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Cable theft

Crooks go for the big score

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Reader Service 1

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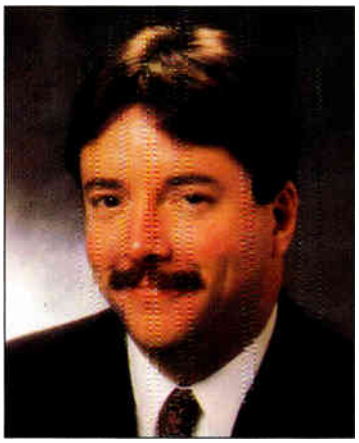

Cable piracy hits the big-time

Did you ever notice how, the minute you buy a new car, you see the same model everywhere you look? And isn't it true that right after you learn a new word, you hear it all the time? A similar feeling swept over me while preparing this month's cover photograph.

For several years, *CED* has published the winners of the NCTA's signal security ideas contest, which highlights innovative and effective ways to combat cable TV signal piracy. And although this was the first time we devoted a cover to the subject, the timing couldn't have been better.

The cable industry was virtually abuzz with the page-one treatment it garnered in the *Wall Street Journal* last month for its efforts to bust a brazen and sophisticated band of cable pirates. The lengthy story details a three-year effort to infiltrate an illicit stolen-equipment cartel that made millions of dollars selling pirate boxes to consumers, often at huge mark-ups.

While participants in that sting operation recounted stories of receiving Porsches as gifts and being paid huge sums of cash from reserves hidden in dishwashers, this year's NCTA winning paper tells of a shoot-out between police and a gang of thieves who were trying to make off with set-tops.

The upshot is that cable TV theft has reached the big-time–and combatting it has become a life-threatening endeavor. Gone are the days where cable theft was a passive and poorly-organized activity; today's biggest cable pirates are, in the words of one source interviewed by the *Journal,* "better than some legitimate cable companies" in their marketing prowess.

In fact, cable operators owe a large debt of gratitude to their two largest equipment manufacturers, General Instrument and Scientific-Atlanta. Both companies have recently been involved in investigating and prosecuting cable crooks and have taken great pains to educate local and federal law enforcement officials, as well as judges, about the severity of the problem.

It appears that the educational efforts are beginning to pay off. GI was able to attract the FBI into what became known as "Operation Cable Trap." S-A recently was awarded $25 million from a district court judge as compensation from a seller of altered set-tops and has been able to convince some magazines not to carry advertising from suspected cable pirate outfits.

The naive might believe that, slowly and surely, cable pirates are being put out of business. The reality is that the market is too lucrative for pirates to simply disappear. Make no mistake: cable piracy is still big business, and cable operators simply shouldn't tolerate it anymore. Operators who haven't already done so should develop an effective counter-piracy program and take the time to ensure that set-tops don't fall into the wrong hands. One of these days, someone may lose their life over a pirate set-top, and that would be the most tragic story of all.

Roger J. Brown

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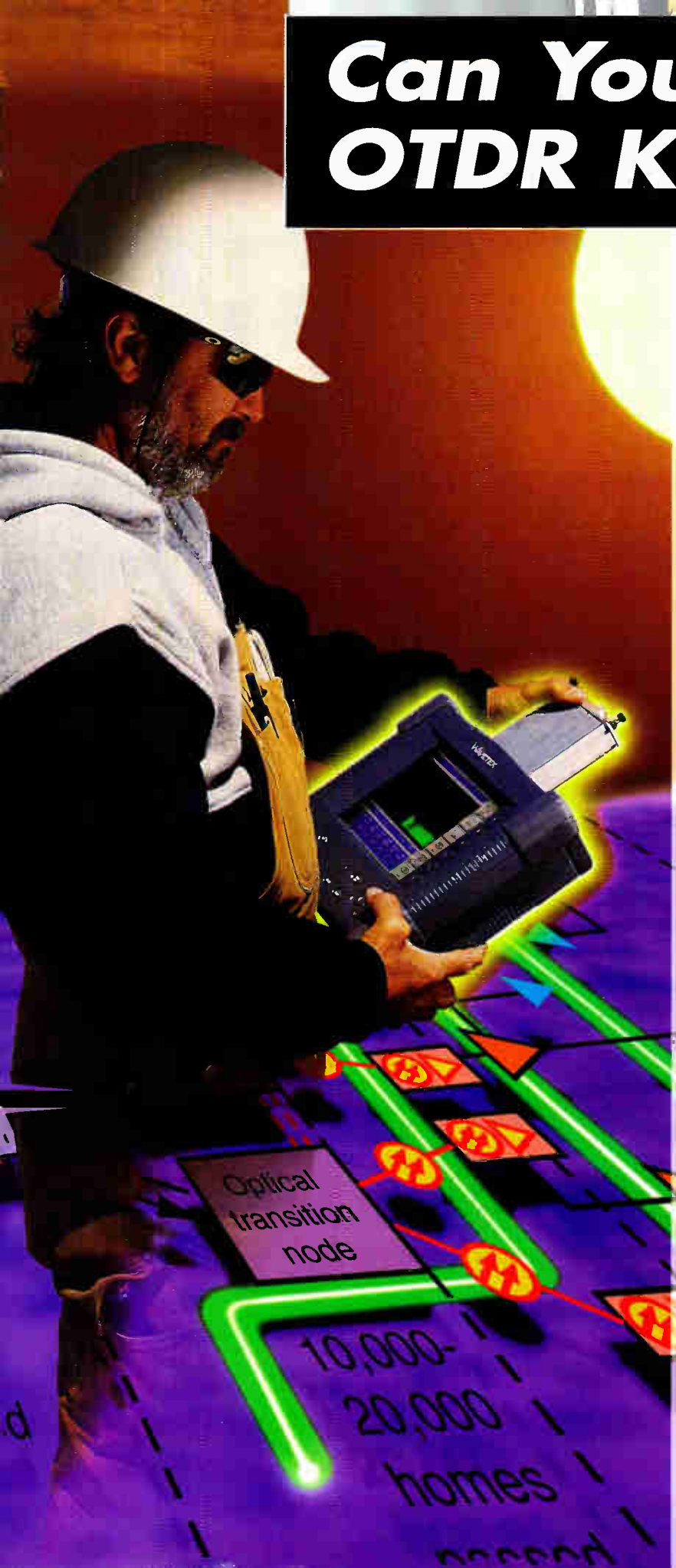

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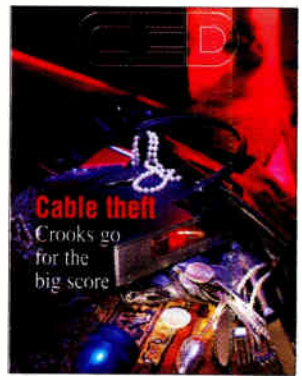

About the Cover
Photo by Mark Sims

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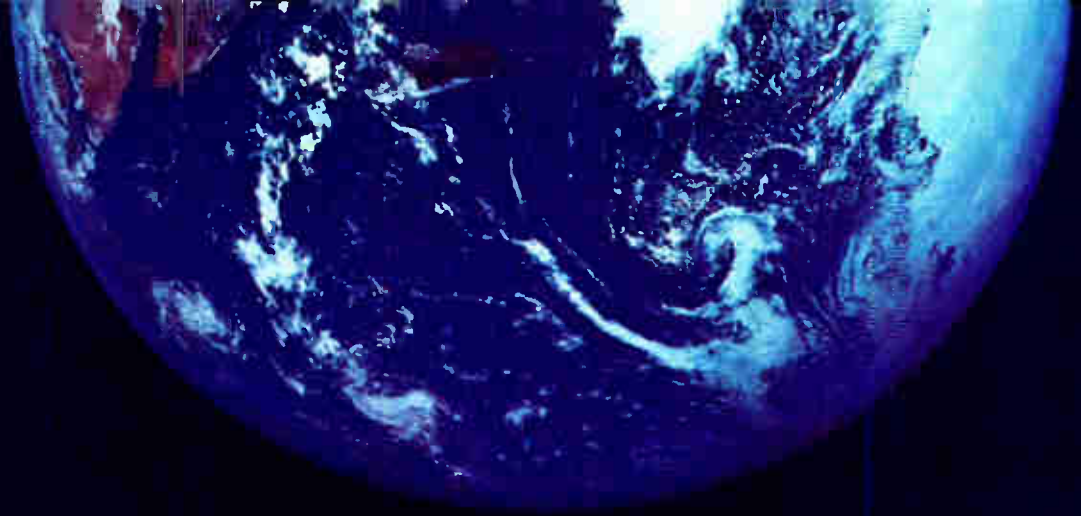

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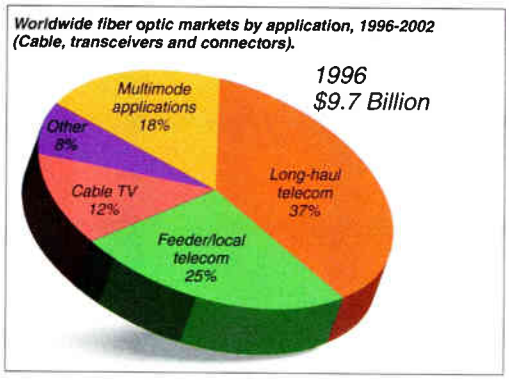

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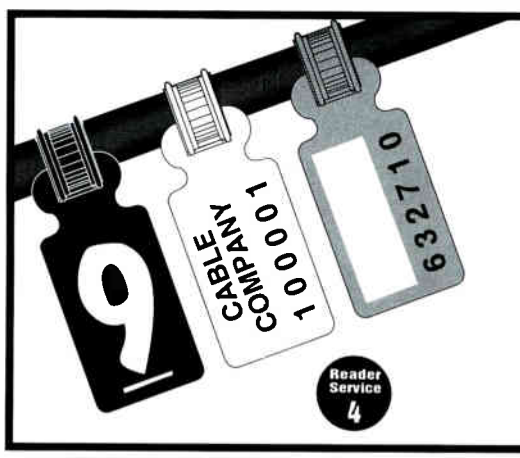

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Reader Service 5

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The only thing growing faster than the pace of technology is your customers' craving for new services. They want everything. Data, voice and video integration, the Internet, E-commerce, and more. And they want it now. With this market churning at an unprecedented rate, how do you differentiate your services, let alone deal with complex technology integration issues? Enter Adaptive Networking.

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Q: WHAT DOES IT OFFER?

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Q: WHAT ARE THOSE SCALABLE TECHNOLOGIES?

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Q: HOW CAN I INCREASE REVENUE AND MARGINS?

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Reader Service 6

@Home, Wave join forces for data; HP and Intel drop modem plans

As cable TV system operators prepare their systems and train their personnel for the deployment of high-speed data and Internet access services, service providers and hardware vendors are jockeying for position. Some shakeout has even occurred. In fact, April was a busy month, as shown by the following announcements:

✔@Home Network and Canada's two largest cable operators said they will create a new service, called "WAVE@Home," to deliver high-speed Internet services over @Home's distributed network architecture to subscribers of Rogers Cablesystems Ltd. and Shaw Communications Inc.

Under the terms of the agreement, Rogers and Shaw will be making an equity investment in @Home Network and will offer the service to approximately five million households, representing more than 50 percent of the Canadian cable television market.

Recognizing Canada's distinct marketplace, Rogers and Shaw will customize the WAVE@Home user experience to reflect and promote Canadian cultural and geographic characteristics. The service will be co-branded "WAVE@Home" and will be available to more than two million "WAVE-ready homes" by the end of 1997. For @Home Network, this relationship means the company will have access to nearly 50 percent of all homes passed by cable in North America.

The @Home network infrastructure utilizes caching and replication technologies to create a high-performance "parallel" Internet and bring the data closer to the customer. These technologies, combined with @Home's focus on end-to-end network management, could greatly reduce the need for users to traverse the global Internet for information. The end result is expected to be reduced Internet "traffic jams" and dramatically improved network speed and reliability.

Under this agreement, WAVE@Home will connect directly to the @Home backbone to alleviate these bottlenecks and provide an end-to-end network solution.

✔Hughes Network Systems Inc. is still on schedule to introduce its Digital Satellite System PC card and is finalizing tests on working units at its Germantown, Md. headquarters. The card, designed for the recently announced broadcast capabilities in Microsoft Windows, can deliver video and data services to multimedia PC platforms.

The Hughes-brand DSS-PC card was demonstrated several weeks ago at a Microsoft engineering conference, as well as the recent National Association of Broadcasters conference.

Once equipped with a DSS-PC card, new multimedia PC systems will be able to receive DirecTV television programming, enhanced video services and other multimedia services, such as the ability for users to view their favorite Web sites. In addition, consumers will be able to watch their favorite TV shows enhanced with complementary data information.

✔Meanwhile, Adelphia Communications

Corp. signaled its intention to deploy more cable modems when it tapped General Instrument Corp. to provide 50,000 SURFboard telco-return cable modems and other network hardware to support Adelphia's "Powerlink" service.

Adelphia, the seventh-largest MSO, is currently serving six markets using two-way cable modems. Adelphia plans to use the telco return cable modems in areas where the plant is not entirely upgraded to two-way capabilities.

The SURFboard cable modems and network are currently being used in Adelphia's Southeast Florida cable TV system, which reaches 250,000 subscribers. Adelphia also plans to use GI's telco return cable modems in six additional sites.

The SURFboard network is the first commercially deployed 64 QAM data network. QAM is a digital modulation scheme that enables data compression to enhance system capacity up to 300 percent. The SURFboard network also features digital MPEG-2 transport and standard Internet Protocol (IP).

✔On the other hand, Hewlett-Packard and Intel both recently announced they were abandoning their plans to design, build and market high-speed cable modems. In a terse news release, HP said it made a strategic decision to focus on its key strengths, and had canceled "plans for QuickBurst cable modem products and any future plans for Kayak digital set-top box products."

The HP announcement came as a surprise to many cable industry engineers. Bill Hahn, operations manager in HP's Interactive Broadband Program, said operators who had deployed QuickBurst modems in trials would be transitioned to "alternative solutions."

Nevertheless, Hahn said HP remains bullish about two-way HFC networks and hopes that the technology remains popular so that the company can sell more PCs, printers and test and measurement gear. HP's Home Products Division will now focus entirely on the home PC market, and Hahn's team will likely be re-deployed in other areas of the company, he said.

Intel, which was shopping its "CablePort" modem as recently as March, abruptly pulled the plug on that effort, choosing instead to redeploy its resources elsewhere. Company officials didn't rule out licensing the product to other companies.

✔Internet Ventures plans to purchase Hybrid Networks' high-speed cable modem systems as it deploys its PeRKInet ("perky-net") Internet access service in conjunction with local cable operators. Internet Ventures has agreed to an initial purchase of 5,000 telco-return cable modems and eight headend systems in addition to service and training packages.

PeRKInet uses the cable downstream with phone return technology, which combines the existing cable TV infrastructure with regular analog phone lines. Avenue TV Cable in Ventura, Calif. is the first cable operator to team up with Internet Ventures. It began rolling out the service in its 12,000-subscriber system in February.

PeRKInet prices on the Avenue Cable TV system range from $14.95 per month for 256 Kpbs service for residential customers to $95 per month for 10 Mbps capacity for business users. Both prices do not include Internet Ventures' monthly service fee of $24.95.

The PeRKInet service utilizes cable modems and routers from Hybrid which utilize one 6-MHz video channel to support up to 4,000 subscribers per channel at up to 256 Kbps downstream, and up to 10 Mbps for "commercial" users. Upstream data is moved via a telephone modem at up to 33.6 Kbps or via an ISDN terminal adapter at up to 128 Kbps. Customers receive data on a personal computer equipped with a cable modem and an Ethernet card.

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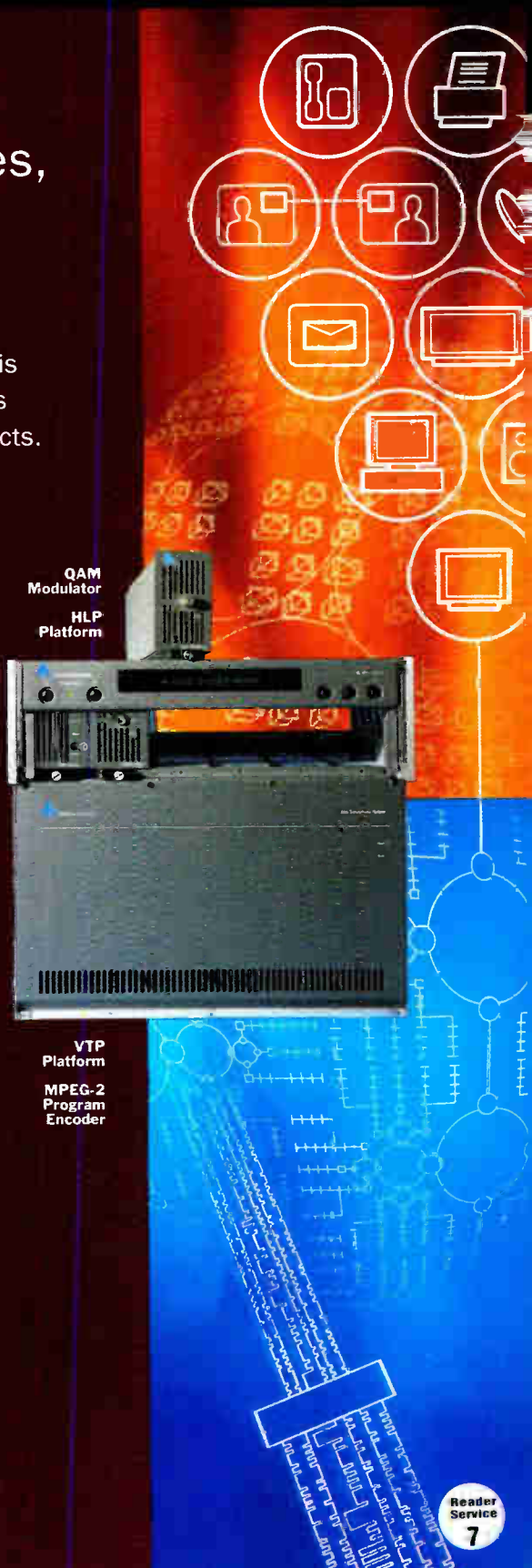

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Reader Service 7

Survey: Consumers ready to buy data

With all this jockeying among high-speed data hardware manufacturers and service providers to gain a competitive edge, the still-unanswered question remains: Will consumers buy this new service? It appears the answer is yes.

The Strategis Group's latest study, "High Speed Internet Access: A Consumer Demand Study," provides a comprehensive consumer database focusing on high-speed access. "Our survey data show that one-in-five U.S. homes will subscribe to high-speed Internet service for at least $40 a month, when it becomes available," said Dr. Samuel Book, president of consumer research at The Strategis Group. "Over 40 percent of current on-line users will pay $40 a month for high-speed Internet access, while most non-on-line homes will wait for prices to decline and for more compelling content to emerge," he explained.

The survey of 500 U.S. households reveals that residential on-line/Internet subscribers spend about six hours per week on the Internet, including four hours a week on the World Wide Web and on-line information services. The typical on-line household sends and receives nine e-mail messages a week.

Fewer than 150,000 homes will subscribe to high-speed services by the end of 1997. As high-speed platforms come on line, especially from cable and telephone companies, pent-up consumer demand for higher speed will result in accelerated growth of high-speed Internet households, the study predicts. The study forecasts nearly 8 million high-speed Internet homes in 2001, with high-speed Internet subscription revenues approaching $4 billion.

World fiber market due for high growth

Driven by major development in the Asia/Pacific region of the world, the worldwide fiber optics market will grow at a compound annual growth rate of 13 percent between now and 2002, growing to nearly $20 billion in annual sales, according to KMI's *FiberGlobe Annual Report on Worldwide Fiberoptics Markets.* In 1996, the global fiber optics market accounted for nearly $10 billion in sales, according to KMI research.

The worldwide cable TV segment is expected to grow at a six percent annual rate throughout the next six years.

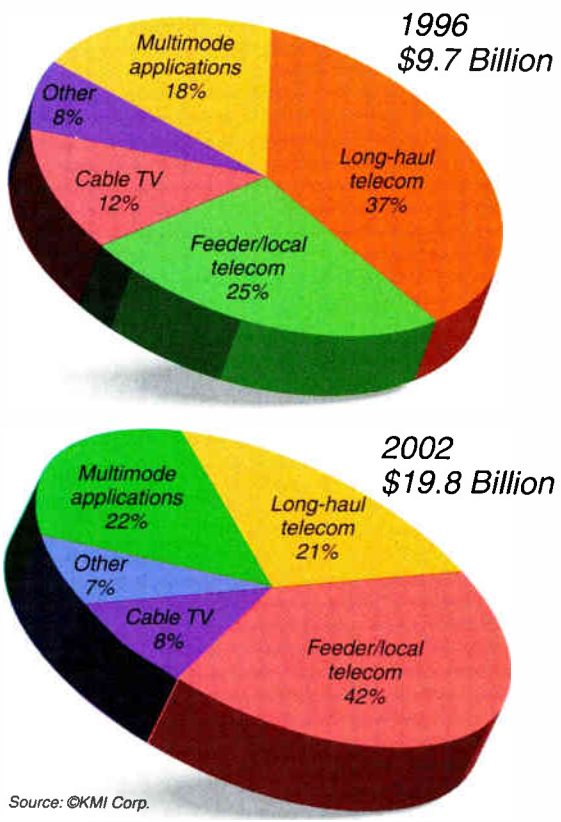
While the Asia/Pacific region now represents the largest market segment, North America is second-largest, according to the report. Cable-TV applications of fiber optics presently account for about 12 percent of the market, or roughly $1.1 billion. The market is dominated by local and long-distance telecom applications, as shown in the figure below.

By 2002, however, KMI predicts that telecom applications will push fiber sales to even greater heights, while cable TV growth falls off somewhat. However, cable TV will account for eight percent of a $20 billion market, or $1.6 billion.

According to the report, singlemode technology accounted for more than 80 percent of the market last year. Over the next six years, it is expected to grow at a 12 percent clip, while multimode applications will cause that market segment to grow at a 16 percent growth rate.

The worldwide cable market is expected to more than double, from $6.6 billion in 1996 to $13.6 billion in 2002. Average link lengths will decrease because of long-haul saturation and the growth of local networks in most regions of the world.

Worldwide fiber optic markets by application, 1996-2002 (Cable, transceivers and connectors).



Source: ©KMI Corp.

Computer trio takes TV angle

Speaking of data, three manufacturers of personal computers–Compaq Computer Corp., Microsoft Corp. and Intel Corp.–said last month that they plan to work cooperatively with the broadcasting and cable television industries to exploit the potential of digital television (DTV) across a range of PCs, hybrid PC/TVs and digital TV appliances.

The companies set forth technical recommendations, based initially on a subset of the Advanced Television Systems Committee (ATSC) specifications, that would greatly accelerate the transition to digital television in the United States. They also announced plans to equip millions of future personal computers to receive transmitted digital video and data as soon as fall 1998.

Last December, the Federal Communications Commission (FCC) issued its rules for digital broadcast transmission; however, the FCC agreed not to mandate which video formats were to be used in transmissions for digital television, saying that the free market should make that determination.

Together with the television industry, the companies believe they can accelerate the time when digital TV products are as commonplace as today's analog television sets. This cross-industry effort is aimed at an approach to digital TV that fosters the highest-quality and most affordable digital television infrastructure in the shortest implementation time possible. Such an approach would provide greater flexibility to broadcasters, cable operators and equipment manufacturers, and would significantly lower consumers' equipment costs.

"PCs and converged digital devices represent a key element of the television industry's future revenue growth," said Craig Mundie, senior vice president of the consumer platforms group at Microsoft. "The computer industry will deliver millions of 'digital sets' to the marketplace–as many as 100 million by 2005. In this time frame, hundreds of millions of sets and digital devices will be capable of receiving digital

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The proposal recommends a starting point for digital television based on a practical subset of the ATSC-specified video formats. The companies support higher resolutions, including 1080 progressive and above, but understand the concern about making existing TV receivers immediately obsolete. Consequently, the initial format proposal is based on a proper subset of the ATSC specifications, allowing all sets to receive the proposed format.

Specifically, digital broadcasts would be initiated using a high-definition 720 x 1280 progressive scan format for film-based materials, as well as standard definition formats in both interlaced and progressive modes. With advances in processor power, compression technology and display technology, it would be practical to enhance this initial "base layer" to offer 1080 progressive resolution and even higher resolution over time, advocates say.

Television receivers could also be built at less cost using this approach, the computer executives argue. "Because this approach aligns closely with the current generation of video decompression hardware and display technology, digital television sets could be offered at price points close to today's analog sets, compared to the $3,000 to $5,000 HDTV sets that the traditional television manufacturers are planning," said Bob Stearns, senior vice president of technology and corporate development at Compaq. "The incremental cost of adding DTV reception to PCs will likely be as little as $100."

A growing number of companies are lining up to support the computer industry's standard for digital television, including C-Cube Microsystems Inc., a supplier of compression chips. In fact, the company's DiviCom subsidiary is preparing to offer broadcasters the capability to make the transition, according to statements made by company executives.

Texas hooks TWC as local phone op

The University of Texas at Austin announced that it has implemented Time Warner Communications as its largest local telephone access provider for its dial-up Internet service, "Telesys."

UT is one of the first customers in Austin to choose Time Warner Communications for local business switched telephone service. Austin is the first city in Texas, and the third Time Warner Communications city nationally, to provide local calling to business customers. It recently began offering Austin business customers local telephone service when it activated its Class 5 telephone switch.

"By adding Time Warner Communications services, we have increased overall quality, positioned ourselves to use new technologies, and lowered cost at the same time," said UT Telecommunications Designer Dave Stewart. "So far, we have been very happy with the Time Warner service."

Telesys is the dial-in service for the University of Texas' campus network. In operation since 1993, Telesys now serves more than 37,000 faculty, staff and students at the UT Austin campus. Time Warner will supply over 50 percent of UTnet's dial-up access, representing nearly 1,400 local lines.

Time Warner's 250-mile Sonet-based digital fiber network in Austin connects more than 60 buildings to the advanced high-speed network, according to company officials. The company also built and staffed the industry's most advanced National Operations Center (NOC) to monitor network quality and reliability of all Time Warner Communications networks in 18 U.S. markets, including: Austin, Houston and San Antonio, Texas; Cincinnati, Columbus, and Lima, Ohio; Charlotte, Greensboro, and Raleigh, N.C.; Honolulu, Hawaii; Indianapolis, Ind.; New York City and Rochester, N.Y.; Milwaukee, Wis.; Memphis, Tenn.; Orlando and Tampa, Fla.; and San Diego, Calif.

TWC issues RFP for interactive TV

While some believe that interactive TV and two-way cable services are still being gestated, Time Warner Cable is planning to dive headlong into the market. Last month, the nation's second-largest cable MSO said it was issuing a request for proposal and request for quote for its "Pegasus" digital set-top. Specifically, the company is seeking software and hardware solutions to support full video-on-demand and the addition of its RoadRunner high-speed data service over the television.

The RFP seeks an architecture of servers, disk storage, transmission equipment and transport components. The RFQ asks vendors to develop client-server-based software using hypertext mark-up language (HTML) to enable delivery of RoadRunner for the TV.

According to Mike Hayashi, vice president of advanced technology at Time Warner Cable, the company believes it can offer interactive TV to its customers "by the end of the decade." "New architectures, interfaces and media servers have reduced headend costs to the point where they could support a viable business in 1999," he said.

The Pegasus platform is currently being developed by Scientific-Atlanta, Pioneer and Toshiba. It will be able to offer digital pay-per-view and other programming. It is being built with additional capacity to allow for full VOD and Internet access. That service is scheduled to be rolled out at year's end at a site to be announced later.

Meanwhile, Time Warner plans to shut down its highly publicized Full Service Network office in Orlando by the end of the year. The company said the office, which helped define the company's VOD and data strategy, is no longer necessary as those services begin to roll out.

CAI given OK for wireless lab

CAI Wireless Systems Inc.'s proposal to use its Multichannel Multipoint Distribution Service (MMDS) spectrum to create a "wireless laboratory" to test two-way voice, video and data services in Pittsburgh has been approved by the Federal Communications Commission, the company learned recently.

The FCC action authorizes CAI to simulate a commercial roll-out of two-way services to customers within a 20-mile radius in the Pittsburgh area. As previously announced, CAI intends to work with ADC Telecommunications Inc. to jointly develop a fixed two-way broadband wireless system. Testing was set to begin no later than April 30.

The test will encompass a wide range of telecommunications services, including high-speed Internet and Intranet access; high capacity voice and data transport; and subscription television and other two-way services. CAI hopes to seek similar approvals in other markets.

CAI, based in Albany, operates six analog-based wireless systems in New York City, Rochester and Albany, N.Y.; Philadelphia, Pa.; Washington, D.C.; and Norfolk/Virginia Beach, Va. CAI also has wireless cable channel rights in Long Island, Buffalo and Syracuse, N.Y.; Providence, R.I.; Hartford, Conn.; Boston, Mass; Baltimore, Md.; and Pittsburgh. CAI also owns a majority interest in CS Wireless Systems Inc., an MMDS operator with markets located primarily in the southwest. CED

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A few degrees of Chris Bowick

Chris Bowick

Ever heard of the game, "Six degrees of Kevin Bacon," in which participants are challenged to link any actor to the film star Bacon via no more than six movie roles? How about, "A few degrees of Chris Bowick"? No? Well, if you hold any treasury bills or bonds, use an ATM card, subscribe to cable television or pilot light aircraft, chances are that your technological link to Chris Bowick is, at most, just a degree or two.

Bowick, who has worked for Glenn Jones in a number of capacities over the past five-and-a-half years, has influenced the development of communications technologies far beyond the realm of broadband video. Since 1995, he has played a dual role as president of Jones Intercable subsidiary Jones Futurex, which designs, manufactures and markets data encryption devices and performs turnkey electronic manufacturing; and (since 1991) as group vice president/technology and chief technical officer for Jones Intercable.

Futurex, which handles a substantial number of the money transfers between the Federal Reserve Bank and its member banks, offers PIN encryption for charge cards and ATM cards, and conducts contract electronics manufacturing. The company had never been profitable until Bowick took the reins two years ago; last year, the company did about $20 million in business.

At the same time, Bowick has worn a number of hats with Jones Intercable, including the oversight of strategic technical development for the company, while guiding day-to-day technical operations. He has also created the company's New Business Development group, which identifies new products and services for potential launch and eventually brings those to fruition. Those projects include the launch of telephony services in Alexandria, Va., as well as the implementation of long distance resale services, the Internet Channel (high-speed Internet access), and paging in several of Jones' systems.

In fact, telephony service is one of the bigger projects to be tackled by the development group. Though Jones has recently launched business communications services in the Washington area, most of its telephony work in Alexandria has been with multiple dwelling unit complexes. "It's easy for us to take fiber directly to these MDUs and provide telephony services to the entire complex," explains Bowick, "without having to worry about coaxial-based telephony or deploying new twisted pair."

Outside of the new business sector, until very recently, Bowick was also charged with supervising the engineering operations of the company's satellite uplink facility.

Add to this the reality that Bowick is just finishing up a third job, of sorts. By the time this article appears in print, he will be a free man, having earned an MBA from the University of Colorado at Denver, which will round out the double-E degree he holds from the Georgia Institute of Technology. Participating in the university's executive program, Bowick has attended classes each week, on alternating Fridays and Saturdays, for the past two years. And how has he fared through all of this? "It's been kicking my butt," says Bowick. "The homework!"

Pilot, author, citizen Bowick

Prior to joining Jones, Bowick spent 11 years on the manufacturing side with Scientific-Atlanta, starting out as a design engineer and working his way up to VP of engineering for headend and earth station products, developing new modulators, processors and satellite receivers. And then, a couple of years before he left S-A, Bowick started the company's digital video compression group, which worked on technologies like MPEG and vector quantization.

But Bowick's introduction to the world of communications came soon after college, when he joined Rockwell International, Collins Avionics Division, to design navigation and communications equipment for general aviation aircraft. To Bowick, who got his pilot's license just days after he graduated from high school, it was a "dream job"; in fact, the single-engine, Piper Dakota plane that he pilots today contains some of the very equipment he designed at Collins.

Still an avid pilot, Bowick is an FAA-certified flight instructor, a member of the Civil Air Patrol and is the Aerospace Education Officer for a local cadet squadron, in which capacity he gives orientation flights to young people, ages 11 to 18. As a result of his work with the cadets, Bowick earned the Brewer Award in 1995, recognizing him as the outstanding Aerospace Education Officer for the five-state Rocky Mountain region.

In spite of his busy schedule, Bowick still has time for the odd flying trip, taking his 16-year-old daughter, 14-year-old son, and his wife of 20 years, Maureen, with him. This summer, Chris and Maureen will celebrate their 20th anniversary with a tour of Europe: Berlin, Prague, Vienna, and then a return to Germany via Munich. "How Maureen has put up with me for the last two years (during the pursuit of the MBA), I'll never know," says Bowick.

Maureen was also there to support Chris (and type the manuscript) when he decided to write a book dealing with the practical information electrical engineers need to know, but are never taught in school—*RF Circuit Design,* now in its 12th printing. And for eight years, Bowick wrote a monthly column for *CED,* entitled, "From the Headend." The latter "gave me all of my fame and fortune," says Bowick, with tongue planted firmly in cheek.

Given his influence on the world of communications, and a unique perspective entwined with so many different facets of technology, how does Bowick see the cable industry's immediate future?

"You will see a lot of good, solid, incremental business on top of the old core business," says Bowick. "But I don't think that you will see something that is an absolute killer application." *–Dana Cervenka*

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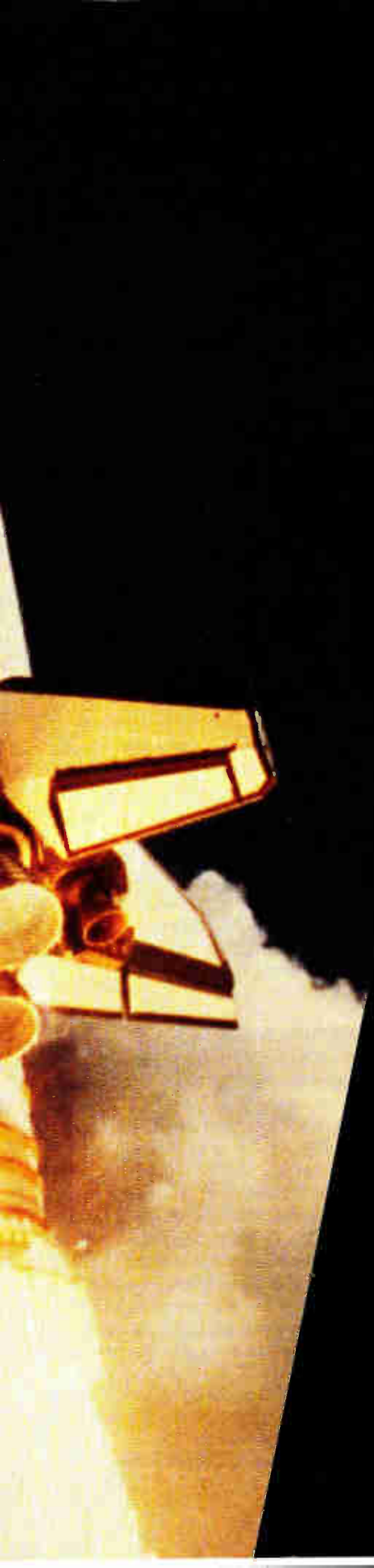

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EDFA-based video lightwave trunking systems

Performance and applications

By Dr. Shlomo Ovadia, Principal Scientist, General Instrument Corp.; Dr. Hongxing Dai, and Dr. Chinlon Lin, Bellcore

The performance characteristics and applications of Er-doped optical fiber amplifier-based, multichannel AM/M-QAM video lightwave trunking systems are reviewed. These systems can transport up to 80 AM-VSB video channels, and more than 30 64/256-QAM digital video channels over 100-km of standard SMF using a single EM-DFB laser transmitter with cascaded EDFAs. Using both experimental results and frequency-domain simulations, the EDFA selection criteria for AM video lightwave trunking are discussed. Such lightwave trunking systems can provide an AM CNR greater than 50 dB with CSO and CTB distortions less than -65 dBc, and nearly error-free transmission (BER $\leq 10^{-9}$) for the 64-QAM channels with SNR of 30-dB or better. Comparison between 64-QAM and 256-QAM video channel transmission and the effect of QAM channels on the AM-VSB channels are also presented. The implications of these results and others in hybrid AM/QAM video lightwave trunking systems are discussed.

Editor's note: *Material contained in this article was presented as an invited paper at OFC '97 in Dallas, Texas this past February.*

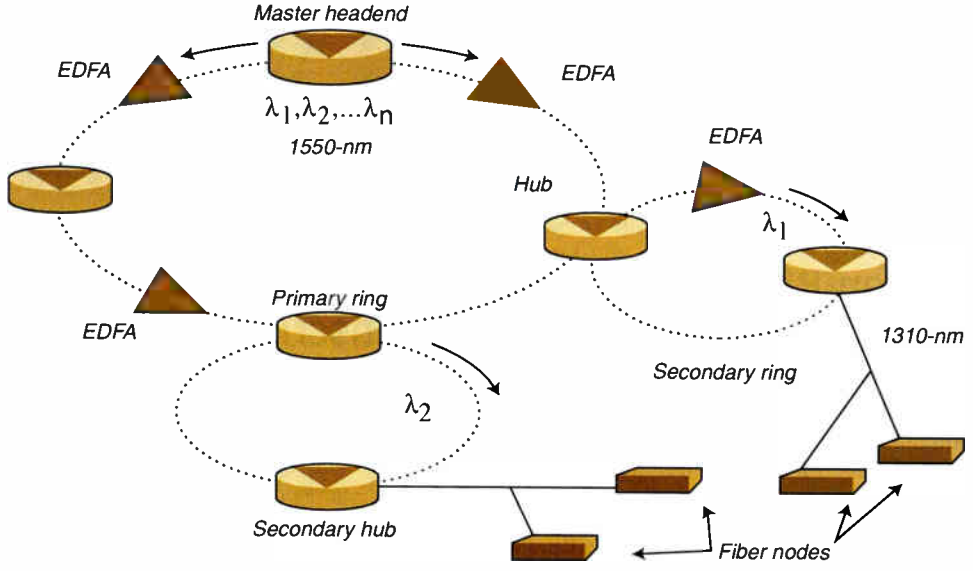
Introduction

Multichannel AM-VSB/M-Quadrature Amplitude Modulation (QAM) subcarrier-multiplexed video lightwave transmission systems are currently being installed by the telecom and cable companies as a practical approach for simultaneous delivery of both multichannel broadcast analog video and interactive digital video/data channels. Within the 50-750 MHz bandwidth, these systems can carry up to 80 AM-VSB channels and more than thirty 64/256-QAM channels using a single laser transmitter.[1-3] 64/256-QAM schemes for digital video offer a high bandwidth efficiency (5-7 b/s/Hz) and more robust transmission than analog video transmission with respect to random noise and nonlinear distortions. The operating point of these hybrid systems is mainly dictated by the stringent carrier-to-noise ratio (CNR) requirement of the AM channels.

In order to maintain an acceptable AM CNR, the optical power budget of a video lightwave system based on a 1310-nm directly-modulated (DM) DFB laser transmitter is typically limited to be 10 dB. This moderate power margin imposes an upper limit on the length of the optical link and number of optical splits. Applications such as long-distance supertrunking and broadband networks based on passive optical network architectures require much higher power link budgets than can be provided using a DM-DFB laser transmitter. Er-doped optical fiber amplifiers (EDFAs), together with a 1550-nm externally-modulated (EM) DFB laser transmitter, provide a practical solution to these applications.[4-6]

Figure 1 shows an example of an EDFA-based multiwavelength multichannel hybrid AM/QAM video lightwave transmission network, in which the master cable-TV headend is connected via a main fiber ring to the secondary headends or the hubs in a large metropolitan area. Ultra-high capacity video trunking can be achieved by using high-density wavelength-division-multiplexing and demultiplexing with cascaded EDFAs.[7] Each wavelength can carry a mixture of AM and digital video signals at either passband using 64/256-QAM or even at baseband such as OC-48. At each hub, 1310-nm DM-DFB laser transmitters or 1319-nm EM-YAG laser transmitters are typically used for narrowcasting both the AM and the digital video channels over the hybrid fiber/coax (HFC) networks.

Figure 1: *Multiwavelength multichannel AM/QAM video lightwave trunking network using 1550-nm laser transmitters with cascaded EDFAs.*



Review of AM video trunking systems

Recently, there have been many studies on the transport of only AM-VSB video signals in optically amplified 1550-nm lightwave systems. The lightwave link performance has to overcome the transmission limitations imposed by the optical nonlinearities and chro-

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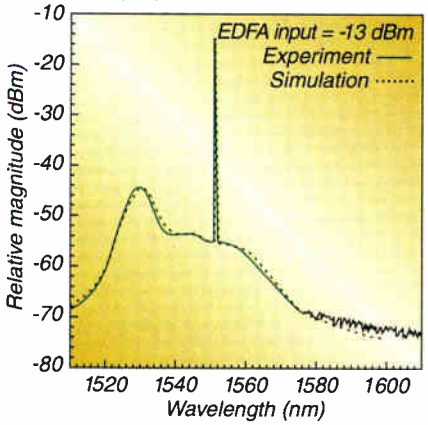
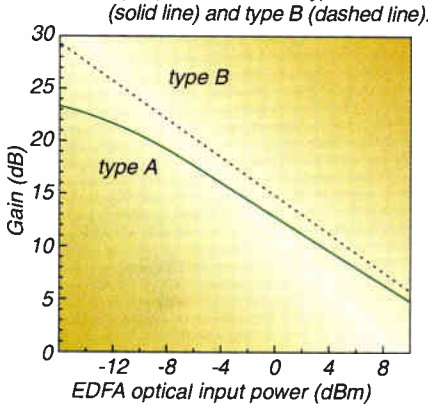
Figure 2: *The measured (solid line) and calculated (dashed line) optical spectra of EDFA type "A" at optical input power of -13 dBm.*



matic dispersion in the fiber. These effects include: (a) stimulated Brillouin scattering[8] (SBS), (b) optical phase noise, [9] (c) distortion due to self-phase modulation (SPM), and (d) chromatic dispersion.[10] 1550-nm transmission systems using a DM-DFB laser transmitter, which were reported by Bulow *et al.*,[11] and Clesca *et al.*,[12] had impressive optical power budgets, partly because of the high laser modulation index, with about 35 AM channels transmitted using a dispersion-shifted fiber (DSF). Muys *et al.* reported a 50 AM video channel transmission using a 1550-nm EM-DFB laser transmitter with three cascaded 980-nm pumped EDFAs and a standard singlemode fiber (SMF).[13]

The advantage of such a system over the DM system is that the intermodulation distortions are essentially independent on the number of EDFAs used, because the EM laser transmitter generates virtually no chirp, hereby preventing interaction with the fiber dispersion. Kuo *et al.* demonstrated 80 AM channels with low composite second-order (CSO) and Composite triple-beat (CTB) distortions transmission over 100-km of a standard SMF.[14]

Figure 3: *The calculated gain vs. the optical input power for EDFA type A (solid line) and type B (dashed line).*



Using a differential detection scheme, which consisted of a pair of receivers followed by a broadband out-of-phase combiner, the authors showed that the AM CNR can be increased by 3 dB to at least 52.5 dB, while maintaining CSO distortion below -65 dBc over the AM frequency band.

The next section discusses the selection criteria of EDFAs for high performance (CNR > 50 dB) multichannel AM-VSB/M-QAM video lightwave trunking systems.

EDFA selection for AM video lightwave trunking

The performance requirements of in-line EDFAs to transport AM video signals are significantly different than those that are needed to transport baseband digital video signals. For example, it is required that the EDFA should allow multichannel AM video transmission with CNR greater than 50 dB and with low CSO and CTB distortions. A 50 dB CNR allows a total of 7 dB link degradation for the transmitted AM video channels from the local cable-TV headend to the home over an HFC network. However, different high-power EDFA types may exhibit a high noise figure (NF) when operating in deep saturation, reducing the maximum available AM CNR below 50 dB. Using experimental results and frequency-domain simulations, the required EDFA characteristics for AM video lightwave trunking links are discussed.[15]

AM-VSB CNR modeling

For an AM-VSB video lightwave transmission system with an in-line EDFA, the AM CNR can be written as:[16]

$$CNR = \frac{m^2}{2 \cdot B \cdot \left[RIN_L + 2 \cdot \frac{q}{I_r} + \left(\frac{N_r}{I_r}\right)^2 + 2 \cdot h\nu \cdot \left(\frac{NF}{P_{in}}\right) + \Delta\nu \cdot \left(\frac{NF \cdot h\nu}{P_{in}}\right)^2 \right]}$$

where m = 3.2 percent is the AM modulation index per channel, B is electrical noise bandwidth of the AM channel (= 4 MHz), RIN_L=-164 dBc is the laser transmitter relative-intensity-noise, q is the electronic charge, I_r =0.85-mA is the receiver photocurrent, N_r = 7pA/√(Hz is the receiver noise equivalent current, hν is the transmitted photon energy, P_{in} is the optical input power to the EDFA, Δν = 40-nm is the optical bandwidth of the EDFA.

The fourth and fifth terms of the denominator in the equation above represent the signal-amplified spontaneous emission (S-ASE) beat noise and the ASE-ASE beat noise because of the in-line EDFA.[16]

With the AM CNR upper bound set by the laser transmitter RIN_L and RF loading (i.e., AM modulation index), the equation suggests that the transmitted AM CNR after the in-line EDFAs is primarily governed by the S-ASE and ASE-ASE beat noise at lower optical input levels (< -10 dBm). In this regime, the NF is approximately equal to $2n_{sp}$, where n_{sp} is the spontaneous emission factor of the EDFA.

If the NF is unchanged when the EDFA is operating in saturation, the AM CNR becomes limited by the receiver's thermal and shot noise at a given detected optical power. However, if the NF increases monotonically with the optical input power, then it sets the upper limit on the AM CNR as seen in the equation.

Frequency-domain simulations

A frequency-domain simulation model allows one to analyze the transmission characteristic of different types of EDFAs based on their known parameters. The model used here analyzes the AM video transmission performance of two different in-line 980-nm pumped EDFAs, which are labeled type "A" and type "B."

EDFA type A is a single-stage, single-pump amplifier with a 980-nm unidirectional forward pumping. EDFA type B is a dual-stage amplifier with a 980-nm unidirectional backward pumping for the first stage, and unidirectional forward pumping for the second stage. The saturated output power level of EDFA type A and B are 14.2 dBm and 16.2 dBm, respectively. Both EDFA types were designed to achieve simultaneously high output power with low small-signal NF and

gain flatness. The 980-nm pumped EDFAs have been selected here because they exhibit almost quantum-limited noise performance compared with the 1480-nm pumped EDFAs. The two different in-line EDFAs have essentially the same small-signal NF (< -10 dBm).

The algorithm for the erbium-doped fiber (EDF) is based on the quasi-analytical steady-state model by Saleh and Jopson.[17,18] The model gives accurate results for low-gain amplifiers (gain ≤ 20 dB) pumped at 980-nm or 1480-nm. At higher gains, the equivalent input noise model by E. Desurvire is used.[16] The various EDFA parameters used in the simulations are summarized in Table 1. The Er^{3+} doping profile of the EDF was identical for both EDFA types. In addition, the isolator forward pump loss and backward loss were assumed to be infinite for both EDFA types.

Table 1: The simulation parameters for 980-nm pumped EDFA type "A" and type "B" (WSC = Wavelength Selective Coupler).

EDFA parameter	EDFA "A"	EDFA "B"
Pump power (mW)	100	90
Pump wavelength (nm)	980	980
Fiber length (m)	30	1st Stage = 20, 2nd Stage = 25
WSC pump loss (dB)	0.6	0.6
WSC signal loss (dB)	1	0.5
Isolator forward signal loss (dB)	0.8	0.65

Experimental and simulation results

The optical spectra in a 100-nm band of each in-line EDFA in the AM video lightwave link were measured at various optical input power levels up to +5.9 dBm. Excellent agreement was obtained between the measured and calculated optical spectra for both types of EDFAs based on the frequency-domain simulations at various optical input powers.

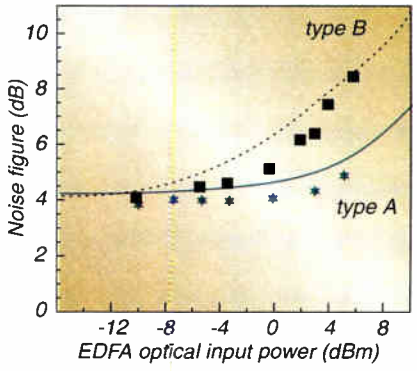
For example, the measured and calculated optical spectra of EDFA type A at optical input power of -13 dBm is shown in Figure 2. Figure 3 shows the calculated gain for both in-line EDFAs, which is reduced by a similar amount as the optical input power is increased. EDFA type B has about 2 dB higher gain than EDFA type A at the same optical input level. Because the saturated gain for both EDFAs remains high (gain >>1), the NF can still be approximated by the $2n_{sp}$ parameter. Based on the simulation results, the NF was calculated as a function of the optical input power for both EDFA designs. The NF was measured at the receiver as the SNR ratio with and without the in-line EDFA. The calculated NF results are in good agreement with the measured ones, as shown in Figure 4. Although the small-signal noise figure of these EDFAs is nearly the same (+4 dB), the NF of EDFA type B dramatically increases to 8.5 dB at high optical input (+6 dBm). In contrast, the NF of EDFA type A remains essentially unchanged, even at these high optical input levels.

This behavior is explained as follows: The lowest EDFA NF is achieved when the pump propagates in the same direction as the signal, as is the case for EDFA type A. There is a much stronger depletion of the Er^{3+} ions inversion at high optical power levels in the backward-pumped first-stage of EDFA type B, compared with EDFA type A. This results in a higher saturated NF for EDFA type B.

Based on these results, what is the required NF of a high-power in-line EDFA for AM video lightwave links? To answer this question, the following measurements were done. Seventy-one AM video channels (55.25 MHz to 505.25 MHz) were used to modulate the 1550-nm EM-DFB laser transmitter with an output power of +16 dBm. The AM-VSB video transmission performance was first measured for SMF lengths up to 50-km without using the in-line EDFAs. The worst-case measured AM CNR at 325.25 MHz was 53.75 dB with low CSO and CTB distortions (≤ -65 dBc).[3] Then, the measurements were repeated with type A or type B in-line EDFAs in the lightwave link with the same 0 dBm optical power at the receiver.

Figure 4 shows the worst-case measured and calculated AM CNR at AM frequency of 325.25 MHz (channel 41) as a function of the EDFA's optical input power level (dBm) for the two in-line EDFAs. Excellent agreement is obtained between the experimental data and the frequency-domain simulations. Notice that the AM CNR difference between the two EDFAs is increased to 1.7 dB at optical input power of +6 dBm. No degradation in the CTB and CSO distortions in the AM video lightwave links was observed with these in-line EDFAs.

Figure 4: The measured (symbols) and calculated (lines) noise figure at AM frequency 325.25 MHz as a function of the optical input power for EDFA type A (stars) and type B (squares).



The experimental results in Figures 4 and 5 suggest that an in-line amplifier with a NF of 5 dB or less is needed for high-performance (CNR ≥ 50 dB) AM video lightwave trunking applications. To test this requirement, a 100-km AM-VSB video lightwave trunking link with a 39 dB link budget was constructed using two similar in-line EDFAs with the optical input power for the first in-line EDFA being kept at +3 dBm and with 0 dBm at the receiver.

With +3.0 dBm optical input power to the second in-line EDFA, the measured AM CNR was 50.4 dB using EDFA type A, representing a CNR loss of 3.4 dB. In contrast, the measured AM CNR was only 48 dB using EDFA type B, or a CNR loss of 5.8 dB under the same

operating conditions. Thus, the NF requirement for high-performance AM video lightwave links is satisfied only for EDFA type A.

AM/QAM video lightwave trunking systems

This section discusses the performance results of a recently-demonstrated 1550-nm multichannel AM/QAM video lightwave trunking system.

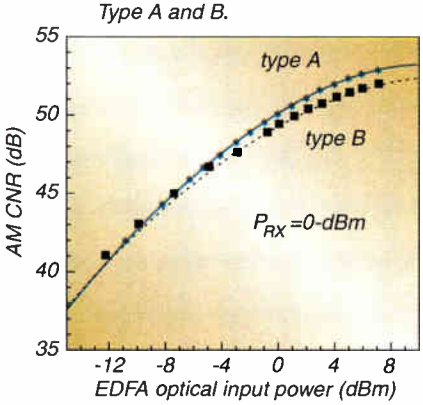


Figure 5: *The measured (symbols) and calculated (lines) AM CNR vs. the optical input power for EDFA Type A and B.*

The experimental setup for the multichannel AM/QAM video lightwave trunking system is shown in Figure 6.[3] Seventy-nine AM-VSB channels (55.25-547.25 MHz) are simulated using CW carriers from a Matrix generator. Four 256-QAM channels are generated from two commercial prototype 256-QAM modems at 43.75 MHz IF frequency, and up-converted to RF frequencies between 550 MHz and 750 MHz using balanced mixers. The composite RF video signal was formed by combining the AM and QAM channels to externally modulate a 1550-nm DFB laser transmitter with an EDFA built-in as a power amplifier. A broadband white Gaussian noise source was used in the QAM link for BER-SNR measurements.

After transmission through 120-km of standard SMF and two in-line EDFAs, the combined signal was detected at 0 dBm optical power at the cable-TV receiver, as shown in Figure 7. The EM-DFB laser transmitter has built-in mechanisms for linearization and suppression of SBS.[7] The SBS effect converts the transmitted optical signal in the fiber to a backward scattered one, and thus limits the maximum optical power that can be launched into the SMF.

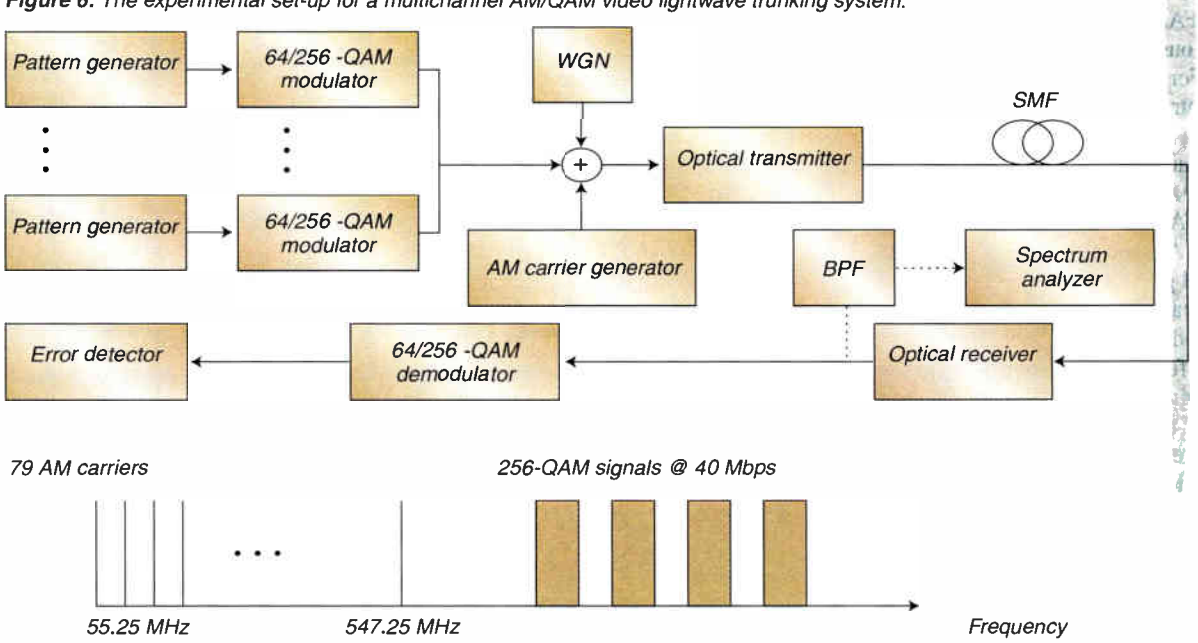
The optical output from the laser transmitter was 15 dBm, and from each in-line EDFA was +13 dBm when operating in deep saturation. At the cable-TV receiver, the composite video signal was detected and separated into analog and QAM channels using high/low-pass filters. Each AM channel was selected using a tunable 6 MHz band-pass filter and evaluated on an electrical spectrum analyzer. The signal corresponding to each of the four QAM channels was down-converted to the IF frequency, demodulated and then fed to an error detector for BER analysis. The commercial prototype 256-QAM modem incorporates many features such as adaptive equalization, and robust clock and carrier recovery algorithms.[19]

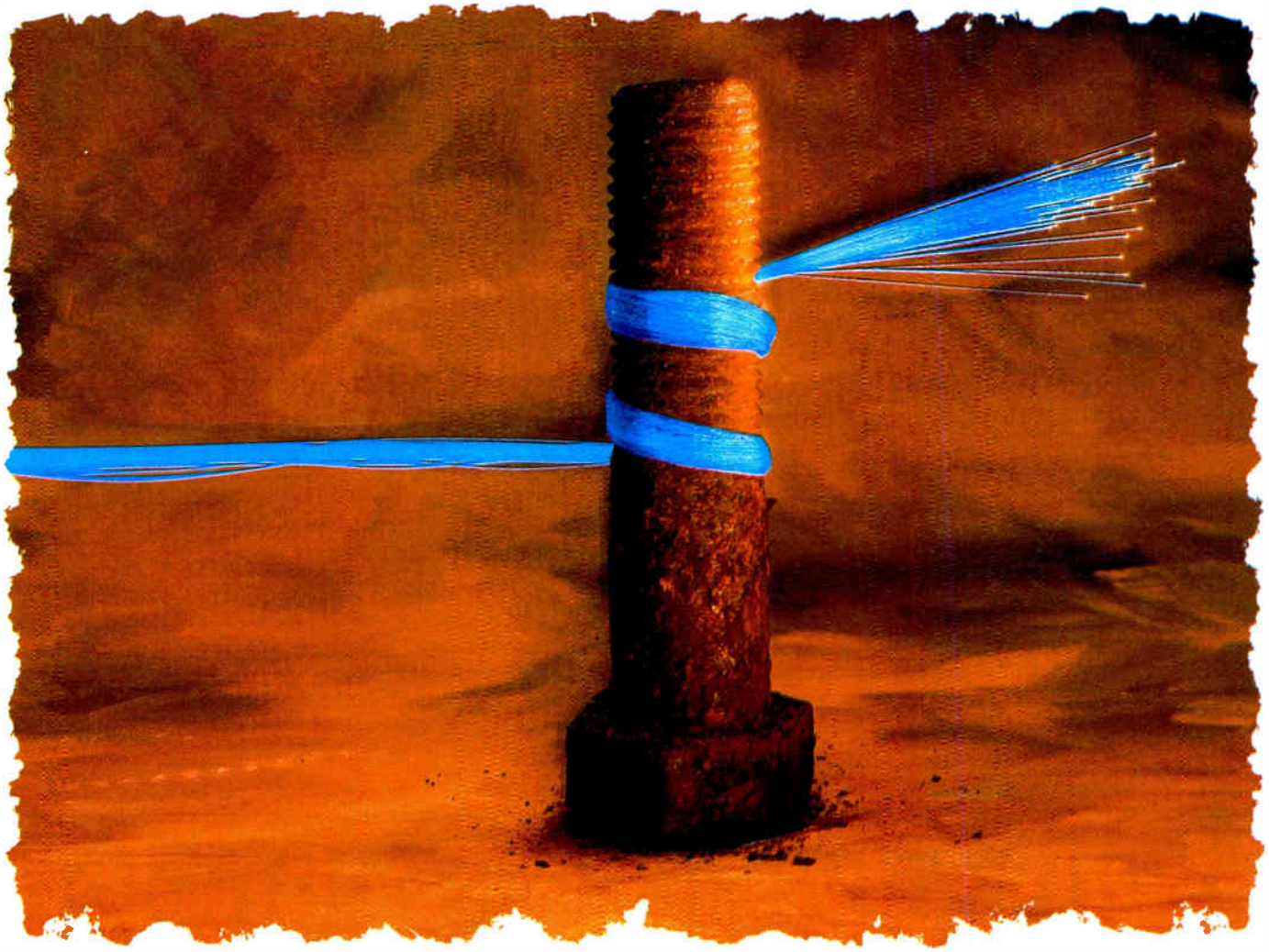
Adaptive equalizers are programmable digital filters which employ multiple taps to compensate for the channel response profile in order to minimize the intersymbol interference caused by the channel. No forward-error-correction (FEC) code was used in these QAM modems for worst-case analysis.

AM video trunking results

The performance of the multichannel AM/QAM video lightwave trunking system were first analyzed for SMF lengths up to 50-km without using the in-line EDFAs. The received optical power was set at 0 dBm using a variable optical attenuator. Figures 8 and 9 show the measured AM CNR with the CSO and CTB distortions (without the EDFAs) at AM frequency of 295.25 MHz (channel 36) as a function of the AM modulation index per channel. At AM modulation index of 3.1 percent per channel, the worst-case mea-

Figure 6: *The experimental set-up for a multichannel AM/QAM video lightwave trunking system.*





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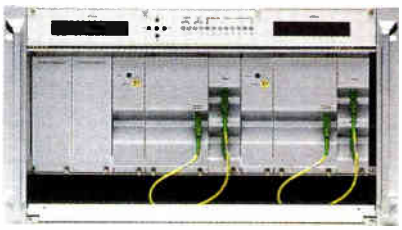

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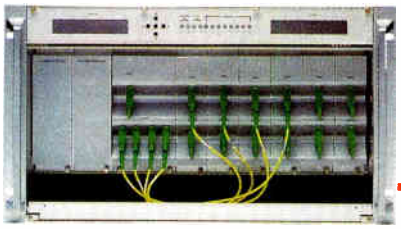

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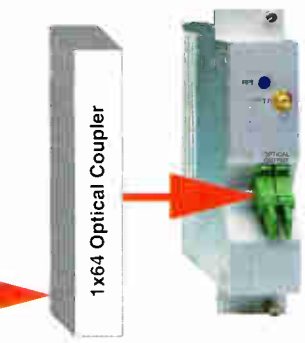

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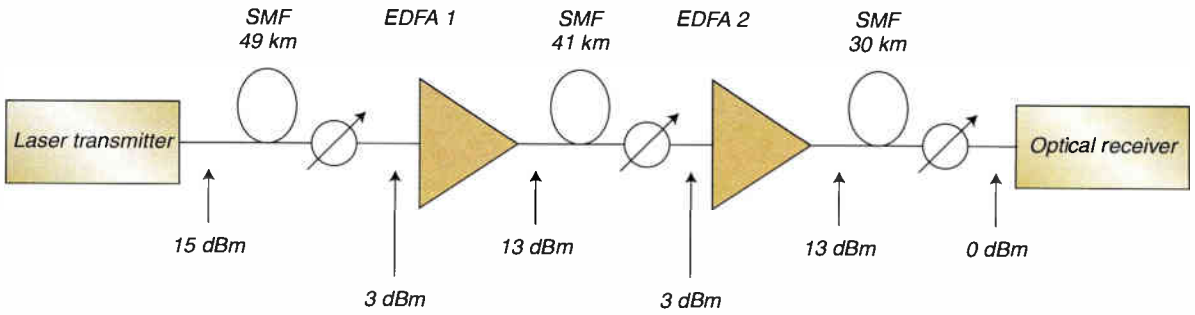
Figure 7: *The lightwave link of the experimental set-up in Figure 6 showing the location of each in-line EDFA with the corresponding optical power level.*



sured CNR (channel 78) was 53.7 dB with CTB distortion less than -65 dBc and CSO distortion less than -70 dBc. In order to select the proper operating point of the AM/QAM video lightwave trunking system with the cascaded EDFAs, the optical input power to each in-line EDFA needs to be determined.

It is desirable to operate the EDFA in saturation to minimize the CNR penalty because of the amplifier's beat noise. With 0 dBm optical power at the receiver, the optimum optical input power to each in-line EDFA of +3 dBm was obtained by balancing the maximum possible AM CNR with the overall system link budget requirement.

Figure 8: *The measured AM CNR at AM frequency of 547.25 MHz as a function of the AM modulation index with and without the in-line EDFAs.*

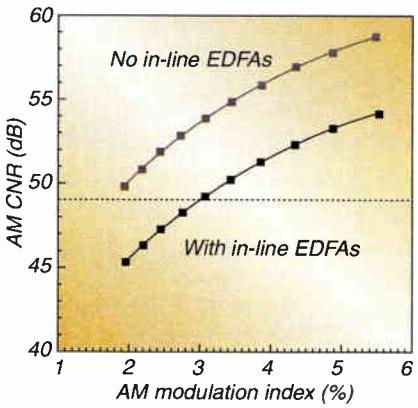
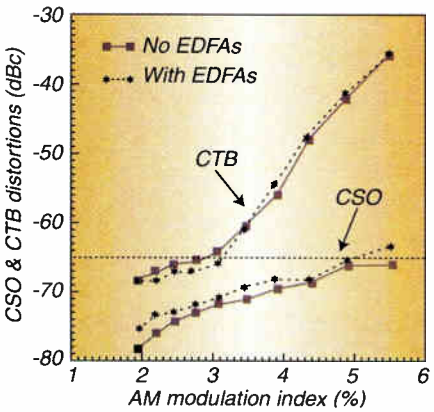


Figure 9: *The measured CSO and CTB distortions at AM frequency of 547.25 MHz vs. the AM modulation index with and without the in-line EDFAs.*



The AM CNR is increased by only 1 dB when the optical input power to the EDFA is increased from +3 dBm to +6 dBm, for example. Of course, the 1 dB addition to the AM CNR reduces the optical link budget by 3 dB. In contrast, some high-power in-line EDFAs, which have NF greater than 5 dB, may require optical input power levels greater than +3 dBm. This is because of the requirement from AM/QAM video lightwave trunking links to transport at least 70 AM channels with a CNR greater than 50 dB at a transmission distance of 100 km or more.

The measured AM CNR with the CSO and CTB distortions at AM frequency of 547.25 MHz (channel 78) as a function of the AM modulation index per channel for AM video trunking systems with the cascaded EDFAs are shown in Figures 8 and 9.

The optical input power to each in-line EDFA was set at +3 dBm, which is well above the input power for reaching the saturation point of these amplifiers. Notice that the measured AM CNR decreased by about 4.5 dB because of the addition of two in-line EDFAs at +3-dBm optical input. This result agrees well with the calculated CNR penalty estimated using the equation on page 34.

Figure 8 shows that the in-line EDFAs have little effect on the CSO and CTB distortions. This result suggests that degradation in the CSO and CTB distortions because of the residual chirp from the optical modulator in the 1550-nm EM-DFB laser transmitter is negligible. The actual operating point of the transmitter is chosen by maximizing AM CNR while maintaining distortion below acceptable levels. For example, according to Figures 8 and 9, the worst-case AM CNR at AM frequency of 547.25 MHz was 49.3 dB, where CSO/CTB distortions less than -65 dBc were obtained at AM modulation index of 3.1 percent per channel. Correspondingly, the optical power budget for this 120-km AM/256-QAM video lightwave link was 35 dB.

AM/QAM video trunking results

The 64/256-QAM digital channels were analyzed in terms of their uncoded BER performance. Figure 10 shows the measured BER of 64-QAM and 256-QAM channels as functions of the QAM signal-to-noise-ratio (SNR). The RF power of the 256-QAM channels was 12-dB below that of the AM channels. The solid lines in Figure 10 represent the theoretically predicted 64/256-QAM BER vs. the QAM SNR in a back-to-back configuration (without the laser transmitter) with the assumptions of only white Gaussian noise and Gray coding,[20] and are included for comparison.

While nearly error-free transmission was obtained for the 64-QAM channels, it is observed that a BER floor starts to emerge at around 35 dB SNR for 256-QAM channels, which were transmitted with the 79 AM channels at AM modulation index of 3.1 percent per channel. This is likely because of the clipping-induced impulse noise and nonlinear distortion within the QAM band,[2,3] which was generated by the AM channels operating at a much higher RF level. The behavior of the clipping-induced impulse noise, which has non-Gaussian statistics

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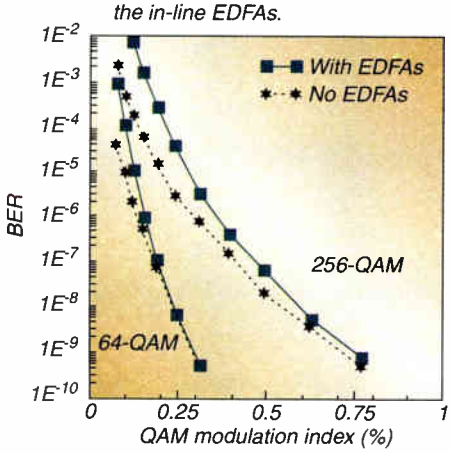
and exhibits a wideband spectrum, has been modeled using Middleton's class A noise model[21] with good agreement with the experimental data.[22,23] Although the BER performance can be improved by operating the 256-QAM channels at higher QAM signal levels, the increased QAM channel loading may cause the degradation of AM channel quality.

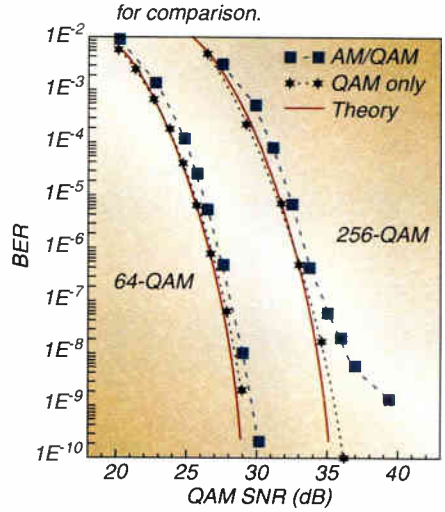
The difference in transmission performance between the 64-QAM and the 256-QAM channels in the presence of 79 AM channels can also be illustrated using the QAM modulation index. Figure 11 shows the BER of the 64/256-QAM channels with and without the in-line EDFAs as a function of the QAM modulation index per channel. The QAM signal level for the transmission link with the in-line EDFAs in order to obtain an equal BER was found to be as much as 2.5 dB higher than that without the in-line EDFAs. This is expected, considering the added ASE noise from the in-line EDFAs. However, no other QAM channel impairment because of the amplifiers was observed under the set operating condition. Figure 11 also indicates that at uncoded BER of 10^{-9}, the 256-QAM channels require almost three times the QAM modulation index of the 64-QAM channels operating at the same low BER. As the QAM modulation level increases from 64 to 256, the minimum distance between QAM clusters on the constellation map decreases, and thus, the 256-QAM signals become more sensitive to inter-symbol interference from impulse noise and other impairments.

Figure 11: *The measured uncoded BER of the 64-QAM and 256-QAM channels as a function of the QAM modulation index with and without the in-line EDFAs.*



Do the transmitted 256-QAM channels affect the AM channels? To answer this question, the AM CNR with the CSO and CTB distortions of the AM channels were measured as a function of the 256-QAM modulation index for the present system with four 256-QAM channels as shown in Figure 12. Notice that the AM CNR starts to deteriorate at 256-QAM modulation index greater than 2.5 percent per channel. In a fully-loaded hybrid AM/256-QAM video lightwave trunking system (79 AM and thirty-three 256-QAM channels), the AM CNR penalty is expected to appear at a 256-QAM modulation index as low as 1 percent, according to numerical calculations. This degradation is mainly because of impulse noise from both the AM and QAM channels, as well as increased non-linear distortions from the QAM channels. This result demonstrates that unlike the 64-QAM case, a FEC code such as a Reed-Solomon code T=8 (204,188), which provides a 4.8 dB coding gain at BER of 10^{-9}, is needed in the 256-QAM modems in order to improve the transmission robustness of the 256-QAM channels and maintain relatively low 256-QAM signal levels relative to the AM signals (≈ 10 dB).

Figure 10: *The measured uncoded BER of the 64-QAM and 256-QAM channels as a function of the QAM SNR with and without the AM channels. The theoretical performance of the BER-SNR of the 64-QAM and 256-QAM channels is also shown for comparison.*

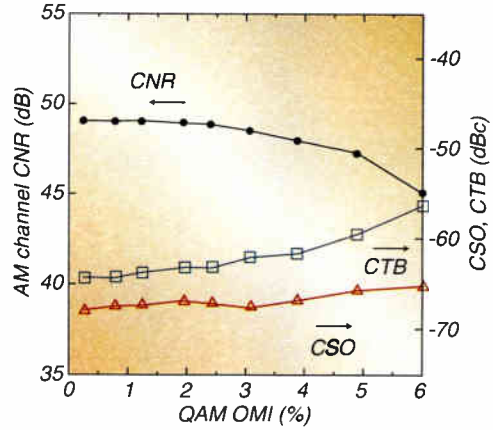


Conclusion

The performance characteristics and applications of EDFA-based multichannel video lightwave trunking systems has been reviewed. These systems can transport up to 80 AM-VSB video channels and more than 30 64/256-QAM digital video channels over 100-km of standard SMF using a single EM-DFB laser transmitter with two cascaded EDFAs. It has been shown by both experimental results and frequency-domain simulations that the suggested NF of a high-power in-line EDFA should be 5 dB or less when operating deep in saturation for high performance AM video lightwave trunking links. An AM CNR greater than 50 dB with CSO and CTB distortions less than -65 dBc, and nearly error-free transmission (uncoded BER ≤ 10^{-9}) for the 64-QAM channels with SNR of 30 dB or better has been achieved.

The uncoded 256-QAM channels require almost three times the QAM modulation index of the 64-QAM channels to achieve a nearly

Figure 12: *The measured AM CNR with the CSO and CTB distortions at AM frequency 547.25 MHz as a function of the 256-QAM modulation index.*



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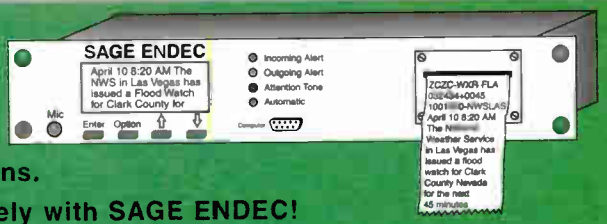

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Setting up a sting to snag cable crooks

Cablevision and law enforcement officers target street dealers

By Harry Maxwell, Director, Signal Security for Lightpath/Rainbow, Cablevision Systems Corp.

Editor's note: *Operators, manufacturers and law enforcement officials are fed up with cable pirates, and are fighting back. Recently, a U.S. District Court judge awarded Scientific-Atlanta Inc. a combined $25.4 million judgment against a major seller of altered set-tops. And in early May, a headline in the* Wall Street Journal *proclaimed: "Cable pirates sought plunder, but blundered into a major FBI sting." The Journal article documents how the Federal Bureau of Investigation used hidden video cameras and other techniques to catch a large and well-organized cartel of black-market descrambler profiteers.*

Given the timeliness of this issue, in the spirit of informing our readers about news surrounding signal security and cable piracy, and offering ways to combat the problem of signal theft, CED *is publishing the two winning papers from the NCTA's 10th Annual Signal Security Ideas Competition. What follows is the first of those award-winning strategies. The second paper begins on page 52.*

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error-free transmission. Unlike the 64-QAM case, it is necessary to employ FEC coding such as Reed-Solomon T=8 (204,188) code in the 256-QAM modems in order to improve the transmission robustness of the 256-QAM channels, and maintain a relatively low QAM signal level relative to the AM signals in a fully loaded (79 AM with 33 256-QAM channels) hybrid AM/QAM trunking system. The demonstrated performance capabilities of such EDFA-based AM/QAM video transmission systems are important for long-haul video lightwave trunking links and seamless integration with existing and new HFC distribution networks. CED

It's necessary to employ FEC coding in the modems to improve the transmission robustness of the channels

References

1. S. Ovadia, L. Eskildsen, J. T. Sciarabba, C. Lin and W. T. Anderson, "Bit-Error-rate Impairment in Hybrid Multichannel AM-VSB/16-QAM Video Lightwave Transmission System," I*EEE Photon. Tech. Lett. 7,* 869-871 (1994).

2. X. Lu, G. E. Bodeep, and T. E. Darcie, "Broadband AM-VSB/64-QAM Cable TV System over Hybrid Fiber/Coax Network," *IEEE Photon. Techn. Lett. 7,* 330-332 (1994).

3. S. Ovadia, H. Dai, C. Lin, and W. T. Anderson, "Performance of Hybrid Multichannel AM/256-QAM Video Lightwave Transmission Systems," *IEEE Photon. Techn. Lett. 7,* 1351-3 (1995).

4. W. I. Way, M. M. Choy, A. Yi-Yan, M. Andrejco, M. Saifi and C. Lin, "Multichannel AM-VSB Television Signal Transmission Using an Erbium-doped Optical Fiber Power Amplifier," *IEEE Photon. Tech. Lett. 1,* pp. 343-345 (1989).

5. W. Muys, J. C. van der Plaats, F. W. Willems, H. J. van Dijk, J. S. Leong, and A. M. J. Koonen, "A 50-Channel Externally Modulated AM-VSB Video Distribution System With Three Cascaded EDFAs Providing 50-dB Power Budget Over 30 km of Standard Singlemode Fiber," *IEEE Photon. Tech. Lett. 7,* pp. 691-693 (1995).

6. H. Dai, S. Ovadia, and C. Lin, "Hybrid AM-VSB/M-QAM Multichannel Video Transmission over 120-km of Standard Single-Mode Fiber with Cascaded EDFAs," *IEEE Photon. Tech. Lett. 8,* pp. 1713-1715 (1996).

7. C. Lin, K.-Po Ho, H. Dai, J. Pan, H. Gysel, and M. Ramachandran, "Hybrid WDM Systems for High-Capacity Video Trunking Applications," *Conference Proceedings NFOEC vol. 2,* pp. 261-269 (1996).

8. X. P. Mao, G. E. Bodeep, R. W. Tkach, A. R. Chraplyvy, T. E. Darcie, and R. M. Derosier, "Brillouin Scattering in Externally-Modulated Lightwave AM-VSB CATV Transmission Systems," *IEEE Photonics Technology Letters 4,* 287-289 (1992).

9. K. Peterman, "FM-AM Noise Conversion in Dispersive Single-Mode Fiber Transmission Lines," *IEE Electronics Lett. 26,* pp. 2,097-98 (1990).

10. M. R. Phillips, T. E. Darcie, D. Marcuse, G. E. Bodeep, and N. J. Frigo, "Nonlinear Distortion Generated by Dispersive Transmission of Chirped Intensity-Modulated Signals," *IEEE Photon. Tech. Lett. 3,* pp. 481-483 (1991).

11. H. Bulow, R. Fritschi, R. Heidemann, B. Junninger, H. G. Krimmel, and J. Otterbach, "Analog Video Distribution System with Three Cascaded 980 nm Single-Pumped EDFAs and 73 dB Power Budget," *IEEE Photon. Tech. Lett. 4,* pp. 1,287-1,289 (1992).

12. B. Clesca, P. Bousselet, J. Auge, J. P. Blondel, and H. Fevrier, "1480-nm Pumped Erbium-Doped Fiber Amplifiers with Optimized Noise Performance for AM-VSB Video Distribution Systems," *IEEE Photon. Tech. Lett. 6,* pp.1318-1320 (1994).

13. W. Muys, J. C. van der Plaats, F. W. Willems, H. J. van Dijk, J. S. Leong, and A. M. J. Koonen, "A 50-channel Externally-Modulated AM-VSB Video Distribution System with Three Cascaded EDFAs Providing 50-dB Power Budget over 30-km of Standard Single-Mode Fiber," *IEEE Photonics Technology Letters 7,* 691-693 (1995).

14. C. Y. Kuo, D. Piehler, C. Gall, J. Kleefeld, A. Nilsson, and L. Middleton, "High-Performance Optically-Amplified 1550-nm Lightwave AM-VSB CATV Transport System," *OFC '96 Techn. Digest 2,* paper WN2.

15. S. Ovadia, "CNR limitations of Er-doped optical fiber amplifiers in AM-VSB Video Lightwave Trunking Systems," to be published *IEEE Photon. Tech. Lett. 9* (1997).

16. E. Desurvire, *Erbium-Doped Fiber Amplifiers Principles and Applications,* John Wiley & Sons (New York, 1994).

17. A. A. M. Saleh, R. M. Jopson, J. D. Evankow, and J. Aspell, "Modeling of Gain in Erbium-Doped Fiber Amplifiers," *IEEE Photonics Technology Letters 2,* pp. 714-717 (1990).

18. R. M. Jopson and A. A. M. Saleh, "Modeling of gain and noise in Erbium-doped fiber amplifiers," SPIE proceedings of *Fiber Laser Sources and Amplifiers III,* vol. **1851**, pp.114-119 (1991).

19. H. Samueli, L. Montreuil, and W. H. Paik, "QAM vs. VSB, which is the best modulation?," *Communications Engineering & Design,* vol. **12**, 44-53 (1994).

20. B. Sklar, *Digital Communications Fundamentals and Applications,* PTR Prentice Hall (Englewood Cliffs, New Jersey, 1988).

21. Q. Shi, "Asymptotic Clipping Noise Distribution and Its Impact on M-ary QAM Transmission over Optical Fiber," *IEEE Trans. on Commun. 43,* pp. 2,077-2,084 (1995).

22. Q. Shi and R.S. Burroughs, "Hybrid Multichannel Analog/Digital CATV Transmission Via Fiber Optic Link: Performance Limits and Trade-offs," *NCTA technical papers,* 182-193 (1994).

23. K. Pham, J. Conradi, G. Cormack, B. Thomas, and C.W. Anderson, "Impact of Noise and Nonlinear Distortion Due to Clipping on the BER Performance of a 64-QAM Signal in Hybrid AM-VSB/QAM Optical Transmission System," *J. of Lightwave Tech. 13,* pp. 2,197-2,205 (1995).

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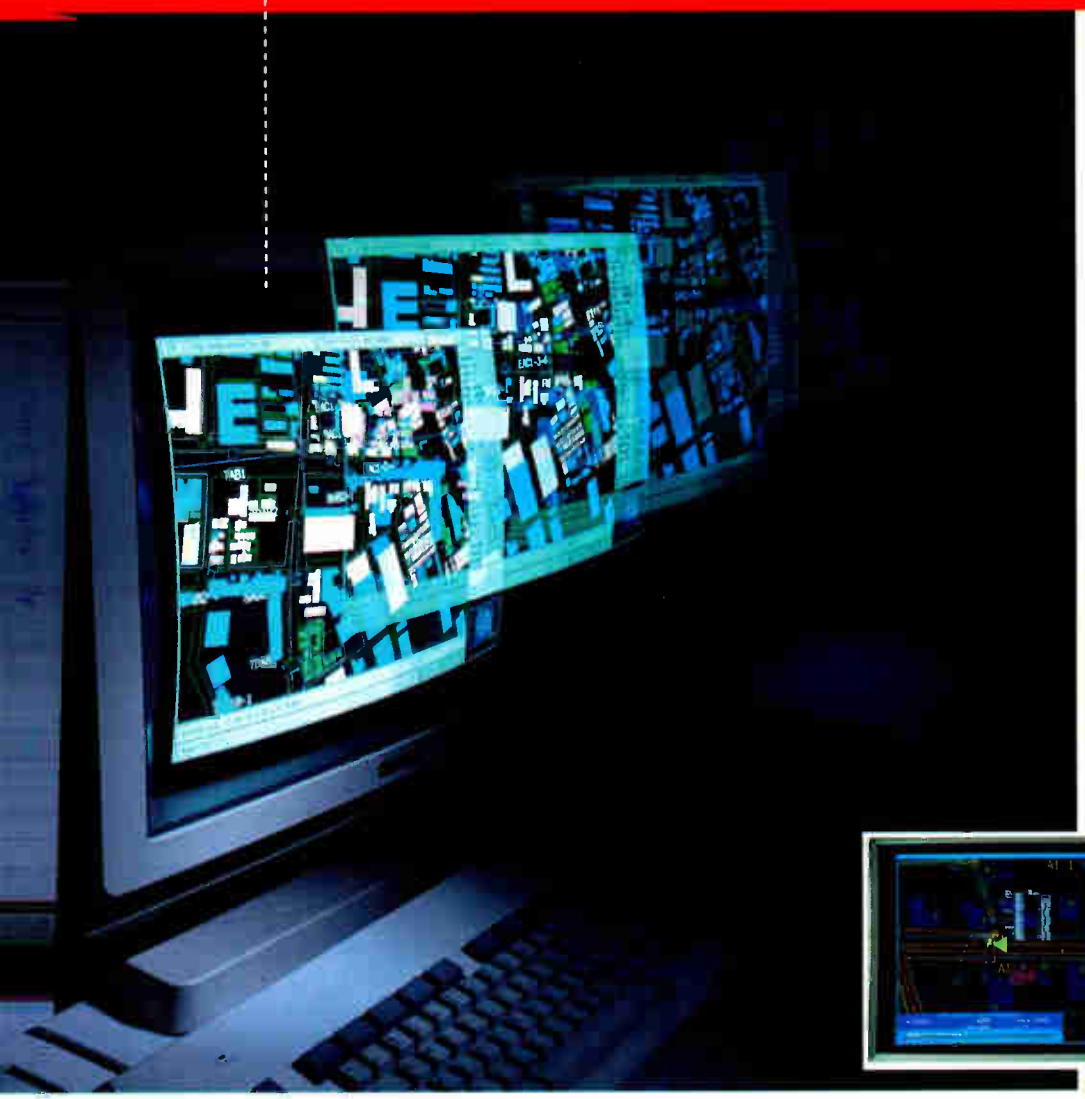

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Setting up a sting to snag cable crooks

Cablevision and law enforcement officers target street dealers

By Harry Maxwell, Director, Signal Security for Lightpath/Rainbow, Cablevision Systems Corp.

Editor's note: *Operators, manufacturers and law enforcement officials are fed up with cable pirates, and are fighting back. Recently, a U.S. District Court judge awarded Scientific-Atlanta Inc. a combined $25.4 million judgment against a major seller of altered set-tops. And in early May, a headline in the* Wall Street Journal *proclaimed: "Cable pirates sought plunder, but blundered into a major FBI sting." The Journal article documents how the Federal Bureau of Investigation used hidden video cameras and other techniques to catch a large and well-organized cartel of black-market descrambler profiteers.*

Given the timeliness of this issue, in the spirit of informing our readers about news surrounding signal security and cable piracy, and offering ways to combat the problem of signal theft, CED *is publishing the two winning papers from the NCTA's 10th Annual Signal Security Ideas Competition. What follows is the first of those award-winning strategies. The second paper begins on page 52.*

Cablevision of New York City is a cable television operator serving more than 450,000 customers in the boroughs of the Bronx and Brooklyn, N.Y. Each customer is provided with an addressable convertor which allows the customer to purchase a "package" of programming they wish to view and enables them to impulse order pay-per-view programming, as it is offered. The addressable convertor, manufactured by General Instrument, also allows Cablevision of New York City to collect the information from the customer's convertor which indicates what the customer has purchased.

Cablevision has been an industry leader in the investigation and prosecution of cable pirates and the customers who purchase and use pirate convertors. These investigations have included the arrest and prosecutions (criminal and civil) of major manufac-

PHOTO BY MARK SIMS

turers, street-level dealers and end-users of the illegal product. Additionally, Cablevision was one of the first to employ techniques such as public service announcements to educate customers, use of ANI systems to identify unauthorized users and field tap audits to maintain the integrity of the system through daily audits.

Our signal is secured by technology provided by General Instrument and is updated to combat the "pirate" technology used to defeat us.

In 1992 it was noted that the report of convertors lost because of fire and burglary was a number that could be an expected loss to any operation with our customer base at that time. As we enhanced our signal security and made RF pirate convertors unusable in the system, it was noted that the burglary reports began to increase. Also, through investigations, it was discovered that the manufacturers and distributors of pirate convertors were going to drastic measures to obtain a source of converters to modify and resell in the illegal market.

In 1993, a number of robberies occurred in the New York City area which confirmed our intelligence. Both install contractors, as well as cable operators, were subjected to masked, well-organized, armed gunmen entering their facilities for the sole purpose of taking convertors. These incidents have continued to date. In September 1994, at a Cablevision facility in the Bronx, machine-gun-toting robbers attempted to steal a large number of convertors. New York City Police responded, exchanged gunfire with the subjects and were forced to send a "robot CCTV" into the facility when employees were taken hostage. The subjects were arrested, and the employees were released.

In addition to convertors being reported stolen from customer homes, through hijacking and warehouse robberies, we also noted an increase in the number of convertors not returned after the customer disconnected from our system.

Although we continued our efforts to identify and prosecute providers of pirate convertors, it wasn't until late 1995 that we really began having any impact in solving the burglaries. The New York City Police Department agreed that the issue of convertors taken during burglaries was a problem they had noted when they did a survey of citywide burglaries and discovered the common denominator in the theft was the removal of a convertor.

The program

Meetings were held with the administration of the New York City Police Department. Both the cable operators and the police explored avenues by which we could reduce these burglaries. It was confirmed through our investigations that many of the burglary reports were filed by customers who had taken their convertors to a pirate, had the box modified and subsequently reported it stolen to Cablevision and the police. The reports were done because the subscriber was being advised by the pirate to have a legitimate convertor in their home in case of audit or a service call.

To have a new convertor issued, Cablevision required a police report. Two changes were made to procedures:

✔Cablevision changed its policy of issuing a credit and a new convertor when a police report was filed.

✔The New York Police had uniformed officers respond to the house of customers reporting convertors stolen for a burglary investigation (look for forced entry).

Although these policy changes did have an impact on the fake reports, it did not fully address the problem.

Having taken all this into consideration, we proposed a project to enlist the cooperation of the entire New York City Police Department with the full sup-

Cablevision enlisted the cooperation of the entire New York City Police Department

port of Cablevision in a proactive approach to the problem. With the understanding that we would continue to attack the major criminal activity of distributors and mail-order enterprises involved in piracy, and press on with the investigation into suspects involved in robberies currently being addressed by law enforcement, Cablevision and other cable television operators, we proposed targeting the local "street dealers." It was agreed that throughout the numerous precincts in the City of New York, many fencing operations were known to members of each command. Many others were known to Cablevision investigators who had attempted "buys" at these locations, but were turned away because they were not "known" to the owners. Because our intelligence indicated that the numbers of these pirate and fencing operations were so great as to preclude individual "cases," one at a time, by Cablevision and specialized detective squads, we proposed having each precinct address these locations with a "sting." We would provide the training, expert testimony and identify those locations we suspected. The "street cops" in each command would identify others. Meetings were held with the district attorneys in the Bronx and Brooklyn. Later, all the five boroughs' district attorneys were involved. The Department of Consumer Affairs was also brought into the sting.

PHOTO BY MARK SIMS

We proposed supplying each police precinct with convertors. At their convenience, undercover officers in each command would approach the suspected pirate/fencing operations. They would claim to be burglars looking to sell the proceeds of their crimes. The district attorney agreed that the "sales" (all done with taped conversation) constituted "probable cause" to apply for a search warrant and arrest of the subject for possession of stolen property. Often the subject would suggest modifying a convertor and giving it to the undercover officer as payment. In these cases, we would test the box, and upon arrest, the subject would be charged with an additional felony charge of criminal possession of a forgery device.

During the execution of the search warrant, we would make ourselves available to the arresting officers as experts to identify cable piracy equipment and devices used to intercept cable programming. In addition, the Department of Consumer Affairs would come in, after the location was secured, and if they determined that the enterprise was engaging in the purchase and sale of stolen property, they would begin proceedings to revoke their license to operate and close the store.

Results

What was accomplished through these "stings" was more than expected. As search warrants were executed, we found the subjects in possession of large quantities of stolen property: computers, VCRs, televisions and cable convertors. In addition, machine pistols, sawed-off shotguns and unregistered weapons of every type were seized at most of the locations. Large sums of cash and quantities of narcotics (in the kilos) were recovered. At some of the locations, the "pirates" were also involved in the cloning of cellular phones. We have since been contacted by units of law enforcement involved in the investigations of cellular fraud and been asked to assist them in their investigations.

As the sting continued, virtually every police command in the city began to contact us to participate. During the recovery of the cable convertors, it was often discovered that, as suspected, some of our customers had filed false reports regarding the theft of the convertors, and the police arrested these individuals for false reporting of an incident to the police. More than 100 arrests have been made to date. The value of the property recovered is in the

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Drugs, guns and stolen property, as well as illegal cable devices, are removed from the street

hundreds of thousands of dollars. The partnership formed with the police has enabled us to continue our efforts to combat piracy. As we continued the sting and were requested to instruct the police in all the facets of cable piracy, other cable operators joined the efforts. Each precinct can now call on the cable operators in New York City to begin a case, as well as the reverse.

As the cases are being adjudicated by the district attorney's office, we will be bringing civil action against these offenders for their damage to Cablevision.

Conclusion

These activities are time-consuming but not difficult to administer and have a great return relative to the time and efforts expended. Manufacturers such as General Instrument are of great assistance. By allowing us to distribute their products for these stings, the industry, as a whole, reaps the reward. Rather than seeing a minimum number of cases worked in a period of time, this partnership has allowed an ongoing major effort to be accomplished in each command.

The administration consists of setting up a central point to distribute convertors to the police, drafting a receipt for signature by the case officer and tracking the results. The police will often ask for an expert to accompany them on the execution of the warrants to identify the illicit cable devices and piracy paraphernalia. The descramblers recovered often need testing and, when possible, an expert's explanation of the type of modification used to alter the convertor must be given to a grand jury. As pirate/fencing operations are uncovered, the New York City Police and federal law enforcement are more than willing to participate in these operations.

This approach could be used in all areas of the country, urban and rural. Law enforcement has sometimes been reluctant to use their efforts on cable pirate operations when they have more pressing issues to combat. This approach solves that problem. Not only does the industry reap the rewards of putting these street dealers out of business, but the local police have the advantage of closing down enterprises that contribute to the overall crime in their areas. Drugs, guns and stolen property, as well as illegal cable devices, are removed from the street.

These endeavors help both the industry and law enforcement and have had only positive results. CED

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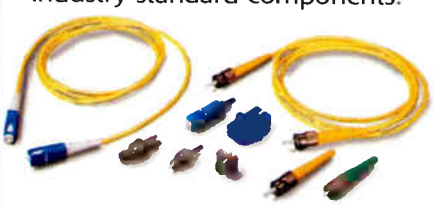

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Closing the backdoor on signal theft

New product makes detection easier

By Kenneth Higgins, CEO, Backdoor Group Inc.

Editor's note: *This is the second winning paper from the NCTA's 10th Annual Signal Security Ideas Competition.*

Backdoor Group Inc. (BGI) was formed to market products that "close the backdoor" on the estimated annual $7 billion loss of revenue to the cable television industry resulting from theft of service. The company's CEO has more than 26 years in the cable television industry as an owner/operator of systems and as an employee of other cable operators. While employed by Time Warner, the author oversaw the development of the predecessor to the Monitor system.

Backdoor Group's mission is to supply automated products that raise the efficiency level of the cable television industry's front-line personnel. This includes service technicians, installers, direct sales representatives, auditors and quality control personnel. The company's signature product, the Monitor, is designed to:

✔Maximize the return on investment of tap audit dollars by expanding the scope and the use of field-gathered data.
✔Minimize administrative tasks and allow for increased revenue through more productive administrative activity.
✔"Close the backdoor" to cable service theft by a series of programs designed to keep the integrity of each plant to a 1.5 percent unauthorized activity rate.

Historically, cable companies have had mixed payback results from tap audits. Marketing department studies have shown that many of these "new customers" disconnect their service after a short period of time and within six months are once again stealing the signal.

Another factor is that customer audits are typically performed using computer printouts. When marking up these printouts, information is frequently illegible, incorrect, misread or sometimes lost. These errors may result in incorrect information being entered into the computer. In the past, money spent on audits was viewed as an unwelcome expense. Cable companies are beginning to realize, however, that the use of automated equipment to conduct an audit will result in increased revenues and more accurate data being collected.

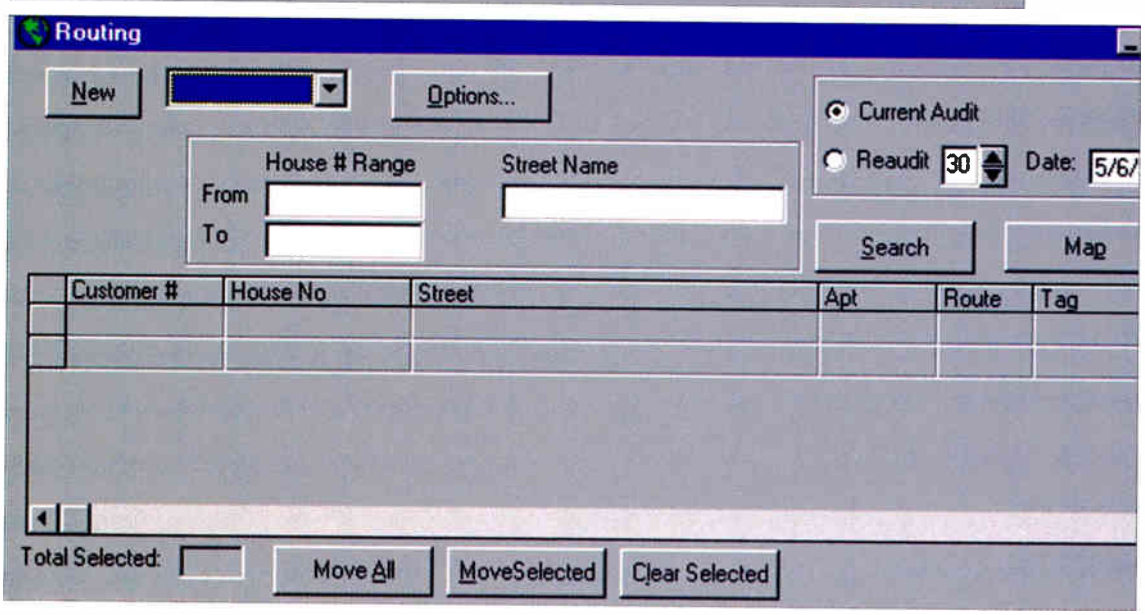
The Monitor system was developed in response to the industry's need to bring tap audits to a higher level of efficiency and reduce the costs associated with tap audits. The author of this article designed, built and implemented the industry's first fully automated tap audit system while auditing 750,000 homes in the Time Warner Cable Milwaukee Division.

The automation of the time-tested process allowed for:

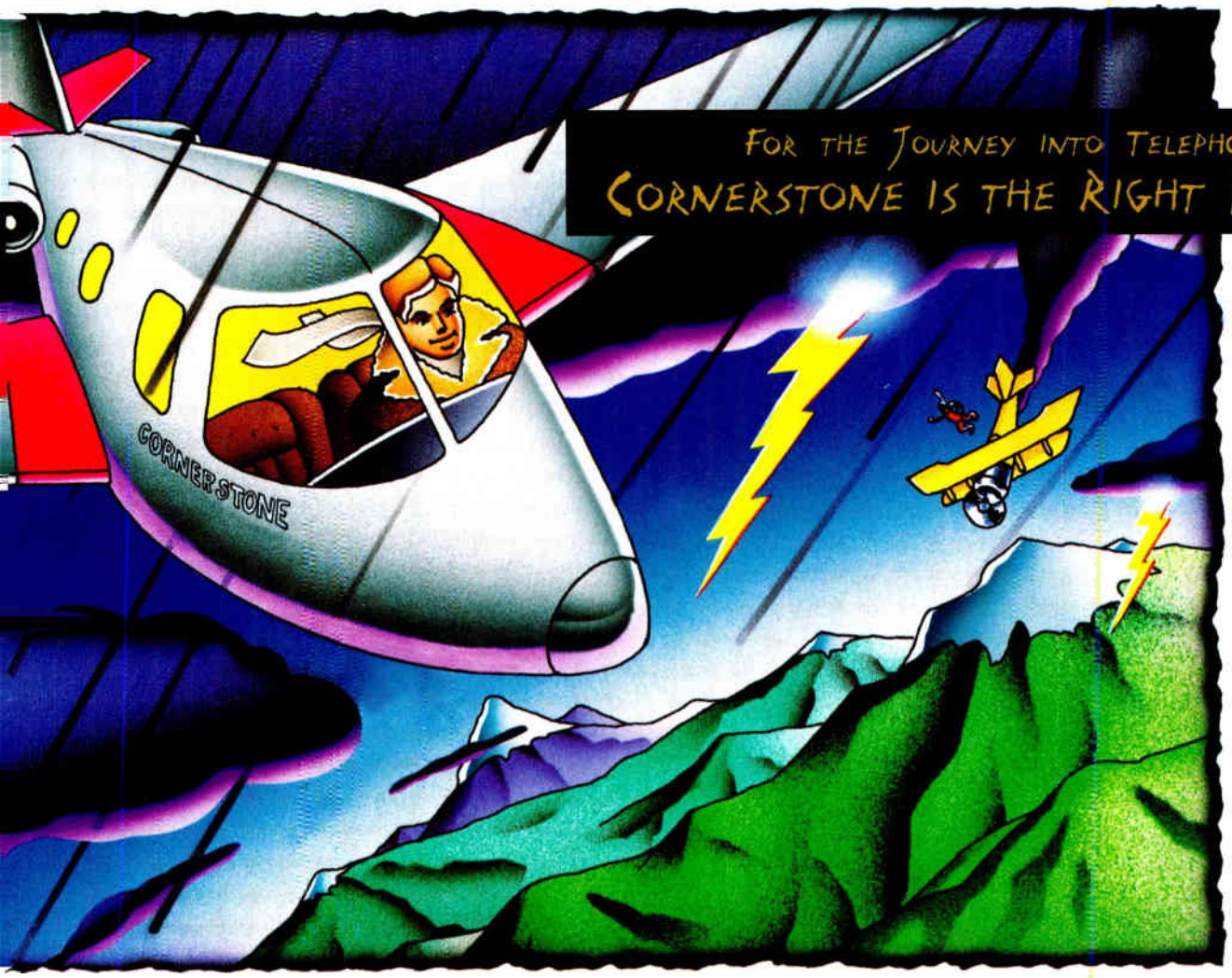
✔Greater amounts of useful information to be gathered while auditing.
✔Much higher efficiency by using computerized data sub-management.
✔Multiple reports generated from the data useful to many departments in the Division.
✔A tool to monitor the audit afterwards, therefore keeping the system clean.
✔Trackable and verifiable return on investment.

When the Monitor system was used in Milwaukee, the "drop off" rate of the "new customers" decreased substantially. These successful results are the outcome of an intentional effort to catch and prosecute those stealing service.

Without the data sub-



Figures 1 and 2: Examples of the Monitor software show how routes can be created.



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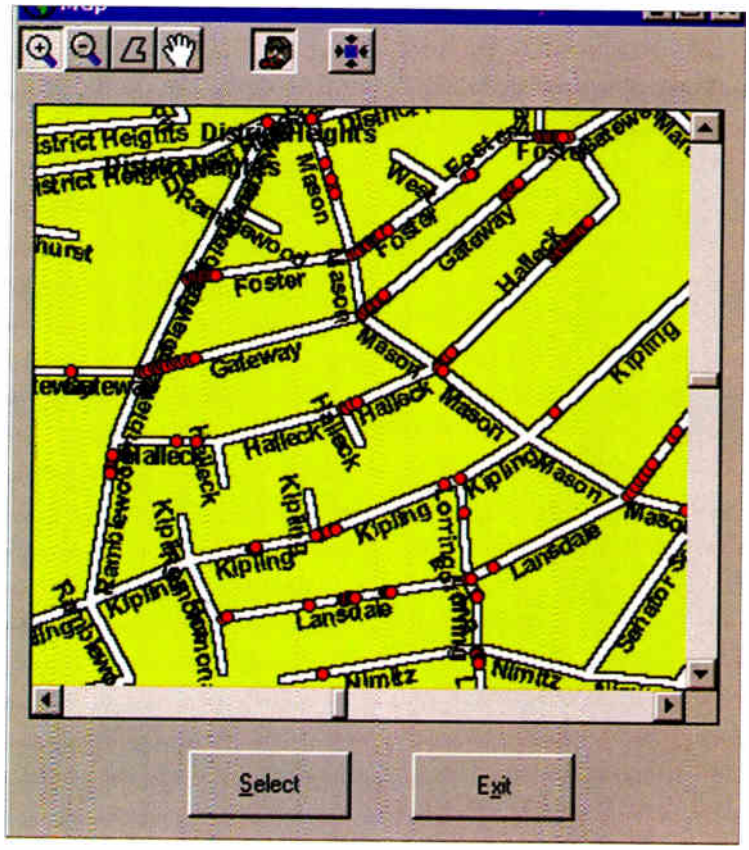


Figure 3: An example of a completed route.

management provided by the Monitor, the following problems will continue to exist:

1. Cable theft will go unchecked and continue to deplete revenue. It is unwise to believe that cable theft can be eliminated completely, but it can be curbed with monitoring. A primary goal of BGI is to bring cable theft under control through an efficient tap audit. An optimum level of theft would be 1.5 percent, which could be obtained through perpetual monitoring. The system monitors chronic offenders, delivers evidence for court actions, and increases revenue. It is estimated that 50 percent of theft offenders become paying customers within one year.

2. The cable television's customer address base will remain corrupt and inaccurate. These inaccuracies could be the result of incorrect input; for example, addresses that have been left in the computer after buildings have been torn down for parking lots or when duplexes are converted to single-family homes. Some of the problems caused by a corrupt database might add to the less-than-positive customer service image that occurs from time to time in the cable television industry.

3. Tag numbers that are used to identify the cable lines at the tap, whether at the pole or in the vault, will continue to be incorrect. Each time a technical person goes into the field for the purpose of checking, repairing or installing a cable line, the tag number should be verified. As many as 90 percent of the tag numbers are wrong, which result in the technicians repeating their work. The Monitor system records the tag numbers in the hand-held computer; the numbers are later transferred into a PC that interfaces with the company's database. This should be done on a daily basis.

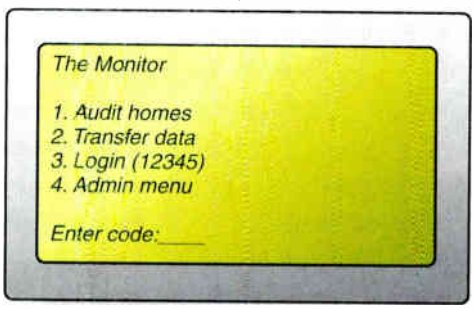
4. Field equipment will not be monitored. Currently, cable companies have no way to track terminator and pay channel filter inventory once it leaves the warehouse. The hand-held product of the Monitor system will direct the technician to record each piece of material as it is used in the field.

5. Time will be wasted between jobs. The system automatically dates and time stamps each entry made in the field. Without this feature, some technicians will continue to take longer to complete a job or state that a job is completed when, in fact, it is not.

6. Cable discrepancy reports will be ignored. Every time a technician goes into the field, he/she finds discrepancies in the plant; e.g. cable wires cut and hanging loose, cable boxes in apartments torn off the wall, etc. The technician will usually ignore them because he/she feels the report will just sit on someone's desk. With the Monitor, the technician records the discrepancy easily and effortlessly by pushing a button on the hand-held computer. A daily report will go to a manager for his/her review and delegation of the repair work to be done. Tracking of the work completed is easily recorded, which helps monitor an employee's or contractor's work performance.

7. Coding of commercial establishments in the database will continue to be under-charged, resulting in a lower revenue from this segment of the cable company's plant. Currently, most commercial establishments in a company's database are being charged residential rates. When the database was originally set up, there

Figure 4: Examples of menu items on the handheld computer.



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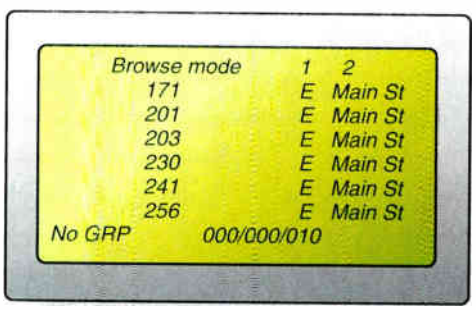

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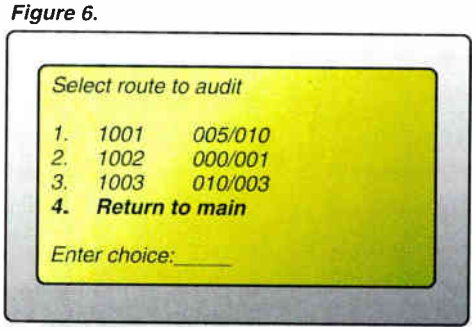

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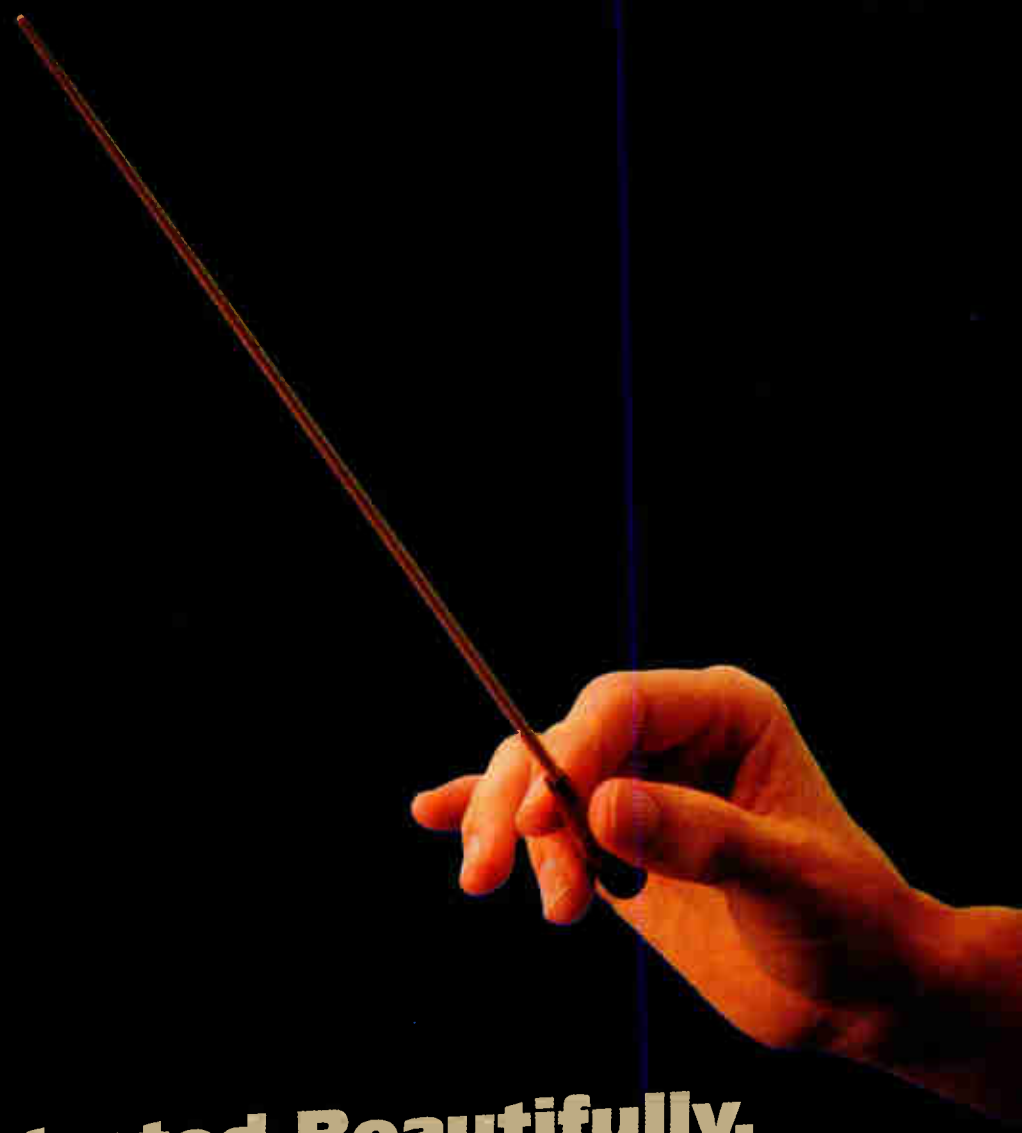

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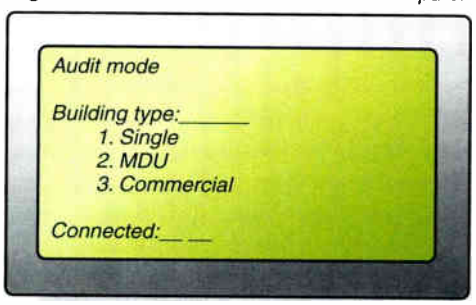
Figure 7: Menu items on the handheld computer



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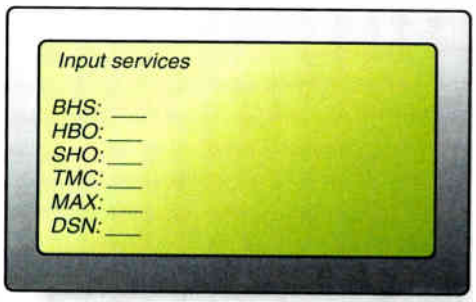


Figure 9.

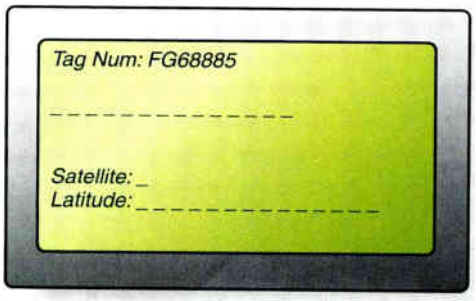
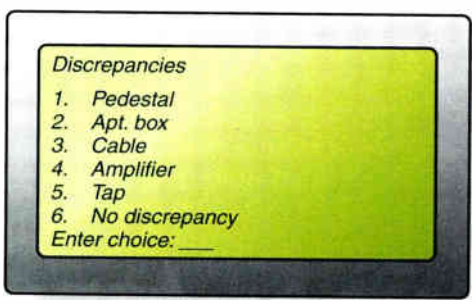


Figure 10.

Figure 11.



was no differentiation between commercial and residential locations. Very few commercial locations are being billed at commercial rates. With the Monitor, the technician easily answers a multiple-choice question as to the type of building he/she is auditing. The database is easily corrected and a report generated listing commercial locations to be followed up on by the commercial department. The owners are required to sign new work orders with the commercial rates, thus increasing revenue for the cable company.

The above-cited examples are classic cable television industry problems, yet they have not been in the forefront of the industry's use of capital dollars. However, this is changing. Tap audit expenses are being budgeted for this year in most large cable television divisions.

Product and process

The Monitor system includes computerized hardware and software, consultation, and on-site service. It allows an operator to perform audits without the need for paper and provides a time-stamped daily report of all activities performed. Data collected is transferred to the system's files by computer.

The Monitor is a first-of-its-kind system. It is the result of over two years of field research and development supported by Time Warner's Milwaukee Division. The product was created because of the need for a cost-effective and accurate audit. This was the first audit that used hand-held computers to collect and transfer data to a customized, PC-based program.

A conventional tap audit is usually performed in the following manner:

Step 1. A management team determines the information that will be obtained by the field audit. Usually the information collected is very limited because of the manual (hand-written) method used. Typically, the only information collected is the customer status (active or inactive).

Step 2. A tap audit manager and audit staff are hired and trained.

Step 3. The tap audit manager uses street maps to select the street ranges and approximate number of homes on each route. Routes are developed by using the "select" mode to access computer mainframe data. The use of the cable company's computer by the tap manager is perceived by other departments to be a low priority. Consequently, the tap audit manager experiences delays, which can cause the creation of audit routes to take several days.

Conventional tap audits are laden with errors because all of the information is manually collected

Step 4. Auditors are dispatched into the field with computer printouts and "street sheets" to collect information.

Step 5. Computer printouts are marked up by the auditors and returned to the audit manager. The audit manager makes copies of the returned sheets and distributes one set to the sales department and another set to the administration department. The sales department follows up on the illegal/inactive accounts to convert them into paying customers. Customers who do not convert are disconnected and become part of a database used to support follow-up investigation of chronic theft (30/60 day reports). The administration department is responsible for entering the collected data into the main customer file. (In the state of California, a tap audit division was forced by the city's fire marshal's office to discard data collected from more than 1 million homes because these massive amounts of paper awaiting processing had become a fire hazard. The collected data was lost!)

Step 6. Direct sales representatives armed with lead reports attempt to contact the unauthorized users and convert them to paying customers of the cable system.

Step 7. Conventional tap audits are laden with human errors because all of the information is manually collected. Typically, tracking after the audit is nonexistent. It is estimated that as many as 70 percent of those customers added as a result of the audit drop off as customers within 12 months.

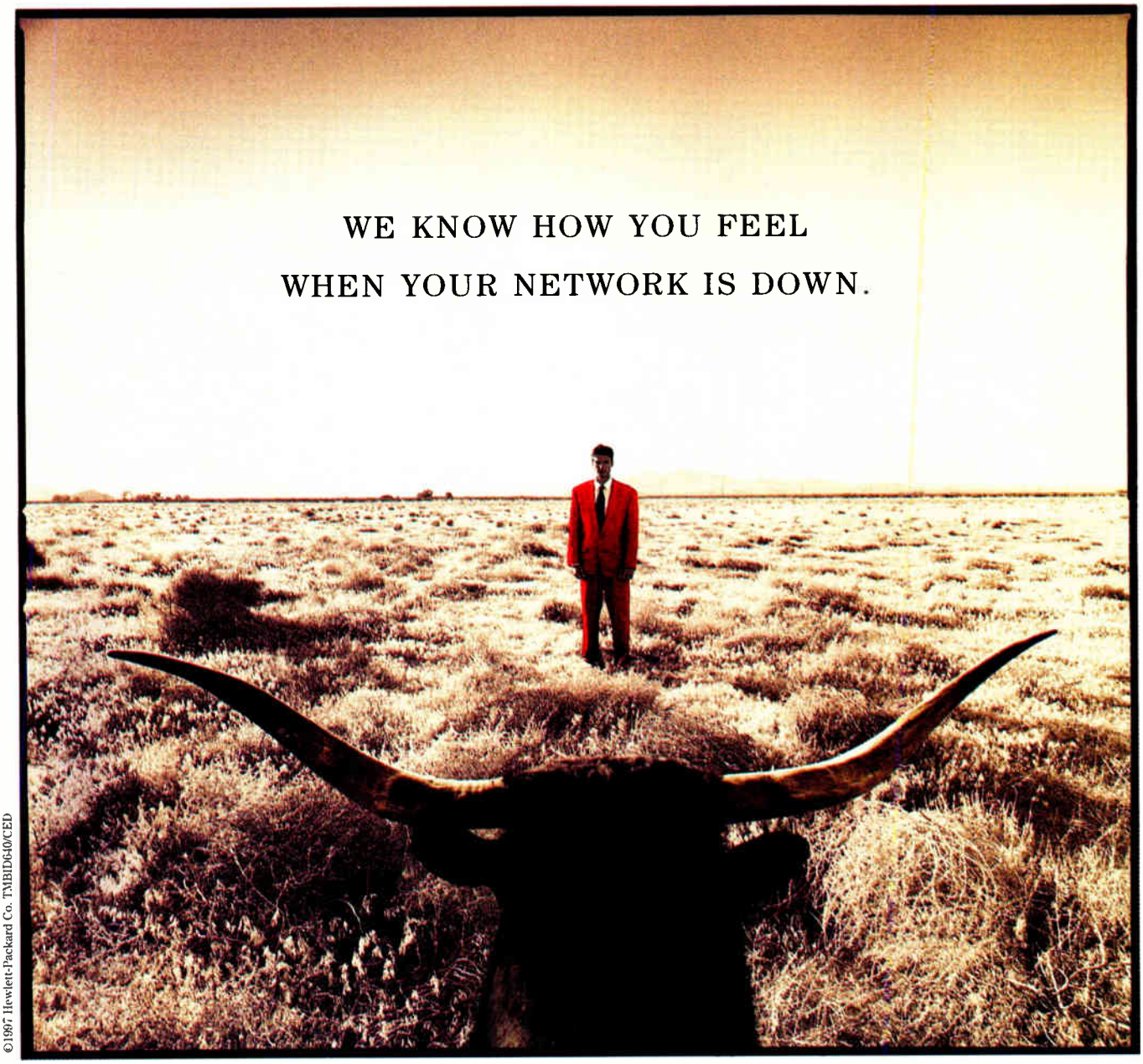


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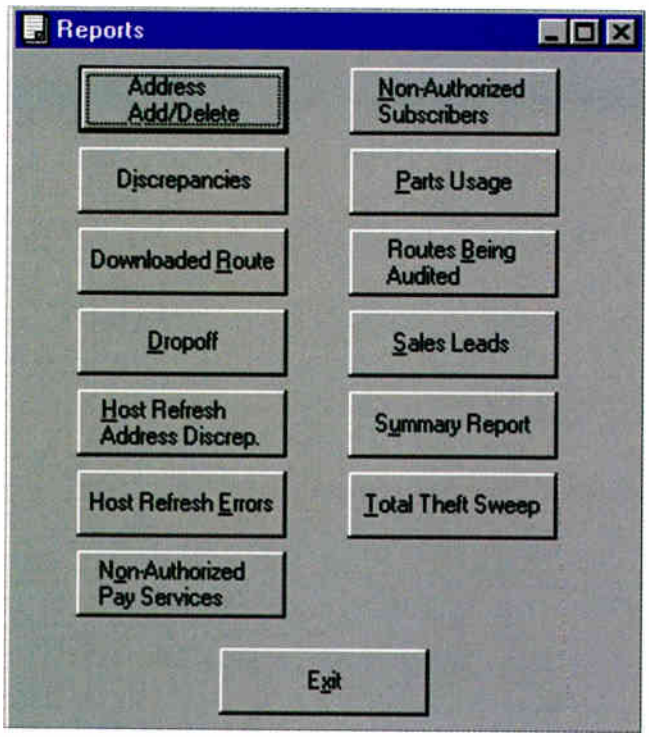
Figure 12.



Conversely, a tap audit using the Monitor system proceeds as follows:

Step 1. A decision is made as to what information will be collected in the field and for what purposes. The Monitor system makes it possible to collect the standard information (whether an address is active or inactive), as well as additional important data, e.g.:

✔accuracy of addresses
✔missing addresses
✔unauthorized activity
✔parts usage
✔discrepancy reports
✔proper classification (commercial vs. residential)
✔tag numbers.

Figure 13: An example of a sales leads report.

Address	Unauthorized	Non-active
104-A Enterprise Ave., Houston		X
104-B Enterprise Ave., Houston		X
105 Enterprise Ave., Houston	X	
108 Enterprise Ave., Houston		X
1205 Solutions Ave., Houston	X	
1209 Solutions Ave., Houston		X

Figure 14: A post audit tracking 30/60 day reports, 30 day reports for route 21.

Address		Connected?
152 Enterprise	Houston	X
211 Enterprise	Houston	X
1205 Enterprise	Houston	X
2204 Enterprise	Houston	X

Step 2. The mainframe database is copied into a Pentium PC. This computer is interconnected to the mainframe to provide real-time updates and status changes, thus assuring that both the tap audit and the billing database contain the same information.

Step 3. The manager of the tap audit establishes the criteria for routing audit personnel. The optimum routing function of the Monitor system is used to compile address route files similar to the routes used by mail carriers. The address route pools can be stored for later distribution into hand-held units using drag-and-drop technology. This process requires a few minutes each morning, as opposed to the hours or days using the conventional method.

(In the Milwaukee project, two administrative employees supported the audit in which 750,000 homes were passed—one for routing and one for reporting. The routing program developed by the Monitor system eliminates the need for a separate routing person, thereby providing additional cost savings.)

Step 4. Auditors are routed geographically to collect the data necessary for functional reporting and updating computer files.

Step 5. Sales leads, audit status and customer reports are developed from the newly-acquired data. Other reports may also be created at this time.

a. The audit department receives 30-day and 60-day reports of customers who refused cable service when visited by a direct sales representative. The auditor confirms whether the home is again illegally connected. If connected, photographs are taken and the data is logged for possible litigation. These 30-day and 60-day reports are used to convert the residents into customers.

As many as 40 percent of the residents who become cable customers do so to get rid of the sales rep

(The Municipal Court of Milwaukee reviewed several of these cases and issued the following statement: "Time Warner Cable's Milwaukee Division evidence is a road map that can only lead to 'guilty' when presented in such a complete and documented manner.")

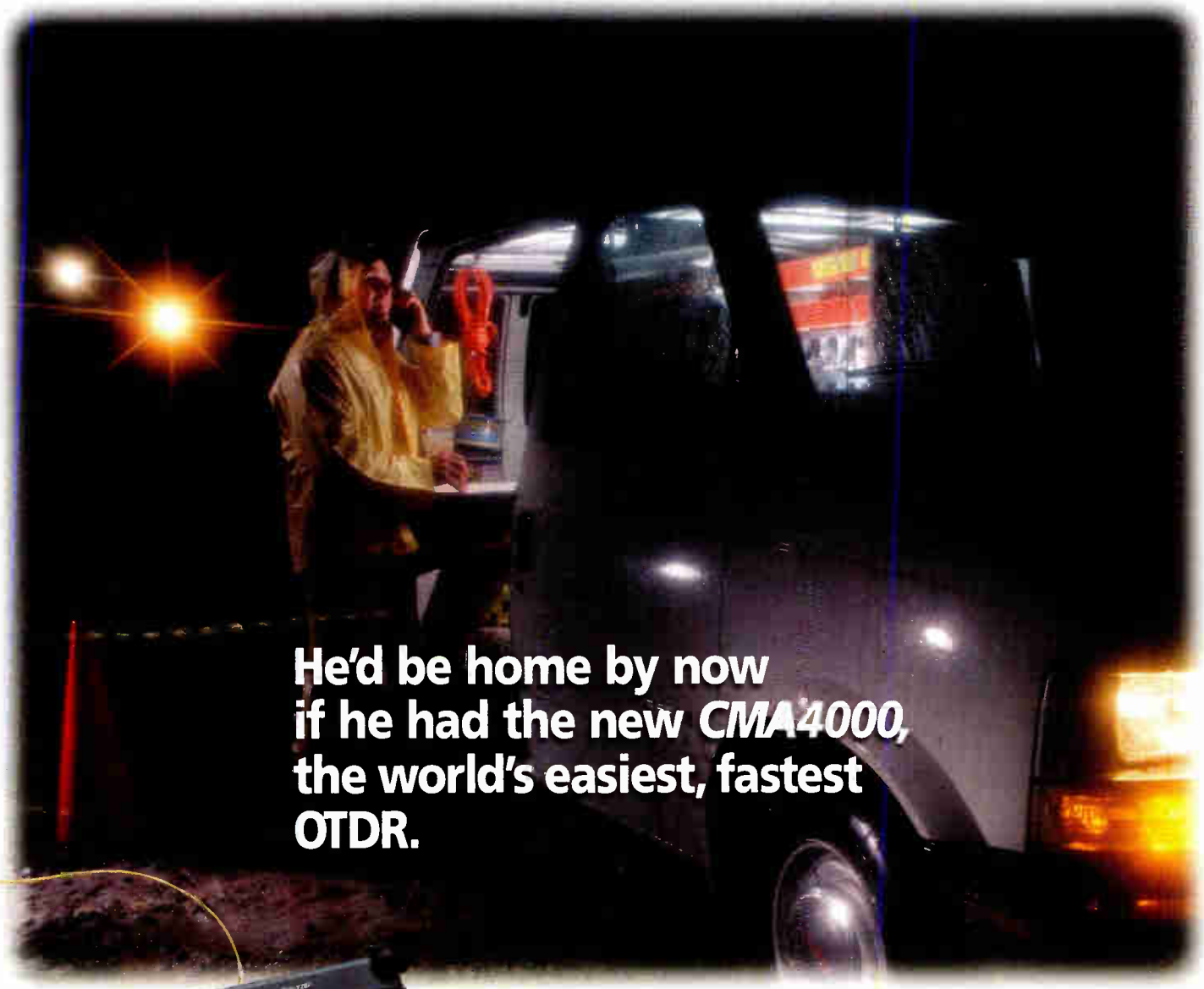
b. A drop-off report is generated that reflects the history of those who become customers after being found to be illegally connected. As many as 40 percent of the residents who become cable customers do so to get rid of the sales representative. These "new customers" never follow up by paying their monthly statements. The drop-off report provides information for a re-audit of these homes and the information obtained may lead to litigation. The obtained data is the same as that in the 30-day and 60-day reports.

c. Additional reports contain information regarding tag changes, customer discrepancies, address corrections, parts usage and time allocation. These reports are available because of the significant data collected in a system-wide tap audit.

d. Return on Investment. Evidence is available from the Milwaukee experience to show a 9-14 month payback on a tap audit using a tool such as the Monitor.

Implementation and installation

Step 1. When necessary, an interface relationship



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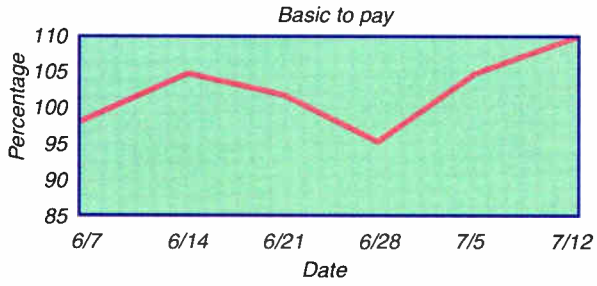
is established with the cable system's database vendor (i.e., CableData, ISD, CSG). If no vendor is present, then the interface is established directly with the system.

Step 2. The cable system's database files are cleaned up and standardized for effective use by the Monitor's optimum routing program.

Figure 15: *A post audit tracking report on marketing trends.*



Step 3. The Pentium PC and Telxon hand-helds units are loaded with customized programming.

Step 4. BDG personnel arrive on-site to install equipment, train tap audit manager on how to develop routes and create reports. Field training is provided to field auditors.

Figure 16: *Financial analysis.*

Theft sweep	$1,421,000
In-house expenses	$514,000
Contract sales	$473,000
Hardware	$53,000
Software	$125,000
Total	$2,586,000
Cost/passing	$7.56
Cost/connect	$146

Step 5. Support and daily follow-up are provided to tap the audit manager for the next several weeks to ensure correct usage and understanding of the product and its processes.

Step 6. Additional services available to the cable system include the training of marketing/sales representatives on how to close a sale.

Product functionality

Tap audits have typically been performed in the field using greenbar or "street sheets" derived from reporting systems available from the many varied host billing systems. Most of these systems are limited in their ability to deliver highly functional street sheets to the tap audit manager in a timely manner.

Figure 17: *Calculation of project return (Based on $2,586,000 investment).*

50% retention = 13.5 month payback
60% retention = 11.3 month payback
70% retention = 9.7 month payback

An auditor was then dispatched and instructed to, in one of many fashions, indicate on the street sheet whether or not the address was connected to the cable plant. Other information was sometimes required (such as tag number changes); however, the information seldom benefited the system because administrative staff for terminal input into the billing host was limited or non-existent.

These street sheets were then returned to the tap audit manager or other administrative personnel who manually developed reports that were normally turned over to the marketing/telemarketing/engineering departments in hopes they would reach fruition.

Obviously, there are many problems in this methodology.

1. Reams of greenbar being sent into the field with a number of crews stand a chance of being lost or destroyed with no easy way of comparing the street sheet results to the database to discern whether all homes had actually been audited.

2. The creation of reports was very labor intensive and subject to human error, i.e. translation of other people's writing and abbreviations, etc.

Functionality of Monitor system

The Monitor system enables the audit manager to select and load a route within a matter of minutes instead of having to request a route through the host billing system and wait for several more days to receive the street sheets. The Monitor's menu allows the audit manager to select the route(s) either by street name and/or range or by the mapping program.

By selecting the "Routing" button, the option of building a route by street name and/or house range or by the mapping program is offered.

The mapping program is from ESRI (used by UPS) and allows the audit manager to build the route by selecting an area on the map. Addresses in the billing system are identified by a red dot. The mapping system can zoom into an area, selects the desired area, then transfers the information to the routing screen.

Once the route is built, it is downloaded into the Telxon PTC-912 handheld computer with a single click on the download button.

Once the information has been gathered into the handheld, the routes are then downloaded into the PC. An average route of 150 addresses takes two to three minutes to download. The information is then matched against the information in the PC database (which is refreshed daily with status changes from the host billing system). The reports are immediately ready for printing and distribution.

Monitor product has been created through field experience by cable people for cable television companies. The author spent months taking software programmers and networking experts into actual tap audit field situations and into the offices to experience actual tap audit administrative functions. From this experience, the Monitor product was created. CED

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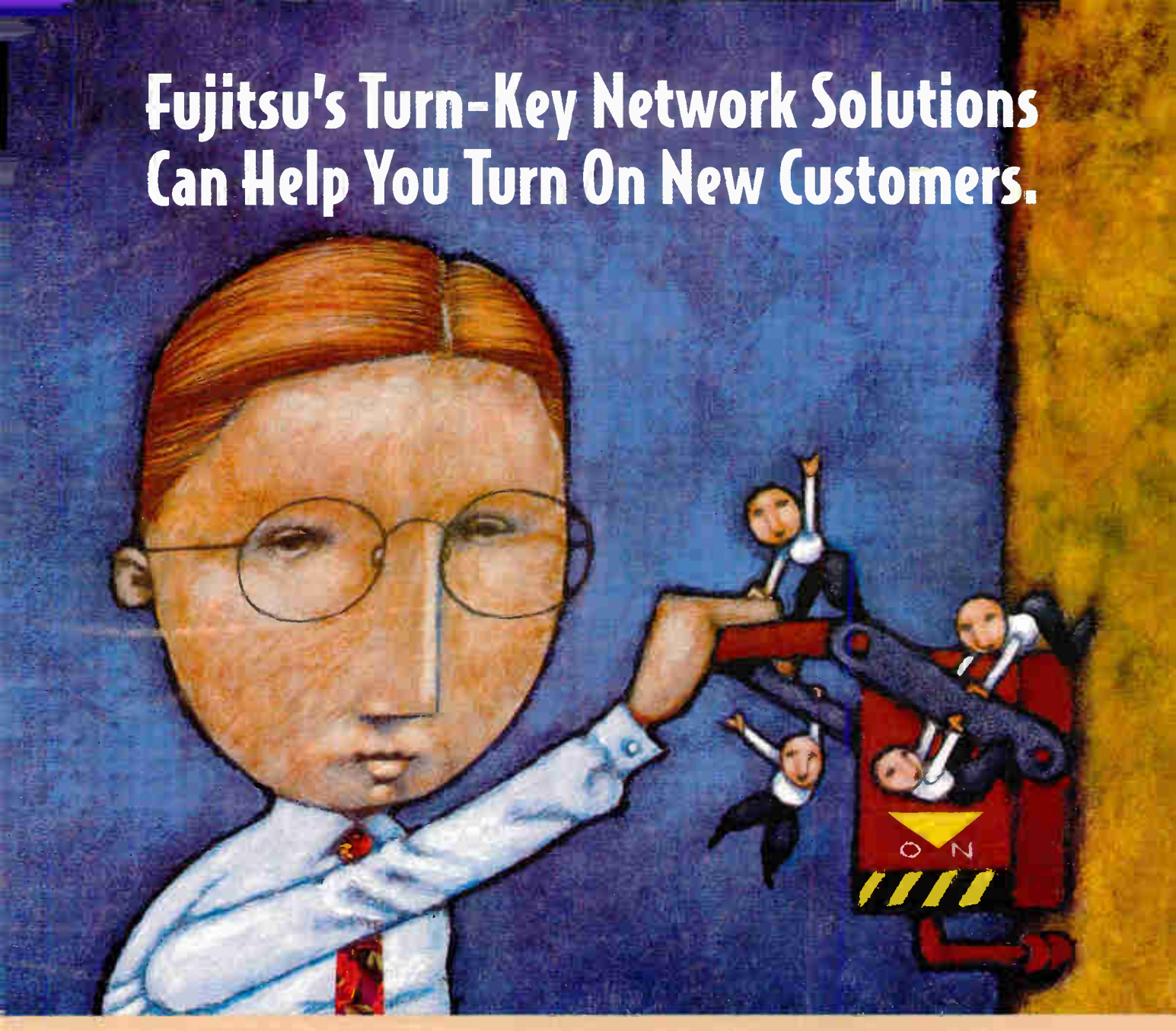

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The DTV process has begun—Where are cable operators?

Solving the digital puzzle

ILLUSTRATION BY MIN JAE HONG, SIS

By Andy Paff, President and CEO, Integration Technologies

The FCC has announced the conclusion of its Fifth Report and Order regarding digital television (DTV). This exercise is intended to be the catalyst for broadcasters to enter the competitive digital world while maintaining "free" programming to the public. The Commission has effectively pushed many of the complicated technical and marketing issues back to the broadcasters. The Commission has also started the implementation clock, which runs through the year 2006, when analog NTSC broadcast delivery is ended.

While the implications for the broadcasting industry are staggering, the implications for the cable television industry go well beyond yet another multi-channel competitive threat.

The time to consider the effects is now, so that the industry can position itself favorably during the implementation process. Very little in the Report and Order appears set in stone, and substantial change along the way is inevitable.

This article is intended to provide a brief overview of the DTV process and to raise a few key issues for the cable television industry to ponder.

A brief overview of the DTV process

The Commission will provide established broadcasters one six-megahertz broadcast channel for digital programming, in addition to the current analog NTSC channel. Each broadcaster will decide whether to provide one high-definition television (HDTV) signal, or multiple digital program streams. One of the digital program streams must be "free," but does not have to be a simulcast of the analog programming. In a strange twist, Chairman Reed Hundt, in his April 3, 1997 statement[1], referred to a "reverse simulcast" requirement of the digital programming on the analog channel for the last few years of the transition. This leads to the question: Which digital channel gets simulcast, assuming multiple programs?

The real loser here appears to be HDTV, which was the original impetus for this whole process. By creating the incentive to develop new revenue streams through multiple programming, the broadcasters have little to gain by pursuing a single HDTV program strategy. Remember the "one free digital channel" requirement? The technical standard, known as the ATSC-DTV Standard (Advanced Television Standards Committee–Digital Television), includes both high-definition and standard-definition formats. Presumably, it will be possible to move from single HDTV to multiple DTV programming without separate encoding, decoding, editing and server platforms.

The cable industry was barely mentioned in the Fourth Report and Order, except to note that "cable interests" consistently argued against mandatory transmission standards. The broadcasters and equipment manufacturers effectively argued that "only a Commission-adopted standard will provide the certainty needed by all parties to undertake the transition to DTV"[2]. This says much about competitive positioning and market adaptation realities, and it also reflects the historical philosophical differences between the cable and broadcast industries.

It appears from Chairman Hundt's comments that the Committee was lobbied hard by strong factions of the broadcast, film, consumer electronics and computer industries regarding video format. Microsoft Corp. was specifically mentioned as being especially helpful in pointing out the benefits of progressive scanning and square pixels. As a result, the FCC, in its Fourth Report and Order for DTV, specifies the ATSC-DTV standard for all layers except video format. Issues such as program aspect ratio and interlaced vs. progressive scanning will be decided in the marketplace.

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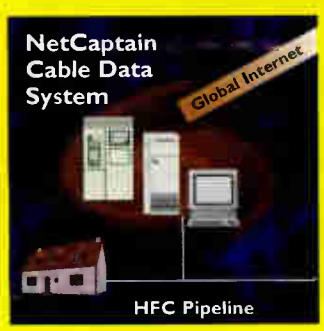

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The official justification for providing broadcasters free spectrum for digital broadcast involves the concept of "spectrum recovery," which is similar, one supposes, to the IRS referring to our taxes as federal government income. This, in essence, means that the broadcasters will give back the analog spectrum at the end of the 10-year transition period.

Through careful allotment, the Commission says it will recover a net 138 MHz (60 MHz immediately and 78 MHz in 10 years). Channels 2 through 51 will be utilized for core DTV spectrum during the transition. The Commission stated in its news release that at the end of the transition period, either Channels 2 through 47, or Channels 7 through 51 would be specified for DTV.

Net spectrum recovery is accomplished by limiting channel assignments above Channel 59. Fewer channels are needed as a result of the propagation and interference characteristics of the new digital transmission plan. The recovered bandwidth, according to Hundt, will provide enormous benefit for the public through assignment or auction. It is important to note that for this plan to work–and the program justification to be valid–analog NTSC broadcast must die.

Impact on cable television

Reactions from the cable industry have generally focused on the competitive ramifications of the multi-channel programming scenario. Given the many complexities associated with the new opportunities and existing competition facing the industry, it is not difficult to understand the somewhat muted interest in the DTV process. However, this is a process that is as prime for exploitation as it is generating threat.

One must first consider the world in the year 2006 and believe that the major tenets of the Commission's plan remain intact. While this might be the least likely outcome, it represents a defined starting point where many large interests are currently focused.

The death of analog NTSC broadcast television and the emergence of multi-channel broadcast programming portend several interesting items regarding video entertainment in general, and cable television in particular:

✔Digital television sets or consumer-purchased convertors will be universal.

✔No relevance between traditional station ID (channel number) and broadcast frequency.

✔No technical reason to deliver any analog NTSC to the home.

✔Cable, satellite and pre-recordings may be the primary source for HDTV.

✔Broadcast stations will either compete individually with 6 MHz or collectively through a third party.

✔If DTV, cable and the consumer electronics standards are in sync, the cable and broadcast digital set-top becomes extinct over time.

Assuming that cable operators and program companies have the appropriate level of access control, moving the digital decoding, memory storage and RF demodulation functions into the DTV set should be positive for everyone. The degree of good cheer will largely depend on how the DTV and cable's digital video standards develop. While the initial cable digital video platform and the ATSC DTV standard share certain aspects of the MPEG-2 video standard, they are by no means identical. For example, the data transport and physical (RF modulation) layers are different. The DTV standard contains latitude for market-driven definition of video format, but is very tight in other areas.

The long-term view for cable must include full compatibility with consumer electronics while maintaining viable controlled access by the customer. Anything less is a potential disaster for the cable industry. Remember how "addressable basic" was received by owners of

Canadian cable reaction to U.S. DTV standard

By James Careless

"What, me worry?" This seems to sum up the attitude of many in the Canadian cable industry when asked about the FCC's new DTV standard. There are three reasons for the indifference noted by *CED*. First off, "We just got the go-ahead to go into local telephone competition," says Sylvie Powell, a communications consultant representing the Canadian Cable Television Association. Although this represents a major opportunity for cable, it comes with a price–namely the end to the industry's monopoly on video distribution. Starting next January, competitors such as the much-feared telephone companies are going to be allowed onto cable's turf; compared to this threat, DTV is definitely "small potatoes."

McEwen

Second, the DTV process currently underway in Canada—spearheaded by the joint industry-government Digital Television Task Force—is one that includes cable in its ranks. What makes this significant is that Canadians like to get everyone onside before they set new standards; whatever happens, cable isn't likely to be left out in the cold. By the way, the reason that Canadians are so cooperative "is because the market is much smaller, and the geography is much more daunting," says Task Force Chairman Michael McEwen. Certainly, awareness of this fact has been the hallmark of Canada's transition to digital radio, which is beginning commercial service this fall using the European-designed Eureka-147 system. The selection of Eureka as the Canadian standard came from seven years of close cooperation between government, public and private broadcasters through a task force that mirrored McEwen's, with more harmony among the players than one sees in most families.

Finally, what may well be keeping Canadian cable calm—in addition to the fact that they've got other more immediate dangers like the telcos to worry about—is the knowledge that over-the-air DTV will probably be no more threatening to the industry than analog. This is because Canada relies heavily on the U.S. for much of its programming, with signals either having to be captured using high-gain terrestrial antennas or via satellite. Hence, most Canadians will still have to rely on cable–or some other distribution system– for access to U.S. DTV programming. This reality, combined with the fact that off-air DTV is an expensive proposition for broadcasters, has people like Shaw Communications COO/President Jim Shaw Jr. seeing the new medium as an opportunity, rather than a threat. "We're already moving to digital," says Shaw, "so we're looking for more digital product." In fact, he suggests that broadcasters might be wise to start out by feeding digital signals to cable first, holding off on over-the-air transmissions until enough people own DTVs to justify the expense.

Whatever the reality, one thing is clear: Canada will follow America's lead on DTV. "I think the trick is looking at the technology and looking at their production and roll-out issues, and then tailoring them to our specific geography, marketplace and cultural needs," says McEwen. However, Canada's emphasis on cooperation may well shield Canadian MSOs from any potential threat DTV poses to U.S. cable.

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cable-ready television sets in the 1980s? In January 1997, the NCTA and the Consumer Electronics Manufacturers Association (CEMA) announced—following years of intense debate—definition of an advanced interface which provides consumers with access to the inherent features of their equipment while maintaining the cable operator's secure delivery.

The announcement indicated that this solution will extend to the "digital environment, future cable services and other media transmissions"[3]. It is not apparent that this effort is tied into the ATSC DTV process in any way, but at least there is some positive dialogue between all the parties regarding issues of compatibility. If digital video through cable is not compatible with future DTV sets, the cable industry service will suffer the same kind of cost and consumer "unfriendliness" problems in the future that the DBS industry is faced with today. It is possible that the DBS industry (particularly Primestar, which will require a "cold start" upgrade at some point) will adapt to the DTV standard if there are cost advantages.

It must be emphasized that cable compatibility with consumer equipment is a long-term requirement. Consumer acceptance of digital receiver equipment will take time. Early deployment of digital video services for the cable industry can, and should, proceed as quickly as the market dictates. However, if the cable operators do not pay attention to ATSC DTV and participate at some level in the process, the convergence with cable television's digital platform will not occur.

In the end, the cable operators may need the same regulatory leverage that the broadcasters have exercised to ensure interoperability and a level playing field. Proactive work in the early years will reduce the scope of regulatory involvement considerably, maybe even eliminate the need. There will be areas where the cable industry will wish to depart from the current DTV standard. The digital modulation format, for example, should be optimized for maximum bits/Hertz, given cable's closed network as opposed to the broadcast environment. How do we keep the option for high bit-rate digital modulation techniques, such as 256 QAM, and not require an external demodulator in the DTV set of 2006?

This is not just an issue of customer friendliness. The major competitive variable for digital entertainment delivery will be overall cost. The cable industry enjoys a significant advantage in terms of one key cost element: bandwidth. The industry must work to insure that it does not give up any of this advantage through its predilection toward closed, proprietary transport systems.

The HFC architecture

For the past few years, cable television has been trying to "justify the wire." New, interactive applications are in their infancy, along with broadcast digital video services. All of these services attempt to take advantage of the enormous bandwidth inherent in hybrid fiber/coax (HFC) systems. The struggle today is one between tangible (and larger than expected) investment vs. unconfirmed, but promising, cash flow. Looking at the current cost issues facing cable operators, several areas appear to be of universal concern:

✔Sub-low return path ingress (cost of tightening plant and keeping it working)
✔Cost of application hardware (e.g., digital set-tops, modems, etc.)
✔Back room and related support not required in traditional cable service
✔Bandwidth upgrade (traditional, on top of everything else).

If one believes in the Commission's year 2006 vision, there is much in the way of good news relative to these 1997 issues. The elimination of broadcast analog NTSC should—presuming satisfactory resolution of the standards issue—enable cable operators to engage in a little "spectrum recovery" of their own. This process can be balanced with market-driven opportunities, such as providing some analog delivery for the analog television sets not yet retired. Cable operators will utilize more advanced digital modulation techniques and statistical multiplexing to provide even more digital bandwidth than the current ratio expected today of six digital programs for each analog NTSC program.

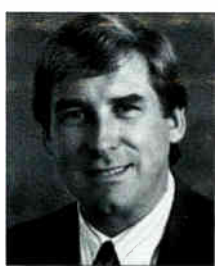
With bandwidth abundance and no logical reason to worry about where Channel 2 begins, the industry can attack the sub-low return issues. Defining a more symmetrical forward/return split will solve many, but not all, of the difficult ingress problems experienced in the sub-low split. Today's return path hybrid amplifier typically provides 5 MHz to 200 MHz capacity, and the return path bandwidth is defined by the cross over filtering. Now is the time to define a future alternative return path split. If it is done right, systems going in today can be designed for future upgrades that are modest in cost and as unobtrusive as possible.

The cost implications for HFC plant extend well beyond the return path issues. Bandwidth upgrades have always been driven by NTSC carrier load and relative performance specifications. Operators are now beginning to implement digital modulation, where carriers have more consistent power over its bandwidth, but are limited in overall amplitude to 6 dB below the analog video carrier. Data recovery from QAM will require much less in carrier-to-noise (C/N) ratio and distortion performance than analog NTSC (e.g., C/N 30-36 dB, depending on bit constellation, vs. C/N 48-50 dB for analog video).

The design implications for an all-digital, more symmetrical return path HFC design will be important. We can assume that by relaxing traditional analog performance specifications there will be a positive impact on overall cost. However, it is likely that some of these savings will go toward plant hardening costs, connectors, drop systems and other little things in large numbers. New elements, particularly back room support systems, will require investment to move beyond traditional cable service. How all of this shakes out for both the technical and business models will depend on what we know and how we apply that knowledge over the next 10 years.

Summary

Regardless of what the DTV vision becomes (and it will likely be much different than what has been proposed), the process has begun. The cable industry must participate aggressively for both defensive and offensive reasons. Using the Commission's current plan to justify and obtain the right to carry the DTV signal at any frequency on the HFC plant, utilizing any modulation format, is one area of immediate concern. There will be other, thornier issues, such as DTV "must-carry" and consumer equipment interoperability, which will ultimately define cable's strategic direction and success. The Commission has put a great deal of its process rationalization on private sector market forces. It has also put a great deal of process justification on spectrum recovery and the end of analog NTSC broadcast. In that milieu, both opportunity and disaster lurk. The process has started. CED



About the author

Andy Paff is president and CEO of Integration Technologies, based in Englewood, Colo.

References

1. Federal Communications Commission, "Separate Statement of Chairman Reed E. Hundt RE: Adaptation of Digital Television Allotment and Service Rules Reports and Orders," 4/3/97.

2. Federal Communications Commission, FCC 96-493, "Fourth Report and Order," Section III, 12/14/96.

3. Consumer Electronics Manufacturers Association, press release, "CEMA & NCTA Solve Cable Compatibility Dilemma for Consumers," 1/15/97.

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Front panel microphone input	Yes	No	Yes
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Pre-programmable weekly test for unattended operation	Yes	No	No
Weekly & monthly test via telephone for remote operation	60 seconds	25 seconds	Optional 10 or 40 seconds
Separate audio storage for secondary (tune to) announcement	Yes (if required by FCC)	No	No
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Provides audio and video information on all channels on the cable system. Text appears full screen. To satisfy requirements of the Americans with Disabilities Act, deaf subscribers are alerted by the video information on every channel; the blind are alerted by audio on every channel.

The Advantage

Operators of cable systems with I.F. switching **already** installed for every channel may find this option cost effective. While direct input into each channel's I.F. port can result in labor intensive installation, larger cable systems serving a considerable number of deaf subscribers may realize cost savings over Configuration Option 3.

Configuration Option 2:

All Channel Audio/Video Override On All Channels

An RF solution allowing for override after the combining network

The Application

Provides audio and video information full screen on all channels on the cable system (up to 117 channels). To satisfy requirements of the Americans with Disabilities Act, deaf subscribers are alerted by the video information on all channels; the blind are alerted by audio on all channels.

The Advantage

Less labor intensive than configurations 1 and 4. The audio/video solution will appeal to cable operators whose head ends are not already IF equipped, but who wish to provide both audio and video warning on all channels. This option offers efficiency for operators of medium to large systems who estimate a relatively large number of deaf subscribers.

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Configuration Option 3:*

All-Channel Audio Override/Video Interrupt

An R.F. solution allowing for override after the combining network

The Application

Provides audio override with video interrupt across all channels, with one channel designated for both audio and video information. Video interrupt displaces the picture with a grey raster screen for short periods. To satisfy the ADA, an equivalent alerting function must be provided to deaf and hard-of-hearing subscribers throughout the system. This requirement is satisfied through separate in-home devices, such as a SAM A Receiver, that also activates deaf subscribers' strobe lights, bed-shakers, etc. The SAM receiver also carries audio alerts and voice warnings.

The Advantage

Less labor intensive than Configuration Option 1, the R.F. solution will appeal to cable operators whose headends are not already I.F. equipped. This option also offers efficiency for those who estimate a relatively small number of deaf subscribers on their systems.

**This option may be modified or deleted by the FCC's second report and order.*

Configuration Option 4:

Audio/Video Crawl On All Channels

A less intrusive solution for cable systems that wish to crawl emergency messages over program video

The Application

Provide audio and video emergency information on all channels on the cable system. The video information appears as a crawl at a location on the screen that does not interfere with closed caption messaging. To satisfy requirements of the Americans with Disabilities Act, deaf subscribers are alerted by the video crawl on each channel. Blind customers are alerted by the audio message on every channel.

The Advantage

Operators of cable systems that choose this option will be able to provide emergency announcements and test messages in a less intrusive manner than other options that produce a full screen interruption. While direct interruption of each channel's base band audio and video results in a relatively labor intensive installation, larger cable systems that serve a large number of deaf customers may find this option more desirable than ones that require the installation of in-home receiving units for deaf customers. While this "crawl" option is more costly than those that depend on full screen interruption, the less intrusive nature of a crawl may pay for itself in improved customer relations.

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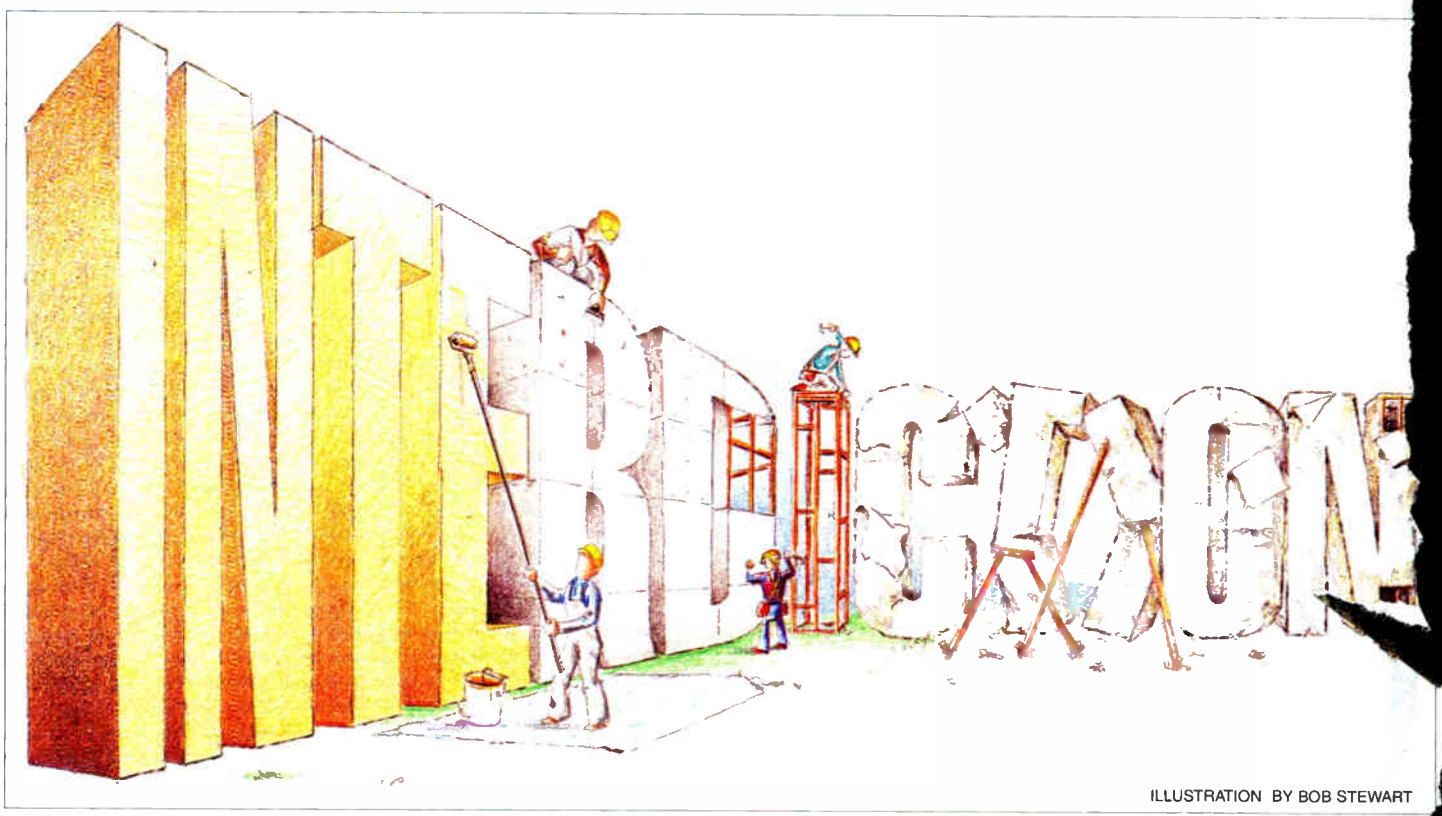

ILLUSTRATION BY BOB STEWART

Whole-house service gets a face-lift

Competition drives a renewed interest

By Roger Brown

As cable operators begin to grapple with competition from myriad sources, one thing has become abundantly clear: they have to effectively market their service. When cable was the only game in town, marketing took a back seat to network operation and maintenance; with deregulation came competition–and to stay one step ahead, cable systems have to tout their advantages and educate consumers.

As a result, some cable systems are rethinking an old concept: whole-house service. With it, a cable operator can offer the entire spectrum of video channels, data services and music without a set-top box. This is appealing because TV/VCR combinations are easier to wire, consumers can use their own remote controls, and features like picture-in-picture are restored.

Consequently, systems like interdiction and broadband descrambling schemes are getting a new look from companies that may have dismissed the very same technology just a few years ago.

James Reynolds, president of Mid-Hudson Cablevision in New York, is one new convert. "Quite frankly, we were nervous back around the time we decided to go with interdiction because there weren't that many people using it," he says. "And the economic model doesn't make sense to an accountant when he compares it to an analog set-top model, but interdiction is a good competitive weapon against services like DirecTV."

Reynolds currently has about 200 miles of his 600-mile hybrid fiber/coax plant interdicted and has been using the technology for about 18 months, he says. In addition to reporting greater pay lift, a reduction in piracy, tremendous operating cost savings and reliable hardware, Reynolds says his customers are ecstatic.

"I never realized how many subscribers think set-tops are a nuisance," he says. "I don't think they'd care that much how the signal was delivered to them."

By being able to remotely turn service on and off, Reynolds has been able to redeploy his service staff to upgrade and troubleshoot the plant instead of doing installs and downgrades, too. "The full suite of interdiction's benefits don't become clear until after it's installed," he says.

The "old" story

Industry veterans will recall that interdiction achieved some minor success several years ago in places like Williamsburg, Va. and Elgin, Ill., when Warner Cable and Jones Intercable trialed the systems. Consumers gave the technology a "thumbs up" because of its convenience, and the operators reportedly enjoyed reduced maintenance and service costs because the system was 100 percent addressable and therefore remotely configurable.

But three large obstacles, other than simple inertia, conspired to keep interdiction from supplanting the ubiquitous analog set-top.

First, the hardware was more expensive, per

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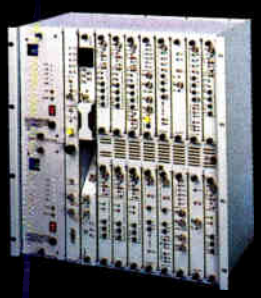

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home, than a set-top. It was also necessary to cover an entire service area with the system, as opposed to the "pay as you go" approach that set-tops offered. In other words, an operator had to spend capital on every home he passed, whether the home subscribed or not.

Second, the system required significantly more power to run than a traditional system. With an interdiction unit that serves several homes, the operator not only needed more power supplies than a conventional system, but he had to foot the bill, too.

Finally, and perhaps most importantly, MSOs were enjoying significant revenue from remote control rental and additional outlet charges. In the case of large operators, remote control rental revenue amounted to tens of millions of dollars annually and would be reduced to zero if interdiction was installed.

As a result of these factors, plus a few others, the technology never caught on beyond a few niche applications like multiple dwelling units, hotels/motels and other highly transient areas.

"The 'old' interdiction story was that it was consumer-friendly, it saved operators (operating) expenses and eliminated the possibility of pirate boxes," recalls David Alsobrook, director of interdiction for Scientific-Atlanta. "The key roadblocks were its high capital costs and the remote control revenues."

Already, several private cable companies are buying into interdiction to distinguish themselves from cable TV providers

Today, the technology hasn't changed much–but a number of other things, including market forces, have.

Most MSOs now have more addressability in their systems than they did at the beginning of the decade. Also, operators are installing, on average, 1.8 set-tops in every subscribing home, according to Alsobrook. Combine that with some technology updates (more passband and the ability to scramble more channels) and a pricetag that is actually less than it was five years ago, and suddenly, interdiction makes a compelling economic story. "That's a huge, huge swing factor," notes Alsobrook.

Although the arguments for interdiction are perhaps more compelling than in the past, the fact is that it doesn't work everywhere. The economics play out best in areas of high density, including apartment complexes and other MDUs.

Already, several private cable companies are buying into interdiction as a way to distinguish themselves from both traditional cable TV and DBS providers, says Bob Palle, executive vice president at Blonder-Tongue, the New Jersey-based manufacturer that competes with S-A in interdiction. "These companies have systems that are separated by many miles of 'drive time', and the economics of interdiction blow everything else out of the water."

After finding success in the private cable industry, Blonder-Tongue is preparing to evangelize on interdiction's benefits to traditional cable operators, where the same economics can play out in some locations. "We want to

Different means to the same end

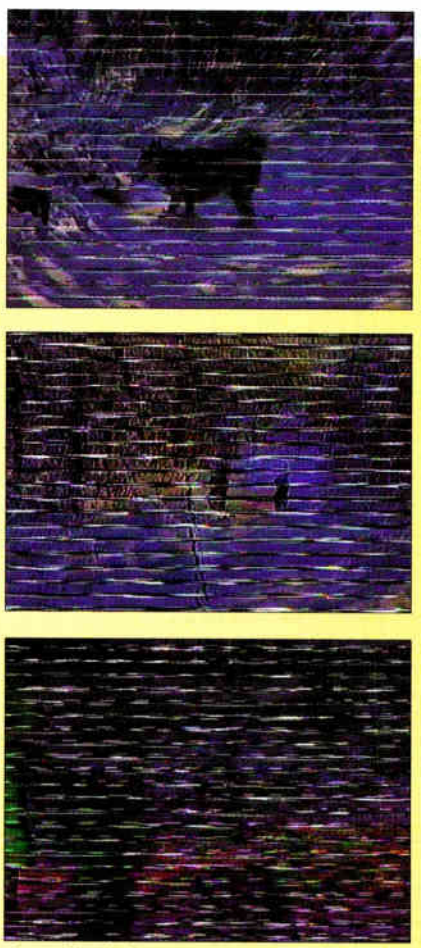
They both might be "whole-house" service approaches, but interdiction and broadband descrambling work in different ways. In general, interdiction is sent from the headend and out over the network in-the-clear to a device that injects a jamming carrier over those signals the subscriber is not authorized to receive. A broadband descrambling system, conversely, sends scrambled signals out over the network, and the device in the field descrambles the services the customer has paid for.

With interdiction, the effectiveness of the scrambling varies by the amount of "dwell" time the jamming oscillator spends on a certain channel. In other words, the fewer channels that have to be interdicted, the better the jamming.

Scientific-Atlanta's system passes up to 750 MHz in the forward direction and from 5 MHz to 40 MHz in the reverse. It can jam any or all channels between 13 and 78 and is compatible with both 60- and 90-volt powering schemes. Five oscillators are dedicated to each subscriber. The product line consists of four- and eight-port units.

Blonder-Tongue's system, which includes a single-home unit, shares up to 16 jamming modules between multiple subscribers, which gives operators more flexibility in cost and channel lineups, according to B-T officials.

Motorola's broadband descrambling system uses a "VideoFolding" scrambling scheme that is incompatible with any of the typical sync suppression scrambling methods used in most cable systems. The receiving unit can descramble up to 57 analog channels simultaneously, and any number of clear channels, up to 1 GHz, can be passed through.



Interdiction's jamming effectiveness varies depending on the amount of time the oscillator is allowed to spend on the signal. Shown at right are three different levels of jamming and their effects.

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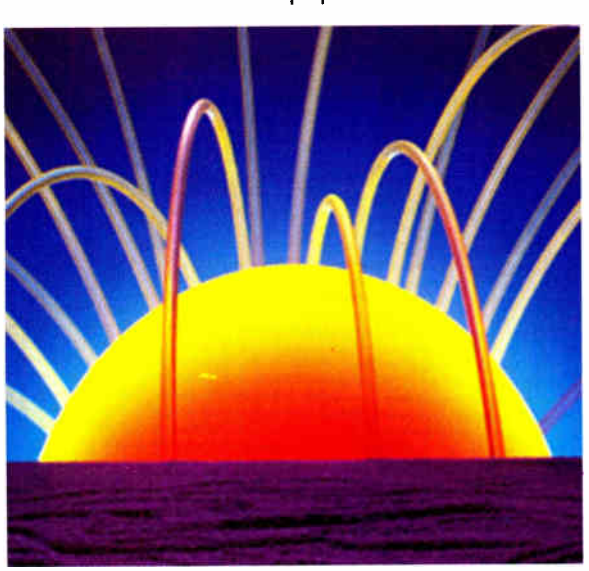

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say in a very loud voice that we're ready to deliver our system," Palle says.

To prove his point, Palle notes that Pacific Bell Video Services chose B-T's interdiction system over similar technology from both S-A and AT&T (now Lucent) following a thorough evaluation. And although it appears PacBell's video plans have been halted pending the merger with SBC Communications, the contract provided a huge shot in the arm to the company.

B-T has also found success in the private cable market, deploying systems to about 18 operators of varying sizes, including Cable Plus Co. of Washington, which just signed a five-year, multi-million dollar order. Why are they signing on? Because those operators have to compete with established traditional cable operators, and they need a differentiator. Interdiction, with its customer-friendly features and addressability, provides the competitive leg-up those operators need, Palle says.

Palle and his crew are now hoping for a chance to prove themselves to a traditional cable MSO. "If the people sit down and really listen to what we have to say, we have a fighting chance," he notes.

As for the technology's detractors, Palle has a few responses:

✔Regarding power, he concedes that the units do need power to run, but notes that with side-of-home units, the consumer pays for it.

✔Unlike his competitor's product, Palle says his company's system is a unity gain device and is therefore less intrusive and simpler to install because it doesn't require a complete system rebuild.

✔Is the system prone to theft because signals are sent in the clear and then denied at the port? "This makes me laugh," Palle says. "You'd have to invade the feeder lines, and that's a pretty brazen thing to do. That seems pretty far-fetched to me."

"I don't think any of those arguments make sense anymore," sums up Palle.

Broadband descrambling

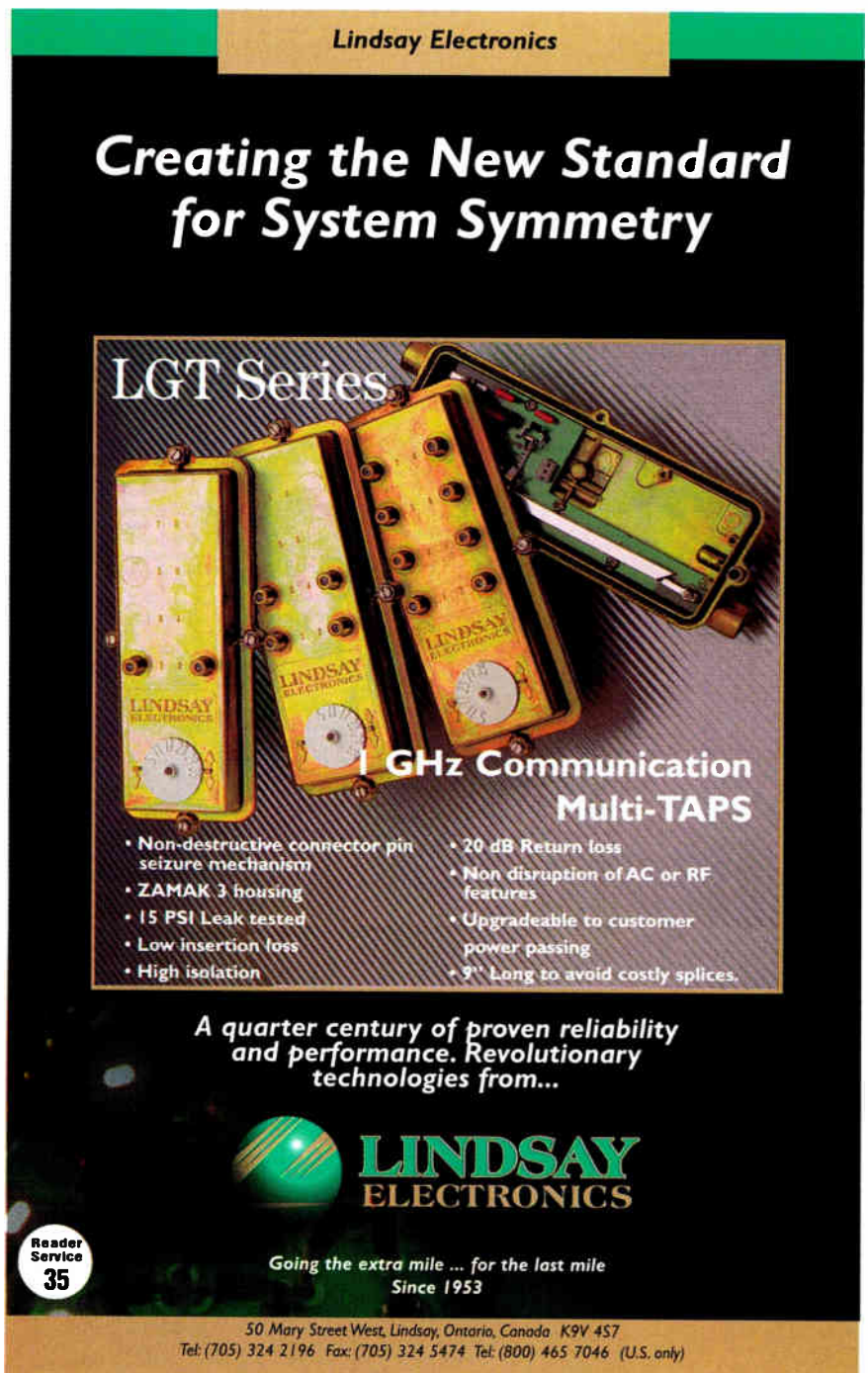
A technology that offers similar benefits, yet is radically different was shown in Motorola's booth during the National Cable Show in March. Dubbed "HomeClear," the system provides each home with the full spectrum of services, but unlike interdiction, scrambles each channel at the headend (see sidebar).

Based on technology from Multichannel Communication Sciences Inc., Motorola's system is presently being field tested to a small number of homes in Time Warner's nearby San Diego cable system. Although the test will soon be expanded to include more homes, it shouldn't be assumed that Time Warner is ready to purchase the technology, says Roger Kramer, vice president of engineering in San Diego.

However, that doesn't mean the MSO isn't interested, either. In fact, Kramer says such a system would be beneficial for serving large apartment complexes. "The technology has proven itself," says Kramer. "There are no technical impediments" to using it, he adds.

"There's a demand for a consumer-friendly approach," agrees Jeff Huppertz, director of broadband video systems in Motorola's Multimedia Group. "And operators want to solve that in a way that makes sense, even with a digital set-top."

Huppertz describes operators as quite interested in the whole-house concept. "The response (to HomeClear) has been very solid," he says. "We're finding that cable operators are being very careful and examining just how it could fit into their overall strategies." CED



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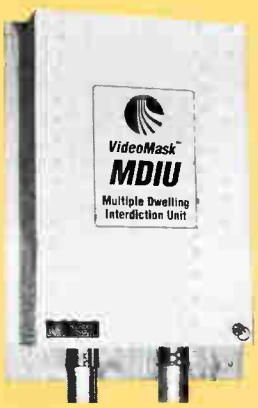

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TCI redefines itself

$1.7B readied for new services (again), charts new upgrade path

By Leslie Ellis

While the overall health of the cable TV industry has largely been good lately, spurred on by competition from myriad other video providers, a wild card known as Tele-Communications Inc. has been on the table for several months now. As the country's largest multiple systems operator, TCI is often considered to be the bellwether of the industry's fortunes, whether they be good or bad. And with its well-documented financial struggles of late, many observers have been wondering if TCI's bad luck would soon begin to rub off on the entire industry.

Instead, TCI showed signs of renewed vigor last month, saying that it will free up $1.7 billion over the next 30 months to buy fiber, bandwidth expansion gear and two-way electronics, all in an effort to prepare its aging infrastructure to accommodate new services.

The news came during two days of meetings with bankers and financial analysts last month, when TCI announced its quarterly earnings and detailed an aggressive strategy spanning all arms of the organization.

The upgrade schedule, which will cost the company just a bit under $680 million per year on average, should come as a relief to cable's hardware community. Last October, the MSO abruptly canceled equipment shipments into its three material support centers, triggering some slim times for those key hardware vendors across the nation who are inextricably linked to the nation's largest MSO.

But the spending hiatus was just one hallmark of a particularly tumultuous 12 months for the MSO, besmirched with layoffs and a wildly aggressive plan to launch three new businesses–digital video, high-speed data and telephony–and pinned to an all-new, complicated "SummiTrak" billing/network management and support system. John Malone, chairman and CEO of TCI, now refers to that plan as one in which TCI was "cascading miracles."

"We had these new product categories, plus SummiTrak, plus call centers, all of which were on a schedule which required them sequentially to come online at the same time. This is very, very difficult, if not impossible, to achieve," said Malone during an interview with *CED* sister publication *Multichannel News*, which was held in conjunction with the financial briefing last month.

"As a result, the costs of all of them were running up. Delays were setting in. And the compounding of the problems between interproject incompatibility was just getting out of hand," Malone continued.

Table 1: *Existing plant status as of March 31, 1997.*

Bandwidth	Headends	Homes passed	Plant miles	Percentage of total plant
220-270 MHz	125	423	6,554	2%
300-350 MHz	657	7,398	90,949	35%
400 MHz	89	2,502	26,261	10%
Total <450 MHz	**871**	**10,323**	**123,764**	**47%**
450 MHz	207	4,661	49,294	19%
550-750 MHz	218	8,793	89,926	34%
Total >450 MHz	**425**	**13,454**	**139,220**	**53%**
Grand total	**1,296**	**23,777**	**262,984**	**100%**
Fiber sheath miles			18,778	7%
Fiber miles			600,896	

Source: TCI

Movement at the top

Malone's first move toward finding a more reasonable way to shepherd TCI into the digital realm, while fending off DBS competition: Staffing. For starters, he hand-picked Leo Hindery, formerly the top honcho of InterMedia Partners, as president.

Indeed, over a span of four months, the revolving doors of TCI's Englewood, Colo. headquarters were spinning. Brendan Clouston, formerly TCI's CEO, was reassigned to financial activities. Other key employees, like COO Barry Marshall, Senior Vice President of Customer Satisfaction Barbara Mowry, and Liberty Media Inc. President Peter Barton, were either let go or resigned.

In the engineering department, Tom Elliot was named senior vice president of technical projects and was re-assigned to perform strategic consultation and to serve as the company's day-to-day liaison to CableLabs, the industry's research and development organization.

At the same time, TCI promoted Tony Werner to senior vice president of engineering and technical operations, and charged him with supervising the company's upgrade plans. Werner, who joined TCI about two years ago from Rogers Cablesystems, detailed the MSO's new technical plan to reporters during a press conference following TCI's briefing to shareholders last month.

Werner said the new plan is to bring all of the MSO's systems up to at least 450 MHz capacity using a hybrid fiber/coax topology, and to activate the return path so that two-way services like high-speed data can be deployed and start generating revenues.

The bandwidth upgrade to 450 MHz marks a sharp departure from other top-five MSOs, all of which are activating 750 MHz gear. Werner said TCI will actually buy 750 MHz electronics, but will not re-space existing amplifier locations to accommodate the extra 300 MHz above the mandated minimum 450 MHz.

Werner also revealed previously unavailable

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figures detailing the MSO's current plant conditions. Based on systematic research Werner conducted to give himself a snapshot he can use for plotting TCI's technological future, Werner said:

✔35 percent of TCI's systems (657 headends covering 91,000 plant miles) offer between 300 MHz and 350 MHz of bandwidth.

✔34 percent of the company's systems (218 headends, 90,000 plant miles) offer between 550 MHz and 750 MHz.

✔TCI properties are almost evenly split between those that are below 450 MHz (871 headends, 123,000 miles) and those above 450 MHz (425 headends, 139,000 miles).

✔Fiber optics accounts for seven percent of the total plant mileage.

In the coming months, TCI intends to subdivide its systems using the HFC architecture. "The plan is to put in fiber so that we're at 1,200-homes-passed serving areas, that we can later subdivide into 600 or 300-homes-passed nodes," Werner explained.

Digital TV–it comes for free?

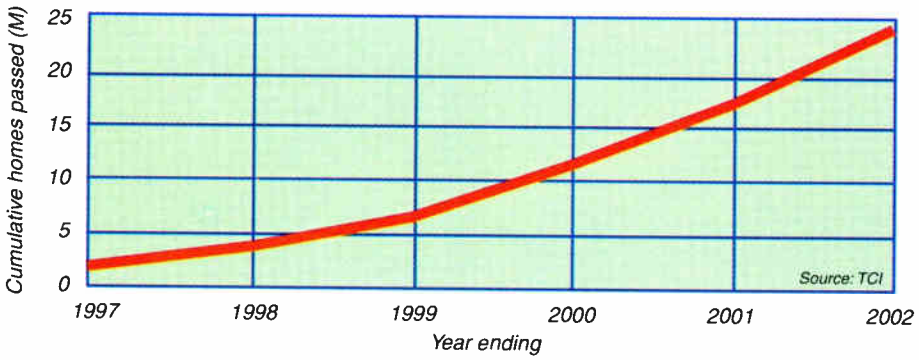
Werner and Malone both emphasized that for the MSO's new digital video package, plant upgrades aren't required because the robustness of digital video technologies means they can ride on "even the crummiest" plant.

In the briefing last month, TCI executives said that the "AllTV" digital platform–considered to be a high-end package in need of a lower-priced cousin by TCI President Leo Hindery–will be augmented by a new iteration called "digital basic." The new plan, said Malone, is to target TCI systems with three available 6-MHz channels, and give them a rack of General Instrument headend gear that enables the system to shoehorn up to 40 channels in that space. Internally, TCI is referring to that plan as "three-pack," and is also crafting "six-pack" and "12-pack" scenarios for systems with more than three open channels.

Malone said that to assuage the heady pace–at roughly three headends/day–of furnishing 600 headends with the digital basic gear by Thanksgiving, General Instrument Corp. is shipping pre-packaged racks that "makes it a no-brainer" for technical field staffers to install. "It's a big effort," Malone said, explaining that TCI assigned "40 guys" regionally, and that General Instrument Corp.–TCI's sole headend system supplier–will be shipping standardized three-channel racks. "It goes to the system and gets plugged in," Malone said.

It is TCI's exclusive arrangement with IMedia Corp., which provides statistical multiplexing equipment capable of smashing up to 17 channels into the same space that one analog channel occupies–that is the kingpin of the new strategy.

Figure 1: *Two-way activation plan.*



The schedule can be accelerated. TCI will react to the market.

Malone said the deployment plan is to first launch the digital headend gear, then allow systems to ready a marketing plan, and then deploy the digital set-tops TCI has on order from GI. Follow-on orders are likely from England-based Pace Micro Technology plc, which announced plans last month to make a set-top that emulates GI's DCT-1000 in features and functionality.

As for the pace of service roll-out, TCI's Hindery said he's confident that the plan to make digital TV available to 90 percent of TCI's 14 million customers by Christmas is possible. "We're not in the over-promising business," he said. "Labor Day will come, and we'll start to cross-promote (digital TV), and Thanksgiving will come, and we'll start to sell the product."

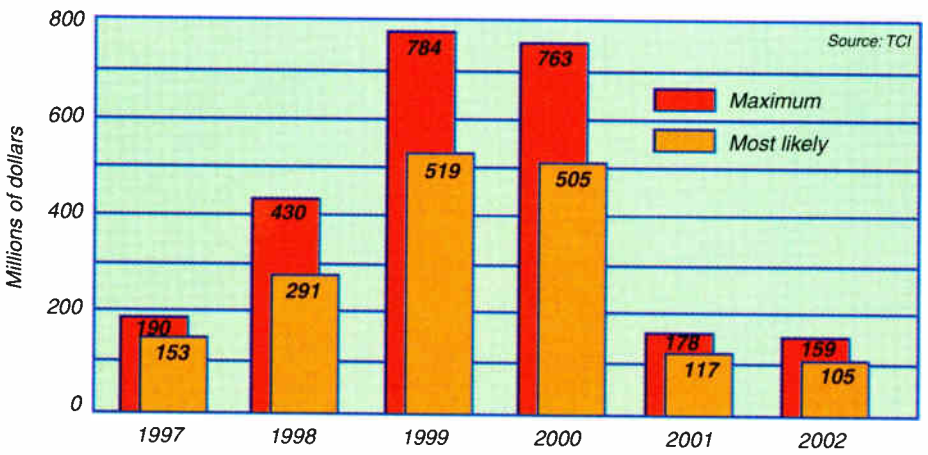
Two-way

As for the cable industry's new darling, high-speed data and Internet access, TCI is busily setting its plan in motion. Some may be surprised to find out that the MSO's plans do not include modems that feature telephone return, an option other operators have taken as a way to enter the market quickly.

Notably, only 10 percent of the MSO's 1,100-plus systems are activated to carry two-way conversations. So, why wait until the infrastructure is built instead of deploying right away? Because executives with TCI.NET, the Internet services arm of TCI, have said they can't find an economic case that supports telco-return modems.

"I don't anticipate ever using telco-return modems," except possibly in cases where TCI's remotely-located "@work" users need access to the network, said Bruce Ravenel, president and CEO of TCI.NET. "They've been over-ballyhooed," Ravenel said

Figure 2: *Upgrade capital plan. Digital headend and plant upgrade.*



- *Most likely $1.7 billion*
- *Maximum $2.5 billion*
- *The spending range is a function of existing network and market requirements.*

of telco-return modems. "The economics don't work."

TCI.NET is up and operational with its "@Home by TCI.NET" in four markets: Sunnyvale/Fremont, Calif.; Hartford, Conn.; Arlington Heights, Ill.; and now, Seattle.

Ravenel said to expect more deployments this year as the MSO plots its neighborhood-by-neighborhood push into various markets. "The strategy for expansion is to find the happy intersection of plant readiness and market characteristics, like PC penetration and demographics," Ravenel said. That means that TCI.NET's moves into additional markets will be largely gated by the amount of two-way plant TCI activates, starting in the third quarter of this year when the $1.7 billion in upgrade funds kicks in.

No more wired telephony

The afterthought of last month's discussions was RF telephony–the seemingly once-fertile market segment that made industry executives salivate over the potentially meaty monthly revenues from lifeline phone subscribers.

Not so now, said Malone.

"We will not roll out any more switched-circuit telephony–residential POTS telephony–until substantial tectonic plate shifting takes place," Malone said, adding that "regulatory certainty and a little more evolution in the silicon-based pieces of the equation, and clarity on lifeline powering (are needed)."

Malone said that powering issues necessary to support lifeline telephony are "probably the biggest hurdle." "But the reality of it is, if you do an economic analysis of it, laid on top of the regulatory uncertainties, it's very difficult to justify massive capital in that area," he said.

On the back burner

Also taking a bit of a lower profile at TCI is its "SummiTrak" integrated billing system, widely considered by TCI insiders to be one of the more expensive endeavors it attempted over the last three years. Instead, at least for its digital TV offering, TCI is counting on its traditional billing system suppliers: CableData Corp. and CSG Inc. Why? Timing.

"I signed a purchase order for the digital set-tops over five years ago. According to the contract, we're already two-and-a-half years into deployment," reasoned Malone. "So, then to come and tell me in October ('96) that I'm going to have to wait another six months because SummiTrak wasn't ready, was not music to my ears," he added.

Malone said SummiTrak won't be deployed until it is fully debugged, its economics are understood, and TCI systems demand it. "Then we'll deploy it, but not until then," he said.

Can TCI pull it off?

The TCI executives present at last month's financial briefing appeared weary, yet motivated. Hindery, a man who admittedly arrives at the office at 5:30 a.m. and frequently works past 10 p.m., consistently praised the new crew, and held up TCI's plans proudly.

> Hindery: 'I'm pleased with the sense of vitality that seems to have been embraced by our employees'

"The company's core cable business has now been restored to vitality, with an aggressive rollout of digital services, both video and data, and a strong financial base on which to do it," Hindery said. "We're very pleased with where this company is today," he continued. "I'm pleased with the sense of vitality that seems to have been embraced by our employees."

Whether or not TCI's ambitious plans prove out, of course, remains to be seen. Reaction from the financial community–which, like it or not, influences TCI's stock price and overall financial health–was mixed between mild skepticism and cautious enthusiasm.

Barry Kaplan, an analyst with Goldman Sachs, praised TCI's improved cash flow for the first quarter. However, he said that TCI needs to show that it can sustain margins after it steps up spending and adds subscribers. Chris Dixon, an analyst with PaineWebber, said that TCI's digital plans seem sensible, and that they should boost the stock price if executed well.

But, he added, "There's a sense that we've heard a lot of this before. One quarter does not a strategy make." CED

Kent Gibbons, finance editor of Multichannel News, *contributed to this story.*

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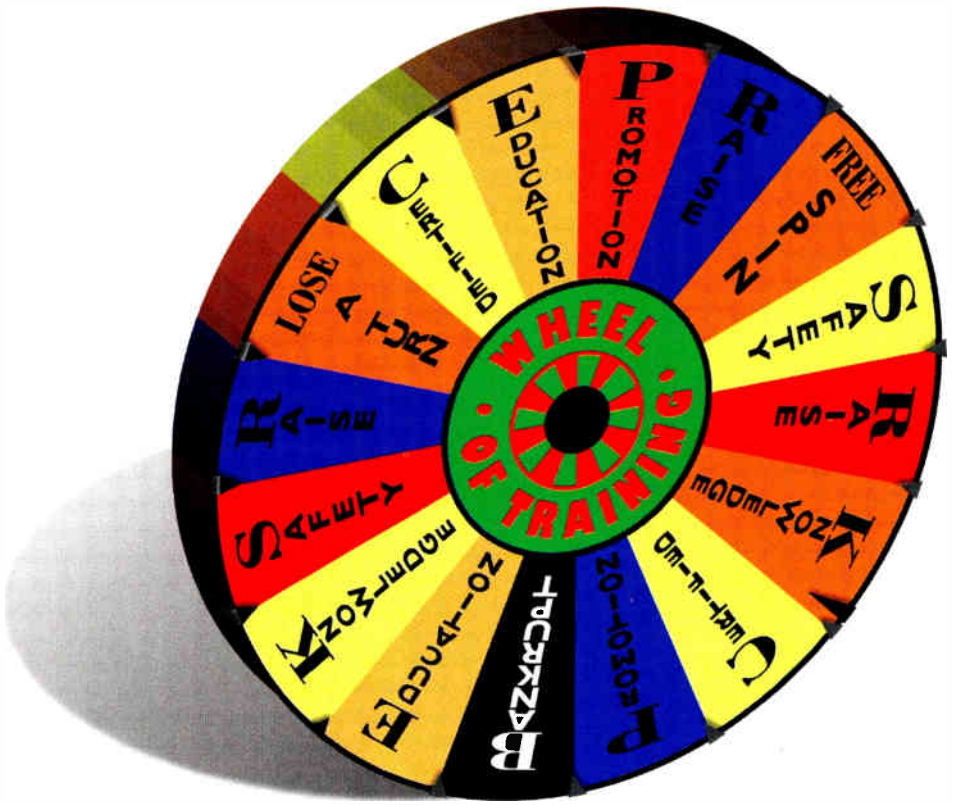
Cable's fortunes revolve around training

Focus on customer service vital to winning convergence contest



By Michael Lafferty

The days when any Tom, Dick or Mary could walk in off the street and take their chances at being a cable installer have all but ended. And with them, has gone the slap dash, fly-by-the-seat-of-your-pants training regimen that many operators found themselves using to handle those telecom tenderfoots shooting in and out the revolving installer door.

Unbridled competition and the growth of converging services are putting operators' fortunes, literally and figuratively, on the line. To win the high-stakes telecommunications sweepstakes, many industry observers and operators are quickly coming to the conclusion that it's not so much the technology that's going to win the day, but it's the people in the trenches who will bring this contest to its ultimate conclusion.

Success, it seems, rests on the shoulders of Tom, the installer/datacom rep, when he calls on a subscriber's home to hook up his new cable modem. Fortunes will be won or lost when Dick, the newest customer service rep (CSR), fields a subscriber's complaint and not only makes them smile, but gets them to sign up for the latest discounted package of services. And, the operators' bottom lines will go black for good only when Mary, the operations tech, uses her computer expertise to keep the whole system running from her control panel in the new network operations center (NOC).

To bring these workers up-to-speed, and their companies to long-term profitability, many have finally come to the conclusion that training is no longer a game that's played when there's some extra cash lying around. Instead, it's become a key factor in any future success operators may have in the go-for-broke telecommunications contest.

To get a fix on just how important training has become, *CED* contacted a panel of industry professionals and queried them on what role training will play in any future success the industry may enjoy.

Those questioned include: **Alan Babcock**, the Society of Cable Telecommunications Engineers' (SCTE) new director of training development (as well as TCI's former director of training); **Mike Dyer**, the national director of training and organizational development for Cox Communications Inc., one of the industry's most aggressive convergence contestants; **Ray Rendoff**, the National Cable Television Institute's (NCTI) director of curriculum development; and well-known cable operations expert **Joe Van Loan**, senior vice president/chief operating officer at Mediacom LLC.

What follows is an edited transcript of interviews conducted with the four panel participants.

Moving beyond the basics

CED: As service offerings expand, there are mounting demands for more training, not only on the basics of providing relatively simple analog video service, but two-way data, digital TV and a host of back office/customer service functions. What kind of impact is this having on training planning and implementation in general?

Babcock: First of all, my comment is 'Thank goodness!' It's finally woken a number of operators up into realizing they need training in the first place. I've been doing training for about 15 years in the cable industry, and I have seen a continued increase in the amount of attention and actual activity in training. And, I think it's started to grow exponentially over the last couple of years as people have talked about the new technologies and facing competition.

People are scared that the folks on the front lines don't have the skills and tools to be able to assimilate the new technologies. And consequently, they're saying, 'Gee whiz, we need to start training our people.'

CED: Do you think this fear extends to the customer relations capabilities of cable personnel?

Babcock: Yeah, I do. I know one of the areas that has gotten a lot of the attention is how we train our customers on how to use this new stuff. The old paradigm where the technician walked into the house and handed the customer the remote control and said, 'Here you go. Thanks,' doesn't work anymore.

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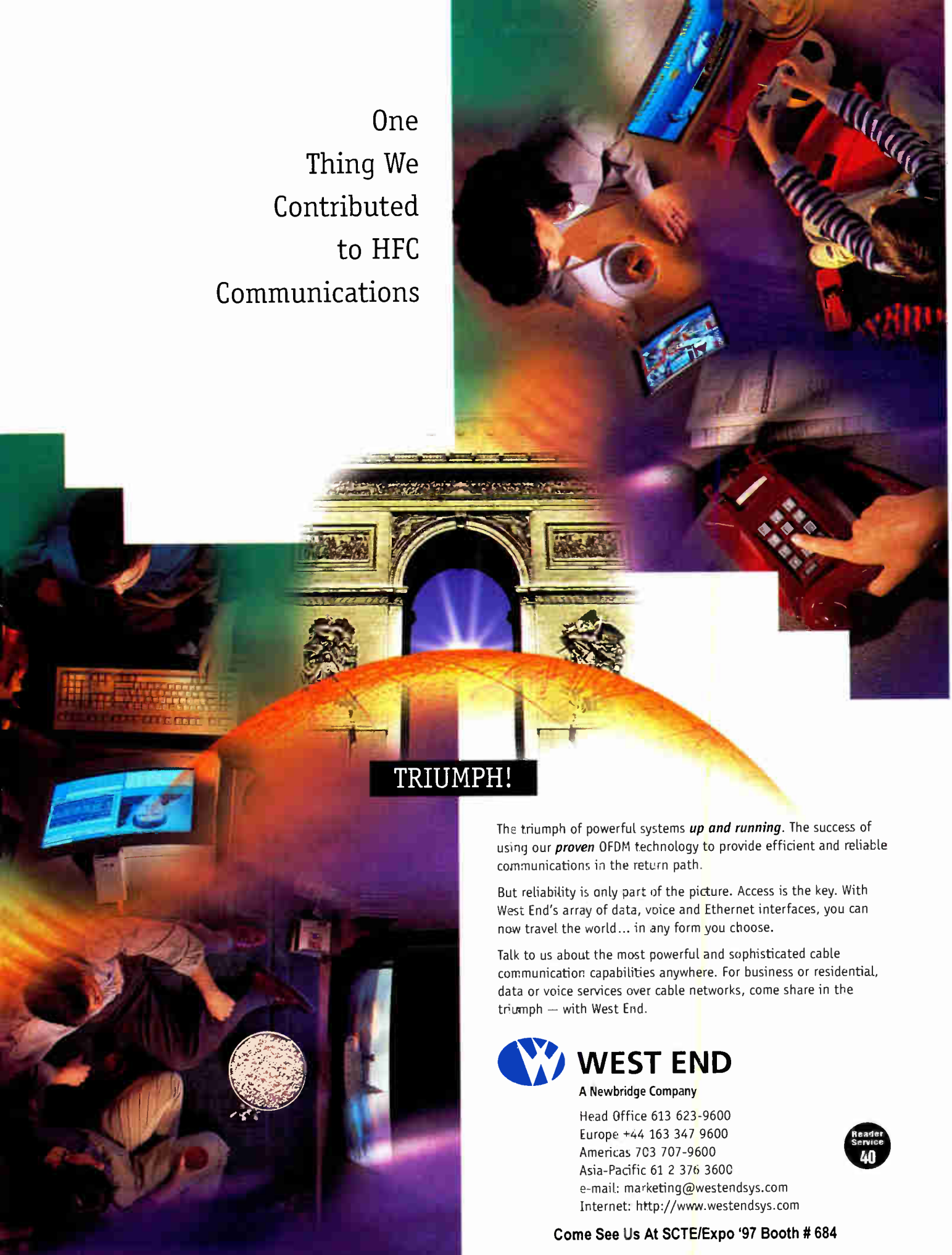

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We need to have a new paradigm where we are willing to spend some time with the customer to help them understand the service, if not some of the technology, so that they get the most out of the new products we're providing them.

Dyer: It's having a significant impact. Basically, what we're having to do is retool our workforce. We're moving from a single-product company to a multiple-product company. And that means providing new knowledge skills to a vast number of people. So, it impacts our training plans in just the sheer volume of what we have to do in a fairly short period of time.

And, it impacts our implementation because we've got aggressive schedules we'd like to follow to roll out these products. But, if we can't get the people in the classroom or get them the knowledge they need in an alternative delivery method, then they don't have the skills or abilities they need to successfully rollout and service these new products.

CED: Given these pressures, and obviously Cox is being aggressive in rolling out a number of new services, are you having to reinvent the wheel or look at new ways of delivering these training services?

Dyer: Yes we are. We're having to look at ways to get the information to people more quickly and more efficiently so that they can act on the data and information in a more immediate fashion.

We don't have the luxury of doing classroom training per se any longer. We still do it in small pieces, but we don't rely on classroom training as much as we used to.

We're using a lot more OJT (on-the-job training) and coaching on the job. A number of our trainers, in fact, will give a small burst of information; for example, installation of the high-speed data modem. We'll take people into the classroom and give them hands-on experience installing and troubleshooting that product. But we quickly get them out to the field where they're going through action learning and working with their managers and supervisors in terms of relying on the coaching role to embed those skills and to reinforce the usage.

Now, that implies we have to do a whole lot of training with our managers and supervisors to give them the skills to be effective coaches. And they have to understand that this is now an important part of their job, where historically, maybe it wasn't. In the past, they relied on the training department to do that.

We're also starting to use an alternative delivery method called 'space learning.' For example, with our customer service and sales training, both of which have become critical parts of Cox's culture, as we're training and trying to transfer the skills and tools to do those functions, we're bringing people into the classroom for two-hour bursts once a week.

And then they own the learning. They go out and apply the skills they've learned on the job, working with their coach, mentor or supervisor. Then, they come back the next week where we do another two hours of talking about how they did with the skills, what did they learn and how did they feel when they used the new skills. And then we give them additional information and knowledge and they go out and apply that over the next week. We're using this delivery technique effectively to cut back on classroom time.

Those technicians came back and told us that, without a doubt, they could do all of those services, except one thing.

Training staff vs. hiring experts

CED: When it comes to rolling out high-speed data services, there seems to be a debate on whether operators, when it comes to hooking up new data subscribers, can or should train existing installers to do that or hire more specialized personnel who have the computer related experience. What's your take on that situation?

Rendoff: I do think there is some merit in evaluating the computer savvy of the existing workforce, to find out which current employees have a bent for that type of thing. Age, I think, is a real issue here as well, even though I normally don't focus on age. But, I think it's no secret that the younger workforce is more prone to working with computers, whether it's in school or whatever. I'm finding it in my own hiring experiences here at NCTI. Younger workers seem to have quite a bit of computer background. The older workers generally don't. But, there are exceptions to that as well. If an older person has an interest in it or they know that they have to for career advancement, they've stayed up with it.

Van Loan: I'm adamant that we don't want our people inside of people's computers. And generally that line of demarcation is probably going to be right there at the F port. Self diagnostics are going to be critical. The computer people —and they may be on staff, but they're different people, different training, different background —will handle the modem itself and the interconnection to the PC. Or, it may be contracted out. A lot of people are using local computer dealers. And that's kind of where we're headed.

Babcock: When I was at TCI, I was responsible for training in the three markets where they were launching all the sexy new stuff. And we took some technicians in one of those systems and asked them to try to work on all three products (telephony, @Home data product and digital television). Initially, we took the tack that we needed to have a group of technicians for each one of those products.

Then, after a period of time, we said, 'Let's talk to the technicians and find out what they think about how difficult these products are to install and service, and let them tell us whether they can do more than one product or not.'

Those technicians came back and told us that, without a doubt, they could do all of those services, except for one thing. And that was popping the hood on the computer to install network interface cards and do the final installation of the @Home data product.

Other than that, they were very comfortable, given the appropriate training and some on-the-job experience, to handle all the products, the customer education for those products, the physical part of the installation and the service, and preferred to do that rather than having specialists, if you will, for each product.

CED: If this type of response holds true for the industry, do operators hire key personnel for the computer hook-ups and train existing staff for the rest of it?

Babcock: Yes. And largely the reason for that is that I don't how many millions or billions of computers that exist out there, but it seems like every one of them is different. They

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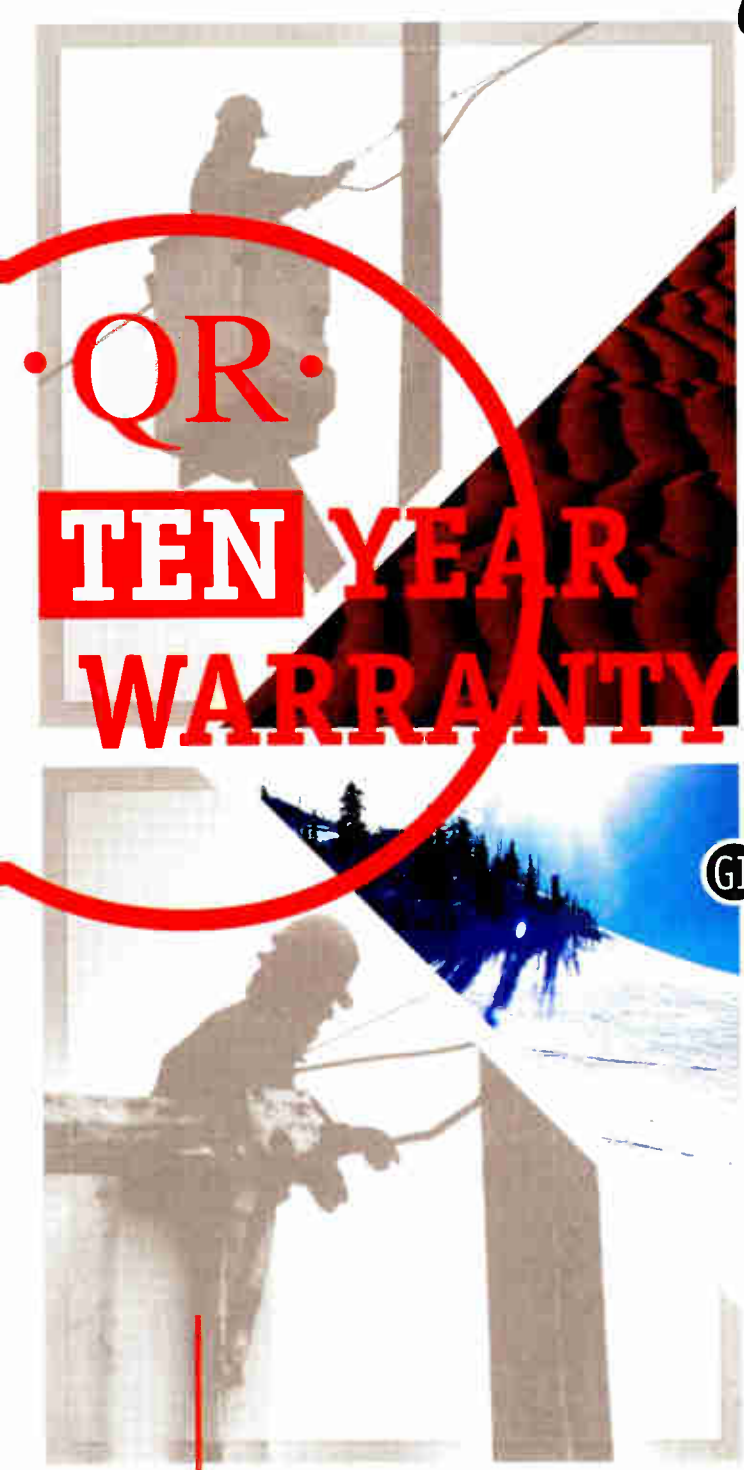

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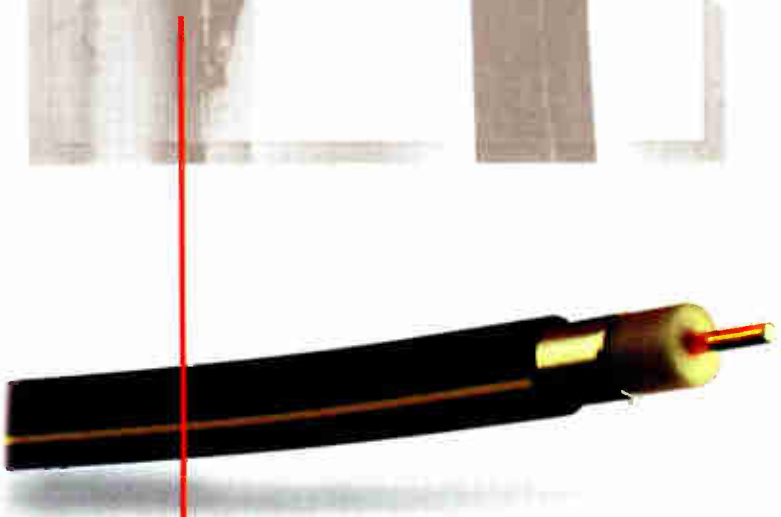

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each have their own personality because of the software a particular customer has installed. And, when you start adding network interface cards, there are lots of technical things inside the computer that start going on, contentions and other stuff. You need years of experience and training to be able to deal with that stuff. You definitely need some specialists.

Dyer: I think both approaches have value. I have a strong belief that our technical folks in the field certainly can learn to install high-speed data, for example. And they are doing that in some of our markets.

On the other hand, one of the key questions is liability and the ability of folks to open the hood (of the computer) and insert the required card and all that stuff. That's the piece that seems to be a little bit more technical.

But, as I talk to our senior technical trainers around the country, they tend to think they can train most of our people to do this work. So, we will selectively recruit external folks who have an expertise that we can't train our folks in.

It can also be a 'can do/want to' issue. You know, we can train them, but they might not want to do that. If that's the case, that's something else we'll have to deal with. But, more and more, we think we can train our people to do the installation and troubleshooting of the new products.

The biggest thing that will drive us outside to hire that expertise is just the sheer volume or size of the potential market and our ability to meet customer expectations of installation when they order the product, while also taking care of our core video business. I think that's the issue that probably drives us to bring people in, rather than train our people.

Building a customer service culture

Babcock

CED: Most analysts and industry observers seem to say it's not necessarily the technology that will determine future telecom winners, but rather how well companies can recruit and retain their subscribers. That means a massive emphasis on customer relations and service. How do operators instill this 'new, revised and reinvigorated' customer service ethic in their organizations, from the bottom all the way to the top?

Babcock: I think there are a couple of things. The first one is pretty obvious, and lots of people are talking about new ways to reward employees for performance using total performance packages and what's become known as incentive plans. While a lot of people argue whether we should incent people for doing the job we're paying them to do, there are certain things you can do to motivate people, not necessarily through monetary incentives, but to reward them for providing the performance that you expect. To treat customers with respect. To retain customers. To obtain new customers.

There are lots of things in total reward packages that can be done beyond just simply giving them an extra 10 cents or a bonus of some sort. Verbal or public recognition is one thing. And that's something other than just 'Employee of the Month.'

Time off is another way to provide some additional incentive. Certainly, compensation based more on performance and real performance systems, rather than an annual review system, is a possibility as well. There are some human resource folks in the business that are looking at some pretty innovative things to do.

Dyer: Well, at Cox, the whole service mentality is well embedded in the corporate culture. And in some cases, too well embedded. By that I mean our challenge is how to get people to understand that selling is not the antithesis to customer service.

We don't talk about selling being separate from customer service. Selling is part of the customer service cycle. If I'm truly doing my job to delight and exceed your expectations, I can identify when there might be other products and services we have that would fit your needs and that you would be open to. And if I'm not making you aware of those, then I'm not taking the opportunity to exceed your expectations.

We don't talk about selling being separate from customer service. Selling is part of the customer service cycle.

But, I think the important thing is that training alone is not going to embed that in the culture. Training is just one of the levers that starts to embed it. But then compensation reward systems, performance management and the whole hiring selection process have to be revised to get people to act a certain way in a consistent manner.

CED: That brings up the debate regarding whether you should reward someone for the job they're supposed to be doing in the first place. How does that register with you?

Dyer: Well, I think, first of all, if we make the assumption that we're paying people fairly for the work they're expected to do, and we define those expectations to the person and they're meeting those expectations, I don't think you have to give them extra money to do that. I think the value of having extra money to give is to reinforce those behaviors when they show them in a consistent, long-term manner, or when they go out and do something exceptional.

Not only does that give a clear message to the person who got the reward, but it also has significant ripple effects in the organization in terms of what is valued. I think there's a blending of the two that is critical.

Customer service role models

CED: In customer service terms, which industry and/or company would you hold up as an enviable model for operators to emulate?

Babcock: I think maybe an interesting analogy is with the automobile business. A few years ago the general population didn't think too well of auto dealerships. The sales experience was horrible. The service experience was worse. And you had to complain until you were blue in the face to get stuff done. And I think cable TV has generally been viewed in the same light.

But, if you look at recent surveys, there's been a marked improvement in what people think of those folks. And I would like to think we could learn something from that.

One of the things Ford and others have done is expend a great deal of money to provide sophisticated training for their service personnel. I think another piece is their promotion of their price-value relationship. Ten years ago, you didn't see auto dealers talking about the price of automobiles on TV. But they're all doing it now, and they're proud of it.

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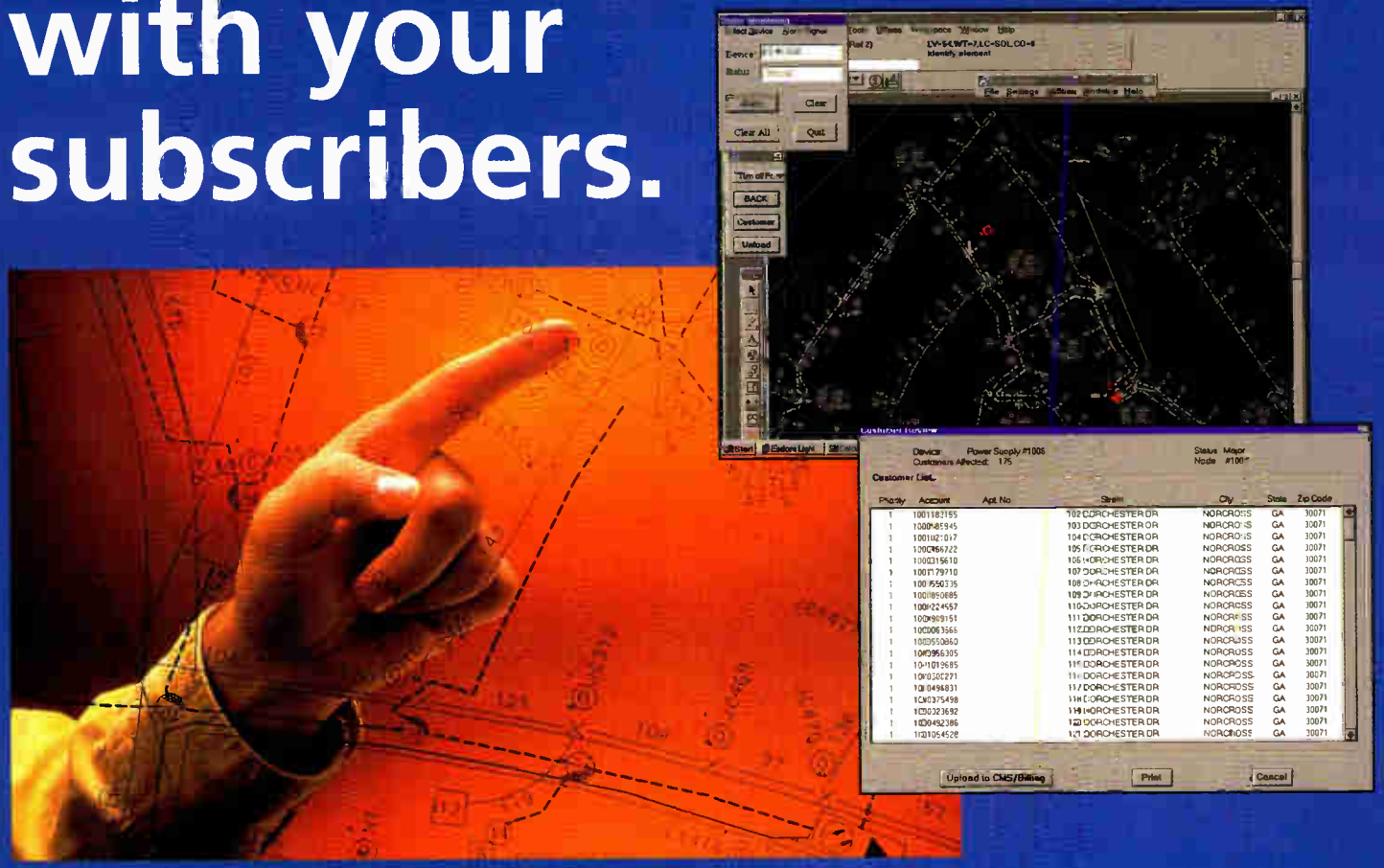

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I think cable can learn something from that. It's not just the bottom-line dollars we charge for the service, but it's the value our customers perceive.

Dyer: A company that sticks out to me is GE (General Electric). They say one of the most valuable things that they do is they engage in dialogue, both internally and externally, on a continuous basis to improve learning. So that means talking to their customers all the time and finding out what works and what doesn't work.

Of the 10 to 12 businesses that they keep active in their business portfolio, they say that in their respective markets, and I don't know if this is true, that the GE companies are either number one or two. And you don't consistently stay either one or two in your market if you aren't focused on your customers. So, I think that they have to be on that list.

Van Loan: I think Cox has addressed these issues up front. One, they've been very responsive in maintaining their plant, in building plant and in terms of reliability. They're adding channels. They're keeping their rates under control, and they're staffing their offices.

I was in a Cox system a month or two ago, and there was a local survey done. I don't remember the exact figures, but it included the electric company, the water company and I think the telephone company. Cox beat all of them. They had the highest rankings of any service company in their community.

They've also done local empowerment. They've made sure that everybody understands that it's a priority from top to bottom in the company. And that's important. Because our systems follow priorities. And what's a priority at headquarters, becomes a priority in the systems.

Cox has made the manager's bonus very much tied to some independent polling that is done. They don't just depend on the management to report on how well they're doing. They actually go into the systems and do the measurements in an audit kind of way, and then manager's bonuses are tied to their ranking. They've really made it important.

CED: Here's the situation: you're a medium-sized operator undergoing a measured plant upgrade in anticipation of getting into two-way data services in the short-term and digital video services in the long-term. Outline a general training strategy or road map that you might set up between now and the year 2000 as you expand your service offerings.

Babcock: I think the first thing to do is some training or communication with every employee about why we're moving into some of these new markets. Just a general communication piece about what's going on in the industry and what that means to a particular locale and let them know there are going to be changes.

You need to let them know that for them to be successful, as individuals, they need to come along and change with the company. And then, I think very early on, you have to get into the technical aspects of the changes.

There may be some other issues, but training will not be the thing that keeps us from getting out of the gate.

You need to start moving people quickly into assimilating the technological changes. You need to provide some general information about the technology, even if you don't know the specifics of how you're going to implement it yet.

You can discuss things like, what is a bit? What is data? What is digital? And then, as quickly as possible, start moving into how those things will be applied specifically to the businesses and services you're going to implement.

As you start getting more specific about the services, that's when you start tying in the customer service folks so that they can address questions from the customers as you go down the road.

Rendoff: There are basics of technology, no matter what. The theory of operations, for example, includes a host of things. This includes terminology and definitions and then correlating those terms to the applications and the equipment.

The theory of operations can include block diagrams with an overview explanation, like how a cable modem works. I think such overviews are fundamental in training strategies.

Other fundamentals include the electrical and mechanical specifications. In the cable modem instance, you would focus on the features of the modem, the minimum input level requirements like bit error rates, the diagnostics that are included, what test equipment is legitimate, distortion characteristics and so on.

One of the things we've found effective, and this is a standard training approach, is to relate a new technology using familiar terms whenever possible. A good example is when we get into fiber. Whenever possible, we correlate it to something familiar, like coax. We go from the known to the unknown.

You also need to be clear on the correct applications of the technologies. You need to take it to classroom or field training and apply the theory to the actual equipment. This is where a standardized, documented, hands-on training program comes in to assure consistent repetition of information. It's also where you can put your finger on any weaknesses in the training program and correct them.

Dyer: Well, I can talk in terms of what we're doing. I think the first thing you have to do is make sure that you've got all the technical, customer service and sales training in place to really do your core business well. You just can't assume everything is fine in that area. Once you've made sure you're in decent shape as far as your core business goes, then you can start to build on that foundation.

On the customer service side, both at the technician and CSR levels, you've got to develop their product knowledge so that they know why a particular product is important to both the company and the customer. They need to know how it measures up to the competition. They need to know all the selling features of the product. They need to know how to position it with the customers they come in contact with.

Then, there's the systems piece. I mean at the same time you're rolling out these products, most companies are having to roll out new total management systems to be able to support the new products. So, we've got to do training on the systems piece for the CSRs, the FSRs and our dispatch people.

Fortunately, our senior management has stepped up to the plate big time to give us the budget we need to be effective and make sure training does not become a barrier that impedes our success. There may be some other issues we have to work on, but training will not be the thing that keeps us from getting out of the gate. CED

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Reader Service 43

Vartanian: SCTE is changing with the industry

Q&A with SCTE Chairman John Vartanian

By Dana Cervenka

Editor's note: *Recently, CED spoke with SCTE Chairman and Region 12 Director John Vartanian to find out what's on the Society's radar screen, and to take a look back at his tenure as chairman. What follows is an edited transcript of the interview.*

CED: What has the SCTE accomplished during your tenure as chairman?

Vartanian: In the past few years, we have put our infrastructure in place, with a new building, with an increase in staffing, and with our ANSI accreditation. And for the past year or so, we've set ourselves up to address our core mission of training, certification and standards. Most of our accomplishments are in these areas.

CED: What are you the most proud of?

Vartanian: I am the most proud of the recognition that the SCTE has earned from the whole industry. As the industry has become more technology-driven, it has come to rely on the SCTE, particularly in the area of standards.

I'm also proud of the tremendous effort put forth in the local chapters. Local chapters are run by volunteers who also hold full-time jobs, and this work requires a significant amount of time and commitment. We are trying to think of ways that we might help out the local chapters to continue their efforts.

One thing in particular we are looking at is "vendor days." These have become very popular among a number of our chapters, and we're investigating ways of supporting vendor day activities that our chapters hold. We see a number of other chapters that are showing interest in holding vendor days in the future.

CED: Can you provide an update on the Society's certification and educational efforts?

Vartanian: We have a number of things happening on the certification front. We have about 5,000 people involved in our BCT/E certification process, and we will be adding two more levels to the certification this summer. One is a service technician level, and another is a telephony certification level. I think that our activities in BCT/E certification have been very successful. One only needs to look at help-wanted ads in the trade publications to see the growing importance that BCT/E certification has. A number of positions being advertised require BCT/E certification.

The telephony certification level will focus on the skills needed for technicians as cable moves toward the distribution of telephony services. The service technician level (exam) will have multiple-choice questions like the other BCT/E categories; it will also include some deductive reasoning questions, and will be targeted toward technicians in the field.

'We have more than 100 standards in various stages of development'

In addition, we have added two new seminar topics to our national training series. One is data communications, and the other is telephony. And these have been added to the fiber optics seminar, which will be continuing.

The SCTE is also committed to publishing a monthly series of educational articles on digital communications–the series is called "Digipoints." It's being distributed to SCTE members at no cost. One of the most significant evolutions in our industry has been a move from analog to digital, so these articles will include (a discussion of) many skills needed by our members in the future.

CED: What is the SCTE's role in creating standards?

Vartanian: Our role is to define standards that meet our needs and to build a consensus among people in our industry, as well as those outside of our industry, who have a vested interest in the particular standards. The SCTE engineering committee, as well as the SCTE staff, have both done a great job moving standards along.

CED: Since receiving ANSI certification, the SCTE has created an F-connector standard. Was that the first standard the organization developed?

Vartanian: The F-connector was the first one that was approved. We actually have more than 100 standards in various stages of development or approval, and these range from standards as basic as the F-connector, to some as advanced as digital video over cable.

CED: Can you hit a few of the high points?

Vartanian: A number of them relate to the various aspects of digital video. I think that those are standards that will be very significant to the industry, as we move to the distribution of digital signals over satellites and through headends, directly to digital set-top boxes.

CED: What should the SCTE focus its efforts on in the future?

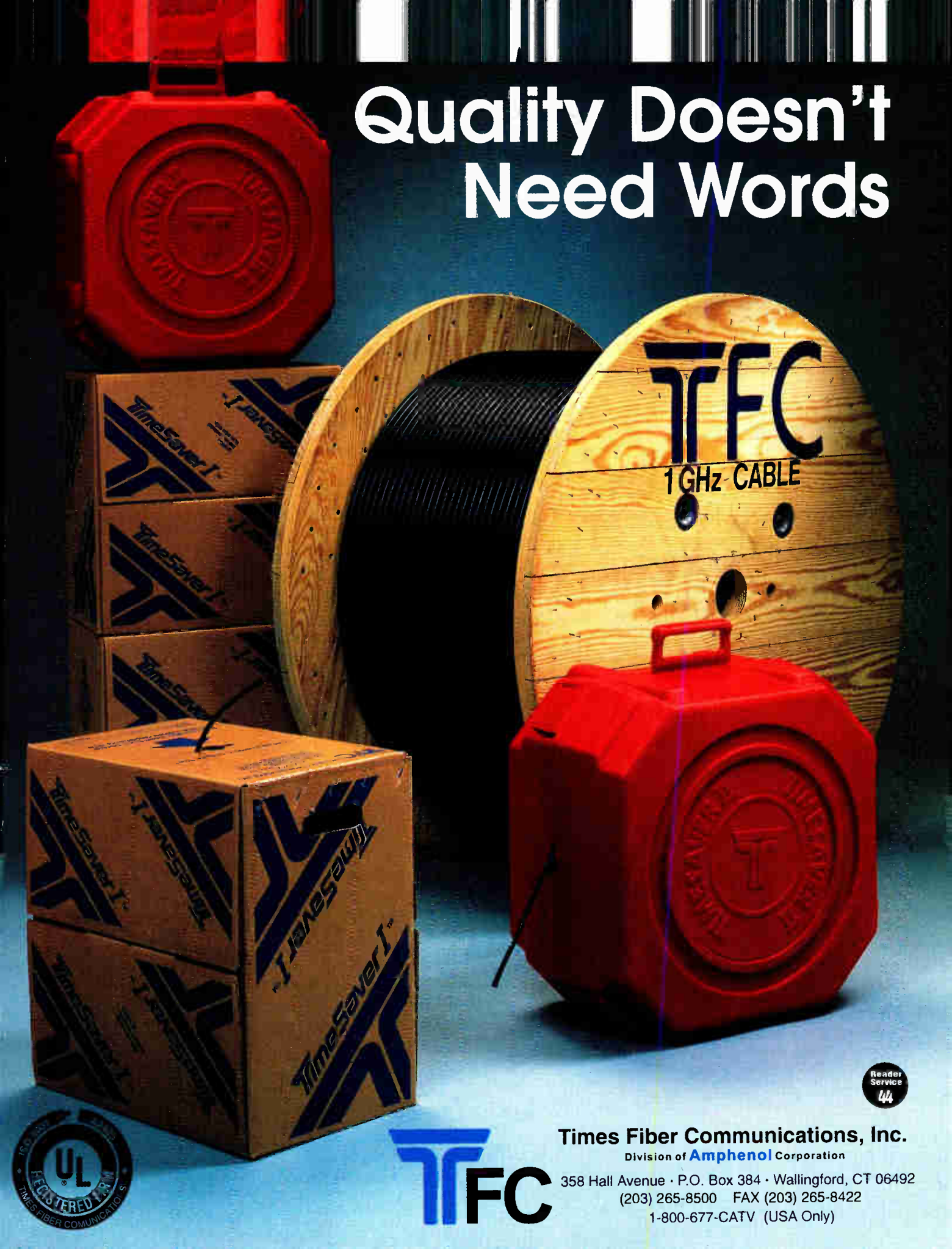
Vartanian: Actually, our planning committee is working on a five-year industry projection so that our Society can best serve our members and the industry's needs.

Clearly, there are many critical issues. Foremost is the move toward digitization of signals; also, the introduction of ancillary services, such as high-speed data modems, as well as the consolidation of cable systems and MSOs. All of these issues impact our membership. And we are developing plans to meet these needs, but fundamentally, we need to continue development of our core competencies of training, certification and standards.

We will develop our training programs to address new technologies that are developing over the years, so that our members always have current training topics available to them.

CED: Any innovations coming up at Cable-Tec Expo or the Emerging Technologies Conference?

Vartanian: Cable-Tec Expo and Emerging Technologies have both been doing very well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over the years. At this point, Expo registrations are up by 100 people from where we were at this time last year. And we have also increased the number of vendors that will be displaying their wares, as well as the exhibit hall space that we will be using.

CED: Do you have any idea what those percentages might be?

Vartanian: There will be over 100 new companies exhibiting at Cable-Tec Expo. And also, with respect to Cable-Tec Expo, we are experimenting with the number of exhibit hours this year. We've had requests to expand the exhibit time, so we will be doing that.

Photographs courtesy of the SCTE

'We do have a few international chapters, and that is where I see the growth'

The 10 workshop topics that are presented in the six sessions continue to be very popular, so we have not changed that. But we will be reducing the Engineering Conference from a full day to a half-day, and using that extra half-day to expand our exhibit hours. We feel that these changes will better meet our membership's needs to see all the exhibitors this year.

Emerging Tech is going well. It's continuing to attract a good number of people interested in exploring new technologies that will be coming to cable television.

CED: Do you see a need for more SCTE chapters to be formed?

Vartanian: I think that the number of chapters that we have, which is 75, is meeting the existing need. Domestically, I think we are saturated in terms of the number of chapters. We do have a few international chapters, and that is where I see the growth. We've had proposals for international chapters in other countries that we are excited about approving.

We already have meeting groups in Canada and Panama, as well as interest from Japan and India. Australia, too.

CED: Is there a need for additional new conferences?

Vartanian: Actually, we have added a new conference. It's a joint conference that we sponsored with the IEEE last year—HFC '96–a conference on hybrid fiber/coax systems. That partnership went well, and we've had proposals from other organizations to jointly sponsor conferences. We may do more of that in the future, if it makes sense for our membership.

CED: Any parting thoughts?

Vartanian: As our industry becomes more consolidated and more advanced technologically, it is up to cable engineers and technicians to become better trained and certified, and the SCTE is the perfect organization to meet those needs. CED

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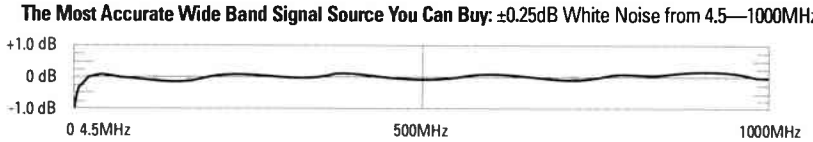

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Come See Us At SCTE/Expo '97 Booth # 412

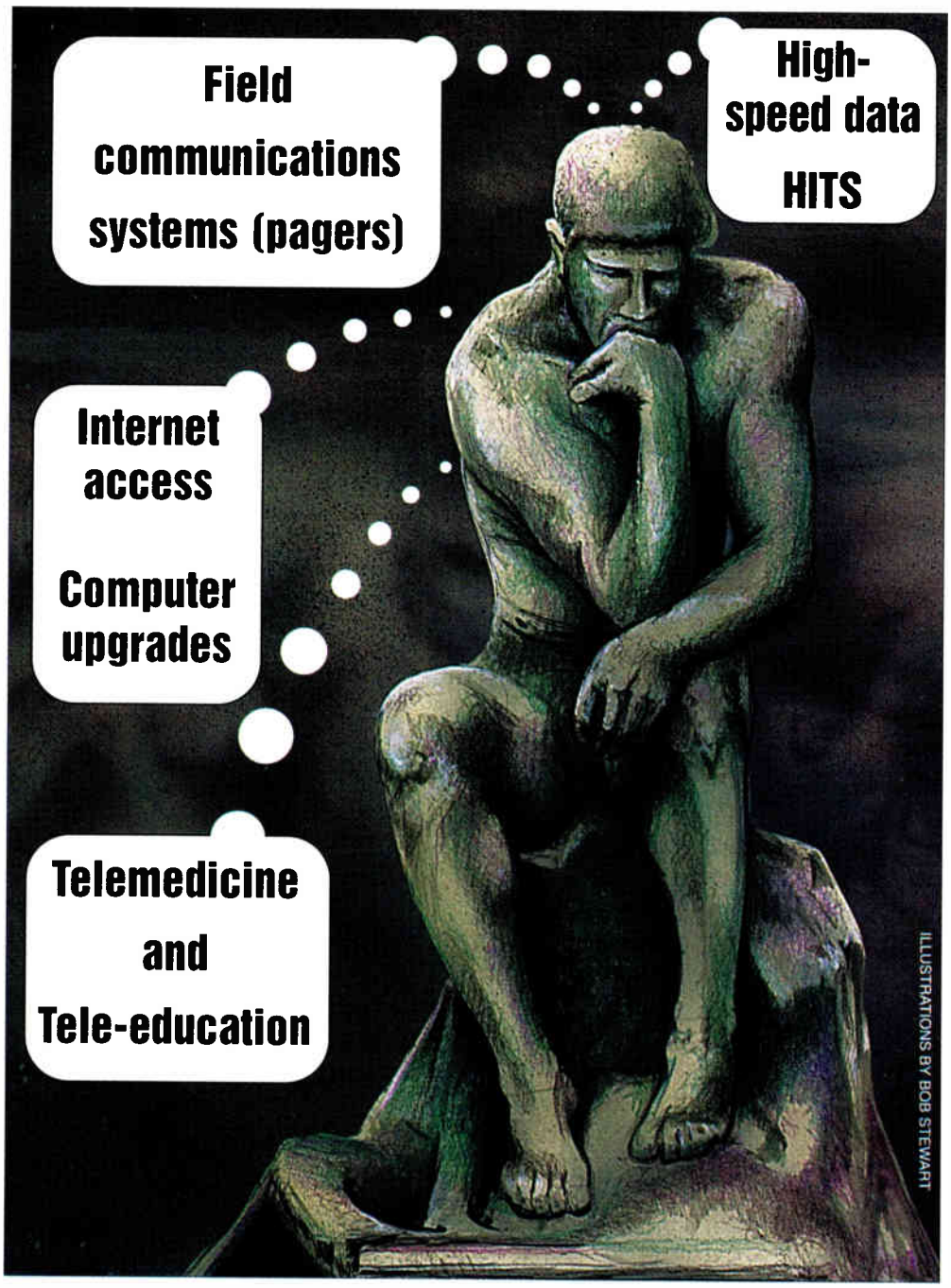
Necessity drives small ops to new technologies

New services, better efficiency

By Craig Kuhl

If necessity is indeed the mother of invention, then smaller cable operators are fast becoming mom's favorite sons. Out of necessity, and in some cases just plain fear, smaller cable operators are becoming more innovative, and inventive, in their use of advancing technologies to further their businesses and to reach those elusive customers and the resultant revenues that in the past were out of reach.

The mix of good old business savvy and some leading-edge technology is allowing smaller operators the opportunity to not only upgrade their back offices and reach their customers in a kinder, gentler way, but is inspiring a more fluid work environment as the front office becomes more accessible and customer-friendly, the back office becomes more fluid, and field personnel keep in closer touch with both. And, what's really pushing the technology hot buttons among smaller operators is the chance to add real value to their operations through Internet and intranet access, digital video, and more.



ILLUSTRATIONS BY BOB STEWART

Computer hardware and software advances and upgrades, along with digital, are big reasons for the groundswell of interest in technologies which are advancing smaller operators' businesses. But, a more visionary attitude by a group of operators who seem determined to grow their companies using new technologies is clearly speeding them toward viable new businesses beyond traditional entertainment video.

"Smaller cable operators will play a significant role in providing services other than cable TV to their rural customers. With new technologies, plant quality and expanded capabilities, cable is probably better positioned to provide these services than anyone else," says Matt Polka, president of the Small Cable Business Association.

A big reason for the newly-found enthusiasm among smaller operators to explore the business of Internet, intranet, Headend in the Sky (HITS) and other technologies is simple economics. Says Polka, "The main reason smaller operators are able to use these new technologies is the Telecommunications Act of 1996. Because of regulation, we didn't have access to capital markets, and as a result, no access to emerging technologies. We said 'if you remove regulation, we'll have access to capital and new services,' and that happened. Without the threat of regulation, the markets loosened up."

Though some will argue that the capital markets still have certain vise-grip qualities, more and more operators are moving ahead with advancing technologies, knowing that

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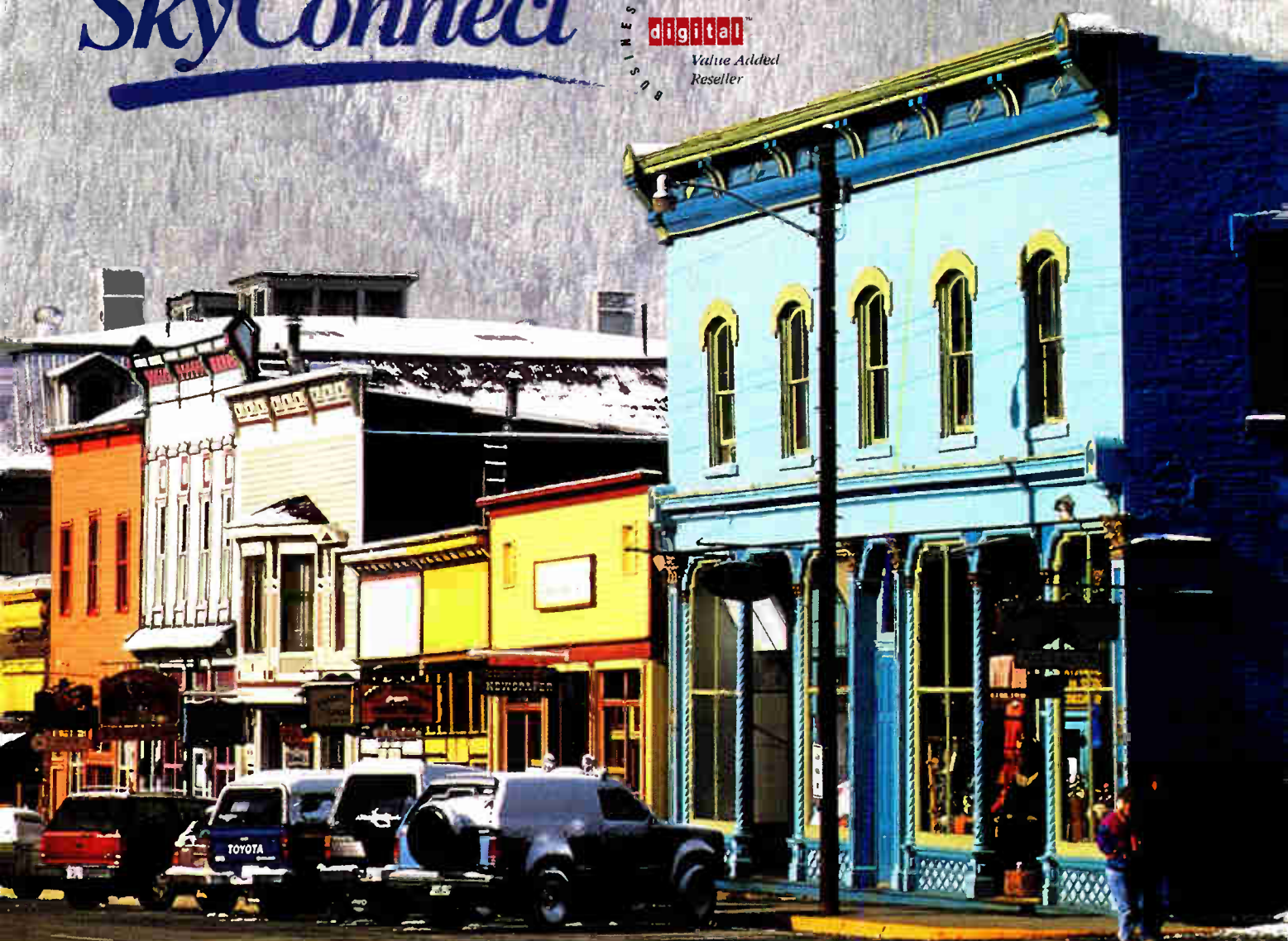

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Telemedicine

Telemedicine and teleeducation have not only generated revenue for Eagle Cable in Hays, Kan., but have helped the local cable system to become an integral part of the community fabric by providing services based on advancing technologies.

Telemedicine allows face-to-face communication between doctors, nurses and patients using TV monitors and computers. It connects seniors' homes, hospitals, pathology labs and doctors' offices, and is helping a growing number of seniors and health care patients remain at home instead of residing in assisted care facilities.

they'll get lost if they hesitate. "We can't just be defensive now, we must not only defend our core business vs. DBS, but find ways to develop other revenue streams in small markets," says Dave Kinley, president of Sun Country Cable, which is certified as a long distance reseller.

An explorer into the new business/technology territory is Eagle Communications of Hays, Kan. It has moved into high-speed data with great success, says Larry Braun, engineer for Eagle. "Two years ago, we were dabbling in high-speed data with just moderate success using straight coaxial plant. So, we installed a hybrid fiber/coax system, and it opened several new doors for us. There is a definite learning curve to it, but it's certainly worth it. We now want to expand even more."

The next logical step, according to Braun, is to install fiber networking "business-to-business," using the Internet. "We want to take the Internet to businesses first. The ones who live on the Internet could provide a good revenue stream. We're just now starting to get our arms around the technology."

Eagle has expanded its high-speed data links to include "telemedicine" through the local hospital. Using its fiber network, nurses and doctors can administer to patients at assisted care facilities via cameras which are placed in selected rooms at the facilities. "Nurses and patients alike have said how helpful it is. It's like having a nurse visit each day, and there is a financial benefit to the hospital too, since its nurses and doctors can spend their time more efficiently," says Braun.

It has been a revenue boost for Eagle as well. The cost per data link is $350 a month, with an $800 installation charge and a 20 percent discount offered by Eagle when more than five links are installed. Says Pete Collins, vice president, cable division, for Eagle, "We began this ancillary business with the opinion that we had to have a business that paid as it went along. But, we've had a positive cash flow since the get-go." Eagle has also ventured into teleeducation, using the same fee structure as its telemedicine business.

Some of the innovations smaller cable operators are thinking of:

- *Experimenting with Internet and intranet access, especially business-to-business*
- *The inclusion of telephone lines into their systems*
- *Exploring the use of Headend in the Sky (HITS) and monitoring tests at a few select cable systems*
- *Expanding the use of digital to ancillary businesses*

High-speed data and the Internet have opened new windows of opportunity for smaller operators willing to combine their innovative minds with an entrepreneur's business savvy. Bill Bauer of Windbreak Cable in Gering, Neb. is another smaller operator making the best of the Internet and intranet. "Getting into Internet takes a lot, and you must understand networks. But, for instance, with an Internet phone, if we bring this technology to the cable plant, we can put intelligent call convertors into customers' homes and carry it back through the cable system, hand it off to a long distance (LD) carrier, and supply an alternate route for the LD carrier. We don't have to deal with the Internet, or change a phone number to do it. We've talked with long distance carriers, and they're extremely interested in finding new ways to their customers."

But, is the business there? "There are lots of challenges; the LD carrier must want to play with you, and the economies of scale must be there. You must have partnerships," says Bauer.

However, Bauer insists that with the newly-found access to advancing technologies, smaller operators now have a chance to show their innovative stuff. "I'm not hearing my customers asking for more channels, because I'm providing them with services like Internet, and that's what they want. I ask, 'going down the path, what can I do that's better than everyone else?' But it must be profitable, and have customers that will buy the service."

The service, according to Dean Peterson, president of Southwest Missouri Cable, is a seven letter word: D-I-G-I-T-A-L. "That's the future," he says. "Chrysler will save more than $2 billion by the year 2000 by using its Intranet in designing automobiles. With digital, it's a whole new situation, and Internet services will take on a whole new form. There are many challenges, but we're putting together an organization to do Internet."

The challenges include creating new strategic alliances and moving into a "commerce" mentality, according to Peterson. "It's the local intranet that has the business community excited. With the intranet, they can promote and sell their products with high-speed data. This is a very powerful part of commerce, of which cable operators have the capability of playing in. That will drive the Internet and intranet for us."

Driving toward the Internet is the strategy for Internet of Beaufort County Cable in Bellhaven, N.C. as well. "I want to get my feet wet with Internet because it's such a natural. I see it co-existing with cable. They were made for each other," says Guinn Leverett, president of BCT Inc. in Bellhaven.

But how do small operators, whose only brush with the Internet may be an occasional day of surfing, use available technologies to help their businesses? Though not exactly out there on technology's edge, Sumner Cable in Wellington, Kan. has made good use of its Auto Page software program to speed up its response time to customers during outages. Says Phil Brown, manager technician for Sumner, "Using the Auto Page program, we can automatically page our technician. We've seen a significant reduction in customer response time, and our customers really appreciate that."

The use of these technologies always comes with a caveat: do customers need them, and will they buy them? But just thinking about them as a business has many small operators grinning. Concludes Leverett, with a scenario from *Alice in Wonderland:* "Imagine two impossible things before breakfast. Well, 18-1 compression is wonderland stuff." CED

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Power migration strategies for future-proofing

Distributed and centralized architectures

By Rick Marcotte, Director of Sales and Marketing, Exide Electronics' Communications Group

The convergence of voice, video and data is fundamentally shaping the way in which the world sends and receives information. For years, networks connecting far-flung locations were the exclusive domain of multi-national corporations. However, the rapid growth of the World Wide Web has brought global connectivity to individual homes. In turn, consumers are beginning to expect information on demand, anytime of the day or night. This demand mandates extreme network reliability.

Cable TV networks, because of their bandwidth capacity, are poised to be one of the major conduits of this convergence–but they must first address reliability concerns before they can become credible providers of services beyond video. The competitive environment is increasingly brutal, with satellites, telephone companies and wireless providers all racing to establish a foothold in this lucrative industry.

In order to remain competitive, considerable time and money is being spent by all major cable operators to upgrade their networks and carry more than one-way video. Most traditional coaxial networks do not provide the reliability necessary for such services as telephony and high-speed Internet access. Tomorrow's services can only be effectively delivered if many existing cable systems are upgraded. A key part of this upgrade is the choice in powering architecture, and operators must think about the future.

Upgrading an existing plant is expensive, and operators cannot afford to strand their investment. Engineering and technical managers must make decisions that will not only benefit their network today, but provide for a smooth and cost-effective migration for future network powering demands.

When planning the powering architecture, operators must take into consideration the following elements, both now and in the future:

Operators cannot afford to strand their investment

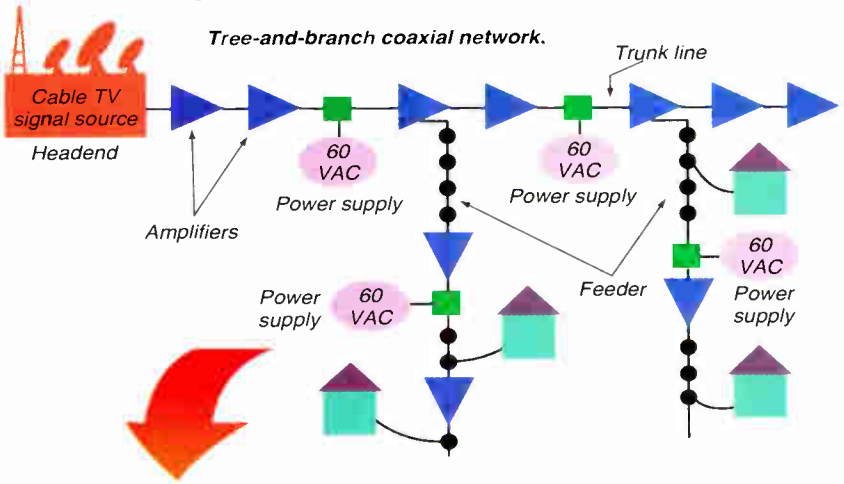
The Lectro ZTT/Plus power protection system from Exide Electronics.

- ✔competition;
- ✔types of services offered over the cable TV network;
- ✔density and demographics of the areas being served; and of course,
- ✔economics and budget limitations.

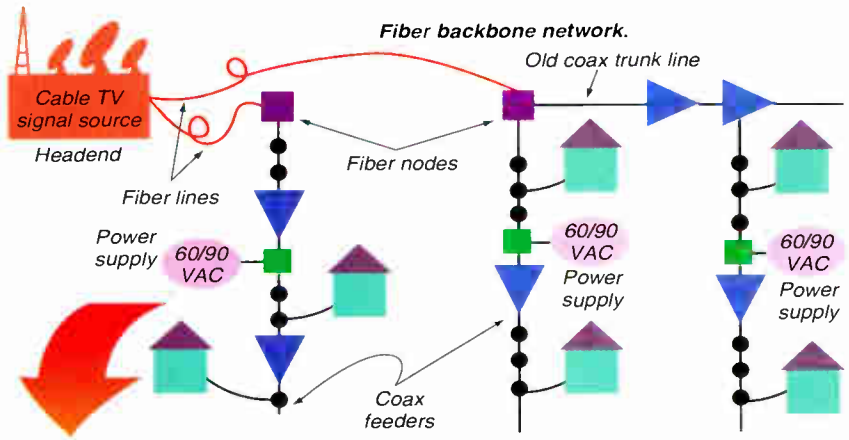
Powering architectures

There are three basic powering architectures that can be implemented in a cable TV network:

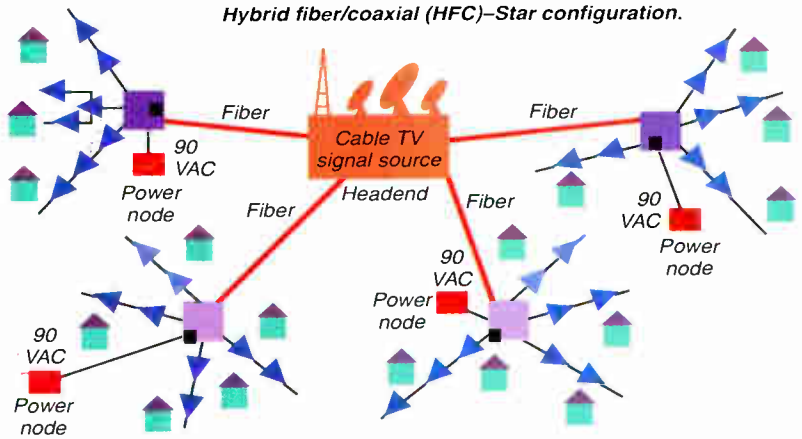
Type 1: *Distributed power without standby protection. Type of service: Video only. Shown below are the components that comprise a traditional cable network. Power supplies are placed along the line (i.e. distributed) to power the amplifiers, which run on 60 or 90 VAC input voltage. This type of network, especially if offering video-only service, does not always require standby power. The operator, however, runs the risk of losing service during utility outages across a wide portion of the network.*



Type 2: *Distributed power with standby power protection. Type of service: Video, cable modems, etc. In this network architecture, operators replace the coaxial trunk (i.e. the "tree") with fiber and maintain the existing coaxial branches. Fiber nodes to handle the optical-to-electrical signal conversion are added, but the power supplies of the network beyond the fiber node stay pretty much intact. Standby powering along the coaxial portion is typical in this network configuration. Standby power is also required if the operator is offering services beyond video.*



Type 3: *Centralized power with extended run-time capability. Type of service: Telephony. In this type of network, the entire service area node requires uninterruptible power (i.e. centralized) for the optical-to-electrical conversion equipment. Amplifier cascades along the coaxial portion of the network are typically short (two to four units), and node sizes are smaller (500-1,500 homes). Advanced services (such as telephony) typically offered on this network configuration require uninterruptible power as well. In addition to normal battery back-up, natural gas or liquid propane generators are usually attached to the centralized powering unit to offer extended run-time.*



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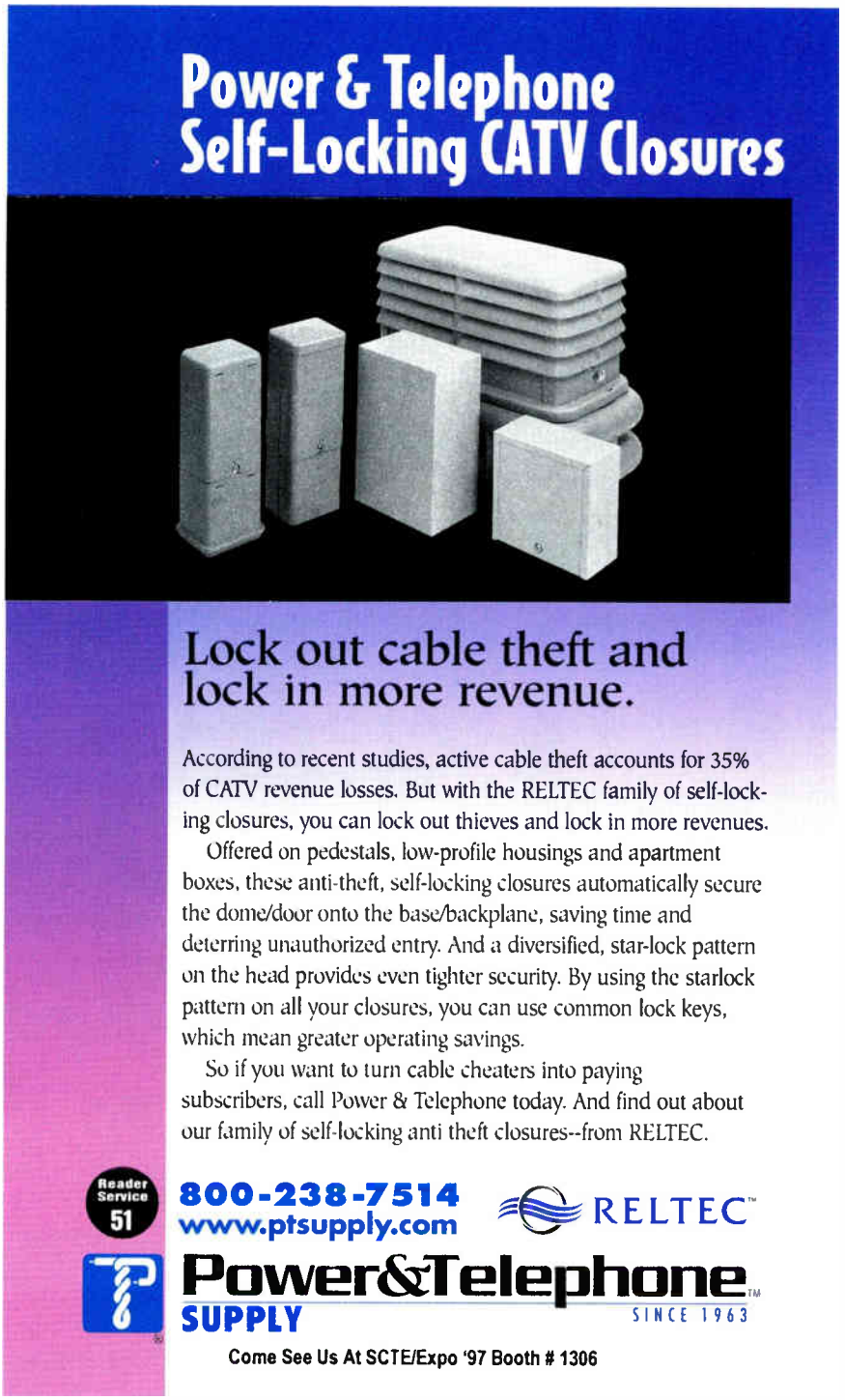
Type #1: Distributed power without battery back-up (non-standby power supplies);
Type #2: Distributed power with battery back-up (standby power supplies); and
Type #3: Centralized power with extended run-time capability (powernode).

Each scenario has its own advantages and disadvantages. As demand on the network increases, the operator may migrate upward from one type of powering architecture to another. Think of each type as a step on a ladder, each rung requiring the network to achieve a higher level of reliability. Before an operator begins that climb, however, he must carefully consider the type of power supply he is purchasing and whether there is a cost-effective migration path.

Reliability is of great concern to all operators, but the level of reliability built into a network can vary. For example, an operator running a video-only cable TV network may not want to invest in standby power unless the cable TV franchise agreement requires it. The operator could purchase standby power supplies without an inverter or batteries, saving approximately 50 percent of the power supply's cost.



One rung at a time

Depending on volumes, an inverter and three batteries for a standby power supply could cost between $700 and $900. An operator with 1,000 miles of coaxial plant could defer approximately $1 million of capital investment in power supplies (based on one power supply per mile) by withholding deployment of the standby portion until the next "rung" of network reliability is required.

It's wise to purchase power supplies having the flexibility to grow with changing needs

However, the operator could lose valuable customer credibility and a competitive edge resulting from network downtime during short-term utility outages. In addition, if enhanced services are being considered, standby power will then be required for increased reliability. Because the future in any business plan is an unknown to some extent, one might argue that it is wise to purchase power supplies that have the flexibility to grow with changing needs. In this age of razor-thin profit margins and high investment in upgrading plant, few, if any, operators can afford to strand their investment.

Even though the above scenario is possible, the majority of cable operators have some type of power protection and back-up, usually in a distributed setting. In this layout, many power protection units are placed throughout a network, and each unit has its own set of batteries providing approximately one hour of back-up time.

The upfront cost is higher compared to a network without standby power protection, but reliability dramatically increases because the network can ride through most power outages. Enhanced services can now be delivered

with a higher degree of network reliability. Taking the next step up the ladder, from distributed to centralized, takes a little more thought and planning.

Making the leap

Expansion of cable and telephony services requires two-way network capability plus a dramatic increase in reliability. As the future networks expand into these new service offerings, powering requirements go beyond the capabilities of traditional cable TV powering architectures. The back-up power requirements for telephony and cable will have stretched the need for standby power anywhere from four to eight hours. To provide back-up power for extended periods of time, an alternate power source, typically a generator, must be used.

For example, lifeline support, like the 911 telephone service, is a 24 hour-a-day requirement. Therefore, the cable network must be capable of operating through a prolonged power outage. Acceptable downtime, per Bellcore standards, is only 53 minutes per year, which translates into 99.999 percent network availability.

Not only is increased back-up time necessary, but network-powered loads such as telephones, network interface units and energy management controllers of the future turn off and on at different times and at different points on the network, creating varying powering demands.

Improving the network's image

In addition, today's interaction of constant power coax amplifiers increases the dynamic power demand on network power supplies. A centralized powering approach provides the architecture for greater reliability and stability, providing operators with a selling point and a way to diffuse some of the negative perceptions associated with cable TV networks.

Demographics and density of a service node also play an important role in whether to adopt centralized powering. If the serving area is demographically attractive (i.e. income, education, multi-unit dwelling vs. single family; business vs. residential), and hook rates are generally high for enhanced services, then centralized powering should be considered. Subscribers willing to pay for services beyond video will demand uninterruptible service.

Economically, centralized powering can lower operator installation and service costs. One larger unit that houses all node powering equipment is much easier to monitor and maintain than several smaller units scattered throughout a network, thus reducing mean time between repairs. Reliability is also dramatically increased. A centralized power supply usually has a generator for virtually unlimited run time or can support a larger number of batteries if a generator is not feasible. In comparison, smaller distributed units usually offer about an hour of battery back-up time with the standard three battery configuration.

Centralized powering nodes also provide the added capability of N+1 redundant power modules, further increasing network reliability.

Growing pains don't have to hurt

To help plan for power migration from one ladder rung to the next, operators should install power supplies capable of operating effectively in all three powering scenarios. Without a flexible "building block," the operator will strand his original investment and incur additional and unnecessary costs. Looking at actual figures, a centralized powering unit typically costs between $15,000 and $20,000, depending on power capacity, number of batteries and accessory equipment. If an operator is already using distributed power supplies designed for immediate redeployment into a centralized setting, operators can save $5,000 to $7,000 per powernode. However, special models are needed to make the migration smooth.

Incorrect cable lengths can be a costly and time-consuming field upgrade

Avoiding incompatibilities

An operator should not assume that all distributed standby power protection units can be readily deployed into a centralized setting. Several differences can exist between standby power supply units built for distributed and centralized settings. In some cases, cable lengths for battery and coaxial hookups vary between distributed and centralized power supplies. Incorrect lengths can be a costly and time-consuming field upgrade. In other cases, the connectors needed for output voltage and battery cables are different between the two power supply designs.

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◆ Powering

Retrofitting connectors is another unnecessary expense. Centralized power supply units typically use a generator for extended run time. The standby power supplies used in the distributed architecture need to be generator compatible. If not, an operator runs the risk of stranding the entire distributed power supply investment if the migration into centralized powering is undertaken.

The power supply should have status monitoring capabilities as well. Constant communication with the power source greatly increases reliability through real-time monitoring and proactive field maintenance practices.

Conclusion

All cable TV networks have their own unique set of dynamics based on services offered, competition, budget constraints, densities and subscriber base demographics. Therefore, the powering architecture used will vary from one system to the next, and in some cases, one service area to the next. But one element that does not vary between operators is the need to consider the future and plan for it. The architecture being used in a system today may not be appropriate for tomorrow. The purchase of standby power supplies capable of migrating across all three powering architectures will save operators a large amount of time and money. A cable TV network without flexibility is a liability not only to the operator, but to the most important asset of all–customers. CED

The architecture being used in a system today may not be appropriate for tomorrow

About the author

Rick Marcotte is director of sales and marketing with Exide Electronics' Communications Systems Group. Marcotte joined the company in 1989 as controller of U.S. sales and marketing operations. Through the years, he has held various sales and marketing management positions involving applications engineering, product marketing, technical support, customer service, inside sales, new business development, marketing communications and strategic planning.

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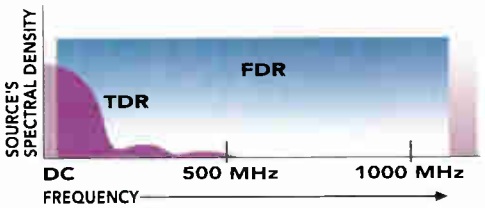

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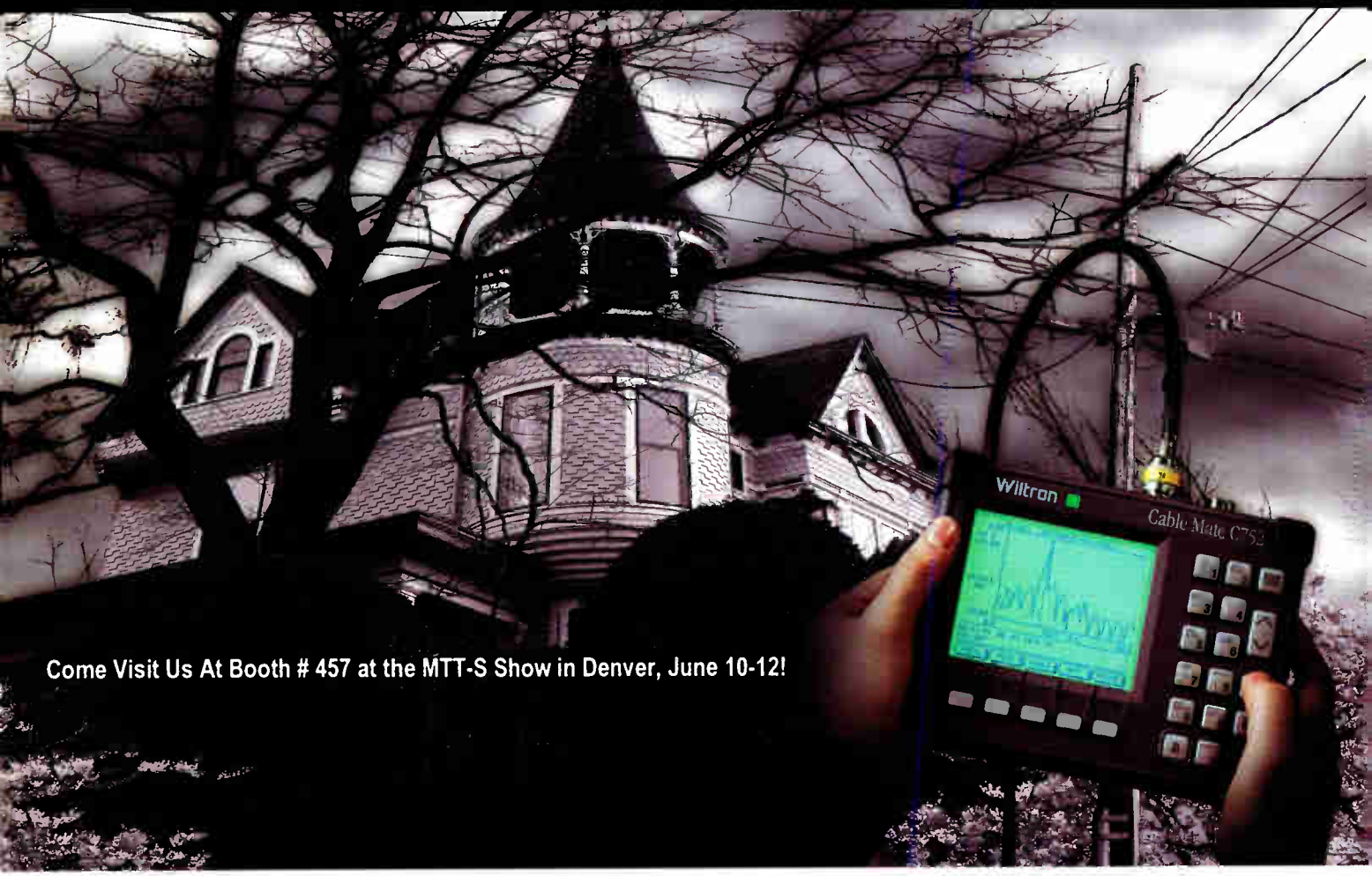

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ATM sends multiple services via same HFC pipe

Price is dropping, technology is flexible

By Staffan Nilsson, Director, Broadband Services; and Ingemar Dahlqvist, Business Line Manager-Cable, Ericsson Inc.

Cable operators in the late 1990s face the dual challenges of increased competition and escalating technology demands. The Telecommunications Act of 1996 dropped many of the barriers that once cushioned cable operators from competition, opening the market to new players like telecommunications carriers and utility companies. The advent of direct broadcast satellite service is making inroads into cable subscriber numbers as consumers are enticed by digital picture and sound quality and increased channel capacity.

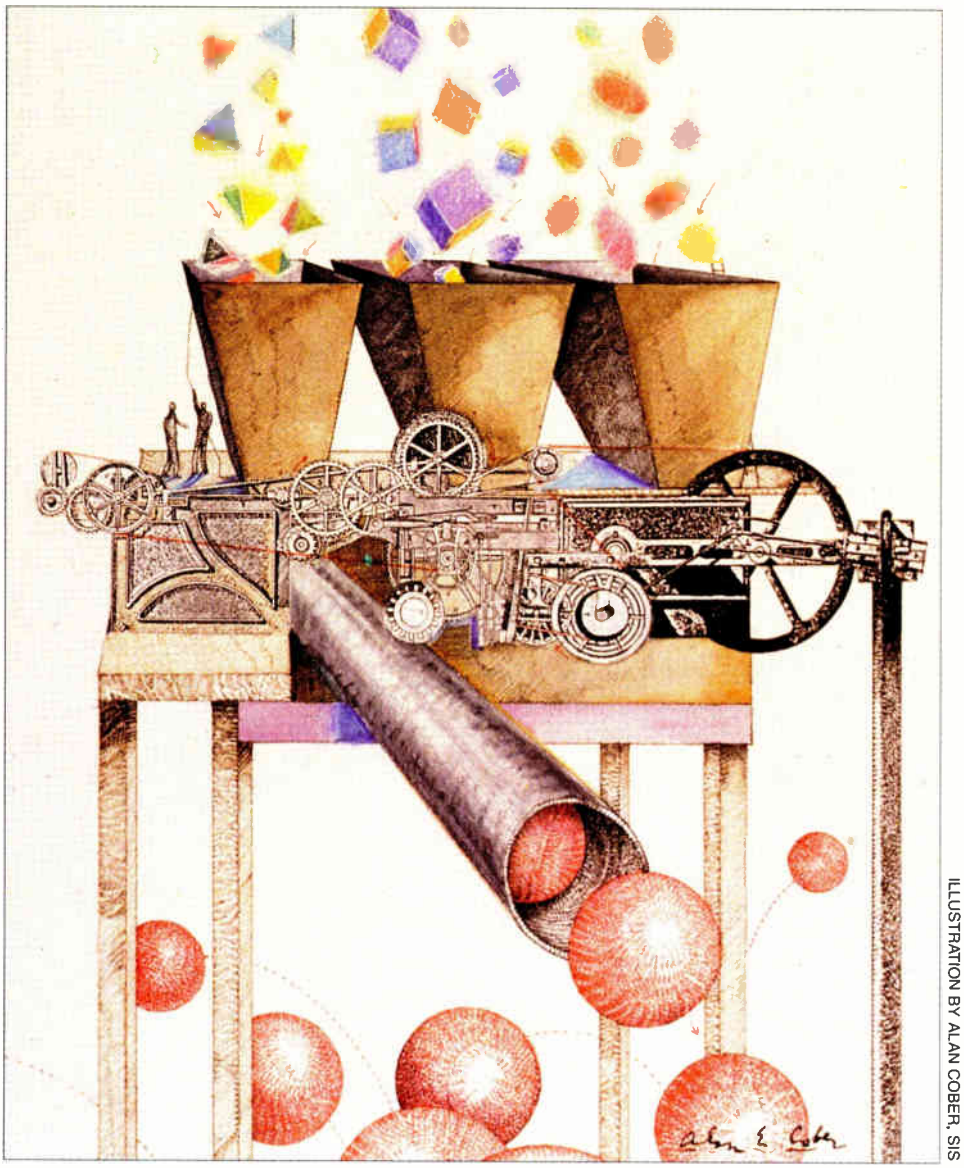

ILLUSTRATION BY ALAN COBER, SIS

At the same time, operators must spend millions of dollars to keep up with technology demands. An ever-increasing number of available channels requires greater bandwidth to keep from angering customers who don't want their favorite channels dropped in favor of new ones when the system can't handle any additions. Customers are also learning to expect digital quality for their viewing pleasure. Operators must upgrade their plants to meet demands, or risk losing customers.

To meet these demands, operators are making the move to hybrid fiber/coax (HFC) systems. By 1999, an estimated 60 percent of MSOs will have upgraded to HFC, according to a Paul Kagan Associates report. U.S. operators are expected to spend about $1.6 billion in 1997 to upgrade and rebuild their plants to HFC. To pay for this upgrade, operators will need additional revenue, which may be more difficult to achieve in the face of increased competition.

Multiple services increase revenue

The key to increased revenue in this deregulated environment is taking advantage of the upgraded network to offer multiple services. HFC networks offer digital capacity and more analog channels, and have upstream capability to support telephony and high-speed data–all of which open doors for operators to provide a new range of services. This is a good time for cable operators to move into multiple services because consumers are increasingly interested in the simplicity of bundled services. They appear to like the idea of working with one provider to obtain several services and only receiving one bill each month for all their communications services.

The market is also driving the push toward multiple services as new technologies become available. The growth of Internet popularity and sophistication has left technology-savvy consumers scrambling for faster, more reliable connections. Even Internet neophytes who don't have high-end computers are exploring the on-line world with WebTV-type services. The interactivity of the Internet also has spurred interest in interactive video programming. And the growing number of special-interest cable channels has consumers wishing for customized programming choices.

Deregulation has opened even more doors for multiple services. Cable operators have the opportunity to move into new markets, like voice telephony. A recent MTA-EMCI study found that one of the most preferred bundled service packages included local and/or long-distance telephone service and cable televi-

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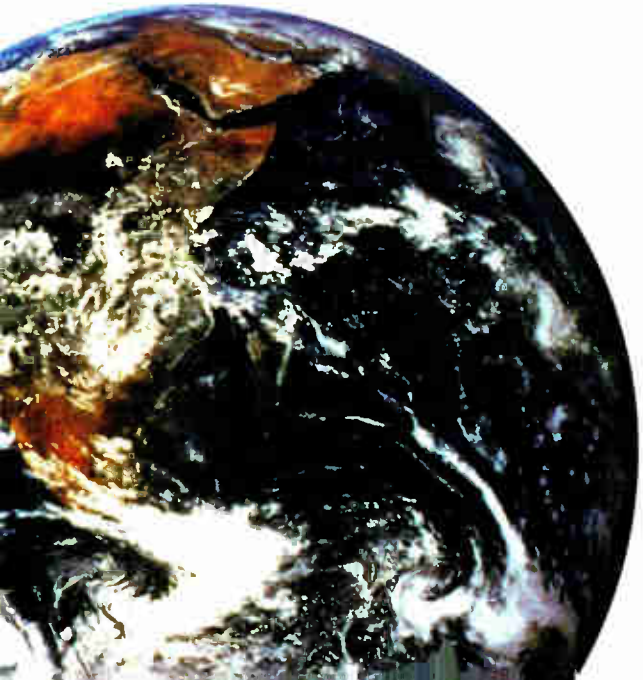

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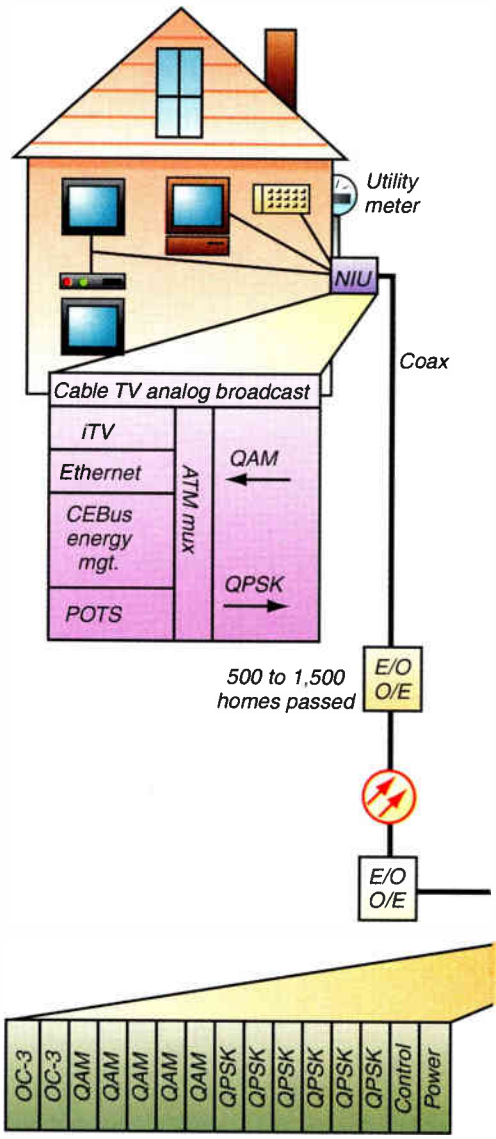
sion. The fastest growing areas of projected cable industry revenue are in digital video and high-speed on-line access, according to Paul Kagan Associates estimates. Existing cable operators have a headstart against other potential service providers because they already have a broadband network in place and can move more quickly to implement broadband services.

To take advantage of the opportunity to provide multiple services with their upgraded HFC networks, operators will have to choose a transmission technology for delivering these services. The transmission technology should be standards-based, should support multiple services, should be versatile in bandwidth allocation and should have built-in management mechanisms. Based on these criteria, asynchronous transfer mode (ATM) is one of the strongest contenders as a transmission technology for the turbulent and evolving situation faced by the cable industry.

The ATM advantage

ATM has a reputation for being expensive to implement, but commercial products are coming down in price as the technology matures, and up-front costs are shared over a large number of users. In the long run, it is considered by many to be the most cost-effective technology. ATM is scalable, with switches available for every size network. Workgroup-sized switches can serve smaller networks, and options go all the way up to backbone switches designed for major national carriers. Because ATM is standardized, operators can choose among a number of vendors



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when selecting network hardware, and all parts of the network will still work together.

The standardized network is also easier to maintain. Only one network management system is required to control the whole network, and it is part of the network system itself. The network management system monitors the quality of service through built-in mechanisms with standardized fault management and performance management that control the quality of the network.

The most attractive aspect of ATM for cable transmission, though, is the fact that it is ready to handle whatever the future brings. The transmission decision will stand in the face of new services. From that point, services can be added as they become available, without major changes being made in the network.

As rapidly as new technology and services appear, any network built just to accommodate current needs is bound to be obsolete in a matter of years. New services that might not have been imagined a few years ago are appearing now, and it is likely that this evolution will continue. Changing or upgrading the network each time a new service is needed would be prohibitively expensive in the long run. With ATM, network interfaces may need modification, but the transmission technology remains the same. The access network is service-independent.

Much of ATM's long-term flexibility comes from its capability to allocate bandwidth dynamically. This makes the most of network capacity. Instead of continuing to upgrade the network as more channels and services become available, ATM uses the 550 or 750 MHz capacity available in an HFC system

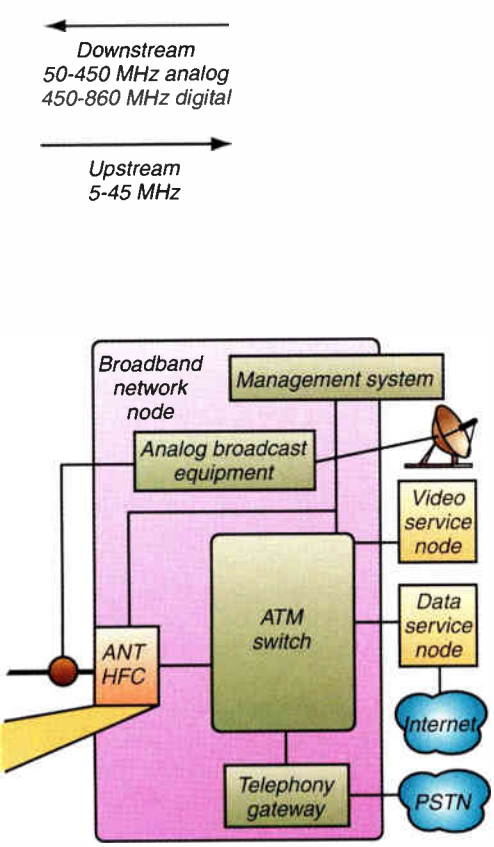

Figure 1: *Ericsson's broadband access system. ATM is used to send multiple services over the existing HFC plant.*

more efficiently, both upstream and downstream. Other technologies require bandwidth to be allocated per service. For two-way transmissions, like interactive video and Internet access, the return path must also be hardwired, with a different return path for each service. If the customer isn't using that bandwidth at that moment, it is wasted. ATM allocates bandwidth only to services that are in use, and different services and subscribers can share the same bandwidth at the same time.

ATM transmission could be implemented on an existing HFC network for less than the initial cost as a modem-based network with two modems (and therefore two services) per subscriber. But the ATM network can handle more than two services. Technology is now available to provide telephony, data, switched digital video, energy management and traditional cable television service through an ATM HFC network–all at the same cost per subscriber as two services on a modem-based network. Each additional service creates new revenue for the operator. With ATM, new services can be implemented as they become available by adding the appropriate network interfaces, without major additional cost or changes to the network infrastructure. The cost of ATM hardware is dropping as more vendors get equipment onto the market, so even the up-front cost of ATM will become more competitive in the near future.

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Implementing ATM

How might an ATM-based HFC system work? A broadband network node residing in the cable operator's headend provides the interface to the various incoming services and the cable operator's HFC network. An ATM switch within the headend directs traffic to and from the HFC network, while an HFC interface unit allocates ATM cells to the appropriate radio frequency (RF) channels.

Digital and analog signals coming out of the interface unit are combined

The digital and analog signals coming out of the HFC interface unit are combined before being sent across the network. A server connected to the network provides switched video services, a router provides access to the Internet, and there is a gateway from the cable headend to the public telephone network.

An integrated network interface unit (NIU) containing an ATM multiplexer, which sits on the outside of the customer's home, would provide the interface to the customer's home devices. The ATM multiplexer in the NIU separates the incoming signal into two telephone lines, interactive video, high-speed data and energy management delivered through interfaces that are compatible with customers' existing devices. Analog broadcast television is bypassed through the NIU and combined onto the same home coax wiring as the digital video. This makes the network architecture transparent to consumers. Additional services could be added by adding an interface to the NIU.

An ATM-based NIU has the advantage of separating the in-home network from the trans-

mission network, preventing problems of ingress noise being sent back up the network path. The outdoor NIU also simplifies maintenance, providing access to network components without needing to enter the customer's home.

Making the long-term decision

As a short-term solution, several operators today are offering services like high-speed data or WebTV through cable modems. But for operators that intend to provide additional multiple services in the future, this is not the most prudent long-term solution. With modems, operators still have to face the capacity issues resulting from bandwidth being allocated per service. Modems don't provide a clear evolutionary path to telephony or videoconferencing services. To provide these, new equipment would be needed throughout the network. Network maintenance with a modem-based network is complicated and expensive because of the number of network elements that must be monitored on a non-centralized system. There is no standardized network management system. A system must be created and added to the network.

Customers may be resistant to modems when more than two are required

Customers may be resistant to modems, particularly when more than two are required to have multiple services. If they are required to purchase modems, they may not want to invest in equipment that may not work on another operator's system. If the operator provides the modems, there is the likelihood of equipment being damaged or disappearing as customers move.

ATM is already the backbone transmission method of choice for the long-distance data and voice carriers. Other competitors for the local loop business are basing their transmission networks on ATM. Cable operators are now being offered an opportunity that will enable them to be competitive, multiservice carriers. Part of that decision is choosing ATM as the transmission standard. This choice is a long-term decision for the future that will only need to be made once. Choosing ATM now means building the foundation for a multiservice network that promises to meet evolving market needs. CED

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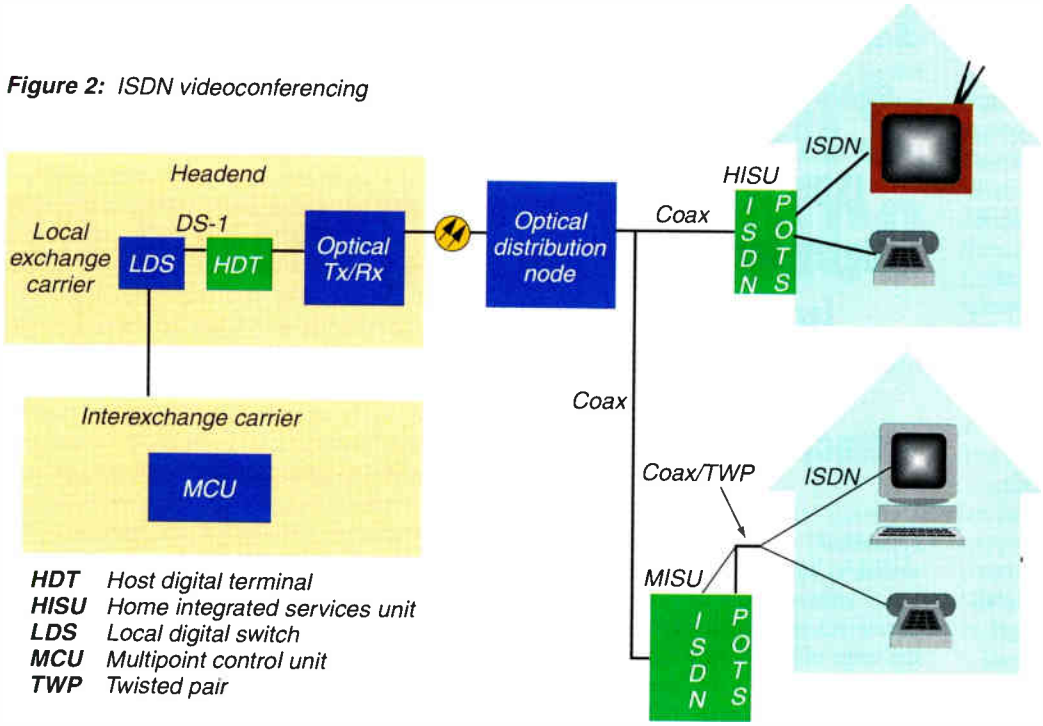
Figure 2: *ISDN videoconferencing*



HDT *Host digital terminal*
HISU *Home integrated services unit*
LDS *Local digital switch*
MCU *Multipoint control unit*
TWP *Twisted pair*

over Ethernet. In fact, the available bandwidth of Ethernet can mean video quality approaching that of television. The issues with Ethernet have to do with contention and isochronous traffic. Ethernet was designed just for data, and continuous contention for the network results in collisions and retransmissions of the packets. This network architecture works well for data transmissions, but it's not as kind to delay-sensitive isochronous traffic, especially under heavy loads.

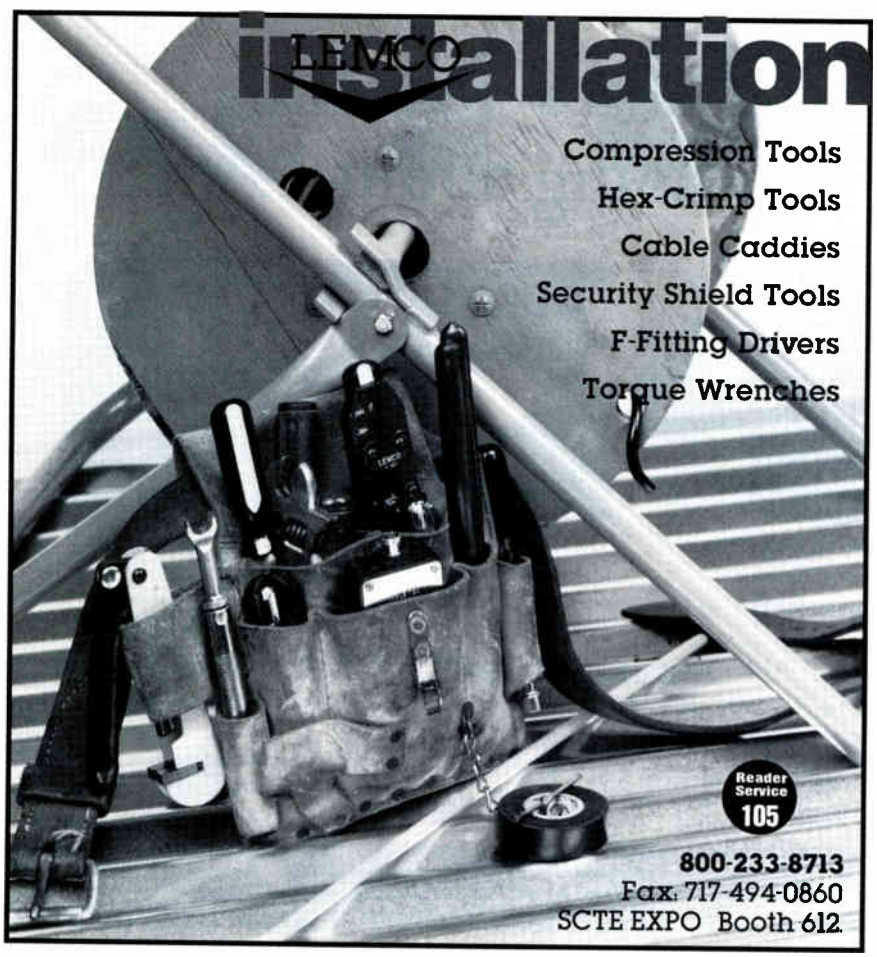
This resource contention and lack of support for isochronous traffic pose a particularly serious problem when asymmetrical cable data modems are used. These modems share an aggregate amount of bandwidth among all users on a system. The asymmetrical approach theoretically allows users very high downstream throughput when alone on the network, but as the number of users increases, the actual throughput quickly decreases. The limited upstream bandwidth of asymmetrical solutions severely constricts data throughput, and therefore, impairs picture quality when used for videophone applications.

The videoconferencing community has identified 384 Kbps as an ideal data rate

Symmetrical, guaranteed bandwidth cable data modems, on the other hand, do not have these problems with contention and isochrony. In fact, they remove contention from their part of the network and allow isochronous traffic to arrive at the regular intervals it requires. Some HFC platforms support integrated symmetrical data modems to provide symmetrical, isochronous service.

384 Kbps

The videoconferencing community has identified 384 Kbps as an ideal data rate for videophone and videoconferencing applications. It delivers TV-like picture quality, and a reliable synchronization of picture and sound. In addition, this data rate, when



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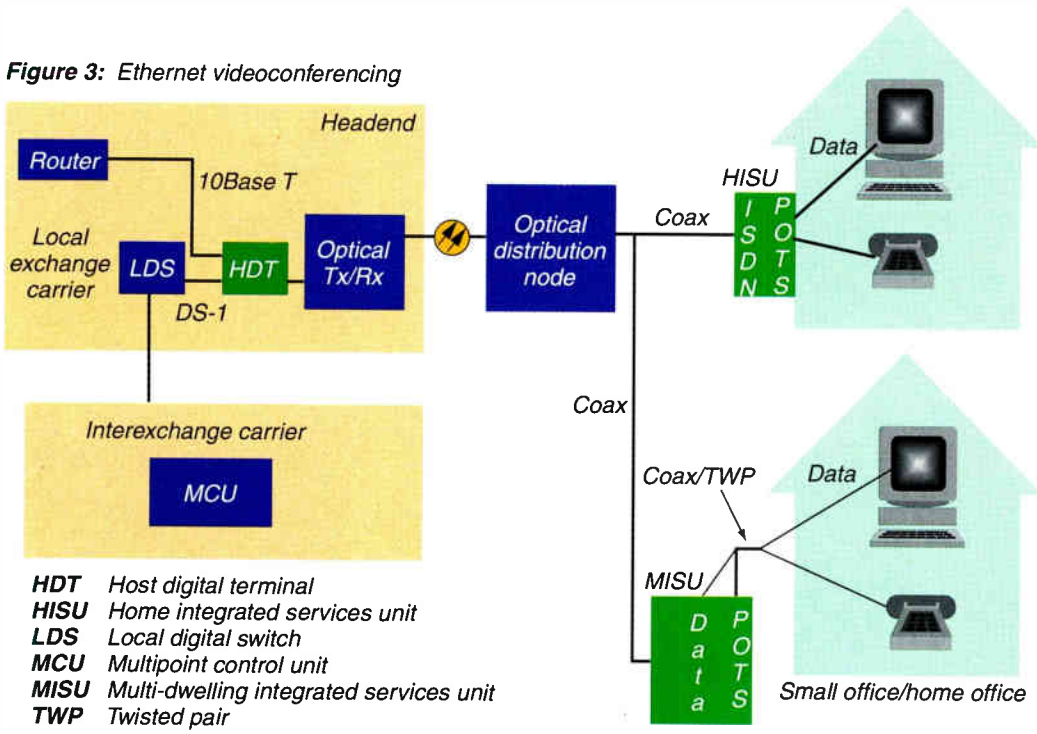


Figure 3: *Ethernet videoconferencing*

HDT *Host digital terminal*
HISU *Home integrated services unit*
LDS *Local digital switch*
MCU *Multipoint control unit*
MISU *Multi-dwelling integrated services unit*
TWP *Twisted pair*

nailed up rather than shared, guarantees sufficient upstream and downstream throughput (without the overkill of DS-1) to enable a high quality of service.

It is worth noting that some HFC network equipment cannot handle both TCP/IP traffic and a nailed-up 384-Kbps link. But for maximum flexibility, it's a good idea to make sure the equipment you deploy can handle both an Ethernet data modem connection and this fractional T-1 connection.

Three criteria

MSOs may elect one or more of these transport media based on their current infrastructure and current and planned services. Whichever transport medium is used, there are some important criteria to keep in mind in designing networks to deliver videophone service.

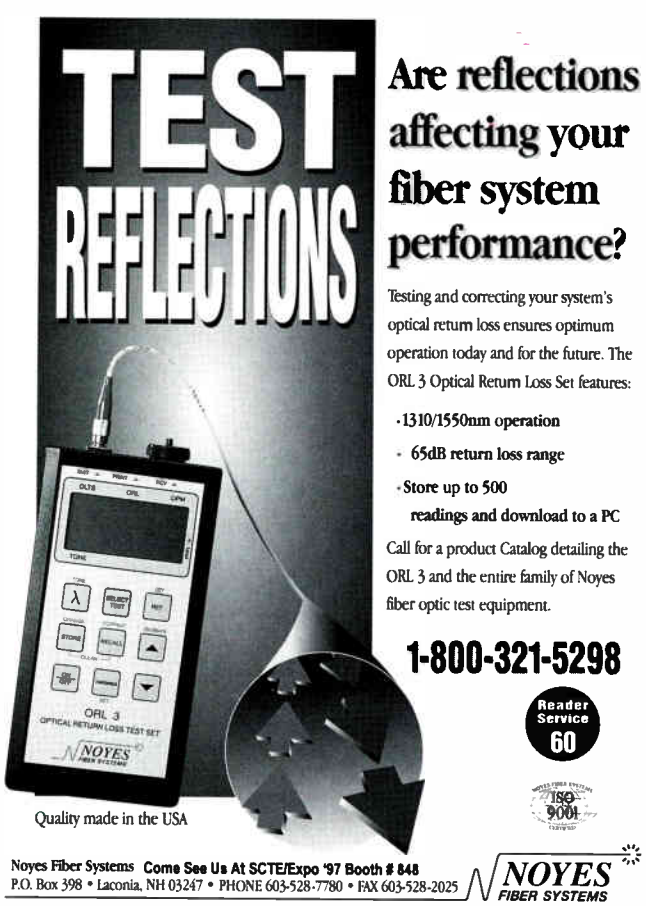
Integrated services

First, since videophone is only one of several two-way services that might be offered, the network equipment should be able to support all planned services over all planned media. In other words, it should be able to integrate voice, video and data over POTS, ISDN, Ethernet or 384 Kbps.

OFDM is a modulation scheme that is more than twice as efficient as QPSK

Efficiency

Second, it should make the most efficient use of available bandwidth, especially in the return path, where bandwidth is at a premium. One way to realize this efficiency is with the right modulation scheme. Orthogonal frequency division multiplexing, or OFDM, for example, is a modulation scheme that is more than twice as efficient as quadrature phase shift keying (or QPSK), an alternative scheme. OFDM uses each 6 MHz channel to carry 480 frequen-



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cies, which equates to 240 DS-0s. QPSK systems, in contrast, can handle only 96 DS-0s in the same bandwidth.

Reliability

As a premium service, videophone needs to be rock-solid. But narrowband and impulse noise ingress in the return path of HFC networks can seriously affect reliability. In particular, the coax portion of the HFC plant can act like a megaphone, amplifying noise into the optical distribution nodes for transmission to the headend.

QPSK transmission systems are especially vulnerable to strong narrowband interferers, which can wipe out an entire QPSK signal. Broadband or impulse interference can do even more damage, affecting all QPSK frequencies. OFDM systems, on the other hand, use very narrow slices of spectrum, so narrowband interferers affect fewer DS-0s. When narrowband interference does strike, OFDM remaps the affected DS-0 to another available frequency, without dropping the call. OFDM systems also are extremely robust against impulse noise.

Because OFDM signals are sliced up by frequency rather than time, their symbol length is much longer than the TDM signals used by QPSK. This longer length makes them more resistant to low-level multipath noise. So for both kinds of interference, OFDM's robustness ensures greater reliability.

Quality of Service

Finally, the network should be able to allocate bandwidth to offer different Quality-of-Service levels. See Mark Laubach's article, "Serving up Quality of Service," in the April 1997 issue of *CED* for a detailed discussion of this critical issue. Cable providers will need to be able to provide and guarantee various levels of service, which can be defined by bit rate, delay and data loss. As Laubach notes, "Multi-tier offerings provide better revenue streams than single-tier offerings" (p. 38). So a business user wanting to hold a videoconference may be willing to pay for symmetrical 384 Kbps service, while a SOHO user may want ISDN, and a residential user may accept POTS-level service for a videophone call.

A residential user may accept POTS-level service for a videophone call

Support for the business case

With the standards and media in place today, videophone services can mean serious revenues for MSOs using HFC plant. MSOs are therefore weighing various transport media and modulation schemes to decide which ones best fit their business case for videophone and other additional services.

Whatever the combination of transport media that cable providers choose, an efficient, reliable, and flexible network architecture will enable them to provide such services and capture those additional revenues. CED

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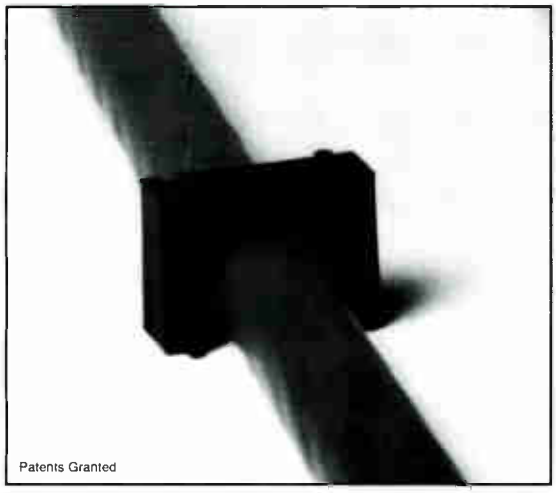

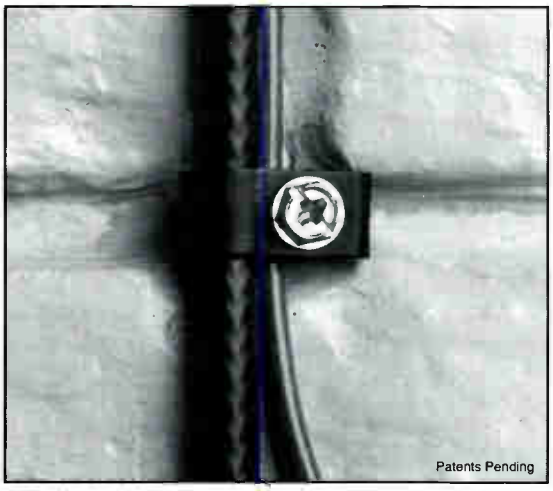

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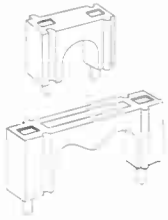

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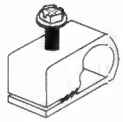

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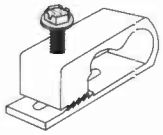

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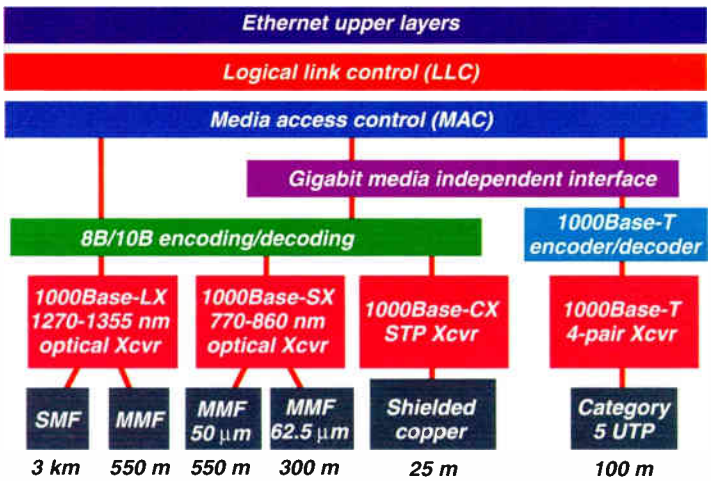
National data net From IP telephony to ITV could be key to new services

By Fred Dawson

Advances in all facets of data-based communications are combining to create a huge advantage over traditional carriers for anyone in a position to build a nationwide network infrastructure, including the cable industry.

This is the dawning realization that has brought cable MSOs together on a plan to cooperate in creating such an infrastructure and is the development that is central to GTE's recently-unveiled plan to develop its own nationwide network with special emphasis on the data side. While key technical issues remain to be resolved and the full potential of many advances, especially in the IP (Internet protocol) domain, remain to be realized, the picture is now complete enough to suggest that high-speed data connections offered end-to-end to small and large customers alike are the ticket into providing everything from telephony to interactive video.

Figure 1: Gigabit Ethernet functional elements.



Source: Gigabit Ethernet Alliance

"Having the opportunity to use state-of-the-art equipment from the start allows us to exploit the latest standards for things like IP telephony and IP broadcasting," said Richard Green, president of Cable Television Laboratories. "It's too big an opportunity to pass up, which is why the CEOs on our executive committee have decided to work together to create a national infrastructure."

This initiative was so new that, at press time, most of the senior technical strategists who will be charged with working out the details were in the dark about the development. But they made clear the benefits could be vast if the issues that have divided them can be overcome.

"There are tremendous economies of scale to be achieved through sharing of a national infrastructure within the cable industry," noted Milo Medin, senior vice president of technology for @Home. "But you need a single point of operation as opposed to simply coordinating efforts among a variety of backbone suppliers."

@Home acted on several fronts this spring to strengthen its position as the leading source of industry backbone support. Most significantly, it gained support from Canadian MSOs Rogers Cablesystems Ltd. and Shaw Communications Inc., both of which took five percent stakes and signed on for backbone and content distribution services from the U.S. firm. With this deal, @Home's partners' cable networks now pass close to half the cable households in North America, officials said. As this agreement was coming together, @Home also completed a deal with Teleport Communications Group, which is controlled by the same cable partners that are involved in @Home. The agreement calls for use of TCG links to open a path to corporate customers that could significantly expand the early revenue base for the data company.

"As our cable partners continue with the rebuilding of their networks to support delivery of residential services, the access to the business community over TCG's facilities gives us a chance to generate a significant revenue return on our infrastructure investment right away," said Matt Wolfrom, spokesman for @Home, which also completed a new round of financing.

"An example of what the TCG agreement means for our business can be seen in Santa Clara, where we currently have an RDC (regional data center) that can use existing (network) facilities to provide services over a 5-to-10 mile radius," Wolfrom said. "With this partnership, we can extend our reach from San Jose in the south to Napa Valley in the North almost overnight."

TCG provides a wide range of switched telecommunications services over wireline facilities in 57 metropolitan markets with connections to some 7,700 buildings and also has access to customers in 103 more markets via 38 GHz wireless links supplied by newly-acquired BizTel, which also holds 38 GHz licenses in all 57 of TCG's markets. "TCG's wireless capabilities give us access to customers anywhere within two to three miles of its fiber routes, as well as to customers outside its primary service areas," Wolfrom noted.

@Home is in the process of completing RDCs in Hartford, Detroit, Union City (northern), New Jersey, Phoenix and Philadelphia, and will soon launch @Work services in those markets, with New York, Boston, Los Angeles and Washington to follow by mid-summer, Wolfrom said. All these markets are served by TCG.

Another MSO moving forward on the CLEC front to establish regional infrastructures is Time Warner Cable, which recently launched switched business services in Austin, the third market it has equipped with its own

5ESS switch, following installations in Manhattan and Rochester, N.Y., where the MSO is offering residential as well as business telephony services. Over the next year or so, the company plans to install switches in all 15 of its other major markets, where it has been offering non-switched competitive access services.

The regional infrastructure envisioned by Time Warner also includes ATM (asynchronous transfer mode) switches, which would serve to handle high-speed data and digital video traffic. While the company is not ready to discuss specific plans, the installation and operation of the ATM units will fall under Time Warner Communications, the telecommunications unit, said Bob Meldrum, spokesman for the group.

Such regional, fiber-rich infrastructures, along with providing support for all locally distributed services, can serve as the data links between an industry wide national data backbone and the local cable distribution plants. The key to making it all hang together is the extent to which the data layer within the regional and local distribution network components is compatible with the architecture of the backbone. For example, where packet telephony is concerned, having a set of regional points of presence that use the same protocols to process packet calls would provide fast connections between callers on disparate cable networks while providing local interfaces to circuit switches that would allow for interconnection between cable-based calls and all other telephony networks with minimal latency.

"We could use a shadow backbone to get much higher performance than we can get over the Internet backbone," said Jerry Bennington, senior vice president for Internet Technology at CableLabs. "We've gone through a watershed over the past two years in terms of our ability to cooperate on strategic issues, so I'm optimistic we can agree on the points necessary to ensure interconnection and interoperability."

Major steps in that direction have already been taken, especially with regard to agreement on protocols for delivering data services over cable networks. But issues remain, including the methods to be used in handling traffic within regional backbones and between the regional edges and the national backbone.

"Successful implementation of a national backbone for the industry as a whole would require agreement on how quality of service is managed at the edge of the local system," Medin said. This is the point at which policy governing handling of various classes of service across the backbone is dictated for managing traffic within the region, which means everyone must employ the same management protocols at the edge and subscribe to the same policies within the local operating cloud, Medin said.

"Depending on how people have built their networks, uniformity could require some major changes in local design," he added.

Given the role of the backbone provider in setting policy for how IP telephony, streamed and cached multimedia services, multicasting and many other classes of services are handled, it will be difficult for cable interests to settle on a cooperative framework, Medin suggested. "It's pretty hard to run what we're doing by committee," he said. "It will be interesting to see how the role of setting policy on the backbone will be handled."

But parties to the discussion among industry leaders said the opportunities were so large that they were determined to overcome the barriers

as well as the anticipated resistance from various technical camps within the industry. "Five percent of this is technical, and the rest is a combination of business and egos," said a senior engineering executive who was instrumental in bringing the industry to consensus.

Asking not to be named, he added, "@Home kind of thought they were going to run with the ball themselves, but now they'll have to accommodate a larger perspective and purpose."

One touchstone for achieving wider cooperation on a national high-speed cable data infrastructure is the possibility of linkage between a new national backbone created by US West's Continental Cablevision and the backbone built by @Home Networks for its cable partners, which along with new additions Rogers Cablesystems and Shaw Communications includes Tele-Communications Inc., Comcast Corp. and Cox Communications. "We're talking, which is about all I can say at this point," said Paul Bosco, director of broadband infrastructure and service development for the MSO.

Continental's new national backbone, linking high-speed data service territories in New England, Atlanta, Jacksonville, Fla., Detroit and Los Angeles, uses leased fiber lines in combination with regional production centers to provide a distributed architecture for delivering various categories of high-speed data services at guaranteed levels of quality that are hard to achieve using direct regional tie-ins to the Internet backbone. This is the same principle on which @Home has built its backbone.

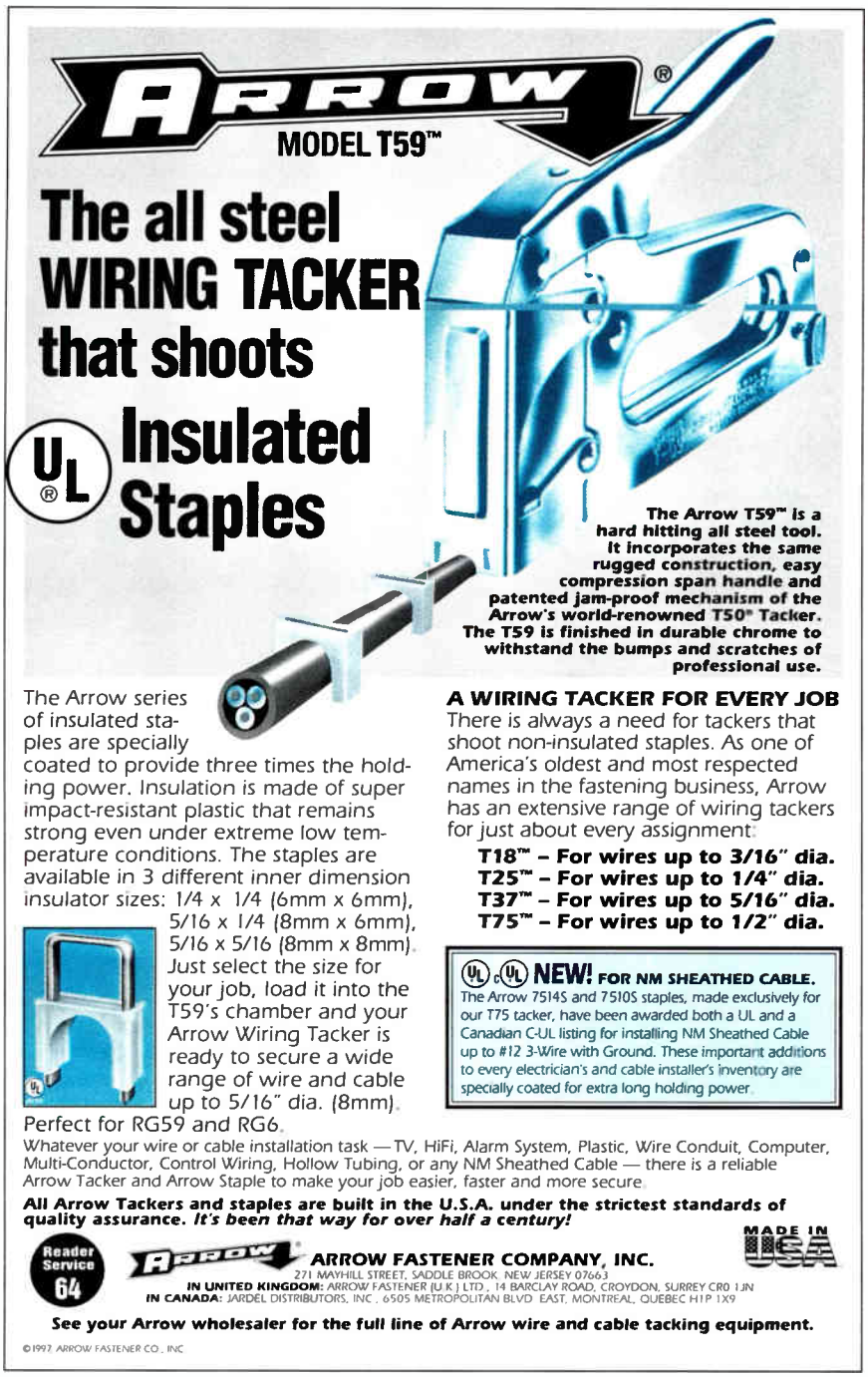
While MSOs that don't have their own national backbones, such as Time Warner, can turn to other suppliers, as Time Warner is in using MCI's links, it would be hard to get such outside suppliers to cooperate on all the issues that need to be resolved in order to support a cable-specific set of service tiers, Medin said. "The MCIs and BBNs of the world have a lot of other priorities to deal with besides cable, so you don't have any assurance that you'll get what you need without doing it yourself," he said.

At Time Warner, the internal focus has swung to IP telephony

The biggest factor in the sudden top-level push for a universal cable data infrastructure is the potential of IP telephony to open a quick path into a highly-featured second-line business for cable operators that avoids the headaches and costs of implementing circuit switched voice over hybrid fiber/coax networks. For example, no one has gone further than Time Warner in preparing for delivery of voice services over HFC, but, despite stronger than expected take rates for its residential voice service in Rochester, N.Y., the internal focus has swung to IP telephony, said Michael Luftman, vice president of public affairs for Time Warner Cable.

"There's a lot of discussion here focusing on IP telephony," Luftman said. "We're studying it very closely, but we haven't reached any decisions yet."

Recent demonstrations of advances in packet telephony have persuaded many industry leaders that their high-speed data pipes will be able to deliver a commercially viable package of enhanced voice services at costs far below



those previously calculated for provision of circuit-switched telephony over hybrid fiber/coaxial lines. But, to make such services viable on a widescale basis, there must be points of entry based on commonly used protocols at all the regional levels, allowing servers to hand off calls destined for circuit service customers, while sending along calls in data formats to customers that are using cable's data-based voice services.

"We think IP (Internet protocol) telephony has the potential to be a very appealing business, but you've got to have standards if you're going to have an effective nationwide service," said an executive at one of the top MSOs, asking not to be named. "This is at a very embryonic level, but that's the plan."

Cable has been behind the "power curve" in packet telephony development, but that's about to change, Bennington said. "We're trying to move up on the list of priorities for the vendors so that they focus on developing products more suited to our needs," he added.

"IP telephony is sort of the CB of the Internet, acting like it's half duplex with a lot of latency," Bennington continued. "But in offering packet telephony over cable systems, you wouldn't have that kind of latency if you used high-speed backbone interconnections between Time Warner, TCI and the other cable companies."

The cable industry is looking for a low-latency service that can interconnect packet line users with circuit switched service users. Moreover, Bennington said, it must have a directory system that makes it as easy to dial someone at a computer as it is to dial a phone number.

Lucent Technologies' packet telephony system, based on the Internet standard H.323, has been especially influential in fostering the strategic shift now underway in cable. But the phone-to-phone version of its Internet Telephony Server SP that it will be supplying this summer for tests by ICG Communications, MCI and France Telecom is meant for a more limited set of applications.

In the initial iteration, users' calls will go out over local telephone lines to the central office switch. The switch will hand off calls designated for a specific distant number to the IT server for conversion to IP format, and transmission over data links to the IT server of the receiving entity in another city. There, the call will be converted back to the switched circuit protocol and handed off to the local central office for switching to the final destination.

"The choice of phone-to-phone capabilities for our initial server product is a matter of priorities dictated by the marketplace," said Brian Allain, director of future Internet initiatives at Lucent's Network Systems Division. "PC-to-phone connectivity will come a little bit later this year."

Avoiding long distance carriers' local access costs, the business PBX-to-PBX connections represent a strong revenue source for Lucent's technology right out of the chute. But cable operators want to be able to offer their second-line service in data format, enabling them to add a variety of features, including video telephony, that are supported by the H.323 protocol. At the same time, operators want to ensure that callers using the high-speed data links can easily reach or be reached by people who are on standard phone lines.

"We have a very long list of the types of services cable could offer along these lines," Bennington said, noting that the opportunities for a second-line service are strong on the resi-

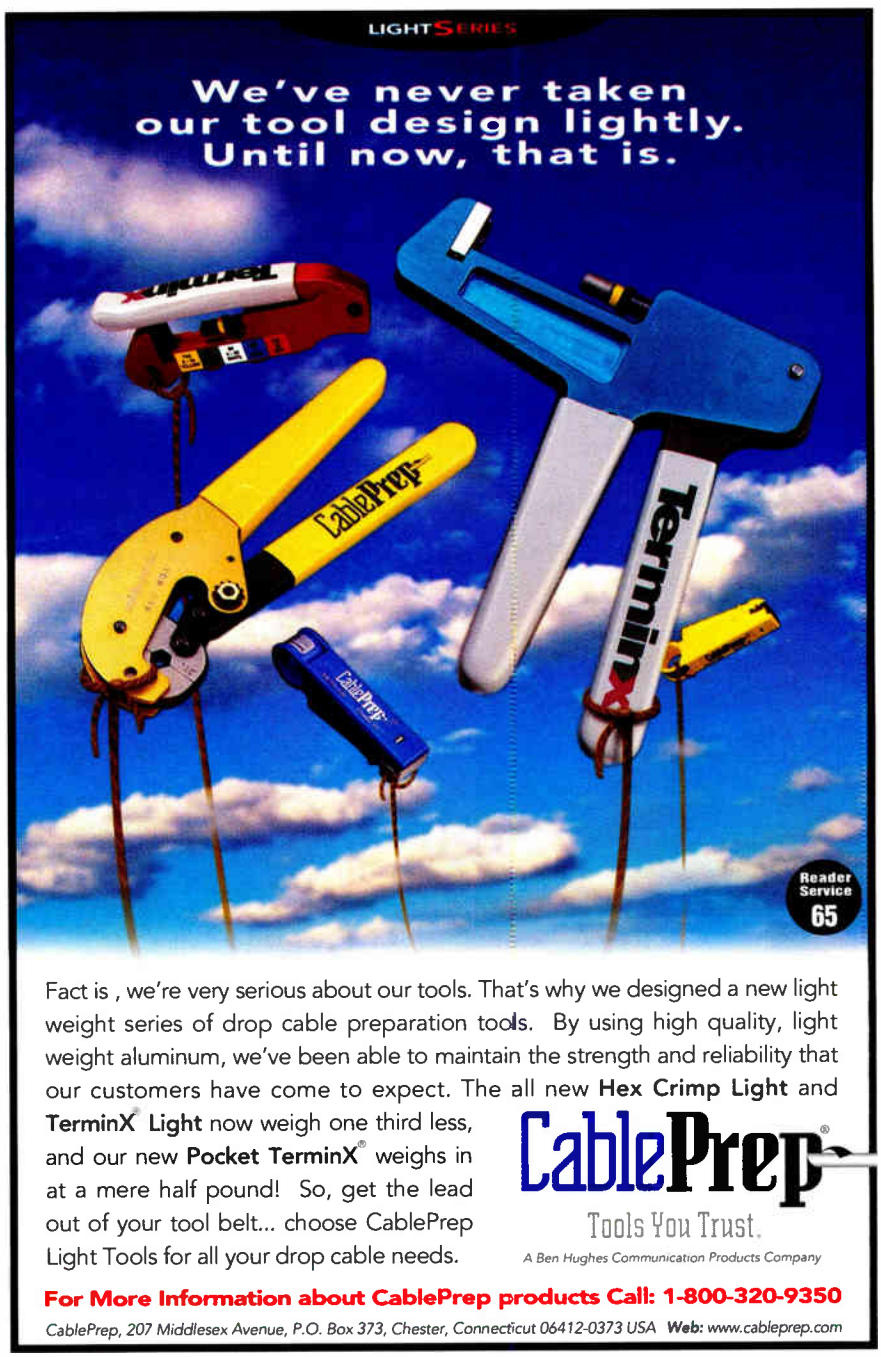


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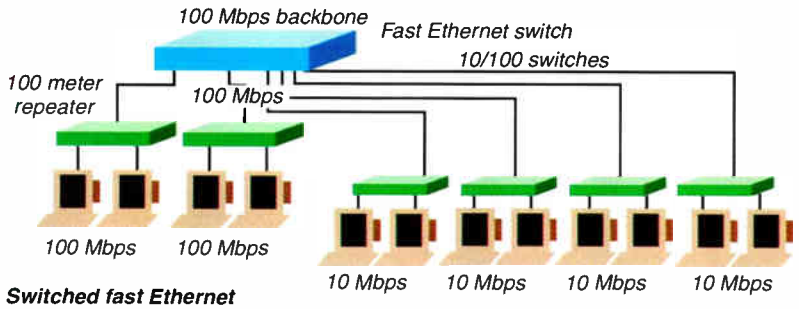
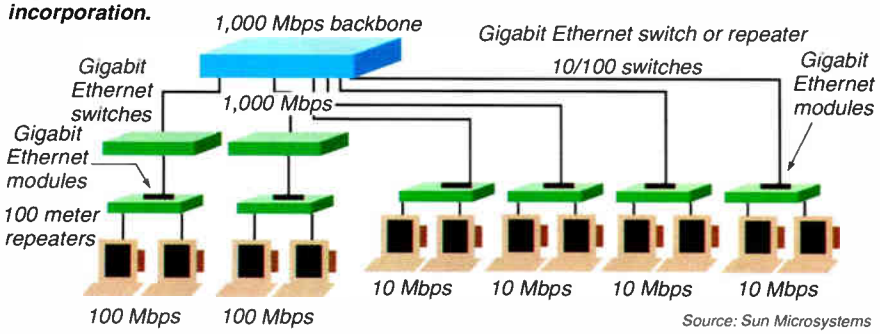
Figure 2: *Gigabit Ethernet technology.*



Switched fast Ethernet backbone network prior to Gigabit Ethernet incorporation.



Switched fast Ethernet backbone network after Gigabit Ethernet incorporation.

dential and business sides alike. For example, he said, in a situation where someone with a large company is working at home, a customer calling the office PBX number could be automatically routed through the server to the worker at home, avoiding any confusion or need to talk with an intermediary.

The important thing, Bennington added, is that IP telephony in systems equipped for high-speed data is largely a "freebie" that avoids the need to equip the network with telephony hardware.

Phone-to-PC connectivity is readily doable, including provision of a directory solution, Allain said, but Lucent is waiting for more work to be done on the H.323 standard before rolling out these capabilities. As for videophone features, "that's something we want to have, but it's not a priority at this moment," he said.

While Lucent's (and other) recent releases of packet telephony, including proprietary versions from VocalTec Ltd. and others, have made full duplex IP a viable concept by eliminating much of the latency inherent to packet communications, they necessarily must add a new, albeit less significant, latency element in providing for call interconnection between circuit and packet networks.

"There's a slightly greater delay caused by the conversion process, which is noticeable," Allain said. Moreover, he added, "Voice quality is very close to standard telephony, though once in a while there are little impairments that you can detect."

Lucent doesn't believe the quality gap will stop widescale use of its initial product, because the software gives carriers the option of offering a different, lower cost class of service that is still high quality and robust. Over time, Allain said, the ongoing gains in processor speeds will serve to overcome both the delays and the voice quality limitations imposed in the digital compression process, which now runs voice data at 7.3 kilobits per second.

The quality issue isn't a show-stopper where cable is concerned either, Bennington said. "The fact that, at this point, packet telephony isn't ready for prime time doesn't bother me," he said, noting that, in whatever interim it takes for processors to overcome the gap, the question of whether a second line packet telephony service needs to be as good as lifeline service "may or may not be an issue."

Cable's drive to create a national backbone comes as the means for creating a low-cost distributed architecture built around the Ethernet protocol are reaching the marketplace. Where, previously, the only way to ensure end-to-end connectivity for a highly flexible backbone such as cable seeks was to

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convert all the data packets to ATM (asynchronous transfer mode) cells once they moved out of the local distribution environment, it is now possible to think about using Ethernet switches instead, including the new gigabit Ethernet gear now making its way into the marketplace.

As previously reported (see *CED*, April 1997, page 76), the business market has proven to be a tough nut for ATM, given the size of the installed base of Ethernet nodes and the costs and inefficiencies surrounding protocol conversion at the wide area edge. Some vendors and their customers are pushing for IP over ATM solutions, where the trafficking information contained in the IP header is preserved, while ATM is used as the transport format, while others are focusing on an all-Ethernet approach where gigabit switches become the backbone workhorses instead of ATM.

Today, routers are designed to handle protocol conversions between Ethernet and FDDI (fiber data distribution interface), which is the primary local backbone technology used in linking LANs or, in cable's case, linking routers at distribution hubs. But the ability to deploy an all-Ethernet network without resorting to FDDI or other non-native formats changes the picture, said Gordon Stitt, president and CEO of Extreme Networks, a supplier of gigabit Ethernet switches.

"You'll see a new generation of switches and routers very focused on Ethernet and high-performance routing that don't do frame translation," Stitt said. Today, there are 100 million Ethernet nodes in place, and by 2000, the rate of deployment will be at about 35 million per year, he noted.

The ability to operate without frame translation opens a wide range of capabilities to Ethernet across the backbone that have been hindered by the frame conversion requirement, Stitt said. "Ethernet has not offered the quality of service capabilities available over ATM and some other technologies, but that's going to change very quickly," he added.

Extreme and other parties to the new Gigabit Ethernet Alliance have settled on a common architecture but have a way to go before all aspects of the technology are standardized. But, as Stitt noted, ATM backers are still wrestling over standards for advanced capabilities as well, including the crucial issue of how to maximize IP potential for multimedia and telephony applications.

Making a choice between ATM and gigabit Ethernet in the backbone is very difficult at this point, noted Kingston Duffie, assistant vice president of technology at Ascend Communications, a supplier of remote networking solutions for corporations and service suppliers. "It's hard to look five years out and know which approaches are going to evolve to keep up with your needs," Duffie said.

But, he added, ATM could be hurt if its advantage as a technology that can mix circuit switched voice with data is neutralized by IP telephony. "My guess is you're looking at IP as the critical technology," he said, adding, "voice over IP is something to watch very closely."

Cox is using ATM switches for its multi-service needs at the regional level

For many cable operators, ATM will be the workhorse in the regional backbone, serving to map all types of services into a fabric that supports sharing of switching resources across all facilities. Cox, for example, while partnered in @Home, which presently uses ATM only as a transport mode for IP, is using ATM switches to handle its multi-service needs at the regional level, noted Jay Rolls, director of multimedia technology at Cox.

But this doesn't prevent Cox from being compatible with @Home, Rolls said. "We use a (private virtual channel) ATM link that provides the connection between our hubs and @Home's regional data centers," he noted. "At the center, the signal is converted to the native IP and sent out as IP over ATM on the backbone."

This suggests there is room for agreement between those who see ATM as vital to efficient operations in the multi-service regional environment and those who want to maximize IP efficiency by operating in an all-Ethernet environment end to end. But, given the strong divisions among technical people, getting them to agree on the distributed architecture approach taken by @Home, and now, Continental, may be harder than it looks.

"It's going to take real leadership, because a lot of egos are involved," said a senior cable executive, asking not to be named. "We can't assume that the benefits from cooperating on this will carry us through the debate to a successful resolution without some serious head-knocking." CED

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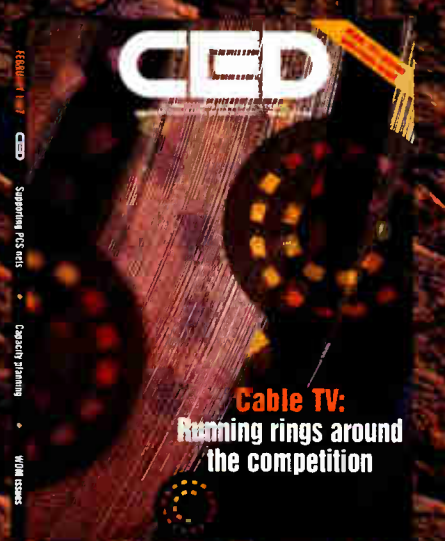

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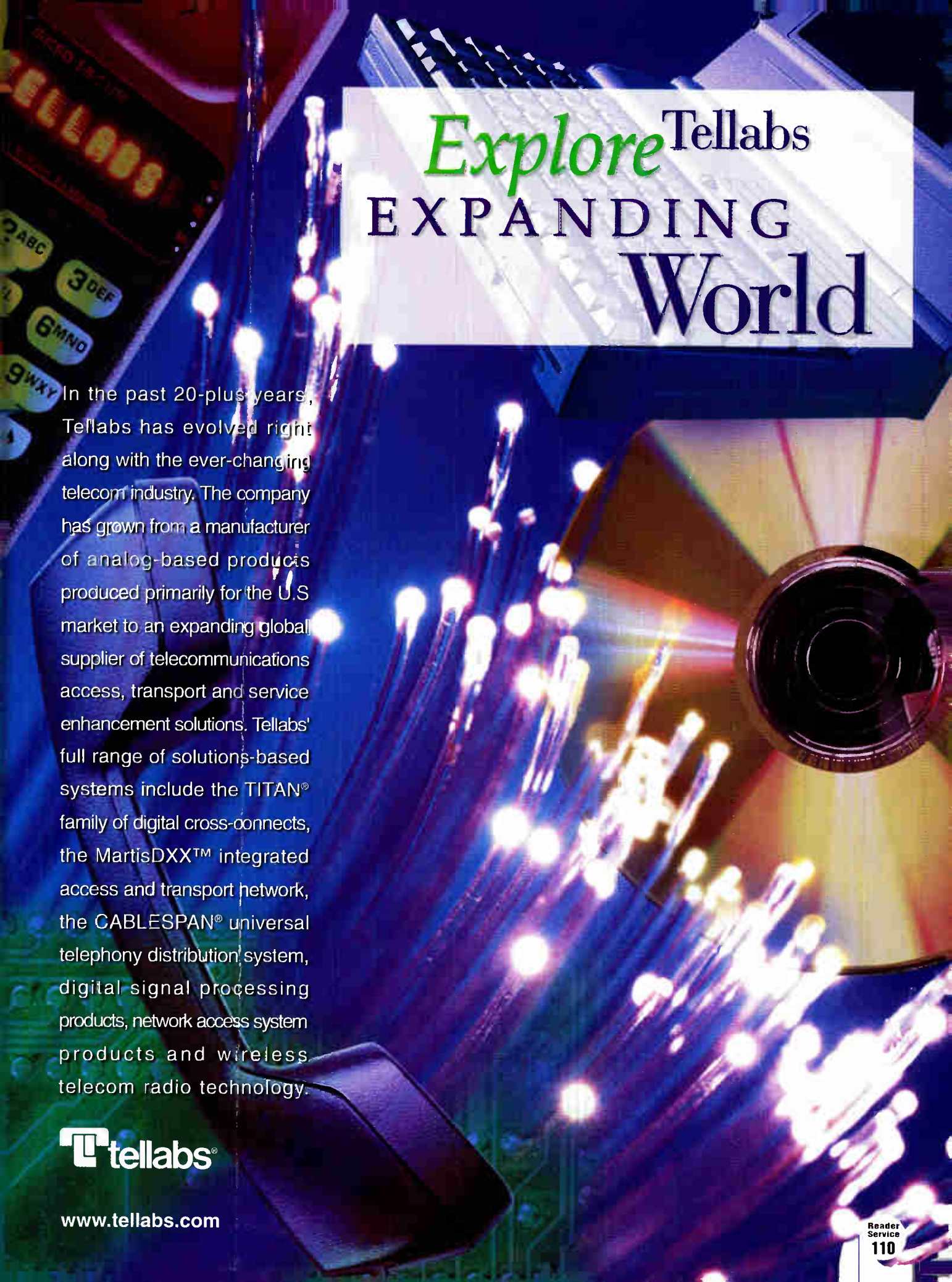
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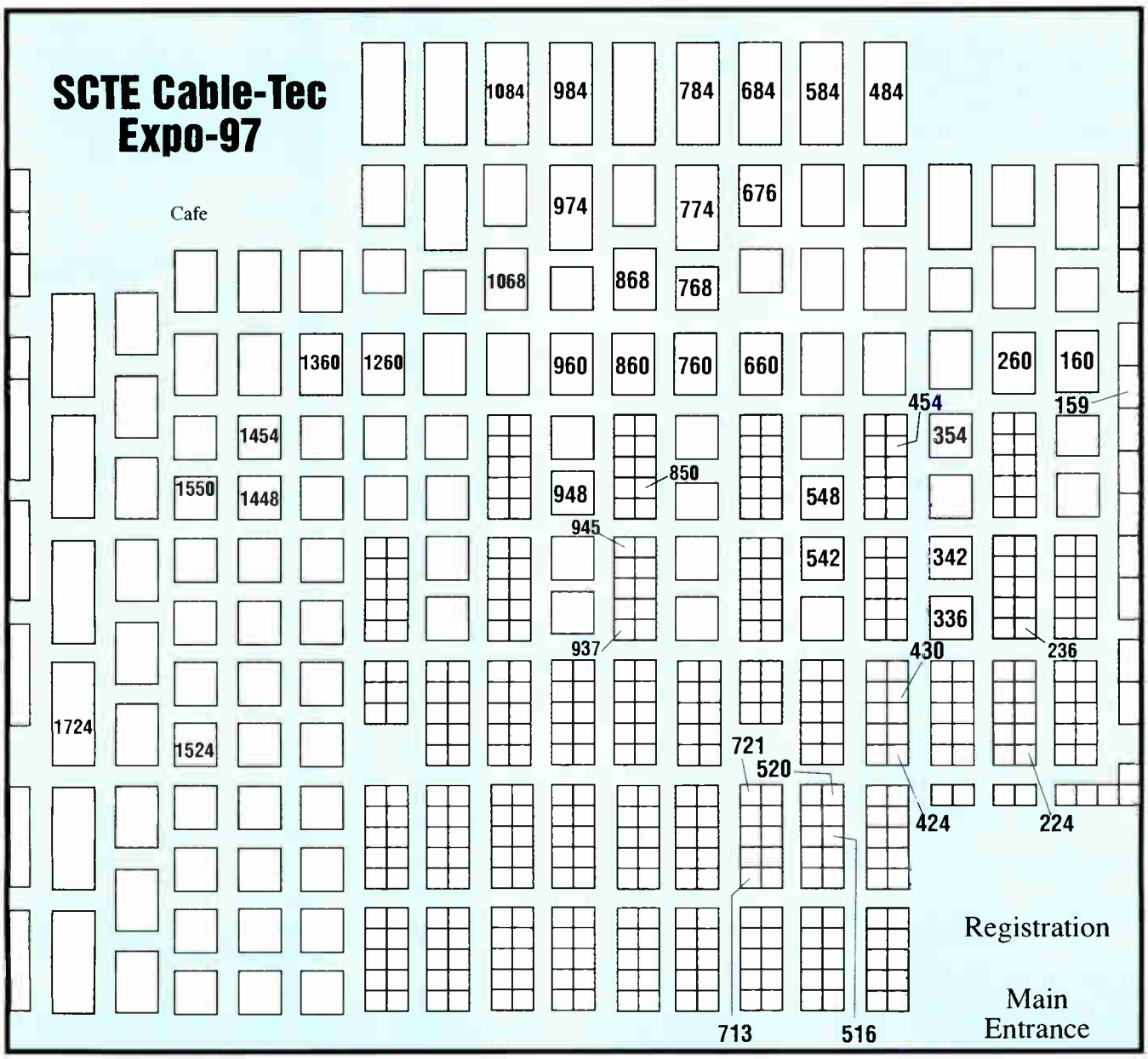

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Toshiba America Information Systems Inc. 1004
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West End Systems Corp. 684
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West End Systems, an affiliate of Newbridge Networks Corporation, develops and markets access and transmission products for the Cable TV and Telecommunications markets. This year West End's Horizon™ cable network interface unit, with its inherent voice and data transmission capabilities, is featured on the "West End Marketplace" Booth, in settings which illustrate how applications such as - Telecommuting • Telemedicine • Education • Internet Access • Business Leased Line Service • Ethernet Connectivity • Security - will make your profits grow.

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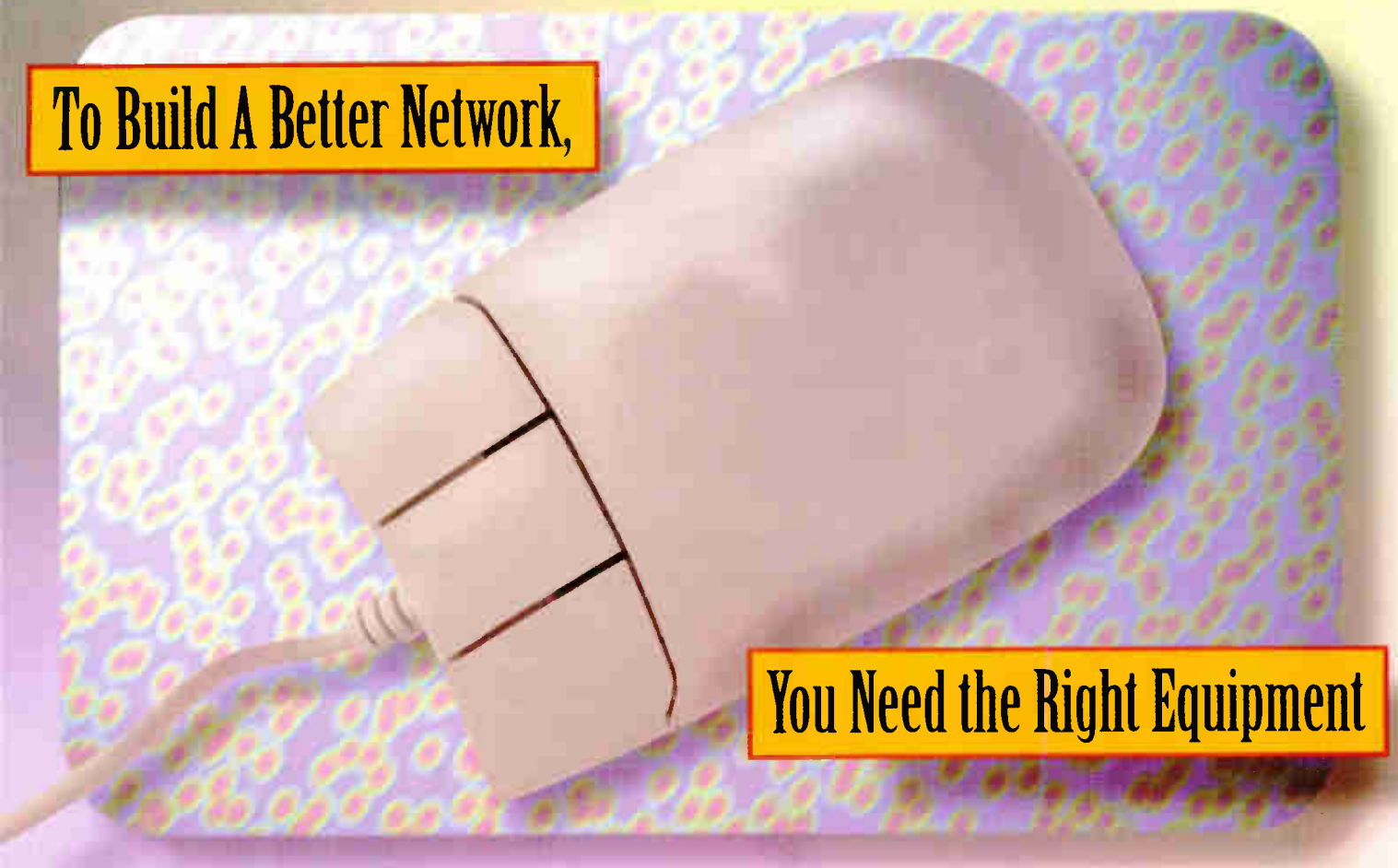

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General Instrument Corporation Circle # 55
General Instrument/ Next Level Broadband Networks Group designs and manufactures end-to-end broadband telecommunications systems. Offices around the world. Headquarters: 2200 Byberry Rd. Hatboro, PA 19040 Telephone: (800) 523-6678. p. 103

Integration Technologies Circle # 56 p. 104

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Arrow Fastener Co. Inc. is a 68-year-old American manufacturer of quality-built hand tools. Its all-steel T50 staple gun is a proven leader. The company makes the worlds only UL and C-UL listed staples shot from staple guns for the electrical, cable installation, and building trades. p. 118

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Telecrafter Products Circle # 4, 62
Telecrafter Products is a supplier of drop installation products for CATV, DBS, and wireless operators and drop cable fastening products for single and dual cables, identification tags, residential enclosures, and more. p. 8, 115

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Times Fiber Communications is an ISO 9001 registered manufacturer of coaxial cables for the telecommunications industry. Committed to quality, service and technology, TFC is standardized on 1 GHz bandwidth for trunk, feeder and drop cables. p. 89

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Focused on the last mile, our revolutionary new technology creates 1 GHz communication amplifiers, passives, taps, and subscriber materials to solve system problems before they become subscriber problems. p. 72, 137

Lucent Technologies Microelectronics Group Circle # 39 p. 78

Philips Broadband Networks Circle # 31
Philips Broadband Networks, a global supplier of broadband RF and fiber optic transport equipment, is also a leading provider of advanced systems used to access broadband telephony and data services. p. 63

Quality RF Services Circle # 76
Quality RF Services manufactures Isolation, Rack Mount and Channel Insertion for CATV headends plus 750 MHz/860 MHz Hotel/MDU amplifiers. The largest independent supplier of Hybrid ICS, equalizers, pads and every common part to repair CATV amplifiers. p. 137

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Trilogy Communications, Inc Circle # 23
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iCS, Inc. is a leading full service stocking distributor of General Instrument, CommScope, Digicipher, Scientific-Atlanta, DX Communications, PPC, Diamond and much more, offering 10 sales offices and 9 warehouses for rapid delivery, repair of converters, and financing. p. 15

Power & Telephone Supply Co. Circle # 51
Power & Telephone Supply serves the power and communications material distribution needs of the US through 18 strategically placed stocking warehouses, including a specialized export facility in Miami, Florida. p. 98

TeleWire Supply Company Circle # 63
TeleWire Supply is the distribution division of ANTEC Corporation and a leading nationwide distributor of products needed to build and service a broadband communications network. p. 117

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Alcatel Telecommunications Cable offers premium fiber optic cable products for outside plant and indoor environments, including optical fiber, loose tube, central tube, and specialty cables. p. 37

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Molex Fiber Optics, a leading worldwide supplier of quality fiber optic products, offers a full range of passive and active solutions, serving the CATV, telecommunication and datacommunications markets. p. 107

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ADC Telecommunications is a leading global supplier of transmission and networking systems used to deliver voice, data and video services. The company holds a preeminent market position in physical connectivity products for fiber optic, twisted pair, coaxial and wireless networks worldwide. p. 2-3, 69

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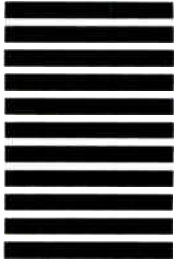

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Circle # 38, 108

The leading manufacturer of RF interconnects for broadcast and telecom applications. Sales (800)982COAX; www.trompeter .electronics.industry.net/trompeter@worldnet.att.net **p. 77**

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Circle # 45

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TCS Communications
Circle # 72 p. 136

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Tellabs, Inc.
Circle # 110 p. 122B

Test Equipment

Anritsu Wiltron
Circle # 53

The Cable Mate cable analyzer is a single, rugged tester for return loss/SWR, insertion loss, RF power and Distance-To-Fault measurements designed for the rigors of field maintenance. **p. 101**

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Trilithic manufactures test equipment for the CATV and LAN industries and components for aerospace and satellite communications. Key products are SLMs, leakage detectors, and a comprehensive line of return test equipment. **p. 31**

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http://www.cecorp.com

Communications Information Software (CIS)
http://www.cisfocus.com

Corning Incorporated
http://www.comingfiber.com

Exide Electronics, Emerging Technologies Group
http://www.exide.com

FONS Corp.
http://www.fons.com

Frontline Communications
Email: flcomllc@aol.com

Fujitsu Network Communications
http://www.fujitsu.com/fnc

General Instrument Corporation
http://www.gi.com

GN Nettest, Laser Precision Div.
http://www.gnlp.com

Harmonic Lightwaves, Inc.
http://www.harmonic-lightwaves.com

Hewlett-Packard Company
http://www.hp.com/go/catv

NFOEC
http://www.pcmisandiego.com/pcminc/nfoec97.htm

PCIA
http://www.pcia.com

Integration Technologies
http://www.integrationtech.com

ISC Datacom
http://www.fastlane.net/~isc

Leaming Industries
http://www.leaming.com

Lucent Technologies Microelectronics Group
http://www.lucent.com/micro

Microwave Filter Co., Inc.
http://www.ras.com/mwfilter/mwfilter.htm

Molex Fiber Optics, Inc.
http://www.molex.com

Monroe Electronics, Inc.
http://www.monroe-electronics.com

National Cable Television Institute (NCTI)
http://www.ncti.com

Ortronics Inc.
http://www.ortronics.com/connect

PICO Macom Inc.
http://www.piconet.com

Pioneer New Media Technology
http://www.pioneerusa.com

Power & Telephone Supply Co.
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RDL Inc.
http://www.rdl-instrumentation.com

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http://www.relteccorp.com

Sadelco, Inc.
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Standard Communications
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Trompeter Electronics Inc.
http://www.trompeter.electronics.industry.net

Wavecom Electronics, Inc.
http://www.sask.trlabs.ca/wavecom/index

Wavetek Corporation
http://www.wavetek.com

West End Systems Corp.
http://www.westendsys.com

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Companies in this issue

The following companies are cited in articles and features in the current issue. Page numbers refer to where the initial mention takes place in a particular story. Listings do not include some departments.

9-13 Broadband Communications Network Design, produced by General Instrument. Location: Denver, Colo. Call Lisa Nagel at (215) 830-5678.

10-11 Wheat State SCTE Chapter, Testing Session. Location: Wichita, Kan. BCT/E certification exams to be administered. Call Vicki Marts (316) 262-4270.

10-12 4th Annual Global DBS Summit, sponsored by DBS Digest/Link Events. Location: Hyatt Regency DTC, Denver, Colo. Call C. Ondrias (719) 545-1986.

10-12 Digital Network Engineering Training, produced by General Instrument. Location: Denver, Colo. Call Lisa Nagel at (215) 830-5678.

11 Rocky Mountain SCTE Chapter, Technical Seminar. Topic: Powering/Safety. Location: TBD. Call Hugh Long (303) 603-5236.

13 49th ARFTG Conference, sponsored by Automatic RF Techniques Group (ARFTG), IEEE Microwave Theory and Techniques Society. Location: Denver, Colo. Call Roger Marks, NIST (303) 497-3037.

14 Llano Estacado SCTE Chapter, Technical Session. Topic: Construction practices. Location: Cox Cable Office, Lubbock, Texas. Call David Fielder (806) 793-7475, ext. 4518.

16-20 Plant Maintenance, Proof of Performance and Signal Leakage Training, produced by General Instrument. Location: St. Louis, Mo. Call Lisa Nagel at (215) 830-5678.

Trade shows

June

1-5 Supercomm '97. Location: New Orleans, La. Call the U.S. Telephone Association (202) 326-7300.

2-5 IEC Communications Forum at Supercomm. Location: New Orleans. Call (312) 559-4600.

4-7 SCTE Cable-Tec Expo '97. Location: Orlando, Fla. Call the SCTE (610) 363-6888.

July

28-31 Jornadas de Television por Cable '97. Location: Buenos Aires, Argentina. Call the Argentina Cable Television Association (011) 54-1-342-3362.

August

18-20 Great Lakes Cable Expo. Location: Indianapolis, Ind. Call (317) 845-8100.

September

10-12 PCS '97 (Personal Communications Showcase). Location: Dallas, Texas. Call PCIA at (703) 739-0300 for more information.

21-25 NFOEC '97. Location: San Diego, Calif. Call (619) 467-9670.

28-30 Atlantic Cable Show. Location: Baltimore, Md. Call (609) 848-1000.

October

21-23 1997 National Communications Forum/InfoVision97. Location: Chicago. Call (312) 559-4600.

December

10-12 The Western Cable Show. Location: Anaheim, Calif. Call the CCTA at (510) 428-2225.

19-20 Understanding ATM Application and Implementation, produced by TRA. Location: Denver, Colo. Call Louis Greene (800) 872-4736.

20 Oklahoma SCTE Chapter, Testing Session. BCT/E certification exams to be administered. Location: Edmond, Okla. Call Doug Huston (405) 348-4225.

23-24 SCTE Regional Training Seminar. Topic: Introduction to Telephony. Location: Chattanooga, Tenn. Call SCTE National Headquarters at (610) 363-6888.

23-25 WCA '97, produced by the Wireless Cable Association International. Location: Anaheim, Calif. Call (202) 452-7823 for more information.

25-26 Understanding Hybrid Fiber/Coax Design, produced by Scientific-Atlanta Institute. Location: San Diego. Call SAI (800) 722-2009, press "3" to register or for info.

25-27 Broadband Communications Technology, produced by C-Cor Electronics Inc. Location: Providence, R.I. Call (800) 233-2267.

25-27 SCTE Regional Training Seminar. Topic: Technology for Technicians II. Location: Chattanooga, Tenn. Call SCTE National Headquarters (610) 363-6888.

28 Cascade Range SCTE Chapter, Testing Session. BCT/E certification exams to be administered. Location: TCI office, Salem, Ore. Call Betty Reed (360) 891-3295 for more information.

21-22 Fiber Optic Network Design, produced by Pearson Technologies Inc. Location: Minneapolis, Minn. Call Eric Pearson (800) 589-2549 for more information.

23 Rocky Mountain SCTE Chapter technical seminar. Topic: Distribution/optical link performance. Call Hugh Long (303) 603-5236.

28-31 Fiber Optic Training, produced by The Light Brigade. Location: Denver, Colo. Call (800) 451-7128.

29-8/1 Fiber Optic Training, produced by The Light Brigade. Location: Vancouver, B.C. Call (800) 451-7128.

30-8/1 Fiber Optic Network Installation, produced by Pearson Technologies Inc. Location: San Francisco, Calif. Call Eric Pearson (800) 589-2549.

5-7 Broadband-LAN Laboratory, produced by C-Cor Electronics Inc. Location: State College, Pa. Call (800) 233-2267 for more information.

12-14 Broadband Communications Technology, produced by C-Cor Electronics Inc. Location: State College, Pa. Call (800) 233-2267.

19-22 Fiber Optic Training, produced by The Light Brigade. Location: Helena, Mont. Call (800) 451-7128.

20-21 Profiting from Wireless Cable and LMDS, produced by ICM Conferences Inc. Location: Chicago, Ill. Call Kimberlee Mulherin at (312) 540-5698.

25-28 Fiber Optic Training, produced by The Light Brigade. Location: Idaho Falls, Idaho. Call (800) 451-7128.

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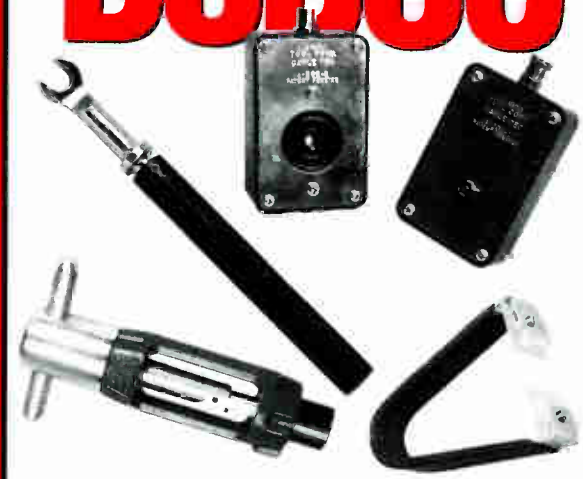

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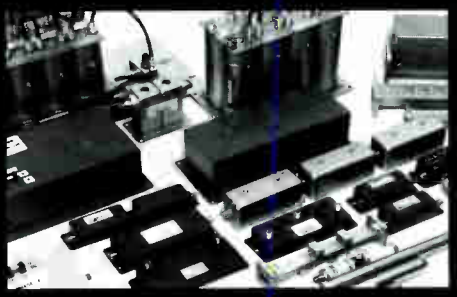

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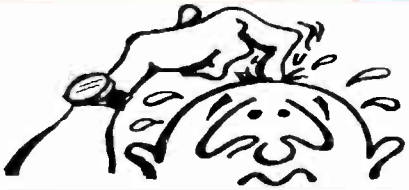

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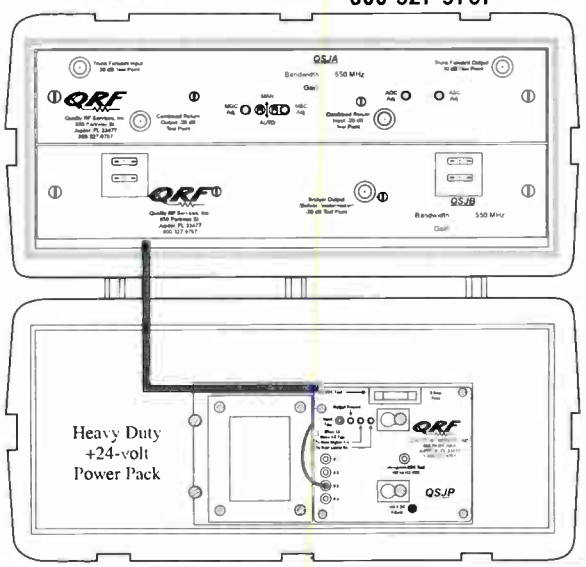

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Shaw, Alliance bring VOD to Canadians

Alliance Communications Corp., a Canadian film and television production company, and Shaw Communications Inc., one of Canada's largest cable MSOs, plan to team to provide a video-on-demand (VOD) programming service.

The Shaw/Alliance partnership will commit $30 million to the development of an in-home video service. The technology and programming commitment will bring Canadian consumers North America's first residential video-on-demand system to the home.

The Alliance/Shaw service is a sophisticated system that will bring real VOD into Canadian homes. Thirteen or more video file servers located across the country would store digitized versions of movies, educational materials and other programs. Each file server houses more than 500 titles. VOD will be available to distribute services such as cable and microwave which offer subscribers digital set-top boxes. Customers use a navigational system to choose from an inventory of titles, ordering directly through their set-top boxes. The order goes to the video file server, and the title is transmitted automatically to the subscriber's television. The billing for the order is handled by the distribution system and appears on the subscriber's invoice.

Alliance/Shaw's $30 million investment includes purchasing 13 video file servers. Major regional video servers will be deployed beginning Fall 1997. Smaller servers will follow digital set-top box distribution.

Comcast brings data to TSU campus

BALTIMORE–Comcast Cablevision of Maryland and Towson State University will be working together to offer TSU students high-speed data and Internet access over cable modems from their on-campus rooms. The agreement makes Towson State University the first university in Maryland, as well as one of the first institutes of higher learning in the entire country, to offer cable modems and a high-speed Internet service for use in student residences.

The high-speed Internet service, called Comcast@Towson State University, will be provided to 1,700 residential and dormitory rooms throughout TSU, serving more than 3,000 students.

The high-speed Internet service uses Comcast's hybrid fiber/coax (HFC) network, Towson State University's HFC network and Motorola cable modems. The local on-line content will include information about Baltimore and its surrounding communities, as well as other content specific to the university, including class schedules, course information, university announcements and other information. In addition, Comcast@Towson State University will also provide access to all other national and international content available on the Internet.

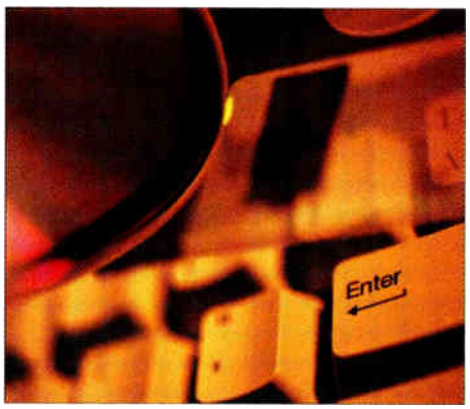
The agreement, which was ratified by the Maryland State Board of Public Works, called for all 1,700 residential locations to be wired with Comcast@Towson State University Internet service by late May 1997.

The new service was made possible after the Baltimore metropolitan area recently became the first in the nation to receive Comcast@Home.

Fanch taps Com21 for modem trial

MILPITAS, Calif.–Cable operator Fanch Communications has chosen Com21 Inc.'s cable modem system for its high-speed trials in Murray, Kan. Fanch will deploy the company's ComPORT cable mode system at Murray State University.

The 50 trial participants are residents living in the student dorms, and others in the faculty and administrative offices. Results from this



five-month test, which concludes in August, will be used to assess the profitability and feasibility of offering two-way, high-speed data on campus, in the greater Murray area, and in the deployment of HFC throughout the city.

Cable modem alliance announced

SAN DIEGO, Calif.–ComStream's Hi-Media Division and U.S. Robotics Corp. have announced an alliance whereby Hi-Media will supply integrated circuits and other components to U.S. Robotics for use in its new cable access system and other broadband applications.

iCS named Maspro distributor

DEERFIELD BEECH, Fla.–Itochu Cable Services Inc. (iCS) has been named as exclusive distributor of Maspro 1 GHz Telephony Taps in the United States and Latin America. In addition, iCS has begun the installation of the taps in Time Warner and MediaOne systems, according to iCS Senior VP Rodman Hicks.

Maspro is a manufacturer of satellite and cable TV equipment in Japan.

iCS is currently installing the taps in Time Warner's Rochester, Green Bay, Milwaukee and Portland, Ore. systems, as well as MediaOne's Atlanta system, according to the South Florida-based distributor. Hicks adds that the deployment and installation of the taps represents $36 million in sales for iCS.

Also, responding to increased demand in two of its key markets, Itochu Cable Services says that its VueScan division has stocked its Buenos Aires, Argentina warehouse with two million meters of CommScope cable, and its Sao Paolo facility with one million meters of the cable. VueScan services Latin America from sales and service facilities in Florida, Argentina, Brazil and Chile, and is the only authorized stocking distributor and service representative in Latin America for CommScope and General Instrument products, according to iCS.

San Juan operator picks Lindsay gear

LINDSAY, Ontario–Cable TV of Greater San Juan has selected Lindsay Electronics' nine-inch LGT Series Advanced Tap and 100 Series Line Passives for its rebuild. The design of the upgrade will allow future expansion of service such as two-way data along with reduced node sizes without extensive plant modifications. The taps and passives are manufactured in North America by Lindsay.

Marcus Cable enhances leakage testing

DALLAS, Texas–Cable Leakage Technologies has announced an agreement with Marcus Cable calling for the installation of the Wavetracker/Deltawave signal leakage test equipment in Marcus properties across the United States. Marcus Cable is the nation's ninth largest cable operator, serving 1.2 million customers in 18 states.

"The Wavetracker will secure our systems with the latest technology in signal leakage," said Terry Blackwell, director of engineering operations for Marcus Cable, in a statement. "In the long run, our customers will receive better service, and better cable service is what we want to secure each day of the year."

The Wavetracker/Deltawave systems are based on differential GPS technology, providing vehicle tracking accuracies in the two to five meter range, while also qualifying all leakage measurements with patented Channel Tag techniques. All data collected in the field is then downloaded to the Automated Positional Leakage Analysis Software, which provides reports, workorders, repair tracking, cause codes, maps and even completes FCC Form 320. CED

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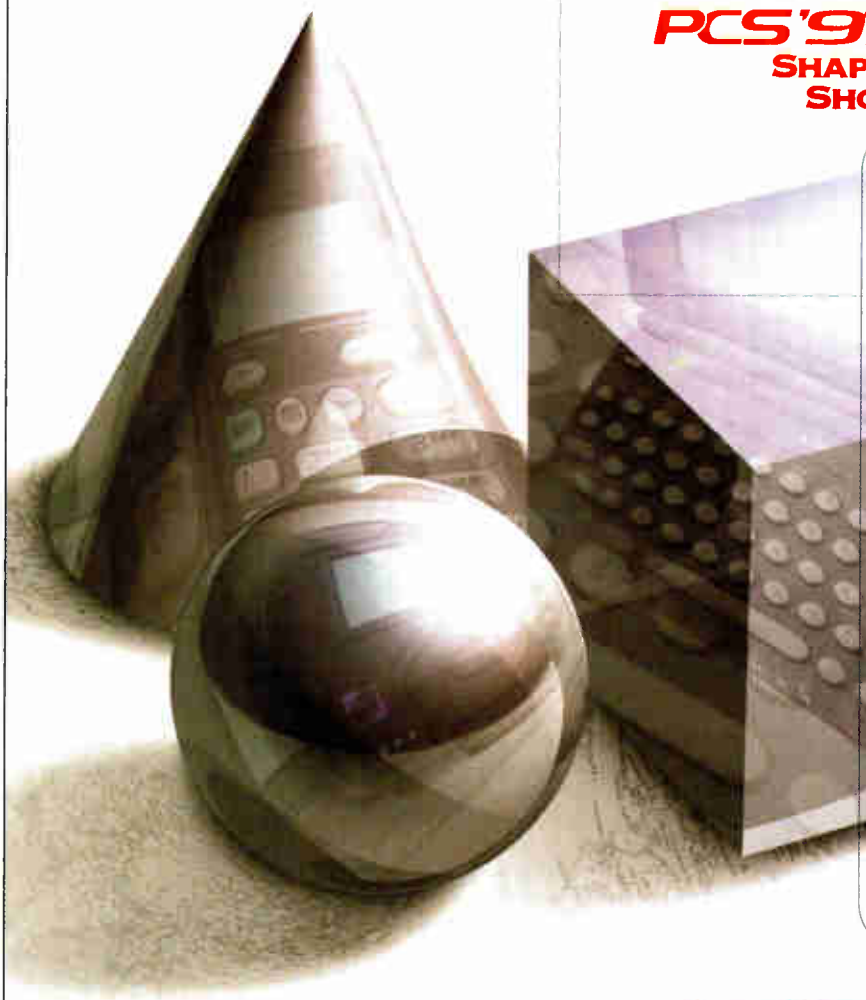

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The issue: Powering

As cable operators begin to load up their systems with ever-more services (high-speed data and telephony are two leading candidates), network powering issues become more important. It's critical that cable operators have a clear powering plan devised when it comes to future rebuilds and upgrades. What's yours?

The questions:

1. Is your system currently involved in, or planning for, an upgrade or rebuild?

❑ Yes ❑ No ❑ Don't know

2. How likely is it that telephony services will be added to your system in the near future?

❑ Very ❑ Somewhat ❑ Not at all

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

4. What power voltage will your company's newbuilds and rebuilds utilize?

❑ 60V ❑ 75V ❑ 90V

5. What is the optimum size (in number of homes) of fiber nodes in your system?

❑ 500 homes or less ❑ 1,000 homes

❑ >1,000 homes ❑ >2,000 homes

6. How much of your system presently uses standby power?

❑ Less than 10% ❑ 10-24% ❑ 25-50%

❑ 51-75% ❑ Over 75%

7. Would you favor using a centralized power approach in your newbuilds?

❑ Yes ❑ No ❑ Don't know

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

9. When it comes to power supply companies and technologies, what are the key requirements you look for?

❑ Price ❑ Reliability ❑ Quality

❑ Modularity ❑ Switchover time ❑ Other

10. Are you familiar with alternative powering options such as flywheels, natural gas generators and others?

❑ Yes ❑ No ❑ Don't know

11. Are you interested in testing or reading about new forms of powering?

❑ Yes ❑ No ❑ Don't know

Your comments:

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DVB transport stream processor

ATLANTA, Ga.–Barco has introduced Taurus, a DVB transport stream processor for cable operators who want to control or monitor a network carrying DVB services. Taurus allows operators to select a single program from an incoming multichannel array of DVB signals and condition the signal for distribution over the network.

The processor is a monitoring/processing/multiplexing tool. It not only monitors incoming digital streams from satellite transponders or telecom networks (DS-3/E-3), but it also provides program identification information, channel transcoding from satellite to cable and performs basic multiplexing. The unit incorporates real multiplexing functions, including local insertion of a single program transport stream into the existing output stream of programs. It also allows the operator to combine a selection of programs from two different transponders into a tailored offering of his choice.

Barco's Taurus

The company has also introduced the Luxor Digital Optical Link to provide reliable, secure transport of uncompressed video, audio and data, in all existing standards, over distances of up to 20 miles.

Circle Reader Service number 81

Fiber fusion splicer

BLUE BELL, Pa.–Aurora Instruments Inc. has introduced a new fiber optic fusion splicer, the Fusion 2500. Having a wide-angle viewing video monitor on an omni-directional swivel mount, the Fusion 2500 shows two simultaneous 65X views of the fiber. A video output port allows the user to display the fiber images on an external monitor as well. The splicer also utilizes Aurora's core-to-core alignment system to produce low splice loss-

Fiber optic adaptors

SOUTH PLAINFIELD, N.J.–Radiant Communications Corp. has announced its new line of fiber optic adaptors. The company currently manufactures adaptors for ST, FC, SC and duplex SC style connectors.

Radiant's ST type adaptors are available in a rugged metal housing with three types of sleeves for all applications: a polymer sleeve for multimode fiber, a phosphor bronze for both multimode and singlemode fiber, and a zirconiz for ultra low-loss singlemode requirements.

The F-style adaptors are designed for singlemode or angled singlemode connectors and are available with either a square-mount style or a "D" hole mount style. The singlemode adaptors are NTT-FC compliant, and the APC is Seiko Giken compliant. Radiant's SC family of adaptors is available for singlemode, multimode, angled polished and duplex applications. All of the high performance adaptors exhibit very little change in insertion loss over repeated connector matings and operate over a wide temperature range.

Radiant's fiber optic adaptors

Circle Reader Service number 82

Filter WDM

DiCon Fiberoptics has introduced 1533+1541/1549+1557 nm Filter WDMs, which are used to split 1533+1541 nm Blue Band signals from 1549+1557 Red Band signals in bi-directional transmission systems. (Custom bandwidths with more than four wavelengths are available by request.) DiCon's Filter WDMs are housed in cylindrical packages which measure 4.7 mm (diameter) by 44 mm (length) and offer exceptional resistance to humidity and temperature. Features include: low insertion loss (0.6 dB typical), an extended operating temperature range (-15 to +65 C) and high isolation over the 13 nm Blue or Red Bands.

DiCon has also introduced a Filter Tap Coupler which uses thin film technology to tap a small percentage of light from a transmission line for monitoring purposes.

Tap ratios of one to five percent are available with spectrally flat performance over a 100 nm range in the 1310 or 1550 nm window. A miniature cylindrical housing (ϕ4.57 mm) offers superior temperature and humidity resistance. Tap signals can be used to monitor power level, signal-to-noise ratio, bit error rates or wavelength drift over time, without disrupting carrier signals.

Circle Reader Service number 83

Aurora Instruments' Fusion 2500

es and accurate loss estimates. It can splice a wide variety of fibers, automatically and with accurate loss estimates, including all standard singlemode and multimode, Erbium-doped, large-core, polyimide-coated, hermetic and Titan fibers. The one-touch automatic splicing system excels at a wide range of altitudes, humidities and temperatures, according to the company.

The Fusion 2500 package includes an independent pigtail port for quality-checked pigtail splicing, built-in heat-shrink oven, RS-232 data port, splice data memory, time and date functions, arc counter, high-capacity battery pack, universal voltage charger, work light, splice tray holder, and precision cleaver, all in a briefcase-type carrying case.

Circle Reader Service number 80

Laser characterization

SAN JOSE, Calif.–E-TEK Dynamics Inc. has announced its Laser Characterization systems, which measure and plot the PV-I and dP/dI curves, near field, far field profile, and wavelength spectrum (optional) of a laser diode. From these, the threshold current, slope efficiency and series resistance are derived. E-TEK-developed, Windows-based software controls the positioning, test, alignment and system diagnostics. Both an automated system and manual model are available, and a laser-mounting fixture is included.

E-TEK's Automatic Laser Characterization System

Circle Reader Service number 84

Modular multi-tap

SECAUCUS, N.J.–RMS Electronics has announced the release of its new 1 GHz Plus Modular Multi-Tap for multi-dwelling unit (MDU) cable installations.

With RMS' new multi-tap, users can specify what dB value they want in their system and have that built into their particular units.

RMS' 1 GHz Modular Multi-Tap

For example, users can select to have a 14, 25 and 29 dB tap value in the same multi-tap unit. The dB value is color-coded so users can tell at a glance the value of that portion of the unit.

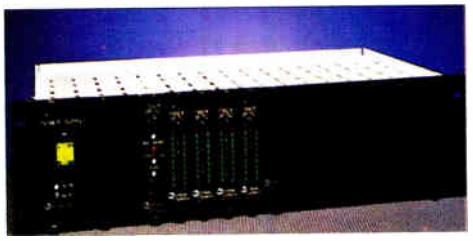
The port design is unique as well, not using the common F connection, but instead, making a direct connection between each unit. The output ports have also been designed so that they can accommodate traps or security sleeves.

The housing of the unit is constructed of 360 aluminum, corrosion-resistant tin plating mounted on a rugged anodized aluminum back plate with stainless steel screws.

Circle Reader Service number 85

Digital transport system

BOHEMIA, N.Y.–Fiber Options Inc. has introduced its Series 1250SB 12-bit digital transport system which has been designed for use with broadcast facilities and remote field production, linking composite video and up to eight channels of audio.



Fiber Options' 1250SB Digital Transport System

The 1250SB system features a bandwidth of 10 Hz to 8 MHz for video and 20 Hz to 20 KHz for audio.

Circle Reader Service number 86

DIN adaptor kit

SAN DIEGO, Calif.–RF Connectors, a division of RF Industries, has released its RFA-4013 7/16 DIN Adaptor Kit.

RF Connectors' adaptor kit

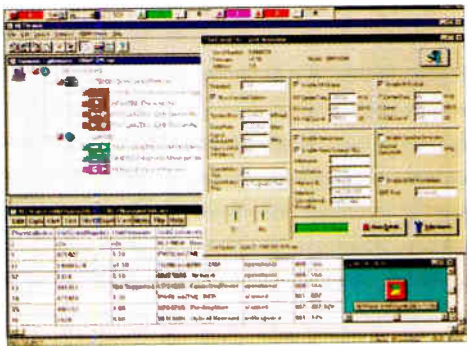
The adaptors are made of machined brass with Teflon insulation and silver-plated contacts and bodies for improved intermodulation performance. The 7/16 sockets, N sockets and ground rings are made of beryllium copper, while all N pins and 7/16 DIN contacts in this series are silver-plated.

The kit contains: a 7/16 DIN male to 7/16 DIN female R/A adaptor; a 7/16 DIN female to 7/16 DIN female barrel adaptor; a 7/16 DIN male to N male; a 7/16 DIN male to N female; a 7/16 DIN female to N male; and a 7/16 DIN female to N female.

Circle Reader Service number 87

Element management

SUNNYVALE, Calif.–Harmonic Lightwaves Inc. has introduced two new products for enhanced element management on each end of the HFC network. The NETWatch Multiple Element Manager (model MEM 5000) has been designed to manage other SNMP element managers. The NETWatch Management Transponder (model NMT 5000) has been designed to extend element management farther downstream to include power supplies, amplifiers and line extenders.



Harmonic Lightwaves' NETWatch Multiple Element Manager (Model MEM 5000)

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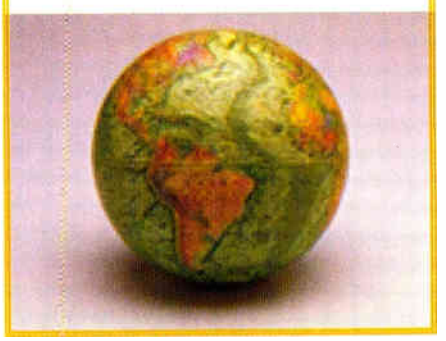

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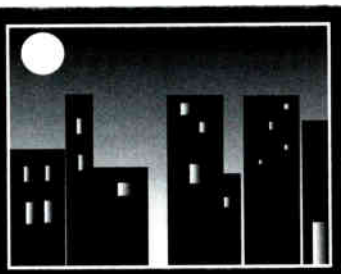

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Is it premature for analog requiem?

By Walter S. Ciciora, Ph.D.

It might be assumed that the FCC's action on digital data transmission in NTSC was too late to be of commercial value. With the emphasis on digital television (DTV), some might consider analog television's demise imminent. This is hardly the case!

The recent adoption of an accelerated schedule for DTV deployment in the U.S. has caused some in the popular press to suggest that the sole surviving technology for terrestrial domestic broadcasting will be digital, and that analog NTSC will rapidly fade away. There are several reasons why this may not happen at all.

The deployed base of NTSC television receivers in the United States is huge. More than 250 million receivers plus another 175 million VCRs–all of which are exclusively analog NTSC–exist in about 100 million American television households. Additionally, Americans purchase about 25 million receivers and about 14 million VCRs each year.

The American viewing public has yet to be exposed to broadcast DTV, and broadcasters have yet to ascertain a viable business plan for the new capital expenditures. Early predictions by the Consumer Electronics Manufacturers Association (CEMA) of the Electronic Industries Association (EIA) project first DTV receivers to have a cost of around $5,000. New VCRs will be at least $1,000. The consumer's willingness to spend such unprecedented sums on a large scale for television has not been tested. There is the promise of digital set-top adaptors, but they will cost at least $500. What motivation would drive consumers to spend this kind of money to get this programming?

It will take at least three years of availability at market for any uptick of consumer acceptance to materialize. Given the optimistic schedule of 40 top-market stations on the air with digital by mid-1999, the migration won't be a national rush, but rather, a market-by-market crawl.

Surprisingly, there is very little talk of HDTV. Most of the broadcaster interest seems to be in SDTV. So the digital offering to consumers is not better TV, but more TV. That may not be an attractive trade-off for the high costs of the new television receivers and VCRs.

While the FCC is postulating the return of analog broadcast spectrum, it has no authority to forbid cable from continuing to serve the huge installed base of analog TVs and VCRs. Such a vast marketplace cannot be ignored; cable will continue to service this important audience. From the broadcaster's point of view, it will be politically unacceptable to be denied access to analog television receivers if cable operators continue to have that marketplace.

From the consumer's point-of-view, it will be politically unacceptable to disenfranchise the consumer's television set. Consider the furor raised over the problems of cable's set-top box and the potential interference with features of television receivers. Imagine rendering the television useless and requiring the purchase of an expensive new digital receiver or a digital set-top box adapter!

A logical conclusion is that analog television will be with us for at least a couple more decades. Cable's huge capacity will assure consumers continued use of their analog TVs and VCRs, while simultaneously providing digital signals to those who can afford and who want them.

The broadcaster's opportunity

There are a number of opportunities for broadcasters. During the period of transition, when an analog and a digital channel are available, the digital capacity of the analog channel should not lie fallow. It should be put to good economic use.

The Supreme Court recently upheld the "must-carry" rules to preserve local broadcast in the face of a heavy First Amendment price. Using this logic, how can it allow local broadcasters to meet their demise in the face of the high costs of a digital upgrade? How can the Court and the political system allow economically disadvantaged voters to lose the utility of their existing analog receivers?

If a digital signal is hidden in the analog signal, the value of the spectrum increases. Not only does it serve those who cannot afford new receivers or adapters, but it also serves those who can make such a purchase. The electronics for digital reception are complimentary to the need of digital signals hidden in analog. When a digital receiver or set-top box is not accessing the digital part of the spectrum, most of those same circuits can be extracting a digital signal out of the analog signal at little additional cost.

The broadcaster may find this double value of the existing spectrum to be a compelling reason for not surrendering it at the appointed time.

Cable vs. broadcast data in analog

Because cable's spectrum is much more well-behaved than the broadcast spectrum, several significant advantages accrue. A time domain equalizer may not be necessary. If one is included, it may have relaxed specifications, leading to lower cost. There is no "airplane flutter," i.e. Doppler effect, from approaching or receding aircraft. Because the spectrum is better behaved, less error detection and correction is required for a given level of performance. While 8-VSB is used for broadcast, 16-VSB was developed for cable, allowing two HDTV signals in 6 MHz on cable. 16-VSB does not have twice the data capacity of 8-VSB. The doubling of payload comes because 16-VSB requires significantly less data protection. If this same approach is applied to the techniques proposed for data carriage in analog television signals, more of the raw data capacity can be harvested for payload purposes. This approach has not been well explored and offers a significant opportunity. An additional advantage is cable's availability of multiple channels to carry data. The data carrying capacity of a cable system is just huge! CED

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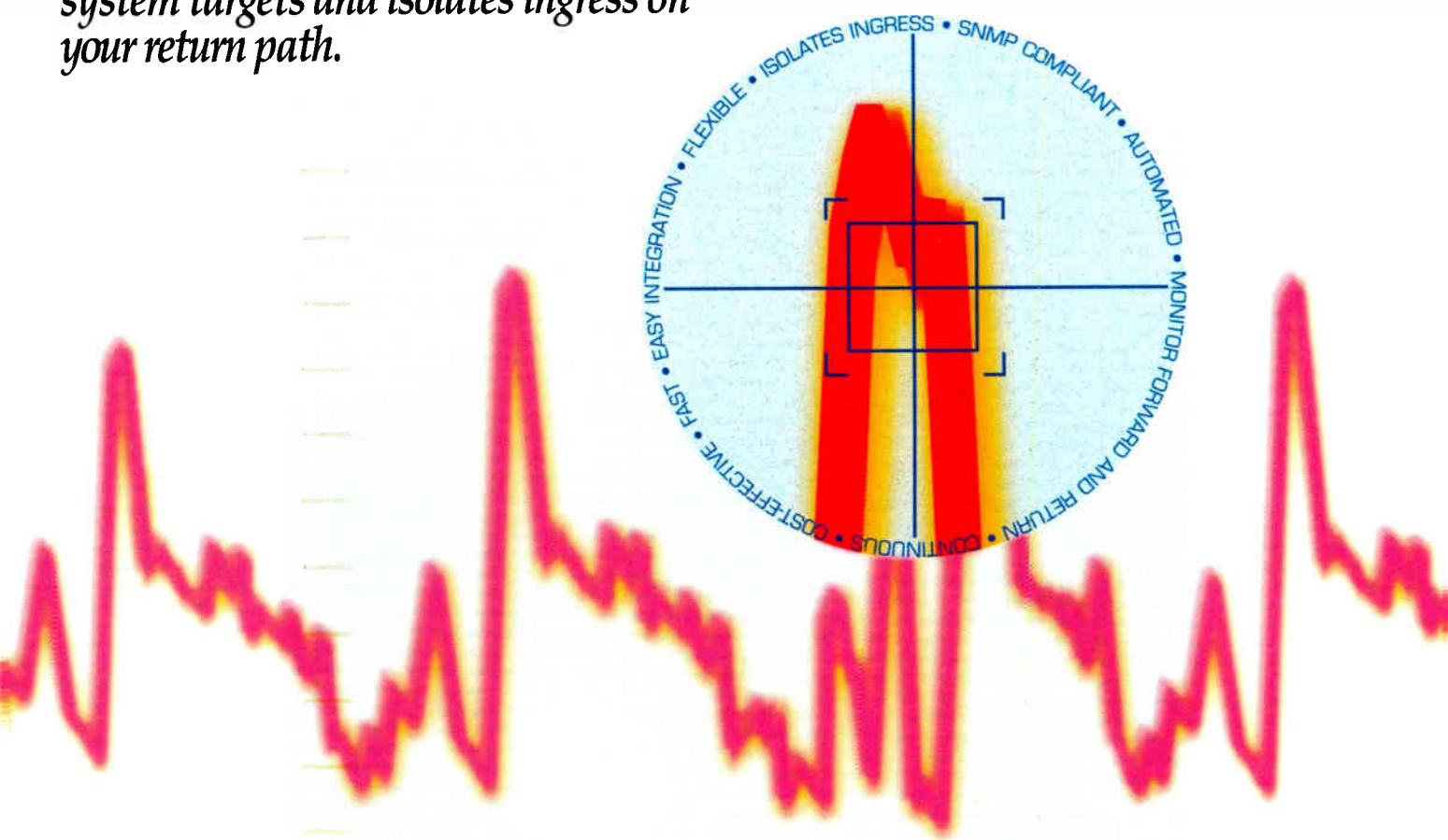
The Cheetah Automated Ingress Management (AIM) system targets and isolates ingress on your return path.



AIM is an automated, cost-effective system that monitors forward and return paths for your entire network from one central computer. AIM is fast, flexible and automatically isolates sources of ingress.

Reader Service 101

AIM Offers A Complete Ingress Solution:

- ***Characterize.*** Every return path has its own signature. AIM isolates ingress by analyzing return paths and determining their unique ingress signatures.
- ***Monitor.*** Take automated, non-interfering measurements 24 hours a day. When AIM detects ingress on the return path, it triggers alarms and notifies you via computer, phone or pager.
- ***Diagnose.*** AIM is an interactive analysis tool for forward and return paths. In addition to automated polling, AIM allows you to use Cheetah spectrum analyzers as interactive devices that are controlled through the Cheetah software.

AIM is part of the Cheetah System – *the world's leading network monitoring solution* – and consists of Cheetah automated headend spectrum analyzers, Return Path Switches and software.

For information on the AIM system, please call (941) 756-6000 or access our web site at http://www.cheetahnet.com

SUPERIOR ELECTRONICS GROUP, INC.

Cheetah™

6432 Parkland Drive • Sarasota, Florida 34243 • (941) 756-6000 • FAX: (941) 758-3800 • http://www.cheetahnet.com

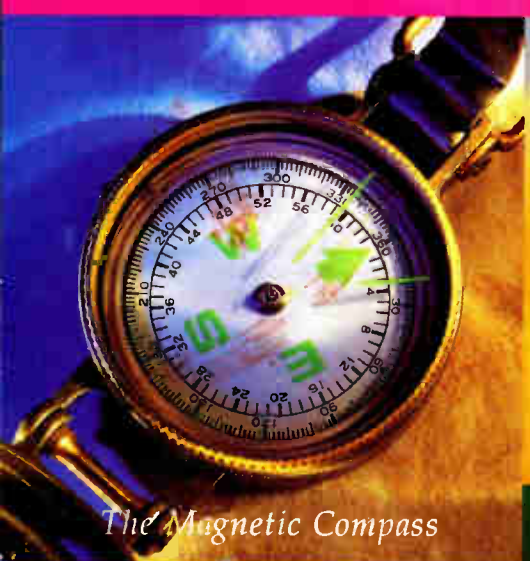
ONLY A FEW THINGS IN LIFE ARE THIS RELIABLE.

As sure as the sun rises, you can count on the Continuum™ Headend System for exceptionally dependable video delivery. Advanced hardware design features like gold plated interconnections and a fully passive back-plane ensure continuous service and peak performance. For proactive headend management, Continuum's Headend Management System (HMS) provides full remote control, status monitoring and automatic backup 24 hours a day. Make your headend one to count on—call 1-888-HEADEND today for a complete information package.

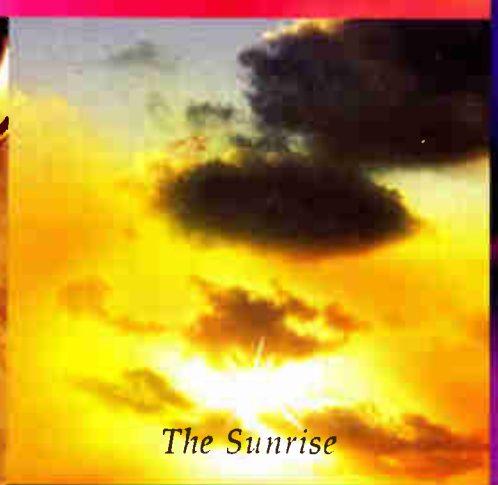
http//www.sciatl.com

Scientific Atlanta™

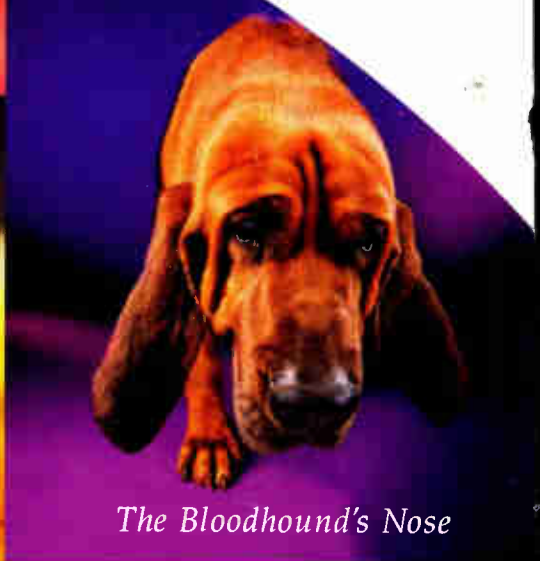
The Atomic Clock



The Magnetic Compass

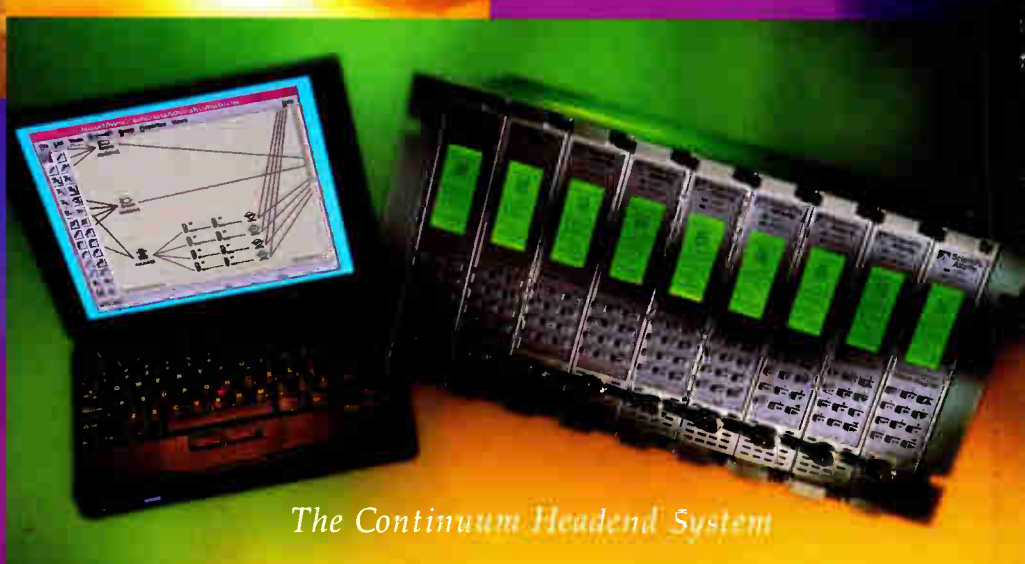


The Sunrise



The Bloodhound's Nose

The Force of Gravity



The Continuum Headend System

CONTINUUM HEADEND SYSTEM

Platform for the 21st Century

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