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Communications Technology

Official trade journal of the Society of Cable Telecommunications Engineers

April 1999

DBS vs. Cable

The Championship Bout

Ted Woo on Network Managment

Plus Tips on...

- Network Monitoring
- Building Bulletproof Drops
- Fiber Options From Utilities

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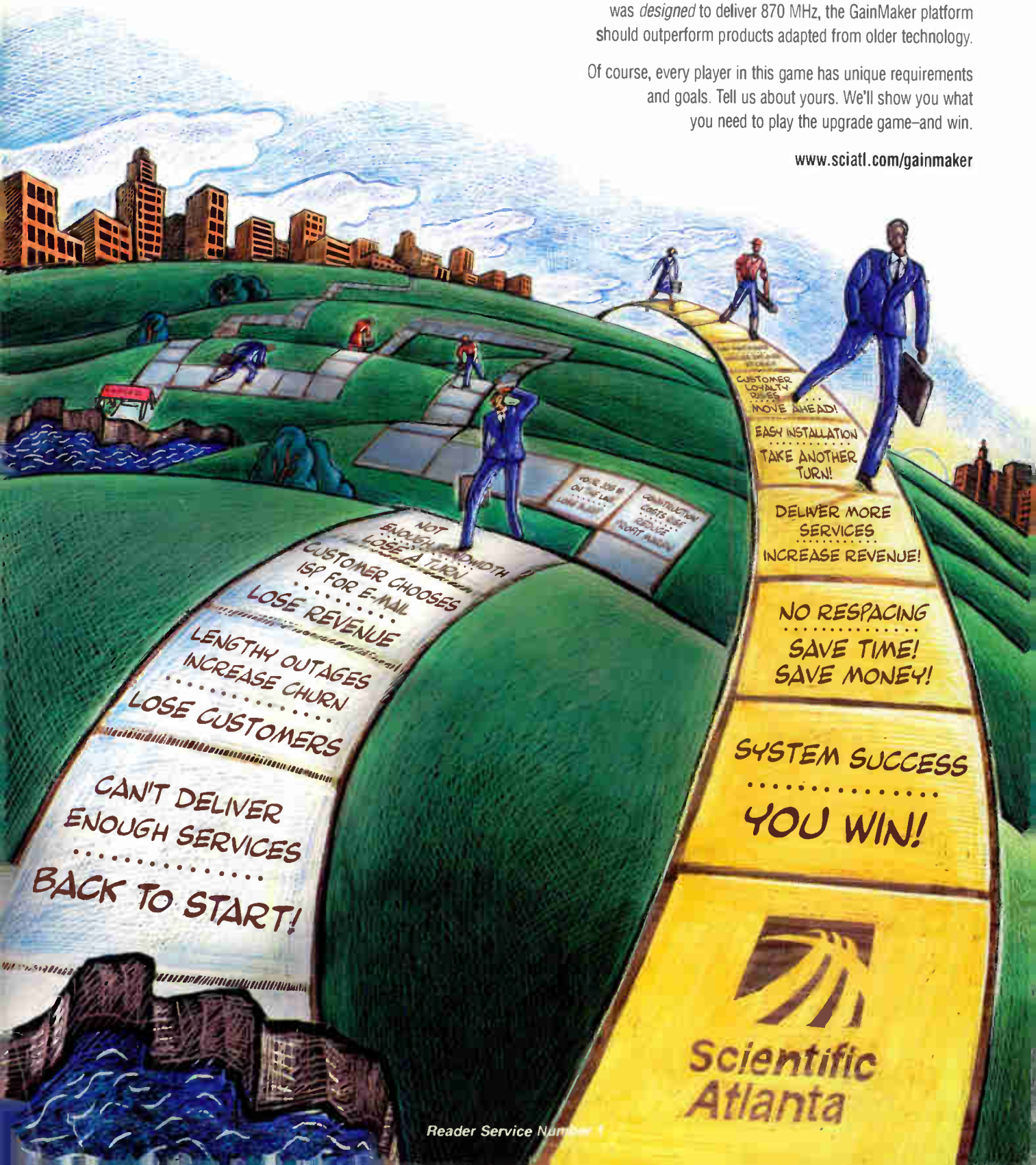

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APRIL 1999

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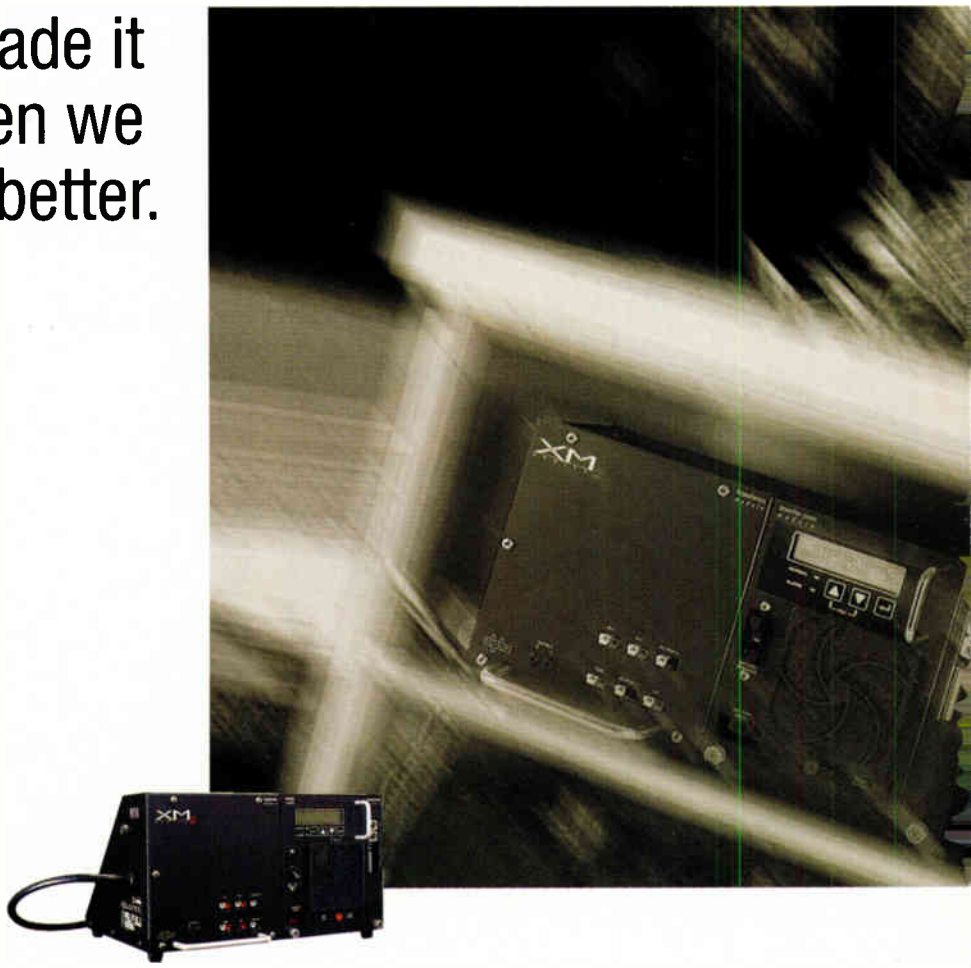

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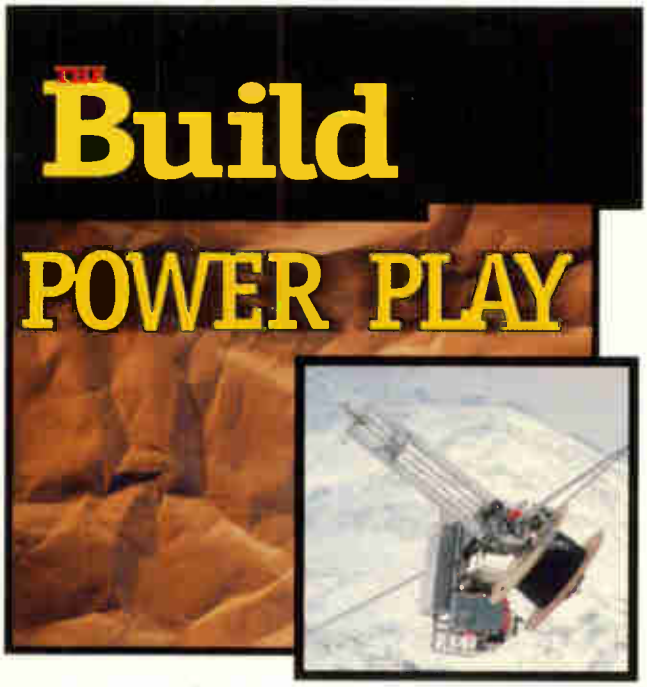

DEPARTMENTS

NEWS & OPINION

REFERENCE

COLUMNS

Finally. A Cable Modem That Can Be Self-Installed.

Anyone can do it. Grandma, the kids, even Dad. Just ask TCA Cable TV. A full 80 percent of their Terayon modems are self-installed by subscribers. That means fewer truck rolls and service calls. You can lower subscriber installation fees, which adds up to satisfied subscribers and more money in the bank for data services.

Proven, Robust Performance

How do they do it? It's built into the box. Terayon's proven, robust S-CDMA technology provides extra margin. Your modems stay up and running, even when your parents are using the hair dryer. No kidding. You can deploy modems over a wider range of cable plant conditions without the usual gold-plated upgrade. Put your gold to better use. Like games for me.

Ready to Install

Terayon's modems come fully packaged and ready to install. About as easy as plugging in your boom box. And if you're ready for retail, so is Terayon.

Take it to the Bank

That's not all. The real beauty of Terayon modems is higher revenue sooner. By switching to Terayon, Shaw Communications deployed modem systems in half the time. And they significantly reduced startup and operational costs. You can too.

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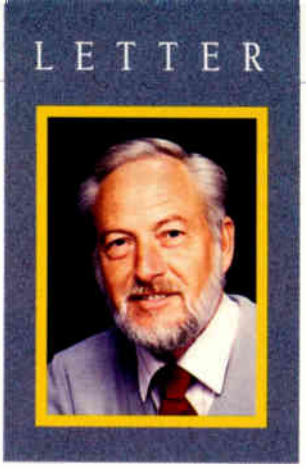
By Rex Porter



Vendor Days: Cooperation Exemplified

Steve Allen and his crew in northern California really started a hot idea back a few years ago. Since then, other Society of Cable Telecommunications Engineers chapters followed suit with their own Vendor Days. By 1998, it seemed every chapter wanted to hold them.

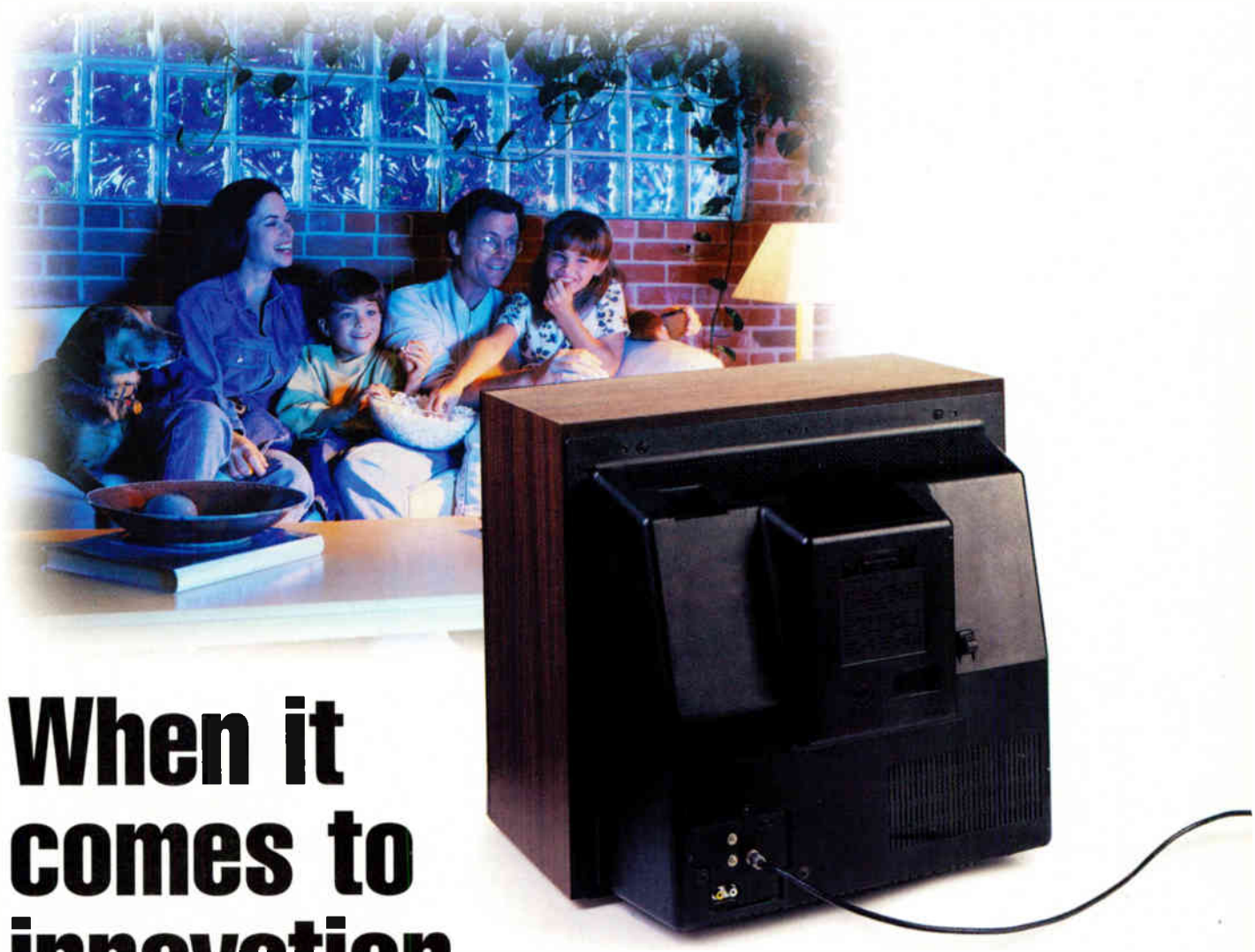
Last year, the Cactus Chapter, under the presidency of Bill Nolan, decided to launch its own event. Nolan, Harold Mackey, Brenda Hunt and Suzanne Holzer planned the project to perfection. It was so perfect, in fact, that I became concerned about the effect the draw to this meeting would have on the Arizona Cable Show and vice versa. Holzer simply amazed everyone with her ability to attract vendors and engineers to this show. Floor space (as large as some of the earlier northern California shows) was sold out well in advance of the show.

The Arizona Cable Telecommunications Association always has promoted the Cactus Chapter. Some of the many benefits of past ACTA-SCTE cooperation are rooms for training, a scholarship program, promotion of the Cable Games, and awarding a special Cable Games "traveling" trophy to the overall winner and his system manager. ACTA has been a successful state association over the years. But cable in Arizona is not as large as it is in California, and the introduction of another meeting might strain the success of ACTA and the SCTE Cactus Chapter.

Negotiations between the ACTA and the SCTE Cactus Chapter aim toward strengthening the joint ACTA/SCTE annual meeting in lieu of having further Vendor Days. The Cactus Chapter acknowledges that the ACTA had always given recognition to the chapter's needs, and the ACTA acknowledges that Holzer has just pulled off one of the most successful Vendor Days anywhere. Susan Bitter Smith, executive director of the ACTA, and Nolan finally have written an even stronger agreement that will ensure a strong ACTA/SCTE Annual Meeting for years to come.

It's encouraging to see people use common sense today. Kudos to both the SCTE's Cactus Chapter and the Arizona Cable Telecommunications Association for a job well done.

Rex Porter
Editor-in-Chief



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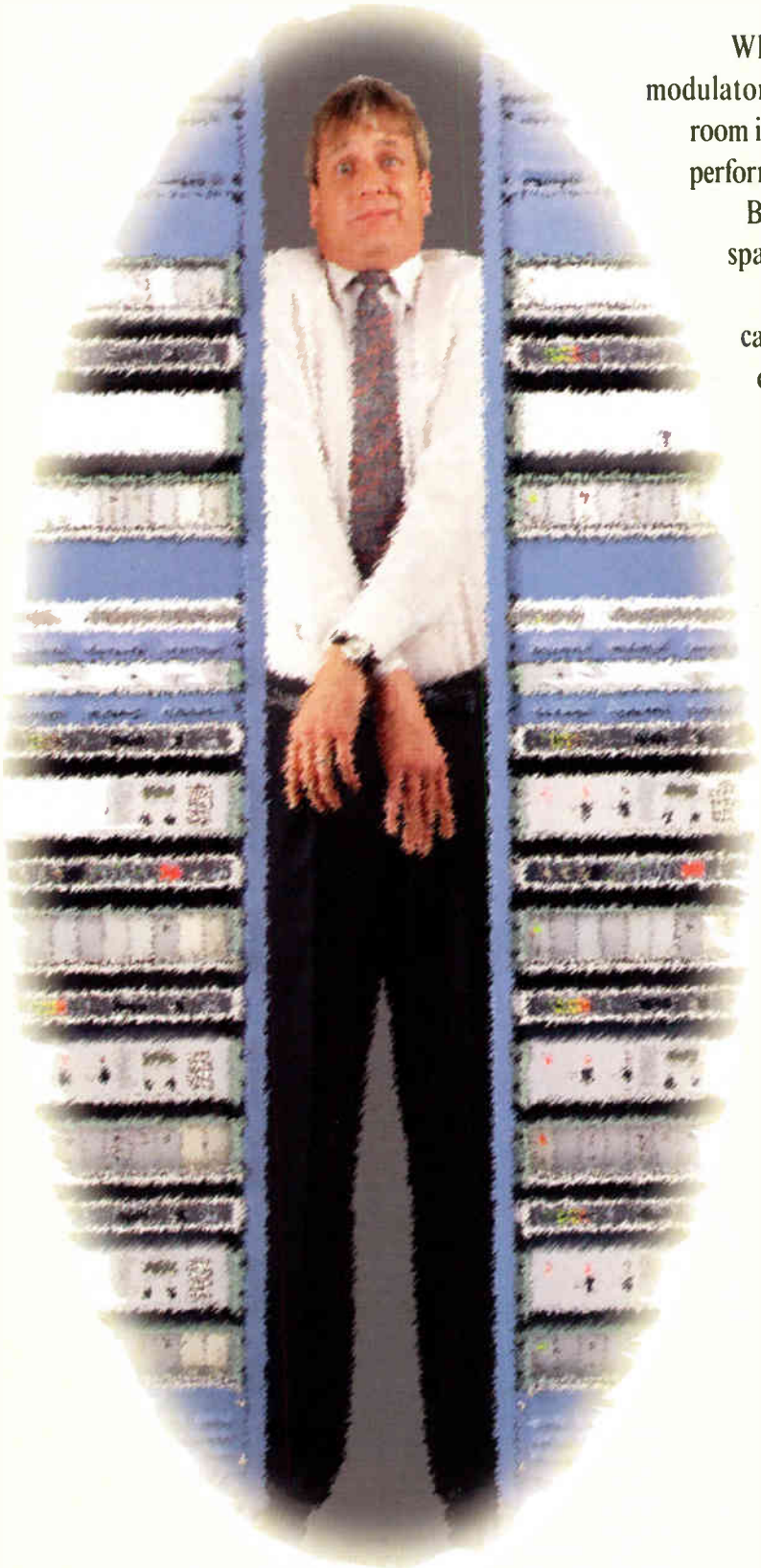

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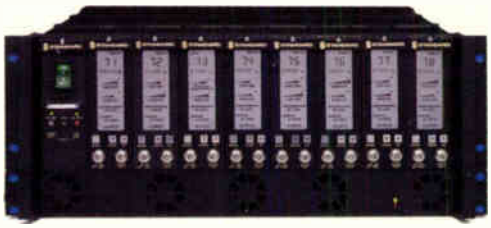

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Reader Service Number 6

Analysts Ponder Deal-Making Frenzy

Though cable rang in 1999 with a tsunami of deals aimed at bringing high-speed access closer to subscriber reality, reeling analysts continue to respond with a number of fresh studies regarding the greater implications to the broadband industry.

Everybody's doing it—or so it seems, with deals either in the works or transpiring among the likes of @Home and Excite, America Online and Bell Atlantic, AOL and Netscape, and AT&T and numerous cable operators.

Companies are teaming up on various levels to streamline and facilitate new services deployment in a trend that's taking the telecommunications industry by storm.

Strategis Group says that continued development of high-speed access technologies is forcing a realignment of Internet service, technology and content providers. According to the group's study, "High-Speed Internet: Demand, Technology, and Strategy," the catalyst for consolidation is the increased availability of residential and business high-speed Internet connections.

The Strategis Group forecasts that there will be more than 1 million cable modem users by the end of 1999 along with almost 70,000 residential digital subscriber line (DSL) customers. The result, according to the report, will be the continuing consolidation of the industry as it strives to stay atop the emerging technologies and capitalize on new revenue streams.

Enhanced content, more secure electronic commerce environments and a graceful move from today's circuit-switched telephony to the more flexible voice over Internet protocol (VoIP) are the industry's current, most pressing goals, agree many analysts.

Technological advancements in wavelength division multiplexing (WDM) are largely to thank for the broadband industry's rapid advancement into telecommunications' new frontier, says a report from Insight Research Corp.

The study also indicates that deregulation and competition are prompting domestic public switched telephone networks (PSTNs) into a new era of broadband service. The report recalls the telcos' two-decade mishandling of integrated services digital network's (ISDN's) revenue potential and points to the future as they try again to benefit from wideband access.

Insight concludes that although it's unlikely that the incumbent telcos will make the same mistakes in pricing, selling and promoting the new higher-speed DSL service, the slightest error could gain cable TV a powerful advantage in the residential broadband market and beyond.

Market research firm Ryan Hankin Kent has predicted North America's broadband access market would grow from $23 million in 1997 to $782 million in 2002.

The firm says the figures represent only 18 percent of the total access market of $4.4 billion in 2002.

RHK's latest study, "Systems for Voice Over IP," indicates that by 2002, revenues generated by VoIP services will reach the $5 billion mark. At the same time, the market for Internet telephony systems equipment is expected to reach $202 million.

The study goes on to project the broadband industry's mass migration from the now-popular voice telephony to the emerging telephony victor, VoIP, over the next five years.

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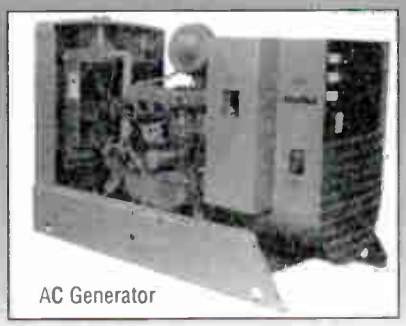
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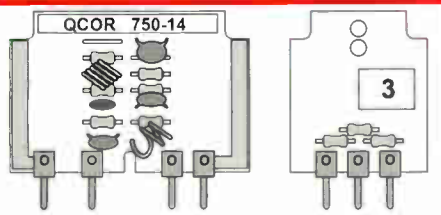

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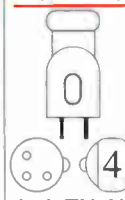

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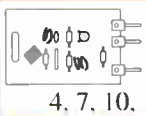

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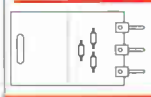

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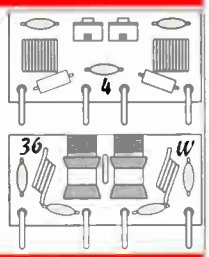
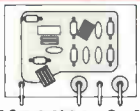


For Philips/Magnavox



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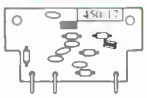

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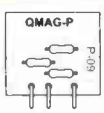

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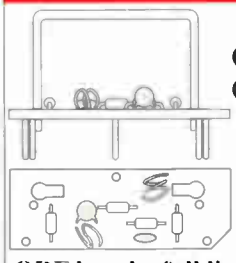

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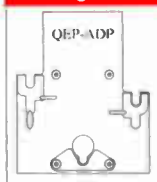

Fixed value equalizer adapter allows **QLX** to replace SEP-*. NO alignment! Lower Cost! Lower Insertion Losses! ***EASY*** installation!
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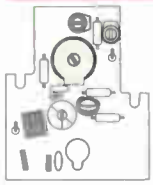

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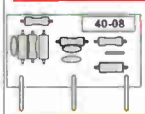

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Reader Service Number 8

Council for its franchise license to be transferred to AT&T.

The decision came down prior to the Federal Communications Commission and the shareholders of both companies giving the deal thumbs up in late February.

Still, the nationwide debate continues to rage on the local fronts over whether AT&T and TCI should have to open their broadband pipe to competing local phone companies and Internet service providers (ISPs) seeking subsidized access to the same market base. Portland, OR, for example, has waged the biggest struggle against the MSO to date, aided by ISP monoliths such as AOL.

Although the FCC already has said it will not force cable companies to open their networks to competitors in the near future, the Denver City Council is seeking to encourage ongoing FCC scrutiny as high-speed Internet and telephony deployments become more widespread.

The council also expressed concerns that services not be limited to affluent neighborhoods and stressed that that issue would play a role when the franchise license comes up for renewal on down the line.

Politicking aside, TCI disclosed some ambitious projections for the young giant's future based on a 4.9 percent average rate increase in store for 1999.

TCI predicts that its cable customer base will grow up to 2 percent in 1999. The number of digital cable customers is estimated to grow to approximately 1.8 million by the end of the year, excluding all announced cable partnerships, the MSO says.

Continuing efforts to upgrade its broadband cable plant will cost approximately $2.1 billion through 2000. That figure, TCI officials say, includes approximately $1 billion estimated for 1999 and approximately $1.1 billion for 2000.

According to TCI, the total amount projected includes upgrade costs for two-way capability.

The capital upgrade plan reflects higher capital spending when compared to the $700 million TCI originally projected it would spend in 1999 and 2000 to prepare for aggressive advancement into the emerging market for high-speed Internet and local telephony services.

The new plan, officials said, will result in 75 percent of TCI's cable plant being upgraded to 550-860 MHz by 2001. The original plan called for only 59 percent of its plant to reach 550-750 MHz by the same date.

Preparing its broadband plant for telephony emerges as a clear priority for the MSO under the revised plan. TCI says its upgrade strategy includes extending standby powering time, reducing node sizes and implementing additional electronics at its system's hubs.

The overall cost, according to a TCI report, does not include the cost of adding telecommunications equipment in the customer's home at service signup. ➤

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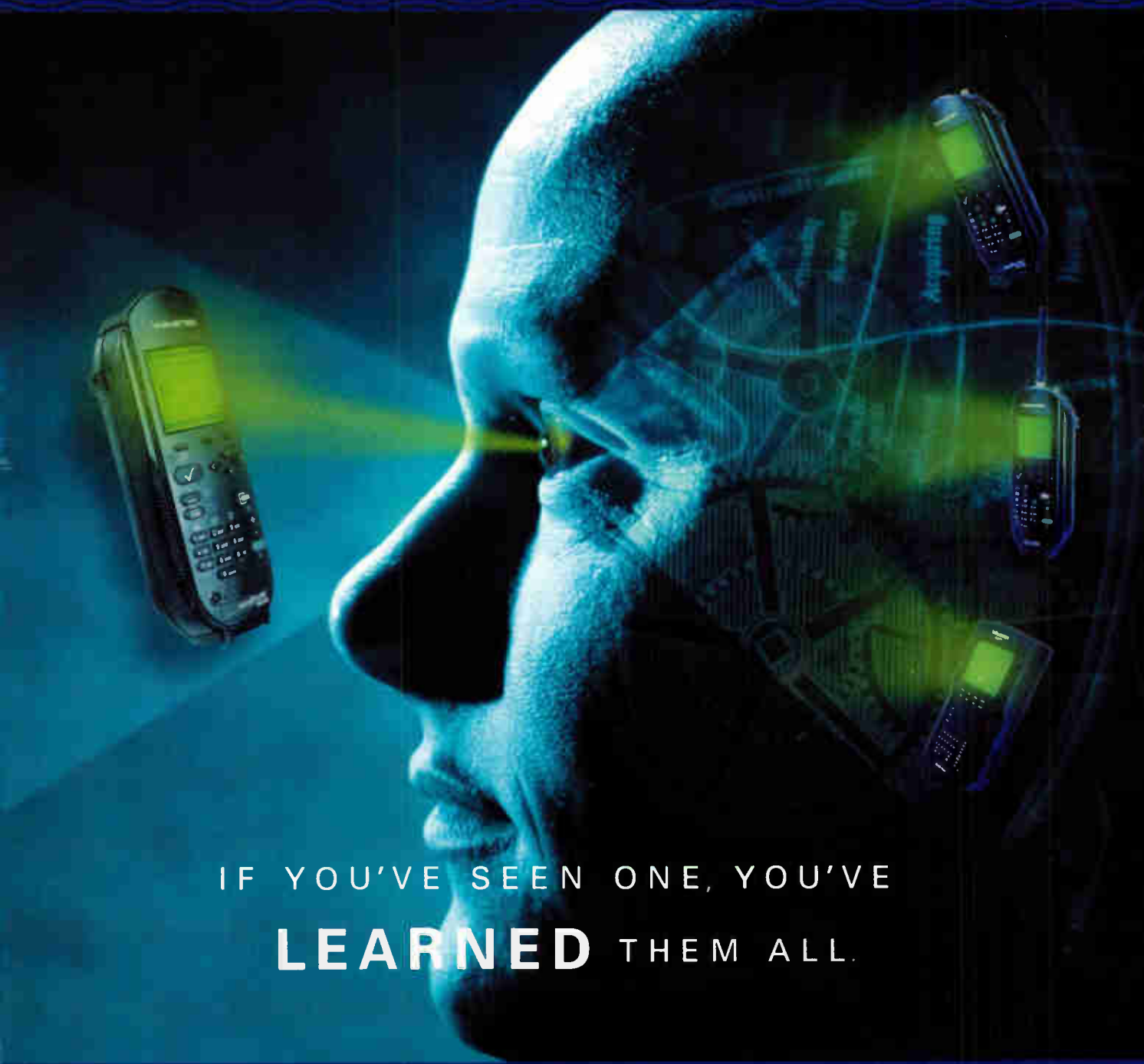

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WAVETEK

Reader Service Number 10

NEWS BITES

- Time Warner Cable plans to deploy Road Runner high-speed Internet access in its Kansas City, MO, system. The second-quarter launch, upon its completion, will be Road Runner's debut in Missouri and marks the service's first launch of Data Over Cable Service Interface Specification (DOCSIS)-certified modems once they become availabe. The service is slated for initial rollout to 357,000 homes in the city's currently upgraded areas. Road Runner's pricing structure is set at $39.95 per month for subscribers, plus a one-time $129 installation fee. The MSO's Kansas City system passes 500,000 homes on either side of the Kansas/Missouri state line.
- In other Road Runner news, a broadband content partnership deal with SegaSoft Networks has targeted subscribers looking for fun. The high-speed Internet access provider has nationwide affiliates rolling out HEAT.NET. MediaOne subscribers were the first to gain access to the free online gaming service earlier this year. Officials say the agreement will bring continuing service launches throughout the Road Runner affiliate family.
- Cox Communications plans to deploy Scientific-Atlanta's Explorer 2000 set-top boxes in its Las Vegas system. The launch in Las Vegas, which is one of Cox's largest systems, comes on the heels of digital roll-out announcements in Phoenix and San Diego. Cox plans to offer digital services in the Las Vegas system later this year.
- MediaOne has selected Canal+, DiviCom and Philips to provide initial OpenCable-compliant digital video platforms for deployment this year in systems serving the MSO's two million subscribers. An expanded set-top deal with General Instrument would allow MediaOne to extend digital services in selected markets beyond its initial Detroit deployment. The MSO also plans to use set-tops from Philips.
- Internet Cable Corp. has struck a deal with Columbia, SC-based apartment complex developer Intermark Management Corp. The agreement calls for ICC to construct, manage and provide cable TV, high-speed Internet access, video telephones and other services in Intermark's newest luxury apartment complex. CT

New Era in Field Portable Spectrum Analyzers

The AT-2000R is said to be the best investment in field portable spectrum analyzers because of its technical merit, quality, weight and price. It's designed from the ground up specifically for CATV field applications. This unit from Avantron Technologies Inc. is 100% non-interfering for CATV measurements and addresses all FCC proof-of-performance RF measurements.

On a performance issue, the AT-2000R's absolute amplitude accuracy is +/- 0.75 dB and meets all specifications within 1 minute after it is turned on. across entire operating temperature range.

Some key elements that distinguishes the AT-2000R from other field portable units is that it weighs only 19 lb. (including the battery which lasts 2.5 hours). Avantron's unique AutoCal feature assures accuracy by periodically self-testing itself and automatically triggering a non-obstructive background calibration, as required. In addition, the AT-2000R is fully upgradeable and less expensive than all other spectrum analyzers in its class.

The 9 top MSOs use the AT-2000R.

SCTE UPDATE

SCTE to Honor "Generations In Cable" at Expo

Recognizing multigeneration families in the cable industry will be a key feature of the Society of Cable Telecommunications Engineers' 30th anniversary celebrations at Cable-Tec Expo '99.

SCTE is seeking multigeneration families who have worked in the industry, especially the engineering community, and who will be attending this year's Expo. Multigeneration families can include but are not limited to parent-child, uncle-nephew and aunt-niece relationships. Sibling relationships are not be included because siblings are the same generation.

If you are part of a multigeneration family in the cable telecommunications industry or know someone who is, please contact the SCTE National Conferences Department at (610) 363-6888 for more details on the celebratory activities.

Preconference Tutorials Set For Expo '99

SCTE's 17th annual trade show, Cable-Tec Expo '99, will kick off May 24th in Orlando, FL, with the following preconference tutorials:

The Basics of Dense Wavelength Division Multiplexing (DWDM), presented by Robert Harris, program manager of digital transmission for ADC Broadband Communications, will define terms and explain how DWDM works within the cable telecommunications industry. The session features several network configuration examples and presents models for examining the cost impact of various DWDM scenarios as they relate to headend interconnection.

The next tutorial is Internet Protocol (IP) and its Applications in Data, Video and Telephony. IP is becoming a fact of life in cable because it is a critical aspect of cable modem technology. In the future, it promises to play a larger role as cable carries IP telephony and streaming video. This tutorial, presented by Walt Ciciora, Ph.D., of EnCamera Sciences, will cover the basics of IP as well as transmission control protocol (TCP). Attendees will walk through a brief history of IP networking and some of the fundamental and more advanced topics that will become important for cable technicians, engineers and managers.

For information about registering for Cable-Tec Expo '99, see the SCTE Web site at www.scte.org or call the Cable-Tec Expo '99 hotline at (610) 363-3822.

SCTE Standards Meetings at Expo

The SCTE will hold standards development meetings at Cable-Tec Expo '99 in Orlando, FL, on the following days:

- May 24: Interface Practices Subcommittee, which develops standards for cable, connectors and housings used in cable TV distribution plant
- May 24: Material Management Subcommittee, which exchanges best practices and develops standards for purchasing, materials management and inventory control for the cable TV industry
- May 24: Data Standards Subcommittee, which advances high-speed data and hardware interoperability
- May 27: Emergency Alert System (EAS) Subcommittee, which interfaces with the Federal Communications Commission to improve cable TV's EAS program
- May 28: Hybrid Management Sub-Layer Subcommittee, which promotes transponder hardware and software for interoperability

SCTE standards development organizations are committed to hardware, software and network reliability, and interoperability design and manufacturing. From traditional cable to digital and cable modem technology, these groups investigate products and services, explore the need for new affiliations, evaluate market availability, and ballot recommended practices for domestic and international applications. Standards development organizations include more than 600 professionals, in 125 organizations and 25 countries.

For more information about standards subcommittees, contact Ted Woo, Ph.D., SCTE director of standards, at (610) 363-6888 or e-mail twoo@scte.org.

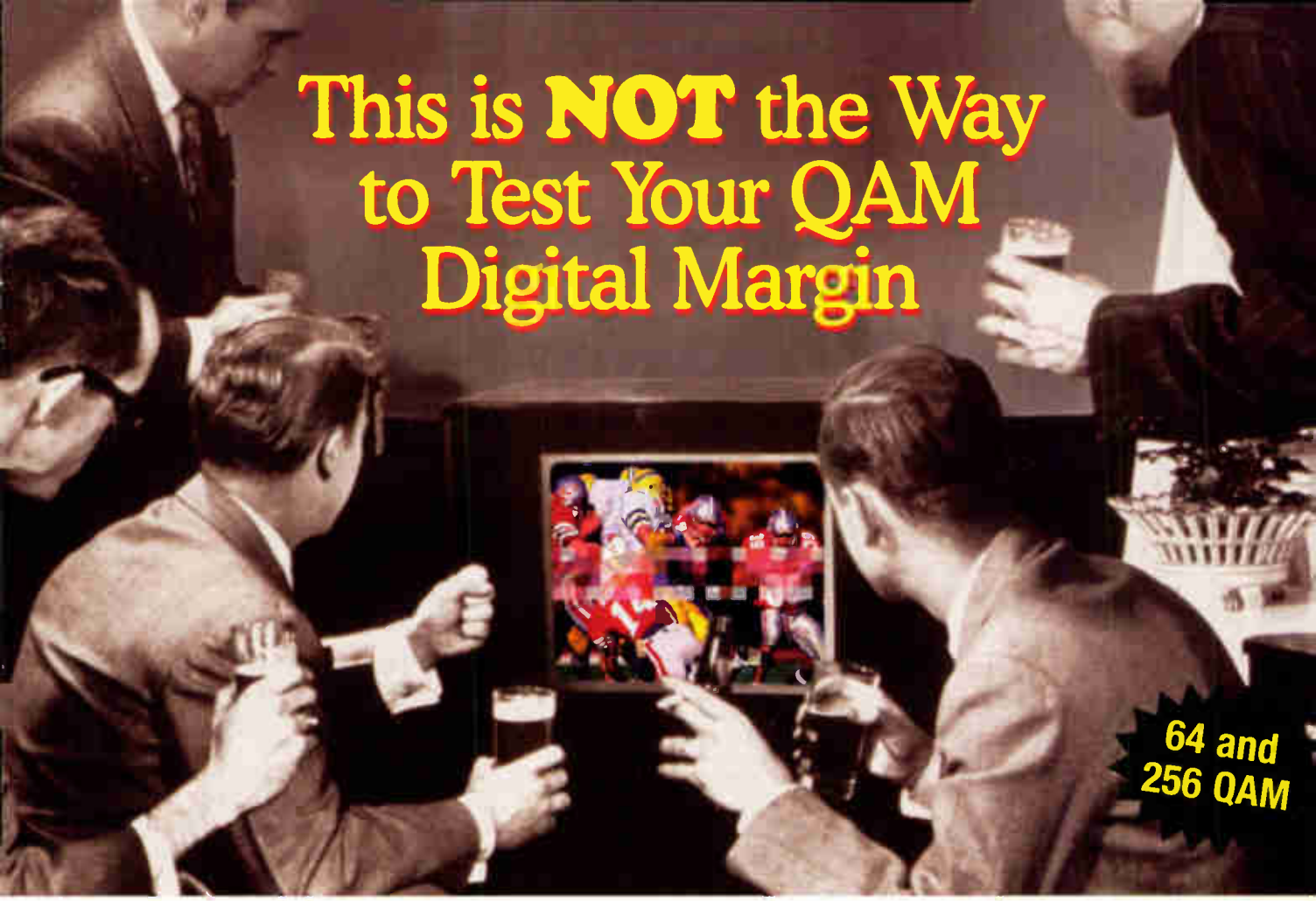
Top-Notch Tech Sessions at Expo

The SCTE will provide cutting-edge technical workshops at its Cable-Tec Expo '99 trade show, May 25-28 in Orlando, FL.

Top industry leaders will address the following topics during the workshop sessions on Wednesday, May 26, and Thursday, May 27:

- DOCSIS Demystified, with presenters Doug Jones, MediaOne Labs; Andrew Sundelin, CableLabs
- Forward and Reverse Plant Maintenance, with presenters John J. Downey, Wavetek Wandel; Kevin J. Oliver, Goltermann; and Dean Becker, Cheetah Technologies
- Upgrading Your Network for Enhanced Services, with presenters Farr Farhan, Optoelectronics Business Unit at Scientific-Atlanta, and Robert Palm, Philips Broadband Networks
- Integrating Digital Broadband Systems, with presenters Frank "Toby" Ayre, Convergence.com, and James P. Ludington, INT2-Internetwork Integration
- Digital Video Deployment, with presenters Virgil "Bo" Urquhart, TCI-HITS; Vince Pombo, Time Warner; and Paul Snopko, Zenith Electronics
- OpenCable, with moderator Laurie Schwartz, CableLabs; and presenters Tony Wasilewski, Scientific-Atlanta; Mark O'Brien, Teralogic; and Alex Nevelson, Pioneer Digital Technologies
- Cable Telephony, with presenters Ham Matthews, ADC Telecommunications; Thomas H. Sloane, Alpha Technologies; and Hugh McCarley, Cox Communications
- DWDM Deployment with presenters John Trail, Ph.D., Transmitter Systems; John Giddings, Harmonic Lightwaves; and Esteban Sandino, TCI Communications

For more information about registering for Cable-Tec Expo '99, see the SCTE Web site at www.scte.org or call the Expo hotline at (610) 363-3822. CT



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Reader Service Number 14

DEPLOYMENTWATCH

By Greta Durr

In the latest slew of announcements that may well be the calm before cable takes telephony by storm, Time Warner and five other cable operators have agreed to join AT&T's ranks and are forging ahead with plans to deploy circuit-switched hybrid fiber/coax (HFC) telephony service.

These agreements, added to the vapor trail left by last year's TCI deal, will fuel the telco's advancement into the 40 percent of all U.S. households served by cable.

Take a Walk on the Supply Side

Under the deals, the cable operators will pay to prepare their systems for two-way communications. These upgrades already are underway and ultimately will enable aggressive deployments well into the century's turn.

The announced telephony joint ventures combined could extend cable's reach to an additional 5 million U.S. households. Eventually, AT&T expects to own up to 65 percent of each joint venture and exclusively provide communications services over each of the five operators' systems. Once their systems pass AT&T's two-way muster, the operators will receive one-time payments from AT&T and monthly subscriber telephony fees.

Although the number of cable telephony customers currently is estimated at 100,000 nationwide, analysts such as the Yankee Group have predicted that number could soar as high as 2.6 million within the next three years.

For Time Warner, the agreement means relinquishing its current telephony business. Eventually, AT&T will own 77.5 percent of a joint partnership set up to offer local service to an estimated 12.6 million Time Warner subscribers in 33 states.

The joint venture will gain Bresnan business from a number of TCI-contributed systems, allowing it to serve more than 600,000 subscribers in four states and surpass 900,000 homes.

Falcon has cable systems in 26 states, serves an estimated 1 million customers and passes approximately 1.6 million homes.

Insight has 500,000 customers and passes about 800,000 homes in four states.

InterMedia serves approximately 1 million customers and passes nearly 1.6 million homes four states.

Peak serves an estimated 100,000 customers and passes 180,000 homes, primarily in Utah and Oklahoma.

News of AT&T's ventures has telephony vendors scrambling to be chosen to supply equipment. Arris Interactive already has received a commitment for $50 million in telephony networking equipment from AT&T. Tellabs, Motorola and ADC also are vying for a slice of the emerging market. Cisco and General Instrument have developed a telephony network built also to handle video and data. A trend toward including voice over Internet protocol (VoIP) support within the networks further enhances the technology's potential for future expansion.

Do the System Swap

MediaOne and Time Warner Cable plan to trade several systems aiming to secure more cohesive and rapid deployment of advanced services.

Under the deal, Time Warner Cable gains an estimated 350,000 customers in Ohio, Maine and California. Currently, Time Warner has nearly 1 million subscribers in Ohio. The trade, officials say, will add 270,000 customers to that total and enhance the company's clusters in California by 70,000 and in Maine by 10,000.

MediaOne, in turn, secures an additional 310,000 customers in Massachusetts, New Hampshire and Georgia. The company currently has about 550,000 customers in Atlanta.

The agreement lands MediaOne 240,000 new customers in Massachusetts and New Hampshire and the potential for an additional 71,000 customers in Atlanta.

MediaOne estimates that upon the deal's completion half its subscribers will be in markets where it has more than a 50-percent share. In areas where telephony and high-speed data already have been deployed, the MSO says it can reduce costs and capture market-level efficiencies.

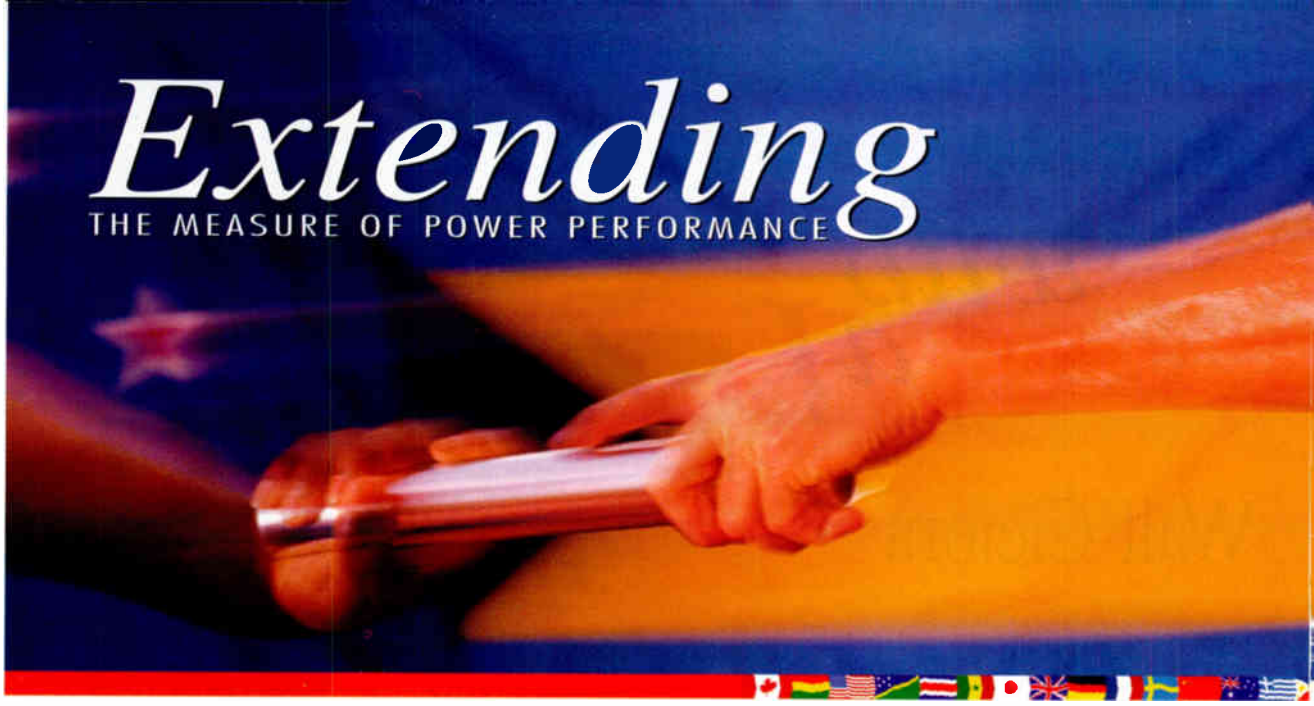
Previously, MediaOne announced it had expanded its telephony services in the Northeast and was planning to deploy services in Detroit over ADC networking gear.

By advancing its clustering efforts nationwide, the deal strengthens Time Warner's position in the markets that it covers as well. The outcome, according to the MSO, will be more efficient cable service and the deployment of new digital products. CT

Greta Durr is assistant editor at "Communications Technology" in Denver. E-mail deployment information or comments to gdurr@phillips.com.

Who's Who in Deployment

- **Road Runner** is teaming up with **Multimedia Cablevision** to deploy Internet services to nearly 1 million subscribers in Kansas, Oklahoma and North Carolina. The agreement adds Multimedia to Road Runner's latest list of high-speed access additions, including **Media General, Greater Media** and **Fanch Communications**.
- **Cox** has deployed its branded digital TV in San Diego. The service now is available in about 20 percent of the MSO's cable coverage area.



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Reader Service Number 16

Interview

that this was going to lead to Internet and all of the exciting things—I was just making coils for a modem at that time.

I also worked for Illinois Bell as a summer student studying how to locate cable faults. My boss there, Joe Enenbach, was an excellent mentor. He gave me one of the best pieces of advice that anyone ever did. He said, "Get involved in industry affairs." He was the chairman of one of the major conferences, and in that conference he gained great exposure, and that helped him with his career. He urged me to do the same thing.

I joined the Institute of Electrical and Electronics Engineers, became very active in the local chapter and have been active in the IEEE ever since (31 years). While in graduate school, I worked three summers for Zenith in research and development and received my Ph.D. from IIT in 1969.

Communications Technology: *After school, what were your first jobs?*
Walt Ciciora: I had a job offer from Hughes in radar in California and from Westinghouse in sonar on the East Coast but decided to join Zenith full-time. Interestingly, the first project I was involved in was on digital processing of TV signals for scrambling, for subscription TV.

My boss at that time was Carl Eilers, who by the way invented FM stereo, among other things. The head of the research and development department was Dr. Robert Adler, who invented the TV remote control.

While working at Zenith, I taught electrical engineering part-time in the evening school at Illinois Institute of Technology. I taught courses such as Communications Theory, Digital Logic Design and Basics of Computers—this was fairly early in that game. Zenith asked me to teach those courses in-house because Consumer Electronics was interested in applying microprocessors and computers to TV sets.

In 1977, I chaired the IEEE Consumer Electronics Society convention. This was a time when consumer electronics was growing, and that was quite an exciting convention. I was president of the IEEE Consumer Electronics Society for two years.

At Zenith, we did a lot of early work on teletext, and I chaired a number of standards committees. Zenith was having financial troubles at that time. I realized R&D was vulnerable because the "bean-counters" see downsizing the department as a way of helping the bottom line right away. So we decided in our little R&D group to build and sell a product, which would pay our salaries and costs and, in that way, protect our jobs.

What we did was build teletext products for use in cable systems. The idea evolved into several flavors. An interesting one was delivering data in the vertical blanking interval of satellite signals received at cable headends using a box that we built. That unit fed a character generator to drive the rolling, scrolling, electronic program guides at the time. Our group built teletext set-top boxes for the Group W, Buena Vista full-field teletext trials, and we also built the Time teletext boxes.

About that time (1977), I started an MBA program at the University of Chicago and finished it in 1979.

Communications Technology: *About then, didn't you spend some time in the sales end of the cable business?*
Walt Ciciora: In 1981, I went to work as director of sales and marketing for the newly formed cable group at Zenith. My boss was Jim Faust. The first year we had sales of $80 million. That's at a time when $80 million was a lot of money. We had just Jim Faust and myself selling, and it seemed that we lived on airplanes. That's also when I met most of my best friends in the cable industry, going out there and peddling Z-TAC set-top boxes.

Communications Technology: *How did you get involved with ATC?*
Walt Ciciora: In 1982, Bob Rast talked me into leaving Zenith to join ATC (known today as Time Warner Cable). This was his third attempt to get me to leave Zenith, and finally I couldn't resist. However, leaving Zenith after 17 years was very difficult. But it was the second best thing I ever did, career-wise.

A couple of years later, I actually was paying more in income tax than my salary had been at Zenith. Rast took "people management" very seriously. He worked very hard at interpersonal relationships and staff development. I would have to say he was one of the best bosses I ever had, and he is a very good friend to this very day.

One of my fondest memories of that

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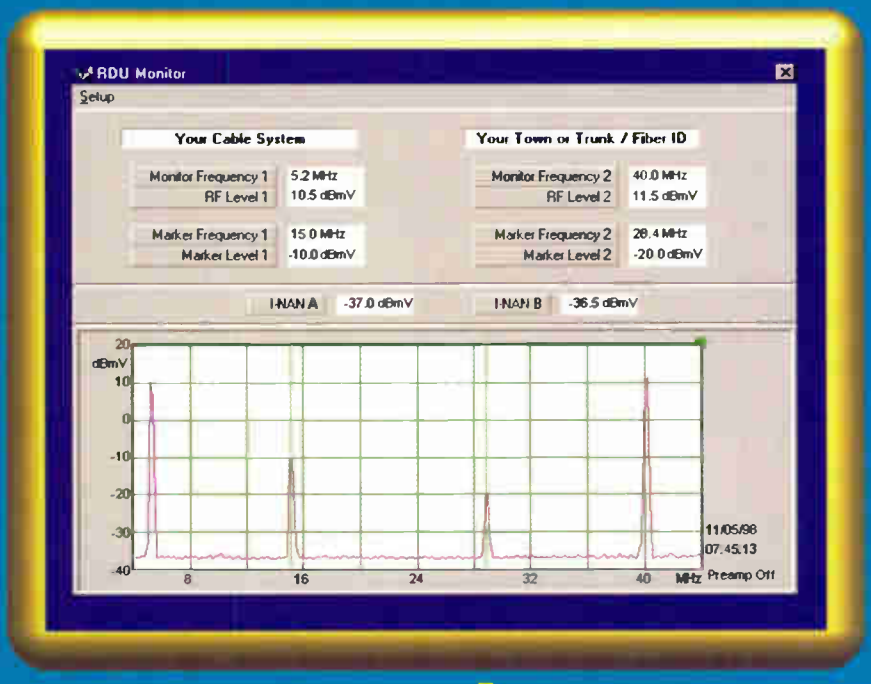

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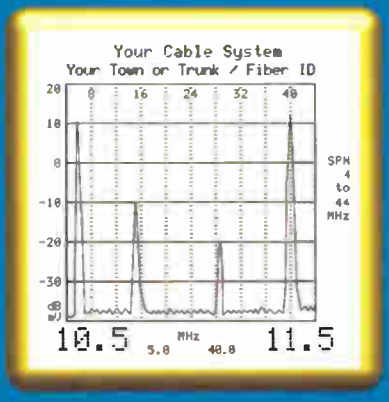

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time was that Tryg Myhren, then chairman of ATC, called me at my home just as I was preparing to leave Zenith and welcomed me to ATC. I've always thought that was an incredibly nice touch. Jerry Levin, who was at that time in charge of HBO and also in charge of Time Teletext, told me he read all of my papers on teletext, and that made me feel awfully good.

At ATC, the R&D department already had begun working on an off-premise converter. After I joined, additional projects were added: home security, wireless home security, and the very first digital audio system for use on cable and electronic program guides. We had an R&D group of about 650 people, about half of them doing software.

In 1983, I substituted for Bob Rast at Montreux, giving a paper that he would have given had he not been too busy at the time. Frank Bias of Viacom, who at that time was the U.S. cable representative on the Montreux committee, was retiring. He recommended that I take his place on the executive committee, and I've been involved in the Montreux Symposium ever since. I'm certainly grateful to Frank Bias for his recommendation.

The mid-'80s saw a lot of pressure to raise stockholder value, and that brought into question the need for an R&D division for a cable company, so we shut down the R&D group at ATC.

Of course, that's a difficult thing to do, and we did it just as it was about to start filing patents on electronic program guides and universal remote controls. And so all of the current struggles over the patents on electronic program guides would have been quite different if we had continued just maybe another year or so.

But, of course, folks who are being "let go" aren't motivated to document their work, and as a result, all of that excellent work was lost. Other companies later filed patents on electronic program guides.

Communications Technology: *And that led you to become involved with other important industry committees?*

Walt Ciciora: Since Bob Rast came from RCA and I came from Zenith, we both had an appreciation for the importance of the interface between cable and consumer electronics. Bob founded the Joint Engineering Committee between the National Cable Television Association and the Electronic Industry Association before I came to ATC.

A year or so after I came to ATC, he asked me to take it over. The two industries have very different and conflicting priorities, so it's been a lot of hard work forging a fragile relationship. I became heavily involved in the NCTA Engineering Committee at that time and met Wendell Bailey, and I became good friends with him and with his wife, Denise.

> "Little did we know that this was going to lead to Internet and all of the exciting things—I was just making coils for a modem at that time."

I also chaired the NCTA Engineering Committee for four years. In the Joint Engineering Committee, we developed something that the EIA called the Multiport. This was a plug on the back of TV sets and videocassette recorders (VCRs) that allowed a descrambler or some other aftermarket device to be plugged in. This was very nicely accepted by the subscribers who used the first prototypes. In fact, they very strongly resisted giving them up after the technical trials were over.

Cable operators had a modest problem with the Multiport because there was very significant remote control rental revenue. Multiport was a threat to that. Plugging the descrambler into the back of the TV set meant that the TV set's remote control and tuner were able to command which channels you watched; thus, there was no need for a cable remote control.

In 1989, ATC moved to Connecticut, and I am very grateful to have been invited to move there. While moving the family with kids still in high school and college was difficult, it was nonetheless a very good move for my wife, the family and me.

Communications Technology: *How was life back on the East Coast?*
Walt Ciciora: I was the first chairman of the CableLabs Technical Advisory Board—I did that for four years. I worked on the GHz Cable System in Queens.

In 1992, the cable industry had imposed upon it a Cable Act with the Leahy Amendment. The Leahy Amendment required that consumers be able to watch one program while recording another; secondly, that consumers be able to consecutively record different programs on different channels; and third, that they be able to utilize special display features of TV sets and VCRs. While it didn't say picture-in-picture, that's what it actually meant.

So the Joint Engineering Committee got a new mission. Initially the consumer side insisted, "Why doesn't cable just not scramble?" That certainly would have solved all of the problems from their perspective. The cable side said, "Why doesn't the consumer side just make monitors?" That would have solved the problem from the cable side.

But both of these are deadly approaches to the other business and would be absolutely devastating. So one of the major goals that we had in the Joint Engineering Committee, after the 1992 Cable Act, was to avoid onerous restrictions on scrambling. We already had a law imposed on us that said broadcast basics could not be scrambled. So we were very concerned that law might be extended to other areas of the cable spectrum and would do serious damage to the cable business.

Our goal was simply to avoid a train wreck. Now, one of the problems when you try to avoid a train wreck is that there are no sparks. This was a relatively difficult and thankless job, with hardly any visible results. Because we were successful, we avoided that train wreck.

Communications Technology: *How did you get into full-time consulting?*
Walt Ciciora: In 1993, I left Time Warner to enter into the consulting business, which took off immediately. I was quite surprised, in fact astonished, at how quickly the business grew. Actually, I did better financially, from the start, than at my previous job.

One goal I did fail with was to slow down and travel less. I've been doing more than 100,000 miles on United every year since that mileage-plus program started, and that includes the last five years that I have been consulting.

Communications Technology: *What about some of your most recent projects?*
Walt Ciciora: While still at ATC, I wrote a pamphlet called "Introduction to Cable Television in the U.S." After leaving Time Warner, I updated it for CableLabs. It was one of CableLabs' biggest sellers, still on its Web site.

Morgan Kaufmann Publishers saw it and asked me if I'd be willing to make it into a book. I insisted on a co-author. I was not going to write a whole book myself. Dave Large and I both were starting consultants at that time, so we thought

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that writing a book would be a great way to fill the dead time between clients—except that there was no dead time.

The good news was that the consulting business took off immediately, and the bad news for the book was that there was no time to write it. After a year, the publisher thought maybe we needed another co-author, and we invited Jim Farmer on board. Now all three of us are pleased that the book is finally out, *Modern Cable Television Technology, Video, Voice and Data*. It appears to be very well-received.

Currently, I am doing expert witness work on patent cases and other cases as well. Right now, I'm doing a wide variety of consulting for different clients and having some fun with "board work" and "technical advisory board work." I serve on the boards of four companies: Microtune; EnCamera, which is a start-up; Matchmaker Media, another start-up; and Millennium, a third start-up. I serve on the technical advisory board of Com21, Stellar One, MCSI, MultiChannel Communication Sciences Inc. and a couple of others.

EnCamera is a technology for compatibly including up to 4.5 Mbps of data in an NTSC signal without impairing its use as a TV signal. I've been working on this with Ted Hartson and Bob Dickinson. We started this about three years ago, and we now have prototypes up and running in Ted's Scottsdale, AZ, lab.

We have acquired a 25 kW channel-4 transmitter that actually was on the air just a few months before in Tucson, AZ. It's an RCA, probably about 20 or 30 years old, but there are still a lot of them in use right now. We also acquired a 1 kW channel-61 transmitter, which just last May was on the air in Maui.

We're having a lot of fun and engaging in some really interesting technology. It's been a great education also in the entrepreneurial route in trying to get money to fund a company and so forth. It's been quite an interesting and challenging experience.

Communications Technology: *Walt, you have had so many accomplishments in your life already. Which one do you view with the greatest satisfaction?*

Walt Ciciora: I would have to say the proudest accomplishment in my life was with my wife having four children, now all married, homeowners, taxpayers and good citizens. We have four grandchildren. Grandchildren are something really fantastic.

My proudest technical recognitions have been as a Fellow of the IEEE, a Fellow of the Society of Motion Picture Engineers and, of course, a Fellow of the Society of Cable Telecommunications Engineers. I was awarded the Vanguard Award, 12 patents with several more pending and, finally, that book. CT

Rex Porter is editor-in-chief of "Communications Technology." He can be reached via e-mail at tvrex@earthlink.net.

a small "x" in chalk on a particular component of the machine and stated confidently, "This is where your problem is." The part was replaced, and the machine worked perfectly again.

The company received a bill for $50,000 from the engineer for his service. They demanded an itemized accounting of his charges. The engineer responded briefly: "One chalk mark, $1. Knowing where to put it, $49,999." It was paid in full, and the engineer retired again in peace.

A pastor, a doctor and an engineer were waiting one morning for a particularly slow group of golfers. The engineer fumed: "What's with these guys? We must have been waiting for 15 minutes!"

The doctor chimed in, "I don't know, but I've never seen such ineptitude!"

The pastor said, "Hey, here comes the greenskeeper. Let's have a word with him." After a pause, the pastor asked the greenskeeper: "Hi, George. Say, what's with that group ahead of us? They're awfully slow."

The greenskeeper replied, "Oh, yes, that's a group of blind firefighters. They lost their eyesight saving our clubhouse from a fire last year, so we always let them play for free any time." The group was silent for a moment.

The pastor said, "That's so sad. I think I will say a special prayer for them tonight."

The doctor added: "Good idea. And I'm going to contact my ophthalmologist buddy and see if there is anything he can do for them."

Finally, the engineer said, "Why can't these guys play at night?"

All the girls in a high school gym class were lined up against one wall, and all the boys against the opposite wall. Every 10 seconds they walked toward each other until they were half the previous distance apart. A mathematician, a physicist and an engineer were asked, "When will the girls and boys meet?"

The mathematician said, "Never."

The physicist said, "In an infinite amount of time."

The engineer said, "Well, in about two minutes they'll be close enough for all practical purposes."

Three engineering students were gathered together discussing the possible designers of the human body.

One said: "It was a mechanical engineer. Just look at all the joints."

Another said: "No, it was an electrical engineer. The nervous system's thousands of electrical connections prove that."

The last said: "Actually, it was a civil engineer. Who else would run a toxic waste pipeline through a recreational area?"

An architect, an artist and an engineer were discussing whether it was better to spend time with one's wife or a mistress.

The architect said he enjoyed time with his wife, building a solid foundation for an enduring relationship.

The artist said he preferred to spend time with his mistress because of the passion and mystery he found there.

The engineer said, "I like both."

"Both?" asked the other two.

"Yes, both," the engineer continued. "If you have a wife and mistress, they will each assume you are spending time with the other woman, and you can go to the lab and get some work done."

An engineering student was walking across campus when another engineering student rode up on a shiny new Harley.

"Where did you get that?" asked the first engineer.

The second engineer replied, "Well, I was walking along yesterday minding my own business when a beautiful woman rode up on this bike. She threw it to the ground, took off all her clothes and said, 'Take what you want.'"

The second engineer nodded approvingly and said: "Good choice. The clothes probably wouldn't have fit."

Maybe my wife is right. CT

Ron Hranac is senior vice president of engineering for the Denver-based consulting firm Coaxial International. He also is senior technical editor for "Communications Technology." He can be reached via e-mail at rhranac@aol.com.

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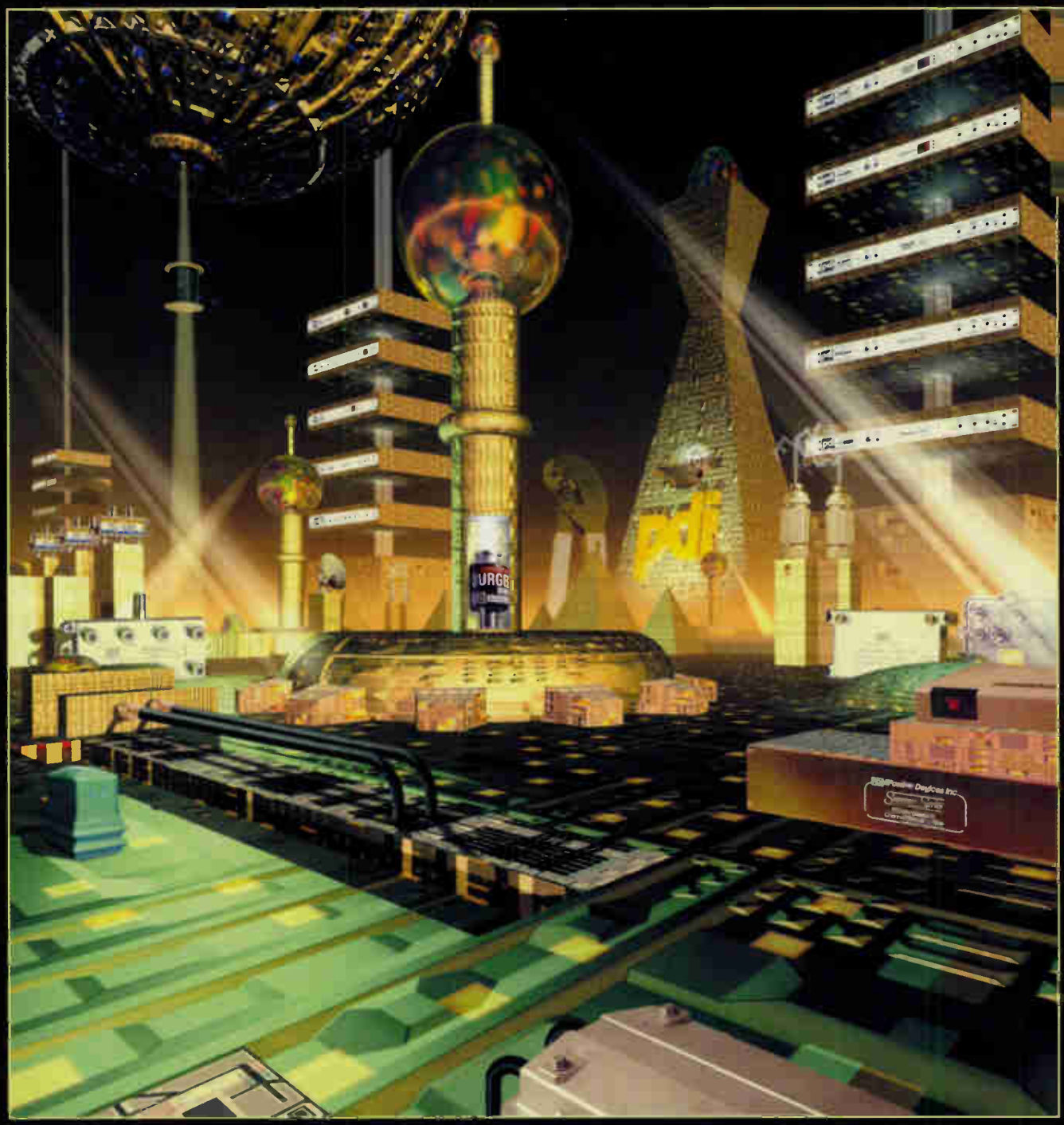

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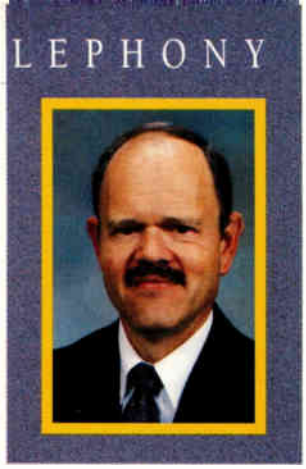
By Justin J. Junkus



The Convergence Of Switched and IP Telephony

The Future Is Closing In

A few months ago, I observed that serious entrants into the telephony market need to deploy circuit-switched technology now to capture the market of feature-conscious consumers. Before Internet protocol (IP) telephony can flourish, the technology must evolve to close the feature gap, and those changes are coming.

A word of caution, though: These changes are on the engineers' and developers' desks now, but they won't be in the field for another three to five years. When they are ready for prime time, circuit-switched technology indeed will give way to an IP telephony alternative, but the cable industry cannot afford to wait for this to happen.

It's all about features

The market, rather than technology, drives the near-term implementation of cable telephony. Becoming a player in telecommunications requires an operator to have a feature-rich telephony solution today. In the longer term (three to five years), continuing to play in the telecommunications arena will require an operator to have a flexible, hardware-independent environment for feature creation and maintenance, as well as a full-featured service.

Today's IP telephony solutions cannot yet provide that environment. Circuit-switching is the only viable choice we now have to give our customers what they want.

By the first third of the next decade, however, products that have roots in the data industry will give IP telephony the capability of defining user features in a distributed, software-driven architecture. Such an architecture makes feature changes easy to implement—essentially, just a few lines of new code in a server on a network change the feature for every subscriber served by the telephony provider.

Circuit-switched telephony systems based upon hardware-driven networks simply do not have the flexibility to rapidly change or deliver new features across an entire installed base of switches.

Directory assistance

A key element of this distributed, software-defined architecture is a directory database.

Directories keep track of network "objects," such as telephony features, access privileges, customer information or billing rates. They reside on one or multiple servers in a network. (Start thinking Internet here.)

The use of such a directory to support an application is called the directory service. Although each directory provides a specific service, certain information may be common between directories and services, such as the subscriber name.

You can gain a great degree of flexibility by allowing separate directories to share certain common entries. For example, imagine the phone, electric, gas and cable companies all having the most current name, address, phone number and home appliance inventory in the same fields of databases with a common format, which could be accessed by each utility.

Think of how easy it would be to add new services involving Internet control of multiple home appliances. Even if you just consider telephony applications, life would be easier for consumers if a centralized server could coordinate their cellular and land-line phone numbers across service providers for "find me" service and end-of-period billing. One call could provide address or other changes for multiple service providers.

This sharing between directories is called a "global directory service." Such flexibility would require cooperation between service providers, but it also would require a standard for directory structure that multiple vendors and service providers could accept. We'll talk about standards later, but for the time being, let's assume that both issues can be solved.

Policy servers

Now, let's allow the global directory service to communicate with another database containing a set of rules that specify what privileges are associated with specific entries in the global directory. An example might be that Joe Cablesub is entitled to forward calls from his home to his business phone number between 8 a.m. and 5 p.m. each day. The computer containing this second database is called a "policy server." You may be starting to see the potential here.

Today, IP telephony provides a call routing mechanism that is an alternative to the public switched telephone network (PSTN). Routing is all it can provide

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because features reside in a telecommunications switch. If the routing functionality of IP telephony could be combined with policy-based decisions coming from servers distributed on the Internet, IP telephony could provide the equivalent to switch features.

The big difference between using a policy-based network for feature delivery and using a conventional switch is that policy-based network decisions

> "Becoming a player in telecommunications requires an operator to have a full-featured telephony solution today."

are made at a computer (think computer in the Internet) that is independent of any telecommunications switch. Features can be added to subscribers' Internet phones at the policy server by associating them with the phone's Internet address. Furthermore, the features can be combined or changed at the centralized policy server, provided the changes are made by the authorized network manager.

Standards

To reach this ideal situation, we assumed that standards issues were solved. This is the biggest obstacle to implementation today. The data industry, particularly the part of it that serves large wide area networks (WANs), has been working on a standards solution to global directory services since 1988. The first attempt is X.500.

X.500 specifies how information in a directory is referenced and organized. It describes a "schema" for information that applies across different types of computer hardware and software, similar to a business form with boxes for specific entries. ➤

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It provides a way to secure information against unauthorized access, specifies the types of operations that may be performed on data in the directory, and defines how a directory service could be maintained across hundreds or thousands of servers.

The problem is that X.500 is too complicated. It requires too much code to run on many servers. Worse yet, it doesn't work well with transmission control protocol/IP (TCP/IP), which is the protocol for the Internet.

In an effort to remedy the problem, software developers created the lightweight directory access protocol (LDAP). As the name suggests, LDAP is a watered-down version of X.500. It began as a way for smaller computers to communicate with the large machines needed to hold the X.500 code, and it has evolved through three versions to a self-contained protocol for directory access.

For now, server vendors cannot agree on standard implementations of LDAP on their products. Because of the complexity of X.500, it is not acceptable for widespread use on communications directory servers, either. Several taskforces are attacking the problem, and eventually consensus or de facto implementation by a predominant vendor will solve it. When that happens, features and flexibility will become part of IP telephony.

For the time being, IP telephony is well-suited to application on the network side of a telecommunications switch. There, it can provide economical call completion over managed networks where quality of service (QoS) problems have been solved.

In the meantime, technical people in cable have some time to learn new technologies. If you aren't data proficient, it's not too soon to learn about networks, servers, databases and packets. For telephony and any other new service, these technologies are the future. CT

Justin Junkus is president of KnowledgeLink, a consulting and training firm specializing in the cable telecommunications industry. To discuss this topic further, or to find out more about KnowledgeLink, you may e-mail him at jjunkus@aol.com.

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By Jennifer Whalen

Thomson, Toshiba Win "High Five" from CableLabs

Although it's taken three years of hard work by vendors and operators alike, the fruit of that labor is starting to show. In early March, Thomson and Toshiba became the first cable modem makers to win the "CableLabs Certified" seal of approval.

The cable industry smartly identified the need to deliver cable modem services over an open, standards-based platform. But many have criticized the time it's taken to move cable modems through the certification process, verifiying that the modems comply with the Data Over Cable Service Interface Specification (DOCSIS).

CableLabs defended its process. "It's a monumental industry move to get from specification to product in three years," said Rouzbeh Yassini, executive consultant with CableLabs, at a recent briefing in Denver. "It's like peeling an onion layer by layer, and we've cried as we've peeled the layers. We must make sure that the software interoperability is right, that the physical layers are right, and that the network management is right before awarding certification. This ensures the quality of the specification is maintained."

Brian Roberts, president of Comcast, agreed."I was quite pleased that we said we had to have 100-percent compliance. If we have to take a little heat, it's worth it to have a compatible product."

Certification Process

Although eight companies are shipping modems built to conform to DOCSIS (see

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table), only two—Thomson and Toshiba—have achieved that magical certification "High Five" in the six-step process of shipping a DOCSIS-certified modem.

The process is tough. Vendors must comply with more than 1,000 line items in the spec, explained Yassini, and put their modems through four sets of interoperability lab tests as well as MSO field trials. The alpha, beta, field, and demo labs test everything from data throughput to network management to application performance. CableLabs also tested the Thomson and Toshiba modems against headend equipment from four manufacturers.

Why bother?

Why devote such an exhaustive effort to compliance? Cable learned from telco mistakes. Early attempts by telcos to launch residential data services, such as integrated services digital network (ISDN), failed because initial deployments were proprietary, networks didn't interoperate, and customer premise equipment (CPE) was costly and scarce. By tackling interoperability up front, engineers will be assured that the high-speed data networks they design will be compatible with the retail CPE that's available as well as with the cable modem termination systems (CMTS) needed in headends. CableLabs has not yet certified any headend systems.

CM Vendor Certification Status

* Askey	1	* Libit	1
* 3Com	1,2,3,4,6	* Motorola	1
* Nortel	1,2,3,4,6	* NEC	1
* Broadcom	1	* Samsung	1,2,3,4,6
* Daewoo	1	* Sharp	1
* Cisco	1,2,3,4,6	* Sony	1,2,3
* Com21	1,2,3,4,6	* Thomson	1,2,3,4,5,6
* E-Tech	1,2,3	* Toshiba	1,2,3,4,5,6
* Gadline	1	* Zenith	1,2,3
* General Instrument	1,2,3,4,6		

Source: CableLabs

What's Next?

Winning the "CableLabs Certified" seal will make it easier for vendors to obtain retail outlets for their modems. "We need a national standard for retail distribution," said Carl Bruhn, general manager of RCA Broadband for Thomson Broadband Technologies. He reported that Thomson is talking with Best Buy, Circuit City, Sears and RadioShack about retail distribution.

If cable modems succeed in the retail market, you the engineer would benefit because billions of dollars in capital spent on CPE would be freed for other uses. "That money could be used to accelerate network upgrades and create new content that other ISPs can't provide," Bruhn said.

Moving to retail won't be easy. Cable gear historically isn't sold via retail, and plant upgrades vary by city and operator. So, it's hard for customers to know if service is even available where they live. Still, Bruhn thinks the move to retail is worth the effort. "If we get retail on our side, we'll be a real force against the RBOCs (regional Bell operating companies) and the DSL services coming out." CT

Jennifer Whalen is editor of "Communications Technology." She can be reached at (301) 340-7788, ext. 2057 or via e-mail at jwhalen@phillips.com.


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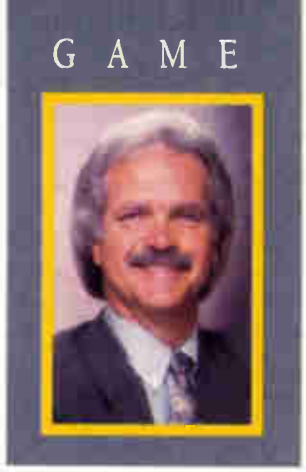

New Services on Your Network

In the February 1999 "Data Game," I pontificated on the "madness, magic and reality" of broadband network management and the need for enhanced network integrity to support high quality, reliable broadband-based advanced telecommunications services.

However, other than identifying the need for proactive (vs. reactive) capability and outlining the critical success factors in broadband network management, I didn't get into significant depth in detailed capabilities and management scenarios.

Because I believe proactive network management will continue to be one of the most, if not the most, critical challenges for the cable industry, it seems appropriate to expand on the theme by examining some of the issues you'll face when deploying new telecommunications services on your network.

A question of perception

Let's begin with the 100,000-foot view. The success of advanced telecommunications services over broadband will depend largely on customers' perceptions of the reliability, performance and integrity of any services they consume.

According to *Webster's New World Dictionary, Third College Edition*, perception's primary meaning is "a) the act of perceiving or the ability to perceive; mental grasp of objects, qualities, etc. by means of the senses; awareness; comprehension; b) insight or intuition, or the faculty for these."

When it comes to customer perceptions of telecommunications services, as is the case in many things, perception is reality. I contend, however, that much of customers' perception of telecommunications services depends on their expectations of those services—that is, the importance of those services to them.

For example, people tend to view the telephone as a very important service that

they expect to be available all the time. Why? It certainly isn't because telephones are important; it's because telephones are tools that enable people to communicate with just about anyone, any time. Reliance on telephony services has become second nature because of its reliability, cost profile and consistency.

Contrast the importance of telephony services with that of traditional entertainment, and it's easy to see why the addition of just telephony service to cable's portfolio imposes new requirements on cable network management.

For instance, if a few seconds' worth of artifacts or frozen Moving Pictures Experts Group (MPEG) frames corrupt the ball game, no one views it as a life-threatening event. However, if people can't reach the ambulance or police on the phone when they need to, it's a different story altogether.

Adding myriad interactive multimedia services to cable's services suite will only impose greater demands on broadband network management capabilities.

These advanced telecommunications services on cable, if perceived as highly reliable and consistent value propositions, stand a very good chance of following the telephony services path. Eventually, these services will become second nature, embedded into our lives as tools upon which we increasingly rely.

The real point here is that the integrity requirements (and by default, your required network management capability) of an entertainment-only network differ greatly from those of an interactive multimedia network delivering entertainment, voice, video-conferencing, home security, education, home-to-office connection, and other services over the same wire.

Latency

We don't have the space here to explore all the issues associated with how new advanced telecommunications services will impact your network and network management system requirements. One issue that you will experience in deploying several of these advanced broadband services is the concept of latency.

Latency can be a confusing term. In telecommunications and computing jargon, latency generally has to do with the regularity of something, such as the arrival rate of video frames in a video streaming application. If the latency is too high in this case, then the viewer may not perceive full motion video.

Minimizing latency for such an application involves the behavior of many functions within the underlying network infrastructure between the source and consumption points. For example, the access methodology by which cable modems introduce and remove information from a cable network medium must ensure acceptable latency between the cable modem termination system (CMTS) and the cable modem.

If the source (server) of the streaming content resides on the headend local area network (LAN), then you need to make provisions to ensure that streaming video packets do not get stuck behind someone's e-mail or batch file transfer. If the source server resides beyond the headend somewhere in cyberspace, then the path between the distant server and the LAN-side

By David Devereaux-Weber

Cheap Splitters Can Add Hum To Your Network

I had been having a problem with hum in the video in one of our student housing buildings and posted a message to the List to help me find a solution. A series of at least a dozen messages followed, from Al Hamilton, Poge Smit, Ron Hranac, John Fleetwood, Bill Naivar, Sean Bristol, Steve Allen and Jim Kuhns. Because the thread is too large to publish, I've included only my summary here, edited to fit.

Asking this question here helped me to understand the problem more clearly; the responses have been very useful. Here's what I have learned:

Power potential differences

In a trunk or feeder line, it is not unusual to find differences in power potential along the line. Line amplifiers, splitters, directional couplers and subscriber taps essentially low-pass filter the power down to the power distribution components (power input, output or throughput and so on). This causes no hum in the TV signals.

In products for indoor applications, the competition to reduce cost has been strong. Because indoor components don't need power distribution capability, some manufacturers remove the components that support power distribution. If you make passives and your competitor cuts out components to reduce cost, you can lose market share to your competitor if you don't follow suit.

As a result, we see a number of splitters and directional couplers that have no capacitor in series with the input side of the toroidal transformer. In most cases, that isn't a problem.

However, when there is a difference in power potential between two points, and when the coax cable is bonded to the power ground in both locations (as required by code), the coax outer conductor is in parallel with the power neutral wire—some 60 Hz power flows down the coax.

If there is no input capacitor, the toroidal transformer (which acts like a transformer at frequencies above 1 MHz or so) may have a lower impedance at 60 Hz. Thus, some 60 Hz power current also will want to travel to the center conductor and down to the other end of the coax.

Saturation

These toroidal transformers are very small, made with thin wire, which is just fine for cable TV signals. However, the level of 60 Hz power current flowing through them can approach the point where an increase of some amount of signal on the input side of the transformer does not result in a corresponding increase on the output side—the transformer "saturates."

When this happens, the cable TV signal, which is trying to get through, is reduced. This reduction coincides with the shape of the sine wave of electric power. This puts hum in the picture.

When a TV carrier has hum, it can't be filtered out. The amplitude of the TV carrier increases and decreases with the low frequency signal. When you measure the hum of a carrier, you don't measure the 60 Hz voltage on the cable; you measure the amount that the TV signal increases and decreases because of hum. Without a lot of effort, it's impossible to undo the effect of hum. The only way to stop hum is to go to the source.

In this case, if you can stop the 60 Hz current from going through the toroidal transformer to the center conductor, you stop the saturation of the transformer and prevent the change to the TV signal. That's what the capacitor does.

The solution

To get the capacitor, buy splitters and directional couplers with them. They probably will cost a nickel or dime more, but when you've gotta have 'em, you've gotta have 'em.

By the way, wherever I have said "TV signal," you also can insert "data signal." Also, I have mentioned only the input side of devices. Saturation also can occur on the output side (in the tap ports to a home, for instance).

After I wrote this, I installed a different directional coupler, which reduced the hum from 11 percent to 1 percent. CT

Dave Devereaux-Weber, P.E., is a network engineer at the University of Wisconsin-Madison. He is a senior member of the SCTE, and he can be contacted via e-mail at djdevere@facstaff.wisc.edu.

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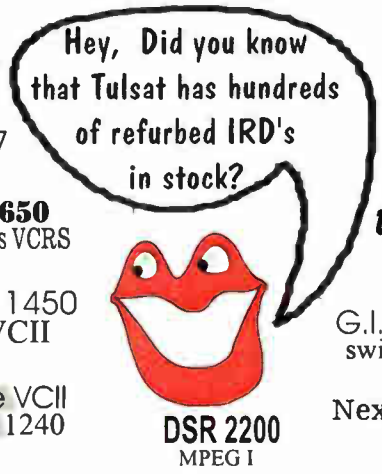

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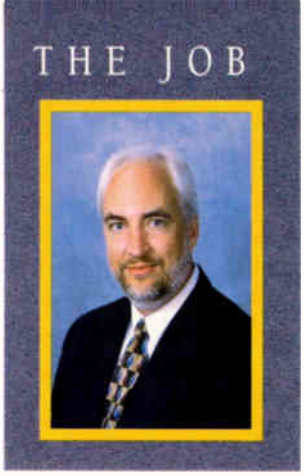


By Alan Babcock

Pay-for-Performance Programs

In today's workplace, managers constantly look for ways to increase proficiencies. Even in this day of record employment levels, growing profits and a bullish stock market, companies want to do more with less. The drive to improve efficiencies in the workplace is changing the way many cable operators hire and promote in the technical workforce.

In years past, employers hired entry-level installers from electronics trade schools, the building trades and so on. As installers learned the ropes, they became eligible for promotion.

Promotions came quickly because of high attrition at all levels of the organization. Promotions usually filled vacancies at higher levels. Promotions often hinged on seniority, job performance or education—though not necessarily in that order. The new technician then would learn the job after receiving the promotion.

The ineffectiveness of this process is clear, and many companies are modifying their hiring and promotion strategies to speed the time to competence.

Pay-for-performance

For many companies, the way to improve this situation is a "pay-for-performance" program. Such a program establishes specific guidelines for individuals to meet prior to advancing in position or pay level. Hiring practices usually are part of these programs. New hires may need to meet specific job performance requirements to become full employees.

Some companies use Society of Cable Telecommunications Engineers training and certification as integral tools in these programs to train and recognize compe-

tency in certain job skills. Let's take a look at how such a program might work.

Let's assume that Company X has multiple cable systems across the country and has deployed circuit-switched telephony in some markets. The company has begun high-speed data trials and plans to introduce Internet access service within a year.

The company has traditional job classifications, including installer, service technician, maintenance technician, fiber technician and headend technician. When a position opens, technicians apply, and someone moves up. Training is on the job, after the promotion.

Encourage everyone to improve

Looking at a new model requires some assumptions. First, assume there are no restrictions on the number of technicians within a specific job classification. This is significant because of such limiting factors as finances or labor contracts.

Next, assume a willingness to let all employees increase their responsibility. In other words, each installer needs to gain the skill to maintain the synchronous optical network (SONET). This can't happen overnight, but the possibility must exist.

Making it happen

The company needs to develop a career path that spells out specific steps to take. This requires thorough analysis of each job grade along the path. List all the job competencies needed at each level. Enlist the help of supervisors and other department heads (customer service, dispatch, sales and so on) to create an exhaustive list of competencies for each job.

Next, determine how to verify that an individual can perform as expected in each competency. These measurements include a variety of tools, such as independent certification testing, course completion scores, on-job quality assurance and supervisor observation.

To assure that all employees have equal opportunity for advancement, the company needs a plan for training. Various forms of training are available, including correspondence courses, videotapes, internally developed and presented classroom training, vocational or post-secondary institutions, and other training forms.

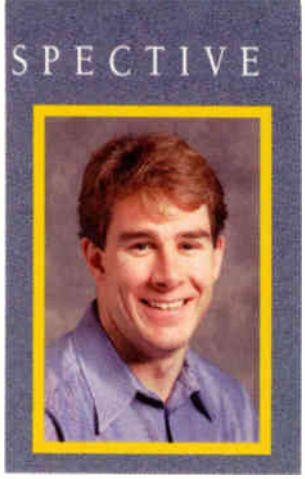
Training must fit the job skills needed and be appropriate for the audience. A company probably wouldn't send an installer to the community college for training in finance just because the job requires balancing daily cash collections.

Laying out the expectations for the program prior to announcing it to employees requires significant work. This preliminary work needs to exhaustively identify competencies at each level, which then form the basis for the entire program. These competencies become the goals, and all other training and measurement tools establish the road to those goals.

Next month, I will examine integrating specific training and certification programs with a pay-for-performance plan. CT

Alan Babcock is director of training development for the Society of Cable Telecommunications Engineers. He can be reached via e-mail at ababcock@scte.org.

By John Canning



People Want Freedom of Choice in Broadband Services

The recent celebration of 50 years of cable confirms a couple of things. First is the primacy of television as the American pastime, world portal and companion; second is the unprecedented choice it offers.

Cable has enhanced the quality of the TV experience in ways that deliver more choice, more channels, better pictures and sound, and more information. Choice certainly was a theme last year at the Western Cable Show, with vendors making new choices available to both consumers and operators.

Consumer demand

For consumers, choice is a simple issue—getting what they want at a price they're willing to pay. Consumers want better pictures and sound, and instant access to information. They want ease of use, low price points and compatibility.

Along with new services, consumers have new expectations, especially for uptime, customer response and help desk support.

Consumers are seeing a proliferation of cable modem services, from telecommuting and games to music and videos. A choice of cable modem products will soon show up in the retail space. And frankly, choice extends to the competitors vying to provide consumer services.

To succeed in today's market, cable operators are extending their offerings beyond traditional video programming to

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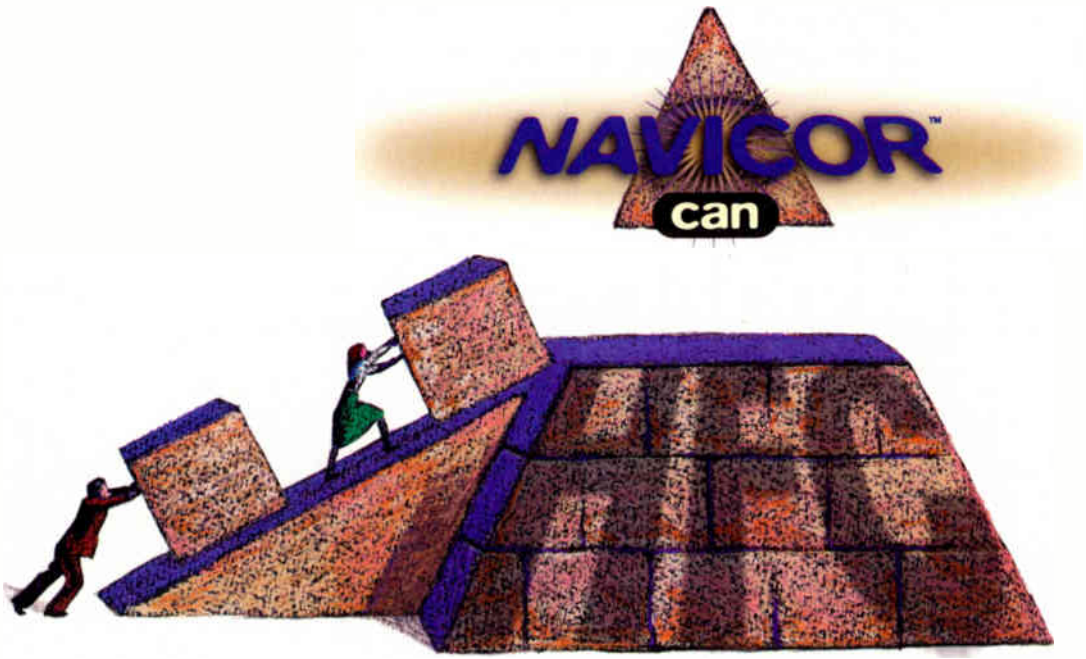

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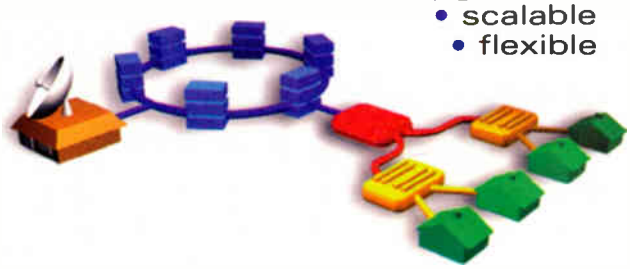

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include high-speed data and phone services over the same infrastructure. New consumer choices mean new decisions for operators, especially concerning how to provide the services.

Obstacles to advancement

The promise of wide-open bandwidth—created by plant upgrades—already is being eroded by new channels and bandwidth needs. Operators need to worry about their network access points, backbone providers and the amount and network location of their caching. They have to decide whether to provide full Internet access or to adopt a limited, "walled garden" approach.

The network operators also have to confront issues such as free access for data service providers, digital must-carry, modular set-top boxes and cable modems in retail.

Choice also brings new opportunities, including new revenues, for operators. A high-speed data provider can market its services to businesses as well as to consumers. Operators can offer virtual private networking (VPN) for work-at-home applications and hosting business sites. They can offer one-stop shopping for a consumer's video, voice and data needs.

> "The promise of wide-open bandwidth—created by plant upgrades—already is being eroded by new channels."

Interactive TV (ITV) is one of those harbingers of greater choice. Yes, ITV. The once over-hyped, under-delivered promise of four or five years ago is back, and this time it's becoming reality.

What's different? First, the definition of "interactive" has evolved. Where the systems of the past brought an onslaught of choice, we now see more focus on the types of interactivity the customer actually wants. An electronic programming guide, for example, is a highly desirable, if simple, form of interactivity. The watchwords of today's offerings are "a la carte," "modular," "integrated" and "choice."

Cable comes of age

The maturing of the industry's vision for ITV has led companies to take a more pragmatic approach. Operators such as TCI are focusing on rolling out systems across the United States that provide incremental value, rather than being promoted as the be-all, end-all. As a result, operators can deliver on their promises—promises that include more choices.

Consumers and operators aren't the only ones facing new choices. Traditional

cable vendors as well as newcomers such as Microsoft have to deal with the complexity of the changing market.

We can't focus just on the delivery of video services. Data and voice services are becoming equally important. We see vendors supplying Data Over Cable System Interface Specification (DOCSIS) 1.0-compliant equipment with new features to support, along with the retail sales option.

> "Subscriber management and billing systems also must be able to support a new set of diverse services."

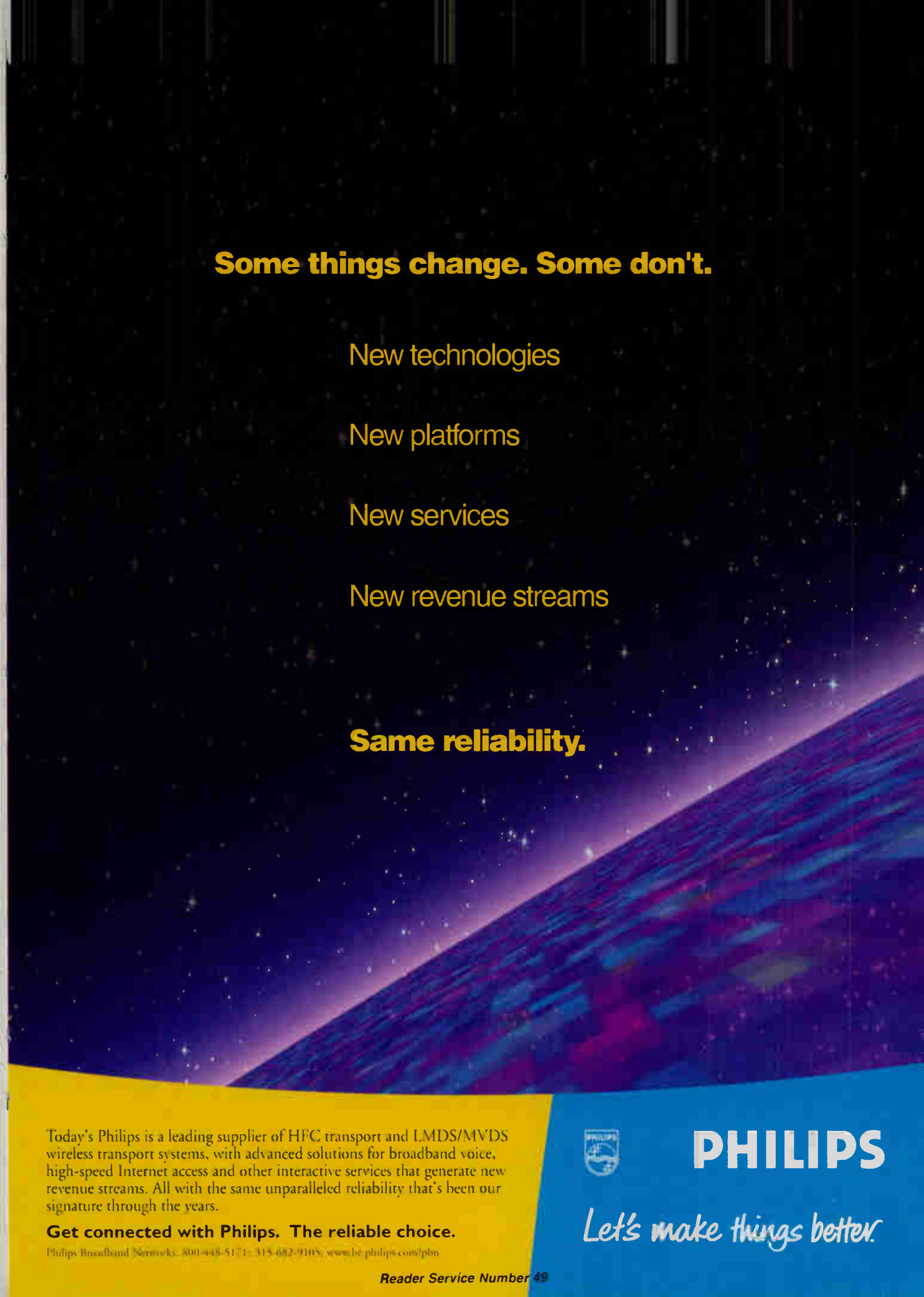
Subscriber management and billing systems also must be able to support a new set of diverse services for systems with a wide range of devices. Beyond that, the operators themselves must have the infrastructures to support new devices such as cable modems and telephones—and it's the job of the vendors to ensure that extensibility.

Integrated future

For Microsoft's part, we have listened to our customers and are responding with a software foundation that allows cable operators to exercise their choice of hardware, software and services. There is no "one size fits all" solution, as the Western Cable Show demonstrated. The key is to find the right combination of building blocks for the operators to build a business.

One thing is clear: Choice brings a richer offering—but it also brings complexity and challenge. As vendors, we must adapt our offerings to meet the demands and challenges created by the growing breadth of services and platforms that cable operators want to offer their increasingly sophisticated customers. CT

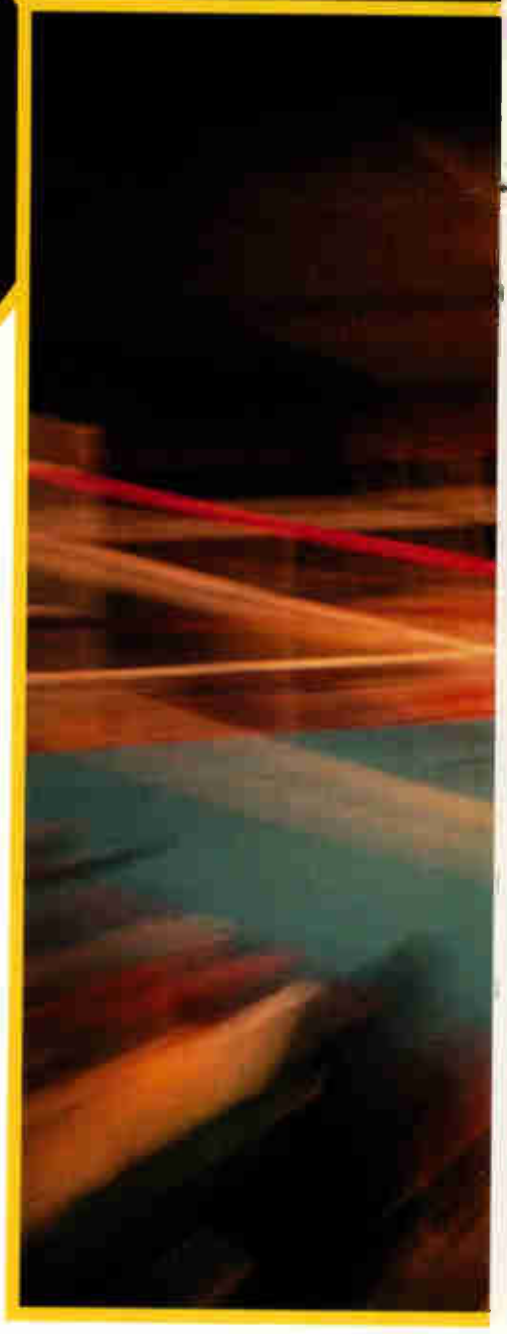
John Canning is cable marketing manager at Microsoft. He can be reached via e-mail at jcanning@microsoft.com.



DBS vs. Cable

A Fight You Can't Afford To Miss

By Doug Larson



Have you ever seen Sugar Ray Leonard fight? In his prime, he was unstoppable, winning five world boxing titles in five weight classes. His success, in large measure, stemmed from an ability to dissect his opponents' weaknesses and devise a strategy to defeat them.

For the past 50 years, cable has been the Sugar Ray Leonard of the multichannel video programming market. We have gone head-to-head with heavyweights and lightweights alike and emerged virtually unscathed each time.

These days, however, we're facing an opponent the likes of which we've never confronted before. And while we're still winning the fight, direct broadcast satellite (DBS) providers are giving us a run for our money. It's the ultimate prizefight, and with millions of your subscribers and dollars on the line, you no longer can afford to dismiss DBS.

In this corner, weighing in at . . .

Following a series of mergers valued at more than $4 billion, DBS has emerged a leaner, stronger industry prepared to go the distance with cable. EchoStar struck first when it acquired the satellite assets of American Sky Broadcasting, a joint venture between MCI WorldCom Corp. and News Corp., in November 1998. Hughes Electronics followed suit in December with a definitive merger agreement to acquire the business and assets of United States Satellite Broadcasting Company in a transaction valued at approximately $1.3 billion. Before the dust could settle, Hughes reached an agreement to acquire PrimeStar, the second largest DBS company in the United States, with 2.3 million subscribers.

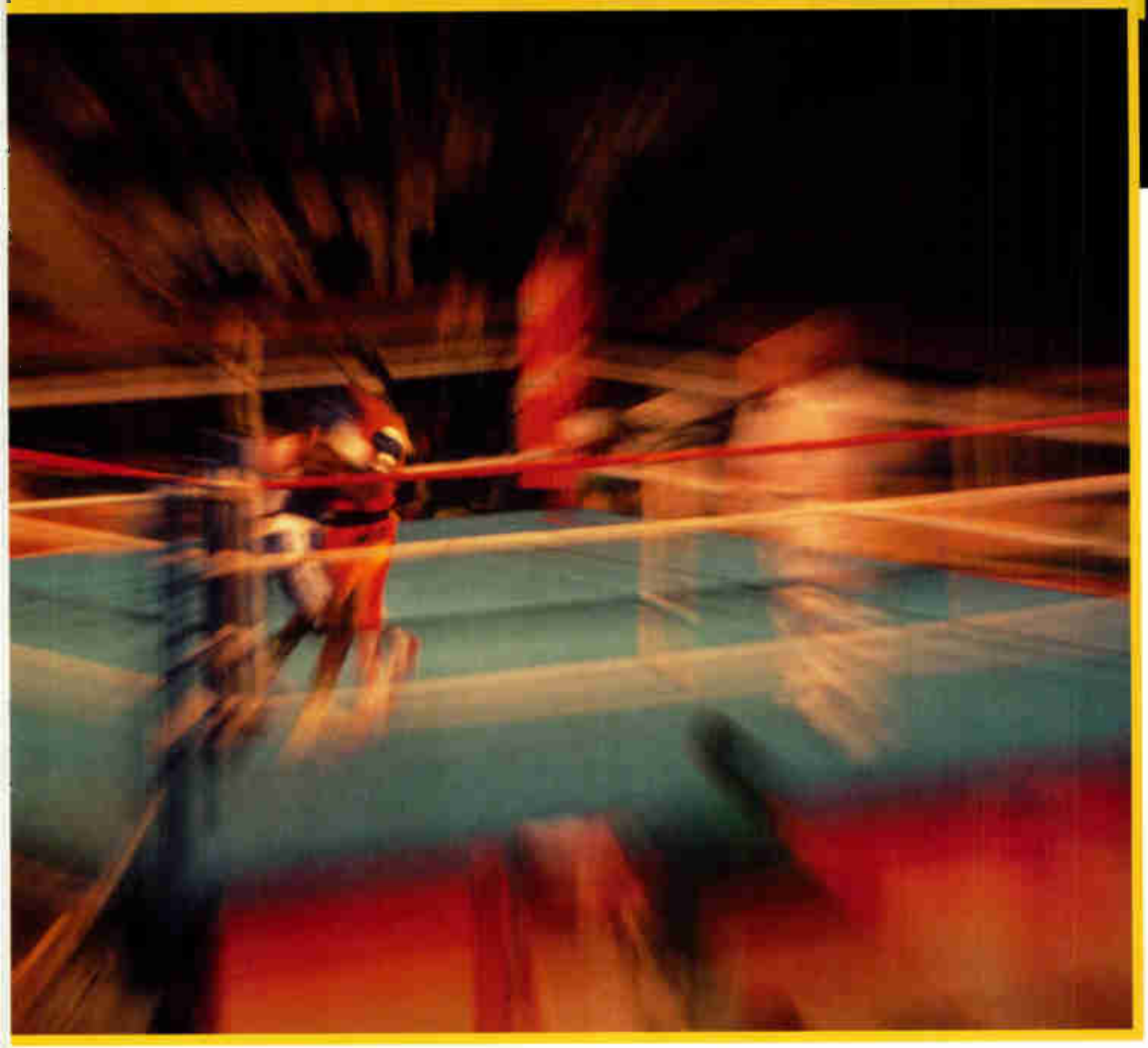
By helping to establish economies of scale and operational efficiencies, these mergers will accelerate an industry that already is in the midst of boom times.

Steve Bloom, a DBS analyst and president of Tellus Venture Associates, says, "The financial community has taken a much more positive view of DBS in the last few months as the industry has rationalized."

Michael S. Alpert, a DBS analyst and president of Alpert & Associates, a Washington, D.C.-based consulting firm, says, "You now have two DBS players with the resources to aggressively pursue the market."

Jimmy Schaeffler, a DBS analyst and chairman of the Carmel Group, also notes the changes, saying: "When a DBS provider goes to a programmer to negotiate a new programming deal, it will have more clout in the marketplace. This may very well find its way to consumers in better value for the service and the product."

DBS controls only 9.2 percent of the market, but while cable growth has slowed to about 2 percent annually, DBS is going through a double-digit growth spurt. EchoStar, the fastest growing DBS provider, added approximately 900,000 subscribers in 1998, a 30-percent increase over numbers it posted in 1997, to bring its subscriber base to 2 million customers. DirecTV added 1,157,000 new subscribers in 1998, a 15-percent increase over its 1997 numbers, and will boost its subscribers to more than 7 million with its purchase of PrimeStar. All told, DBS weighs in with more than 9 million subscribers.



You may not be worried by these numbers because you assume this growth is confined to DBS's traditional niche market: unpassed rural communities. Think again. According to Yankee Group research compiled last year, 55 percent of DBS subscribers now live in metropolitan markets passed by cable.

"We're 4-1/2 to 5 years into the product, so we're at a different life stage," says Bruce Leichtman, director of media and entertainment strategies at the Yankee Group. "The low-hanging fruit was the rural audience as well as the cable-haters. We're past that state."

According to Leichtman, DBS is approaching 40-percent penetration in unpassed markets and ultimately will reach cable-type penetration numbers there. This market represents only 8 percent of the total U.S. population, however, and DBS now is going after the other 90 million customers passed by cable.

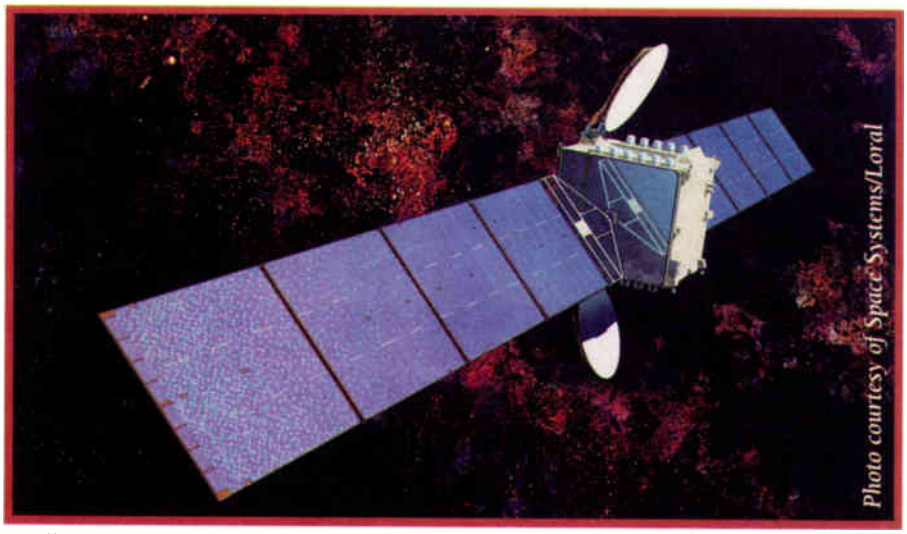
While our digital counterpunch is keeping cable TV competitive, some operators are finding that there's not always a pot of gold on the other end of the digital pipe. According to research conducted by SkyREPORT in 1998, DBS subscriber numbers in certain markets actually have been boosted by digital cable launches.

Cable's cause certainly will not be aided by DirecTV and EchoStar's recent acquisitions, which boost their channel capacities to 500 and 370, respectively. Moreover, through its AskyB acquisition, EchoStar gains satellites at the 110° west longitude orbital slot, enabling the company to provide continental U.S. coverage.

Tag-teaming with the telcos

In an effort to boost subscriber numbers, DirecTV and EchoStar have pulled local phone companies into the ring with them.

"We see the telephone companies as being a key component in growing our subscriber base," says John McKee, DirecTV's



Satellites such as this one built by Loral represent the heart and soul of DBS.

vice president of special markets and distribution. He adds that it will take time for the phone companies to establish a beachhead in the video programming market, but that more partnerships such as these are on the way.

DirecTV currently has partnerships with wireline telcos Bell Atlantic, Southwestern Bell, GTE and Cincinnati Bell, and wireless TV operators CS Wireless, Wireless One, Omnivision, American Telecasting and Heartland Wireless Communications. EchoStar recently began to explore these markets in a multiple dwelling unit (MDU) deal with OpTel for 400,000 units.

Despite the potential market they unlock for DirecTV and EchoStar, it's unclear how partnerships will play out for the two companies. While the telcos have declined to release subscriber numbers, they maintain these ventures are developing as expected.

"We believe DBS is a technology that can be rapidly deployed on a widespread basis, and that's exactly what is happening with our offering," says Lois Kinman, a GTE spokeswoman.

GTE started offering DirecTV services to its customers in Dallas and Los Angeles in October 1998 and has since expanded the service to MDUs in Arizona, California, Texas and Florida. To get the message out, the company has been advertising the service through direct mail, newspapers and GTE Phonemarts in Dallas and Los Angeles.

Following its ill-fated solo venture into the video programming market a couple years ago, Bell Atlantic is giving it another shot with DirecTV. The company partnered with DirecTV in March 1998 for the single-family residence market. Initially available to more than 5 million homes in Washington, D.C., and New Jersey, the service was expanded in January

to customers in Philadelphia, suburban Pennsylvania and Delaware, with more rollouts scheduled later this year.

Bell Atlantic spokesman Jim Smith says the company is happy with the results to date. "Our instincts were right," he says. "We have learned that the medium is transparent to the customer."

Bell Atlantic charges $199 for installation and gives customers the option of renting a receiver for $5.99 a month. Monthly programming packages start at $29.99 and include 85 channels.

Industry analysts are divided on the future potential of these types of partnerships.

"They are offering great installation, great local channel solutions and great follow-up care that an EchoStar located in Littleton, CO, or a DirecTV in El Segundo, CA, can't," says Schaeffler. "These new deals with telcos like Bell Atlantic, SBC and GTE have a great potential because, if you look at them closely, you see that they answer a lot of the needs of consumers in both areas of reducing cost and eliminating confusion."

Blum disagrees: "They're valuable as an alternative distribution mechanism, but right now the action still is in the consumer electronics business. The regional bell operating companies (RBOCs) are doing a good job of getting a selling proposition together this time, but remember, this is the third time around with the phone companies for DirecTV, and there's no guarantee that they're going to do any better this time."

Regulatory grudge match

Legal restrictions on local signal transmission have long been a barrier to consumer acceptance of satellite-delivered TV.

"It's a political battle between the National Association of Broadcasters, networks and local stations," Alpert says.

EchoStar currently offers local network signals in 20 of the top TV markets, representing 40 percent of the U.S. population, but has faced legal troubles in the process. A final judgement and permanent injunction issued by the U.S. District Court for the Southern District of Florida in December 1998 will result in the loss of Fox and CBS feeds by numerous dish owners, according to the Federal Communications Commission.

These problems stem from provisions in the Satellite Home Viewer Act that prohibit consumers who can otherwise receive acceptable over-the-air signals (within a TV station's so-called Grade B service area) from receiving satellite-delivered local signals. However, DBS may win this match in a technical decision by Congress.

Two pieces of legislation, one sponsored by Sen. Orrin Hatch, R-UT, and the other by Sens. John McCain, R-AZ, and Conrad Burns, R-MT, seek to level the playing field by amending the Satellite Home Viewer Act. Hatch's bill would extend the satellite industry's compulsory license for five years and reduce copyright fees from the current rate of 27 cents per subscriber per month to 18.9 cents for superstations and 14.85 cents for network signals.

The McCain-sponsored bill imposes must-carry rules for local-into-local signal broadcasts by DBS operators and also would remove the 90-day waiting period

for current cable subscribers to receive distant network signals.

"There's no question in my mind that some type of local-into-local legislation will pass this year," says Alpert. "The environment vis-a-vis local-into-local services is very good because there has been a consolidation in the industry, cable is raising rates, and Congress is trying to find some way to promote competition to cable.

"The negative from Congress's standpoint is that not every municipality will have local services because, if they are going to put in the rule that eventually you must carry all the local signals in a particular market, then what the satellite operators will do is pick the biggest markets. The lower markets they choose not to carry will

BOTTOM LINE

A Leaner, Stronger DBS

After initially giving us a scare a couple of years ago, it seemed direct broadcast satellite (DBS) would never get its business proposition together and put up any kind of fight. In fact, we poked fun at the acronym, rewording it as "don't be silly." DBS providers continually were plagued with regulatory restrictions, high equipment prices and low subscriber numbers. We started upgrading our systems to digital and two-way and never looked back.

Today, the landscape of the multichannel video programming market hardly resembles that of a couple of years ago, and it's time to start paying closer attention to DBS. Following a series of mergers valued at more than $4 billion, DBS has consolidated into an industry of two major players and more than 9 million subscribers. With renewed interest from financial backers and support from lawmakers in Washington, D.C., DBS' double-digit growth rates should continue into the foreseeable future. And, with increased channel capacities, interactive programming deals, and partnerships with local cable and phone companies, DBS isn't pulling any punches.

not have the opportunity to get local-into-local services," Alpert continues. "The technology exists where you could probably build the spot-beam satellites that could provide most of the local services in most of the local areas around the country. However, EchoStar and DirecTV don't have the capacity to do it in every local area."

If the McCain bill passes, however, it would not require carriage of all TV stations in a market until Jan. 1, 2002, giving DBS some breathing room to address the economic, technological and strategic challenges.

The data undercard

While the success of this legislation certainly would give DirecTV and EchoStar a more compelling selling proposition, they also have been exploring the potentially lucrative data market. In addition to deals with Microsoft's WebTV Network, Gateway and MediaX, EchoStar has completed its acquisition of Media4, a supplier of broadband satellite networking equipment for personal computers (PCs). Similarly, DirecTV has signed agreements with Wink Communications and TiVo to create interactive packages.

An installer mounts a DBS dish on a customer's residence.

The deals likely do not portend moves by DirecTV or EchoStar to become high-speed Internet access providers, however.

"By not having two-way wire at this particular point, you don't have the speed

that you would like going back from the customer's home to the Internet service provider (ISP)," says Alpert.

Blums agrees and adds that any DBS data services will be TV-centric. "Their core business is television—that's how they make their money—and any services you see are likely to be complementary to the television viewing experience."

While the DBS giants might not make a big play for the broadband Internet access market, interactivity will play an increasingly larger role in their line-up.

"Ultimately, some are suggesting that video programming may be offered for free and that the real value will be in the cost of data-type content," says Schlaeffer. He says this may become a reality within five years. In the meantime, DirecTV and EchoStar plan to start rolling out their interactive services this year.

The next round

After losing to cable year after year, DBS finally is entering the ring with the knowledge and capital to give cable a good fight. With renewed interest from financial backers, DirecTV and EchoStar likely will pursue additional acquisitions to further solidify their positions.

"It wouldn't surprise me if one of the players—and it would more likely be EchoStar—would try to make a deal with United Video," says Alpert. The C-Band market, which has lost customers over the past year, has nearly 2 million subscribers.

The two DBS heavyweights also will likely pursue additional partnerships with smaller cable operators, similar to the ones DirecTV has struck with Anderson Eliason Cable Group, Galaxy Telecom and Classic Cable, to include its digital programming as an add-on package to existing analog services.

McKee says DirecTV currently represents roughly 500,000 cable subscribers who can order it through their cable companies.

Finally, expect DBS to continue to expand its programming, including interactive programming and, in the case of DirecTV, high-definition TV (HDTV).

If you're worried about DBS equipment and installation prices dropping even further, don't be. While EchoStar and DirecTV will continue their rebate and special incentive offers, equipment prices are unlikely to drop much lower.

"With the lower barrier to entry, there's a lower barrier to exit, so clearly they will have to battle churn the way PrimeStar has," says Leichtman.

"It's not a question of how much better DirecTV is going to do vs. EchoStar," Alpert adds. "The real issue is how much penetration both DBS companies are going to get vs. cable."

It promises to be a good fight, and millions will be watching. The question is: Will they be watching it via dish or cable TV? CT

Doug Larson is a senior editor at "Communications Technology" in Denver. He may be reached via e-mail at dlarson@phillips.com.

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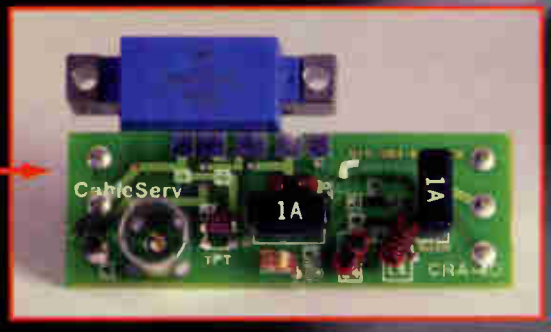

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Reader Service Number 56

Value of Network Monitoring

Keep Your Subscribers Happy

By Nick Fielibert and Peter Boon

New services such as data and voice over a hybrid fiber/coax (HFC) network require an extreme level of network reliability, resulting in increased expectations where subscribers won't accept outages and faults any longer.

Trends analysis

Only very rarely do you get home and find yourself without electricity, water or gas—but when you do, you start to realize not only your dependence on but also the miracle of these close-to-perfection services. Not only telephone and new services such as home-working and home-banking, but also Internet, live sports coverage, and the Friday late-night movie are rapidly spreading these high expectations into the world of information and telecommunications.

This public awareness of quality, combined with the ever-growing number of new services on the network, makes network management systems indispensable.

Company image is, therefore, the most important factor next to price and the available services because the cable TV and telecom markets are merging rapidly, and competition can be expected from many fronts. It is in this crucial stage of image-building that the words "quality" and "reliability" for each service are generally treasured, bringing us back to the full control of what is happening.

The role of cable TV in this full marketing concept cannot be underestimated: Cable TV is the only "window" to the subscriber. Subscribers will generalize the reliability of all other services offered on the network based on what they see every day on their TV sets. And indeed, subscribers can no longer be expected to be the only monitoring source. Moreover, they will no longer tolerate it.

Long-term monitoring and evaluation of trends will enable corrective actions when detecting signal degradation, eliminating problems before they become visible to the clients—or at least before they start complaining.

Multiuser status monitoring

Besides this long-term trends monitoring, a second-by-second awareness will provide immediate alarms pointing you exactly to problems. The monitoring system must alarm the correct people—headend engineers, fiber-optic technicians, amplifier specialists and so on—and give them all the necessary details of the problem.

And how about the complaining subscribers? If you have no network monitoring system, telephone conversations like this one may sound familiar: "You have a problem, sir? And what is it? Do you see lines on your picture, or is it more like snow? And where do you live? Is this the first time? Does it appear every evening?"

This old-style sort of customer service will work. If you wait long enough and receive complaints from enough people, you may eventually be able to trace the problem.

On the other hand, a properly created status monitoring system can eliminate lost response time and provide clients with a correct and precise answer instead of waiting for their critical input.

Also, the billing department will be happy to use status monitoring reports.

Photo courtesy of Barco

The knowledge that a pay-per-view (PPV) channel has gone down or was of poor quality can be considered automatically when invoicing the client, taking care of complaints before they arise.

The fact that more and more people need this kind of status report on the quality of service at the subscriber terminal stresses not only the need for network monitoring, but also the need for a client/server architecture where a central database can be consulted by all who are entitled to do so.

Four imperative levels of monitoring

Up-to-date control systems consist of several layers of monitoring. In the cable TV world, the first layer is the headend, the vital source of all signals. No matter how good your network is, channel outages in the headend will result in an outage for the whole network. This is why, next to monitoring, there is more and more demand for self-healing headend automation.

Furthermore, an automatic level control (ALC) will assure a flat headend output, which is important for maintaining optimum network operation.

The second layer comprises the

Modern network monitoring systems can spot problems in the headend, nodes and trunks, ends-of-line (EOL), and the return path.

major nodes and trunks. Their strategic importance demands full testing and reporting of these sites. Besides levels, it is the signal-to-noise ratio (S/N) and not the carrier-to-noise ratio (C/N) of all channels that brings us all the information we need. Better than the C/N, which looks at only the level of the carrier vs. system noise, the S/N provides details of exactly what the subscriber is seeing: all influences, including program source problems.

An alarm correlation and filtering engine provides the general and global overview, tracing and isolating the problem source.

Besides S/N, other important parameters are hum and network line power.

Monitoring the major nodes and trunks already leaves you with a pretty good problem-tracing and quality-awareness tool.

Bringing the monitoring even closer to the subscriber's home gives us the third monitoring layer. Installing one small quality sensor at every end-of-line (EOL) enables you to pinpoint problems and regions, ensuring easy, reliable and immediate tracing of problems. As mentioned earlier, other possibilities exist, such as integrating this information into the subscriber billing system.

These EOL sensors also serve other purposes. Masses of third-party equipment need monitoring all over the network. A backup battery in a node or

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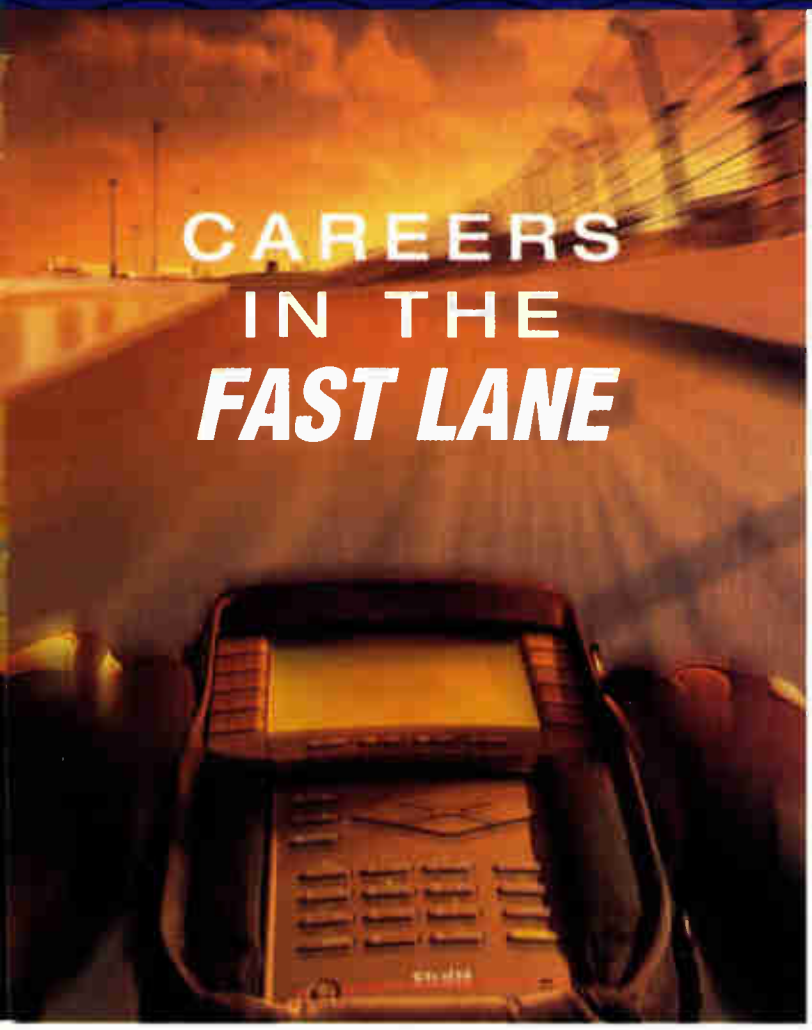

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Software System Integration: The team is looking for Software Engineers to develop C/C++ test suites, conduct system integration, and provide support. A BSCS, BSEE or equivalent is required along with experience in C/C++ development and the ability to work in high performance teams with 4-8 members. Advanced degrees, as well as knowledge of digital communications, circuit emulators, logic analyzers, microprocessors and development tools are preferred.

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BOTTOM LINE

The Four Levels Of Network Monitoring

We have long been dependent on services such as water, gas and electricity, but only recently have we come to expect the same level of reliability in our access to information and the telecommunications network. This public awareness of quality, combined with the ever-growing number of new services on the network, makes network management systems indespensible.

Network monitoring has four imperative levels. The headend is the first layer, the vital source of all signals. No matter how good your network is, outages of channels in the headend will result in an outage for the whole network. The second layer comprises the major nodes and trunks and includes signal-to-noise (S/N) measurements. The end-of-line (EOL) sensors make up the third management layer and can provide critical information about third-party equipment, such as backup power supplies. The fourth layer should monitor the health of the return path and provide information about ingress, impulse noise and other monsters lurking in the upstream.

cabinet is useful only with some kind of monitoring system. Take, for example, the case where the local line power goes down and the backup battery installed in the node or cabinet takes over. If the responsible person doesn't know of this action, the battery will run down and only delay the loss of service. An informed technician, however, can take care of this while the battery is taking over. This is valid for all backup equipment or corrections.

The fourth monitoring layer could be in the return path: Ingress, common path distortion (CPD), impulse noise and extreme level differences are key factors in unreliable interactive services. Using the network sensing devices as return path generators and analyzing the signal back in the headend will help in the commissioning and ongoing maintenance of the return path, just as well as the forward path.

Increasing the number of services on the cable TV network is one thing; making them generate revenue is another. Network management may well make the difference. CT

Nick Fielibert is a division product manager at BARCO Communication Systems and may be reached via e-mail at nick.fielibert@barco.com. Peter Boon is an area sales manager at BARCO and may be reached via e-mail at peter.boon@barco.com.

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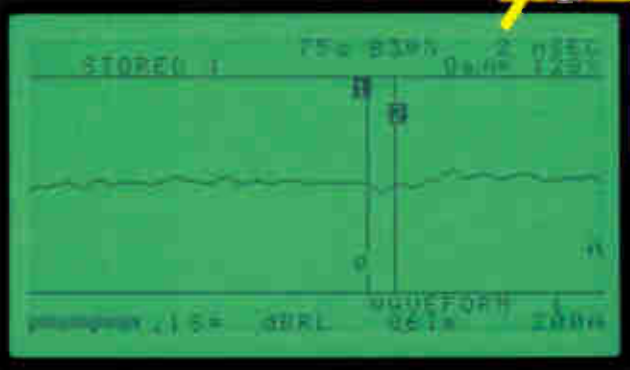

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SCTE Standards Development

What's New in Network Management

By Dr. Ted Woo

The Hybrid Management Sub-Layer (HMS) Subcommittee is the newest standards development organization of the Society of Cable Telecommunications Engineers' Engineering Committee.

Its mission is to develop specifications in the protocol suite to support the cost-effective interoperability of management systems for hybrid fiber/coax (HFC) outside plant (OSP) networks. This group concentrated on critical parameters in network architecture, network interface elements (NEs) for the physical layer (PHY) and media access control (MAC) in its first two conferences.

Technical experts from Barco, Hewlett-Packard, Silcom and Tollgrade were among the major contributors for the proposal submissions. The references for PHY and MAC are based on the Data Over Cable Service Interface Specification (DOCSIS) definitions. Its latest document is the SCTE Data Standards Subcommittee DSS97-2 Revision 1, which also is an International Telecommunications Union-Telecommunications J.112 internationally approved standard.

Message layer

The message layer specifications describe the message transaction of the protocol stack used to communication between OSP and NEs and a centralized headend controller. The data link layer (DLL) and its message set provide the functionality necessary to complete both the pull-based and other-based methods of communication. The message set calls for a simple network management protocol (SNMP) proxy agent to reside at the headend controller and a non-SNMP transfer protocol for communications between the headend controller and the NEs.

The proposed procedures for MAC address the fiber node overloading issue and collision resolution.

This specification describes the message layer functionality that must be implemented by all network elements and their associated headend controllers to allocate bandwidth and establish communication links.

Data link layer

The DLL provides a simple and powerful mechanism for allowing access to the network. The NE's return channel packet transmission is governed by a mixture of information including the onboard parameters and bits in the DLL header of the previous forward packet. A combination of the address bytes and the contention and return channel access for address terminal bits allows for a mixture of polled and unsolicited messages, the ratio of which is under headend control.

Return channel transmissions are determined by the state of address bytes and the return channel access for addressed terminal bits on the most recently received downstream packet. Headend return packet reception and collision detection is determined by using its signal power detector for packet-length byte and the packet redundancy check.

Physical Layer

The PHY transmission power level specifies the minimum set of peak power levels supported by the transmitter. It is expressed in dBmV and is measured across the full bandwidth of a single channel. ➤

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Transmit power accuracy is of the actual transmitted power relative to the provisioned value for transmit power. The transmitter frequencies specify the minimum set of frequencies on which the center frequency of the transmitter can be placed.

The received return loss is the ratio of the received signal power to the reflected signal power at the receiver measured over the full frequency range. The forward range is 50 MHz to 1 GHz. In the return channel, the measurement range is 5-42 MHz.

Media access layer

The proposed procedures for MAC are intended to solve the fiber node overloading issue, and they also flesh out the collision resolution mechanism. The proposed concept uses the multicast address as a mechanism to minimize overloading. Each NE must have at least one multicast address available. It must be initialized as high bits indicating multicast address and the low "n" bits replaced with the low "n" bits of the NE's unicast MAC address. All other bits are zero. Note, "n" is defined as the number of bits used to prevent overloading.

For collision prevention resolution, the MAC packets are used to solve the MAC issue. It is a "slot-based" mechanism where the window for the slot is the maximum packet duration of the longest unsolicited packet. This puts a premium on keeping the unsolicited packet as small as possible. In pursuance for the optimal cases, further studies will be conducted.

The subcommittee meets every two months. The next meeting will be held during Cable-Tec Expo, in Orlando, FL., on May 28, 1999.

BOTTOM LINE

Standards Update

The Hybrid Management Sub-Layer (HMS) Subcommittee's mission is to develop specifications in the protocol suite to support the cost-effective interoperability of management systems for hybrid fiber/coax (HFC) networks.

This group concentrated on network architecture, network interface elements (NE) for the physical layer (PHY) and media access control (MAC) in its first two conferences recently.

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Ted Woo is director of standards at the SCTE. He may be reached via e-mail at twoo@scte.org.

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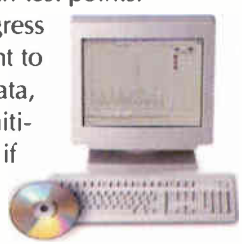

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Composite TRIPLE Beat

Don't Let it Distort Your Picture

By Henry Kallina

As we move into higher operating levels and increased channels in our systems, composite triple beat distortion (CTB) can become more troublesome. Visible CTB, which appears as sort of a "busy" background in the picture, originates in the minor imperfections of amplifiers, and keeping it out of the subscriber's TV picture is both a design and maintenance issue.

For instance, a 750 MHz system running 110 analog channels will have 4,206 beats under the video carrier on Ch. 65.

Amplifiers have improved greatly since the phenomenon was discovered in the '70s, largely conquering CTB in older, smaller systems. However, recent trends toward running higher levels and more channels have brought CTB back to the fore, so it pays to conquer it.

Some history

In 1974, Burt Arnold of RCA Distribution Systems conducted tests to determine the CTB impact on cable TV systems. Arnold documented the relationship between the number of continuous wave (CW) carriers to the production of CTB and their amplitudes.

Using CW carriers, he developed a graph predicting the "threshold level of perceptibility." The graph shows the number of the CW carriers and the level of CTB they produce in relation to their perceptibility as viewed on a TV set.

Arnold also derived the mathematical relationship of CTB using CW carriers vs. modulated TV carriers. He showed that the average amplitude of a CW carrier was reduced by 5 dB when modulated by a TV carrier. This reduction of 5 dB in average amplitude would lead to a reduction in the CTB of 10 dB using the unmodulated CW carrier as a reference level.

All distortion measurements for CTB are performed with a Matrix generator producing multiple CW carriers. At the measurement frequency, the amplitude of the CW carrier is measured. This carrier then is turned off, and the remaining distortion representing CTB is measured in dB below the amplitude of the carrier.

In 1990, Herzel Laor, a fiber-optic consultant to ATC, redesigned the Matrix generator to simulate a headend with modulated TV carriers. The results of his tests confirmed Arnold's 1974 results. Laor found that the CTB generated by a modified Matrix or cable headend was 11 dB lower than CTB resulting from CW carriers.

As a side note, Laor found the composite second order distortion (CSO) to be 6 dB lower with modulated TV carriers than with CW carriers.

What we know

The CTB generated from a cable headend is 10 dB less than the CTB generated by a Matrix multicarrier generator.

Manufacturers spec their equipment using CW carriers. In proof of performance measurements, the CTB generally is greater than 60 dB down at the test points, confirming Arnold's and Laor's findings (in a properly designed and maintained cable system).

This difference between CW carriers and modulated TV carriers provides about 10 dB of headroom in CTB calculations.

- >53 dB CTB = a distortion-free picture (satellite competitors)
- 53 dB CTB = when Arnold says there are "no perceptible beats"
- 51 dB CTB = the FCC specification

We need to maintain this CTB over the temperature range where the manufacturer guarantees equipment performance. ➤

This typically is -40° F to +140° F.

We need to provide excellent picture quality on 25- to 36-inch color TV sets with high quality video resolution and stereo-quality multichannel TV sound (MTS).

We must include 0.5 dB CTB degradation for a 77-channel headend with post amplifiers used in signal combining. Combining amplifiers also provides high isolation between channels in the headend.

The amplifier output levels establish the CTB performance of the RF coax system. Channel loading greatly impacts the system CTB. The amplifier spacing is not determined by the CTB spec.

CTB is the least costly system specification to change once the system is built and operational. Improvements in amplifier technology continue to provide us with more channel capacity and higher amplifier output levels.

Determining CTB in the coax plant

51 dB CTB is the FCC specification for noncoherent beats, and 53 dB CTB is Arnold's "no perceptible beats" in the picture. CTB can include 0.5 dB of CTB contribution of combining amplifiers in the headend.

Select 51 dB CTB ratio. It represents at least a 6 dB to 10 dB margin in actual measured CTB distortion at the plant extremities. It also represents the best choice over temperature and provides a very high quality, interference-free picture on large-screen color TV sets.

Other CTB considerations

Cable operators have yet to sell subscribers 60 or 77 channels of CW carriers. As cable engineers, we must strive to understand exactly what distortions do to system picture quality over time and temperature.

We must use our engineering knowledge and experience to build cost-effective plants with the least embedded capital cost. Using our knowledge about CTB and CSO ratios and their impact on picture quality, we can raise these ratios to increase the length of the distribution system and minimize the length of the trunk system.

We can design RF coaxial plant with the high operating levels in the feeder. If trunk amplifiers are necessary to extend the reach from the fiber node, then their distortion contribution to the distributions must be less than 1 dB.

Feeder cables with taps have paying subscribers and are revenue-generating plant. Trunk cable without taps feeds no subscribers and has yet to generate a single dollar of revenue. CT

Henry Kallina is a consultant for Pangrac and Associates Consultants Inc. in Parker, CO. He can be reached at (303) 841-6522.

BOTTOM LINE

Eliminate Distortion To Improve Picture Quality

Visible composite triple beat distortion (CTB), which appears as a "busy" background in the TV picture, comes from minor imperfections of amplifiers, and keeping it under control requires both design and maintenance attention.

Amplifiers have improved greatly since the phenomenon was discovered in the '70s, largely conquering CTB in older systems. However, today's higher operating levels and greater channel loadings have brought CTB back to the fore, so it pays to know its background.

In 1974, Burt Arnold of RCA conducted tests to determine the CTB impact on cable TV systems. Arnold developed the mathematical relationship of CTB using continuous wave (CW) carriers vs. modulated carriers. His results, which were later confirmed by Herzel Laor, indicated that CTB was 10 dB better with modulated carriers than with CW carriers of the same amplitude.

In order to provide subscribers 60 or 77 channels of CW carriers, cable operators must strive to understand what distortions do to picture quality over time and temperature. Based on what we know now about CTB and composite second order distortion (CSO) levels, operators can cost-effectively spec their systems to deliver high quality pictures to their subscribers.

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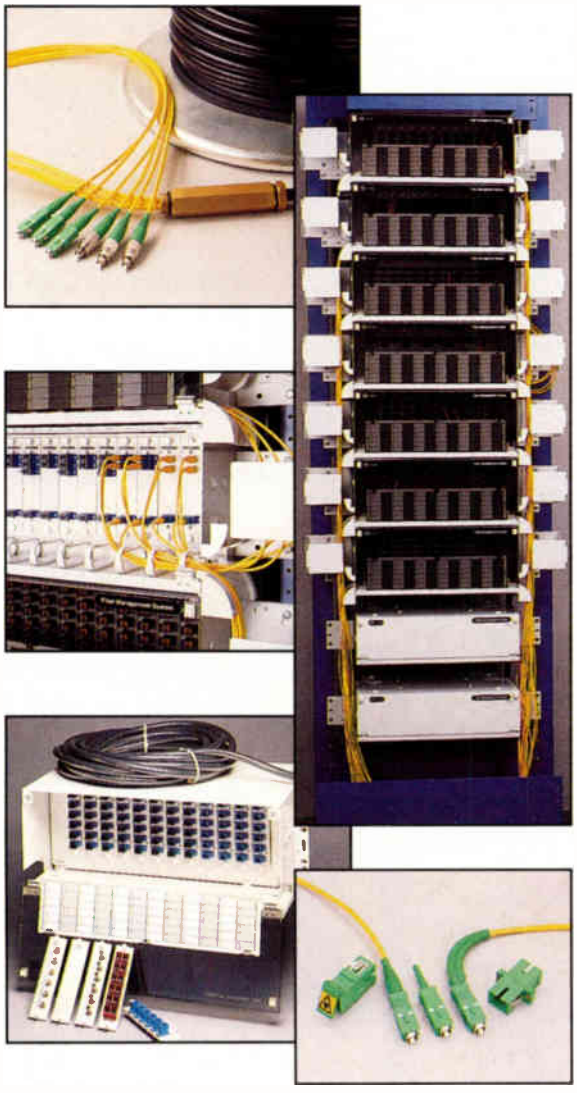

Being a cable operator today means more than offering entertainment packages to ***customers***. Telephone, internet access and interactive services are just a few of your new network requirements.

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Reader Service Number 67

Comcast Bites on Harmonic DWDM System

By Reed Miller

Comcast is hungry for more bandwidth, so it's turning to dense wavelength division multiplexing (DWDM). The cable operator plans to deploy Harmonic Lightwaves' METROLink DWDM system in its network in Sarasota, FL.

Comcast is using DWDM for return path upgrades. The system supports eight wavelengths on the International Telecommunications grid, each one of which runs at every 200 GHz or 1.6 nm. Cable system operators run 260 Mbps of capacity over each wavelength. The capacity carries nine RF channels on each wavelength.

"In investigating our options for upgrading the return path portion of this system, we quickly indentified DWDM as offering the best mix of performance and price," said Andrew Behn, area engineering manager for Comcast's West Florida network.

The agreement is a sign that the development of cable modem services may lead to increasing business for DWDM equipment manufacturers. As subscribership to @Home and Road Runner increases, more cable companies could turn to DWDM to increase bandwidth to avoid bottlenecks.

"I think DWDM absolutely will become more commonplace in cable networks," said Greg Howard, senior analyst at Infonetics Research in San Jose, CA. "If you look at the applications that are planned by many cable operators, such as voice, video-on-demand (VOD) and Internet service, they are all bandwidth-intensive. As the bandwidth at the homes grows, the capacity on the fiber needs to grow. DWDM can handle this by placing more channels on the fiber."

Enron a Potential Partner For IP Telephony

Cable companies looking for a managed Internet protocol (IP) backbone provider might want to consider a utility. Enron Communications of Portland, OR, is constructing an all-IP national OC-48 backbone. It recently inked a deal with Dallas-based CapRock Communications Corp. to add 1,000 miles of fiber in Texas.

The move allows Enron to quickly extend its 15,000-mile-long IP network. The added segment, to be completed this fall, will let Enron compete with Level 3 Communications of Omaha, NE, and Qwest Communications International of Denver, which have slightly larger networks.

If they more forward with IP telephony plans, cable companies will need access to a national managed IP backbone, which will be able to provide guaranteed quality of service (QoS). Enron's network gives cable systems another IP provider to consider.

Enron was to begin deploying its network management software, InterAgent, on its portion of the fiber last month, said Tracy Smith, director of marketing communications. The software would allow Enron to give customers QoS guarantees for IP applications. The company also will deploy Ciena DWDM equipment.

The $100 million network expansion will distribute a minimum of 192 strands of single-mode and TrueWave fiber along the Texas route. The new network segment will run through Amarillo, Austin, Bryan, Dallas, Fort Worth, Houston, Lubbock, San Antonio, San Marcos and Waco. TB

Reed Miller is the editor of sister publication "Fiber Optics News." He can be reached at rmiller@phillips.com.

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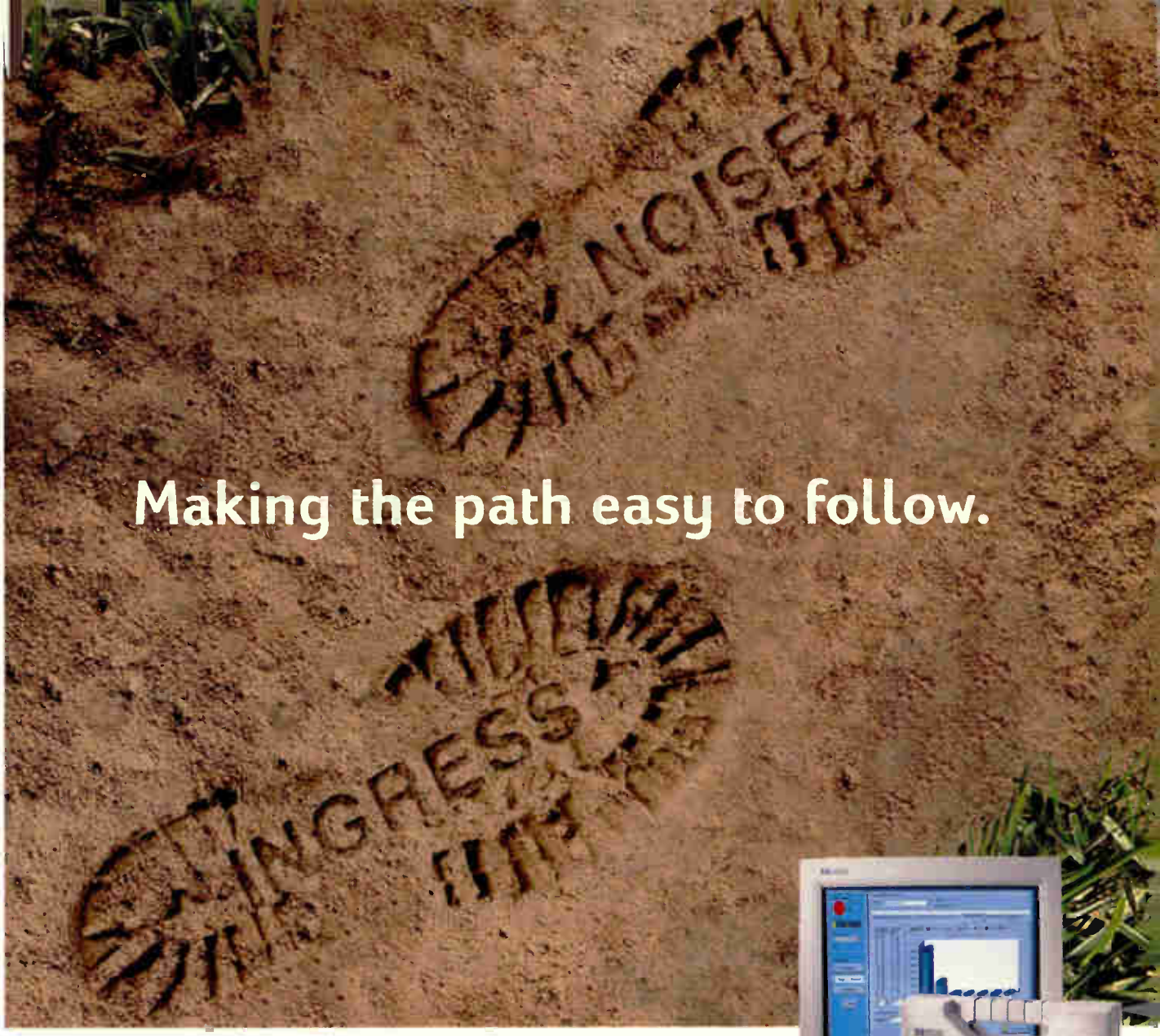

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Expanding Possibilities

BULLETPROOF Your Drop

Build It Right the First Time

By Ron Hranac

How can a small piece of coaxial cable that provides the connection between a cable TV operator's network and a subscriber's TV set be the source of so much trouble? After all, a drop is seldom more than 100 to 150 feet in length, and its installation isn't rocket science.

Still, the lowly subscriber drop generally is the weakest link in most systems. It's responsible for up to 70 percent of subscriber service calls, and in two-way systems as much as 95 percent of reverse path problems originate in the drop.

In some regards, the drop is the most labor-intensive part of an operating cable system because it's arguably the most "handled" part of the system. We connect it, disconnect it and reconnect it. We add new outlets, remove old outlets and relocate existing outlets. We tighten loose connectors, replace damaged parts and add new parts. The wind blows it around, and trucks, snow, ice and tree limbs knock it down. The subscriber moves it, tampers with it, drives fence posts through it—and then the dog chews it.

And through all of this, the drop has to transport conventional analog TV channels, FM radio, digital audio, digital video, and data for cable modems and interactive services. The subscriber drop, despite its perceived shortcomings, remains the most cost-effective broadband pipe into the home, whether its content is analog or digital.

Thus, the drop must be transparent to the transmission method used, be capable of two-way operation from at least 5-1,000 MHz, and do so over an expected 10- to 15-year service life or longer.

Coaxial drop cable advantages

When thinking about the advantages of coaxial cable for providing broadband service to the home, one comparison that invariably comes to mind is the telephone company's copper twisted-pair. Of course, there is also fiber, but fiber to the home isn't yet practical or cost-effective.

Recent technology developments in the area of xDSL (digital subscriber line) allow very high data rates to be carried on existing telephone wiring. xDSL is known as a fast-copper technology that includes asymmetric digital subscriber line (ADSL), high-speed digital subscriber line (HDSL) and very high-speed digital subscriber line (VDSL).

VDSL, for instance, can provide data rates from 13 Mbps to 51 Mbps. This is impressive, considering that the twisted-pair originally was intended to support only voice communication, which requires a nominal 3 kHz bandwidth.

However, twisted-pair pales in comparison to coaxial cable. Given that a coaxial cable subscriber drop can easily transport 5-1,000 MHz—that is, 995 MHz of bandwidth—then the usable capacity of coax becomes apparent. That much bandwidth can carry the equivalent of more than 165 TV channels, each 6 MHz wide.

Assuming the use of 64-QAM (quadrature amplitude modulation) digital modulation on each 6 MHz channel, more than 4.4 Gbps could be transported on a single coax. More complex digital modulation schemes will allow an even larger amount

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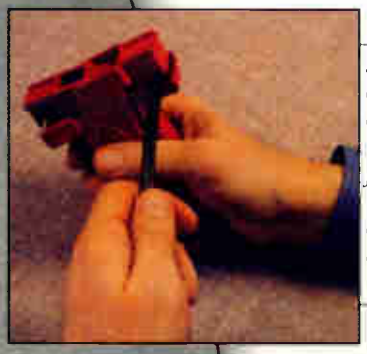
Step 1: Squarely cut the end of the cable with a sharp pair of wire cutters.



Step 2: Next, insert the end of the cable in the cable preparation tool. This particular model features color-coded replaceable blade cartridges for 59, 6 and 11 series cable in the same tool.

Step 3: Rotate the tool around the cable three to five times. This will remove the correct amount of jacket and dielectric material.

Step 4: Pull the tool away from the end of the cable, exposing the trimmed end.

Step 5: If required for the particular connector being used, fold the braid back over the jacket.

of data. In reality, cable TV coaxial cable can be used well above 1,000 MHz, so its theoretical data capacity is greater still.

Another coax advantage is its ability to provide a consumer-friendly interface. Millions of cable-compatible TV sets and videocassette recorders (VCRs) can be connected directly to the subscriber drop cable, and the addition of a set-top box, which has a coax input and output, takes care of conditional access when necessary.

The point of this is that a coaxial cable subscriber drop that has been installed correctly using quality components and good workmanship is very capable of delivering video, voice, data and much more.

Preparing for new technologies

Two key elements critical to the deployment of new technologies are system quality and reliability. Achieving these requires use of the previously mentioned quality components and good workmanship, plus appropriate tools for the job. Let's look at each of these as they apply to the subscriber drop.

Components: One of the first places to start when selecting drop components is the cable itself. At the very least, all cables must be bonded foil types. One-way systems can get away with conventional foil-braid cables, but the braid needs to be four-end braid. Two-way services usually require extra shielding for ingress resistance in the 5-40 MHz spectrum; tri-shield or better is recommended.

All of the major cable manufacturers offer optional corrosion-inhibiting compounds, which you need to use for extra insurance against moisture damage. Of course, all underground cables must use flooded (filled) cables. And all overhead drops must use messengered cable, regardless of length—no exceptions.

Passives are another story altogether. For years, we've generally used the cheapest drop passives available, but these simply aren't good enough in most cases.

One particular splitter design is fairly common, but it does not provide good RF shielding. Its construction is straightforward: A thin sheetmetal plate is used as the cover (usually on the back of the splitter), and it's glued to the splitter body.

The problem with this design is that during assembly the glue gets under the metal cover, preventing good metal-to-metal contact and compromising shielding effectiveness. You're better off spending a few cents more for splitters that have their covers crimped on, soldered or press-fit before the bead of weatherproofing is applied.

Hardware may seem like a no-brainer, but a closer inspection of what's available will show that some is very good, and some isn't. For long-term reliability and drop longevity, pay a little more for the better hardware.

In terms of hardware, cable attachments occasionally are overlooked. At one time, installers used staples widely, but you must avoid them like the plague. If a staple penetrates the cable jacket, rapid deterioration of the shield will follow. A staple through the cable will result in a direct short. Instead, use clips that are sized to fit the cable, and be sure to space them unevenly. Don't forget other important drop hardware: ground blocks, weatherproofing

(especially weatherproofing), lockboxes, wallplates and so on.

The last component is responsible for up to half of all drop-related service calls. It's the F-connector. More specifically, it's the way the connector is installed that causes the majority of problems. Over the years, manufacturers have designed a variety of premium sealed connectors to reduce craft-related problems, while providing a more reliable and better quality interface. Here, too, I suggest you spend a little more up front for better connectors to avoid expensive callbacks in the future.

Workmanship: The very best drop components are of little value if they are installed incorrectly. By far, poor workmanship is the biggest cause of controllable subscriber drop problems. Loose and improperly installed F-connectors, lack of weatherproofing, cable bent too tightly around corners, sloppy cable routing and so forth result in callbacks, service calls, signal leakage, poor reception and shortened drop life.

The only two ways to reduce craft-related subscriber drop problems are training and quality control.

One of the best places to start with installation training is the Society of Cable Telecommunications Engineers' Installer certification program. It provides a broad overview of the subscriber drop installation process and includes a combination of written and hands-on exams. Some companies have adapted this program for system-specific training.

Other good sources of training include courses from the National Cable Television Institute, Cleveland Institute of Electronics, vocational-technical schools, and night and weekend classes at local colleges. Many industry manufacturers have product-specific training programs available.

As we move toward the deployment of more advanced services, training programs will evolve along with these services. The installer of the future will be expected to know traditional installation techniques, plus data communications and networking, personal computer (PC) operation, basic telephony, and advanced home entertainment equipment operation.

The second part of good workmanship is quality control. An effective installation quality control program will provide a means to randomly inspect 5 percent to 10 percent of all installations, including those performed by both in-house and contract installers. Positive feedback is essential for good work, and when problems are identified, appropriate steps can be taken to remedy the situation. Generally, this will involve additional or refresher training.

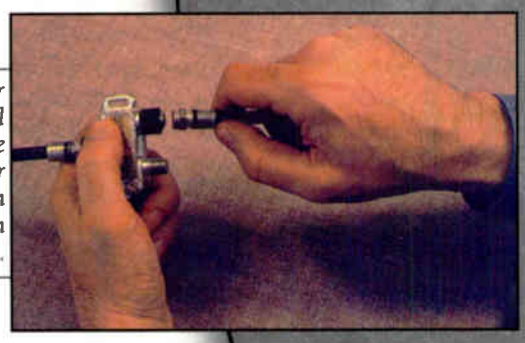
Tools: Gone are the days when a pocketknife and pair of crimpers were all you needed to install connectors. The critical nature of some of the signals carried on cable systems makes them highly susceptible to loose or improperly installed connectors that can cause ingress, intermittent connections or poor return loss.

Doing the job right really requires a suite of tools: one for cable preparation, another to crimp the connector and one to correctly tighten the connector on the mating interface. Furthermore, the tools

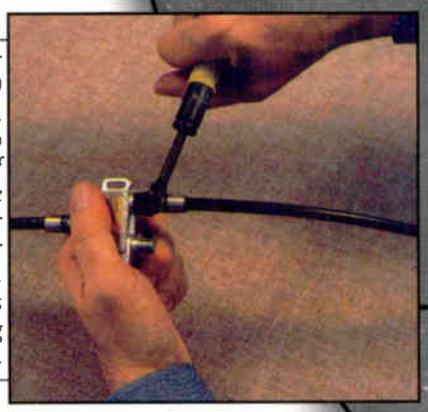
Step 6: Install the F-connector on the prepared end of the cable.

Step 7: Insert the cable and connector into the crimp tool. This particular tool is a compression-type crimper.

Step 8: Crimp the connector.



Step 9: For all outdoor connectors, install a thread-sealing sleeve on the mating connector port. Then hand-tighten the connector on the port.



Step 10: Torque the connector nut to between 20 and 30 inch-pounds. The torque wrench shown is factory preset to 30 inch-pounds. A word of caution: Do not use torque wrenches on consumer equipment such as TV sets or videocassette recorders (VCRs). The connectors on those devices may be damaged by tightening much beyond finger-tight.

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Reader Service Number 72

cuts with preset blades. This leaves little room for error. When looking for a tool, choose one made from strong lightweight materials—the last thing an installer wants is something heavy added to the tool pouch. For convenience and safety, consider tools that have replaceable blade cartridges.

So just what can happen if the cable isn't prepared correctly before connector installation? Potential problems include:

1) Too much braid cut off: Increased signal leakage and ingress; decreased axial pull (it should take at least 40 pounds to pull a crimped connector off of the end of a piece of drop cable)
2) Incorrect dielectric length: Poor return loss
3) Incorrect center conductor length: Excessive signal loss if the center conductor is too short; mating interface damage if the center conductor is too long
4) Center conductor scored: Possible signal loss at higher frequencies

Crimping

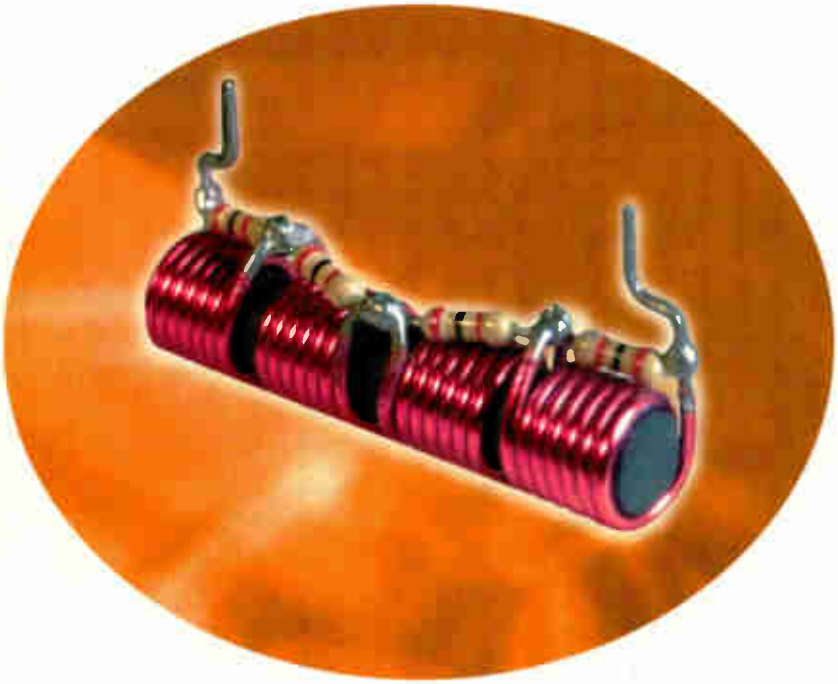
Here, the right tool for the job is critical. I've seen connectors crimped with pliers, the wrong size hex crimp tool, worn-out crimpers, and in some cases not crimped at all. Almost all premium connectors (Digicon, EX, EZF, Push & Lock, TAC and so on) require a special crimp tool. Make sure you are using a tool that was designed for a given connector.

While it's pretty obvious that a hex crimper won't work on a Snap-N-Seal connector, what may be less obvious is the size of hex to use on a hex crimp connector. If you try to use a .360 hex on a connector designed for a .324 hex, you'll be able to pull the crimped connector off the cable by hand. Going the other way, using a .324 hex on a connector designed for a .360 crimp will damage the crimp ring area of the connector. If you try to use pliers to crimp any connector, you can pretty much figure on a crushed connector and probably damaged cable. ➤

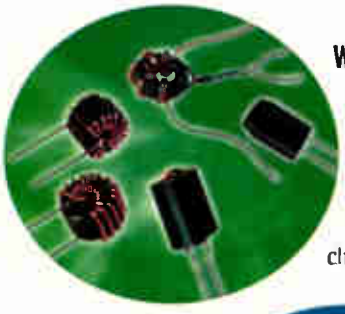
F-Connectors, Step by Step

Drop installation tools have come a long way from the old semi-circular crimper and a pocketknife. The major cable TV tool manufacturers have available quality tools that eliminate as much craft sensitivity as possible from cable preparation and connector installation. For instance, Ripley Co., manufacturer of the Cablematic line, has designed a system of tools for drop installation that includes a cable preparation tool, connector insertion tool, crimper, pocket toner continuity tester, and combination torque wrench and F-port rethreader. The photos on pages 84-85 provide a step-by-step guide to drop connectorization using some of Cablematic's tools and a premium sealed compression style F-connector. All photos are courtesy of Coaxial International.

HUM MODULATION?



Wound ferrite components from MMG are ideal for reducing high-frequency "hum-modulation" in CATV amplifiers and other broadband communications applications. MMG's advanced ferrite material technology, together with proprietary winding techniques, produce the industry's most comprehensive selection of ferrite cores for inductors, chokes and other suppression components.



Wound baluns, beads & toroids are available in production quantities from MMG, providing economical circuit protection and noise suppression components that include high-frequency splitters, matching transformers, parasitic suppressors, chokes and inductors.

Raw ferrite cores are available for custom windings. MMG's wide selection of raw ferrite cores includes toroids, baluns, beads and rods in a variety of materials and sizes.

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Improperly crimped connectors can lead to signal leakage and ingress problems, poor return loss and compromised weatherproofing—which leads to damaged cable and components and intermittent connections.

Tighten things up

Assuming you've chosen the right connector for the cable being used, prepared the cable correctly, installed and properly crimped the connector, what's next? Making sure the connector is adequately tightened on the mating interface. This requires a suitable torque wrench. When tightening the connector at the tap, ground block, splitter and other cable hardware, you need to torque it to between 20 and 30 inch pounds. The exceptions are TV sets and VCRs because their built-in connectors may twist off or be otherwise damaged by going much beyond finger-tight.

Loose connectors can be a source of signal leakage and ingress and likely will produce an intermittent connection. To ensure the correct connector torque (tightness), use a preset torque wrench.

Keep the water out

Last but not least, make sure all outdoor F-connectors are weatherproofed—even those in pedestals and lockboxes. Conventional hex crimp connectors must be protected with boots and silicone grease; premium connectors, which usually have built-in O-rings or some other weatherproofing mechanism, still need a sealing sleeve installed over the threads on the tap, splitter or ground block.

> "By far, poor workmanship is the biggest cause of controllable subscriber drop problems."

Put it all together

As I mentioned earlier, installing subscriber drops is not rocket science. Drops are arguably the most craft-sensitive part of a cable system. Choosing good components and dealing with workmanship issues are two important areas, but a common thread in all of this is use of the right tools for the job. Proper installation tools will increase productivity and ensure consistency from drop to drop, resulting in improved quality and reliability. Over the long term, you can expect fewer service calls, lower maintenance costs, better two-way performance and ultimately happier subscribers. TB

Ron Hranac is senior vice president of engineering for the Denver-based consulting firm Coaxial International. He also is senior technical editor for "Communications Technology." He can be reached via e-mail at rhranac@aol.com.

[Photo Essay]

Build POWER

Utilities Offer Cable Systems New Fiber Options

Regardless of whether you are rebuilding an existing cable system or overbuilding another company's network, electric utilities can play a critical role in supplying you with rights of way for fiber-optic cable. Utilities are taking advantage of fiber-optic construction programs to improve internal operations and customer services and increase revenues. Although the fiber inside utility systems is exactly the same as that used in cable TV networks, the cabling structures and construction techniques can differ from traditional cable installation methods. If you're not familiar with electric utility techniques, this photo essay is a good introduction.

Electric utilities use three types of cables in fiber projects: optical ground wire (OPGW), all-dielectric self-supporting (ADSS), and fiber wrap (over shield wire or phase conductors).

Optical Ground Wire

OPGW is a dual-purpose shield wire and communications cable. It replaces the overhead shield wire that is normally used for lightning protection of electrical transmission lines. The cable's core can hold as many as 216 fibers and maintain a reasonable outside diameter dimension. OPGW offers high tensile strength, crush resistance and excellent conductor ratings.

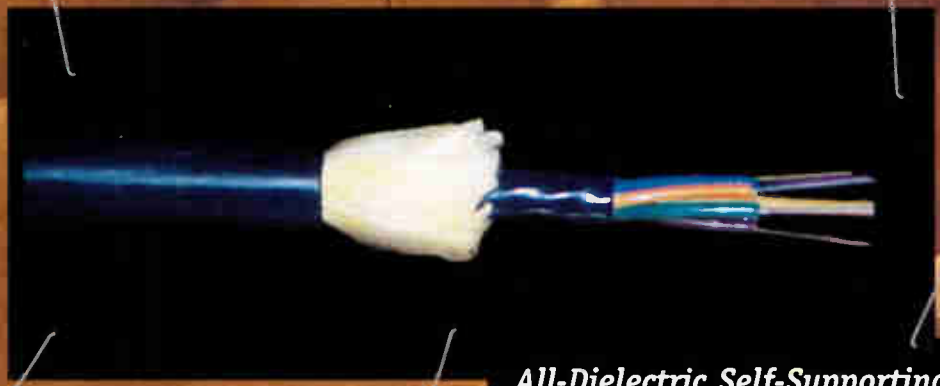
PLAY

by Steven W. Blume

OPGW Installation

Most of the time, a utility will need to de-energize the phase conductors (the transmission lines that carry electrical current) before OPGW installation can proceed. Special precautions are needed to install OPGW when the phase conductors are energized.

Typical fiber splicing and case protection installations take four to six hours for each splice location (which contains 48 fibers). Loss analysis and performance testing can take an additional two to four hours.



All-Dielectric Self-Supporting

ADSS is a self-supporting cable that generally is attached to poles, outside the safety clearances of energized phase conductors, but it can be installed inside the electric utility space. These cables do not conduct electricity because they do not contain metal. The central strength member of an ADSS cable can undergo very high mechanical stress. The strength of these cables comes from the internal fiberglass reinforced rods and the aramid polymer yarn such as Kevlar.

ADSS Installation

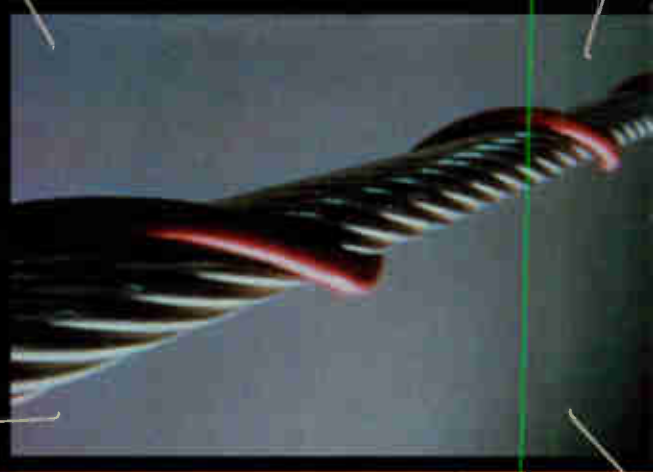
One thing to be cautious of when installing ADSS cable is that excessive span length can pose wind, ice and clearance problems. Another factor to watch for is that the electric field strengths on extra high voltage (EHV) power lines can damage ADSS cables.

"wrap fiber around shieldwire or phase conductors"

Fiber Wrap

Wrapping fiber cables around existing shield wires (sometimes referred to as ground wires or earth wires) is a very popular application among electric utilities; however, you can also wrap phase conductors. Wrapping fiber cables around shield wires can be performed during de-energized or live-line conditions.

Wrapped cables do not require high-strength central members because they are installed around existing high-tension wires. Each cable can have 60 fiber strands, and two fiber cables (total of 120 fibers) can be wrapped on a single shieldwire. Fiber wrapping is not possible around bundled cables. You can install large aircraft warning balls on wrapped conductors to make them easier to spot.



Fiber Wrap Installation

Fiber is wrapped around power lines with proprietary machines, which travel along the conductor and deploy the cable in a helical manner. This machine can be pulled by rope from ground level, by helicopters or towed by a motorized tug. Wrap installation rates run about 1 to 2 miles per day, depending on the number of structures per mile.

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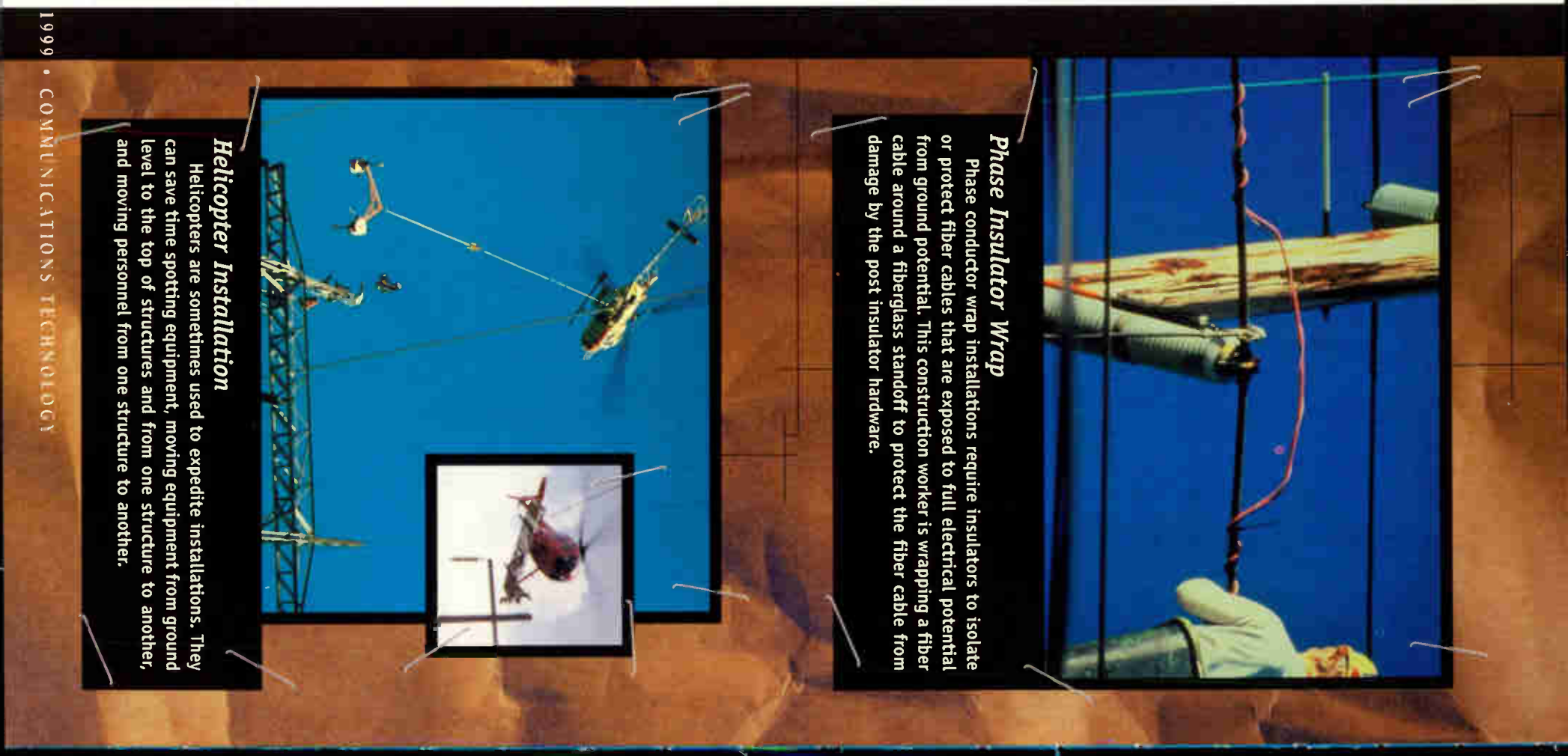


Helicopter Installation

Helicopters are sometimes used to expedite installations. They can save time spotting equipment, moving equipment from ground level to the top of structures and from one structure to another, and moving personnel from one structure to another.

Phase Insulator Wrap

Phase conductor wrap installations require insulators to isolate or protect fiber cables that are exposed to full electrical potential from ground potential. This construction worker is wrapping a fiber cable around a fiberglass standoff to protect the fiber cable from damage by the post insulator hardware.

Substations

Utilities use fiber in electrical substations to reduce costs, improve operations and take advantage of the nonconducting properties of all-dielectric fiber-optic cables. Utilities also install local area networks (LANs) in substations to interconnect intelligent electronic devices (IEDs) through full-blown communications systems over power lines.

Deregulation of electric power utilities' generation and transmission facilities, combined with more open competition in the telecommunications market, encourage utilities to investigate merger, acquisition and joint venture opportunities with communications partners. Most electric utilities favor partnerships to help them benefit from shared resources and the new market opportunities made available through fiber-optic communications.

If you're looking for new fiber-optic opportunities, rights of way, dark fiber paths or access to strategic customers, you may want to contact the electric utilities in your area. **B**

Steven W. Blume is president and CEO of Applied Professional Training, Inc., in Carlsbad, Calif. He can be reached at (800) 431-8488, or visit APT's Web site at www.aptc.com.

Photos courtesy of FOCAS and Applied Professional Training.

Evaluating Multiple Outlet Requirements, Part 1

This month's installment begins a series on evaluating the requirements for multiple outlets. The material is adapted from a lesson in NCTI's Installer Course. © NCTI.

Customers now are requesting more cable outlets within a single premises. Systems are designed to provide an adequate signal level at each tap port for a certain number of outlets at each customer premises. Beyond that, to provide adequate signal level to each outlet/wall plate, an auxiliary amplifier (house amp) is needed. Before connecting multiple output cables to a splitter, consider whether there is adequate signal level for the number of outlets requested. (Federal Communications Commission regulations require the signal level of any video carrier at the input to the customer premises equipment to be no less than 0 dBmV.)

The number of outlets/output cables to be installed at a premises determines the number of output ports on the RF signal splitter(s). Similar to coaxial cables, RF splitters reduce the signal level passing through them. The following presents a method to determine if the input signal level is adequate for the number of planned outlets, then provides approximate loss values for various splitters and splitter combinations that can be used to easily make rough estimates in the field.

Calculating outlet signal levels

To determine if the input signal level is adequate for the number of planned outlets: 1) connectorize the drop input cable, 2) measure the input signal level with a signal level meter at the highest channel's frequency, 3) estimate the required cable length to the *furthest* outlet, 4) calculate the cable loss at that frequency, 5) add the cable loss to the splitter's or combined splitters' loss for the total loss, and 6) subtract the total loss from the measured input level. (See Figure 1.) If the result is below the minimum for your system-specified signal level for an outlet, install an auxiliary house amp. Because minimum cable outlet/wall plate signal level and auxiliary house amp installation policies vary, follow your system's procedures.

Calculate cable loss of 80' Series 6 cable to furthest wall plate with 5 dB/100':	
Cable length to furthest wall plate ÷ 100'	.80 (100' cable unit)
x Cable loss/100'	x 5 dB (per 100' Series 6 cable)
Cable loss	= 4 dB (cable loss)
Calculate total loss:	
Splitter(s) loss	8 dB (splitter loss)
+ Cable loss	+ 4 dB (cable loss)
Total loss	= 12 dB (total loss)
Calculate available signal level @ furthest wall plate:	
Measured input level	15 dBmV @ 550 MHz (measured input level)
– Total loss	– 12 dB (total loss)
Available signal level	= 3 dBmV (available signal level)
	(In this case an auxiliary house amplifier is not needed)

Figure 1: Calculating signal level at furthest outlet/wall plate

Loss Specifications

FREQUENCY (MHz)		5-10	10-20	20-400	400-500	500-600	600-900	900-1,000
Regal S3DGH10	INSERTION LOSS (dB MAX.)	3.5	3.5	3.6	3.9	3.9	4.4	4.5
Viewsonics VSP2WSP		3.5	← 3.8 →				← 4.2 →	

Figure 3: Two-way splitter loss specifications

Estimating effects Of two-way splitters

The amount of signal level attenuation a splitter causes, known as insertion loss, varies slightly with the signal frequency, number of output ports and manufacturer. Remember that a two-way splitter lowers the input signal level by about 4 dB at each output port (Figure 2) at frequencies between 50-550 MHz (slightly more at higher frequencies). Figure 3 provides examples of typical loss specification for two-way splitters. Check manufacturer specifications for the exact insertion loss of the splitters in your system. TB

The next installment will provide approximate insertion losses in three-, four- and eight-way splitters.

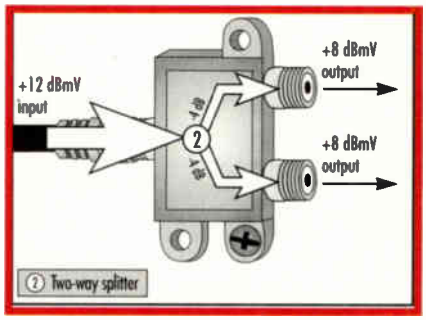
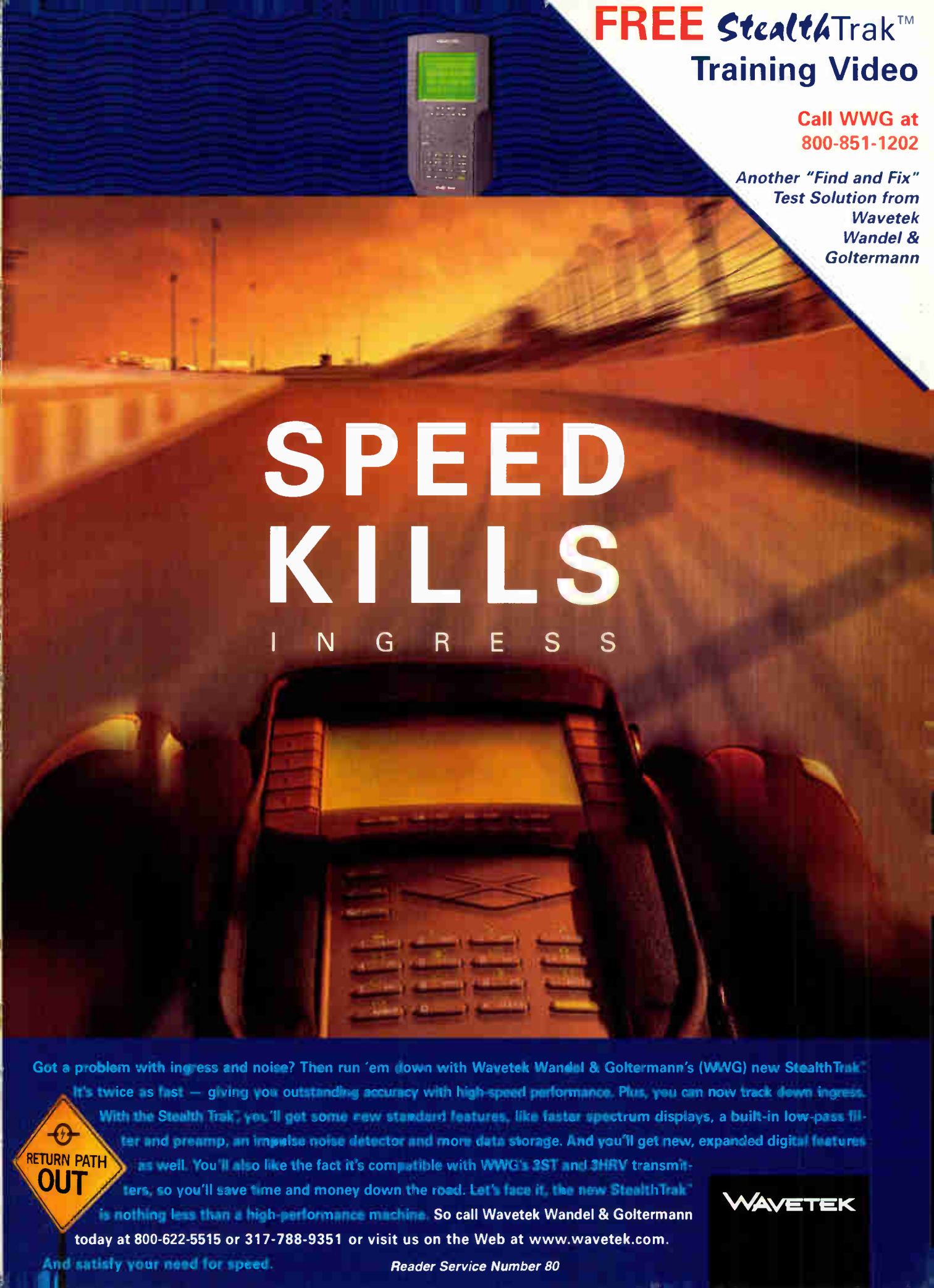


Figure 2: Insertion loss effects of two-way splitters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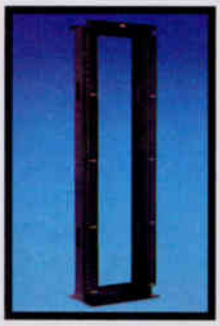

Cable Rack System

The RS2 Series cable management rack system from Siemon was developed through a cooperative agreement with Sprint Communications. RS2 products are now widely available and feature two high-capacity vertical cable management channels with modular covers that conceal cabling and provide a neat appearance. Vertical side rails provide space for routing horizontal and backbone cables. Cable access holes on the rack's side rails provide routing space between adjacent racks. RS2 also comes with hook-and-loop cable managers that may be custom located for easier cable additions or changes. Ladder channels on top of the rack transition to a standard 12-foot ladder tray. The RS2 is available in aluminum or heavy-duty steel and a variety of sizes.

Reader Service #306

VRLA Batteries

Trojan's valve regulated lead acid (VRLA) batteries are available in gel and absorbed glass mat (AGM) technologies, both suitable for use in cable TV operations. According to the manufacturer, the Supergel Cycling Series deep cycle batteries are recommended for a number of cable telecommunications applications. Trojan's Maxguard Standby Series also may be used for cable and selected uninterruptible power supply (UPS) environments. Both lines feature Trojan's proprietary Alpha Plus paste formulation in a special terminal design for high-rate discharge, epoxy post seals and dry charge plate formation. The company says that its products aren't subject to premature battery dry-out, end wall expansion, cell-to-cell imbalance and grid corrosion commonly associated with VRLA batteries.

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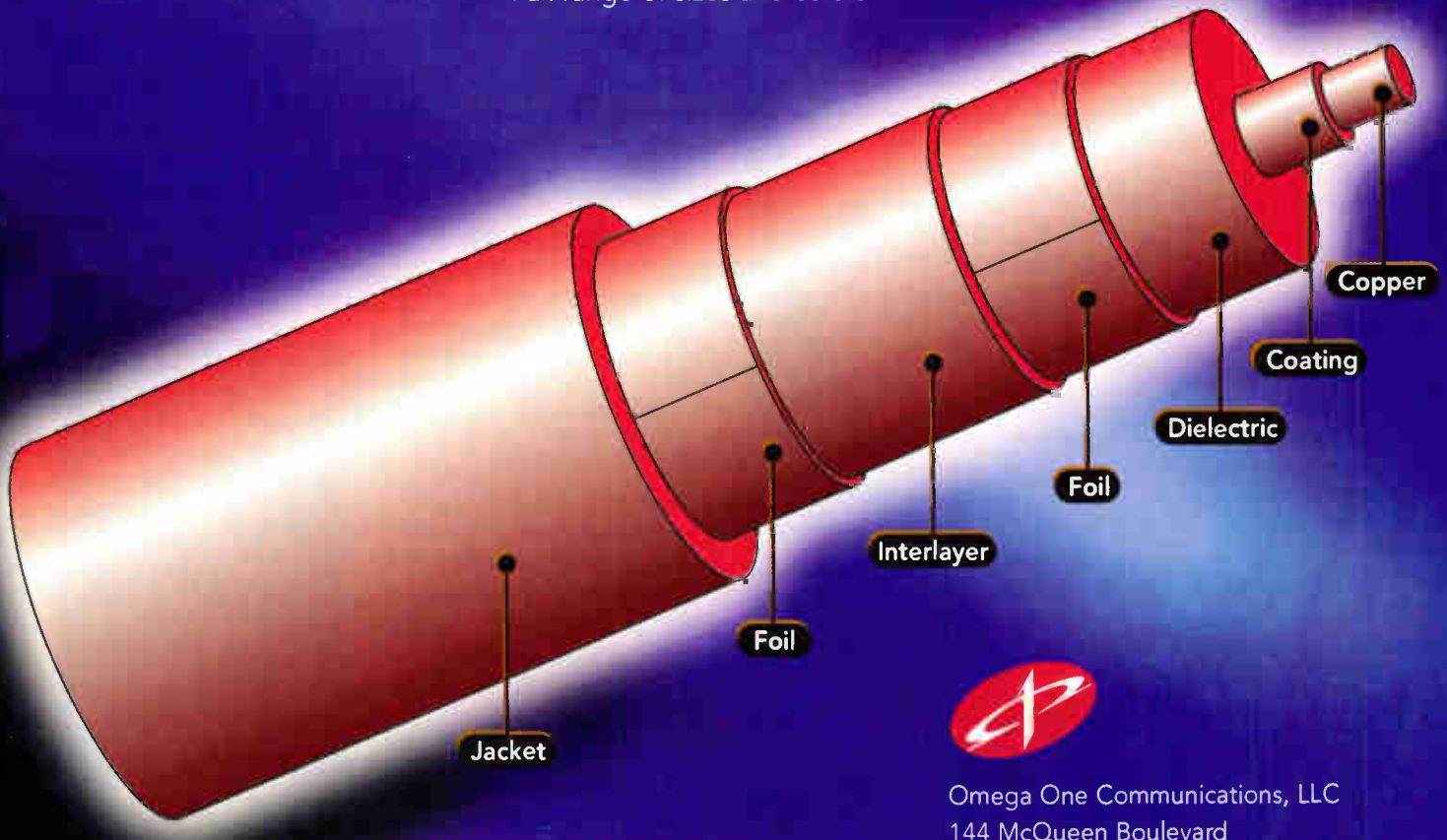

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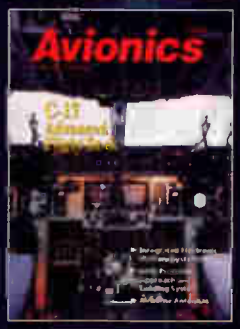

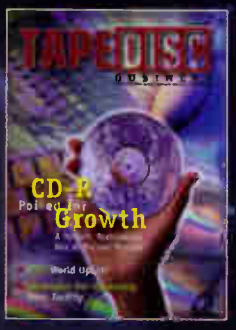

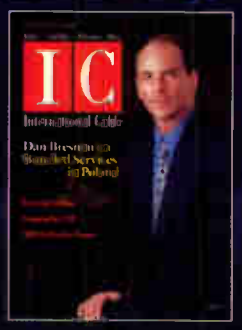

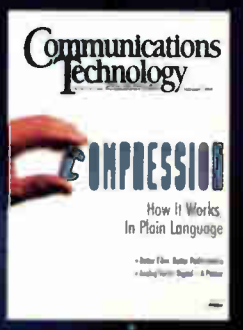

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☐ 09 Microwave
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☐ 11 Electric Utility
☐ 12 Satellite Manufacturer
☐ 13. Satellite Distributor/Dealer
☐ 14. Fiber Optic Manufacturer
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☐ 16. Commercial TV Broadcaster
☐ 17. Cable TV Component Manufacturer
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☐ 23 Educational TV Stations, Schools and Libraries
☐ 24. Other (please specify)

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☐ 29 Engineer
☐ 30 Technician (Technical Director, Manager, Supervisor, Technician)
☐ 31 Installer (Installation Director, Manager, Supervisor, Installer)
☐ 32 Sales (Vice President, Director, Manager, Sales Representative)
☐ 33. Marketing (Marketing Vice President, Director, Manager)
☐ 34 Other (please specify)

D. In the next 12 months, what cable equipment do you plan to buy?
☐ 35 Amplifiers
☐ 36 Antennas
☐ 37 CATV Passive Equipment including Coaxial Cable
☐ 38 Cable Tools
☐ 39 CAD Software, Mapping
☐ 40 Commercial Insertion/Character Generator
☐ 41 Compression/Digital Equip
☐ 42 Computer Equipment
☐ 43 Connectors/Splitters
☐ 44 Fleet Management
☐ 45 Headend Equipment
☐ 46. Transmission/Switching Equipment
☐ 47 Networking Equipment
☐ 48 Vaults/Pedestals
☐ 49 MMDS Transmission Equipment
☐ 50 Microwave Equipment
☐ 51 Receivers and Modulators
☐ 52 Cable Modems
☐ 53 Subscriber/Addressable Security Equipment/ Converters/Remotes
☐ 54 Telephone/PCS Equipment
☐ 55 Power Supplis (Batteries, etc)
☐ 56 Video Servers

E. What is your annual cable equipment expenditure?
☐ 57 up to $50,000
☐ 58 $50,001 to $100,000
☐ 59 $100,001 to $250,000
☐ 60 over $250,000

F. In the next 12 months, what fiber-optic equipment do you plan to buy?
☐ 61 Fiber-Optic Amplifiers
☐ 62 Fiber-Optic Connectors
☐ 63. Fiber-Optic Couplers/Splitters
☐ 64 Fiber-Optic Splicers
☐ 65 Fiber-Optic Transmitter/Receiver
☐ 66 Fiber-Optic Patchcords/Pigtails
☐ 67 Fiber-Optic Components
☐ 68 Fiber-Optic Cable
☐ 69 Fiber-Optic Closures & Cabinets

G. What is your annual fiber-optic equipment expenditure?
☐ 70 up to $50,000
☐ 71 $50,001 to $100,000
☐ 72 $100,001 to $250,000
☐ 73 over $250,000

H. In the next 12 months, what cable test & measurement equipment do you plan to buy?
☐ 74 Audio Test Equipment
☐ 75 Cable Fault Locators
☐ 76 Fiber Optics Test Equipment
☐ 77 Leakage Detection
☐ 78 OTDRs
☐ 79 Power Meters
☐ 80 Signal Level Meters
☐ 81 Spectrum Analyzers
☐ 82 Status Monitoring
☐ 83 TDRs

I. What is your annual cable test and measurement equipment expenditure?
☐ 84 up to $50,000
☐ 85 $50,001 to $100,000
☐ 86 $100,001 to $250,000
☐ 87 over $250,000

J. In the next 12 months, what cable services do you plan to buy?
☐ 88 Contracting Services (Construction/Installation)
☐ 89 Repair Services
☐ 90 Technical Services/ Eng Design

K. What is your annual cable services expenditure?
☐ 91 up to $50,000
☐ 92 $50,001 to $100,000
☐ 93 $100,001 to $250,000
☐ 94 over $250,000

L. Do you plan to rebuild/upgrade your system in:
☐ 95 1 year
☐ 96 more than 2 years

M. How many miles of plant are you upgrading/ rebuilding?
☐ 97 up to10 miles
☐ 98 11-30 miles
☐ 99 31 miles or more

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20	44	68	92	116	140	164	188	212	236	260	284	308
21	45	69	93	117	141	165	189	213	237	261	285	309
22	46	70	94	118	142	166	190	214	238	262	286	310
23	47	71	95	119	143	167	191	125	239	263	287	311
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☐ 10 Telecommunications Carrier
☐ 11 Electric Utility
☐ 12 Satellite Manufacturer
☐ 13. Satellite Distributor/Dealer
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☐ 17 Cable TV Component Manufacturer
☐ 18 Cable TV Investor
☐ 19 Financial Institution, Broker,Consultant
☐ 20 Law Firm and Gov't Agencies
☐ 21 Program Producers or Distributors and Syndicators
☐ 22 Advertising Agencies
☐ 23 Educational TV Stations, Schools and Libraries
☐ 24 Other (please specify)

C. Please check the category that best describes your job title:
☐ 25 Corporate Management (Chairman, Owner, President, Partner, Executive/Senior Vice President, Treasurer)
☐ 26 Management (Vice President, General Manager, System Manager and Director)
☐ 27 Programming (Vice President, Director, Manager, Producer)
☐ 28 Engineering Management (Vice President, Director, Manager)
☐ 29 Engineer
☐ 30 Technician (Technical Director, Manager, Supervisor, Technician)
☐ 31 Installer (Installation Director, Manager, Supervisor, Installer)
☐ 32 Sales (Vice President, Director, Manager, Sales Representative)
☐ 33 Marketing (Marketing Vice President, Director, Manager)
☐ 34 Other (please specify)

D. In the next 12 months, what cable equipment do you plan to buy?
☐ 35 Amplifiers
☐ 36 Antennas
☐ 37 CATV Passive Equipment including Coaxial Cable
☐ 38 Cable Tools
☐ 39 CAD Software, Mapping
☐ 40 Commercial Insertion/Character Generator
☐ 41 Compression/Digital Equip
☐ 42 Computer Equipment
☐ 43 Connectors/Splitters
☐ 44 Fleet Management
☐ 45 Headend Equipment
☐ 46. Transmission/Switching Equipment
☐ 47 Networking Equipment
☐ 48 Vaults/Pedestals
☐ 49 MMDS Transmission Equipment
☐ 50 Microwave Equipment
☐ 51 Receivers and Modulators
☐ 52 Cable Modems
☐ 53. Subscriber/Addressable Security Equipment/ Converters/Remotes
☐ 54 Telephone/PCS Equipment
☐ 55 Power Supplis (Batteries, etc)
☐ 56 Video Servers

E. What is your annual cable equipment expenditure?
☐ 57 up to $50,000
☐ 58 $50,001 to $100,000
☐ 59 $100,001 to $250,000
☐ 60 over $250,000

F. In the next 12 months, what fiber-optic equipment do you plan to buy?
☐ 61 Fiber-Optic Amplifiers
☐ 62 Fiber-Optic Connectors
☐ 63. Fiber-Optic Couplers/Splitters
☐ 64 Fiber-Optic Splicers
☐ 65 Fiber-Optic Transmitter/Receiver
☐ 66 Fiber-Optic Patchcords/Pigtails
☐ 67 Fiber-Optic Components
☐ 68 Fiber-Optic Cable
☐ 69 Fiber-Optic Closures & Cabinets

G. What is your annual fiber-optic equipment expenditure?
☐ 70 up to $50,000
☐ 71 $50,001 to $100,000
☐ 72 $100,001 to $250,000
☐ 73 over $250,000

H. In the next 12 months, what cable test & measurement equipment do you plan to buy?
☐ 74 Audio Test Equipment
☐ 75 Cable Fault Locators
☐ 76 Fiber Optics Test Equipment
☐ 77 Leakage Detection
☐ 78 OTDRs
☐ 79 Power Meters
☐ 80 Signal Level Meters
☐ 81 Spectrum Analyzers
☐ 82 Status Monitoring
☐ 83 TDRs

I. What is your annual cable test and measurement equipment expenditure?
☐ 84 up to $50,000
☐ 85 $50,001 to $100,000
☐ 86 $100,001 to $250,000
☐ 87 over $250,000

J. In the next 12 months, what cable services do you plan to buy?
☐ 88 Contracting Services (Construction/Installation)
☐ 89 Repair Services
☐ 90 Technical Services/ Eng Design

K. What is your annual cable services expenditure?
☐ 91 up to $50,000
☐ 92 $50,001 to $100,000
☐ 93 $100,001 to $250 000
☐ 94 over $250,000

L. Do you plan to rebuild/upgrade your system in:
☐ 95 1 year
☐ 96 more than 2 years

M. How many miles of plant are you upgrading/ rebuilding?
☐ 97 up to10 miles
☐ 98 11-30 miles
☐ 99 31 miles or more

Circle Numbers for Free Information

1	25	49	73	97	121	145	169	193	217	241	265	289
2	26	50	74	98	122	146	170	194	218	242	266	290
3	27	51	75	99	123	147	171	195	219	243	267	291
4	28	52	76	100	124	148	172	196	220	244	268	292
5	29	53	77	101	125	149	173	197	221	245	269	293
6	30	54	78	102	126	150	174	198	222	246	270	294
7	31	55	79	103	127	151	175	199	223	247	271	295
8	32	56	80	104	128	152	176	200	224	248	272	296
9	33	57	81	105	129	153	177	201	225	249	273	927
10	34	58	82	106	130	154	178	202	226	250	274	298
11	35	59	83	107	131	155	179	203	227	251	275	299
12	36	60	84	108	132	156	180	204	228	252	276	300
13	37	61	85	109	133	157	181	205	229	253	277	301
14	38	62	86	110	134	158	182	206	230	254	278	302
15	39	63	87	111	135	159	183	207	231	255	279	303
16	40	64	88	112	136	160	184	208	232	256	280	304
17	41	65	89	113	137	161	185	209	233	257	281	305
18	42	66	90	114	138	162	186	210	234	258	282	306
19	43	67	91	115	139	163	187	211	235	259	283	307
20	44	68	92	116	140	164	188	212	236	260	284	308
21	45	69	93	117	141	165	189	213	237	261	285	309
22	46	70	94	118	142	166	190	214	238	262	286	310
23	47	71	95	119	143	167	191	125	239	263	287	311
24	48	72	96	120	144	168	192	216	240	264	288	312

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BOOKSHELF

The following listing covers resources currently available by mail order through the Society of Cable Telecommunications Engineers. The prices listed are for SCTE members only. Nonmembers must add 20 percent when ordering.

- *Advances in System Architectures*—With moderator Jim Ludington, J.R. Anderson, John Mattson, Karl Poirier, Don Gall and Doug Wolfe, the video program delves into how deep fiber needs to go into the network, how many fibers need to go to the node, hybrid fiber/coax (HFC) architectures, fiber-rich design and fiber-deep design. It reports on system architectures, the addition of switched and interactive services, and the impact of digital networks. The broadband industry's migration towards future architectures, the radial distribution node and how to control the costs of fiber splicing and testing also are covered. (90 min.) Order T-1151, $45.
- *Digital Transmission Techniques*—This video features Tom Elliot, Tony Filanowski and Bill Nash. The presentation focuses on digital signals, including testing compressed video quality, coder/decoder, subjective/objective, analog and error measurements. The tape highlights impairment quality rating, troubleshooting digital system performance, synchronous optical network (SONET) architectures, master headend and remote hub, quadrature amplitude modulation (QAM) advantages, and settops. (90 min.) Order T-1152, $45.
- *Broadband Return Systems for Hybrid Fiber/Coax Cable TV Networks*—This guide covers designing and deploying two-way cable systems. For cable operators, it delivers a primer on two-way services, capacity and equipment planning, performance analysis, setup, and maintenance. System designers can gain an in-depth understanding of equipment requirements for the headend, distribution system and home. Equipment designers will find in-depth coverage of performance requirements and the technical characteristics of the return path. Order TR-32, $57. CT

Note: The videotapes are in color and available in the NTSC 1/2-inch VHS format only. They are available in stock and will be delivered approximately three weeks after receipt of order with full payment.

Shipping: Videotapes are shipped UPS. No P.O. boxes, please. SCTE pays surface shipping charges within the continental U.S. only. Orders to Canada or Mexico: Please add $5 (U.S.) for each videotape. Orders to Europe, Africa, Asia or South America: SCTE will invoice the recipient for additional air or surface shipping charges (please specify). "Rush" orders: a $15 surcharge will be collected on all such orders. The surcharge and air shipping cost can be charged to a Visa or MasterCard.

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CALENDAR

To view our entire calendar, please visit www.cabletoday.com

April

1: All-Optical Networks ComForum, International Engineering Consortium, Renaissance Orlando Resort, Orlando. FL. Contact IEC at (312) 559-4616.

8: Society of Cable Telecommunications Engineers Satellite Tele-Seminar Program Galaxy 1R, Transponder 14, 2:30-3:30 p.m. ET. Topic: "Digital System Deployment." Contact Janene Martin at SCTE headquarters, (610) 363-6888, ext. 226.

10: Llano Estacado SCTE Chapter technical seminar. Topic: "Theory and Troubleshooting of Two-Way Systems" with Lee Skinnell of Cox Communications. Contact David Fielder, (806) 793-7475.

15-16: Wheat State SCTE Chapter Vendor Day, Cable-Tec Games and Golf Tournament, Wichita, KS. Contact Joe Cvetnich, (316) 262-4270, ext. 139.

17-22: National Association of Broadcasters '99: The Convergence Marketplace, National Association of Broadcasters Convention Center and Sands Exposition Center, Las Vegas. Contact NAB at (202) 429-5335.

20: American National Standards Institute presents "Taking the Secret Out of Secretariat" at ANSI Headquarters, New York. Contact Stacy Leistner at (212) 642-4931.

22: New England SCTE Chapter testing session, Boxboro Woods Holiday Inn, Boxboro, MA. Broadband Communications Technician/Engineer, Installer, Telephony and Service Technician certification examinations to be administered. Contact Brian Bedard, (413) 562-9923, ext. 228.

26-27: California Cable Television Association's Spring Meeting, Hyatt Regency, Sacramento, CA. Contact CCTA at (510) 428-222 C_T

Planning Ahead

May 3-6: Women in Cable and Telecommunications hosts "Merging Cultures, Technology and the Consequences of Stagnation" Conference, Hilton and Towers, San Francisco. Contact WICT at (312) 634-2330.

May 4: New York State Cable Show, Lake George, NY. BCT/E, Installer, Telephony and Service Technician certification examinations to be administered. Contact SCTE headquarters at (610) 363-6888.

May 25-28: SCTE Cable-Tec Expo '99, Orlando, FL. Call the Expo hotline at (610) 363-3822 or see the SCTE web site at www.scte.org.

June 13-16: Cable '99, the National Cable Television Association's 48th Annual Convention and International Exposition, McCormick Place Convention Center, Chicago. Contact the NCTA at (202) 775-3669.

June 22-24: International Conference on Consumer Electronics, Los Angeles. Contact Diane Williams, (716) 392-3862.

SCTE MEMBERSHIP APPLICATION

Section 1: Personal Information (please type or print)

Name: _____ Phone: _____

Title: _____ Fax: _____

Company: _____ MSO: _____

Address: _____

City: _____ State: _____ Zip: _____-_____

Country: _____ E-Mail: _____

Signature: _____ Date: _____ Ham Radio: _____

Section 2: Demographics

Primary Job Responsibility:
❑ 1 Manager/Administrator ❑ 2 Technical Operations
❑ 3 Financial ❑ 4 Installer ❑ 5 Sales/Sales Support
❑ 6 Construction ❑ 7 Corporate Engineering ❑ 8 Technician
❑ 9 Field Engineer ❑ 10 Training Manager/Trainer
❑ 11 Customer Service ❑ 12
Other: _____

Company Type:
❑ Vendor ❑ Operations ❑ Manufacturer ❑ Telephone
❑ Independent Telecommunications ❑ Government
❑ Association ❑ MSO ❑ Educational Institution
❑ Other: _____

Where did you hear about us?
❑ SCTE Member ❑ Industry Trade Journal
❑ Local SCTE Group ❑ Supervisor ❑ Other: _____

What area are you most interested in?
❑ Certification ❑ Training Materials ❑ Local Training
❑ Regional/National Shows ❑ Standards
❑ Speaking Opportunities ❑ Engineering Subcommittees
❑ Other: _____

At what level are you able to participate in SCTE?
❑ Receive technical information via mail
❑ Attend local meetings ❑ Attend national shows
❑ Serve on local board ❑ Speak at local meetings
❑ Run workshop at national show ❑ Serve on National Board

How do you prefer to obtain your technical training?
❑ Hands-on Experience ❑ Books and Journals
❑ Seminar/Classroom Instruction ❑ Videotapes
❑ Audio Tapes ❑ E-mail Lists ❑ Computer Programs

What technical topics would you like to investigate?
❑ Digital ❑ Telephony ❑ Installation ❑ Data
❑ Training Techniques ❑ Broadband ❑ OSHA/Safety

Section 3: Sponsor

_____

Section 4: Payment

❑ MasterCard ❑ VISA ❑ AMEX ❑ Check enclosed

Card #: _____ Exp: _____

Signature: _____

Make checks payable to SCTE, or include credit card information above. Please make payments in U.S. funds, drawn on a U.S. bank. SCTE is a 501 (c) (6) non-profit professional membership organization. Your dues may be tax deductible. Consult your local IRS office or tax advisor. Additional member material will be mailed within 30 days. Dues are billed annually.

Section 5: Membership Type

❑ Individual @ $40 ❑ Sustaining @ $250
❑ International @ $60* ❑ Student @$20**

*Members outside North America pay an additional $20 for mailing costs.
**Student member application must be accompanied by a copy of a student ID or statement from the registrar.
An individual SCTE member will receive all standard benefits of membership. A Sustaining Member is listed under the company name and has one contact person who is afforded all benefits of an individual membership. Sustaining member companies are given discounts while exhibiting at the SCTE Cable-Tec Expo.

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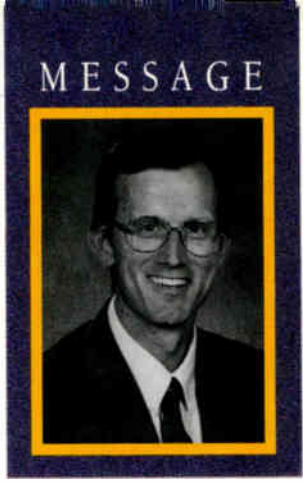
By Chris Bowick



Cable-Tec Expo '99 Preview

As I look forward to Cable-Tec Expo '99 and the Society of Cable Telecommunications Engineers' 30th anniversary party, I'm reminded of the saying, "Something old, something new, something borrowed, something blue."

Bear with me—the proverb really applies.

Something old

While this is no wedding, the Society's 17th annual trade show embodies SCTE's commitment to training, certification and standards. We will celebrate the 30th anniversary of that commitment in Orlando next month. There's our "something old," even though our Society still is young.

Something new

As the Expo '99 Program Subcommittee chairman, I'm excited about everything this year's show has to offer, particularly our "something new." Bringing together the industry's top leaders to discuss our future, where our challenges lie and how we will get where we want to be is sure to spark imagination and lively interactions.

The Annual Engineering Conference features two panels—one of chief executive officers and the other of chief technical officers, all from major MSOs—that will design a theoretical framework for participants, combining vision with reality testing. We will explore that framework throughout the rest of the educational activities at the show. I strongly encourage all Expo participants to attend this forum.

Expo '99 kicks off with preconference tutorials featuring information on dense wavelength division multiplexing (DWDM) and how Internet protocol (IP) applies in data, video and telephony.

These workshops begin May 26:

- DOCSIS Standards-Based Platforms examines what migration to Data Over Cable Service Interface Specification (DOCSIS) means to field engineers and how it will impact customer service.
- Forward and Reverse Plant Maintenance explores both statistical analysis and common-sense return path testing.
- New Modulation Methods reviews upgrading networks for enhanced services and using digital technology to solve the reverse path transmission issues.
- Integrating Digital Broadband Systems focuses on the complexities of successfully launching a digital tier service.
- Digital Video Deployment discusses rollout of compressed digital video and consumer interface issues related to high definition TV (HDTV), cable-delivered digital and analog TV.
- OpenCable presents CableLabs specifications that allow the transition from analog to digital signals over cable systems while maintaining compatibility among subscriber equipment.
- Cable Telephony addresses logistical and technical issues such as circuit-switched, packet-switched and IP telephony.
- DWDM Deployment features discussion of operational benefits and upgrade options for interactive services.

This year's program also includes a day-long workshop called Designing and Maintaining Transportation Systems for Today's Suite of Services. This workshop is broken into segments with students receiving workbooks on microwave, fiber optics and satellite systems.

I encourage attendees to take advantage of the other program highlights. For example, the annual membership meeting lets members share their feedback with the SCTE board of directors, chapter and meeting group leaders, and staff. The annual awards luncheon honors the achievements of members who have contributed organizational leadership and technical innovations. Participants in SCTE's certification programs can test in SCTE's five programs: Installer, Service Technician, Broadband Communications Technician, Broadband Communications Engineer and Telephony.

Something borrowed

As for "something borrowed," Expo '99 is an excellent chance for those in the industry to share ideas about what technological approaches will be important in the future. This peer-to-peer networking forms the backbone of our Society. Attendees will have prime technical networking opportunities while celebrating with their colleagues at Expo evening, various receptions and the golf tournament. And don't miss this year's Cable-Tec Games.

At the SCTE Bookstore, attendees can "borrow" from SCTE's resources, from training materials to technical video programs and computer-based training.

Something blue

And of course "something blue" ... as in the blue skies of sunny Florida, where Expo '99 will take place May 25-28. Remember to bring your digital cameras, walking shoes and the family as you tour the attractions that make Orlando famous, such as Animal Kingdom, Magic Kingdom, Epcot Center, Disney/MGM Studios, Universal Studios, Sea World, Kennedy Space Center, Busch Gardens and more.

Look for more details about the Expo '99 program in next month's column. In the meantime, if you haven't registered, information is available on the SCTE Web site at www.scte.org or by calling the Expo hotline at (610) 363-3822. CT

Chris Bowick is vice president of technology development for Cox Communications and chairman of SCTE's Cable-Tec Expo Program Subcommittee. He can be reached at (404) 845-8622.

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