSB) modulation, which was adopted as part of the North American terrestrial HDTV standard. However, nearly every cable MSO and telco had chosen to use QAM to deliver digital programming.

The Zenith/Divicom set-top will utilize the "network interface module" architecture, making it compatible with a range of network architectures, including hybrid fiber/coax, switched digital video, MMDS and potentially others.

In the realm of digital security, Macrovision has completed its Copy Protection Management Framework for digital video networks, the company announced. The document is now available for network operators and set-top box manufacturers.

And Pioneer New Media Technologies joined the group of set-top makers which will use Wink Communications' interactive kernel in its advanced analog set-tops, joining existing players General Instrument Corp. and Scientific-Atlanta Inc. Using the Wink Engine, Pioneer will be able to offer interactivity within traditional TV programming by overlaying interactive applications and content.

Cablephone

Tellabs demonstrated its new element management system designed to work with the company's CableSpan cable telephony system. Scheduled for release in the first quarter of 1997, the CableSpan EMS operates under a Microsoft Windows NT environment and provides a graphical user interface for network configuration and surveillance. Based on the Telecommunication Management Network framework, the system interfaces to any upper-level operational support system, Tellabs officials said.

The software package provides a way for cable operators to manage their telephony networks, and provision and reconfigure services.

CableData Inc. introduced Intelecable, its transaction management system designed to support converged telephony and cable operations, to the U.S. market at NCTA. In making the announcement, the company cited the product's success internationally and in U.S. convergence trials, including the BellSouth interactive system. Additional U.S. installations of Intelecable are underway and will be announced in the weeks to come.

A multiple-service transaction management system that utilizes a relational database architecture, Intelecable was designed to meet the business requirements of companies offering multiple telecom services. The package supports addressable interfaces, as well as audio response unit and two-way impulse event-ordering technologies. Intelecable also includes localized banking interfaces for a range of electronic-funds-transfer methods, direct debit and GIRO. It also allows customer billing statements to be printed on site or at a fulfillment facility.

Intelecable is currently deployed at 26 locations worldwide, including the U.K., Japan, Australia and Portugal. CableData has already reached an agreement to add more than one million subscribers in Holland and Brazil this year.

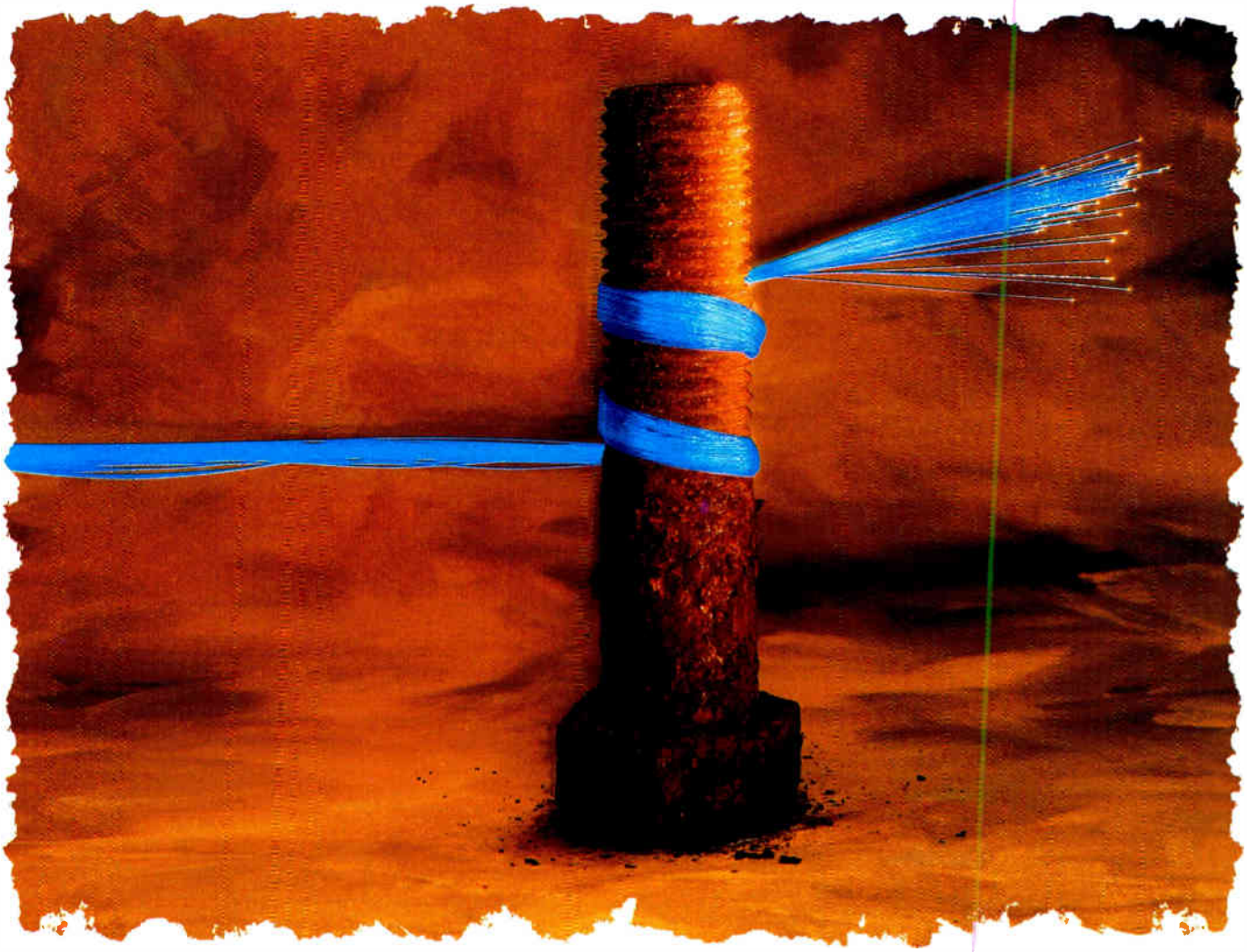
Headend equipment

Tele-Communications Inc. will use Compression Labs Inc.'s "Magnitude" digital broadcast system to transmit four channels of broadcast video over a terrestrial link between the MSO's Denver and New York City facilities, it was announced during the show.

Compression Labs executives said they think the project is a first, because it sends multiple MPEG-2 video signals over a standard DS-3 (45 Megabit-per-second) circuit–while most similar circuits can carry only one channel in each direction.

The network link uses a standard high-speed serial interface, or "HSSI," adapter, between CLI's MPEG-2 multiplexer and off-the-shelf terrestrial circuit terminal gear, which means that other operators could use it, too, executives said.

Digital outputs from MPEG-2 encoders manufactured by General Instrument and Divicom conform with the MPEG-2 standard, according to tests performed by Cable Television Laboratories. The tests are important because within the complex MPEG-2



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standard, it is common to experience implementation errors, according to CableLabs Senior Vice President and Chief Technical Officer Richard Prodan.

The testing currently involves verifying 104 system transport stream elements and 73 video stream elements, such as bit stream syntax and semantics, program multiplexing information, buffering, timing and synchronization to determine compliance with the MPEG-2 main profile/main level definition.

TVN Entertainment Corp. demonstrated its new digitally compressed cable programming service at the show. General Instrument's newest MPEG-2 digital encoders, recently installed at TVN's Digital Network Operations Center, digitally encoded special programming, including wide-screen film and previews of TVN's PPV movies. Digitized signals were transmitted to a GI IRT, modulated, decompressed and decoded in TVN's booth.

Axicom launched its "ADvantage" digital advertising system, developed specifically for small- to medium-sized cable operators who want to replace existing analog insertion gear.

The system is software-centric, said Geoff Allen, president and CEO of Axicom, and uses a concept called "Dynamic Channels" to shave one-third to one-half off the price of hardware-centric digital systems.

The hardware portion of the system includes off-the-shelf PC components including Pentium microprocessors, and will be available this summer in configurations that scale from four to 20 channels.

Pioneer New Media Technologies and its Cable Group unveiled their DiscBank commercial insertion system at the National Show. The DiscBank is an MPEG-2, MP@ML-based system targeted toward high-end MSOs and interconnects. Pioneer also offered a preview of some of its new DVD technology, with a demonstration of its DVD Authoring System. The system will synchronize audio, video, subpicture and program logic elements into an integrated bit stream that can be used for DVD mass replication.

TeleCorp Systems showed off its "VocalPoint Interactive Services Transition Architecture," or "VISTA," at the show, terming it a call processing platform made especially for large, high-volume call centers. The system integrates TeleCorp's automatic response units, CTI servers, database services and agent screen software into a single, automated pay-per-view and customer service solution for cable operators, executives said.

For example, the server architecture eliminates the need for each ARU to perform all functions–instead, the servers can be combined resources that are accessed when needed, executives said.

In another deal announced in L.A., Channelmatic has been selected by National Cable Communications to install an 80-channel, five zone, MPEG-2 digital ad insertion system for the Chicago Interconnect, a deal estimated at $1.5 million. Installation is targeted for completion by August 1, 1996. The Interconnect will be the first to deploy the Channelmatic MVP/Sony VideoStore system, which is capable of providing advertising spot management, distribution and insertion. It will have a capacity of 2,500 30-second spots and will serve 49 individual headends. It will be the second interconnect to use the IndeNet Digital SpotServer to receive spots via The IndeNet digital spot network.

IBM announced several vendor agreements in L.A., including relationships with SeaChange International, StarNet Development Inc. (SDI) and Applied Digital Technology for digital ad insertion, as well as an agreement with Arrowsmith Technologies Inc. for a cable fleet management system that runs on IBM's platform.

SDI's Digital Video Insertion Systems are intended to be integrated into larger digital advertisement insertion systems offered by IBM's Telecommunications and Media Industry solutions unit.

As part of a distribution agreement with SeaChange International, IBM will provide SeaChange's digital SPOT advertising insertion system as part of its offering to the television industry. And rounding out the ad insertion announcements, Applied Digital Technology has signed an agreement to supply key components of IBM's offerings of digital advertisement insertion systems to the broadcast and the cable TV industries.

Arrowsmith, which has introduced its Fleetcon product on the IBM RISC System/6000 family of workstations and servers, is working with IBM on the development, deployment and operation of Continental Cablevision's Customer Expert System (CCES).

TCI Technology Ventures Inc. announced its intent to adopt Imedia Corporation's StatMux technology for its Headend In The Sky (HITS). StatMux is a real-time statistical multiplexing compression technology that provides transmission of 24 different programs over a single analog transponder.

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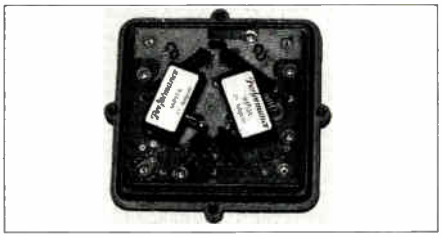

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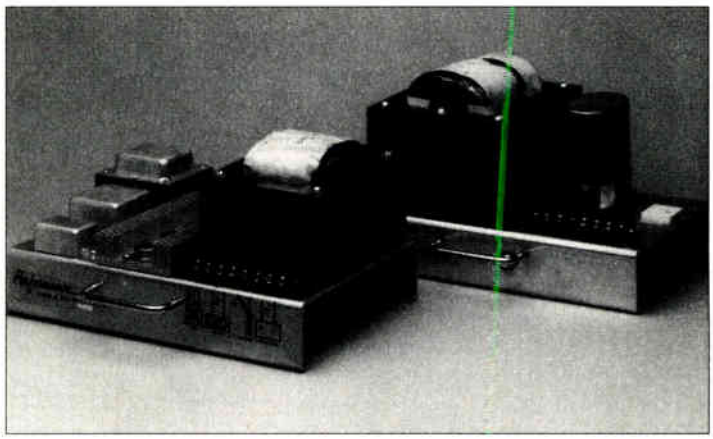

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The ***Flexi-Power*** modules feature multiple output taps for easy upgrade to 72 or 90 volts and have a lifetime warranty.

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TCI's HITS service will provide digitally compressed programs and addressable management services to U.S. cable operators nationwide when it launches later this year. Imedia technology will allow operators to "cherry pick" programs offered by HITS, tailor programming packages for their systems individually and offer localized near-video-on-demand as well. Imedia's technology was demonstrated in TCI's HITS booth during the show.

Distribution

Not to be forgotten amid the high-speed cable modems, digital set-tops and other high-tech paraphernalia at the National Show was a new F-connector from Antec Corp., designed for use both inside and outside the home.

"Digicon resulted from our asking customers what they needed to enable them to install a superior product today that will eventually allow them to handle higher bandwidth, bi-directional and digital services," said Pete Wagener, vice president of network transport at Antec.

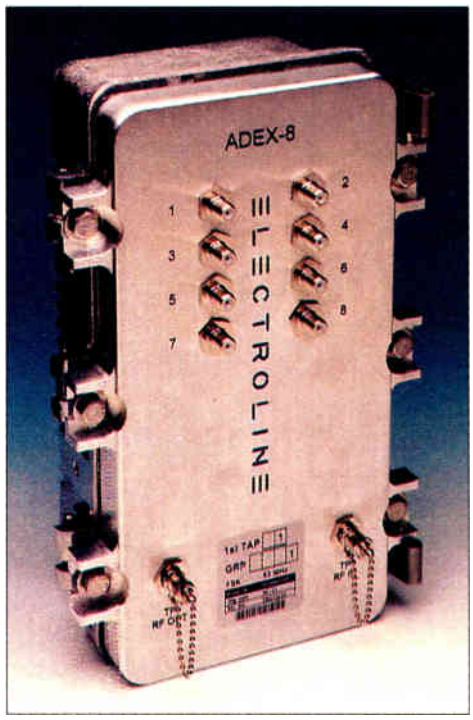
What makes it different from other compression-style connectors is that Antec engineers removed the "O-ring" from inside the connector to prevent physical and electrical degradation from repeated connection and disconnection, executives said.

Because the new connectors have universal scaling, one can be used for all braid coverages of a particular cable type. The connectors are currently available for both series-6 and -59 cable, company executives said.

Electroline Equipment Inc. announced the availability of the Addressable Drop Extender (ADEX), a new tap with built-in status monitoring and signal gain of 18 dB per port. Designed with the needs of telephone company HFC networks in mind, ADEX 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. ADEX is available in 450 MHz, 550 MHz and 750 MHz versions.

Where some HFC networks use status monitoring at amplifier, power supply and end-of-line locations, ADEX takes the network monitoring process one step further, providing tap-level information on addressable tap port function. ADEX also contains a built-in surge suppression circuit to protect internal components, and thus heightens network reliability, according to Electroline officials.

The eight-port and 16-port ADEX units also adjust radio frequency signal performance as part of the signal amplification process, equalizing the RF signals in the tap before amplifying them. Features include: remote on/off control of all tap ports; alarm signals sent by twisted pair



Electroline Equipment's Addressable Drop Extender (ADEX)

wiring to a central monitoring site; automatic surge protection; signal padding and equalization; automatic signal amplification; integrated RF in/out test points; adjustable slope control (corrects signal for frequency response); and local programming of all tap ports.

Electroline also announced the availability of 90-volt powering options for its line of passive and active multitaps, including the 1 GHz SuperTap and Compact Addressable Tap (CAT). The new powering option allows two-way operation at the higher power configurations cable TV and telephone companies are adopting for their HFC networks.

The 90-volt SuperTap comes in a variety of configurations. featuring models that block or pass power on all or some of the ports.

In addition. Electroline has introduced its new two-port Compact Addressable Tap, which allows a network operator to use any standard trap or filter. The two-port CAT allows both on/off control of each tap output, plus the ability to add a third party filter on the output. The external port allows the use of a "notch filter," for example, to locally trap one or more channels, in addition to remote control of the on/off functions of the tap.

And finally, Electroline demonstrated its CLEARPath ingress isolation software for the first time. CLEARPath can rapidly and remotely fix the location of drop-cable-related signal interference. The company's booth demo showed how a cable or telephone company can identify the source of signal interference that damages data and voice communications over the hybrid fiber/coax network. Demos further showed how search parameters are set, and how the software helps identify the geographic location of a signal interference problem, without the need to dispatch a technician to manually hunt for the source of interference.

The CLEARPath software runs on a standard personal computer running Microsoft Windows and features a color graphics display. The control station is connected to a rack-mounted Electroline Addressable System (EAS) control unit.

Texscan Corp. and Superior Electronics Group announced a cooperative sales and marketing agreement to integrate their respective technologies. The agreement will facilitate the integration of all Texscan distribution products with the Cheetah status monitoring product line.

Customer care and management

CableData Inc. debuted the latest version of its DDP/SQL software, Release 3.2. DDP/SQL is the company's customer care business support system, used by more than 50 percent of the cable television providers in North America, according to CableData.

The new and enhanced features of Release 3.2 include support for near-video-on-demand (NVOD), along with other improvements in the system's pay-per-view module. The enhancements mean operators can more easily enter complex programming schedules, use variable pricing schemes and better control master and component events.

CableData has also expanded DDP/SQL's Regionalization module to include nationalization, which means the system transparently supports consolidation of customer service locations into regional call centers across networked host computers. Another module lets cable providers track all incoming and outgoing customer contacts, as well as annotate contact data, access it onscreen to improve customer care, and generate reports to analyze customer trends and marketing efforts. The DDP/SQL system is based on relational database technology.

CBIS has announced that Time Warner Cable is implementing its CableMaster 2000 Subscriber Management and Billing solutions for the MSO's systems in Albany, N.Y. and Minneapolis, Minn. Combined, those two markets serve more than a quarter-million Time Warner Cable subscribers.

CableMaster 2000 utilizes an on-line, real-time relational database which enables each of Time Warner's departments to update and access data at all times.

The CableMaster 2000 package currently

Jones Intercable's theft of cable amnesty campaign

Oxnard system fights back

By Bill Rivas, Marketing Manager, Jones Intercable, Oxnard, Calif.

Editor's note: For several years running, CED *has published the winning papers from the NCTA's signal security ideas competition. What follows are edited versions of the two winning 1996 papers.*

What is theft of service? There are three key forms of cable theft:

✔Primary theft–The cable thief climbs a utility company pole or gains access to a junction box in order to tap into the cable coaxial wires, and runs an illegal line directly to the home.

✔Unauthorized use of convertors—A paying customer with basic cable (usually the broadcast cable tier) or a cable thief hooked up illegally, purchases or tampers with a convertor. This enables the convertor box to receive all basic cable channels, premium pay channels, pay-per-view movies and special events.

✔Theft of cable company equipment—The subscriber moves or cancels service and does not return the convertor box. Most recently, we have seen our convertors traded for illegally tampered convertors.

The problem

Studies conducted by the National Cable Television Association (NCTA) conclude that unrestrained theft of service is costing cable operators $4.3 billion per year. A significant proportion of those revenues are recoverable by marketing, public relations and legal means.

In our system, we have recovered many altered convertors from customers who simply state they did nothing to the box, or that someone in their household may have played with the convertor, but they did not receive free services or know who exactly tampered with the convertor. It is commonly known in the City of Oxnard and surrounding communities that the security features of our convertor boxes are easily defeated. A local electronics school gives schematics of our convertor boxes to students who, in turn, use them to tamper with our convertor boxes or sell them to cable thieves.

The theft of service problem in our industry is undermining consumer perception of the price-to-value relationship of cable TV service; i.e., the honest customers bear a greater share of the cost of service and ask themselves why they should be paying for services when their neighbor(s) currently pays nothing.

The thief

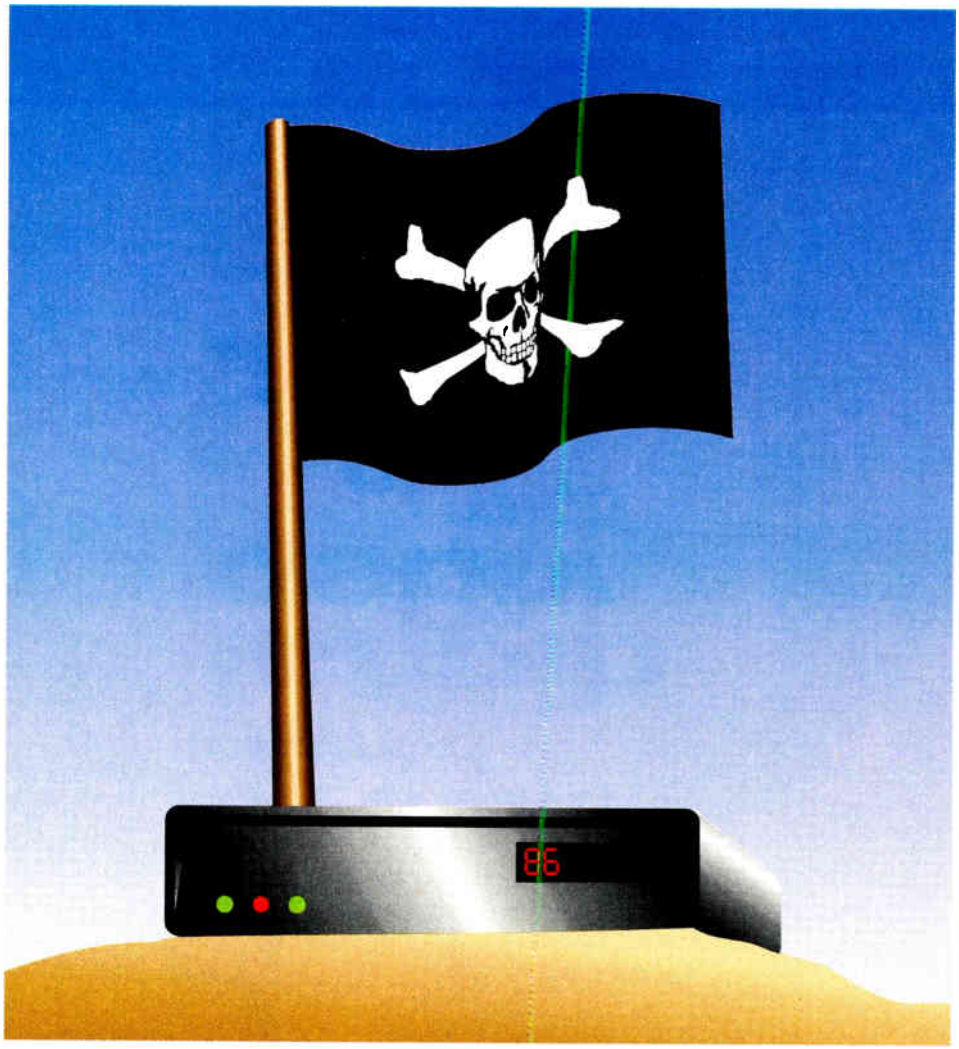
In Oxnard, we have found five types of cable thieves:

1. Accidental thief. We define the accidental thief as someone who discovers a live cable drop (or unreturned convertor) when moving into a new residence.

2. Innocent thief. We define the innocent thief as the recipient of cable service due to the actual actions of another family member or resident, i.e., the parents of the children that tampered with a convertor, or the wife of someone who has either tampered with equipment or bought illegal equipment.

3. Regular thief. We define the regular thief as someone who willfully makes an illegal connection, tampers with a convertor box or purchases one at a flea market or through a local newspaper or electronics publication.

4. Dishonest associates. We define this thief as any employee who willfully connects customers with cable or provides tampered equipment to the public without setting up a proper account. This may also be an associate who



Keeping the Lines of Communication Open

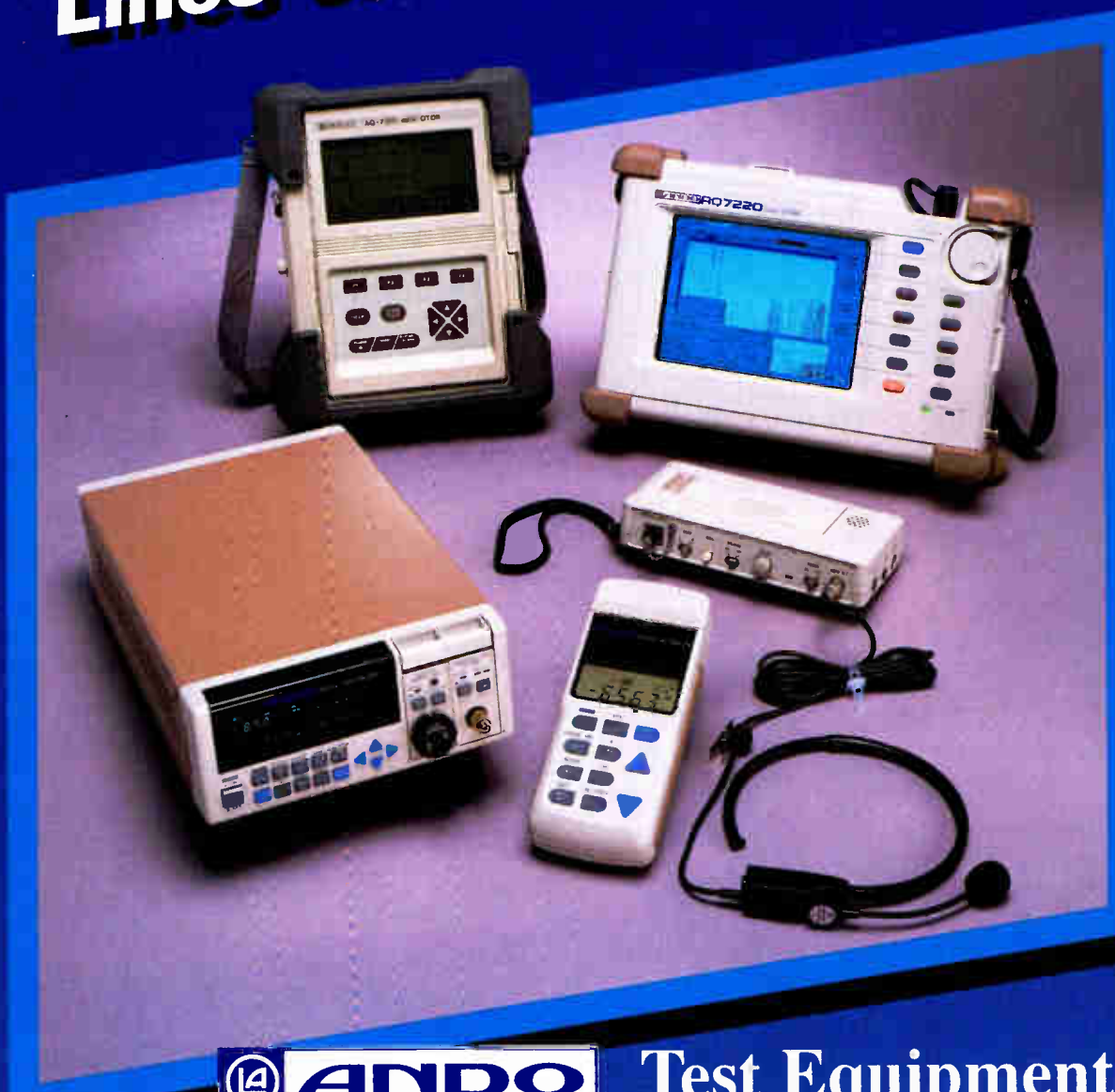


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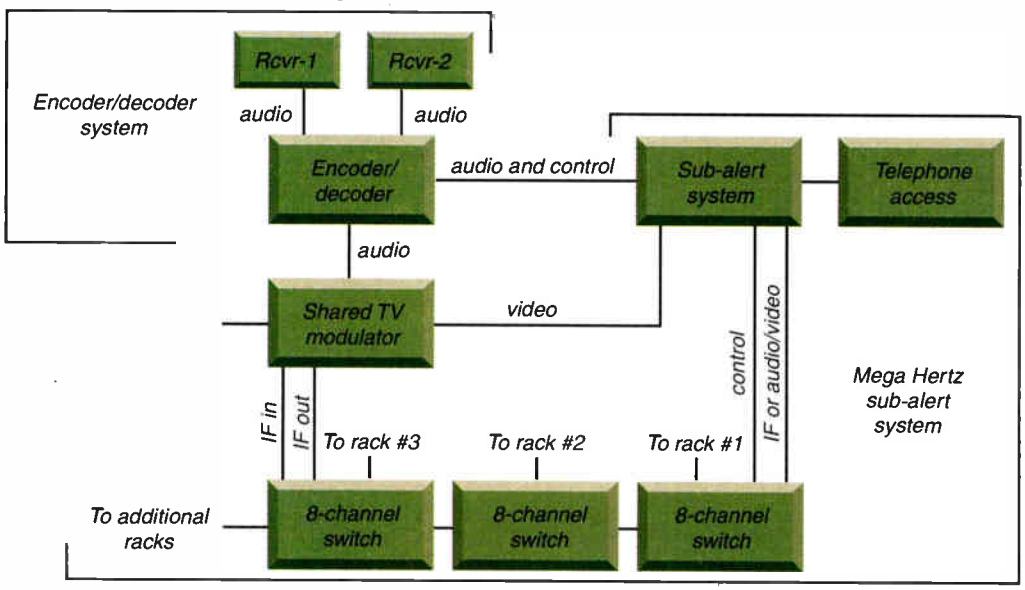
Figure 2: Basic headend block diagram



ry source for activating local EAS signals (see sidebar, "EAS Activation Codes").

What you need to install

You will need to install one of the following systems.

1. Audio-only interruption.

a. Audio messaging on all channels.

b. Audio and video EAS messages on the "emergency channel generated by a special character generator fed from an EAS Encoder/Decoder."

c. Audio-only override system.

d. EAS encoder and decoder.

e. "In-home devices" in the homes of subscribers who are certified as hearing impaired or deaf.

2. Audio and video interruption

a. Audio and video messaging on all channels.

b. Audio and video EAS messages generated by a special character generator fed from an EAS encoder/decoder.

c. Audio and video override system.

d. EAS encoder and decoder.

Recommendations

Let's start with the encoder/decoder. This portion of the EAS processes the digital burst. It first looks at the header to see if the message is intended for your cable system. If it is, the signal is processed. If not, it is ignored. Either way, it is automatically retransmitted over your system so other EAS facilities can use you as a potential signal source.

If the signal received is an active signal, a data output is provided to a character generator that feeds the TV modulator on your emergency channel (or on all channels if your system is configured that way). The emergency channel will typically not be a dedicated channel, but rather, a channel that is shared with another service, such as local origination. If digital audio is included in the burst, it is converted to analog and output to the TV modulator. Up to two minutes of 5 kHz bandwidth audio can be provided in the EAS data burst. Note that the emergency character generator uses a data input to derive its video and is not a "standard" off-the-shelf character generator.

The cost of a typical audio/video interrupt system is no more than that of an audio-only interrupt

The encoder/decoder includes provisions for processing the weekly and monthly tests and a printer for logging. The FCC has recently type accepted two encoder/decoder manufacturers: Sage and TFT.

As previously noted, you must monitor two EAS signal sources. These can be a combination of AM, FM, NOAA or UHF/VHF over-the-air broadcasts.

My recommended approach is to use audio and video interrupt on all channels, rather than audio-only. The use of audio and video negates the requirement for "in-home devices" and their associated costs. It also eliminates the cost of truck rolls for device installation and maintenance and removes potential liability problems if an in-home device fails. Note that the cost of a typical audio/video interrupt system is no more than that of an audio-only interrupt system.

Different requirements

The author's company has developed the "Sub-Alert" audio/video EAS system. The Sub-Alert consists of a message generator, telephone access, and switching equipment to work independently of or in conjunction with the encoder/decoder. The system can be configured to include composite IF switches, dual IF switches, and/or baseband audio/video switches in any combination. Each switch controls eight cable channels and is designed to control the switching in a single rack, minimizing wiring requirements. Since the requirements of every cable headend will be different, the system can be customized to meet most needs. Hundreds of cable channels can be supported.

For emergencies where the encoder/decoder is activated, the encoder/decoder automatically activates the Sub-Alert with a pre-programmed audio/video message telling your subscribers to tune to the emergency channel for additional information. In the event of a local alert, the Sub-Alert can be activated through a touch-tone telephone.

When activated, program audio and video are switched out and a character generated message is switched into the channels. Emergency audio is provided through the telephone handset or from a pre-recorded digital audio player. Video messages can be pre-programmed into the character generator, programmed locally, or programmed remotely via a personal computer and a modem. Memory capacity is 95 pages. The display includes both full screen text and a crawl.

In conclusion

Unless you can arrange an exemption with the FCC, you must have the new EAS operational no later than July 1, 1997. It is a complex system, and operators should begin planning soon. CED

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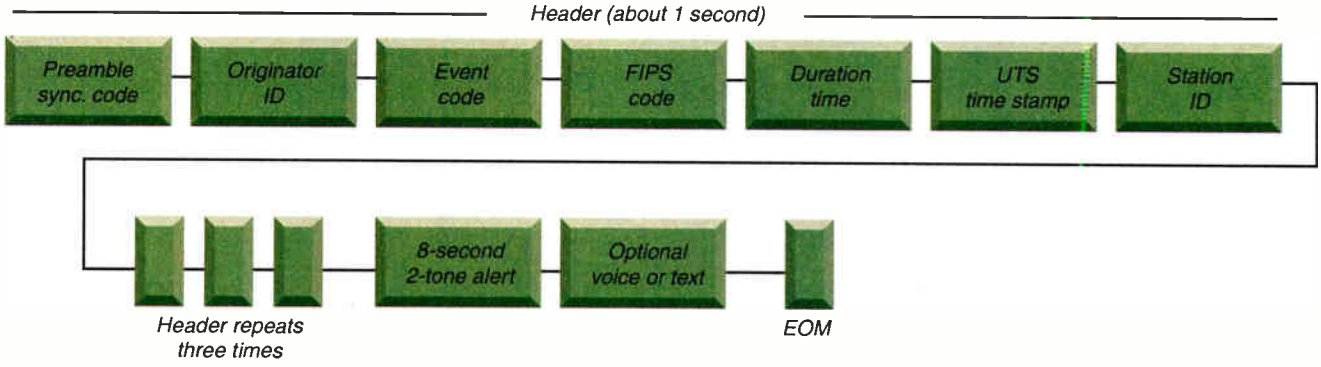
 * Compliance with the new EAS regulations must be completed by July 7, 1997.

Circle Reader Service No. 62

Figure 1: The EAS signal



Federal Emergency Management Agency (FEMA), and the FCC. The FCC will notify the participating networks, wire services, cable networks and program suppliers and common carriers of the selected time window for the test at least four working days (holidays excluded) before the test."

What you must provide

Each local EAS system (cable TV, radio, etc.), must have two signal source inputs to provide redundancy. A data input is also available to monitor other communications sources such as the Radio Broadcast Data System (RBDS), National Weather Radio (NWR), satellite, public switched telephone network, or any other source that uses the EAS protocol.

Cable operators have two options for compliance.

✔You can provide audio and video interrupt on all channels (unless prior arrangements have been made with local broadcasters) with emergency details on one "emergency" channel. Video interruption options include a full screen message or a text crawl.

If a genlocked crawl is used, it must be displayed in an area of the television screen where it will not interfere with other visual messages, such as closed captioning.

✔You can provide an audio signal on all channels with instructions to tune to a specific video channel for additional information. This second approach requires the cable operator to provide special "in-home devices" for the certified hearing impaired. Considering that the average disability rate is 3 percent to 5 percent of subscribers, this could add up to a significant expense to a cable operator.

The audio-only option arose with the passage of the Americans with Disabilities Act (ADA), which requires that the disabled be provided with the same emergency information as the non-disabled. ADA is satisfied with audio/video messaging, but not with audio only, hence the requirement for "in-home devices" with audio-only messaging. Keep in mind that the purchase and installation of "in-home devices" is the responsibility of the cable company, not the subscriber.

The EAS signal

The EAS signal is an FSK modulated digital transmission at 520.83 baud. This slow transmission rate is intended to make equipment compatibility easier and to keep costs down. The signal is an open, non-proprietary protocol. All EAS messages are referenced to the Universal Coordinated Time Code (UCTC).

The EAS protocol is based on NOAA Weather Radio's Specific Area Message Encoding (SAME) digital signal, which has been used for the past seven years for the automatic distribution of weather related emergencies.

The EAS digital burst contains, in this order:

✔Sync. code
✔ID of the type of emergency and the origination point
✔Event code
✔Geographical areas affected
✔Alert duration
✔ID of the EAS location transmitting the alert
✔Date and time stamp
✔Two alert tones
✔Voice message
✔End of message or start of text signal
✔Text message
✔End of message signal.
✔The portion of the burst from the sync. code to the date and time stamp is referred to as the signal "header."

Since most activations of the current EBS are weather related, SAME broadcasts from NOAA Weather Radio will become the prima-

The EAS Activation Codes

EAN Emergency Action Notification (national only)
EAT Emergency Action Termination (national only)
NIC National Information Center
NPT National Periodic Test
RMT Required Monthly Test
RWT Required Weekly Test
ADR Administrative Message
BZW Blizzard Warning
CEM Civil Emergency Message
DMO Practice/Demo Warning
EVI Evacuation Immediate
FFA Flash Flood Watch
FFS Flash Flood Statement
FFW Flash Flood Warning
FLA Flood Watch
FLS Flood Statement
FLW Flood Warning
HLS Hurricane Statement
HWA High Wind Watch
HWW High Wind Warning
HUA Hurricane Watch
HUW Hurricane Warning
SPS Special Weather Statement
SVA Severe Thunderstorm Watch
SVR Severe Thunderstorm Warning
SVS Severe Weather Statement
TOA Tornado Watch
TOR Tornado Warning
TSA Tsunami Watch
TSW Tsunami Warning
WSA Winter Storm Watch
WSW Winter Storm Warning

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The EAS equipment installed by that time must be able to automatically interrupt programming, whether facilities are manned or unattended, to transmit national presidential emergency messages.

Cable operators must have the ability to transmit message codes, the attention signal, emergency messages and the end of message code to their subscribers, along with weekly and monthly testing.

Note that the EAS rules refer to national messages only. State and local messaging is optional according to the federal mandate; however, local franchising rules may require you to provide state and local emergency notification along with the required national emergency notification. Check your local rules to be sure.

At the operator's discretion

The new EAS mandate also requires the creation of new state and local operational plans. According to the rules, "The EAS may be activated at the State or Local Area levels by broadcast stations and cable systems at their discretion for day-to-day emergency situations posing a threat to life and property. Examples of natural emergencies which may warrant activation are: tornadoes, floods, hurricanes, earthquakes, heavy snows, icing conditions, widespread fires, etc. Man-made emergencies may include: toxic gas leaks or liquid spills, widespread power failures, industrial explosions, and civil disorders."

If you have a superheadend or are co-located with a broadcast station, your equipment requirements may be different from an independently located cable headend. Again from the rules, "Broadcast stations or cable systems that are co-owned and co-located with a combined studio or control facility (such as an AM and FM station licensed to the same entity and at the same location or a cable headend serving more than one system) may provide the EAS monitoring requirements . . . for the combined station or cable system with one EAS Decoder."

Not everyone must implement the new EAS. "Class D FM and low power TV stations are not required to have two tone or digital encoders. LPTV stations that operate as television broadcast translator stations are exempt from the requirement to have EAS equipment." "A broadcast station or cable system may submit a written request to the FCC asking to be a Non-Participating National (NN) source. The FCC may then issue a Non-Participating National Authorization letter. NN sources must go off the air during a national EAS activation. NN sources may voluntarily participate in the State and Local Area EAS. Participation is at the discretion of broadcast and cable system management and will be in accordance with the provisions of State and Local Area EAS Plans.

"If the required EAS sources cannot be received, alternate arrangements or a waiver may be obtained by written request to the FCC's EAS office." Keep in mind that, even if you are an NN source, local franchising guidelines may require local and state EAS participation. If you are an NN source, and a presidential emergency occurs, you must go off the air for the duration of the emergency. At this time, there are no other exemptions for cable systems. If you aren't an NN source or haven't received a waiver from the FCC, you must implement the EAS.

Each local EAS system must have two signal source inputs to provide redundancy

Local broadcaster interruption is optional. If you have reached agreement with a participating local broadcaster, you do not need to interrupt that channel. All other channels must be interrupted during an alert.

All EAS equipment must have the ability to monitor at least two of the EAS sources assigned by the FCC. This provides a means of redundancy for receiving the EAS signal. Additional detail is provided later in this article.

A presidential EAS activation will take priority over any other alert and will preempt any other alert in progress. Other than national alerts, messages should be transmitted with the following priority: Local Area Messages first, State Messages second and National Information Center (NIC) messages last.

How EAS works

The EAS is a digital signal that can be sent through any audio channel. The transmission is about one second in duration and is repeated three times. Resolution can be as large as national in scope and as small as one-ninth of a county.

The two-tone signal remains as a part of the protocol for sending EAS messages and will be used to alert the slightly hearing impaired of an emergency.

There are 24 authorized event codes listed in the rules, ranging from tornado to flood warnings.

EAS is compatible with NOAA weather radio and uses a standard, non-proprietary protocol. By July 1, 1996, at least 95 percent of the country will be covered by NOAA transmitters. This is important since NOAA will be a source of many of the local or regional alerts which are generated.

National emergency messages will include information about the originator of the message, the event, location and valid time period. At the headend, this requires digital equipment with a signal encoder/decoder which is used to drive the additional equipment needed to deliver the emergency information over the cable system. This is the equipment which you will be installing.

EAS equipment manufacturers are required to provide some means of protection to prevent unauthorized access to EAS encoders and decoders. Also, the equipment must be capable of issuing alerts and tests in languages other than English. Eventually, the EAS signal will be accessible by pagers, telephones, cellular phones and other communications devices. The method of accessibility has not yet been determined. Both an EAS decoder and an EAS encoder are required at each site. This makes every site both a receiving station and a transmitting station to other EAS sites.

Weekly and monthly testing of the system is required. The weekly tests can be performed at any time within the day after the test message has been received. Monthly tests must be transmitted within 15 minutes after receipt. The weekly tests are performed at random days and times and may be on-air or unobtrusive. The monthly must be on-air and must include an attention signal of at least eight seconds, the transmission of the digital codes, test audio, and the end of message code.

Monthly tests in odd numbered months will take place between 8:30 a.m. and local sunset. During even months, these tests will occur between local sunset and 8:30 a.m. The monthly test messages will originate from state or local primary sources. Nationally sourced tests will also be conducted.

Again from the rules, "Closed Circuit Tests (CCT) of National Level EAS shall be conducted on a random or scheduled basis not more than once a month and not less than once every three months. Test times will be selected by the White House in coordination with participating industry personnel, the

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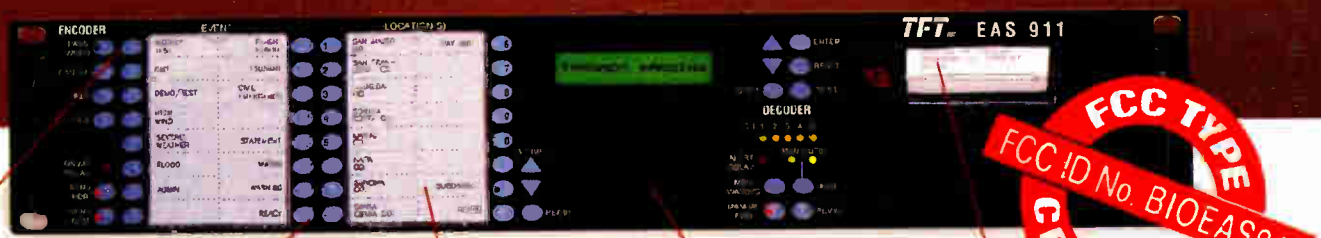

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Implementing the Emergency Alert System

What operators must do, and when

Cable operators may soon be required to inform the public of emergencies like natural disasters via the Emergency Alert System. Photo courtesy of The Weather Channel.

By Steve Fox, Eastern Regional Sales Manager, Mega Hertz

The new FCC mandated Emergency Alert System (EAS) will soon be a reality. In order to properly integrate EAS in your headend, it is important to understand what is required and what equipment you will need. The purpose of this article is to help you gain that understanding.

First, let's look at the history of emergency alert. In 1951, the CONELRAD system was developed to notify the public audibly in the event of a national emergency (most likely in the event of a nuclear emergency). The primary method of notification was the Civil Defense or air raid siren, many of which are still in use today.

The Emergency Broadcast System (EBS) was established by President Kennedy in 1963 and mandated broadcast stations to transmit emergency messages to the public, thus adding audio text notification. This is the system currently in use (until July 1, 1996). The National Association of Broadcasters (NAB) petitioned the FCC in 1989 for a rule to shorten the two-tone alerting signal used by the EBS and to revise other operational aspects of the system. Later, the Society of Cable Television Engineers (SCTE) established its EBS working group to explore the most efficient and cost-effective method of reaching cable subscribers during an EBS alert.

Between 1991 and December 1994, the FCC looked at ways to modernize the EBS. In 1993 in field trials in Denver and Baltimore (two distinctly different geographical areas), 11 new EBS systems were tested to evaluate the impact of new technologies on emergency broadcast. Representatives from broadcast stations, cable television, satellite transmission companies, emergency management agencies, engineering consulting companies, amateur radio organizations and equipment manufacturers all took part.

The end result was the realization that the current EBS technologies in use were too limited for present day requirements, and that new technologies were better suited for current and future needs. A decision was made by the FCC to ". . . adopt a mandatory standard digital protocol with a flexible architecture usable by many kinds of transmission media." Thus, the EAS was born.

The Commission has granted an additional year for the cable industry to be on-line

The rules

The purpose behind the new EAS rule-making follows. "The EAS provides the President with the capability to provide immediate communications and information to the general public at the National, State, and Local Area levels during periods of national emergency. The EAS is composed of broadcast networks; cable networks and program suppliers; AM, FM and TV broadcast stations; Low Power TV (LPTV) stations; cable systems; and other entities and industries operating on an organized basis during emergencies at the National, State, or local levels. It requires that at a minimum all participants use a common EAS protocol . . . to send and receive emergency alerts . . . ." This means that if you are a broadcaster or a cable operator, you are, in all likelihood, required to implement the new EAS. Those who are not required to add the system will be discussed later in this section.

Broadcasters must have the new EAS operational on or before July 1, 1996. Since cable television was not required to participate in the old EBS, the FCC has granted an additional year for the cable industry to be on-line. The implementation date for cable is no later than July 1, 1997.

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supports a number of systems owned by Comcast, Southwestern Bell, Cox, Media General and Western Communications. In addition, it's currently used in 15 Time Warner markets.

CBIS also announced the availability of its cable subscriber management and billing solutions in a managed environment. The company will run both the CableMaster 2000 Subscriber Management and Billing System, and ICOMS, which adds cable telephony capabilities to CableMaster, in its data centers in Cincinnati and Orlando, Fla.

Through this offering, CBIS is able to provide cable and integrated cable telephony providers with features such as 24-hour system availability and immediate repsonse time. Managed billing and customer care clients can have real-time, on-line access to their data as if it were being processed on site. CBIS will also offer features including redundant data processing and disaster recovery.

West End Systems Corp. has formed a partnership with CrossKey Systems Corp. to provide management capabilities over hybrid fiber/coax networks.

The West End system incorporates CrossKeys OpenKnowledge software, which was developed to provide support for new and emerging service technologies in the business, communication and entertainment industries. OpenKnowledge is key to the management of the West End WestBound 9600 broadband access and transmission technology.

The companies' agreement revolves around cooperative marketing and product development.

Fiber optics

Larry Stark, the Ortel executive who made headlines three years ago by proclaiming 1550 nm lightwave technologies "dead," said at one point during the show that the concept isn't dead after all. As evidence, Ortel used the National Show as a platform to unveil its new 1550 nm components, which will be used by as-yet undisclosed OEMs in the optical products they sell to cable MSOs.

The new product line consists of an externally modulated transmitter for U.S. and European frequency configurations; an erbium doped fiber amplifier touting 40 or 80 milliwatts of output power, depending on customer requirements; and a high input-power optical receiver.

Stark, business manager and vice president of broadband communication products, said that "1550 nm technologies are very much alive again," because of an industrywide need for equipment that enables network consolidation. "The situation is different now–the technology has matured, and broadband networks are reaching the point where 1550 is a good solution," he said.

Each of Ortel's system components were developed internally, which Stark said will differentiate its line from competing 1550 nm optical equipment providers. One example is Ortel's optical receiver, which operates with "ultra-low" distortion at input power levels of +2 dBm, Stark said.

Ortel also announced a family of new DFB lasers for point-to-point hybrid fiber/coax networks. The Series 3631A, 3631B and 3631C lasers provide both broadcast and targeted digital channels on a single fiber within an HFC network. By transmitting analog television signals and digital signals on the same fiber, the DFB laser enables HFC network operators to serve their traditional cable television customers while offering new services such as Internet access, telephony and video-on-demand.

The point-to-point lasers consist of a high performance DFB laser integrated with a flexible RF predistortion circuit board. The combined laser and predistorter operate with very low CTB and CSO distortion over the frequency range of 42 to 750 MHz. The Model 3631 A/B/C lasers are available at power levels from 1 mW to 5 mW.

Harmonic Lightwaves Inc. announced the availability of the MAXLink 1550 nm transmission system for broadband networks. Incorporating the company's SBS suppression and patented performance doubling technology, the MAXLink system offers high launch power and performance at 1550 nm. Users can launch 17 dBm into a single fiber with no SBS, company executives said.

The MAXLink is suited for long distance transmission and a variety of evolving applications, such as interconnecting cable system headends and telecom central offices.

Harmonic Lightwaves also introduced a new strand-mount optical node, the HLR 3830, as the first of its new PWRBlazer family of optical nodes. The new device integrates optical receivers, a multiple, high-output level amplifier and a return path transmitter in one package to facilitate full interactive data and video services. The node is available for immediate delivery.

And finally, the company unveiled an element management system, NETWatch, for the transport layer of broadband communication networks. The new system, which operates on a Windows-based platform, enables cable operators to monitor, manage and control the performance of their system from a central office or remote location. The standard NETWatch system (HEM 5000W) includes four components: the computer software, the computer (a mouse-driven 486 or Pentium PC running Microsoft Windows), a transponder and a serial port interface. Volume shipment of the system is scheduled for June 1996.

C-Cor Electronics Inc. showed off its AM fiber optic transmission system and its I-Flex family of amplifiers at the Show. The transmission system, which features Ortel's high performance 1310 nm DFB technology, utilizes a three-rack unit design that allows up to eight transmitter plug-ins. The system consists of 750 and 862 MHz forward path transmitters and receivers, and 5-200 MHz return path receiver modules. It meets NTSC, PAL and Cenelec standards and has AC and DC power options that provide 4-16 milliwatts of power.

C-Cor also displayed its new 862 and 750 MHz I-Flex Global family of amplifiers. This family of products was developed using power doubling hybrid technology.

Pirelli made its entrance into the cable TV signal transmission market with the introduction of a high-performance 1550 nm optical amplifier system. Consisting of a linearized externally modulated transmitter, an optical amplifier and a receiver, the system is available in 17 dBm and 13 dBm output power options. It includes built-in SBS suppression, distortion compensation and an optional automatic gain control.

Comcast Cable Communications announced that it will interconnect its Baltimore headends using a digital fiber optic transport system provided by ADC Video Systems. The order, valued at about $2 million, calls for Comcast to install ADC's DV6000 transport equipment in Baltimore, which serves 400,000 subscribers.

Developments at the component level

VLSI Technology chose the show as a platform to introduce its VES1514, a single-chip receiver for the digital cable market that is DVB-C compliant. The receiver integrates QAM demodulation, forward error correction, adaptive equalization and descrambling functions.

At the board level, Matrox Video Products Group demonstrated its new QMPEG-2, a four-channel, PCI-bus MPEG-2 audio/video decoder board designed for OEMs and system integrators of MPEG-2 video servers. The QMPEG-2 cards can be integrated directly into low-cost PC-platform servers, enabling suppliers to replace "black box" decoders.

The QMPEG-2 features full CCIR-601-composite and Y/C video, full screen overlay for menus and graphics, and independent genlock on each channel. The card also offers transport demultiplexing and program, PES, audio and video elementary stream decoding. CED

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hooks himself up illegally or tampers with his convertor box in order to receive free premium services.

5. Local dealers. Dealers are those who traffic in illegal decoders, advertising them in newspapers, electronics magazines, at flea markets and through word-of-mouth.

Diagnosing the problem

The following are telltale signs indicating theft of service problems:

✔Is pay penetration substantially lower than adjacent area systems?

✔Are disconnects increasing to a level above what was once considered normal?

✔Is convertor recovery low on disconnects?

✔Are above normal numbers of customers reporting lost or stolen convertors?

✔Upon check-in of convertors from the field, are convertors returning modified or with signs of tampering?

✔Are you experiencing high convertor or trap losses from your warehouse?

✔Do technicians find illegal devices during service calls?

✔Do CSRs receive many calls requesting premium channel guides or PPV information from customers who do not show premium service activity?

If you have answered "yes" to any of the above, and if you have not already done so, we suggest you try to quantify the problem. Below, you will find some suggestions:

✔Run a sample audit (5 to 10 percent of homes passed) in different demographic neighborhoods.

✔Run PPV stings after major events using 800-telephone numbers.

✔From stings, you may be able to pinpoint relative degrees of theft from the non-sub, basic-only and pay homes universe.

✔Audit your internal records, including administrative problems—discrepancies between disconnect reports and convertor inventories vs. actual performance.

✔Contact state and federal agencies to obtain lists of convicted distributors of illegal equipment to your area. The FBI keeps extensive records of convicted interstate distributors.

Discuss the legal aspects of cable TV theft with local law enforcement agencies, public officials and local press. Points that should be covered are as follows:

✔Are there local laws that apply to cable theft? What are the state and federal statutes that apply toward theft of cable TV service?

✔What are the penalties?

✔Contact the local district or state attorney's office to get assistance in prosecuting illegal users.

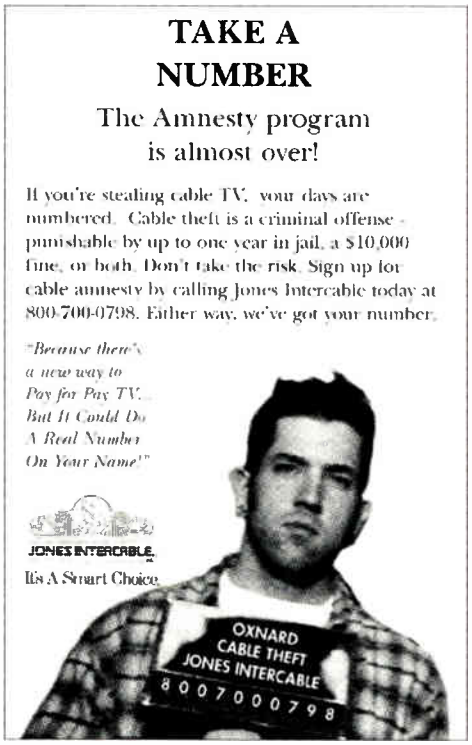
✔Are they willing to publicly support your efforts?

✔Call all local news agencies to explain the problem and ask for their support. If you advertise through local media, also contact your sales representative. In most cases, they will tell you they do not have any input as to news coverage, but we found them to be key in swaying news coverage during our amnesty campaign period.

Auditing

✔Has your system staff committed to actively look for and combat theft of cable TV services?

✔Do you have the appropriate resources to conduct a full amnesty campaign (CCP staff, auditing teams, etc.)?



One of the advertisements from Jones' amnesty campaign.

✔How committed is your system to treating cable thieves with respect and as potential revenue producing customers?

✔Is your system willing to spend the money and resources to hire lawyers or detectives to seek prosecution of cable thieves?

✔Is your system willing to commit the necessary marketing dollars to successfully deliver the message to your customers?

✔Does your system have a policy already set to deal with an amnesty campaign? Is it outlined for all associates?

✔How will your system handle potential public backlash?

✔Have associate committees been formed or discussions held with associates to measure their interest in cable TV theft, and to receive their input on cable TV theft?

We recommend that until the system management has addressed all of the above issues and come to agreements on the above, that a system amnesty program *not* be implemented. We feel it is very important to fully commit to the program and not sway from a planned course of action. Customers have heard the rhetoric on how cable operators plan on prosecuting cable thieves before; therefore, as an industry, we need to develop credibility among these kinds of programs.

The campaign

What exactly is an amnesty campaign? An amnesty campaign for our system was a specified period in which we conducted a "No Questions Asked" program, offering customers who were illegally hooked up or who had altered equipment a legal way of obtaining premium services and/or a way of becoming a legal paying customer without facing penalties.

Because cable TV theft is a *criminal* offense, legally, a cable operator cannot grant amnesty. However, cable companies may agree not to take action or file a complaint. The willingness to not seek prosecution for a limited time constitutes the basis of an "amnesty" program. Additionally, in our system, by working with local law enforcement officials, they also agreed not to pursue any investigations in which we granted amnesty.

Amnesty strategy

✔Enlist the support of adjacent systems. This will make your efforts more newsworthy and increase local awareness.

✔Enlist the support of affiliate program suppliers.

✔Enlist the support of law enforcement officials.

✔Launch the campaign at a well-attended press conference. In general, the best days for press conferences are Tuesday through Thursday–those are usually slow news days. The press conference should be held prior to 11:30 a.m. to maximize press coverage and meet 5 p.m. news deadlines.

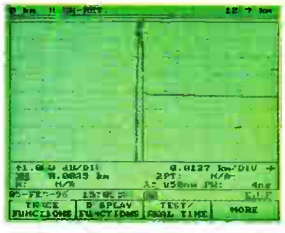
✔Limit amnesty period to a maximum 45-day period. This may help increase media attention.

✔The campaign should be divided into three equal parts:

Our new FiberWizard™ Mini-OTDRs have the world's shortest deadzones so you can see what you've been missing.

You don't have to live with long deadzones anymore. Now you can get accurate Mini-OTDR traces showing virtually every event – no matter how closely spaced they are.

You can do it because the new Laser Precision FiberWizard family has typical deadzones as short as 2.5 m. (The shortest in the world!)



Using a higher bandwidth and shorter pulsewidth, our engineers have dramatically shortened these blinding reflections so you're not left hanging and guessing.

For singlemode and multimode, the Wizard works wonders.

Get the complete picture from any of seven different high-resolution models for datacom, CATV and telephony. Plus, all our easy-to-operate FiberWizards offer optional visual fault location for even greater versatility.

For over 25 years, we've made nothing but fiber optic test equipment to help you easily see what's happening in your cable. Call us toll-free or write today to learn more about the FiberWizard Mini-OTDR you're missing.

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Circle Reader Service No. 66

A. Education. Inform customers of what cable theft is, how it hurts the community and of costs to honest, paying customers.

B. Information about penalties and the resources available to detect theft.

C. Let customers know what will happen to them if they are caught.

The campaign messages should start light and progress in tone and seriousness as the end of the campaign approaches. In our system, we found that this created a level of anticipation and anxiety. Also, seek to upgrade each violator turning himself in. In our system, we experienced a 220 percent pay sell-in. It's also important to keep the press informed of developments. Book a system representative on local talk shows (TV and/or radio) to discuss the subject.

If appropriate to your system, include all material in a bilingual format or create material in appropriate languages to communicate with your other major demographic groups. In addition, at the same time that you launch an "amnesty" campaign, launch an audit team. In our system, we did not do both simultaneously. We contracted a detective agency to follow up on theft leads after the amnesty period. We feel that at a minimum, twice as many customers would have turned themselves in, had we simultaneously started an audit program. Throughout the campaign period, mix 15 percent of all media buys with "image" type ads. With all the negativity in the air waves, you want to make sure you reassure your legal customers that you are doing this for them.

✔Finally, follow up on all cable theft leads.

Amnesty logistics

The following action steps were determined for our system. Your individual system may require more.

1. We agreed on a 45-day "amnesty campaign" period.

✔Created all media material with a call to action, except for the image component.

✔We felt a longer campaign period would diminish the news value and impact.

2. We agreed on a three-phase "amnesty" campaign.

✔Based on our demos, we created separate Spanish language pieces for our campaign.

✔We decided to stay away from preaching on the morality issues. We felt it would diminish our message, due to possibly opening up the campaign to debate.

3. We agreed to involve as many local authorities as would support us.

✔The local chief of police agreed to support our action plan. In addition, he appeared at all of our press conferences to show his support and to answer media questions (this also helped turn our press conferences into media events).

4. Prior to any announcements of amnesty being made, we conducted several PPV event stings. In each case, we sent a scrambled signal prior to the start of the event or at termination of the event advising viewers to call an 800-number to register for their free T-shirt. The message could only be seen by customers illegally descrambling our services.

5. We determined that in order to increase our results and maximize media coverage, we would give customers complete amnesty, including the waiving of tampered box charges and for lost or damaged convertors.

✔At the time, we felt that our convertors were being swapped for tampered boxes.

✔The strategy confirmed that within our system many boxes get swapped.

A second press conference is a great forum in which to thank loyal, paying customers

✔The strategy also paid off by providing additional violator leads because boxes were coming in from customers who swapped the box, and the box *they* had belonged to another customer's account.

6. We created a "theft of cable TV hotline." This was an 800-number where customers could receive, through numeric prompts, information on cable theft, or leave anonymous messages.

7. We created a three-part NCR "amnesty guarantee" form, to be given to those customers who turned themselves in.

8. We created an in-house committee that decided on tag lines, scripts and print material. We also worked with a local agency on print material.

Local media coverage

1. Determine if local coverage can be turned into statewide or national coverage, i.e.:

✔Our local Oxnard efforts were covered by a Santa Barbara ABC affiliate.

✔In the following weeks, several Los Angeles cable theft stories aired.

2. Launch your campaign at a well-attended press conference.

✔Present at least three speakers with diffe perspectives of the problem. We presented general manager, the local chief of police a system engineer.

✔Pass out press kits that include: theft o cable TV facts sheet; press release on de of amnesty program; related articles and coverage; state, federal and local statutes slicks; amnesty guarantee forms; and sa questions you want addressed.

✔Maximize media pick-up by scheduling press conferences Tuesday, Wednesday o Thursday by 11:30 a.m. to meet evening story deadlines.

✔Arrange a room large enough to accom date TV crews and mikes.

✔If available, have your LO department record the press conference and make tap available to the media. We aired the press ference on our LO channel the same even

3. Follow up during amnesty period.

✔Build momentum by providing the medi with weekly information.

✔Book a spokesperson on as many talk sh as possible. We were successful in bookin GM on three radio talk shows, and obtain five interviews for our marketing manager. Several of the interviews were conducted the Spanish language radio stations. In a tion to the press conference coverage we received from broadcast TV stations, the conducted an additional three interviews system spokespersons during the amnest campaign period.

✔We preempted all PPV channels on th occasions to transmit a scrambled signal was a loop tape) advising customers that they were able to watch this program, cl they were in violation of state and federa statutes (we actually listed several of the We also asked them to turn their illegal ment into our offices ASAP.

✔We sent out a press release, in advance the fact that we were going to "talk to il boxes" on that day, and that subscribers tune-in to the PPV channels if they want see if they had an illegal box.

✔The press release was picked up by ou media sources and generated interviews company spokespersons.

4. At the conclusion of the amnesty p gram, conduct a second press conferenc announce successful results of the campa

✔It is also a great forum in which to tha loyal, paying customers and announce a thing special you may be doing for them.

✔The weekend after the press conferenc held a '40s dance event in celebration of success and provided free tickets to all c tomers wishing to attend.

✔At the final press conference, unveil that now that the amnesty program is over, you will increase your efforts to audit the system, aggressively pursue cable theft leads, and file civil and criminal charges where and when appropriate.

Oxnard's results

Negativity. Initially, we received calls from customers offended by the delivery of a direct mail theft of service campaign piece to their homes. In hindsight, our direct mail piece should have been in a lighter tone, or used as a last-chance offer piece. In addition to the above, throughout the campaign, we received calls from customers complaining about the media bombardment on the theft of service campaign. In general, the number of calls numbered below 100 in a 39,000 subscriber system.

Publicity. It is hard to estimate the overall value of all of the positive publicity we received. Our initial press conference was the lead story on the local ABC affiliate and UPN affiliate. We were a featured story on four local radio stations and obtained a total of six interviews for company spokespersons on radio, and four on local broadcast TV. We also generated five news stories in the local newspapers. In general, just as many customers that complained, complimented our campaign. We feel that we created extreme awareness of the problem.

To date, we continue to receive tips from customers about cable theft on our cable theft hotline and CCP.

Payback. Although it is too early to judge the return on our investment, overall, we feel we have been very successful. Suffice it to say, that our budget for '96 is very aggressive, and when planned, we counted on the success of this campaign to increase PPV and premium pay revenue.

It is very difficult to know how many illegal convertors were simply thrown away. Many acquaintances have acknowledged that they know of persons in the community who have either simply disconnected their illegal equipment or thrown it away.

Initially, we felt that many customers who had illegal equipment would simply wait to see if we really meant what we said. Our feelings have been confirmed by the fact that several customers turned in equipment once our amnesty program was over due to a news story regarding our hiring of a detective agency to follow up on theft leads.

Our policy on these individuals has been to receive the equipment and still forward their names to our detectives in order to seek restitution. We feel that customers must understand that we are serious, in order to prevent future theft.

Our current return on the program is as follows: Customers who turned in illegal equipment–278; illegal convertors recovered–295; illegally hooked up individuals converted into full paying customers–39; total number of persons who took advantage of our amnesty program–317; pay sell-in–205 percent.

Based on the above numbers, we have estimated a 10-month pay back. Our pay back model does not represent additional revenue generated, such as PPV buys, additional premium channel buys or recovered revenue through our audit.

In addition to the above, the model does not represent any estimate on the number of customers who have thrown away their illegal equipment. CED

Acknowledgements

Without the help or contributions of the following individuals or organizations, we would not have had as successful a campaign as we did: Dawn Callahan, SQIM, Oxnard system, and Gregg Nagel, production manager, Oxnard system, for the writing and production of our broadcast TV spots–"Special Announcement," "Commitment to Service," "Commitment to Low Prices," "Cable Theft Patrol" and "We've Got Your Number." Johanna Trumba and Hamilton & Associates, for their creative work on our direct mail piece and creation of our local print ads. Dean Westmoreland, American Movie Classics. The National Cable Television Association's Office of Cable Signal Theft for providing research, the use of its "Pinstripes to Prison Stripes," "Wallet," and "Thieves Have Rights" print ads, and for the use of its "FBI" and "Jail" broadcast TV spots. Showtime Networks for providing the initial "Combat Kit," in 1985. Greg Amerson and HBO, for their research help, participation and use of their "George Foreman" theft spot. Jeff Jones, general manager, Jones Intercable Oxnard System, for providing the support to successfully carry out our "Theft of Service Amnesty Campaign."

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Time Warner Cable NYC attacks theft at all levels

From legal action to education

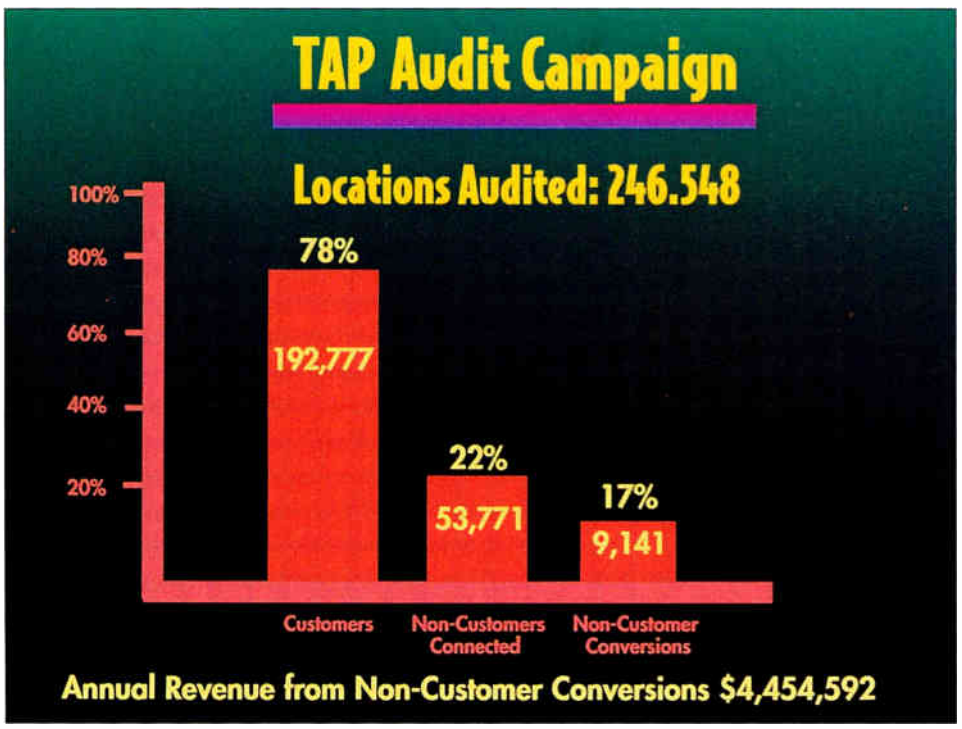
By Kathleen Scopp, Vice President and General Counsel, Time Warner Cable of New York City; Barry Rosenblum, President, TWC-NYC; and Daniel J. Lefkowitz, Trial Counsel, Time Warner Cable

Editor's note: This is the second winning paper in the NCTA's signal security contest.

Time Warner Cable of New York City ("TWCNYC"), a division of Time Warner Entertainment Company, L.P., is a cable television operator which serves more than 1 million subscribers throughout its franchise areas, which include all of Manhattan and Queens, N.Y. and parts of Brooklyn, N.Y. This is the largest cable cluster in the United States. Our headquarters is in Manhattan, and our five area offices are located in Woodside, College Point, Flushing and Jamaica, Queens, and Park Slope, Brooklyn.

We secure our system initially by providing each TWCNYC subscriber with one of three different types of addressable convertors and decoders manufactured by Jerrold, Tocom and Pioneer. These devices communicate with TWCNYC's facilities and enable subscribers to access and view the exact level of programming services to which they subscribe.

Additionally, for over 10 years, we at TWCNYC have aggressively combatted the theft of cable services. However, as the magnitude of theft of services grew significantly in our franchise areas (and nationwide) in recent years, we felt we had to do more to protect our system and programming services. To that end, we designed and implemented a comprehensive program to secure the integrity of the system and to aggressively prosecute those who engage, or assist, in the unauthorized interception of cable television programming services at all levels.



The results of Time Warner Cable of New York City's tap audit.

Specifically, TWCNYC targeted theft of programming services by individual subscribers and commercial locations, and those who engage in the manufacture, sale or distribution of pirate cable television decoding devices and equipment. TWCNYC worked with federal law enforcement agencies, private investigators and legal experts; employed electronic countermeasures; conducted a tap audit campaign; and instituted a theft-of-services hotline.

We further committed resources to educate our subscribers about the harm TWCNYC suffers from theft and the consequences of engaging in such theft. As discussed below, TWCNYC's educational efforts included television public service announcements, print advertisements and direct mailings. In addition, where appropriate, we publicized the results of some of our anti-theft efforts in order to spread a message of deterrence to those who would steal programming services or enable others to do so.

Program implementation and results

1. Investigation and civil prosecution of major manufacturers. TWCNYC utilizes private investigators to identify and investigate distributors of pirate decoding devices throughout the United States which sell such devices into TWCNYC's franchise areas. Common sources of such investigations are print advertisements containing "1-800" telephone numbers. Such advertisements are found in myriad publications, including science and technical magazines such as *Popular Mechanics* and *Nuts and Volts*. These investigations have resulted in the civil prosecution of numerous distributors of such devices, including such major distributors as Freedom Electronics Inc., U.S. Cable Inc., and Cable Box Wholesalers Inc. Freedom Electronics operated in Florida, U.S. Cable operated in Florida and New York, and Cable Box Wholesalers operated in Arizona.

In each of TWCNYC's investigations and resulting civil prosecutions against Freedom Electronics, U.S. Cable and Cable Box Wholesalers, TWCNYC's investigators made controlled purchases by telephone of pirate devices, attempting in the process to elicit valuable admissions from the sales representatives. In the investigations of U.S. Cable and Cable Box Wholesalers, the telephone conversations were recorded on audio tape which was later transcribed for use as evidence in the civil cases.

Upon receiving the devices they purchased, TWCNYC's investigators conducted tests to determine each device's descrambling capabilities. These tests simply involved connecting each device to TWCNYC's cable television

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system and observing unscrambled premium and pay-per-view programming. The tests were carefully documented, and the devices were secured for use as evidence in the civil cases.

The investigators then identified the business organization of each of the pirate decoder sale operations, including the identities of corporate parents, shareholders and the officers responsible for business conduct. They further identified any known corporate assets, including bank accounts, which were generated by these identities from the illegal sale of pirate cable decoding devices.

When such investigations were completed, TWCNYC, in conjunction with outside legal experts, developed a strategy whereby TWCNYC commenced actions against each respective decoder sales operation. Simultaneously, TWCNYC sought immediate relief, including court orders directing the seizure by the United States Marshal Service of the pirates' entire stock of illegal decoding devices, all related business and computer records, and other evidence. Such orders also provided for a freeze of defendants' assets. This strategy was designed to expedite the civil litigation process, secure evidence, put the pirates rapidly out of business, and preserve for judgment collection the assets of the illegal enterprises.

In the three cases described here, an approximate total of 35,000 pirate decoder devices was seized.

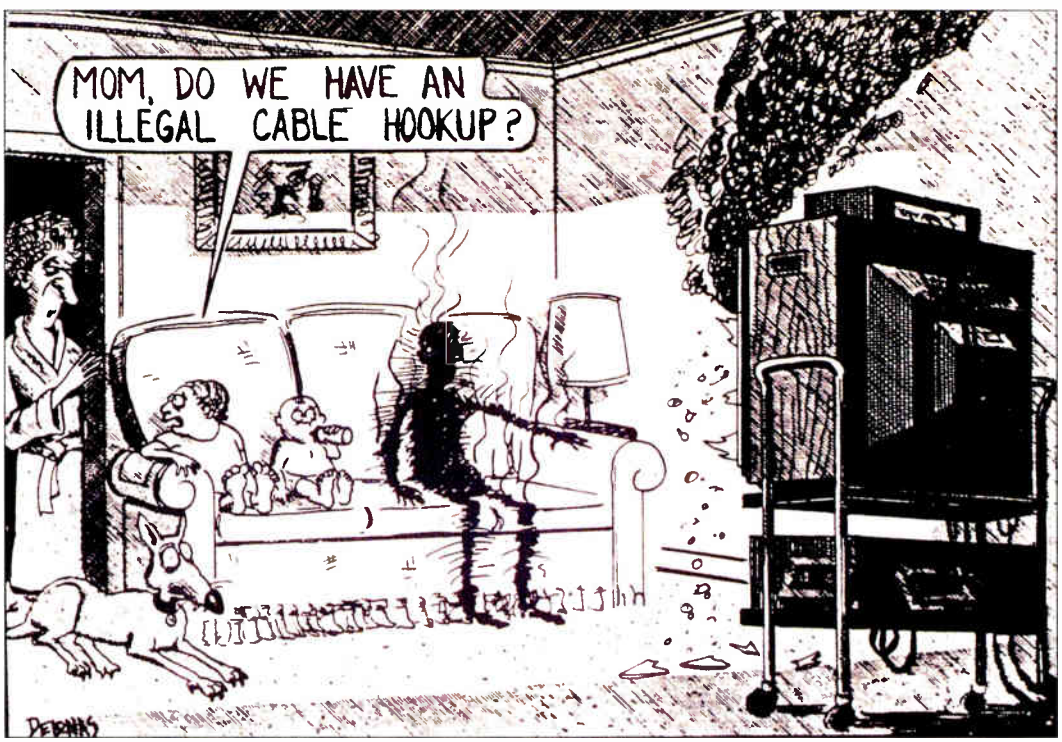
In the cases of Freedom Electronics and U.S. Cable, TWCNYC obtained, at a total cost of less than $100,000, cash settlements totaling more than $1.2 million as well as court-ordered permanent injunctions prohibiting each pirate from ever again selling decoding devices. In the process, TWCNYC's litigation generated reported decisions which have significant precedential value to future civil prosecutions of such manufacturers by cable television companies.

TWCNYC has also demonstrated a commitment to insuring that such pirate decoder operations do not resume activity. In the case of U.S. Cable, the defendant attempted to re-enter the decoder sales business less than a month after its payment of a substantial settlement sum. In a civil contempt prosecution commenced immediately thereafter, TWCNYC was able to identify the importation and pending sale of approximately 8,000 illegal "pancake" cable descramblers and to have such devices seized by the U.S. Marshal Service before such devices could enter the black market. TWCNYC also learned that U.S. Cable had sold its "800" number to another pirate descrambler sales operation. We then successfully prosecuted U.S. Cable's civil contempt, for which we were recently awarded $7.44 million in damages plus attorneys' fees. This was a significant victory, and it appears that U.S. Cable is finally out of business for good. In regard to Cable Box Wholesalers, we were recently awarded partial summary judgment and are awaiting a substantial damage award for hundreds of violations of 47 U.S.C. sections 553 and 605.

2. Actions against mail order purchasers of descrambling devices. Through the civil prosecutions of Freedom Electronics, U.S. Cable and Cable Box Wholesalers, TWCNYC recovered extensive computer records detailing tens of thousands of sales of illegal pirate decoding devices to individuals and subdistributors across the United States. We have downloaded those records and are presently pursuing litigation against TWCNYC's subscribers who purchased pirate cable decoding devices from the three mail order descrambler sales operations mentioned above.

Prior to commencing civil actions against these TWCNYC subscribers, TWCNYC sends letters to them inviting pre-litigation settlement. This approach reduces significantly the number of subscribers against whom TWCNYC has to resort to judicial intervention. Once a civil action against the remaining subscribers is filed, more settlements are obtained without the need for further proceedings. All those who settle, whether prior or subsequent to the commencement of litigation, must agree as part of the settlement not to engage in such conduct in the future. In the cases of those who settle after the commencement of litigation, they are subject to permanent injunctions prohibiting them from ever again engaging in theft of services. The penalties for violating these injunctions is stiff. As a result, we have found that there are few repeat offenders among those who settle these cases. Those who do not settle are civilly prosecuted to final judgment.

3. Investigation and criminal prosecution of local distributors. TWCNYC conducts investigations in conjunction with Federal and New York State law enforcement agencies, including the Federal Bureau of Investigation, the United States Secret Service, and the District Attorneys' offices in each of the boroughs of New York City, to identify and criminally prosecute distributors of pirate cable decoding devices. For instance, in conjunction with the Queens County, New York District Attorney's



A cartoon which appeared in the* New York Post *immediately after Time Warner introduced its first "bullet case," which disabled hundreds of illegal decoders.

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Stealth Sweep... **Stealth Reverse Sweep...**

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- Automated FCC 24-hour test capability

The Stealth Reverse Sweep provides all the accuracy, speed, and features you'd expect from the leader.

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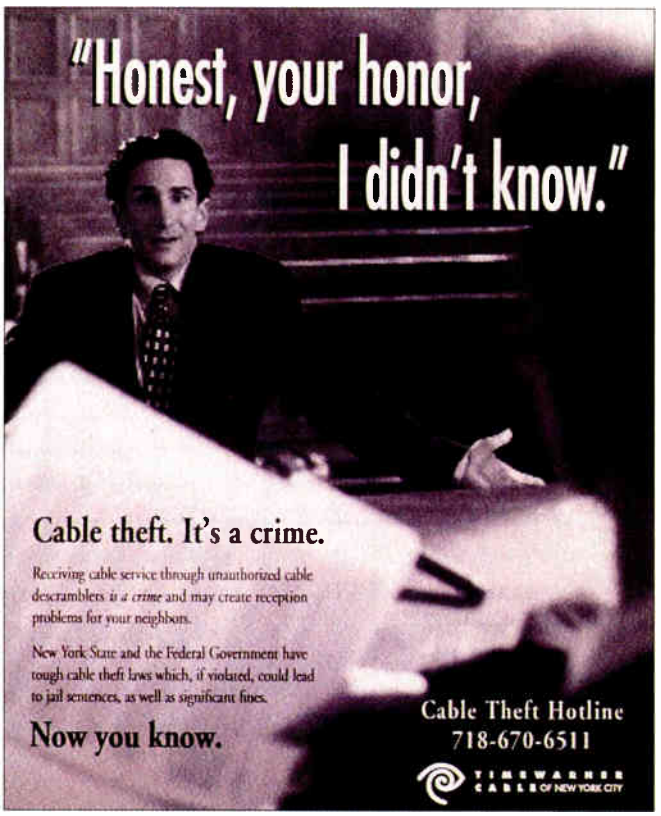
Circle Reader Service No. 69

office, TWCNYC's investigations resulted in arrests of six different distributors of pirate devices in the New York area. Of these arrests, three ultimately resulted in felony convictions, two resulted in misdemeanor convictions and one case is pending. Furthermore, these investigations and prosecutions resulted in the destruction of more than 1,000 pirate decoders and the turnover of more than $30,000 of the distributors' assets, representing proceeds of their illegal businesses. Such investigations originate from a variety of sources, including the hotline described below, which generates approximately 15 to 30 calls per week, recovered flyers advertising the sale of pirate decoding devices and word-of-mouth tips. In addition, such investigations often reveal that those distributors buy and sell from each other. As a result, an investigation of one distributor often produces evidence which strengthens civil and criminal prosecutions of other distributors.

4. Audits of commercial establishments. TWCNYC regularly utilizes the services of private investigators to audit commercial subscribers and identify those which intercept TWCNYC's programming services. These investigators regularly audit commercial subscribers which publicly display, without authorization or payment, TWCNYC's premium and pay-per-view services such as professional boxing events and major motion pictures. The investigators also audit non-subscriber commercial establishments which access TWCNYC's system by way of unauthorized splices and attachments. We engaged in the civil prosecution of more than 100 commercial establishments in 1995, and of those, we have either settled with or obtained judgments against 42, recovering a total of more than $175,000. Litigation is pending against the remainder.

5. Electronic countermeasures. With the support and assistance of General Instrument, manufacturer of the Jerrold and Tocom devices used by TWCNYC, and Pioneer, TWCNYC routinely employs electronic countermeasures or "bullets." The employment of such countermeasures results in the disabling of pirate decoders, thus removing such devices from TWCNYC's system. TWCNYC then civilly prosecutes those subscribers who are found to have used such devices to steal TWCNYC's services. Such cases, in which litigation against some defendants is still pending, have resulted in settlements with numerous defendants totaling in excess of $230,000. The settlement agreements TWCNYC enters into in these cases contain permanent injunctions identical to those described above. TWCNYC anticipates additional settlements as the cases progress. Employment of these countermeasures also causes word to be spread that TWCNYC is diligent in protecting the integrity of its system, thus deterring subscribers from engaging in such conduct.

6. Tap audit campaign. In 1995, TWCNYC's tap audit campaign, which utilized both TWCNYC employees and outside contractors, resulted in the audits of 250,000 locations. Through it, we found a total of 53,771 unauthorized subscribers, representing a theft ratio of 21 percent. TWCNYC recovered convertors from 20 percent of these individuals. More importantly, the majority of the subscribers from whom we recovered modified convertors thereafter became paying subscribers, resulting in a gain of approximately 10,500 subscribers for a gross annual revenue of more than $483,000.



TWCNYC runs a variety of ads to educate its subscribers about the effects of theft of services.

7. Hotline. TWCNYC also instituted a hotline which subscribers may call to report theft of services. This hotline has been quite successful, attracting approximately 15 to 30 leads per week. Such leads often result in the criminal or civil prosecution of pirate descrambler manufacturers and end-users.

8. Education. In an effort to educate its subscribers about the effects of theft of services, TWCNYC runs television and radio public service announcements and places print advertisements in publications which are distributed in the TWCNYC franchise areas. TWCNYC also uses direct mail to educate subscribers. These mailings provide a reminder to subscribers and supplement our other educational efforts.

Applicability to other operators

The TWCNYC signal security program attacks theft at all levels. The program has had both an enormous impact on the education of TWCNYC's subscribers that theft of services will not be tolerated, while also being a revenue-generating aspect of TWCNYC's business. By using the established successful techniques employed by TWCNYC, other operators can address many of their security problems while participating in sending a message to those profiting from theft that such conduct will not be tolerated by the cable industry. As part of our program to combat theft of services throughout the industry, we have provided to the NCTA and other MSOs customized lists of pirate decoder purchasers who reside in those companies' franchise areas, which were obtained from illegal distributors such as Freedom Electronics, U.S. Cable and Cable Box Wholesalers. Information of this type can serve as a starting point to combat theft by subscribers in other systems.

The entire organization of TWCNYC has worked diligently in implementing this program. Through it, we have made notable progress in identifying and eliminating sources of theft of our services at all levels, and in the process, we have educated our subscribers about the effects of such theft.

We are further committed to continuing these efforts through new and innovative means, striving to repeat our successes and learn from our failures. TWCNYC's continued commitment to eradicating the problem of theft will enable us to be more competitive, resulting in higher quality services to our subscribers. CED

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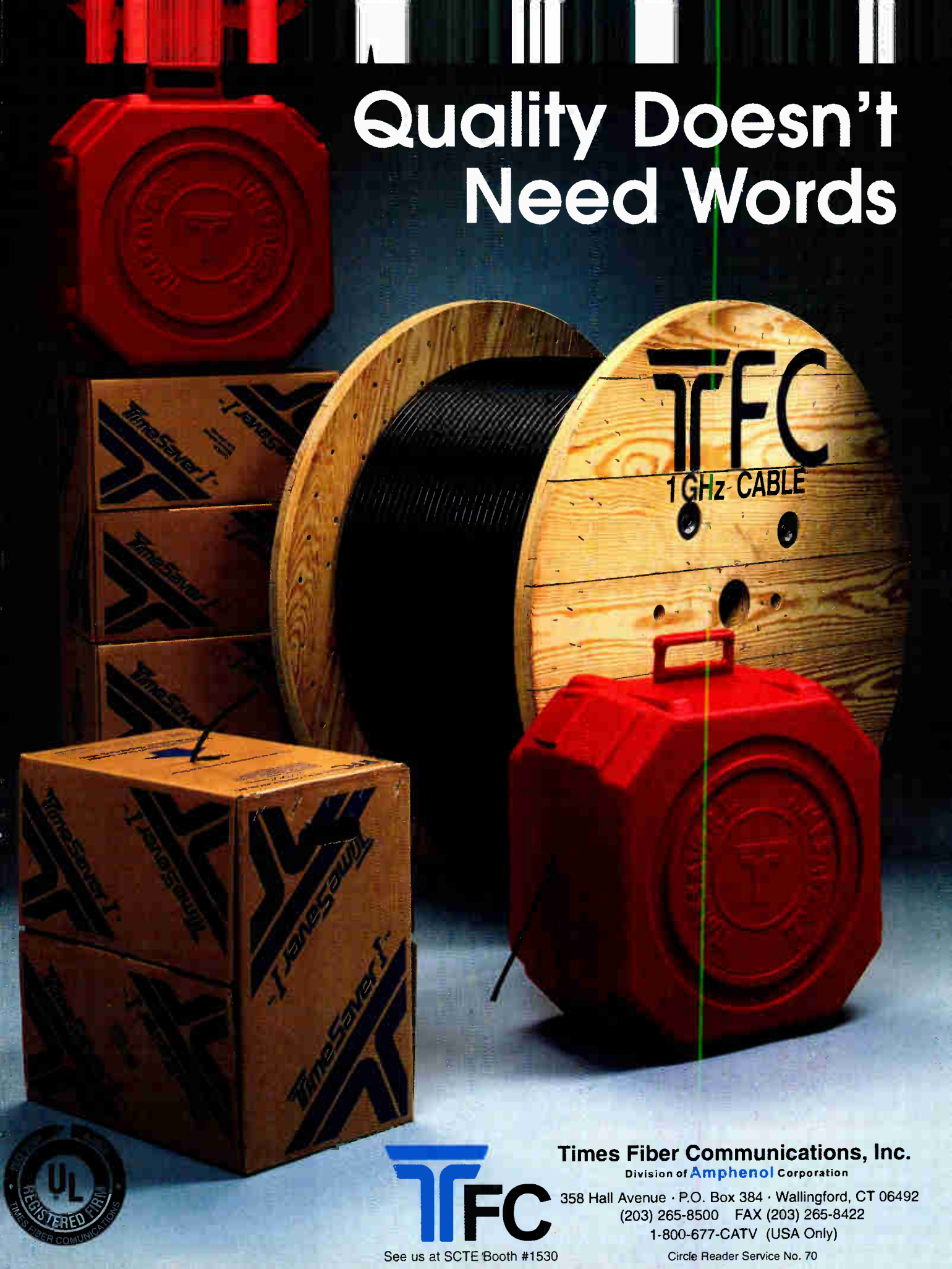

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Circle Reader Service No. 70

Theft of services and Chain of Evidence

By Bob Waters, Safety Control Manager, Quantum Cable Services Inc.

The good news about security is that the cable TV industry is experiencing a fast-paced evolution of technology and is continually adopting new releases, versions, upgrades and models of hardware, software and firmware. The bad news is that, in spite of these technological changes, serious revenue losses are continuing to increase because signal pirating technology is evolving at the same pace.

As a cable TV equipment service and sales facility, Quantum Cable Services Inc. (QCS) of Salem, Ore. provides cable TV convertor remanufacturing for MSOs and cable operators throughout the western United States. QCS' president, Tim Wilburn, observes that if the cable industry is to prevail against these pirating efforts, it needs to consider and plan through, and sometimes around, the electronic technology issues.

As a service company, "We detected that within weeks of the release of a new model of convertor, cable pirates had already developed several versions of component-level electronic modifications, thereby enabling signal theft," says Wilburn, who has been examining, testing, recording and reporting signal piracy techniques for the past three years. "Our statistics indicate that different cities and geographical areas experience varying degrees of convertor pirating at different times," he explains. "The number of convertors showing evidence of tampering and/or modification can fluctuate between 0.5 percent and 38 percent in a given cable system territory."

Why cases are dismissed

Companies which are either involved in, or which are going to pursue a civil or criminal case should be mindful of one of the most sensitive and volatile issues that they will encounter as they proceed through the recovery of their loss–the Chain of Evidence. More legal cases are dismissed (more than 60 percent) because of a breach or problem in the Chain of Evidence than for any other reason. However, if a cable company develops and implements a simple set of written procedures for the handling and storage of all convertors received from customers, and promptly brings this problem to the attention of its legal counsel or the local prosecutor, as appropriate, this fault can be avoided.

If evidence of convertor tampering is not discovered immediately (upon receipt from the customer), then the Chain of Evidence can be established at a future event, because procedures can track all received inventory.

The following are some recommended methods and procedures:

✔Any CSR, field representative or technician should, upon discovering or taking possession of a convertor (showing signs of tampering and/or modification), immediately notify their company's security manager or assigned security employee and place the convertor in a secure area like a lockable closet; or, if the employee is in the field, the convertor should be placed in his vehicle's trunk until the convertor is accepted by the assigned security employee.

✔Handling of evidence. The assigned security employee should, upon taking possession of the property or convertor, place the article(s) in an appropriate container. These may include a clear, plastic bag or a paper bag. (Note: It is not advisable to use plastic bags, as they attract moisture and can thereby contaminate evidence.)

The assigned security employee should document the unit serial number, location, time and date that the reporting employee discovered the convertor and the circumstances surrounding this discovery. Customer service representatives, technicians, etc. should be provided with and have available a report form to complete and sign. The security employee should see that the property is properly catalogued and documented.

In addition, the security employee should properly tag the property for identification. When possible, the employee should date and initial, with an indelible felt pen, the bottom of said convertor, or date and initial evidence, unless this would destroy its evidentiary value. He should tag the item with the appropriate evidence tag, attaching the tag with twist-on wire. For smaller items, placing them in a plastic envelope/bag, together with the evidence tag, will ensure their safekeeping.

✔Storage of evidence. The assigned security employee should deposit property for evidence as follows. Enter the serial number of the convertor or other property description into the appropriate evidence storage logbook. Place the tagged or bagged property in the approved storage room. (The storage area should be locked and accessible to only one or two people.)

✔Presentation of evidence (for testing, examination or hearing). Only the assigned security employee should retrieve the needed property from its storage location and personally take it to the proceedings, or prepare it for transfer to a recognized expert testing facility. If property is to be shipped, it should be transferred via a recognized common carrier. It's important to properly package and seal property so as to provide proof of tampering during shipment. Shipping documentation should include and require the common carrier to obtain the signature of the receiving party (i.e., testing facility). After testing or examination by the recognized expert, property should be returned to the attention of the recognized security employee using similar, approved tamper-proof packaging, via common carrier, requiring a delivery signature.

Attention to detail will help cable companies protect their professional image (liability) and the Chain of Evidence for their legal counsel and the court. The steps mentioned in this review are not intended to constitute legal advice, and operators should promptly consult with their attorneys or the local prosecutor in protecting evidence of convertor tampering. CED

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No turning back on modem spec effort

MCNS edging toward the rocky RF interface

By Michael Lafferty

The cable modem euphoria of last year's Western Show has long passed. The excitement of the premier event of that show–a packed press conference with a stage filled with some of the cable industry's biggest movers and shakers–has died down considerably. So much so, that the recent NCTA show seemed something of a letdown because there were really no dramatic cable modem developments.

Yet the issue of cable modem standards is far from dead. In fact, the silence you hear is the faint, possibly frantic, conversations going on behind closed doors as a determined group of industry professionals struggles mightily to hammer out workable specifications for the much-touted cable modem.

The spec process involves MCNS Holdings, which includes Tele-Communications Inc., Time Warner Cable, Comcast and Cox Communications, as well as Rogers Cablesystems, Continental Cablevision and CableLabs.

The initial modem standards announcement last fall set an unrealistic goal of mid-April for a good part of the work to be done. While it made great headlines then, few believed it was attainable. And they were right.

Yet, emerging out of all the smoke and mirrors surrounding the modem hoopla last fall, a little known organization, MCNS, appeared suddenly on the public horizon. That group has now taken center stage in the effort, and it seems determined to finish the task in a more reasonable amount of time. The new deadline? The end of this year for final specifications.

According to a *USA Today* report shortly before the NCTA Show, apparently there a lot of other people keeping their eyes on the MCNS effort. The article, which included a subhead that read: 'The cable industry's credibility is on the line,' went on to detail how supposedly many Wall Street insiders considered cable modem development as some sort of litmus test on the viability, profitability and/or survivability of the industry itself.

The article contained a line that seemed to put the industry's fate squarely in the hands of its own creation, the cable modem. Opined *USA Today* writer David Lieberman, "If the cable industry stumbles, other communications powers–particularly the phone companies–could move in for the kill."

How's that for pressure?

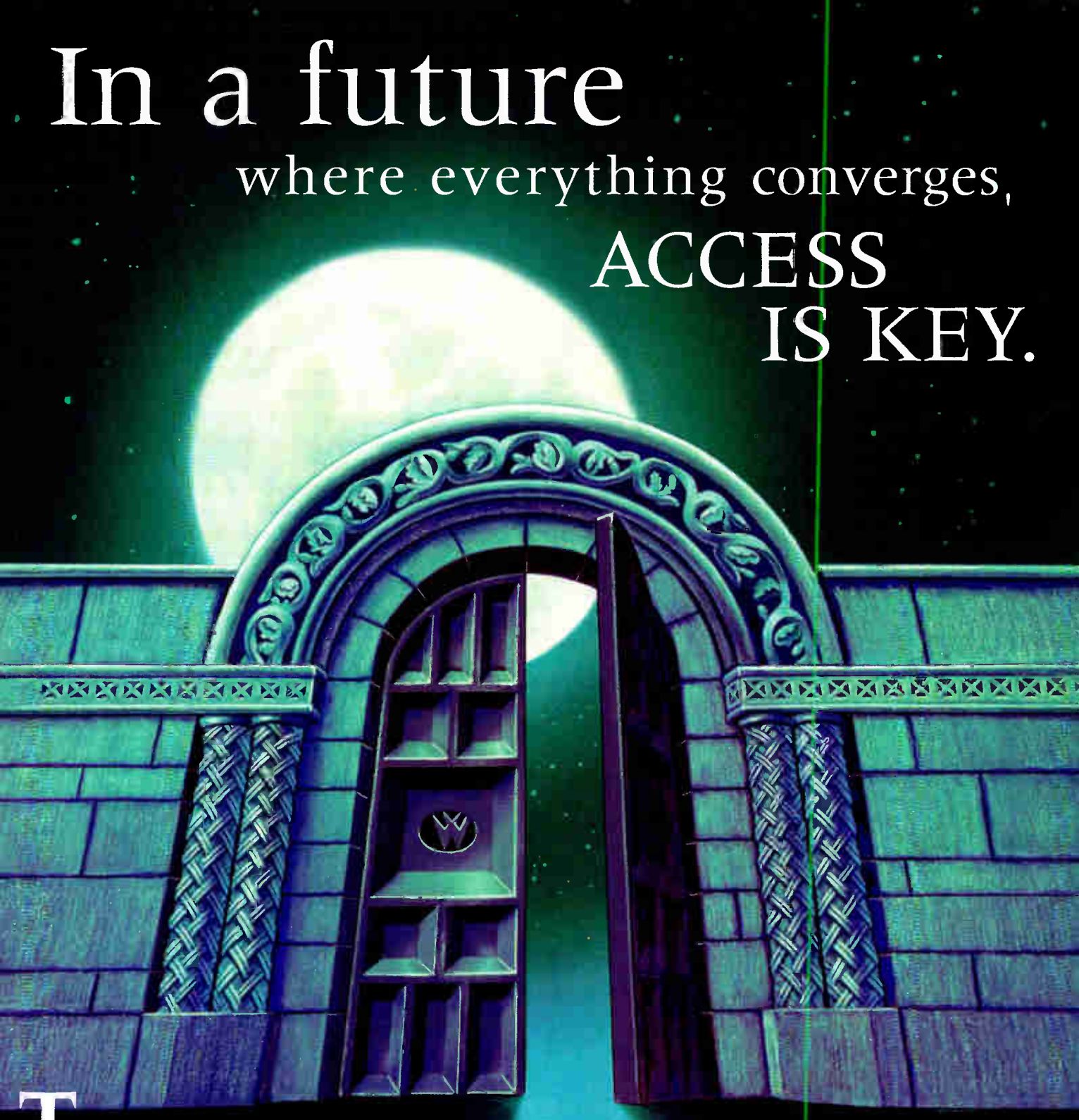
Cool, calm and collecting input

Panic is something that Stephen Dukes, TCI's vice president of technology and point man in the MCNS effort, doesn't seem to acknowledge. His cool, calm exterior gives credence to his determination to see the modem specification issue put to rest by the end of the year.

His reason for doing so seems as earnest as his demeanor. "One of the reasons for the interface specification," says Dukes, "is to provide manufacturers with the single interface they can manufacture to and that all cable operators and even telcos with HFC facilities who plan to provide high-speed data, can purchase to. That creates a higher volume opportunity and a lower price point."

Dukes reports the MCNS group has divided its work into three distinct phases. (See Table 1.) As each phase is completed, it will be sent out to key manufacturers and other concerned organizations for comments or input. Those comments will be reviewed, modified and/or included in the final spec as deemed appropriate. To help coordinate this massive shuffling of papers and proposals, MCNS has signed on the consulting firm of Arthur D. Little Inc.

PHOTO BY JOHN P. KELLY, THE IMAGE BANK



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Phase 1, which is largely complete, deals with the connections between the cable modem and the computer, as well as the cable headend to the wide area network. The proposed specs were released on April 15 with a late April/early May request for replies.

Phase 2, which was tentatively slated for a late April release and a late May reply deadline, involves data over cable system operations support systems and the interface for cable modem return using telephone lines.

Phase 3, the really slippery rock along the trail to a standards summit, will concern itself with specifications for security management, the downstream RF transmissions, upstream RF and the cable modem to RF connection.

To help keep all interested parties informed, whether it's a cable engineer in New Mexico, or an electronics manufacturer in Connecticut, MCNS and A.D. Little have created a web page on the Internet (http://www.cablemodem.com). The Internet site is periodically updated and contains the latest specs, MCNS' Data Over Cable RFP, press releases and even frequently asked questions about cable modems.

Slippery rock time

It's no surprise to Dukes, MCNS or knowledgeable cable groupies that Phase 3 in general and the RF interface in particular is the real butt-buster of this whole exercise. But Dukes sees it as a straightforward situation that, though difficult, can be resolved.

"We are really relying on the manufacturers to tell us what they think the best modulation scheme is," declares Dukes. "And then we're taking those inputs as part of the specification. Again, we're providing them with our requirements; they're providing us with what they think is the best modulation scheme at the right price point at some point in the future.

"They're the experts. They're the ones that have to manufacture to the price points that they commit to. Part of this Phase 3 is to go out there and complete laboratory testing and to complete field testing on cable systems so that we know with reasonable certainty what the best modulation scheme is at the right price points."

Table 1.

The three phases of MCNS

Phase 1:

✔*Upstream and downstream data interface*
✔*Consumer PC interface*

Status: Completed, sent out for comment and replies received.

Phase 2:

✔*OSS interface*
✔*Telco return interface*

Status: Completed, sent out by late May for comment, replies due back in late June.

Phase 3:

✔*Security management interface*
✔*Upstream RF interface*
✔*Downstream RF interface*
✔*Consumer RF interface*

Status: Outline completed, field tests/trials to be completed by late September or early October, specs to be sent out for comment by late October, replies due late November, completed spec due late December.

And, despite pressures from both inside and outside of the industry (*USA Today*, anyone?), Dukes and his MCNS cohorts are pacing themselves deliberately to get the job done right.

"We think if we hurry Phase 3," says Dukes, "the probability of success is reduced significantly. In other words, if we try to get something out in June, we probably have a 50 percent chance of this effort succeeding. But if we give it the amount of time that we have scheduled for completion, either late September or early October, we think we have better than a 90 percent chance of succeeding. The issue here is testing the systems in real cable systems and taking that data back to manufacturers."

While the MCNS group has been working, talk has been circulating throughout the industry that some sort of de facto standard may already be in place by year's end. Dukes is blunt in his reply: "Any manufacturer that doesn't adhere to the interface specification will not be purchased from. The interface specification will be a part of the RFP of all cable companies."

What about those modems already deployed by then? "Well, we've indicated those that provide product in the initial launches of our systems would be grandfathered," explains Dukes. "Likely, they'll be available in certain geographic areas, and we'll support them independent of the other system. They've got a life of 10 years, at least. So there's no reason to throw them away. And retrofitting them may not be a practical solution. But once the interface specification is complete, if someone doesn't adhere to that, we're not buying product from them."

Who knows? Maybe by the time this year's Western Show convenes, modem euphoria will be back, this time to stay. CED

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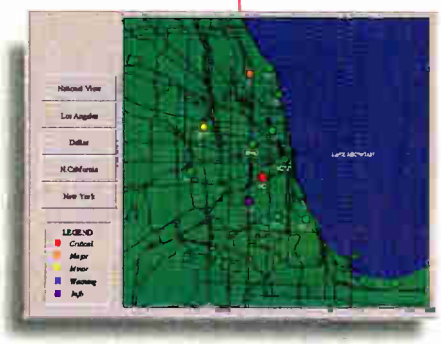

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Circle Reader Service No. 74

Does ADSL have a future in the telco/cable contest?

Serious questions remain unanswered

By Alan Stewart, President, Network Interface Corp.

Launched in 1992 by AT&T, asymmetrical digital subscriber line (ADSL) was promoted as a video-on-demand technology. It uses a technology similar to dial-up modems to deliver up to 6 megabits per second (Mbps) over copper telephone lines. It was dubbed "asymmetrical" because a high-speed downstream channel is supported by a much narrower band upstream path to enable the user to order video programming.

Bell Atlantic, US West and GTE are now positioning asymmetrical digital subscriber line (ADSL) as a major weapon in their battle with the cablecos for Internet access. But a long road lies ahead before they can provide their business subscribers with high-speed lines. Four years of development and dozens of video-on-demand trials have left advocates with little to show for their efforts.

Riding the Internet wave, the telcos and their vendors are scrambling to design off-the-shelf ADSL products that small business customers can use to send and receive high-speed data over unshielded twisted pair (UTP) telephone wire. But it's an uphill struggle as the following problems suggest:

✔ADSL products based on AT&T's carrierless amplitude/phase (CAP) and Amati's discrete multitone (DMT) are incompatible.

✔Because no standard products exist, the telco has to retain control, and users cannot make their own choices of equipment.

✔Not all telephone loops can transport ADSL signals. Subscribers farther than three miles from the exchange are excluded.

✔Older types of premise wiring are often unsatisfactory for higher speed ADSL, causing interference to other systems.

✔Created nearly two years ago, the ADSL Forum is involved in a debate over network standards needed to support ADSL.

✔Unlike dial-up modems, ADSL requires special transceivers at the telephone exchange in addition to regular line circuits.

✔Originally slated for television-on-demand for residential subscribers, ADSL advocates now see a more limited marketplace.

✔Transceiver cost is a major problem–an end-to-end system sells for around $1,200, while telcos say their limit is $500.

Bell Atlantic

Until this year, Bell Atlantic was the sole advocate of ADSL among the regional Bells. Activity commenced in 1992 with a field trial in Union City, N.J., which was soon cancelled. The technical trial phase culminated with plans to provide up to 1,500 users in northern Virginia with ADSL systems that provide 6.0 Mbps downstream and up to 0.5 Mbps in the upstream direction.

The telcos badly need a technology that lets them make better use of existing copper loops, says Ray Albers, vice president-technology planning, for Bell Atlantic. "ADSL enables subscribers to receive switched TV over their telephone lines. Even faster technologies are in the wings that provide an alternative to cable TV. Using fiber-to-the-curb, the final few hundred feet of copper could provide an alternative to analog coax."

US West

Together with Cisco Systems, US West announced in April that it will deploy ADSL in selected markets during 1997. Jerry Parrick, president of !nterprise, the telco's new data networking integration arm, said that ADSL is just one of several options for the company. "Our long-term objective is to concentrate on symmetrical solutions," he added.

"Our ADSL and HDSL (high bit rate subscriber line) product suite provides true peer-to-peer connections to business LANs," continued Parrick. "We intend to concentrate on data networking rather than the kinds of VOD applications conducted by Bell Atlantic. We also intend to make use of the even higher bit rates promised by VDSL (very high bit rate digital subscriber line) and SDSL (symmetrical digital subscriber line)."

Is Cisco committed to high bit rate copper as a broadband access methodology? "The capabilities of ADSL and HDSL are important tools in meeting the increased demand for Internet connection, but they're not the only ones," explained Jon Shantz, vice president for service providers. "Our intention is to stay reasonably engaged with a number of different technologies."

ADSL in Texas

"Less than five percent of the cable plant in the U.S. has been upgraded for two-way cable service," declared Sean Dalton, product manager for GTE's Irving, Texas-based ADSL trial. ProTech Books and Irving public library are among several businesses engaged in the trial. Installation was carried out by GTE Telephone Operations.

"The trial will help us learn how ADSL operates in the public network, and determine if a commercial offering is prudent," said Jeff Kissell, assistant VP of business product management. "If successful, we believe ADSL could become an alternative to cable modems."

"GTE has told us that it expects the basic monthly service charge for ADSL to be around $30," said ProTech's Chris Davis. "One problem is that the telco has to pass on its added network costs to the customer which puts ADSL at a disadvantage with respect to dial-up modems."

Where does ADSL go from here? It is obvious that unshielded twisted pair cannot alone provide an alternative to coaxial cable, fiber and wireless. Before high bit rate copper can be a major contender, it must overcome radio frequency interference issues, in-building wiring problems, and the absence of a support infrastructure. Here are the questions that overhang today's ADSL marketplace:

✔What is ADSL's main application: television-on-demand? Internet connectivity? Multimedia?

✔Which type of customer equipment will be used: a standard set-top box for the TV? A plug-in card for the personal computer? Or both of these?

✔What building wiring will be required–unshielded twisted pair, coaxial cable or a mixture of both?

✔What equipment will the telcos provide–video and/or data servers, access to data points of presence and network management and billing systems?

Until there are more answers, ADSL will remain a curiosity, viewed by many as a last ditch attempt on the part of the telephone companies to utilize their millions of miles of old fashioned copper wire. CED

Editor's note: The author is a founding member of the ADSL Forum and is a regular contributor to CED.

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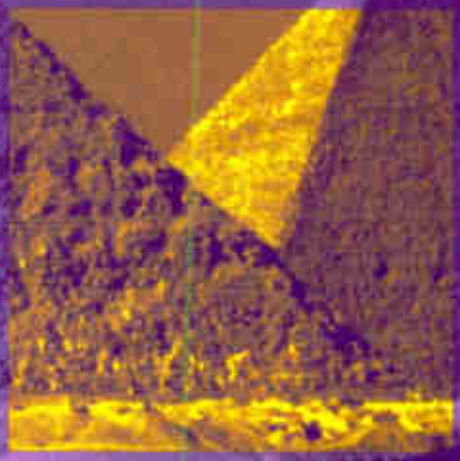

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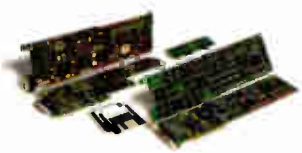

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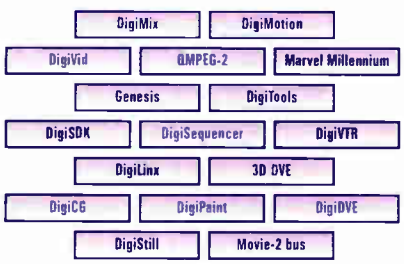

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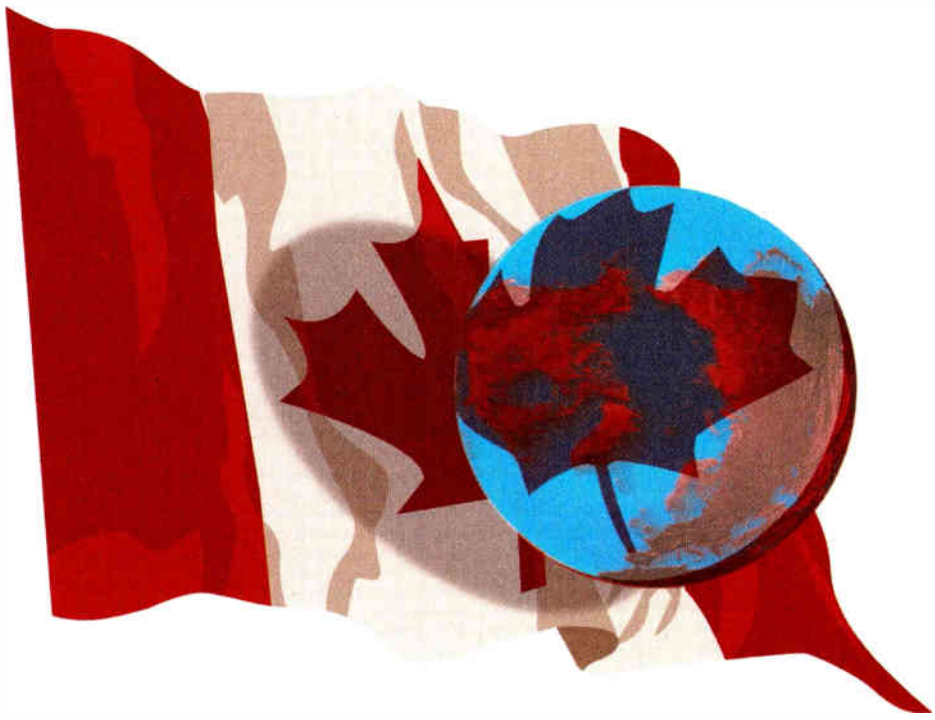


By James Careless

"New World, New Rules"– that's the theme of this year's Canadian Cable Television Association Convention, scheduled for the Edmonton Convention Centre in Edmonton, Alberta from June 2-5, 1996.

It's a theme that underlines the fundamental reality facing this industry, which has operated as a series of protected monopolies for more than 40 years. That reality is change, both in the form of impending competitors such as the telephone companies, DBS and Local Multipoint Communications Services ("wireless cable"), and products like high-speed data access and cable telephony.

That is why the convention "will be very heavily focused on competition," says CCTA president and CEO Richard Stursberg. "The second thing we're going to be talking about is customers," he adds. Improving and maintaining high levels of customer satisfaction is "crucial: it's part and parcel of the issue of competition. The third thing we'll be talking about will be the whole theme of cooperation among the industry members," Stursberg concludes.

As an example of this last idea, he points to the April 2 launch of "vision.com," the Canadian cable industry's new commercial consortium, aimed at developing industrywide products and marketing strategies for high-speed data transmission, interactive digital TV and cable telephony.

According to Stursberg, vision.com represents the type of nationwide approach cable needs to pursue, if the industry is to compete successfully against the united might of Stentor, the telcos' lobbying and marketing alliance.

A glance over the convention's agenda backs up Stursberg's assertions: this year, learning the secrets of successful competition is what this conference is all about.

The CCTA Convention: Sunday, June 2

Although this event is being billed as pre-conference, the "Technology tutorial" being offered at 1:30 p.m. is likely to generate a great deal of interest among delegates. That's because it focuses on "Demystifying the technology of new cable services."

In other words, it will attempt to explain what all the technological advances highlighted at this convention really mean, and how this technology can benefit cable companies.

Monday, June 3

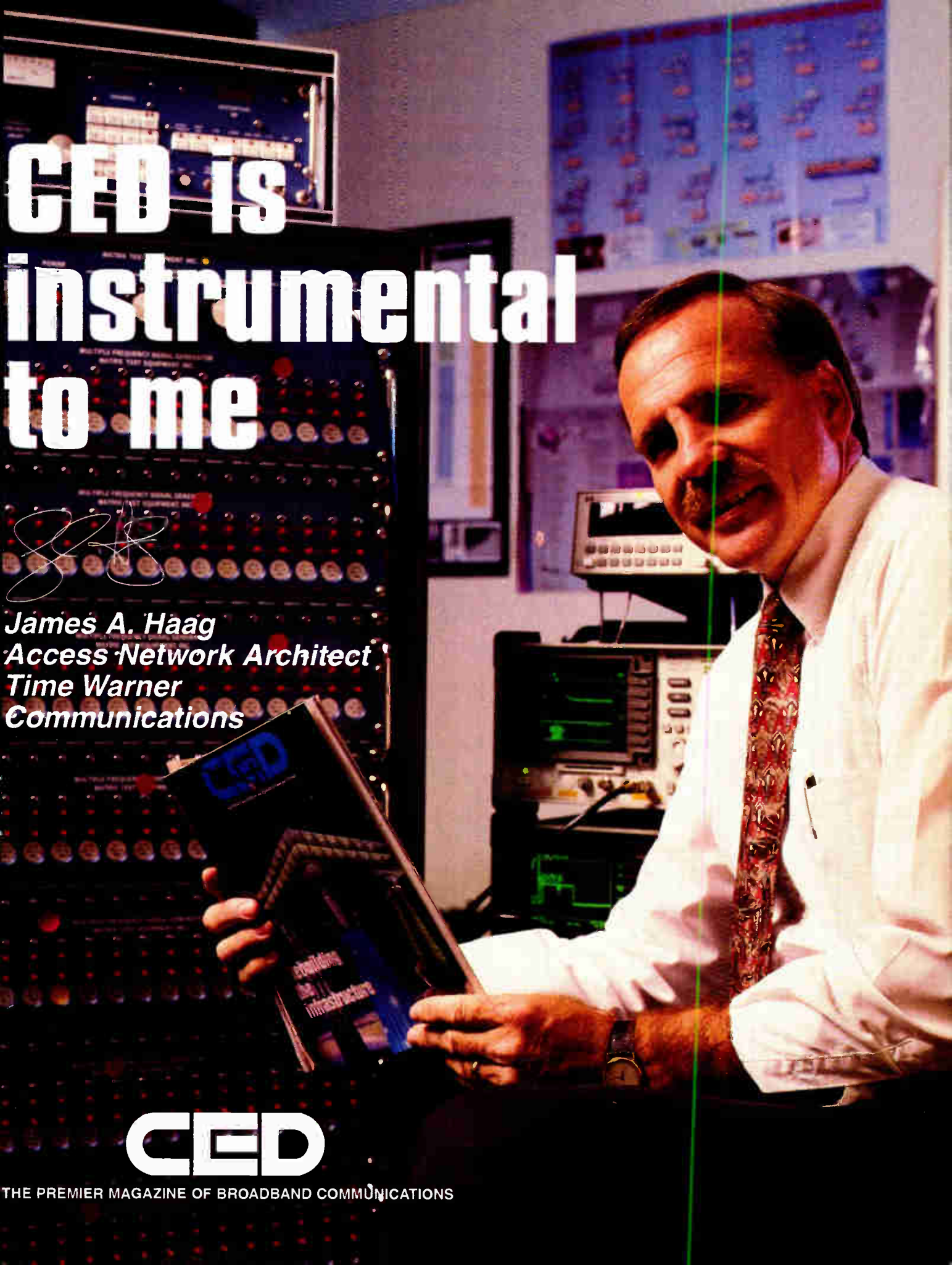
The real business of the CCTA convention starts Monday at 8:45 a.m., when the first of three Plenary sessions begins, namely, the "Cable industry report." Rightly described by Stursberg as "a perennial favorite," this event features the three heavyweights of Canadian cable: Ted Rogers (Rogers Cablevision), J.R. Shaw Sr. (Shaw Communications) and André Chagnon (Vidéotron). Between them, these three serve the majority of Canadian cable households–a testimony both to the power of their companies, and to the personal influence each of them has in determining what the industry does next. That's why, as in previous years, a packed house will likely turn out to hear them give their views on "What does the future hold?"

Following the Plenary, Cablexpo, the convention trade show, officially opens its doors. Echoing the rest of the show, leading-edge technology will be taking center stage at Cablexpo, with a special display of cable modems. "We have all the major manufacturers coming up to exhibit their gear," says Stursberg: "Motorola, Scientific-Atlanta, Zenith–the lot."

At press time, the identity of the luncheon speaker was up in the air, given the resignation of Canadian Heritage Minister Sheila Copps, who was initially invited to speak. Speculation is that her replacement could be Industry Minister John Manley (whose department shares responsibility for communications regulation with Canadian Heritage).

That's because "the policy dealing with the introduction of sustainable competition to the cable industry by the telephone industry is expected to be unveiled in the next days and weeks," says Guy Beaudry, vice president of corporate affairs at Le Groupe Vidéotron Ltée, Vidéotron's parent company. "Therefore it wouldn't be surprising that Minister Manley would choose the CCTA convention as a forum to unveil that policy."

Later in the day comes the "National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report," where Stursberg and CCTA Board chairman Bill Stanley talk about the present and future of the CCTA, and the Canadian cable industry in general.

Tuesday, June 4

Following a 7:45 a.m. breakfast, the delegates will sit back for the much-anticipated second Plenary, "An informal chat with John Malone." For many, if not all, Canadian cable operators, TCI's president and CEO represents what they want to be when the industry grows up: big, powerful and capable of meeting competition head-on.

Stursberg reflects this attitude when he says, "Obviously, we're looking forward to hearing from John Malone, who owns the largest cable company in the world. He is widely regarded . . . as one of the leading figures in North America, in terms of overall strategy for this industry."

After Malone's "chat," the CCTA holds its Annual General Meeting, and several sessions begin. The first two are sessions on building "Customer loyalty in the new world" and "Improving customer service in a competitive environment," which will discuss ways of managing databases to help build loyalty, provide examples of loyalty campaigns that did (and didn't) work, and other aftermarket techniques that can help hold customers.

The customer service session will focus on using technology to improve managing networks and customer information systems.

A third workshop, "Cable in the classroom: the next step," is hosted by Shari Baldwin, executive director of CITC. It's aimed at coaching cable operators in promoting this service to their local schools.

Then comes lunch and the return appearance of John Cassaday, president and CEO of CTV, Canada's national private television network. But Cassaday is also a masterful motivational speaker with a passion for promoting the competitive edge of customer service to business.

"Last year I spoke at the convention about the importance of being customer-oriented," explains Cassaday, "and the CCTA has asked me to come back this year and really talk about the same thing–talk about the progress that's been made in the industry as it relates to developing a greater service mentality, and talk about some of the challenges that remain to be dealt with."

After the Cablexpo closes later in the day, it's time for the CCTA Annual Awards Show, which recognizes the best in community programming, marketing and engineering.

Wednesday, June 5

On Wednesday, the third and final Plenary begins at 8:30 a.m. Entitled "Surfing the new world–on the PC," it features panelists from Yahoo (the Internet directory service), TCI's @Home service, Newbridge Networks and National PC Access, focusing on the opportunities offered to cable by the 'Net, how companies can cash in on this market, and how to make sure they do it right.

"We're going into the computer business, and it's not something the industry has done in the past," explains Stursberg. "Obviously this is a fabulous, fabulous opportunity for us, because this is like one of the great 'killer applications,' but it requires a different skill set in many cases.

The key to success in this "new world" is to be "very customer focused"

"You have to now build a two-way network to accommodate it," he says. "Very sophisticated network management tools are required to ensure a high quality service. (And) you're dealing with people who are preoccupied not with television services, but computer services, and so the nature not just of the network management skills, but the customer sales and representation skills (as well), are really quite different."

After this Plenary, three concurrent sessions begin: "Competitive market realities," "Retrofitting to compete in the new world," and "The key to launching two-way services."

The first features panelists from Cox Communications, Jones Intercable and HBO, who will discuss ways to successfully package, price and promote product in the competitive marketplace. The second spotlights how two other non-cable companies–Canadian Airlines International and Canadian National Railways–have had to change to cope with competition, and the third focuses on the art and science of upgrading to two-way cable networks.

Following lunch, there are more sessions. "The 200 channel universe. . .Fact or fiction?" session tackles the problems of juggling limited analog capacity, an ever-fragmenting advertising base, new access rules and the coming of digital technology, while "Creating the new community channel" looks at ways of boosting this unique asset, one not offered by DBS, LMCS or the telcos.

These will be followed by the final two sessions of the convention: "Polishing cable's image," which focuses on public relations, and "Voices of experience–Canadian and U.S. trials and services."

This last session will likely be widely anticipated by delegates. It's chaired by Dr. Richard Green, president and CEO of CableLabs, and features presenters from Tellabs, Delta Cable Television, Cable Television Laboratories and Lapp-Hancock Telecommunications Services.

Of particular interest will be the report from Tellabs, which has been experiencing substantial success with its Cablespan 2300 cable telephony product.

To date, Cablespan is being tested by a number of U.S. MSOs, including Time Warner and TCI. Time Warner is already using it to offer commercial service to multi-unit dwellings in Rochester, N.Y., and TCI has plans to use it as part of a rollout (along with Motorola's and Nortel's equipment) in California, Connecticut and Illinois by the end of this year.

"We're hoping to show, first of all, that the technology is working," says Jeff Gram, a marketing manager with Tellabs Canada; "that we've had successes and that this is a viable business for cable companies to get into.

"We'll (also) be talking about what has to happen within the infrastructure of the cable network in order to allow this to happen properly," he adds. In order to successfully deploy cablephone over a two-way hybrid fiber/coax network, "you pretty much have to go fiber-to-the-curb and have coax for the last leg. You have to watch over the leakage problem, make sure everything's properly terminated."

One clear message

Obviously there's going to be a lot of hype and hoopla during the CCTA convention. But despite this, there's a very firm purpose behind this conference, and one clear message Stursberg wants delegates to take home.

"We're entering an era that is quite unprecedented for the industry," he notes. "We're moving into radically new lines of business. (And) we're going to competing with hosts of different players."

Because of this, Stursberg wants the delegates to remember that the key to success in this "new world" is to be "very customer-focused. I'm hoping that what everybody will take away from it ultimately is the centrality of the customer." CED

About the author

James Careless is a freelance communications writer based in Canada.

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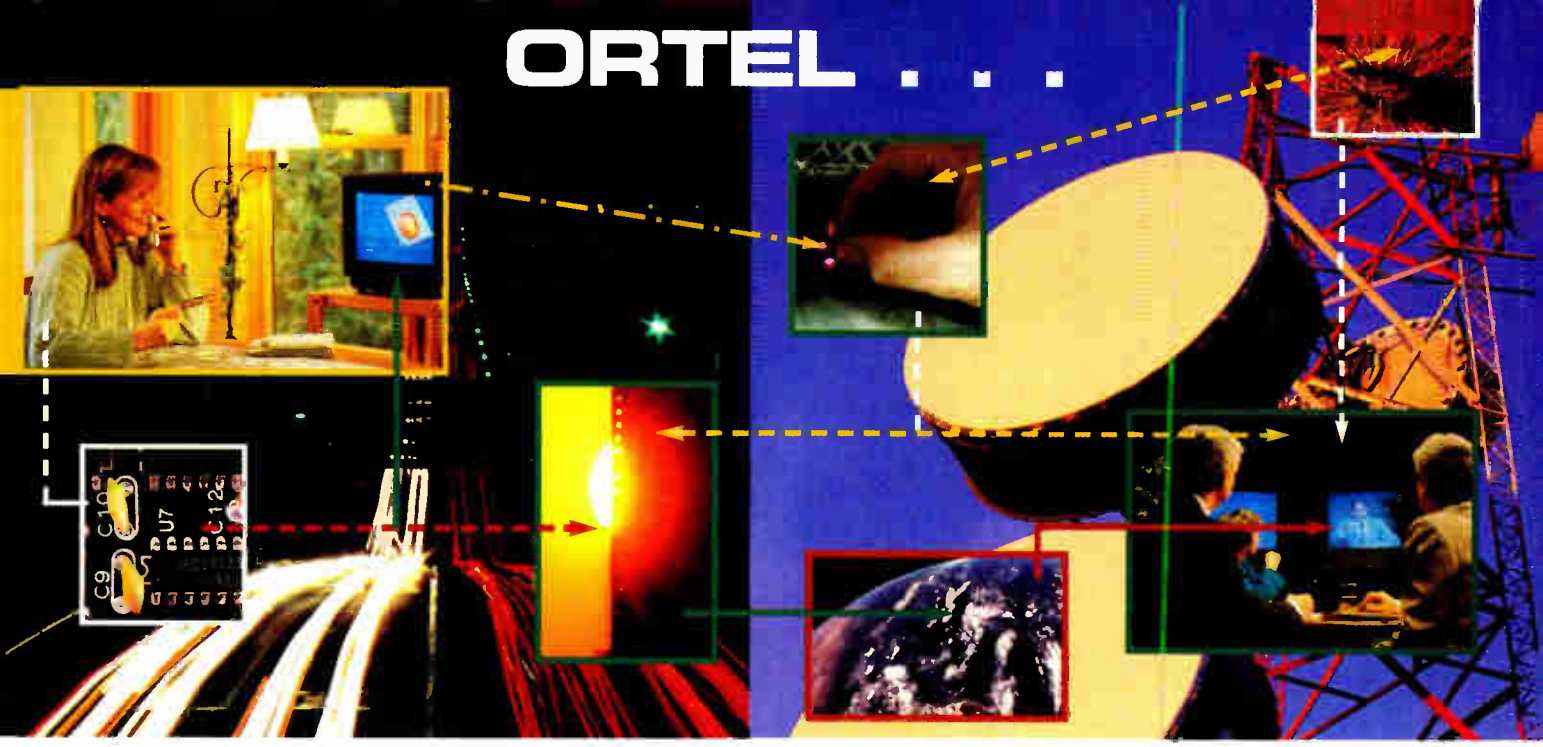

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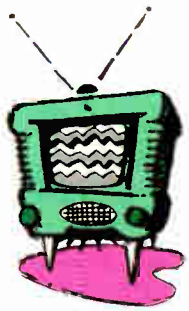

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A unique fiber optic upstream data system

Transmission without light

By Lawrence W. Lockwood, Technology Correspondent, and President, TeleResources

The unique feature of this system is that no laser or light source is required in the upstream path of this baseband packetized data transmission system. In the system, each packet traveling from the central office (CO)/headend consists of a front half which contains the downstream information going to the subscriber. The second half of the packet consists of a steady stream of light. At the optical network unit (ONU), the packet travels through a fiber splitter, sending the downstream signal to a receiver and simultaneously sending the packet to an optical modulator, which imprints the upstream data on the CW light in the second half of the packet.

This scheme was developed at AT&T Bell Laboratories (now Lucent Technologies) for low data rates (currently up to 1.5 Mbps at BER 10^{-9}) and is described in references 1-4.

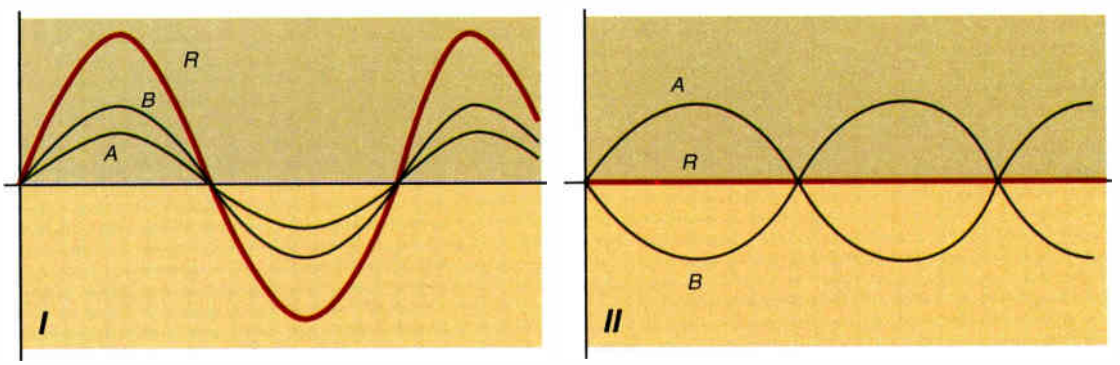
Optical interference

The heart of this system is the optical modulator in the upstream path, which is a silicon micromechanical device that controls optical interference in a thin film.

Since light is electromagnetic radiation, optical interference follows the same principles as microwave interference. Two waves of the same frequency, in phase with each other and moving in the same direction, produce reinforcement. The result is shown in part I of Figure 1, in which individual waves are represented by A and B. The resultant wave R is in phase with the component waves and has an amplitude equal to the sum of their amplitudes.

Two waves of the same frequency, in phase opposition and moving in the same direction, produce interference; if they have equal amplitudes, the result is a complete annulment. An annulment is represented in part II of the figure, the amplitude R of the individual waves A and B being zero at all points. If waves A and B in part I are separated by one wavelength (λ) then reinforcement occurs, and if A and B in part I are separated by $\lambda/2$, then optical interference occurs, and no light is transmitted.

Figure 1: *Interfering waves A and B, and their resultant R. Part I shows reinforcement, and part II, annulment.*

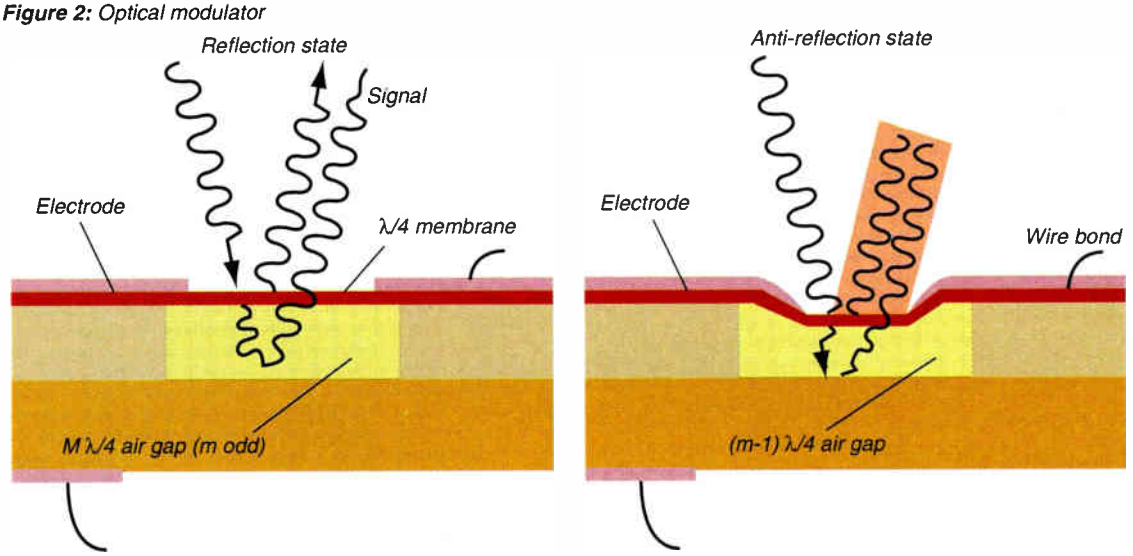


The modulator

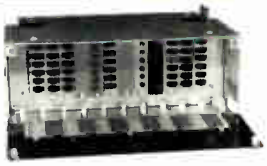
The device developed by Bell Labs proposed for use as the subscriber end modulator is shown in Figure 2.

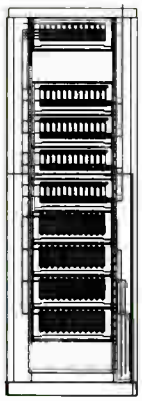
A semi-reflecting, semi-transparent silicon nitride membrane is formed with thickness equal to 1/4 of the incident wavelength, λ, of the incoming light and is suspended over an air gap. Since the membrane thickness is $\lambda/4$, then when the airgap is also $\lambda/4$, the device forms a high reflectivity mirror. In fact, for an air gap thickness of $m\lambda/4$, for m even, an anti-reflection condition exists; for m odd, a high reflection exists. The air gap is electrostatically controlled at the upstream data rate. Hence the Bell Labs developers call the device the Mechanical Anti-Reflection Switch, or the MARS

Figure 2: *Optical modulator*



AFL Patch Panel





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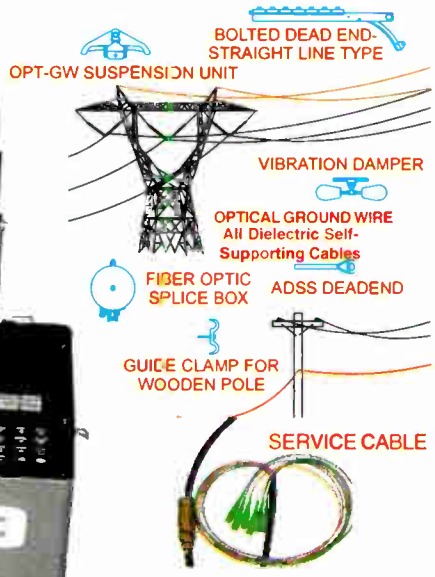

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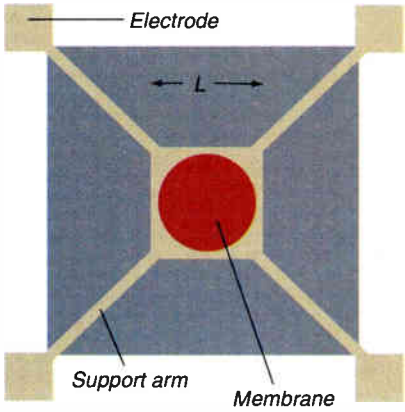
Figure 3: *Top view of MARS (Mechanical Anti-Reflection Switch)*



device. A top view of the MARS structure is shown in Figure 3.

James Walker of Bell Labs, and one of the developers of the optical modulator, explained that during the course of development several MARS optical modulators were made. One was made with m = 3 and L = 20 μm. The support arms were 30 μm long and 5 μm wide, with voltage requirements of 25 volts for 1/4 λ deflection. These requirements should decrease greatly by going to m = 1. Figure 4 shows a photo of one of the MARS optical modulators built during the development.

The overwhelming attraction of this system is cost–it is enormously less expensive than using a laser

Comparing the dimensions above of the MARS optical modulator to the dimensions of an optical fiber seen in Figure 5 shows that the optical modulator is smaller than the diameter of the fiber, meaning that the optical modulator might be mounted directly on the fiber.

Since this device operates surface-normal, tens of thousands may be fabricated on a wafer. In addition, the device requires only course lithography (2 micron linewidth rules would suffice). The cost of the device (minus packaging costs) will be a few pennies.

Performance

Since the device is intended for operation by phone companies in climates ranging from Arctic to desert conditions, the operating temperatures are -50 degrees C to 90 degrees C (certainly more than adequate for mounting on the side of a house or out on a pole). Although tests were made at low data rates (e.g. 0.756 Mbps), BER measurements show great promise that the modulator can operate at 1.5 Mbps with a BER of 10^{-9}.

Conclusions

This is a very novel scheme developed at Bell Laboratories for relatively low data rate return paths (very high data rates–e.g. hundreds of Mbps–can be implemented by using more costly devices such as a lithium niobate or semiconductor modulator). However, it must be remembered that the scheme is in essence simplex transmission, with part of the downstream packets being used to provide for the upstream data, as opposed to most modems which use duplex transmission (i.e., separate full-time downstream and upstream channels). The overwhelming attraction of this system is cost–it is enormously less expensive than using a laser. CED

Figure 4. Photograph of a MARS optical modulator.

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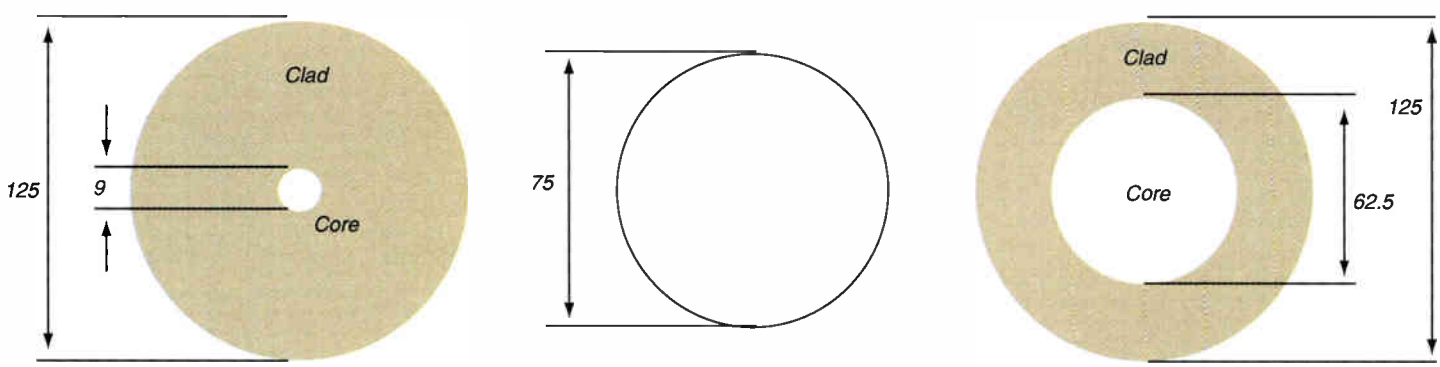
About the author

Lawrence W. Lockwood is president of TeleResources, a consulting firm based in Arlington, Va.

Figure 5: *Relative sizes for optical fiber (in microns).*



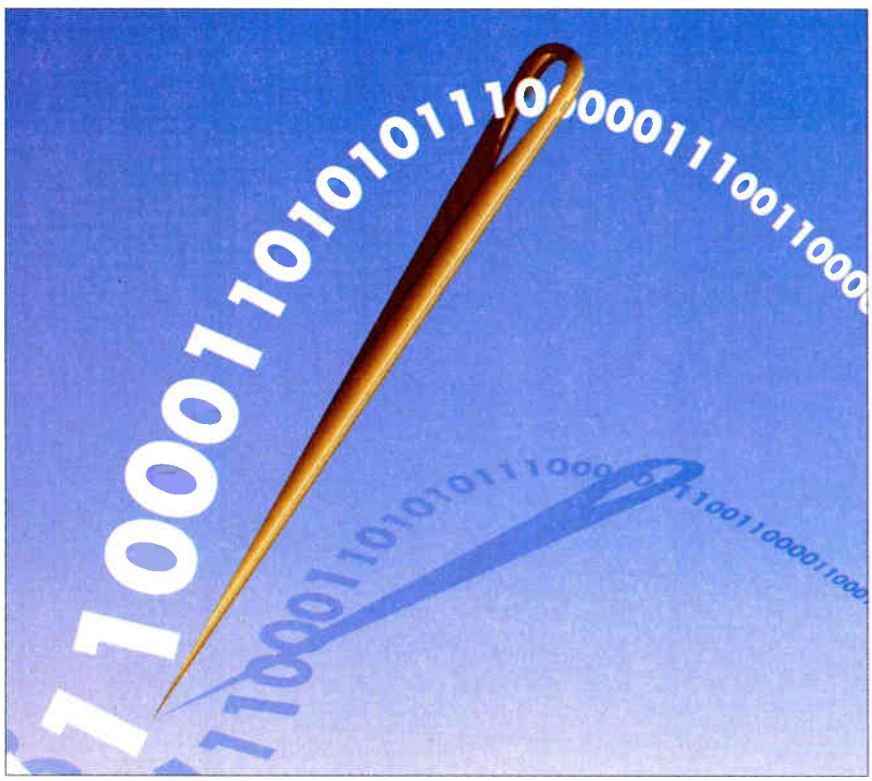
More questions than answers for data

Can MSOs thread the mass-market needle?

By Fred Dawson

The cable industry is in a position to create a huge consumer market for high-speed data services ahead of anyone else, assuming MSOs can come up with a truly mass market product.

This is no mean task in an environment where commercialization of the Internet is putting market momentum behind next-generation technical advances that could have a lot to do with just how broadly connected cable's broadband pipeline turns out to be. Making the task more difficult is the fact that many



MSOs are seriously considering mass-market expansion of high-speed data services using one-way cable networks in conjunction with telephone return links, leaving little time to think through the implications of new developments.

"It makes sense to us to do whatever we can to expand our market base as quickly as possible without waiting to activate all our systems for interactive service," says Glenn Jones, chairman and CEO of Jones International, which began offering "Jones Internet Channel" services to subscribers in Alexandria, Va. in April. Jones, the first MSO executive to go public with such plans, says his firm will use telephone lines for return signals as it extends high-speed data services into several additional cable systems in the coming months, including its main Colorado properties.

To some technical leaders in cable's high-speed data initiative, such plans are tantamount to heresy. "It will undermine the integrity of the business we're building to link our services to the constraints of upstream telephone connections," says a leading engineer, asking not to be named. "If we don't lock in the serious users, who own most of the PCs that can benefit from high speed in the first place, the telcos will."

But broad market reach is crucial if cable is going to go beyond offering faster navigation of the Internet to capture the content potential that goes with high-speed data access, insists NBC Cable President Tom Rogers, who is banking on the ability to use the NBC-Microsoft Network to deliver multimedia tie-ins with regular cable and broadcast fare.

"The high-speed data modem can't be another digital set-top disappointment," Rogers says, noting the on-line tie between cable and broadcast TV and high-speed data access is "the raison d'etre" for NBC's partnership with Microsoft. "The cable modem is absolutely critical to the cable industry's regaining the mantle as the provider of choice among consumers."

While many would contend cable has not lost that mantle, notwithstanding the encroachments of digital satellite service, there is growing concern within the industry that limiting the market for high-speed data services to two-way cable plant could not only slow development of consumer-oriented content, but could cause a backlash among customers as well. "Cable subscribers may not be understanding when you tell them they have to wait to get the service until the two-way plant is built," says Bill Luehrs, president of network systems for Zenith Electronics Corp., which saw its stock value skyrocket last month following news that it was turning to U.S. Robotics for supply of a telephone return path interface with headend routing gear.

MSOs have traditionally been reluctant to use the telephone return path for a number of reasons, including the desire to avoid any perception on the subscriber's part that the system uses telephone infrastructure. Moreover, there's a concern that the long periods spent on-line would require users to order second phone lines, adding new revenues to telco coffers.

But recent changes in the regulatory environment open ways for MSOs to mitigate the downside, says Donald Mulder, vice president for strategic planning at U.S. Robotics. "One option resulting from the changes in the rules is the cable company can become a reseller of telephone services, so that the return channel is part of its own branded service," he notes.

Operators might also consider using a wireless con-

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Microsoft Network is using wavelet compression to support fast-paced browsing and image access

nection to PCS microcells, Mulder says. "By adding a transmitter to the modem, we could supply a path that avoids the telephone line altogether," he notes.

For a long time, the voice in the wilderness supporting use of the telephone return to broaden cable's high-speed market base was General Instrument, which gambled on the appeal of one-way cable with a first-generation cable modem that doesn't even provide for using a return path over the cable network if one is available. The firm's SURFboard, operating at 27 megabits per second, per 6-MHz channel in the downstream, is designed to deliver consumer-oriented multimedia with video content from the get-go, says Mike Ozburn, vice president and general manager of GI's telecommunications group.

"Our focus is on encouraging operators, content developers and suppliers to think about the platform as a conduit for what we're calling 'videoware'," Ozburn says. "The content is out there. The issue is what the mass market platform is going to be as developers plan to expand the multimedia components on-line."

GI's Videoware Innovation Partners program has drawn participation from more than three dozen software and hardware tool makers, programmers and other entities, including Macromedia, Microsoft, Silicon Graphics, Sun Microsystems, 7th Level, PBS and FORE Systems. "We've spent two years growing this platform, and we think it's going to pay off in the near future," Ozburn says.

As further evidence of growing demand for a telephone return path, Motorola Corp. plans to add the capability to its modems by the third quarter, says Ron Smith, director of operations for the firm's multimedia group. "The modem will be fully two-way capable in the HFC (hybrid fiber/coax) environment so that the operator can go to the cable upstream without changing out the subscriber hardware," he says.

The new content wave

TCI, with 2 million of its 20 million franchised households now passed by interactive high-capacity plant, according to COO Brendan Clouston, is said to be among the companies looking at use of the telephone return path to expand its high-speed service delivery base. "They know there's going to be a new buzz on data access in the media world as things move to video, and they don't want to constrain the opportunity they see for their programming interests in this area," says a source familiar with the company's thinking.

But, to begin with, TCI and its media affiliates will exploit the narrowband side of the on-line marketplace where there is product to build a business. "We . . . believe consumer information services tied to news, travel, health and sports will lead the way into a larger market for data services," says Allen De Bevoise, president of TCI Interactive, a unit of Tele-Communications Inc. that is seeding content development by backing large and small developers alike.

These will pre-date and help prepare the way for more entertainment-oriented fare, De Bevoise adds. But, from a technical standpoint, they will also help dictate the parameters for broadband versions of narrowband content.

"To think one new system takes over and changes everything people are doing in today's on-line environment is a mistake," says cable programming and on-line veteran Scott Kurnit, who was head of the MCI/News Corp. on-line venture until it was disbanded three months ago.

"We're going to see 14.4- and 28.8-baud access operating side-by-side with 1.5 megabit-per-second data streams, and content will have to be positioned to flow over whatever lines the orders are coming from," Kurnit says. "The answer isn't four or five different versions of content stored at a Web site."

This applies not only to things like run-time and graphics engines, APIs (application program interfaces) and operating systems in the creative environment, but to the compression system as well. MPEG as a solution for the on-line data world as it moves to broadband "is never going to happen," Kurnit warns.

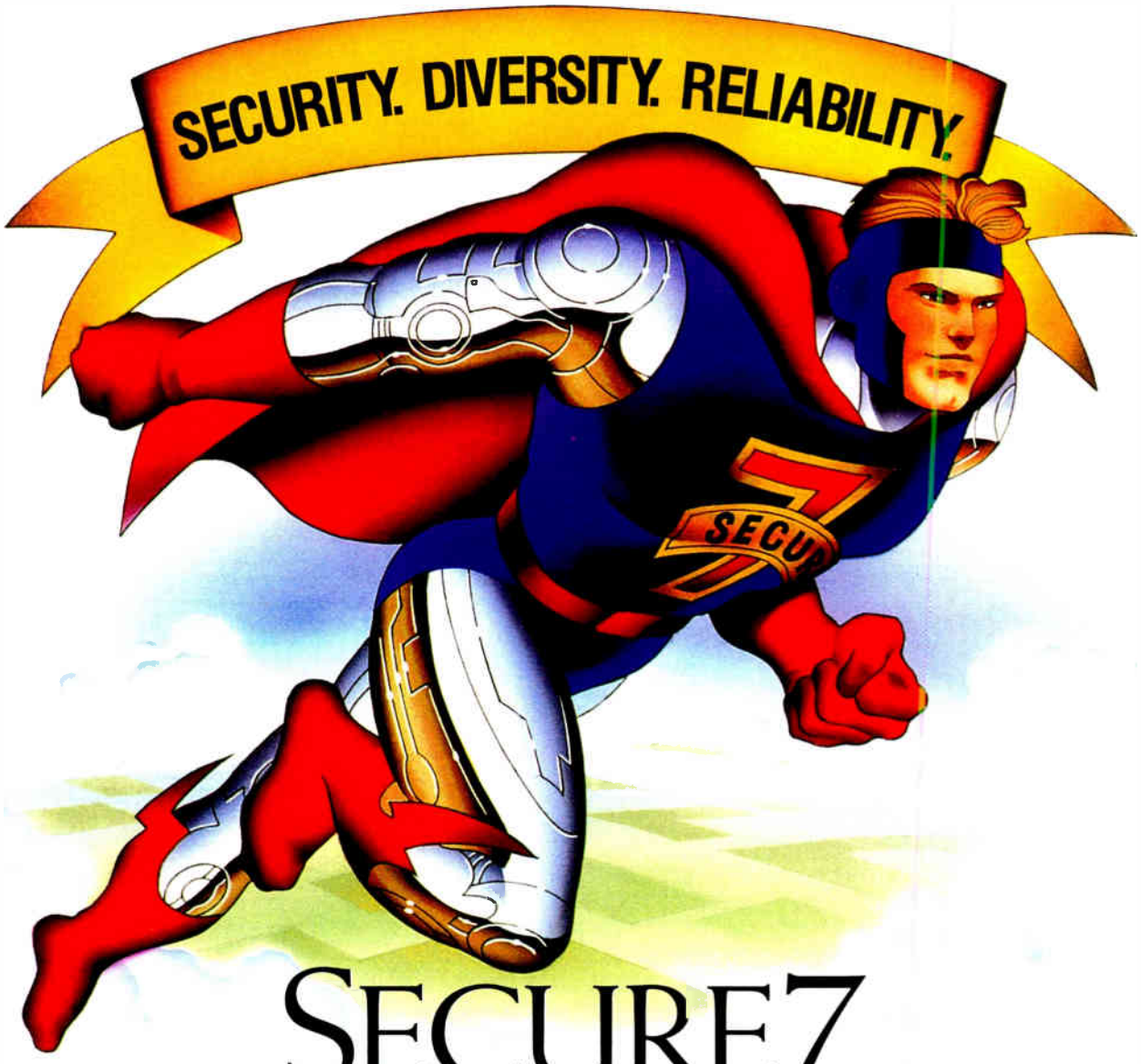
As Kurnit notes, the leading alternative to MPEG, wavelet technology, is moving rapidly into the mainstream, boosted by a major move in that direction last year by Microsoft Corp. and recently fueled by the efforts of VDOnet Corp., a startup in Santa Clara, Calif. that has begun real-time video transfers over the Internet on low-speed phone lines. The VDO software supports choppy but viewable TV segments in a window covering about one-fourth of the PC screen, with screen size and frame speeds varying with the amount of bandwidth available to the user.

"The system as presently configured scales up to 256 kilobits per second," says Mark Smith, a member of VDO's technical staff. "Everything is done in software, with a video capture card as the only equipment necessary at the user end."

The system is not capable of showing live TV, because all material must be encoded and stored to enable the software to read the end-user data capacity and to adjust the feed accordingly. But its low-bit-rate capability makes video feasible in on-line environments where MPEG falls apart, Smith notes.

Microsoft Network is using the scalable properties of wavelet compression to support fast-paced browsing and image access, says David Seres, senior product manager responsible for ITV network marketing at the company's consumer systems division. "We've found that this technology allows us to make the best of the narrow bandwidth available over telephone lines," Seres says.

Where MPEG is based on algorithms that eliminate redundant information and predict motion, wavelet compression retains the information of every picture frame, redundant or not, and does not use motion prediction. Instead, the wavelet transform clips the sine waves that are used to represent information, reducing the amount of data required to characterize each waveform.



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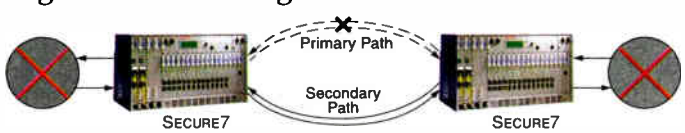

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Interoperability with the existing content base is crucial to creating a product for a mass market

"We're gaining efficiency by how the code is stored rather than throwing away redundant data," says Tom Lineham, project coordinator for the "HARC-C" wavelet technology developed at the Houston Advanced Research Center, a non-profit affiliate of the University of Texas. "We can recover each frame in its entirety, and there is no problem with quick scene changes."

Adding fuel to the wavelet trend are the efforts of Digital Video Arts Ltd. of Dresher, Pa. and Intel Corp., supplier of a new wavelet version of Indeo video compression software. DVA is producing a video capture and compression board, known as the "WakeBoard," to support non-linear editing in real time as well as real-time video distribution over networks.

"We're taking a different approach from VDO, but it's in the same ballpark," says Scott Hooper, an engineer with DVA. "We're looking into approaches that would allow content developed on our board to be distributed over a variety of Internet distribution systems, but, right now, we're focused on the editing end of the process."

Lineham is convinced the market base on the developers' side will drive penetration of the compression format to the mass market. "We believe our compression software solution can capture a significant share of the installed base of PC users who want to work with video," he says.

Covering all bases

The good news for network operators is that the emerging wavelet platform doesn't represent a threat to anything currently underway in MPEG on the video side, given MPEG's role as the compression standard not only for network systems but for DVD (digital video disk) as well. But it suggests network operators must be careful to ensure hardware they're implementing maximizes transport efficiencies for emerging technologies.

This is why GI is moving from an MPEG transport layer in its first-generation cable modems to ATM (asynchronous transfer mode) transport with the next generation of SURFboard product, which is designed for use on two-way cable systems. "This is the format best suited to the network remaining forward compatible," Ozburn says.

The telcos agree, which is one reason they are not in a big hurry to deploy ADSL (asymmetrical digital subscriber line) or its symmetrical variations, notwithstanding cable's headstart in high-speed data. The leaders in the field, Bell Atlantic, US West and GTE, have taken cautious approaches to bringing ADSL along, leaving unclear when they will move beyond recently announced technical trials to high-speed data rollout.

Telcos, of course, want to make sure the technology is really up to real-world operations in all types of line-environments, but they also don't want to rush out a high-speed data product based on Ethernet protocols, notes Kim Maxwell, who heads the ADSL Forum. "There is a strong, strong feeling among telephone companies participating in the forum that, over time, they want to base high-speed data access on the emerging ATM infrastructure," he says.

"Mass rollout for ADSL is probably going to be significantly ATM based," says Bill Rody, marketing vice president for ADSL system supplier Westell Telecommunications Inc. "Fast Internet and on-line access can be introduced over the IP (Internet protocol) network, but the grand vision among all of us is a seamless multimedia network embedded in the ATM architecture."

Meanwhile, the sudden show of telco aggression on the ISDN front promises to accelerate efforts to scale the narrowband Web content environment to a more graphic-rich wideband environment. Here, again, the message for cable is that interoperability with the existing content base is crucial to efforts to create a broadband product for a mass market.

In one example of what is coming together in this vein, Bell Atlantic recently announced creation of a new unit, Internet Solutions, that would provide a wide range of data services to consumers and business customers over a new generation of user-friendly gear. Stuart Johnson, group president for large business and information services at Bell Atlantic, says Bell Atlantic is testing new pricing and installation procedures in Maryland in preparation for a streamlined approach to offering ISDN in conjunction with Internet access rollout this summer.

"We are perfecting ways to reduce installation time and to simplify ordering ISDN services," he says, adding that, already, "our prices are as good as or better than ISDN prices anywhere else."

Officials note Internet Solutions has licensed the first ISDN-compatible version of Netscape Communications' browser and will use other tools from the software supplier to support content development. BAIS has also reached an agreement with Microsoft Network for provision of a customized version of the service.

"We will be major players in the Internet arena," says Bob Beron, president of BAIS. "Our customers are asking for these services, and we intend to provide them."

Can cable thread the needle, maintaining compatibility with an exploding multimedia base in the narrow- and wideband Web environment while building a mass market base for high-speed access in advance of the anticipated shift of the data communications platform to ATM two years from now?

"You have to remember that the cable industry has the option to add more channels for data as new systems come on the market and demand grows," Ozburn says. "What we're saying is that, as long as there is a base for interoperability with the rest of the world at the headend, there's plenty of room to evolve in the cable plant environment."

From Tom Rogers' perspective, cable has no choice if it is to capture the audience of the future. "Everything we're seeing in consumer-oriented Web site development is really a forerunner to personalized, interactive TV," he says. "That's what we're playing for." CED

JUNE

3-6 Fiber Optic Training, produced by The Light Brigade Inc. Location: New York, N.Y. Call Pam Wooten (800) 451-7128 for more information.

3-7 The International Conference on Consumer Electronics (ICCE), sponsored by the Consumer Electronics Society of the IEEE. Location: Westin O'Hare Hotel, Chicago. Call Diane Williams (716) 392-3862.

6-7 Fiberworks: Broadband Cable Television Technology (BCTT), produced by Antec. Location: Elk Grove Village, Ill. Call (800) FIBERME for more information.

11-13 8600X System Operation and Maintenance, produced by Scientific-Atlanta Institute. Location: Atlanta. Call Bridget Lanham (800) 722-2009, press 3.

11-14 Fiber Optic Training, produced by The Light Brigade Inc. Location: Phoenix, Ariz. Call Pam Wooten (800) 451-7128.

11-14 Fiberworks: Fiber Optic System Training (FOST). Location: Antec Training Center, Denver, Colo. Call (800) FIBERME.

13 Penn-Ohio SCTE Chapter, Testing Session. Installer certification exams to be administered. Location TBA. Call Marianne McClain (412) 531-5710.

18 Desert SCTE Chapter, Testing Session. BCT/E and Installer certification exams to be administered. Location: Colony Cablevision office, Palm Desert, Calif. Call Bruce Wedeking (909) 677-2147.

18-20 Digital Network Engineering Training, produced by General Instrument. Location: Hatboro, Pa. Call Lisa Nagel at (215) 830-5678.

24-27 Hands-On Fiber Optic Installation, Maintenance and Restoration for CATV Applications, produced by Siecor Engineering Services Training. Location: Hickory, N.C. Call Lynn Earle at (704) 327-5539, or Phyllis Townsend (704) 327-5560 to register.

25-26 Migration to Digital Networks, produced by Scientific-Atlanta Institute. Location: San Francisco. Call Bridget Lanham (800) 722-2009, press 3.

25-27 Fiberworks: Digital Networks Training (DNT), produced by Antec. Location: Sheraton Suites Hotel, Elk Grove Village, Ill. Call (800) FIBERME.

29 Llano Estacado SCTE Chapter, Technical Seminar. First Annual Vendor Day with Technical Workshops and Cable-Tec Games. Location: Lubbock, Texas. Call David Fielder (806) 793-7475, ext. 4518.

JULY

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.

9-12 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.

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.

Trade shows

June

2-5 Canadian Cable Television Association's Annual Convention & Cablexpo. Location: Edmonton, Alberta. Call Christianne Thompson of the Canadian Cable Television Association at (613) 232-2631.

10-13 SCTE Cable-Tec Expo '96. Location: Nashville, Tenn. Call SCTE headquarters (610) 363-6888.

23-27 Supercomm '96. Sponsored by USTA and TIA. Location: Dallas, Texas. Call (800) 278-7372.

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.

Singapore licenses Macrovision tech

SUNNYVALE, Calif.–Singapore Telecommunications Pty, Ltd. has been licensed to implement and test Macrovision's Pay-Per-View Copy Protection technology in the digital video network trial it will launch later this year. The company represents the second major digital video network operator in Asia to incorporate Macrovision's copy protection into its VOD system, according to information released by Macrovision.

As part of its agreement, Singapore Telecom will implement Macrovision copy protection in its video server headend and in all of the digital set-tops it deploys throughout Singapore for the test. The network operator has engaged the services of Fujitsu Ltd. as its system integrator and will be utilizing set-tops made by Stellar One Corp., and video servers from Hewlett-Packard Company.

Wegener delivers MPEG-2 to Turner

DULUTH, Ga.–Wegener Corp. has delivered MPEG-2 digital video broadcast products to Turner Broadcasting System Inc. That package includes Satellite News Gathering (SNG) capability, and Wegener's Series DV MPEG-2 digital products.

Replacing an existing analog channel, the Wegener equipment will be used to transmit daily, live-anchor news broadcasts from CNN's Hong Kong studios for use on CNN and CNN International program services.

CableData forms new group

RANCHO CORDOVA, Calif.–CableData Inc. has formed a Professional Services Group, to be led by Rick Cluthe, group vice president. Already involved in projects worldwide, the group was formed in anticipation of changing market needs and in response to customer requests, according to the company.

The new group is comprised of four organizations: Education Services, Consulting Services, Systems Support Services and Technical Writing Services.

The Education Services unit includes two CableData education centers, located in the United States and in the United Kingdom, which offer instructor-based product and industry courses; on-site training at customers' facilities; video-based independent training kits; and ClassROM, an interactive, multimedia CD-ROM training package.

The Consulting Services group offers pre- and post-sales analysis; operational audits and data reconciliation; workflow analysis; and other services.

The Systems Support Services team offers services including data warehousing and decision support services; database services such as system definition and initialization, system expansion, database migrations and system consolidations; and network services. Finally, the Technical Writing Services unit develops the reference libraries for CableData products, processes and systems.

SeaChange has new name, address

MAYNARD, Mass.–SeaChange Technology Inc. has changed its name to SeaChange International Inc. The company has also relocated its headquarters from Concord to Maynard, Mass., about 30 miles west of Boston.

The company's new corporate headquarters has 25,000 square feet. SeaChange still retains its manufacturing facility in Acton, Mass., and its video server development facility in Greenville, N.H. Its regional sales offices remain unchanged.

The new corporate headquarters is located at 124 Acton St., Maynard, Mass. 01754. Phone: (508) 897-0100; fax: (508) 897-0132; customer service phone: (508) 897-7300. Its web site is located at: http://www.seachange-tech.com.

GI, HCL create India joint venture

CHICAGO–General Instrument Corp. has signed a definitive joint venture agreement with HCL Corp. of New Delhi, India to produce broadband communications equipment for the Indian market. GI and HCL will be equal partners in HCL General Instrument Ltd., which will design, manufacture and distribute products such as set-tops, cable television amplifiers, RF and fiber optic distribution equipment and headend electronics.

GI's partner in the joint venture, HCL Corp., is a $450 million Indian conglomerate with interests in the manufacturing and distribution of computers, office automation products, software, satellite-based VSAT network services and global education services.

Since 1991, India's cable subscriber base has grown from zero to more than 13 million. The country's subscriber base is expected to pass 50 million by the year 2000.

Alpha opens facility in Atlanta

BELLINGHAM, Wash.–Alpha Technologies has opened a new, 25,000 square-foot manufacturing facility in Atlanta, which will house final assembly operations for Alpha's Broadband Power Systems, as well as regional sales offices and a customer service center. Full production capacity at the facility is slated to be brought on-line in July.

The address of the new facility is: 1775 Corporate Way, Suite 100, Norcross, Ga. 30093; phone (770) 931-1001.

Alpha is headquartered in Bellingham, with facilities in Canada, the United Kingdom, Germany, Cyprus and Australia.

S-A opens tech support center in Brazil

ATLANTA–Scientific-Atlanta Inc. has opened a sales and technical support center in Sao Paulo, Brazil. The new facility, Scientific-Atlanta do Brasil, houses sales and technical staff to service the company's customer base in Brazil, providing broadband voice, video and data networks and satellite television distribution networks for cable television, telephone, electric utility and programming companies in the area.

S-A has done business in Brazil since the early 1980s, with earth station and B-MAC encryption network installations. In 1995, cable subscriber rates in the country grew an estimated 220 percent and are expected to increase by 85 percent in 1996.

Jorge Vespoli, managing director of the southern cone of South America, will direct operations at S-A do Brasil, and Derek Gant, country manager, will manage the new center. The sales and technical support center is located in the Morumbi district of Sao Paulo.

Motorola cooking up interactivity

ARLINGTON HEIGHTS, Ill.–Motorola Inc.–Multimedia Group has launched the CyberSeed Venture Program to stimulate the growth of companies that provide customers with revenue-generating development tools, interactive services and content. The program will provide selected companies with a range of support for their growth, including equity funding, strategic partnership development and the establishment of distribution channels, as well as marketing and technical resources.

Venture companies will also have access to the Motorola Multimedia Group's cable and telephony customers.

Companies already receiving such support from Motorola include Omniview Inc., Virtus Corp., Protozoa, Viewpoint DataLabs and Multichannel Communication Sciences Inc. (MCSI).

In a related announcement, the company's Multimedia Group has established a cooperative marketing agreement with Discovery Communications Inc., which provides a framework for the two companies to explore joint marketing and educational campaigns such as print advertising, trade show exhibits, direct mail programs and market research. The two will also collaborate on the development of interactive multimedia content which takes advantage of Motorola's CableComm products. CED

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Ad Index

Product Showcase

Matrox Video Products Group's DigiSuite

ActiveMovie is a specific multimedia implementation of the Component Object Model (COM) software architecture known through its use in Microsoft's OLE. The improved audio/video file format that was originally proposed by the OpenDML consortium has been incorporated into ActiveMovie. High-performance I/O throughput is ensured by the new data streaming architecture, according to the company.

DigiSuite features CCIR-601 10-bit D1 video quality, PCI-bus high performance and a modular architecture. The family's components include: DigiMix, a digital video/graphics mixer with 2D DVE; DigiMotion, a dual-channel motion-JPEG codec/digital audio mixer/SCSI controller; DigiVid, a multi-channel analog video I/O board; QMPEG-2, a four-channel MPEG-2 decoder; and Marvel Millennium, a video-in-a-window console.

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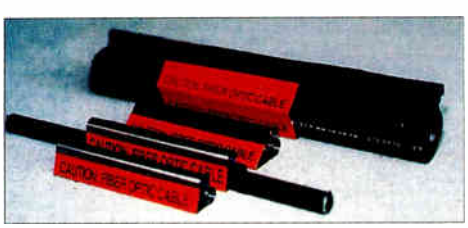
grammable attenuation software and altitude compensation. In addition, the M90 now has a service counter for cleaning and changing the electrodes, displays that show total splices made and hours used, optimized parameter menus for easier access and a clock with data and time. The enhanced M90 also features expanded memory to store more than 1,000 splice loss values, a new processor, and simplified mechanics and electronics for easier maintenance.

Circle Reader Service number 95

Aerial cable marker

ARLINGTON, Texas–ACP International has introduced the Millennium, a stainless steel cable



Millennium fiber cable marker

marker which is designed and guaranteed to last the life of the cable, according to the company. The marker is a one-piece, snap-on unit that can be custom embossed and printed as requested.

Circle Reader Service number 96

Optical amplifier

RICHARDSON, Texas–The Alcatel 1610 OA optical amplifier (release 4.0) now features a fluoride amplifier which provides flat gain across the entire 1550 nm window. Test results with fluoride fiber have shown flat gain over the entire erbium pass band (1530-1560 nm). The flat gain curve is achieved with equal input powers of the individual optical channels.

The technical benefits of this flat gain are two-fold, according to Alcatel. First, the gain excursion–the difference between the channel with maximum gain and the channel with minimum gain–is around 2 dB. Second, the signal-to-noise ratio excursion (the difference between the channel with the maximum SNR and the channel with minimum SNR–is around 1.5 dB. These results enable the use of the 1530-1542 nm wavelength range in line-amplified systems and to achieve improved performance across the entire 1530-1560 nm range.

This improved performance also allows re-use of the currently deployed optical wavelengths in 2-channel systems. With the entire pass band available for use, 19 channels can be transported via wave division multiplex (WDM), or 16 channels with bi-directional WDM. Other benefits that are recognized with the use of fluoride-based optical amplifiers include ease of addition or subtraction of channels because of the flat gain, and ease of channel add/drop because express and drop wavelengths can be segregated.

Circle Reader Service number 97

Commercial IRDs

LAS VEGAS–DiviCom Inc. has announced a family of products designed to provide secured video, audio and data services for program distribution. The ProView Commercial IRD Series includes the PV 1110, PV 1120 and PV 1130, based on the international MPEG-2 and DVB standards for digital video, audio and data compression. ProView commercial IRDs offer an easy network management and upgrade path and wide L-band coverage (950-2150 MHz), according to the company.

Applications include satellite distribution to cable headends, business television and/or private networks, and digital turn-arounds.

The ProView 1110, 1120 and 1130 consist of an MCPC (multi-channel per carrier) QPSK satellite receiver and MPEG-2 decoder integrated into a compact chassis intended for rack-mount applications. The receiver provides connection with wideband communications channels, and the decoder provides demultiplexing, descrambling, video/audio decoding and data services. SCPC, or single-channel per carrier models, will be available late this year.

Unique features include an independent audio port, and MPEG-2/DVB ASI (M2S) serial transport stream.

Circle Reader Service number 98

Leakage detection

INDIANAPOLIS, Ind.–Wavetek Corp. has incorporated a sensitive leakage detection mode and MicroStealth measurement technology into one unit, the CLI-1450 leakage detection and signal level meter. The lightweight, handheld meter includes all of the features of MicroStealth Signal Level Meters: multi-channel measurement displays, a Go/No-Go Quick Check function, and an easy-to-read, high resolution LCD. The CLI-1450 can be used by leakage crews, and with leakage GPS tracking systems.

Circle Reader Service number 99

Coaxial surge protectors

MIAMI, Fla.–Citel America Inc. has unveiled a new line of surge protectors for satellites, microwave and radios. The surge protectors will shunt to ground all the excess electricity and reset automatically after every strike. A special patented coaxial gas tube makes them capable of absorbing many surges without degrading.

Different types are available for UHF, BNC, F and N type. They maintain excellent transmission characteristics up to 2.5 GHz, according to Citel. In addition, all protectors offer EMI/RFI protection through their shield. Their small, compact size makes them easy to install in line as close as possible to the equipment to be protected.

Circle Reader Service number 100

Strand-mount optical node

SANTA CLARA, Calif.–Harmonic Lightwaves Inc. has introduced the HLR 3830 Optical Node, the first in the company's new PWRBlazer family of optical nodes. The HLR 3830 integrates optical receivers, a multiple, high-output level amplifier and a return path transmitter in a compact package. The HLR 3830 is optimized for the company's network management system (NMS) software.

The basic configuration of the unit consists of one optical receiver, three RF output ports, a high-efficiency switching power supply, fiber port, fiber organizer and a return input/output port. The node features a forward bandwidth which extends from 45 to 870 MHz.

Circle Reader Service number 101

PRODUCT/SERVICES SHOWCASE

CED Product/Service Showcase offers the latest equipment and services available in the broadband marketplace. Many of these will be featured at upcoming industry shows.
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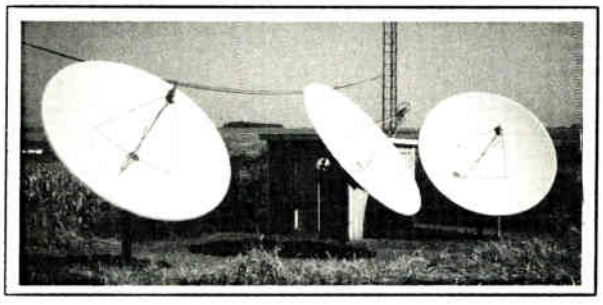

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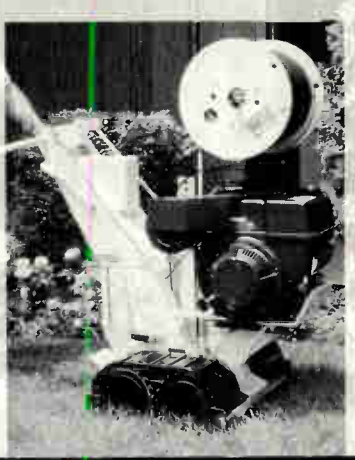

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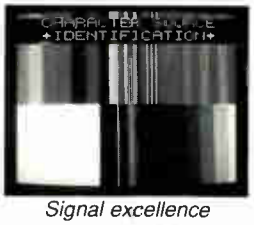

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Reader Service 118

The issue: DBS competition

One of the most successful new products in the consumer electronics world has been digital TV–or more specifically, DirecTv. Since its launch about two years ago, DBS has exploded onto the multichannel video marketplace, signing up millions of subscribers between DirecTv and PrimeStar. And now, EchoStar is up and running and others are soon to follow. Meanwhile, cable operators are forced to wait to implement digital technology, probably until next year. What impact has this had on local cable systems?

The questions:

1. How well would you say DBS is doing at signing up customers–both your subscribers and people who have never subscribed–who reside in your cable system?

❑ Excellent ❑ Good ❑ Poor

2. How soon do you think DBS will have a measurable impact on your system, in terms of number of subscribers served?

❑ Already has ❑ Within 2 years ❑ 2-5 years ❑ 6+ years

3. Do you think consumers see DBS as a better financial investment than cable TV over the long run?

❑ Yes ❑ No ❑ Don't know

4. To what degree has the launch of DBS affected your system's rebuild or upgrade schedule?

❑ A lot ❑ Some ❑ Very little

5. In your opinion, what is DBS' "weak link" when compared to a cable system?

❑ Hardware cost ❑ Programming cost ❑ No return path
❑ Broadcast-only ❑ Other

6. What percentage of your former subscribers have already switched to DBS services?

❑ 1-4% ❑ 5-10% ❑ 10%-20% ❑ More than 20%

7. How likely is it that the success of DBS will hasten your system to upgrade to more channels and/or new services like data and interactivity?

❑ Very likely ❑ Somewhat likely ❑ Not at all

8. Do you think most DBS subscribers are rural residents who haven't been wired for cable?

❑ Yes ❑ No ❑ Don't know

9. Which do you think is a more formidable competitor to your system over the next three years–DBS or the telcos?

❑ DBS ❑ Telcos ❑ Don't know

10. Has your system either lowered prices or offered any special promotions to ward off DBS competition?

❑ Yes ❑ No ❑ Don't know

11. If it was available, would you implement digital compression today to increase your channel count?

❑ Yes ❑ No ❑ Don't know

Your comments:

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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.

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RESULTS

The issue: Powering

Like the blood that flows through our veins and arteries, power is the key to life when it comes to networks. Lose power, and you've lost revenue; make the system more reliable, and the world beats a path to your door. So, what are you doing to improve your network's powering reliability?

A large majority of those who responded to this survey are either presently involved in or planning a system upgrade or rebuild, and nearly all of them are making plans to add telephony and high-speed data services over their networks.

Of course, one of the trickiest design questions for such networks revolves around plant powering. Some say it's necessary to go to 90V power to extend its reach, but most are sticking with 60V solutions, according to this survey.

Even though a large percentage say they use standby power supplies throughout their networks, they are split when it comes to deciding whether or not to use the centralized powering approach. In addition, there appears to be two schools of thought when it comes to reserve power, with the respondents split between four and eight hours.

When it comes to selecting power supplies, operators say they are most swayed by reliability, followed by quality, price and modularity. And finally, most operators are aware there are alternative forms of power, such as flywheels, natural gas generators and others.

Congratulations to Eugene Neary of Adelphia Cable in Plymouth, Mass., who won $50 just for sending in his response. Fill in this month's survey and fax it in today!

The results:

1. Is your system currently involved in, or planning for, an upgrade?

Yes	No	Don't know
84%	**11%**	**5%**

2. How likely is it that telephony services will be added to your system in the near future?

Very	Somewhat	Not at all
58%	**32%**	**11%**

3. How likely is that high-speed data and Internet access services will be added to your system in the near future?

Very	Somewhat	Not at all
79%	**11%**	**11%**

4. What power voltage will your company's newbuilds and rebuilds utilize?

60V	75V	90V
74%	**0%**	**32%**

5. What is the optimum size (in number of homes) of fiber nodes in your system?

<500 homes	500 homes
32%	**21%**

1,000 homes	>1,000 homes
32%	**11%**

6. Does your system presently employ standby power supplies throughout the plant?

Yes	No	Don't know
79%	**21%**	**0%**

7. Would you favor using a centralized power approach in your newbuilds?

Yes	No	Don't know
47%	**11%**	**42%**

8. When it comes to reserve power, how much do you think will be adequate in the future?

2 hours	4 hours	8 hours	Other
0%	**53%**	**47%**	**0%**

9. When it comes to power supply companies and technologies, what are the key requirements you look for?

Price	Reliability	Quality
37%	**95%**	**42%**

Modularity	Switchover time	Other
37%	**11%**	**0%**

10. Are you familiar with alternative powering options such as flywheels, natural gas generators and others?

Yes	No	Don't know
53%	**47%**	**0%**

Your comments:

"Supplies should upgrade easily from 60V to 90V and be able to upgrade to future wattage requirements as the service penetration percentage increases."
– Joe Hohlmayer, Continental Cable, Centerville, Ohio

"90 volt powering through the drop is financially and operationally not viable for smaller operators because of the longer standby times required."
– Dan McKay, Coaxial Communications, Columbus, Ohio

"Powering will be a real challenge in the 750 MHz realm. Discussion has come up regarding use of 90V power supplies. Need will dictate that change."
– Greg Homer, Cox Communications, Kenner, La.

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- SVC TECHS - MW LOC. $9 TO $12.75/HR
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The FCC's compatibility rules: good news & bad

By Walter S. Ciciora, Ph.D.

The FCC issued its first set of rules on the compatibility between cable systems and consumer electronics equipment in May of 1994 in ET Docket No. 93-7. These rules were required to implement Section 17 of the 1992 Cable Act. Shortly after these rules were issued, numerous Petitions for Reconsideration were filed by both the consumer electronics and the cable sides. The FCC has issued its reconsideration in a Memorandum Opinion And Order released April 10, 1996 and has modified the rules. There's some good news, and some bad news.

First, the good news

1) The IR code restrictions have been removed. The requirement to use the same IR codes when replacing a set-top box no longer exists. This is good news, because the rule imposed extreme expense and operational difficulties on cable operators while providing essentially no consumer benefit. See § 25.

2) The requirement to provide set-top boxes (on request and in proportion to cost) which include "multiple" descramblers has been clarified as being satisfied by just two descramblers. See § 9.

3) This requirement can also be satisfied with a "Master/Client" configuration involving two or more descramblers operating with just one remote control. An integrated unit is not required. See § 10 & 11.

4) It was clarified that the Decoder Interface component descrambler is not restricted to just descrambling. A unit can be leased to subscribers including any features and functions. See § 38.

Now, the bad news:

1) Cable operators must provide (upon request) a component descrambler performing only signal security functions. See § 38.

2) CVS' request that consumer electronics manufacturers be required to share the burden of consumer education was denied. See § 29.

3) Several technical specifications for "cable ready" TVs and VCRs have been relaxed.

a) The upper tuner frequency was reduced a trivial amount, rather than extended to the likely upper limit of cable systems during the lifetime of these products as requested by CATA. See § 56 & 57.

b) Tuner overload specifications were relaxed per EIA's and Zenith's request. See § 61

c) Image channel interference was relaxed. See § 65.

4) Most damaging, the "Fair Warning Label" was lost. The "Fair Warning Label" was intended to reduce confusion when consumers are making point-of-sale purchase decisions and are offered TVs and VCRs which tune cable channels and have an F-connector. Most rational consumers would assume that these devices are "cable ready." Furthermore, it is easy for a consumer electronics salesperson to be confused by these products and suggest to consumers that these products are "cable ready." Unscrupulous salespersons may use these features to deliberately mislead consumers and close a sale. The "Fair Warning Label" was intended to minimize these hazards and to at least offer some degree of protection to cable operators when subscribers complain that their "cable ready" receivers have problems.

The consumer electronics manufacturers and the retailers were able to take this situation and stand it on its head. They convinced the FCC that a "Fair Warning Label" would actually cause confusion!

§ 48 ". . .We agree with the EIA/CEG that a negative advisory requirement could cause consumers confusion about the capabilities of TV products. . . . we are eliminating the advisory labeling requirement for consumer TV equipment that incorporates features intended to be used with cable service, but does not fully comply with the 'cable ready' equipment standards."

Even more alarming, the FCC gave the consumer electronics industry approval to include highly misleading statements in its advertising:

§ 49. . . " . . . factual statement about the various features of a device that are intended for use with cable service or the quality of such features are acceptable so long as such statements do not imply that the device is fully compatible with cable service. We do not consider statements relating to individual features that provide 'partial' compatibility, such as those mentioned by EIA/CEG to be representations that a device is fully compatible. ... We disagree with NCTA that statements about individual features will convey the impression that a device is fully compatible with cable service."

A look at the acceptable examples practically invites suggesting to consumers that products are "cable ready," even when they are deficient in many respects.

§ 41 & 42 ". . . For example . . .'tunes cable channels with unsurpassed accuracy' or is 'capable of receiving 125 cable channels'. . . should not be considered a representation that a device is fully compatible."

To make matters worse, products which do not meet FCC requirements for "cable ready" can still carry a statement that they are "cable ready" according to the Canadian rules!

§ 43 ". . . Zenith also seeks clarification regarding the certification statement required under Canadian General Radio Regulations. . . requires the phrase 'Cable Compatible Television Apparatus Canada GRR Part II' appear on some equipment sold in Canada . . . Zenith submits that manufacturers should not be prohibited from labeling equipment sold in the U.S. with a phrase required by the government of Canada . . ." .

Given the above, any salesperson can provide convincing reasons for consumers to expect proper performance when an ordinary TV or VCR is connected to cable. When the subscriber complains about difficulties, the FCC has given the salesperson an easy out in blaming the cable operator. CED

Have a comment?
Contact Walt via e-mail at: wciciora@aol.com

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