30th 1969-1999

Communication Technology

Official trade journal of the Society of Cable Telecommunications Engineers

July 1999

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Reader Service Number 1

Happy 30th Birthday, SCTE!

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Satellite Tele-Seminar Program:

Correct Ignorance in a Hurry

A popular Society of Cable Telecommunications Engineers offering is the Satellite Tele-Seminar Program, which was first uplinked in 1985. The first session was titled "dBs and dBmVs" and covered the basic measurements such as noise figure and carrier-to-noise (C/N) ratios. Jones Intercable, in association with the then-SCTE Rocky Mountain Meeting Group (now the Rocky Mountain Chapter), recorded the program at the University of Denver. The series was made possible through satellite transponder time donated by programmers, including Showtime, HBO and ESPN, and was taught by then-SCTE At-Large Director Richard Covell.

While these sessions now cover a broader range of topics, from transportation systems to telephony to data networking, the goal of providing distance technical education remains the same. Since the program began, videotaping has been encouraged for personal reference or for use as a company training tool. This year, supplemental material, including the books *Return Path Test Seminar* from Hewlett-Packard and *Television Measurements* from Tektronix, have been added to the program.

With more than 160 participants so far this year, the program is presented the second Thursday of each month from 2:30-3:30 p.m. Eastern time on Galaxy 1R, Transponder 14. For information on how to register, call SCTE at (610) 363-6888 or e-mail info@scte.org.

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JULY 1999

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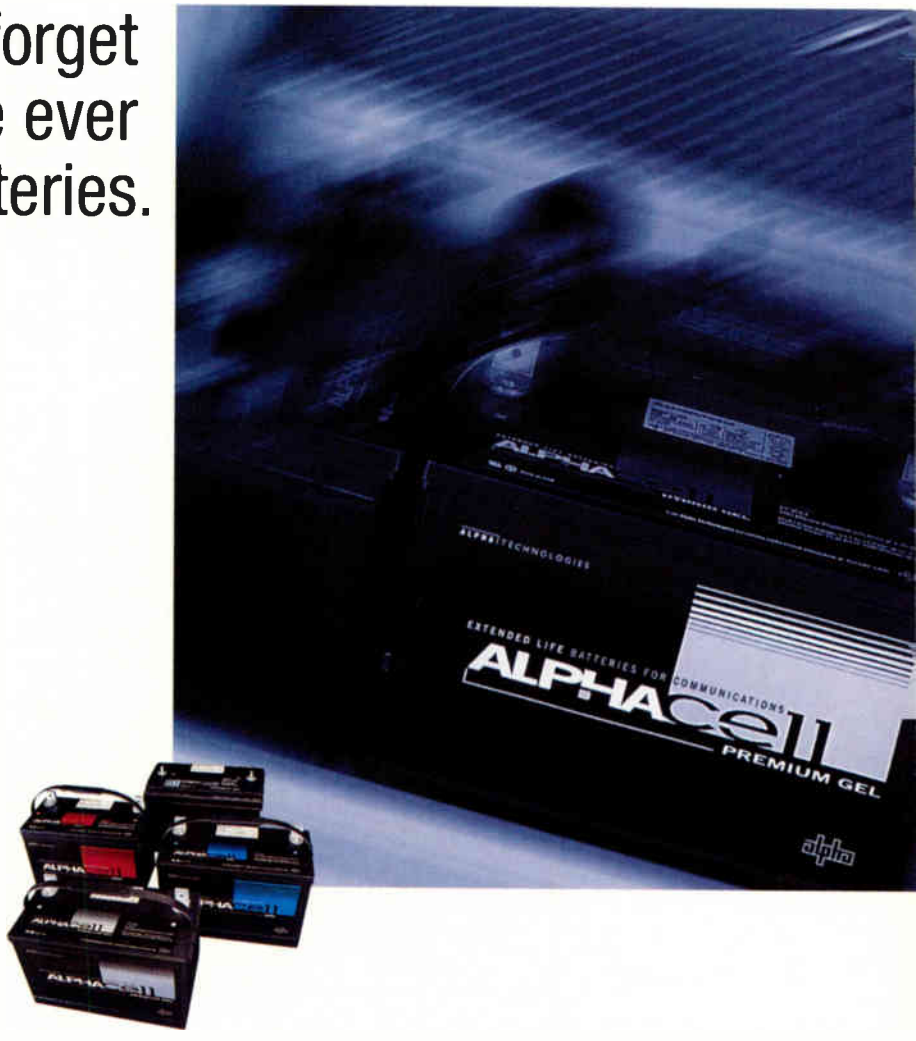

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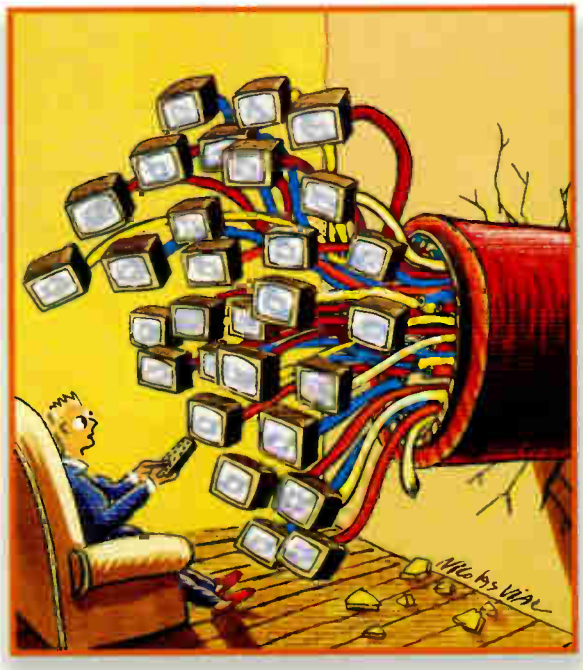

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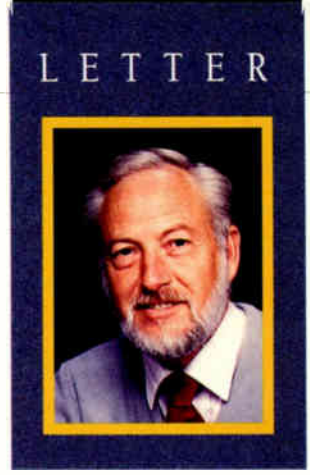
By Rex Porter



Expo Flourishes in Florida

I have never missed a Society of Cable Telecommunications Engineers Cable-Tec Expo, and I always think the most recent one was the best. So, with Bill Riker's departure and John Clark's first opportunity to preside, I was a little apprehensive before Expo 1999.

I shouldn't have worried. Sure, there were minor glitches; there always have been. But Clark and his staff gave us an Expo that now rivals any other major telecommunications engineering convention.

From the opening ceremonies that recreated the first SCTE gathering of 1969 to the Expo golf tourney, this show proved to be an excellent platform for companies to show their products and services. And the technical sessions were planned around subjects that are of interest to today's engineering community.

More and more, companies from the computer and telephony side of the business are coming to this show. The importance of your hybrid fiber/coax (HFC) networks is beginning to be recognized. If we look back only 10 years ago, we never would have imagined some of these companies would be so interested in what cable engineering now offers. We can look forward to heavier attendance from such industries, and the Expo should grow.

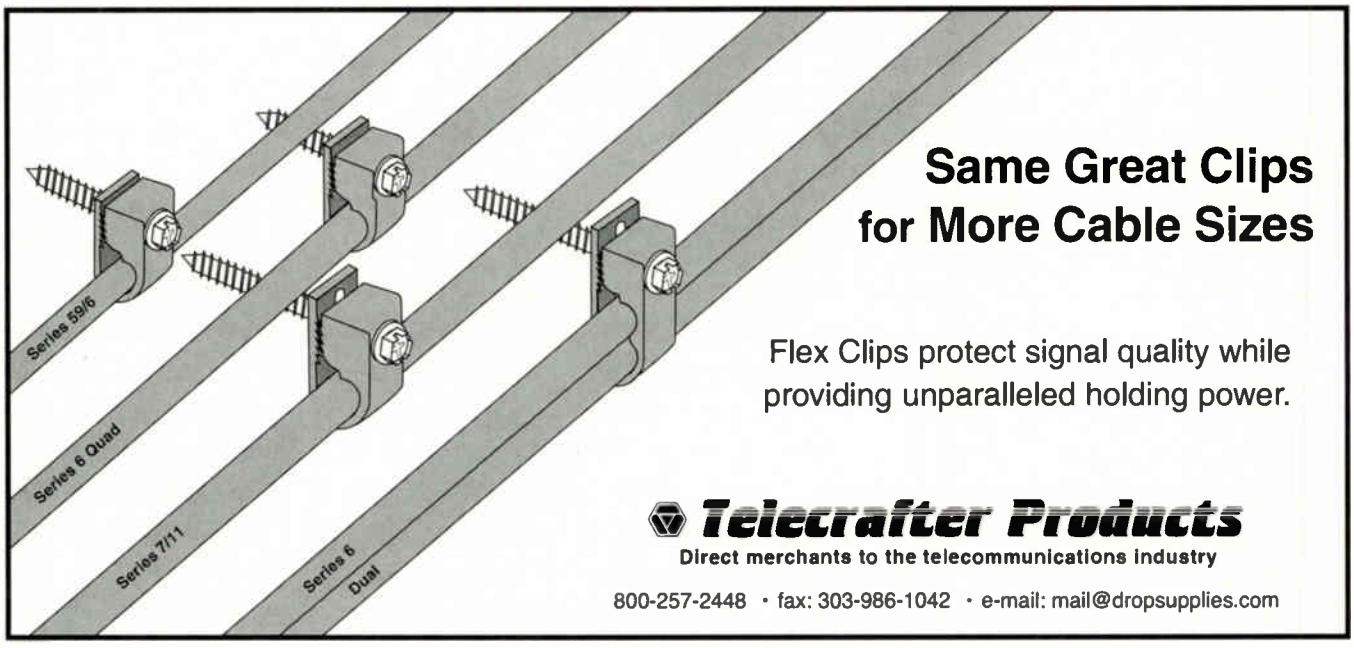
But what about membership? Is there a parallel in membership growth to Expo growth? There certainly should be. Every one of these new companies should be a sustaining member. I know John Clark and his staff, along with the board of directors, are concerned with expanding our efforts outside the United States. They need our help here at home, though.

How many members do you have at your system? It is not the job of system headquarters to supervise interest and individual efforts in SCTE. Every board member is a volunteer. Every committee and subcommittee member is a volunteer. Do you volunteer? Is there an effort to get 100-percent membership from engineers, technicians and installers in your system? Do you attend local chapter meetings regularly? When salespeople call, do you ask if their company is a sustaining member?

Our Expo is a wonderful national event that portrays our engineering success to the world. But the foundation of the Expo and Emerging Technologies seminars is our grass roots "volunteerism."

We will only continue to be as great nationally as we work to be locally.

Rex Porter
Editor-in-Chief



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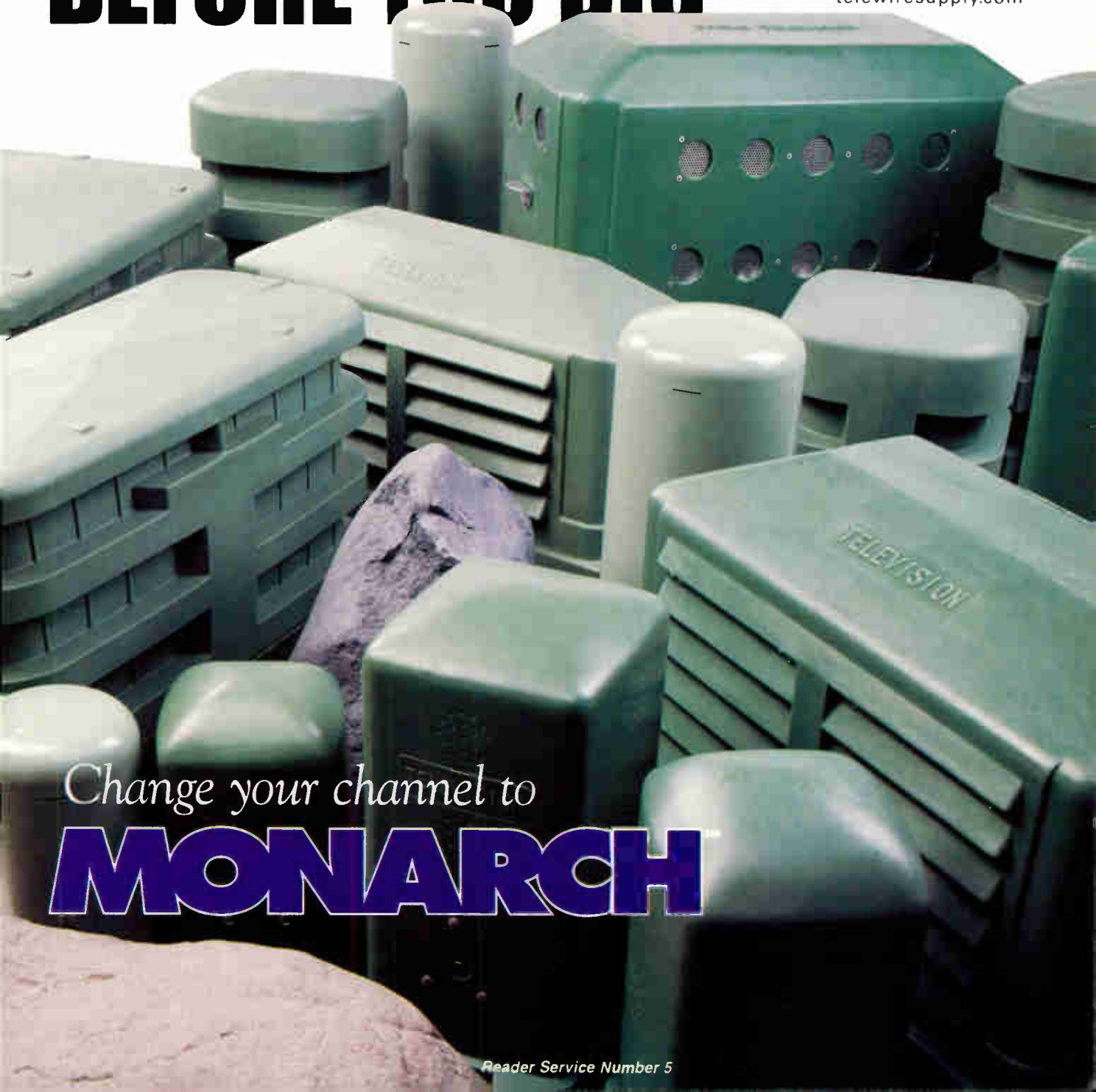

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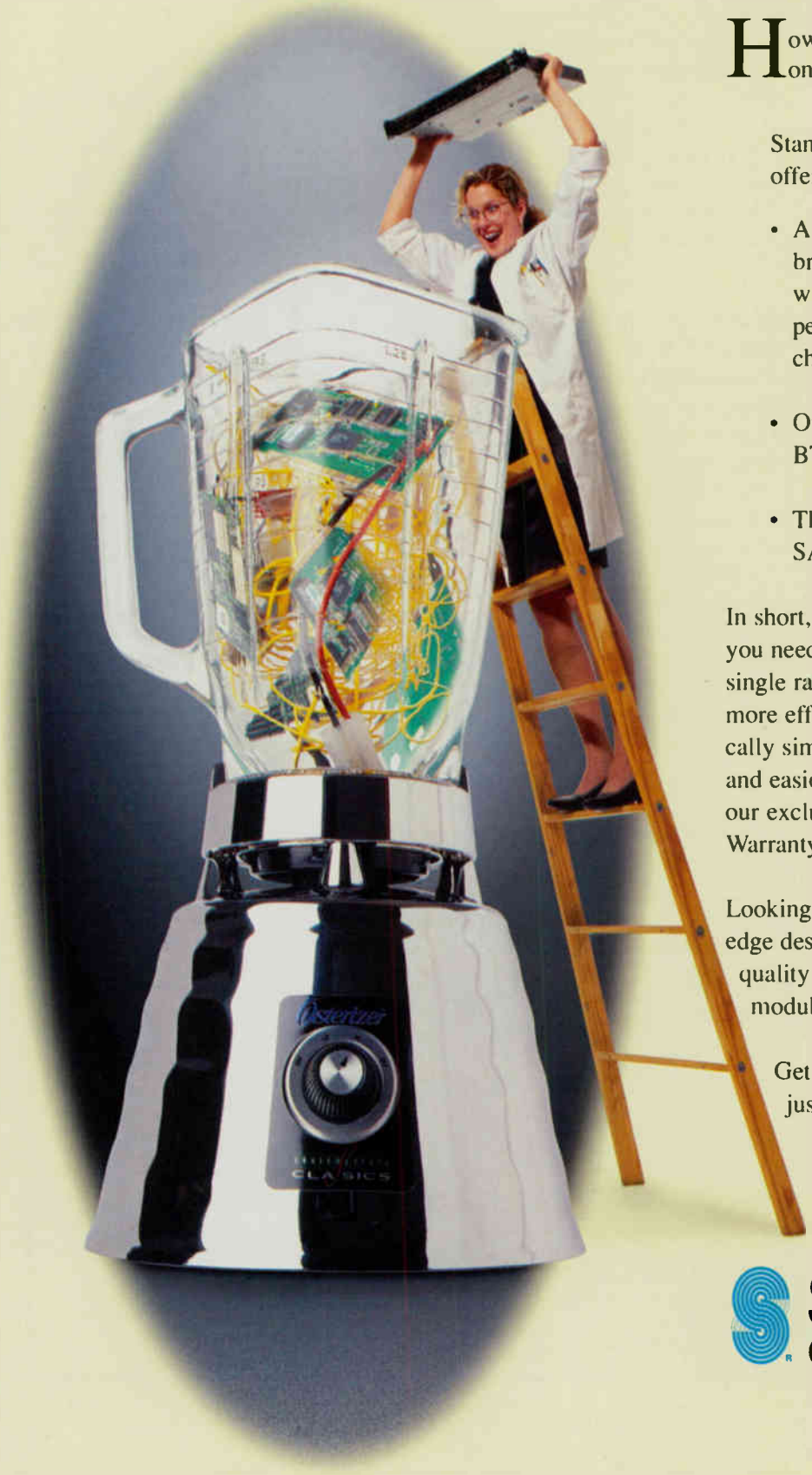

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Reader Service Number 6

SCTE Board Chooses New Officers

The Society of Cable Telecommunications Engineers Board of Directors elected new officers for the Society's 1999-2000 term at Cable-Tec Expo '99 in Orlando, Fla. At the same time, new regional directors also officially assumed their posts.

The new officers are Chairman Jim Kuhns of Region 7, Eastern Vice Chairman Wes Burton of Region 10, Western Vice Chairmen Larry Stiffelman of Region 5, Secretary Steve Allen of Region 1, Treasurer Don Shackelford of Region 8 and Executive Committee Member Steve Johnson of Region 2.

Incumbent Chairman Hugh McCarley of Cox Communications passed the torch to Kuhns of Terayon, who formerly was eastern vice chairman. In keeping with today's political climate, McCarley was "term-limited out." Members can serve on the board for only three consecutive two-year terms.

Burton of MediaOne moved into the eastern vice chairman seat vacated by Kuhns.

CommScope's Stiffelman retained his post as western vice chairman, which he attained in last year's election.

Former Secretary Bob Schaeffer relinquished his post to Allen of JCA Technology Group. Allen was elected director of Region 1 earlier this year and officially assumed that post at Expo as well, replacing Ralph Patterson of Patterson Communications.

John Vartanian of Viewer's Choice relinquished the treasurer's post to Shackelford of Time Warner Cable.

Johnson, also of Time Warner Cable, ascended to the executive committee. Johnson also has served as chairman of the SCTE board.

Subcommittee Launches Standards

The SCTE Interface Practices Subcommittee has submitted four of the 19 standards its various groups are working on to the Society for formatting and engineering approval.

Once they garner the go-ahead, they'll be sent to the American National Standards Institute for additional scrutiny and final approval.

"In all, the process takes about 120 days," said SCTE standards guru Ted Woo, who is charged with making sure all the terms and mathematics used in the proposed standards are in perfect order and sending them on their way for SCTE/ANSI consideration. The process could take longer if the Society has to do additional work on them or if questions are raised during the 60-day period during which ANSI leaves them posted for public comment.

The formatting process is complete for the following proposed testing procedure (TP) standards, said Woo.

- TP-206, by Ed McQuillen of RDL, addresses composite distortion measurement, composite second order (CSO) and composite triple beat (CTB).
- TP-208, also by Ed McQuillen, examines cross modulation distortion (XMOD).
- TP 210, by Dave Franklin of Time Warner Cable, regards coaxial cable systems for customer premise protection.

Woo said that he also has received the text for TP-018, a test method for measuring diameter over core from author Brad Pope of Belden Wire and Cable and expects it to soon be formatted and submitted for due process examination.

"Most of the test procedures are still up in the air," subcommittee Chairman Brian James told the members in attendance at the subcommittee's Expo meeting, which took most of a day, stressing that much

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work has yet to be done. "We're looking for input from MSOs and manufacturers." James' day job is at TAC Test Centre, where he is vice president.

Developing standards is an arduous procedure for all parties involved, said Woo, but the hard work is worth it. The industry is under pressure to develop standards now, before entities from crossover industries have a chance to dominate the scene. "I'm watching out for other industries stepping on our toes," Woo said. The noncommercial environment offered by the SCTE/ANSI process is one that allows for the best possible solutions, he added.

The subcommittee attracted at least 50 attendees over the course of the day-long meeting, reported Woo. He also is enthusiastic about the growing diversity of interest in the subcommittee's work.

Representatives from outside cable's traditional realm, Woo said, are a strong indication that the cable industry and the SCTE's standards efforts are being taken very seriously by mighty forces such as Lucent and Corning, which now have representatives in the subcommittee.

"There is no new technology that I've seen," said Woo, "only new technical papers." The standards and specifications under development at SCTE, ANSI and CableLabs are allowing the industry to deploy the technologies the industry has been buzzing about for years.

"Technology is a market-driven tool," explained Woo, asking, "What good is technology unless somebody buys it?"

Revised Optical Fiber Construction Guide Due Next Year

After nearly two years of meetings, phone calls, faxes and e-mails, members of the SCTE's Fiber Construction and Testing Committee believe they can see the light at the end of the tunnel for an updated version of the *Recommended Practices for Optical Fiber Construction and Testing* manual. The Committee met at Expo '99 in Orlando to discuss the subject.

The manual, which was introduced in 1995, is being massaged and reworked to reflect the technical changes grasping today's cable industry, covering technical and safety issues associated with aerial and underground cable placement, splicing, field testing and bonding, among others. If all goes as planned, the revised version will be available next year.

"Our goal is to provide guidelines to the end user to assure that the plant that's going to be installed will provide reliable performance," explained Doug Coleman, chairman of the group and supervisor of application engineering at Siecor. "Without the guide, cable operators might not see a potential problem immediately, but a problem can arise one, two, three or four years down the road if the cable was not installed correctly."

In addition to providing new guidelines, the modified manual also will refit antiquated terms, such as CATV, with designations that better suit the new, digitally-enabled industry.

"We're going through the guide, updating material and correcting mistakes that might have been there before," added Committee volunteer Robert Pierce, who also serves as director of technical support for NaCom. "We're trying to make this a better product, trying to get from the Chevy to the Cadillac."

Moreover, the Committee is adjusting the manual's recommendations to take advantage of, and remain consistent with, current field practices.

"We spent considerable time on the underground cable section where we've inserted the air-assisted method of cable and spent a lot of time validating the accuracy of the material that's in the document at this time," Coleman said. "Fiber-optic cables are much bigger than they were two years ago, so we've had to make some special recommendations to include the increased size, the higher fiber counts and so forth."

Though no specific timetable for the release of the new manual has been set, Coleman said it will be made available some time next year. Once completed, the revised guide will cost $100 to $125, far below the $400 to $500 price attached to similar optical fiber training publications, Coleman said, adding that plans call for the manual to be updated every five years.

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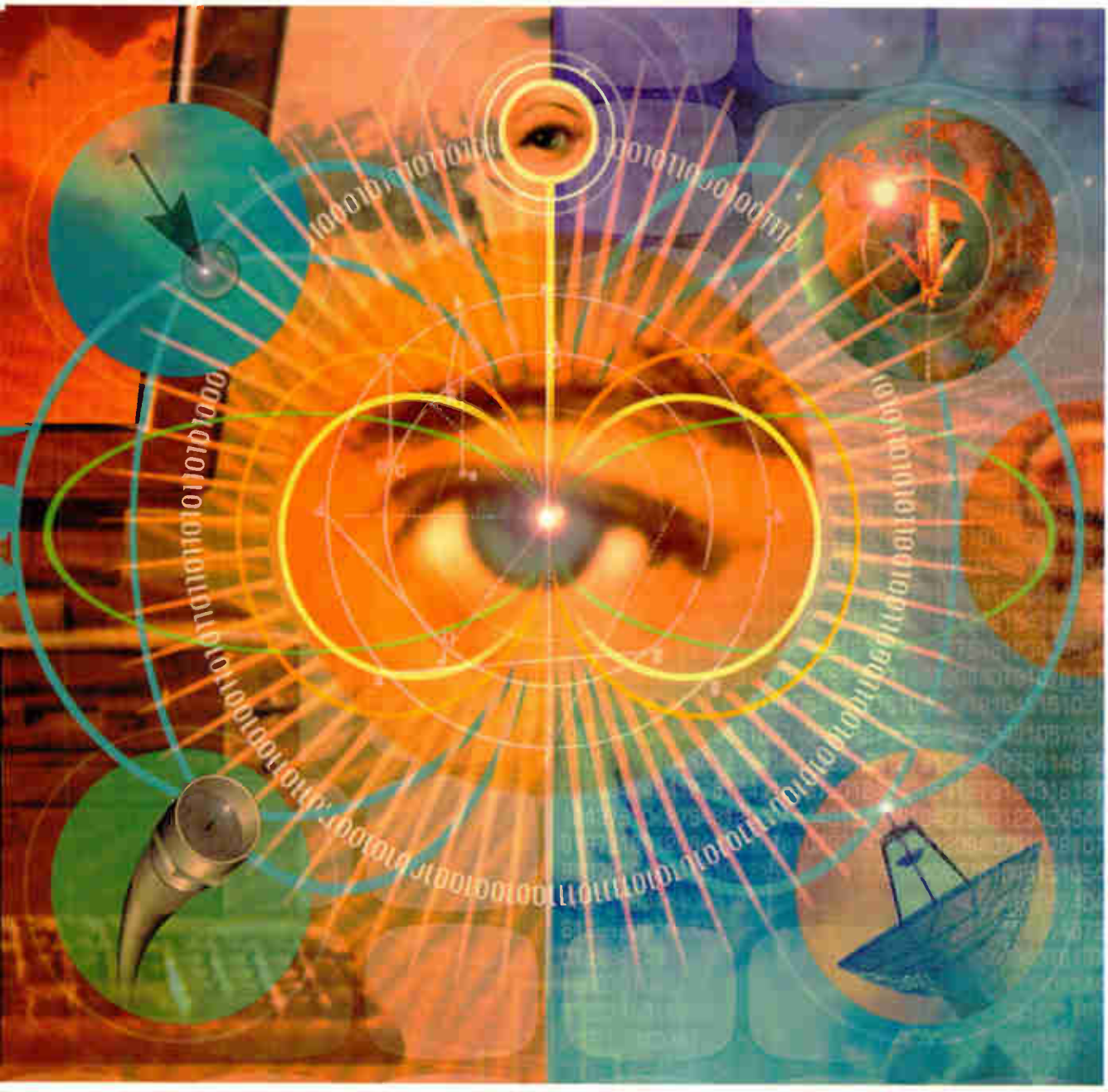

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Reader Service Number 10

The new modem, which made its public debut at Expo in May, wears a Cisco label on its box and uses its Networks software to provide Internet services connectivity and interoperability for security and network management. The modem is based on Data Over Cable Service Interface Specification (DOCSIS) 1.0. Philips also plans a modem that features a universal serial bus (USB) to aid in self installation.

"We've had it in testing with the four main CMTSs (cable modem termination systems) currently on the market, which are Cisco, 3Com, Nortel, Motorola. We've based it on the Cisco reference design. We feel this gives us an advantage," said Dave Torr, PBN's group product manager of data systems. "We will be coming out later this year with a 1.1 capable modem."

So what does this mean for Philips' existing deal with Com21? "We're certainly one of the largest distributors of Com21 modems. We intend for that relationship to continue," Torr added.

Philips hopes to sell the modem directly to operators and in conjunction with operators through retail channels.

"One of the driving forces behind DOCSIS was the general wish by operators for the product to go retail," Torr explained. "Some operators want retail immediately; some may never go that way.

"We're prepared to do whatever the operators want," said Torr. "Flexibility is one of the keys."

Launching modem availability in the consumer retail arena poses a number of mission-critical issues to operator and vendor alike, Torr said. "We're faced with an issue that we haven't really seen in the industry before. Whether a retailer can sell a modem or not depends on the consumer's address. There's no point in selling one unless that particular street has been activated for DOCSIS. There are some processes to be involved there."

Torr is optimistic that this awkward transition period is a surmountable task for the industry, provided that operators partner with vendors who are prepared to accommodate their needs. "By understanding both sides of the game, we can work with the operators and the retail channels to get this product into the right financial model for any operator."

Perhaps a faster route to consumers can be found in the current trend toward outfitting personal computers (PCs) with connectivity. "We'll be coming out with a version with USB connectivity," Torr explained. "That obviously is going to make the product easier to install for those with newer PCs. There's going to be no need to open up the box, which is one of those things people get worried about."

Although PBN has so far failed to make the DOCSIS certification grade, the company expects to soon garner the coveted CableLabs seal.

"We expect to get it certified in the next CableLabs round. We were in it the last round. It was our first time in. We were disappointed, but we're in pretty good company not getting in."

Philips demonstrated its high-speed data transmission products for cable's broadband networks at Expo and the National Cable Television Association's Cable '99 show in June. The line includes proprietary and DOCSIS-compliant modem systems and networking monitoring equipment that controls service provisioning, operation and maintenance.

NEWS BITES

- Modems from 3Com, Arris Interactive and General Instrument have washed up on CableLabs' shore with the latest waves of Data Over Cable Service Interface Specification (DOCSIS)-certification. This announcement means that five suppliers' products now are supported for retail sale. The other certified suppliers are Toshiba and Thomson Consumer Electronics.
- DirecTV, which today serves more than 7 million subscribers (including 2.3 million recently acquired PrimeStar subscribers), is preparing to deliver local broadcast network channels to approximately 50 million homes, or about half of the nation's TV households. DirecTV will offer local-into-local services to major metropolitan markets across the United States. The company's local-into-local delivery is contingent upon Federal Communications Commission approval. CT

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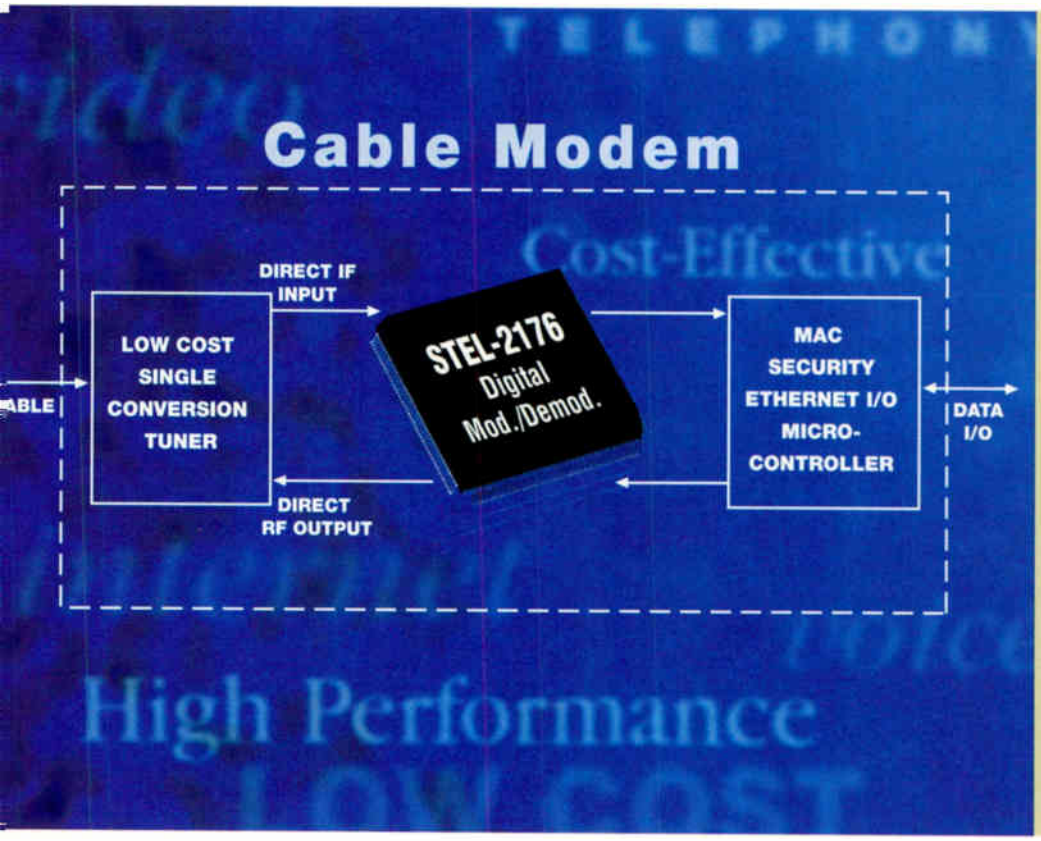

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Reader Service Number 12

New Certification Director Named

The Society of Cable Telecommunications Engineers has named industry veteran and long-time SCTE member Gary Selwitz, Broadband Communications Technician (BCT), as director of certification.

Selwitz, who has served the cable industry since 1966, will focus on the certification portion of SCTE's mission and facilitate the certification programs to a higher level of quality and quantity to meet industry advancements.

Selwitz commented: "It is a privilege and a pleasure to work for the Society. I hope to make contributions in the ongoing efforts to provide certification to the industry. Expanding this endeavor is foremost in my mind."

Selwitz's background includes extensive experience in management, training, engineering and maintaining technical operations. He most recently served as director of personnel development for the Raystay Co. corporate office after he was promoted from network manager for Raystay Co. TV Cable of Chambersburg, Pa. Prior to this, he was a special projects leader in field engineering at C-Cor Electronics and a technical trainer for Time Warner Cable, where he was a member of the task force that first implemented service technician training at three regional training centers. He also worked in engineering management and as a service and line technician for Warner Cable Communications.

Marv Nelson, Broadband Communications Engineer (BCE) and SCTE vice president of technical programs, said, "Gary's background in training and his enthusiasm for certification will serve the Society well as we go forward."

Selwitz served as Region 11 Director on the SCTE Board of Directors from 1985-89. He is certified at the Technician level of the SCTE Broadband Communications Technician/Engineer (BCT/E) certification program. He has successfully completed two of the seven exams at the Engineer level. Additionally, he is certified in the SCTE Installer certification program and is enrolled in the Broadband Service Technician (BST) certification program. He has been active at the local chapter level and also has served on several of the Society's committees.

Selwitz is a member of the Pennsylvania Cable Telecommunications Association. He earned his education at the Cleveland Institute of Electronics in broadcast engineering and in U.S. Navy Electronics Training.

Tech Sessions Set for East Coast Show

SCTE will coordinate four technical sessions at the East Coast Cable Show to be held at the Baltimore Convention Center from Oct. 12-14.

Each 90-minute session will feature up-to-date information from industry leaders addressing some of the challenges facing today's broadband telecommunications professionals. The following sessions are slated for the show:

- "Requirements for the Digital Program Inserter" with moderator Paul Shen, Imedia
- "High Speed Cable Modem" with moderator Rouzbeh Yassini, CableLabs
- "Program System Information Protocol" with moderator Julius Bagley, Scientific-Atlanta
- "Road Map of Information Technology" with moderator Dr. Michael Hogan, National Institute of Standards Technology

Session times will be Oct. 12 from 2:30-4 p.m., Oct. 13 from 9:30-11 a.m. and 2:30-4 p.m., and Oct. 14 from 9:30-11:00 a.m.

For more information about these SCTE technical sessions, contact SCTE Director of Standards Dr. Ted Woo at (610) 363-6888, ext. 228 or e-mail twoo@scte.org.

Call for Women in Tech Nominations

The SCTE, Women in Cable & Telecommunications and *Communications Technology* magazine are seeking nominations for the 1999 Women in Technology Award.

This award—established in 1995—recognizes leading women within the cable and telecommunications communities.

Each year, the Women in Technology Award identifies and acknowledges the achievements of one woman who has demonstrated outstanding personal and professional growth and has contributed significantly to the industry.

Nominations are open to all women working in a technical field of the cable TV and telecommunications industries. Eligible nominees must be current national SCTE and WICT members. Other considerations include an exhibition of high levels of knowledge, skill and professionalism, as well as a commitment to raising public awareness of cable telecommunications, especially of women in technology.

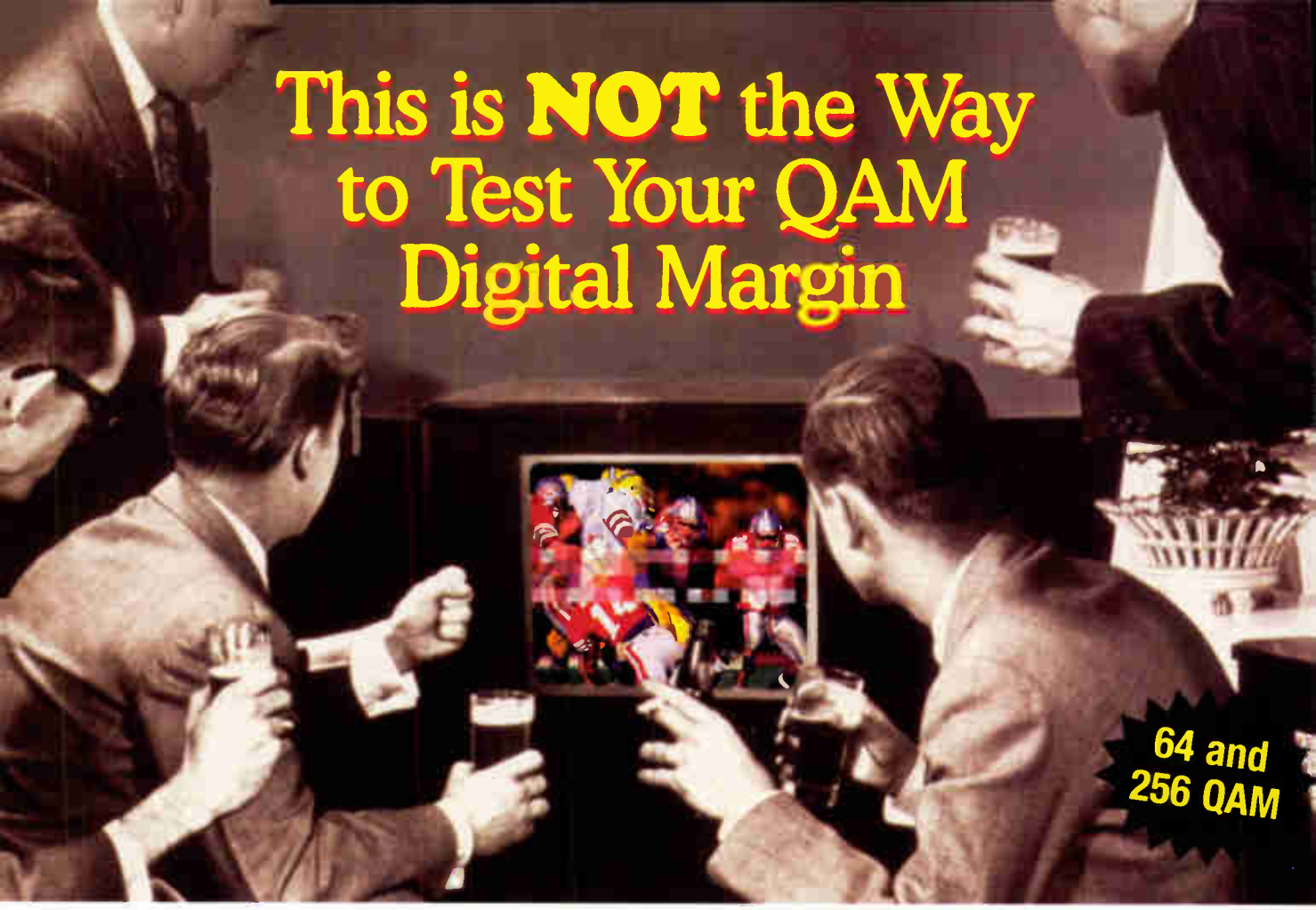
For more information or to receive a nomination form, contact Parthavi Das of WICT at (312) 634-5270 or Paula M. Jones of SCTE at (610) 363-6888, ext. 209. Nominations must be received by Sept. 3.

The award will be presented during the 1999 Western Show in Los Angeles. Past winners include SCTE members Sherry Stinchcomb of Cox Communications, Pam Arment of TCI International, Pam Nobles of Jones Intercable and Yvette Gordon of SeaChange International.

Safety Committee Chooses Leader

At Expo, members of SCTE's safety committee elected John Young, safety director of 21st Century Telecom Group, as its new chairman. Ken Flechler, safety director for Comcast, takes over as vice chairman.

The group also voted to expand its awards program to honor a vendor and an individual for significant safety contributions to the industry. "Vendors are part of the team. We want to make sure products are developed with safety and user-friendly considerations," said Ray Lehr, corporate safety director for AT&T B&IS and outgoing committee chairman. CT



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Reader Service Number 13

DEPLOYMENTWATCH

By Greta Durr

As its synchronous-code division multiple access (S-CDMA) technology assumes center stage in CableLabs' Data Over Cable Service Interface Specification (DOCSIS) 1.2, Terayon reports modem shipments have topped 100,000.

Though the market for the company's TeraPro modems is seeing rapid expansion, the lion's share of deployments has taken place in international markets.

An interview with TCA's Executive Vice President of Communications, Newt Farrar, illuminates one domestic cable operator's experiences deploying a technology that, because of its current proprietary status, may be considered risky by some industry observers.

By the numbers

TCA has reported an 80-percent success rate with subscriber installations using Terayon modems. Farrar said that although the program is successful, the approach is not appropriate for some of TCA's markets.

"We're also reaching a lot of people who don't have a whole lot of interest in self-installation," he said. "It's not because they couldn't do it or because the modem wouldn't work; they just don't want to deal with it."

Farrar estimated that 10,000 modems are out in TCA's field being tested in various markets, and about 5,000 of those have been deployed and are currently in use.

Among the TCA subscribers participating in the self-installation program, Farrar said that up to 15 percent need tuning in the drop.

"We've actually had customers take these modems home and get them going. A day later, we'll call to schedule a truck roll if we think the levels are off-kilter," Farrar explained. "Still, we've got customers saying: 'Hey, this is the fastest thing we've ever seen. I can't believe you can make it run better.' Then we clean up the drop, and it's three or four times better than before. That modem just pushes its way through. It's pretty remarkable."

Using Terayon's monitoring software, Farrar says, it is easy to detect potential problem areas.

"As the new modems come online, we can see what the levels are and then determine if a visit is needed."

Launch targets

Still, he predicted that the trend behind full-service turnkey provisioning will continue to require a healthy percentage of installations on TCA's part.

Among the five systems Farrar describes, the smallest has 5,000 subscribers, "and we've got them all in between from there to 25,000 in Texas and Arkansas."

Currently, Farrar said, TCA is offering its own branded high-speed broadband Internet service in two of its systems. "We've also got a little action going in some of the others, either a partial launch that's really quiet that we're not yet advertising, or it's in a beta test mode, and we haven't yet announced that it's available."

At press time, just following Cox's acquisition of TCA, Farrar said that the five additional deployments would begin in June.

"In these five markets, we've got just a squeaky little bunch of bandwidth. It's not enough to support a commercial launch yet. As soon as we get commercial bandwidth in there, that's when we'll start rolling it out."

Ingress issues

Farrar, like many industry professionals, has a lot to say about ingress. "In a good plant that's been rebuilt, it either works or it doesn't. We've really been pleased by our College Station, Texas, and northwest Arkansas properties, which have just recently been rebuilt," Farrar reports. "They're all up in the 26 signal-to-noise ratio (S/N).

"We've established a lower form of what the plant has to be measured on. That's a 19 dB S/N that's coming out of the TeraLink headend, with a combined noise level from 5 to 8 nodes. They balance the return path and set all those levels according to spec, and it works."

At that point, Farrar explained, shrinking the nodes becomes critical. "We typically have 2,000 homes per node and somewhere between 10,000 and 13,000 homes per TeraLink when we launch. As long as we see at least 19 dB, we feel like we've got some buffer. We've actually gone into some plants and reduced that figure to 10 dB. It all slows down, but it keeps going."

IP issues

Farrar reports another Terayon advantage with Internet protocol (IP) address assignment. "With a lot of other modems, you've got to assign an IP address to them before they'll work," said Farrar. With Terayon, "The machine's already set up for dial-up service. That's especially useful in a SOHO (small office, home office) environment. Using Terayon software, we also can limit the number of IP addresses assigned."

With the Cox acquisition, adding telephony to the mix appears to be in closer reach to Farrar. "Now that we're going to be part of Cox, I expect our plans for telephony to accelerate," he predicted.

"There's a lot of infrastructure that's got to be built before we even talk about making that work. We're currently in the process of tying all of our systems together. Once we've done that, we'll have a lot more to be talking about." CT

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

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By Ron Hranac

New Look at an Old Problem: Satellite Leakage and Ingress

What do you think of when you read or hear the terms "signal leakage" and "ingress?" If you're like most folks in the cable TV industry, you probably think about damaged shielding integrity that results in signals inside the cables leaking out, or over-the-air signals leaking in. You might also think of midband cable channels: aeronautical radionavigation and communication frequencies, cumulative leakage index (CLI), signal leakage logs, leakage detectors, resonant half-wave dipole antennas, Part 76 of the Federal Communications Commission's rules, and maybe even reverse path interference.

All of these are things most of us know well and deal with on a day-to-day basis.

Here's a new one for next week's technical staff meeting: satellite equipment leakage and ingress.

"C'mon Hranac, there aren't enough hours in a day as it is," you groan. "We don't need more goblins to chase."

OK, I promise it's not as bad as it sounds. It is a problem, though, and one that deserves a closer look than what we've given it in the past.

L-band leakage

This month's column evolved from e-mail correspondence and subsequent telephone conversations with Sierra Satellite Technology's Jeff LaRoche. LaRoche is a satellite antenna installation specialist and has several years of experience working with Simulsat and multibeam antennas.

He has found that many satellite reception problems can be traced to leakage and ingress in the 950 MHz to 1,450 MHz L-band, a common low noise block converter (LNB) output frequency range. Another problem is crosstalk interference.

To deal with this, Jeff has assembled an L-band leakage detection package consisting of a small UHF antenna and DX Communications' 950 MHz to 1,450 MHz line amplifier that he uses in conjunction with an ATCI model TE-887B satellite/CATV analyzer and monitor (Antenna Technology Communications Inc., 602-264-7275, fax 602-898-7667, www.atci.net).

He switches the TE-887B to satellite receiver mode and from a few feet away points the antenna at suspect cables, connectors and other equipment. If leakage exists, voilà!, watchable pictures appear on the TE-877B's display.

He told me that an estimated 60 percent of the systems he has done work for have L-band leakage problems. More often than not, when peaking the satellite antenna and adjusting LNB cross-polarization don't resolve digital reception troubles, busy backgrounds in the pictures, or as LaRoche puts it, "just plain unexplainable intermittent situations," he does a little bit of careful sniffing around with his test equipment and finds horrible L-band leakage. The problems LaRoche has seen are not unique to any particular type of satellite antenna installations, either.

Connectorization

Outside at the dish, LaRoche has seen crosstalk between 4 GHz low noise amplifiers (LNAs) and LNBs, and problems with N-connectors on some LNAs. The N-connectors themselves aren't necessarily to blame; frequently the trouble is with how they were installed. Often there is no strain relief provided for the interconnecting cables, and damage to the cable's center conductor or shielding occurs inside the connector.

Aside from loose, corroded (you did weatherproof them, right?) or improperly installed F-connectors on the backs of the LNBs, one of the biggest sources of outdoor L-band leakage is near the base of the antenna.

"The next point I check is the metal junction box at the base of the antennas," LaRoche comments. "Everybody loves to break the cable here and switch to a hardline cable. Often the test equipment is set up, and when this metal box is opened, leaks become very obvious. With my analyzer set to satellite receiver mode and the line amp turned on, it's not unusual to see clean, unscrambled pictures from several feet away." ➤

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Reader Service Number 16

In the headend

His next test point is the power inserters and splitters in the headend. The cheap ones generally leak like a sieve, and low-cost cable TV drop splitters with their back covers simply glued on are especially bad at L-band frequencies. Not only can these components leak, but when placed too close to other satellite feeds, crosstalk may occur, especially when different satellites use the same frequencies and polarities.

LaRoche recommends the use of dedicated high quality L-band splitters. They cost more, but they are specifically designed for 950 MHz to 1,450 MHz or higher frequencies.

"Loose connections, conventional crimped connectors and unterminated ports are favorites of my test equipment," he adds. "This important satellite connection matrix is often jammed into the rack or under the floor, and most of the cables are unsupported.

> "'C'mon Hranac, there aren't enough hours in a day as it is,' you groan. 'We don't need more goblins to chase.'"

"In some ways, the satellite signals are like water. When you switch between many types of cables and have bad 'valves and fittings,' the correct 'pressure' will never reach the receivers. Many systems then use poor quality line amps to make up for the losses they have already incurred. It is not uncommon to view relatively clear video on my test set caused by L-band leakage from the headend's satellite antenna cabling, splitters and power inserters."

Trouble can sometimes happen when a lot of signals are brought into the headend in common conduit or when the wiring and components are hidden away haphazardly to keep the headend looking superficially neat.

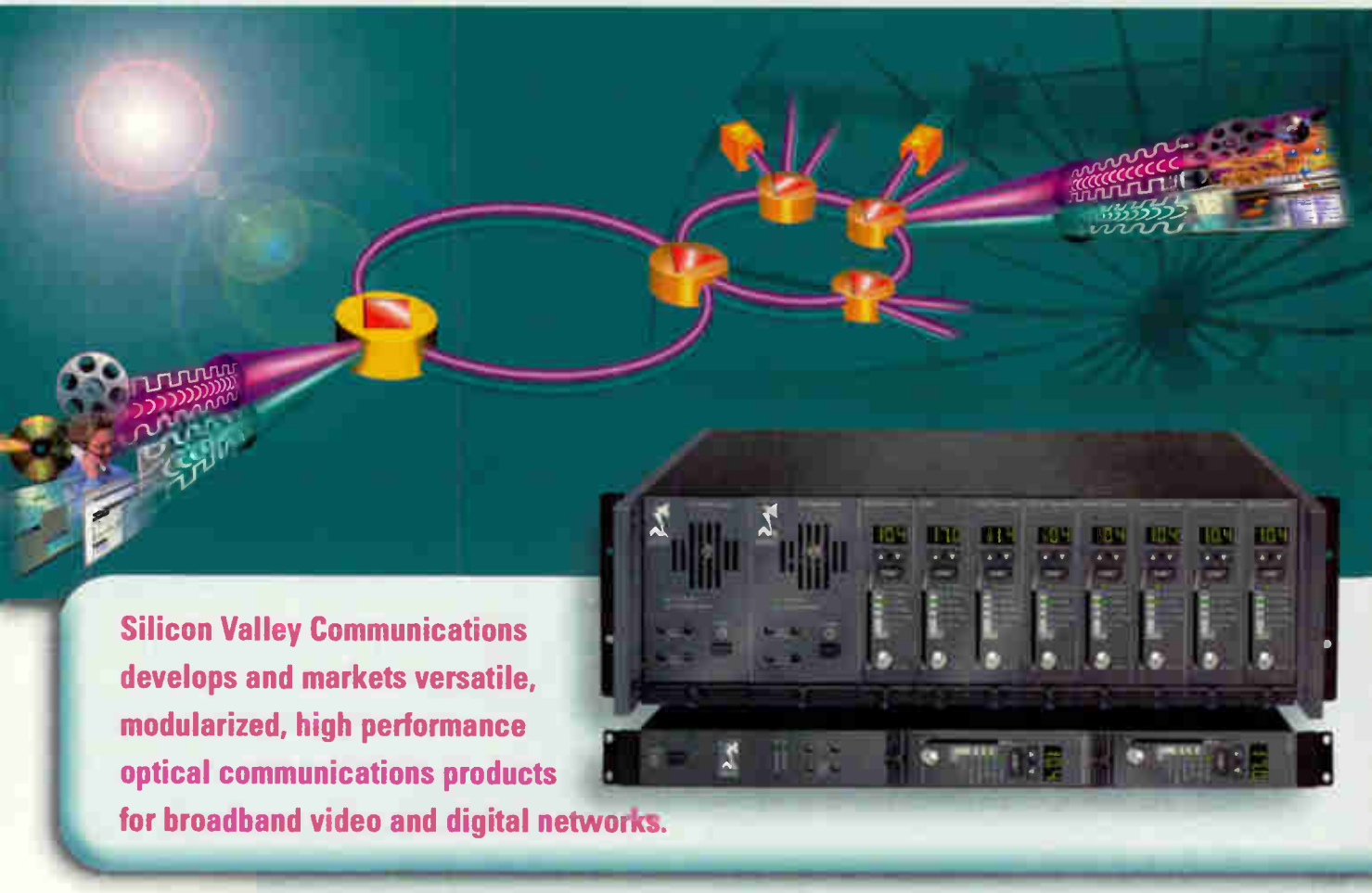
Many of these problems boil down to a handful of causes: too many splices or connectors in the cable between the LNB and satellite receiver; poor quality splitters, or the use of low-cost cable TV drop splitters; unterminated splitter ports; loose connectors; use of the wrong cable; and craftsmanship.

Some immediate solutions

LaRoche suggests the use of quad-shield coax whenever flexible cabling is necessary, along with premium sealed F-connectors. This includes cabling between the splitters, power inserters and satellite receivers. Where possible, run a single continuous piece—that means no splices—of quad-shield 11-series coax all the way from the LNB output to the splitter array. Unless the distance is greater than a couple hundred feet, 11 series will work just fine for most applications.

If hardline cable must be used, take extra care when installing the connectors. Remember, you're trying to make this perform well in the 950 MHz to 1,450 MHz range. Provide strain relief at all connections so the cable's weight is not supported by the con-

Advanced Optical Communications Products and Research



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nector and so that any flexing that may occur will not affect the cable-to-connector interface.

Tighten and weatherproof all outdoor connectors, even those not directly exposed to the elements. Try to provide as much physical separation between cables as possible, especially cables from different satellite antennas. The same recommendation applies to splitters, power inserters and L-band line amplifiers.

Terminate all unused splitter ports, and make certain the splitters and power inserters really were designed for L-band operation. While many passive component manufacturers make drop splitters that work fine up to 1 GHz (1,000 MHz), their performance can fall off quickly above that frequency. As was mentioned previously, use dedicated L-band splitters and components. Some of the better splitters cost $20 to $30 each, but they're worth every penny.

Make your own test set

What's next? Why not do what LaRoche does and put together your own L-band leakage detection equipment? If you have a spare satellite receiver available, use it as the leakage receiver. Connect it to a portable video monitor. Track down an L-band line amplifier, fabricate an antenna that will work at L-band frequencies (a half-wave dipole resonant around 1,200 MHz will be about 4.7 inches from end to end), hook the equipment together, and sniff around for leakage.

> "Aside from loose, corroded, or improperly installed F-connectors on the backs of the LNBs, one of the biggest sources of outdoor L-band leakage is near the base of the antenna."

While a spectrum analyzer might work just fine, determining just what you're looking at may be a little harder. At least with the satellite receiver setup, a leak will allow you to see pictures from one or more unscrambled satellite channels on the video monitor. You just might be surprised at what you find.

If you have any questions or would like more information on coping successfully with satellite leakage and ingress, I encourage you to contact Jeff LaRoche directly. His e-mail address is satman@ibm.net, and Sierra Satellite Technology's Web address is www.satinstallpro.com. Alternatively, LaRoche can be reached via telephone at (530) 544-2307. CT

Ron Hranac is vice president of RF engineering for High Speed Access Corp. and senior technical editor for "Communications Technology." He can be reached via e-mail at rhranac@aol.com.

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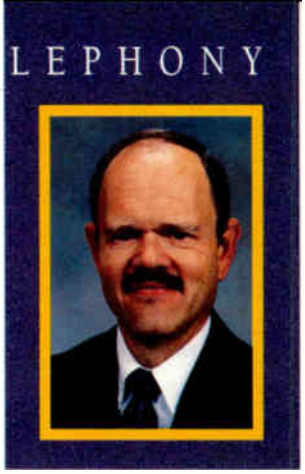
By Justin J. Junkus



Concentration: A Topic for Serious Thinkers

Obviously, the title to this column is a play on words. When we are talking about solving a problem, for example, concentration means focused thought. In telephony, concentration is more funneling than focusing.

It means that, in any possible call path, callers will be using shared resources to reach the other party. If you're planning to offer telephony service, it's wise to give serious consideration to how the resources are allocated to keep service at an acceptable level.

A little background

Concentration is a relatively new phenomenon to the cable industry, and its age in cable roughly correlates to when we stopped being cable TV and became cable telecommunications.

Broadcast services, by their nature of going out to everyone tuned to the appropriate channel, do not need individual communication paths. Two-way services do need this capability, however, because each subscriber must be able to send and receive unique information.

Dedicated paths from subscribers to their call destinations do not have to be permanent, however. In fact, the cost of providing private lines for every possible connection is prohibitive and was the driving force for the invention of manual cordboards and then automated telephony switches. Common sense confirms the economics—after all, it's not very likely that everyone will be on the phone at the same time.

So, subscribers to two-way services contend for various pieces of equipment needed to complete a call. I referred to this phenomenon in my March column on switched telephony's network interfaces when I mentioned the concentrated mode of operation of the TR-008-compliant remote digital terminal (RDT).

Concentration has a long history in telephony, but before we get into that part of it, let's look at how much concentration can be tolerated, and how the affects on service are measured.

How it works

Concentration is based upon a specialized branch of probability theory called traffic engineering. Traffic engineering is aimed at giving the subscriber the illusion of exclusive use of telephony equipment. How many subscribers will, on average, receive this illusion is known as the grade of service.

A typical benchmark for grade of service is that 99 percent of the calls presented to the piece of equipment will experience less than 3 seconds delay before receiving service. This is known as P.01 Grade of Service: "P" for probability of delay, ".01" for the 1 percent that misses the objective.

Other grades of service also are possible, such as P.03 and P.05. The higher the number, the less equipment the service provider needs. The tradeoff, of course, is that 3 percent or 5 percent of the callers, rather than 1 percent, have to wait for equipment availability.

Just how serious and noticeable this delay becomes depends on the number of calls per second offered to the system. There are extensive tables showing grades of service for various call volumes and quantities of equipment.

Network design requirements

Service providers must build their networks based on the highest call volume for the busiest day of the year, and that occurs (if you're lucky) only once a year.

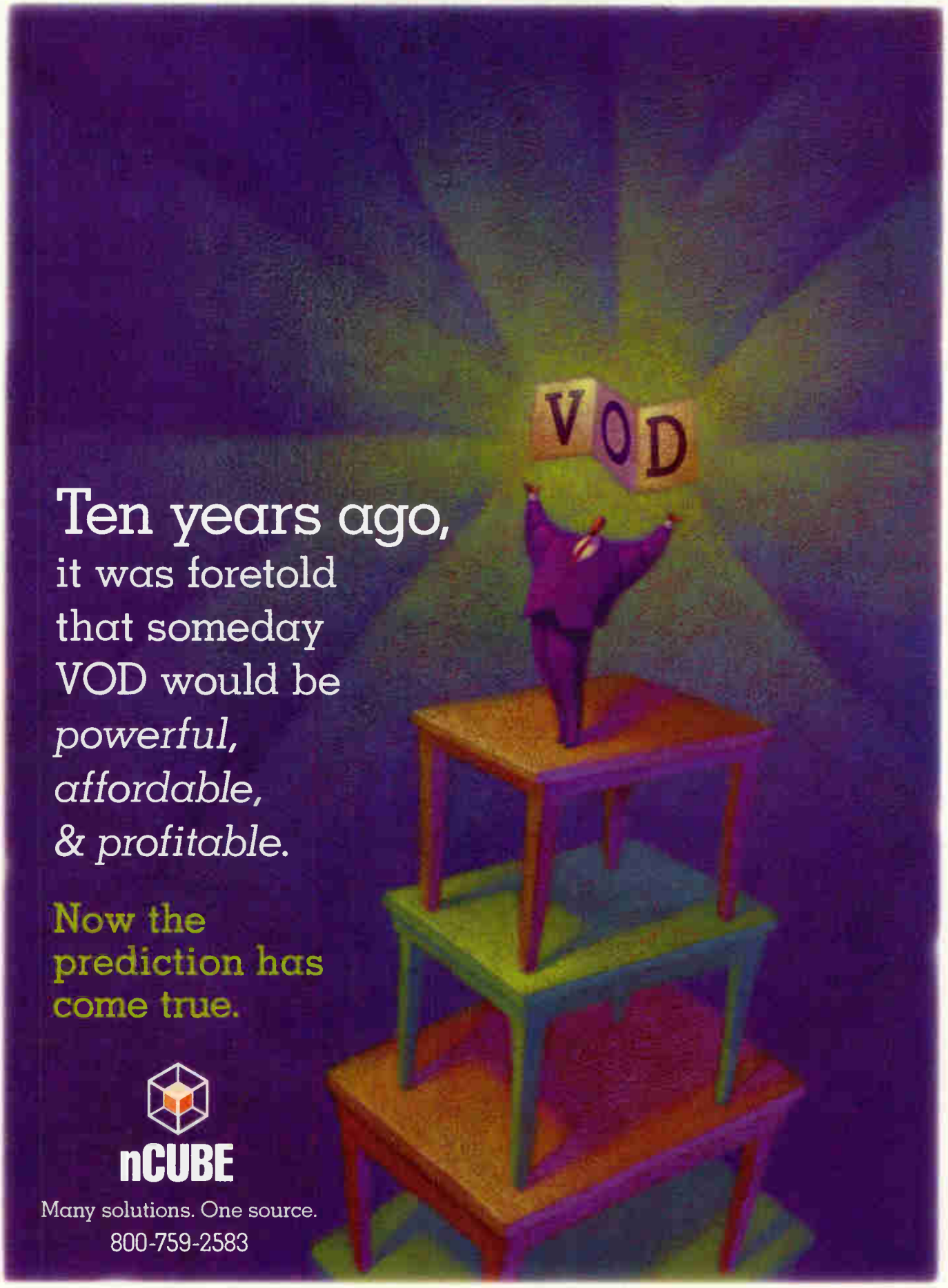
On the other hand, if the high-day, busy-hour load is exceeded for some reason, the probability of any one subscriber's delay in receiving service becomes greater. This situation might occur during a natural disaster, such as a tornado hit.

Now let's look at the choice of busy hour and busy day. Call volume is measured in hundred call seconds, abbreviated CCS. As there are 3,600 seconds in an hour, the maximum traffic that can be handled by any piece of equipment in one hour (in use all the time) is 36 hundred call seconds, or 36 CCS.

The traffic engineer needs to pick the most likely busy hour and estimate the number of CCS that will be offered during it to each pool of common equipment. This traffic load is the sum of call setup time and holding (in-use) time for all the calls drawing upon the pool.

Skill, training and experience still come into play because the traffic engineer needs to understand factors that might change the estimate of the network's load. Data calls over a telephony modem are a good example of such factors. They tend to have much longer holding times than, say, an ordinary person-to-person telephone conversation.

As I mentioned earlier, concentra tion has a long history. I am indebted to Dan Paone, director of product marketing for Antec, for his excellent white paper on this history. Much of the flow



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of thought that follows comes from reading his document.

How it all began

Concentration was first introduced into one of the earliest telephony switching systems, Step-by-Step. "Steppers" included a piece of equipment called a line finder. This device recognized an off-hook condition and provided the connection to a dial tone generator. It was equipped on a 1:10 basis for the number of subscribers being served by the switch.

In the first 100 years of telephony, this method for sharing common equipment needed to provide telephone service permeated into every type of telecommunications switch.

On the other hand, subscriber loops—the distribution plant that connects the subscribers to the central office that houses the switch—remained as dedicated pairs of wire per subscriber. Concentration didn't become part of the subscriber loop until the introduction of digital loop carrier (DLC) systems using multiplexing technology.

> "Service providers must build their networks based on the highest call volume for the busiest day of the year, and that occurs (if you're lucky) only once a year."

Initially, even DLCs didn't provide concentration. Rather, they shared lines by giving each subscriber line the exclusive use of high-speed lines between remote and central office terminal equipment in the pair gain system for a fraction of the total time. This fraction of time became known as a "timeslot."

In the late 1970s, engineers devised a system that allowed lines not only to share the high-speed lines in the pair gain system, but also to contend for their timeslots by assigning 48 subscriber lines to 24 possible timeslots. This contention provided a 2:1 concentration on the line side of the DLC. Over time, TR-008-compliant DLC systems grew to serve a greater number of subscriber lines by adding more high-speed lines between the DLC and the switch. Line side concentration, however, remained at 2:1.

Today's situation

In the early 1990s, Bellcore's TR-303 standardized an improvement to DLCs called the Next Generation Digital Loop Carrier, or NGDLC. This development included a timeslot interchanger (TSI), which allowed any line to use any available timeslot in the set of all high-speed lines going to the switch.

Pooling of timeslots allowed higher overall concentration levels, but more importantly, markedly decreased the probability that any one line would find all paths to the switch busy.

Up to 2,016 lines could compete for 672 possible timeslots to the switch, and each line might receive a path via any of the 672 timeslots. The particular timeslot used by a subscriber line could be different for every call (dynamic concentration). This use of the TSI in the NGDLC is commonly referred to as switch-side concentration.

Circuit-switched cable telephony's host digital terminal (HDT) is a mutation of the NGDLC. As I discussed in the March column, the HDT functions very much like its telephony cousin and provides a standard interface to a digital telephony switch.

When both line-side and switch-side concentrations are combined, circuit-switched telephony systems can provide up to a 5:1 dynamic concentration ratio for subscriber lines. 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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Reader Service Number 22

By Jennifer Whalen

Members Want MSO Leaders To Support Certification

With cable companies aggressively launching a variety of advanced services comes the seemingly obvious need for a trained and certified workforce. Yet, it was clear at the annual membership meeting held at this year's Cable-Tec Expo that some members believe the cable industry's leaders could do more to support the Society of Cable Telecommunications Engineers' certification efforts.

Bob Brandel Jr., with LWS, expressed his concern over the lack of industry support for certification. "I'm surprised that the MSOs (multiple system operators) don't push certification more," he said, adding that the industry ought to require that employees be certified by SCTE. "How many installers are out there that don't have a clue about SCTE certification?" he asked.

Roger Hughes, operations engineer with Armstrong Cable Services, echoed that view.

"The technical people can't be certified unless they are supported by upper management," Hughes said. "SCTE needs to pressure MSO leadership to require certification of technicians.... If management supports it, you'll see more involvement in certification and involvement in the SCTE in general."

Hughes added that in light of the consolidation of the industry and the shrinking number of MSOs, such involvement is critical. "If the support is not there, some of these chapters will fold," he said. "If the MSOs don't give their support, people won't be coming to the meetings, and we won't be able to survive."

Steve Allen, western regional sales engineer for JCA Technology Group, agreed the industry can do more to support certification, but felt the problem was more at the local system manager level.

"Most CTOs (chief technical officers) fully support certification. Where it tends to fall apart is at the local level," Allen said. He added that training costs and lost man-hours for training frequently are not factored into system budgets. By focusing only on the bottom line, money and time for training gets forgotten.

"Once competition is here and prevalent, and people start walking away to the competition, which has highly trained personnel, then you'll see support for certification," Allen added.

"In some places, there's the feeling, 'If these guys can install wires, that's all they need to do.' That's absolutely wrong, especially as we move to digital," Allen said in a follow-up interview.

"A knowledgeable workforce is critical to the successful launch of these products," Allen continued. "There's too much money at risk. People are paying a lot more money and demanding a lot more."

Society attacks certification

Certification is a key theme in SCTE's celebration of its 30th anniversary. "To build certification will require two elements: One, greater allocation of resources, and two, greater awareness building of its benefits. Step one occurred with SCTE hiring its first director of certification, Gary Selwitz," said John Clark, SCTE's president.

"Clearly, wishing alone will not make it so. We've taken the tangible step of hiring a director of certification, so we will have a full-time staff person devoted to improving and upgrading our certification program. Parallel with that, we will devote greater awareness building resources to both members and nonmembers concerning the benefits of certification," Clark explained.

"Our members already do a good job of promoting certification. The piece that needs to be filled is SCTE's role in making the industry overall more aware of certification's benefits. We will attack the challenge from different directions, but both with the same goal," he added.

SCTE also seeks support from MSOs through visits with leaders and by encouraging participation in events such as Cable-Tec Expo's Annual Engineering Conference, which features panels composed of both chief executive officers and chief technical officers.

In addition, chapter officers are encouraged to visit the MSOs in their region to promote certification.

Approaches to training

Members also raised questions about how to develop fresh ideas for chapter meetings to keep engineers interested and coming back. SCTE's Marv Nelson suggested that chapters volunteer to be beta test sites for some of the new training sessions that SCTE is developing.

Other suggestions included watching the SCTE-List to detect hot topics, covering "the basics" during two meetings a year for the new technicians that are joining the chapters, and partnering with neighboring chapters to plan meetings and share speaker ideas. 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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By David Devereaux-Weber

Find Convergence Answers

We are in the midst of the convergence of seven industries: the movie industry, broadcast TV, coble TV, consumer electronics, telephony, computers and the Internet. In addition, these industries are becoming global in scale.

How will cable engineers and technicians survive convergence? How will engineers and techs from other industries learn about cable?

You have eight ways to keep up with the changes: technical societies, industry associations, controlled-subscription ("free") print publications, paid-subscription print publications, educational institutions, industry conventions, industry laboratories and the Internet.

To succeed in this era of change, we need information—and lots of it. However, difficulty often arises in figuring out exactly where to find said info. To that end, this month I'll outline some of the technical societies, associations and labs, and where you can find them on the 'Net.

Societies

The Society of Cable Telecommunications Engineers, www.scte.org, provides training material for our converging industries. If you are not an SCTE member, you are missing the best way to communicate with others in our industry and improve your knowledge. The SCTE holds two major technical conferences each year—Cable-Tec Expo and the Conference on Emerging Technologies.

Here follow several more societies, whose names are fairly self-explanatory:

- Institute for Electrical and Electronics Engineers, www.ieee.org
- The Society of Broadcast Engineers, www.sbe.org
- Society of Motion Picture and Television Engineers, www.smpte.org
- Internet Society, www.isoc.org
- Association for Computing Machines, www.acm.org
- The International Telecommunications Union, www.itu.int

Each of these societies holds annual conventions and publishes information both in print and on the Internet.

Associations

Industry associations exist to help focus industry direction, influence public policy, lobby regulators and disseminate information. If you have a specific question or area of interest, associations can be quite helpful. Here follow several sources:

- Electronic Industries Alliance, www.eia.org (consumer electronics)
- International Engineering Consortium, www.iec.org (nonprofit sponsored by universities and engineering societies)
- National Cable Television Association, www.ncta.com
- National Association of Broadcasters, www.nab.org
- Telecommunications Industry Association, www.tiaonline.org (telecom manufacturers and suppliers)
- United States Telephone Association, www.usta.org

Conventions

If you want to really get a feel for what's going on in a given industry, attending its conventions is a great help. It's especially valuable to visit noncable conventions to see what "those people" are thinking.

The major industry conventions are:

- SCTE's Cable-Tec Expo, www.scte.org
- NCTA's Cable '99, www.cable99.com
- CES, www.cesweb.org (consumer electronics)
- COMDEX, www.comdex.com (computing)
- Digital Hollywood, www.digitalhollywood.com (entertainment convergence)
- NAB, www.nab.org
- National Communications Forum, www.ncf.org (telecom, Internet)
- Networld+Interop, www.interop. com (Internet interoperability)
- SuperComm, www.supercomm99.com (U.S. telephone)

Research labs

Much like industry associations, laboratories are a great help in answering specific questions. The major industry laboratories are:

- AT&T Labs, www.att.com/technology/
- Bell Labs (Lucent), www.bell-labs.com
- CableLabs, www.cablelabs.com
- GTE Laboratories, http://info.gte.com
- Sarnoff Corp. (formerly David Sarnoff Research Center and RCA Labs), www.sarnoff.com
- Telcordia Technologies (formerly Bellcore), www.telcordia.com

Keeping up with these separate industry associations, societies, laboratories and conventions is a full-time job in itself, but it's worth it to keep up with the changing nature of our technological world.

Further, I suggest that our technical societies consider the effect of convergence. In the future, it may be useful for some societies to form partnerships or merge. 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 reached via e-mail at djdevere@facstaff.wisc.edu.

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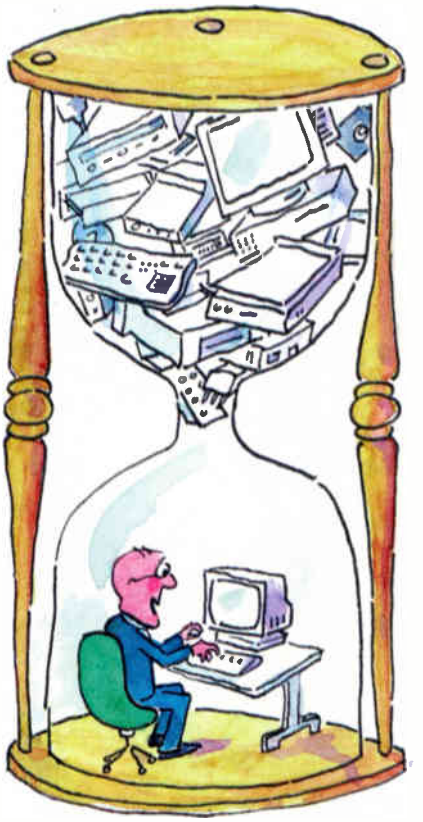

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Cable-Tec Expo '99

Fun in the Sun, Cable-Style

By the *CT* Editorial Staff

Orlando, Fla., played host to the Society of Cable Telecommunications Engineers and nearly 10,000 members of cable's technical community generally at the end of May for the year's biggest technical get-together, Cable-Tec Expo '99.

The show transformed the Orlando Convention Center into a veritable engineer's paradise, from the preconference tutorials to the closing night parties and everything in between. The next several pages cover some of the highlights from this year's show.

Interoperability and looming threats from competing industries were at the forefront of discussion at this 100-percent technical confab. The topics of two-way deployment and making various technologies work together in today's rapidly changing telecommunications landscape kept everyone busy from conferences and workshops to the show floor.

Turn the page for a wrap on this year's Engineering Conference. Industry leaders expound upon building tomorrow's network today, merger mania, digital deployment and competitive threats.

The Annual Awards Luncheon gave the Society a great forum for celebration and advancement into new horizons. It also commemorated the Society's 30th Anniversary. See page 44 for the accolades.

On page 50, you can learn about the technical workshops. If you still want to know more afterward, contact the SCTE for a copy of their proceedings manual; it's brimming with valuable information.

Breaking news and commentary from *Communications Technology*'s editors from the exhibit floor can be found on page 58.

There were plenty of diversions, games and fun of all stripes at Expo '99. To learn more about the special events that personalize the Society's innate technological fervor, turn to page 66.

This wrapup is a joint effort on the part of the following members of the *CT* editorial staff: Rex Porter (editor-in-chief), Jennifer Whalen (editor), Doug Larson (senior editor), Ron Hendrickson (managing editor), Greta Durr (deployment editor), HSA Corp.'s Ron Hranac (senior technical editor), KnowledgeLink's Justine Junkus (telephony editor) and Jeff Baumgartner (senior editor, *CableFAX Daily*). PBI's Paul Levine and Allan Rubin provided further assistance. Unless otherwise noted, all photographs are by Craig Weiman.

CT

fun in the Sun. Cable-Style

ENGINEERING CONFERENCE '99

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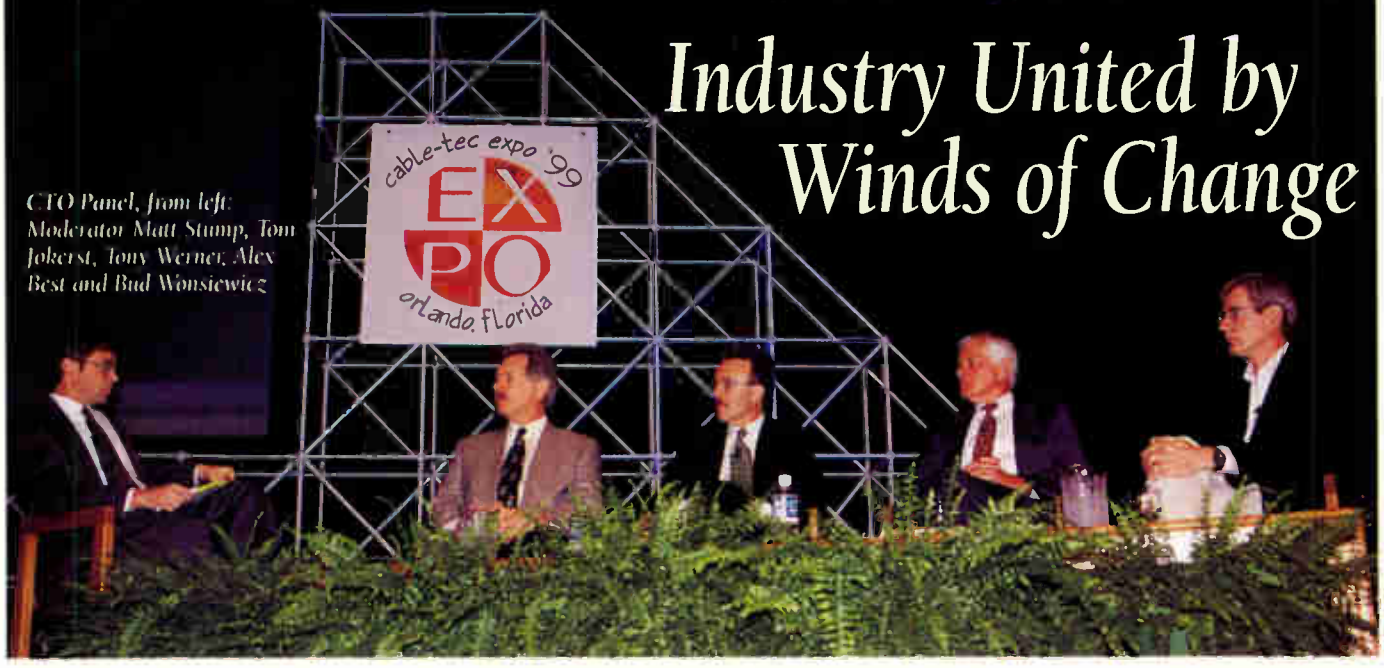

CTO Panel, from left: Moderator Matt Stump, Tom Jokerst, Tony Werner, Alex Best and Bud Wonsiewicz

By Jennifer Whalen and Greta Durr

With the pace of technological change and service innovation crashing relentlessly upon the cable industry, many engineers came to the 1999 Cable-Tec Expo to discover how their colleagues are surviving in today's tumultuous environment. They weren't disappointed, as chief executive officers (CEOs) and chief technology officers (CTOs) from the leading cable companies shared their visions during Expo's Annual Engineering Conference.

Society of Cable Telecommunications Engineers President John Clark kicked off the opening session by stressing the increasingly significant role the Society has assumed in the cable TV industry over the past 30 years. "Our commitment to training, certification and standards remains as strong and relevant as ever," said Clark, promising to "grow SCTE for the benefit of our members, the industry and its customers."

Future Perspectives: System Leaders Outline the Plan

Although individual panelists, led in discussion by Leslie Ellis of Paul Kagan and Associates, reported varying priorities concerning digital video, high-speed data and voice services deployment, they

CEO Panel: From left, Moderator Leslie Ellis, Barry Babcock, Stephen Burke, Jan Peters, Bill Fitzgerald and Jim Robbins

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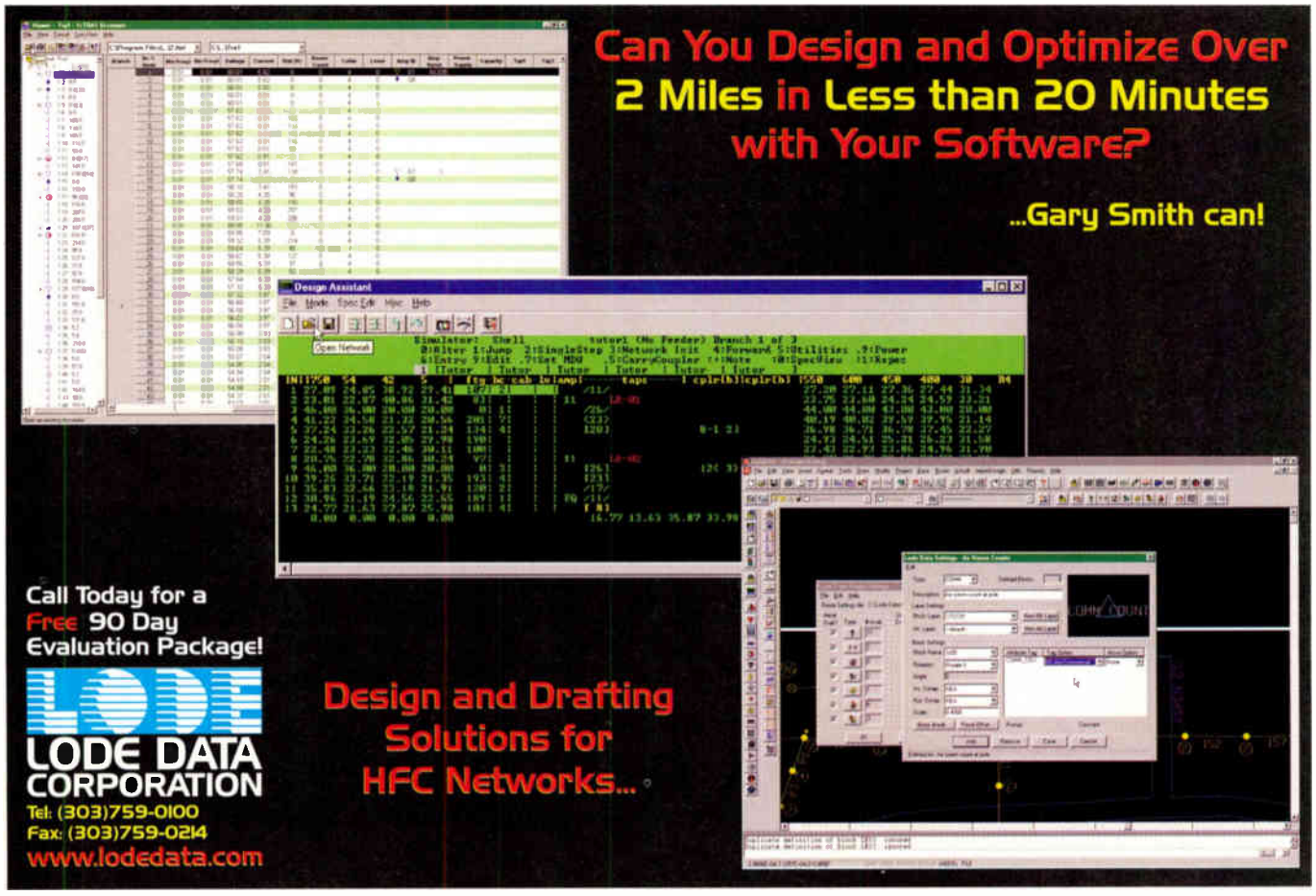

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Celebrating the Present by Honoring the Past

In the mad rush to upgrade our systems, deploy new services and generally stay abreast of the rapid advances in cable technology, it's altogether too easy to lose sight of what got us here in the first place.

"History is important," said John Clark, president of the Society of Cable Telecommunications Engineers, in his opening remarks at Cable-Tec Expo's Annual Engineering Conference. Those words were put to action when the SCTE honored its charter members with a re-enactment of the original board meeting, which was held on June 22, 1969.

Following an audio-visual retrospective featuring what must certainly be the longest car commercial in TV history (for the "wide track" Pontiac line), three of the Society's charter members took center stage. In the spotlight were (from right) Charles Tepfer of *Cablecasting* magazine, Bill Karnes of National Trans-Video and Ron Cotten of Concord TV Cable.

As he did almost 30 years ago, Tepfer started the ball rolling with a motion to establish the Society for the purpose of uniting the industry, facilitating the exchange of information and increasing the level of competence in the field. Karnes seconded the motion, which was then put to a vote.

"I, Ron Cotten, of Concord TV Cable, call for a roll call vote. How do you vote?"

Six additional charter members in the front row of the audience then stood to vote on the motion they together passed in their first meeting. In attendance were (from left) Al Williams of Reeves Telecommunications, Herb Timberlake of Jerrold Electronics, Jake Landrum of Commco (not pictured), Rex Porter of Times Wire Cable, Wayne McKinney of Texas Community Antennas and Austin Coryell of Television Communications.

The re-enactment concluded with a bit of humor. "Ladies and gentleman," said the announcer, "that's how it all started 30 years ago, and how amazing is it they can still stand." How many of you were standing after Cable-Tec Expo wrapped up?

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generally concurred on the need to build today the full-service telecommunications model of tomorrow—and to do it quickly in a rapidly changing market.

"We've put our chips on digital and high-speed data," said Steve Burke, president of Comcast Cable. "We have a healthy respect for the complexity of the business."

Telephony: You make the call

With many cable operators scrambling to launch telephony services, the question of how to deal with Internet protocol (IP) telephony is among the greatest technological challenges facing the broadband industry today.

Bill Fitzgerald, executive vice president at AT&T Broadband & Internet Services, predicted that the support platforms for telephony service provisioning and customer care won't change as deploying voice over IP (VoIP) comes closer to the industry's grasp. "It behooves us today to get those components in place to support whatever technical platforms we choose to deploy tomorrow," Burke said.

"Being in the market is what's most important. The circuit-switched platform is here, and it's reliable," added Jan Peters,

CEO of MediaOne. "As IP evolves and becomes more robust and reliable, we need to look at the economics of services delivery more than anything else."

Digital video dance

The delivery of many new services over advanced digital set-tops also was a hot topic for the multiple systems operator (MSO) panel. "The muscularity of the new boxes is way ahead of the muscularity of the systems right now," said Burke, adding that it will take a few years for the systems to catch up with the set-top technology.

Barry Babcock, vice chairman of Charter Communications, was bullish on future applications for the new set-tops. "Everything you watch on TV will have VCR functionality ... and every transaction will be done on the TV," he said, predicting that the TV set will turn into the personal computer (PC) and the PC will turn into the TV set.

"Early adopters are going to drive the limits of our imaginations," added Fitzgerald.

Consolidation countdown

The CEOs generally concluded that consolidation is one of the most relevant industry trends that will work to facilitate and to expedite new services deployment. "Over time, the competitive landscape is going to become more intense," forecast Peters. "As you go through these changes, it does bring about some turmoil."

With consolidation, panel members agreed, come the challenges associated with bringing new systems into the cluster, securing system upgrades to two-way capability and integrating the systems into the clusters.

"As a consolidator, I can tell you that we're running 100 miles per hour," said Charter Communication's Babcock. "I can't imagine having a better strategic partner for this than (Microsoft co-founder) Paul Allen."

The name of the game is retain

Reflecting the maturity attained by the broadband industry over the past 30 years, the panel also agreed on the importance of technical staff and training to make the industry strong in the upcoming years. Stock-incentive plans for employees and programs to enhance the technical knowledge of personnel are either under

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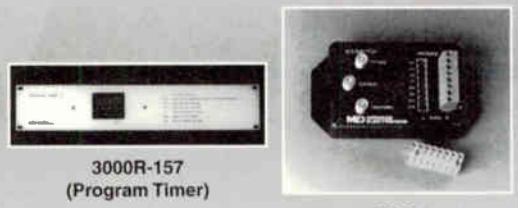

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CEOs: Stephen Burke, left, and Jan Peters

consideration or a current reality in most of the systems represented on the panel.

For the future, James Robbins, president and CEO of Cox Communications, predicted the broadband industry's expansion into uncharted markets. "We've neglected businesses because for some reason it hasn't been fashionable to go into the business environment." In the next five years, all that is bound to change, he said.

Promising Technologies: CTOs discuss risks and benefits

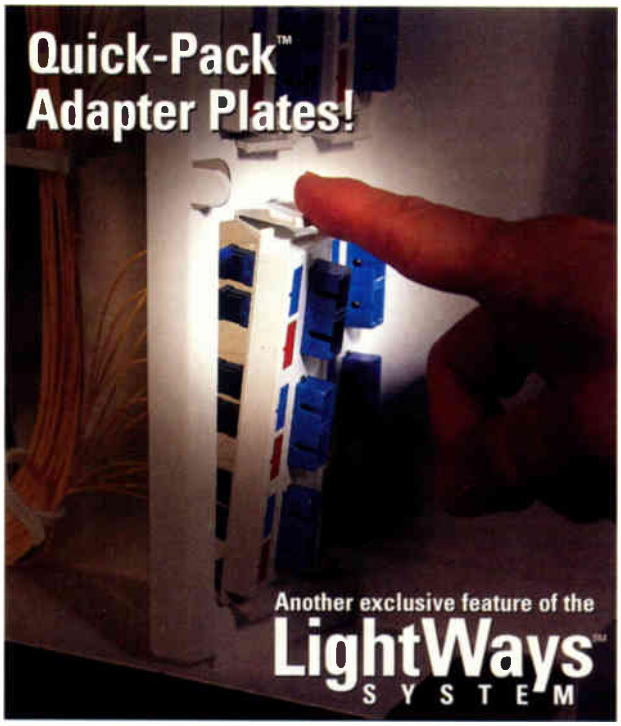
Of course, it takes more than a vision for the future to guarantee success in today's cable industry. It's up to the chief technical officers at each MSO to see that the network ultimately supports the CEO's vision.

The CTO panelists, moderated by Matt Stump of *Cable World*, discussed the network upgrades underway with a view toward future scalability and the competitive threats posed by satellite and digital subscriber line (DSL) services.

"We are going after the network upgrades and rebuilds as fast as we can, limited by people and permits," said Tony Werner, executive vice president of engineering and technical operations for AT&T Broadband and Internet Services. He added that AT&T BI&S also is focusing on "10 pilot lights" for telephony this year. "We're getting the equipment installed and the talent trained to go for aggressive deployment next year."

What's in a node?

A critical issue behind deployment of advanced services such as telephony and high-speed Internet access is ensuring that the network can scale to accommodate future demand. "The beauty and power of



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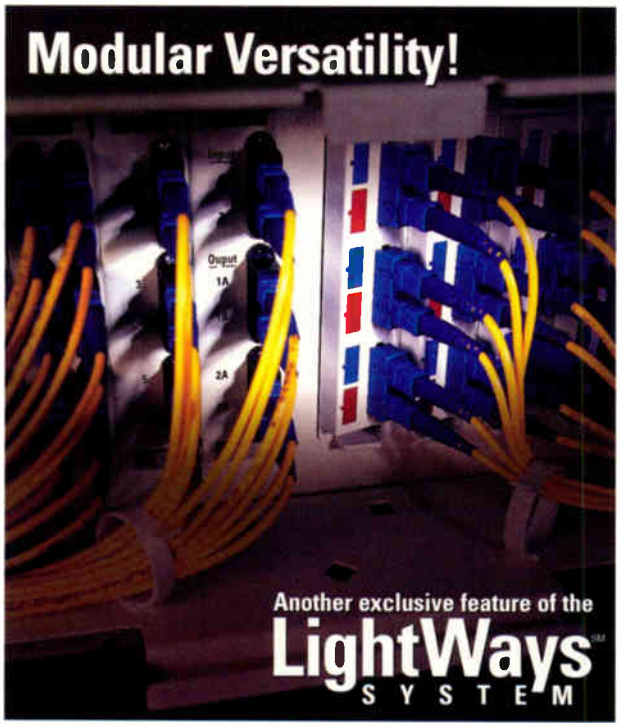

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the HFC (hybrid fiber/coax) network is that you can subdivide the nodes and reuse the bandwidth again and again," said Tom Jokerst, senior vice president of advanced technologies for Charter Communications. "If the product can scale, the networks under it can."

Right now, Cox Communications is able to meet its advanced service needs with 1,000-home nodes, reported Alex Best, Cox's senior vice president of engineering. "We feel pretty good that (with 1,000-home nodes) the network can support the new services well into the future." He added that new applications with unknown bandwidth requirements, such as streaming video, video-on-demand (VOD) and video telephony, could impact node sizes at a later date.

Werner reported that AT&T B&IS is piloting a new architecture based on a mini-node concept that would support 50-75 homes. This low-power node is small enough to fit into a splitter. The advantage of such an approach is that fiber is pushed deeper into the network, fiber counts are lower, and active components are reduced by 60 to 80 percent. "We think we'll see a two- to four-year payback on distribution, power and maintenance costs (from the new architecture)," Werner explained.

Also, Werner warned the audience that when you split a node, you need to reprovision service to all those customers. "By going to a smaller node up front, you can avoid that," he said.

Is DSL a threat?

"There is tremendous power in node subdivision. It's basically pennies on the dollar of the original upgrade costs to achieve a factor of 64 increase in bandwidth," added Bud Wonsiewicz, chief technical officer with MediaOne. "It can be done on a neighborhood-by-neighborhood basis led by revenues. This will be crucial in the battle with DSL."

What will one do with so much bandwidth? "We ought to encourage as much traffic on the network as possible and encourage higher performance," Wonsiewicz continued, "because that's our biggest advantage over DSL and satellite."

Best was more cautious on the immediate threat of DSL because of technical issues such as load coils and bridge taps on the copper plant. "Today, it's more press than reality," he said, adding that the Bells are focusing DSL offerings more on business customers than residential ones. But DSL is coming. "We need to take this seriously. We have a window of opportunity and need to keep up the pace."

Wonsiewicz cautioned the audience not to be too complacent about telcos' ability to offer DSL. "I've been a satisfied DSL customer for a year," he said, adding that he can't get cable modem service. "It's very reliable, and it's never failed. When the phone companies get their act together, they can reach 60 percent right off the bat. If they clean up their plant, they can reach 70 percent." CT

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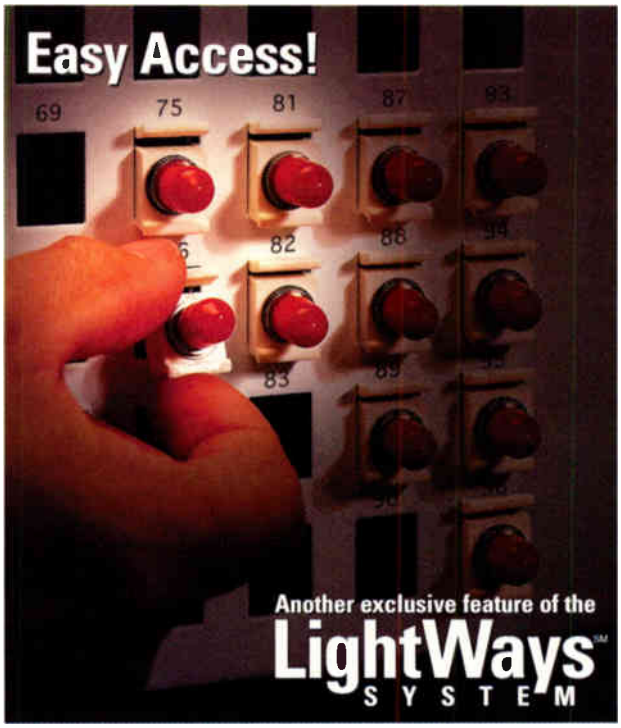

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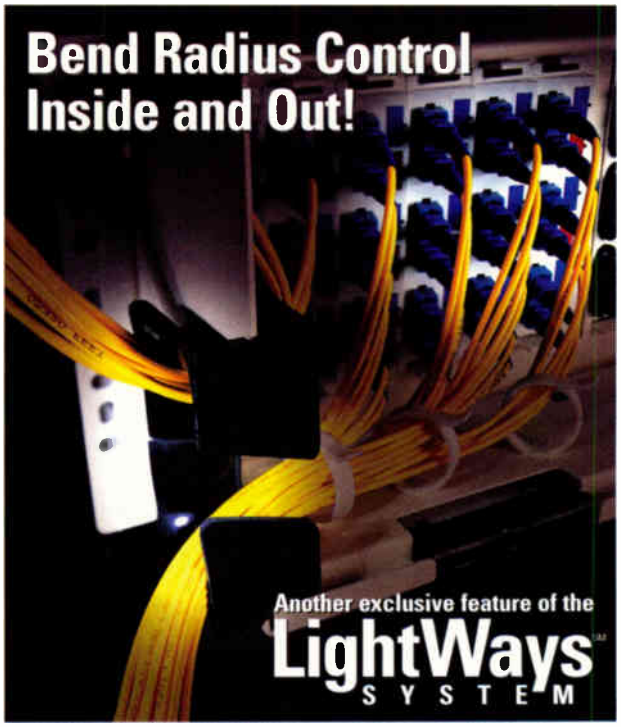

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Awards Luncheon

SCTE Honors its Best and Brightest

By Doug Larson and Jeff Baumgartner

In addition to providing plates of fine vittles, the Society of Cable Telecommunications Engineers recognized a number of the broadband industry's top professionals during its Annual Awards Luncheon.

Outgoing Chairman of the SCTE Board Hugh McCarley, left, passes the gavel to incoming Chairman Jim Kuhns.

SCTE President John Clark shared the stage with Senior Member Les Read during the award presentations. Read kicked off the ceremony by introducing Hugh McCarley, 1999 Chairman of the Board, to present the Chapter Awards, created last year to honor those members who dedicate their time and effort to the SCTE on the local level through their regional chapters.

"These volunteers are often unsung heroes," said Read before handing over the mike, "spending their valuable time administering tests for the certification programs, conducting training seminars for area telecommunications personnel and spreading the word about SCTE membership."

McCarley recognized the elevation of the Mid-Columbia Meeting Group to chapter status, a promotion that occurs only after a meeting group completes 40 hours of technical training within an 18-month period.

McCarley then presented the Chapter of the Year award, which is awarded to the group that has demonstrated innovation, commitment and leadership in efforts to achieve the SCTE mission during the preceding 12-month period, to the New England Chapter. For the second year in a row, the New England Chapter was recognized for its strong support for the Society at the local and national levels.

Torches are passed

As in years past, the SCTE Board of Directors met prior to the show to elect new officers for 1999-2000, whose offices were announced during the luncheon. ➤

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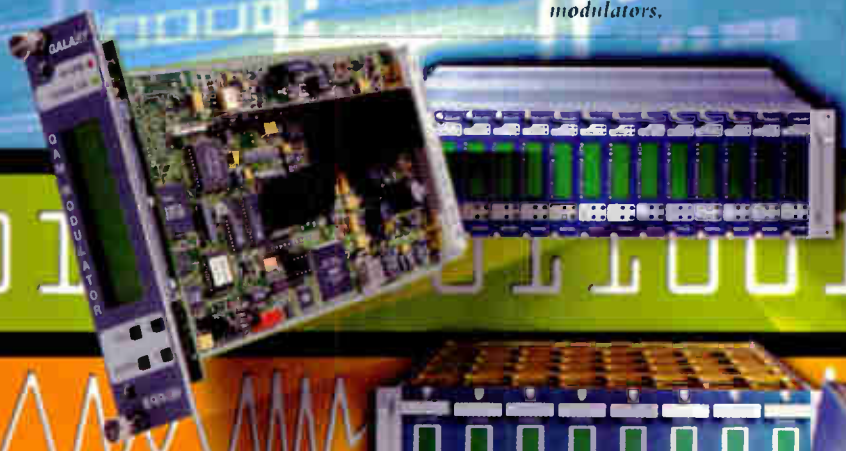

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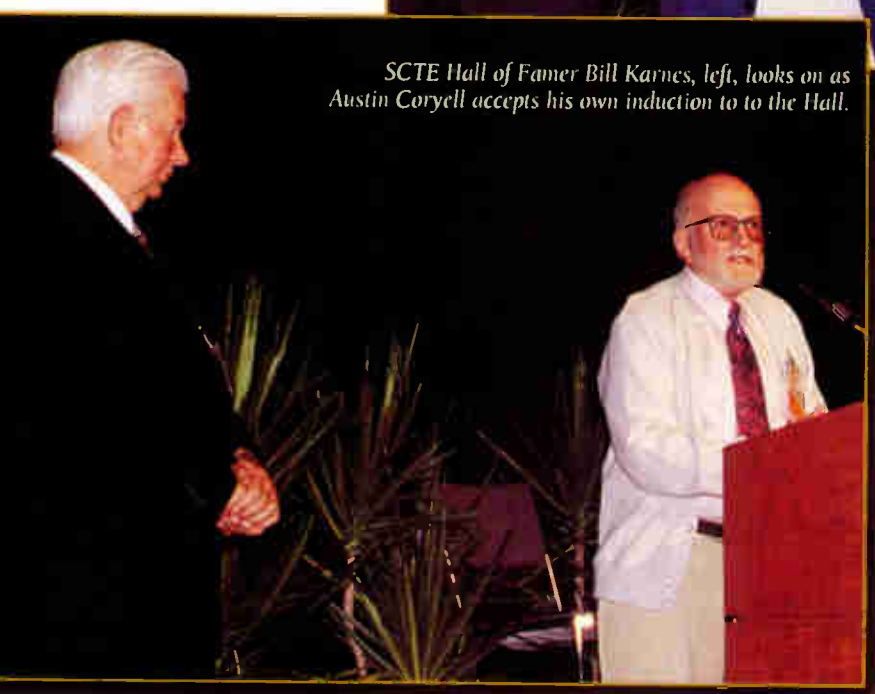
SCTE President John Clark, left, presents outgoing Chairman Hugh McCarley with a plaque-mounted gavel in recognition of his service as SCTE's 1998 Chairman of the Board.

1998 Member of the Year Keith Hayes presents the 1999 award to Antonio Huerta of Telecable for translating several SCTE publications into Spanish.



SCTE Hall of Famer Bill Karnes, left, looks on as Austin Coryell accepts his own induction to to the Hall.

For complete details on the election results, see the related story in "Pusle" on page 12.

After announcing the newly elected Board officers, Clark presented a gavel plaque to outgoing Chairman Hugh McCarley in recognition of his service to the Society. "The past year was an eventful one for SCTE," said Clark, adding that McCarley carried the Society through a changing of the guard "with dedication, diligence and flexibility."

Hall of Fame

Tom Polis, Austin Coryell, Dave Large and Wayne McKinney were inducted into the SCTE Hall of Fame, joining ranks with such luminaries as *Communications Technology*'s Rex Porter and CableLabs' Tom Elliot. Established in 1988, the award seeks to permanently recognize SCTE members who, over the years, have made extraordinary contributions to the professional development, ideals, goals and enhancement of the Society and the cable TV industry.

Safety Awards

Presented by Ray Lehr, chairman of the Safety Award Subcommittee, the annual awards were this year went to five operators. The Gold Safety Awards went to Comcast Cable of Dover, Del.; Comcast Cable of Florence, Ala.; Comcast Cable of Georgetown, Del.; and Four K Cable Services. The Gold Award is presented to operators that maintain Occupational Safety and Health Administration reportable incident levels at or below 50 percent of the industry's national rate.

Presented to companies that have an OSHAreportable incident rate at or less than 25 percent, the SCTE Silver Safety Award was conferred to Comcast Cable of Mobile, Ala.

Field Operations Award

Read made the presentations for this year's Field Operations Award. Greg McGrath of Paxton Cable TV received $500 and first place honors in this year's competition for his submission entitled "Perfect 0," which created a tool that aids installers making same-size loops in a retrofit/rebuild.

Larry Thomas of Cox Communications and Alan Bergman of Time Warner Cable placed second and third, respectively. Thomas received $300 for his entry, which described his development of a ground strap to protect against the potential shock hazard involved with telephony tap installation. Bergman, whose submission was titled "Presenting an Easy-to-Build Cable Caddy Project," won $200.

Established in 1989 for the purpose of rewarding broadband telecommunications personnel for the development of concepts, tools or procedures for improving the work performed by cable TV technicians and engineers in the field, the award has been supported by Telecrafter Products for the past six years.

If you have implemented a great operations idea, or know someone who has, be sure to let SCTE know. Send nominations for the 2000 Field Operations Award to Manager of Membership Services Paula M. Jones at (610) 363-6888 or e-mail pjones@scte.org. You have until March 1 to make your nomination.

Shapp Scholarship

Established by General Instrument, the Milton Jerrold Shapp Memorial Scholarship Fund each year awards $20,000 to a deserving high school senior. This year, the scholarship was presented to Barry Dillon-Malone from Liverpool High School in Liverpool, N.Y. Dillon-Malone, who carries a 3.79 GPA, recently won a gold medal in physics for his entry on cable TV.

Cox honored for service

The Annual Awards Luncheon also recognized Cox Communications, which received the 10th annual Service in Technology Award for its outstanding service in furthering the goals and ideals of the broadband industry. Annual honorees are selected by *Communications Technology* magazine, and a donation is made to SCTE's scholarship fund in the name of the recipient. Paul Levine, founder and senior publisher of *Communications Technology*, made the presentation to Alex Best, Cox's senior vice president of engineering.

"Cox Communications is helping the broadband consumer realize the amazing potential of the truly interactive, high-capacity broadband system," said Levine, who also cited Cox as a leader in the deployment of new technologies over the cable industry's broadband infrastructure.

Cox offers digital TV, telephony and high-speed data services to thousands of customers across the nation, and it does so with some of the highest levels of customer service in the industry. Cox has won a top rating in J.D. Power & Associates' customer satisfaction survey in 1996, 1997 and 1998.

Chairman's Award

Presented to Fred Kaiser and Kevin Eicher of Alpha Technologies, the Chairman's Award recognizes the outstanding effort of either a company, organization or individual who has given exceptional support the Society during the current chairman's administration.

"Their entrepreneurial spirit in working with the many operators across the country certainly qualifies them for this award," said McCarley, who made the presentation. "Their entire organization has strongly committed to generator-driven power supplies at the request of operators for the introduction of new

Above: Outgoing Chairman Hugh McCarley, left, presents the Chairman's Award to Kevin Eicher, center, and Fred Kaiser of Alpha Technologies in recognition of Alpha's strong support of the SCTE during McCarley's tenure.

Left: Ray Lehr, director of safety for TCI Communications and outgoing chairman of SCTE's Safety Committee, presents the Gold Safety Award to Comcast's Bill King, technical operations manager for Dover, Del. (right)

Paul Levine, left, presents Alex Best of Cox Communications with a donation check for the SCTE Scholarship fund in Cox's name.

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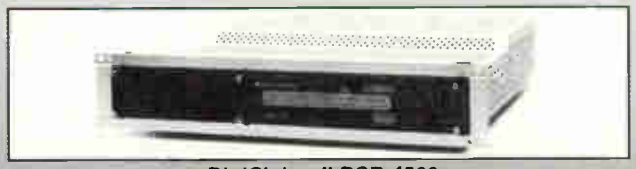

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services to our customers as we roll out high-speed data, voice and enhanced video services across the country." McCarley added that Alpha has joined with cable TV operators as a partner rather than a vendor.

Member of the Year

The coveted Member of the Year award was presented to Martin Antonio Huerta for his unselfish dedication to the Society. "His enthusiasm for his work, the SCTE and the telecommunications industry is unsurpassed," said Hayes, the 1998 Member of the Year award recipient.

> "This year's Member of the Year is helping the Society stay in front of telecommunications industry trends." —Keith Hayes, speaking of Martin Antonio Huerta

Since translating Ken Simons' book, *Identifying Picture Problems*, into Spanish in 1994, Huerta has translated the SCTE *Installer Certification Manual* and currently is working on a translation of William Grant's *Cable Television*, one of the SCTE's best-selling training books. Huerta has never asked the Society for compensation for his time-consuming work.

"This year's Member of the Year is helping the Society stay in front of telecommunications industry trends," said Hayes, adding that Hispanics are the second-fastest growing ethnic group in the nation. CT

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Broadband's Acceleration into Hyper-Reality

By the *CT* Editorial Staff

Before Expo could even get off the ground, droves of engineers landed, storming Orlando's Convention Center for preconference seminars exploring Internet protocol (IP) and advancements in multiplexing technology.

Soon the prelude was over, and Expo '99 launched in full force with an arsenal of workshops that gave more than a few weary broadband explorers a chance to get off their feet and delve into the heart of the cable telecommunications industry's future.

Cable takes on future with IP

IP may be even hotter than Orlando's tropical climate. Famed consultant Walt Ciciora reinforced that notion in his preconference tutorial addressing IP's emerging role in broadband's quest for advanced services deployment.

Internet access via cable modems, voice over IP (VoIP), full telephony service capability and ancillary telephony are some of the emerging IP-based services that will have an immense impact on the Internet's continuing evolution, he said.

"The Internet is changing. Now is an important time to be adding to your skill set," explained Ciciora. "SCTE is your key to all of this." Various materials and training offered by the Society of Cable Telecommunications Engineers are there to help. "It's a critical tool for keeping up with this new world."

Cable's brave new world is one of change, said Ciciora. The Internet and inexpensive personal computers (PCs) have culturally influenced consumers to demand more speed and advanced services from telecommunications providers.

According to Ciciora, cable's information age has been disappointing. There have been many failures and some potentially embarrassing situations for the industry, posing challenges to cable operators, and it is certain that there are more to come.

Boost capacity with DWDM

"Fundamentals of Dense Wavelength Division Multiplexing for CATV," explored the use of DWDM in cable TV networks. Presented by Wes Simpson, director of product management for ADC Telecommunications, the tutorial included a review of fiber-optic physics and examined some proposed architectures.

While engineers have two choices when it comes to designing a DWDM system, Simpson suggested using a mutliplexer/demultiplexer instead of a combiner/splitter. "It is important to see that with this transport system, the DWDM multiplexer and demultiplexer gives you a lot more power

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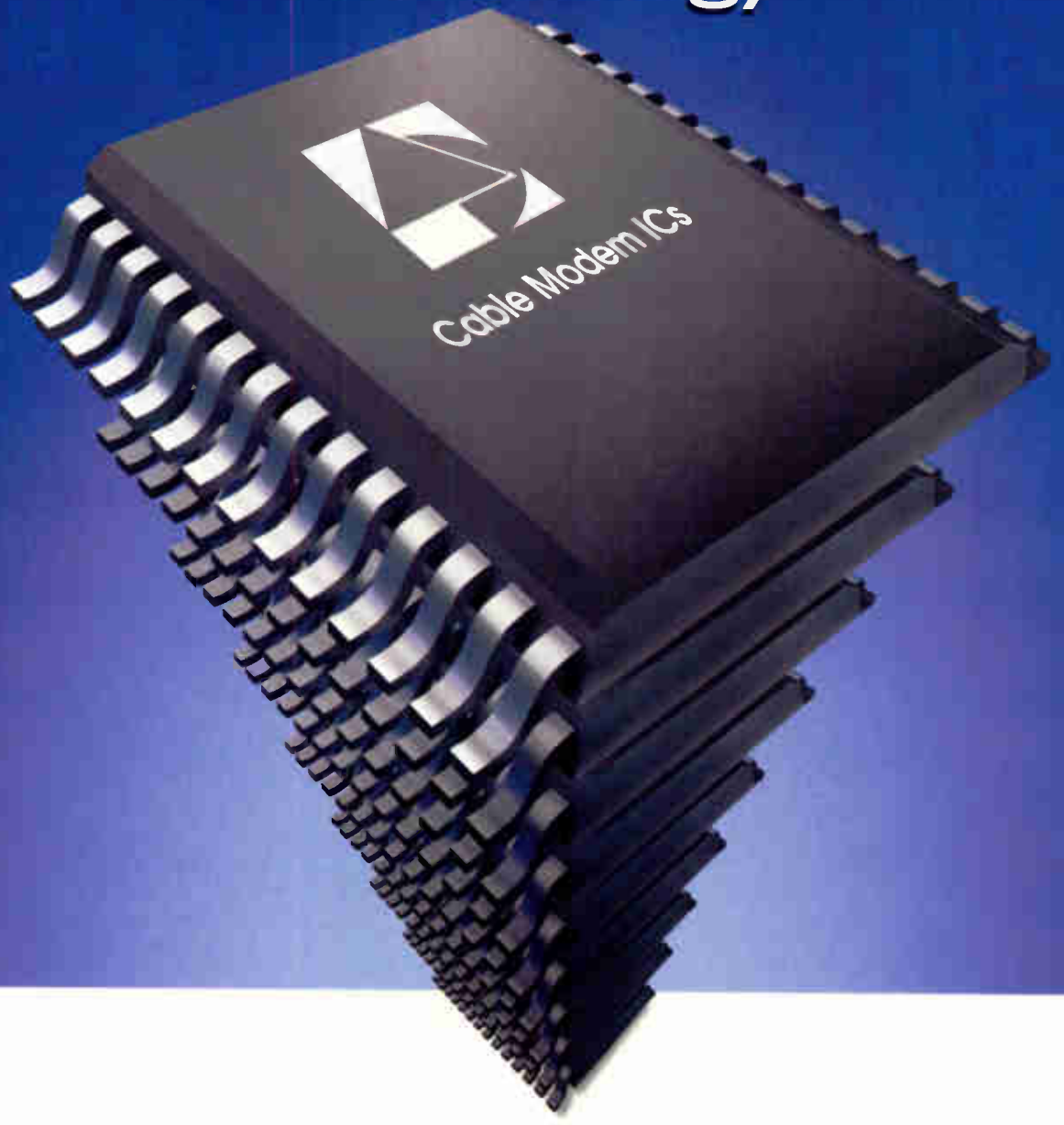

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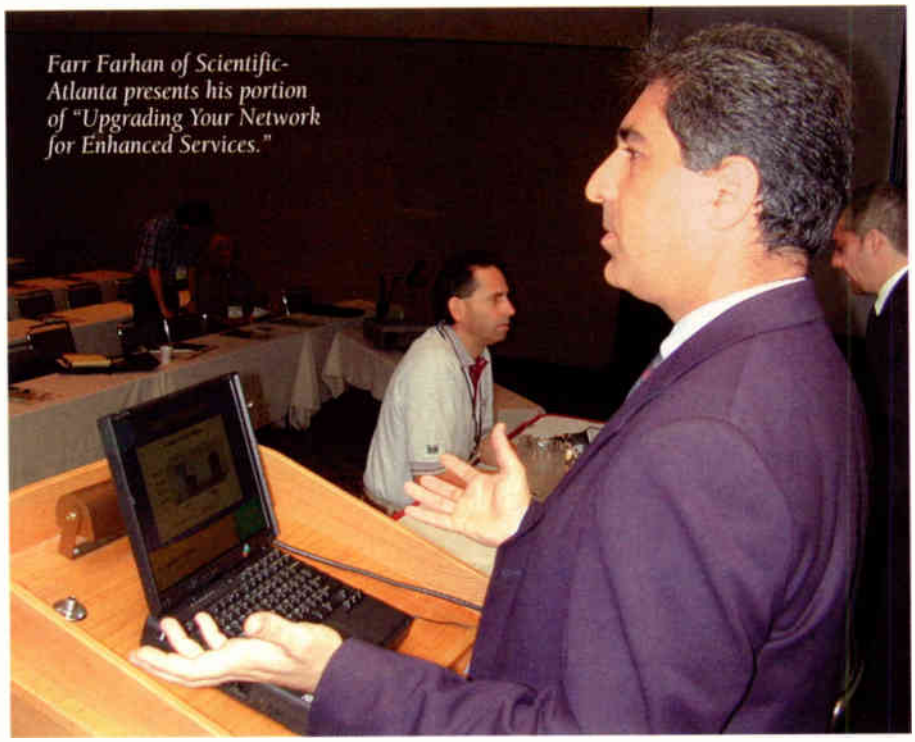
Reader Service Number 34

available at the output."

Simpson warned of some potential problems in DWDM systems, including linear crosstalk, stimulated Brillouin scattering (SBS) and four wave mixing (FWM). Simpson suggested a filter solution for linear crosstalk, which rears its head during the channel selection process.

Simpson concluded DWDM currently is being used for a number of applications, and among its transport advantages is the ability of any wavelength to carry any protocol.



Farr Farhan of Scientific-Atlanta presents his portion of "Upgrading Your Network for Enhanced Services."

Mission: Deploy digital video

"Digital Video Deployment" covered a lot of ground in a little time. Presenters included Virgil Urquhart, director of technical launch services, HITS for AT&T Broadband and Internet Services; Vince Pombo, vice president of engineering, Time Warner Cable of New York City; and Paul Snopko, director of research and development at Zenith Electronics.

Noise remains perhaps the greatest challenge to having an active return path, Urquhart said. "If you've got amplifiers, you've got residual noise," he said. From there, he covered suggestions for activation, troubleshooting and maintenance of the pesky path.

Urquhart also warned attendees about what he called "the great myth" that RF solves nonresponding terminal issues. "Although moving to RF return will stop many definable problems caused by customers, such as disconnecting the phone line from the terminal, in many cases it merely causes a shift in focus to other issues."

Still, he predicted that most operators will soon be using RF return. Effort now to discern what new challenges will come into play can save time and money when RF replaces telco return, he said. "If you've got a return path, using RF makes common sense."

Pombo concluded that it's probably not a good idea for operators to set out for a short-term solution until the long term has been considered. The bandwidth requirements could cause strain on the system and headaches for its engineers.

Snopko delved into consumer interface issues associated with digital TV (DTV) and high definition TV (HDTV) cable carriage. "There's a lot going on with interfaces right now," he concluded.

Mark O'Brien of TeraLogic and Paul Zimmerman of CableLabs talk with an attendee after the OpenCable workshop.

Demystifying DOCSIS

MediaOne Labs engineers Doug Jones and Pak Siripunkaw conducted an Expo workshop to set the record straight; the Data Over Cable Service Interface Specification (DOCSIS) is no longer a technological mystery wrapped in a specifications riddle.

Essentially, Jones said, DOCSIS is all about opening the retail channels for cable modems and spurring competition among cable modem vendors. At the same time, enabling cable modem retail availability for consumers, he said, should help cable operators lighten their overhead.

As of press time, five cable modem vendors have already gained the coveted DOCSIS interoperability seal (Toshiba, Thomson, 3-Com, General Instrument and Arris) for the specification's 1.0 version. Currently, there are 14 additional cable modems being tested at CableLabs. ➤

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explained. By moving to a digital scheme, operators avoid that scenario.

Broadband network integration: A recipe for success

Assembling a broadband network isn't like pouring Cornflakes into a bowl, dousing it with milk and then calling it a done deal. Rather, it's an elaborate recipe that calls for the correct portions and the right ingredients.

In essence, it's all about planning, explains Internetwork Integration President James Ludington, who conducted a broadband network workshop at the show. Moreover, it's about business planning.

"Building a broadband network is a philosophy," Ludington explained. "It's a decision a company makes, not a solution. You have to install a specific business strategy because all of your businesses, not just your technology, are managed by this network."

Part of that strategy begins with developing the integration process. From there, he suggests that companies create a step-by-step approach to the integration process and involve all facets of the business, including the engineering and technology, operations, information technology (IT), and marketing departments.

Then, during the execution stage of the project, Ludington recommends that companies keep a detailed analysis of the network's functionality. This analysis includes performing tests, comparing specifications and expected performance, constant reviewing of documentation and results, and maintaining a database that logs and tracks the project's history.

Cable telephony deployment

Ham Matthews, director of IP business development for ADC Telecommunications, and Thomas Sloane, vice president of corporate technology for Alpha Technologies, addressed a packed house for their cable telephony seminar.

"The path from circuit-switched to IP telephony over HFC networks is full of pitfalls and distractions," Matthews said. "Standards development and implementation have been slow and tedious."

"Standards aren't the only obstacles the industry faces in deploying IP telephony," he said, adding that a service rollout is more like "putting on a parachute while falling through the sky" than "adding another channel to a crowded lineup."

The emergence of primary lifeline IP telephony services over HFC fills an obvious need in the industry, he said. Now, "vendors are once again scrambling" to stay on top of market needs.

Sloane and Cox Communications' Hugh McCarley charged into HFC powering issues and recommended curbside engine-generators (E-Gs) with a one-hour standby period for legacy power installations that support telephony.

The E-G, they agreed, offers a more convenient and reliable method of upgrading standby times. In HFC systems especially, the E-G can't be beat, Sloane said, especially not by the expensive, weather-vulnerable batteries typically used in the industry. CT

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Reader Service Number 39

fun in the Sun, Cable-Style

The Exhibit Floor

The Ultimate Engineering Buffet

By the *CT* Editorial Staff

If you came to Cable-Tec Expo '99 hungry for new products and solutions to make your system run more smoothly and your job easier, you most likely loosened your belt a couple notches before leaving the show floor.

With 387 exhibiting companies, this year's Expo appeared to satisfy even the pickiest of eaters. Here's a peek at just a few of the products whetting appetites on the floor.

Some notable entrees

The Alpha Technologies booth included some new powering products that Eric Wentz, Alpha's director of marketing, said were a response to the new reliability requirements of lifeline telephony services. About 80 percent of the products that were on display were developed within the past 18 months, said Wentz, including its CESC-3X Powernode for unlimited backup power.

ADC demonstrated Internet protocol (IP) telephony calls using a development prototype IP integrated service unit (ISU). Ham Matthews, ADC director of IP business development, explained that the IP ISU will include many of the functions of a Data Over Cable Service Interface Specification (DOCSIS) 1.1 cable modem and will allow a user to use a standard phone to make an IP telephony call.

Cable Innovations introduced a line of fuseless passives, which remove a potential weak link in the cable TV powering chain.

Raychem demonstrated its new TCS2 heat-shrinkable cable sleeve that insulates, seals and protects underground and aerial connections.

CommScope showed off a new series of corrosion-resistant drop cable called Bright Wire.

Hewlett-Packard provided a sneak preview of its new cable TV spectrum analyzer based on its L1500 series, which will be available for delivery this month.

Matrix demonstrated its new Model ASX-16-QAM (quadrature amplitude modulation) 256-QAM generator. This device can generate continuous wave (CW) carriers, plus AM, quadrature phase shift keying (QPSK), and 4-QAM through 256-QAM modulated test signals.

Philips Broadband Networks' sprawling exhibit included interactive set-top box solutions, POD/NRSS-B type removable conditional access (CA) technology, and an MPEG-2 splicer called StreamCutter for standard definition TV (SDTV) and high definition TV (HDTV) switching applications.

Scientific-Atlanta introduced its "baseband digital reverse" family of products that provide a way to digitize the entire 5-40 MHz reverse spectrum at the node and, using time division multiplexing (TDM), combine that with three other digitized 5-40 MHz signal paths for transmission back to the headend on one fiber.

HSA Corp. demonstrated operating DOCSIS technology, including cable modem Internet access, voice over IP (VoIP) and video.

Broadband Access Systems demonstrated its Cuda 12000 14-slot, carrier-class IP switch designed from the ground up to support delivery of IP-based data, telephony and video services.

3Com shows off the goods

3Com unveiled its Bandwidth Manager quality of service (QoS) kit at Expo, touting it as the "cable industry's first ready-to use" QoS system that utilizes existing cable access router and upstream receiver cards within the 3Com cable modem termination system (CMTS) in combination with the EdgeServer integrated NT server card.

"What we're able to do is actually limit the

Roger Cunningham of Cox shows off the C-note he received as part of a "CT" promotion.

Vela Broadcast demonstrated Y2K compliance with their emergency alert equipment to representatives from major system operators, including Time Warner Cable, AT&T Broadband and Internet Services and Comcast. The SCTE Standards Department and its EAS Subcommittee organized the demonstration.

"All vendors successfully demonstrated Y2K compliance," commented EAS Subcommittee Chairman Steve Johnson of Time Warner Cable. "The demonstration was well-received by 100 attendees, and the operators were pleased that SCTE provided a forum for one demonstration that would satisfy all interested parties."

"I was highly pleased with the outcome of this public event," stated National Cable Television Association Director of Engineering Andy Scott.

For the bookworms

The SCTE bookstore featured more than 60 items and included a number of book signings. Walt Ciciora, Ph.D., Jim Farmer and Dave Large were on hand to sign their highly acclaimed 873-page tome, *Modern Cable Television Technology*. Also signing away were Jim Kuhns, Steven Biro, Jay Junkus, Dean Stoneback, Jeffrey Thomas and Francis Edgington.

Giveaways

In addition to handing out $100 bills on the show floor, *Communications Technology* magazine also awarded two $1,000 Grand Prizes to Eric Hall, regional sales engineer for Comcast Network Services, and Larry Sayre, a regional training and development manager for Time Warner Cable, in its annual Deployment Professional drawings. CT

Justin Junkus, Jeff Baumgartner, Greta Durr, Ron Hendrickson, Doug Larson and Jennifer Whalen contributed to this report.

"The top eight cable operators have gone digital."

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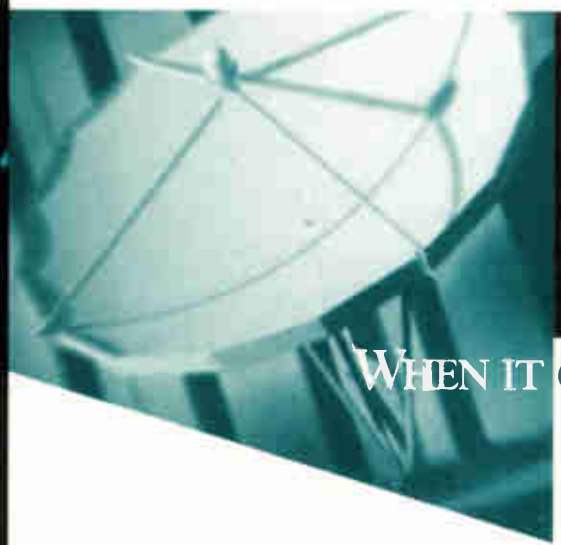

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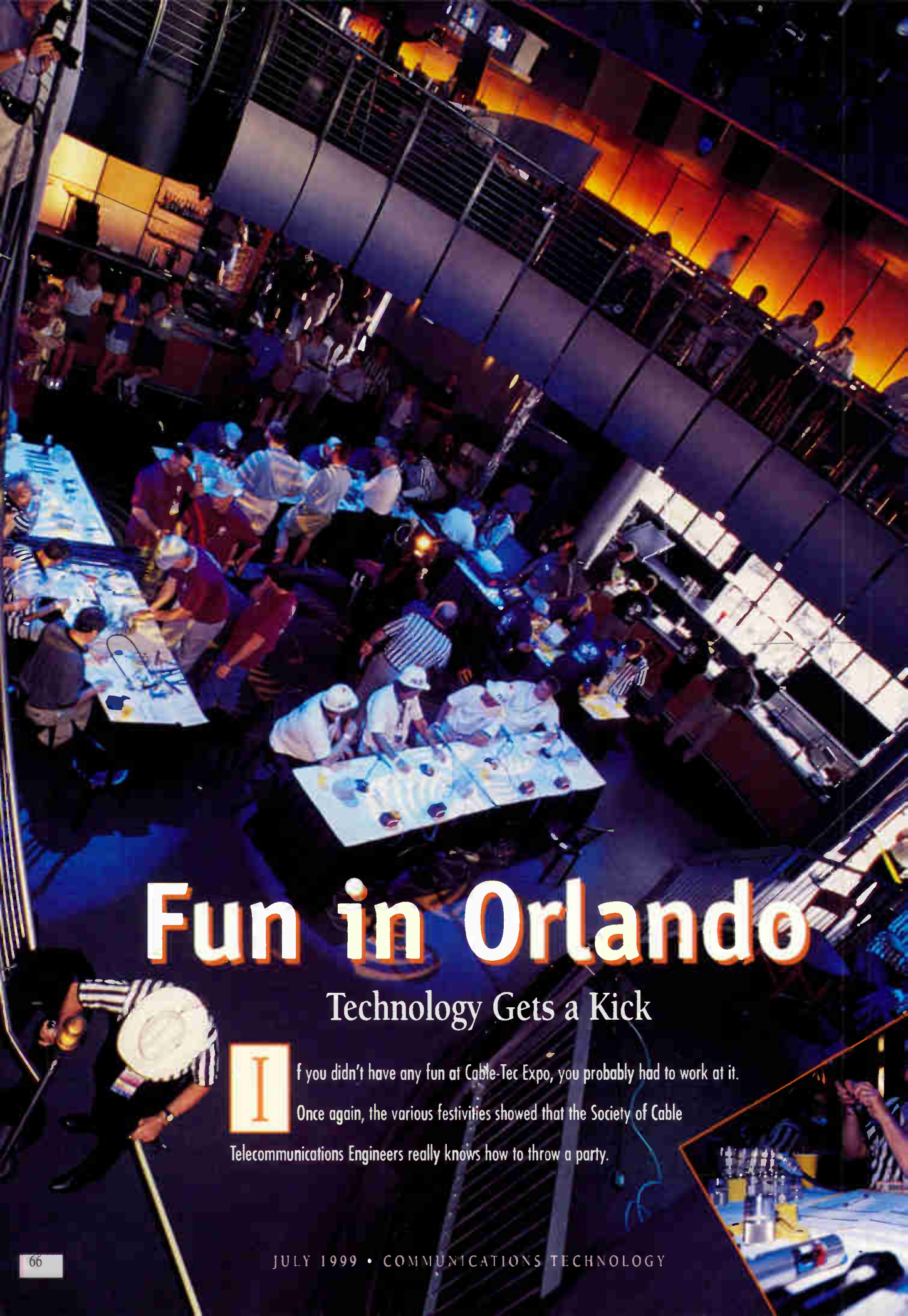


Fun in Orlando

Technology Gets a Kick

If you didn't have any fun at Cable-Tec Expo, you probably had to work at it. Once again, the various festivities showed that the Society of Cable Telecommunications Engineers really knows how to throw a party.

fun in the Sun, Cable-Style

Stranded on pleasure's isle

Sponsored this year by Antec, CommScope, General Instrument, Philips Broadband Networks and Scientific-Atlanta, Expo Evening proved once again to be a cultural extravaganza representing everything the cable TV industry stands for.

Beer flowed, cans shook and skillets stayed hot all night at Walt Disney World's Pleasure Island party spot for Mouseketeers of a more advanced chronology.

Entertainment included a variety of dancers, but the show really stopped when SCTE President John Clark brandished a large knife on stage and cut an even larger cake celebrating the Society's 30th year of cable industry achievement. The SCTE birthday fest was really topped off by Pleasure Island's simulated New Year's Eve celebration, during which more than a few of cable's finest got kissed, a moment that was truly best punctuated with fireworks.

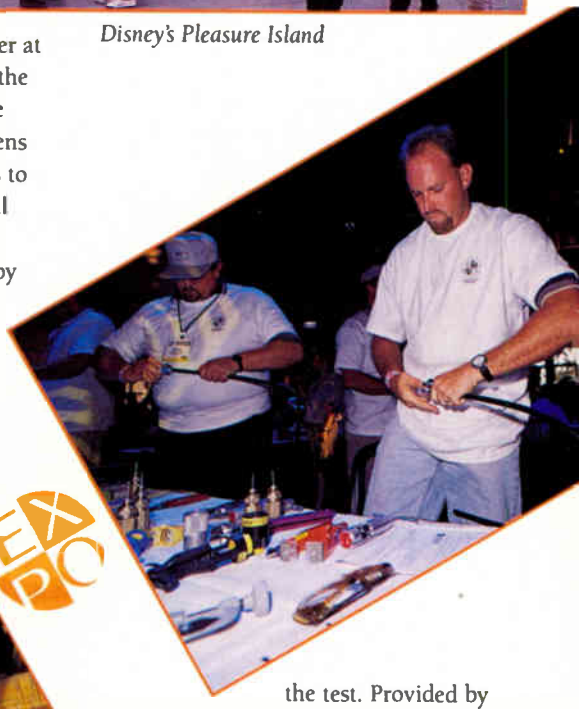
Disney's Pleasure Island

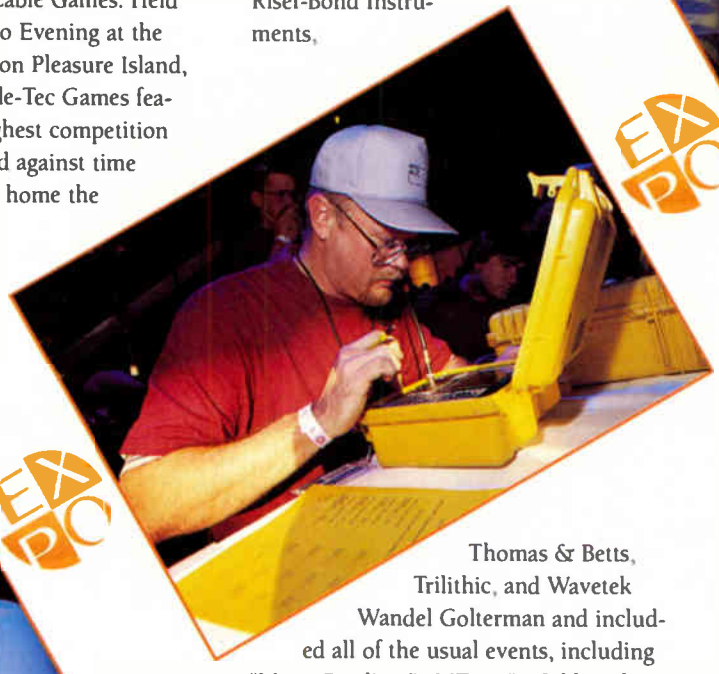
Cable-Tec Games test wits, skill

It may not matter whether you win or lose, but don't tell that to any of the contestants in this year's Cable Games. Held concurrently with Expo Evening at the BET Soundstage Club on Pleasure Island, the Ninth Annual Cable-Tec Games featured some of the toughest competition yet as contestants raced against time and their peers to take home the gold.

"The competition gets harder and harder every year," said Woody Cash, overall winner at the 1997 Games. First introduced by the Rocky Mountain Chapter in 1989, the Cable-Tec Games each year draw dozens of cable TV technicians and engineers to test their industry knowledge and skill against their peers.

This year's Games were sponsored by Gilbert Engineering, JCA Technology Group, National Cable Television Institute, Riser-Bond Instruments, Thomas & Betts, Trilithic, and Wavetek Wandel Golterman and included all of the usual events, including "Meter Reading," "MTDR," "Cable Splicing," and "Cable Jeopardy."





By CT's Editorial Staff

Hosted by Alex Trebek impersonators Steve Allen and Diana Riley of JCA Technology Group, "Cable Jeopardy" once again put contestants' cable knowledge to the test. Provided by the NCTI, the questions covered the cable gamut, from regulatory issues to signal level testing to proper connector fitting. The competition included seven teams, including an SCTE board member crew comprised of Don Shackelford of Time Warner, Wes Burton of MediaOne, Jim Kuhns of Terayon and Steve Johnson of Bresnan. When it was all said and done, Bill Dennis of TCI took home the honors of "Cable Jeopardy" champion.

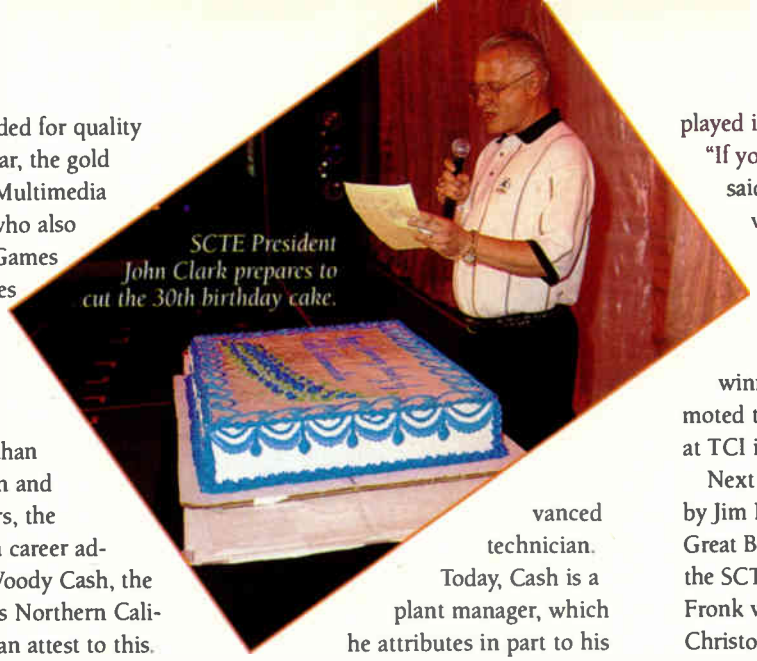
The competition also included "Cable Splicing," an event created by Gilbert Engineering, which requires competitors to prepare both ends of a 0.500 cable and connectorize one end with a 0.500 pin

connector. Points are awarded for quality and workmanship. This year, the gold went to Dennis Majors of Multimedia Cable in Edmond, Okla., who also was overall winner at the Games and received an all-expenses paid trip to next year's Expo in Las Vegas.

When the dust settled after this year's Games, the winners took home more than prizes, personal satisfaction and peer respect. Over the years, the Games have evolved into a career advancement tool of sorts. Woody Cash, the overall winner at this year's Northern California Cable-Tec Games, can attest to this.

"It's a hell of a lot of fun," said Cash, "and that's the main thing. But it does give you a lot of notoriety as well. It puts you in people's minds. Everyone knows who you are around this small industry, and people start to recognize you: 'Oh, you're the cable guy!'"

When Cash first won at the national Cable-Tec Games in 1997, he was an advanced technician. Today, Cash is a plant manager, which he attributes in part to his success in the Games. "You definitely gain the respect of your peers and employer," said Cash.



SCTE President John Clark prepares to cut the 30th birthday cake.

This year's reigning champion, Doug Nolan, also shares Cash's enthusiasm for the Games. "In our local communities, you get a certain sense that it really means something to some people," said Nolan, adding that his success in the games played into a job interview he had.

"If you do well at the Cable Games," said Nolan, "it shows that you have a well-rounded understanding of cable and you're someone that's into cable and how it works—you're into it for a career."

Since being crowned overall winner in 1998, Nolan has been promoted twice and is now a project manager at TCI in Santa Cruz, Calif.

Next year, the Games will be headed up by Jim Fronk of Multimedia Cablevision in Great Bend, Kan., as the new chairman of the SCTE Cable-Tec Games Subcommittee. Fronk will fill the very large shoes of Steve Christopher, current chairman.

For the complete list of winners in this year's games, check out the sidebar on the next page.

Charter members' dinner: Roswell revisited

On Expo's second day, SCTE Charter members met for cocktails and dinner arranged by Anna Riker and hosted by

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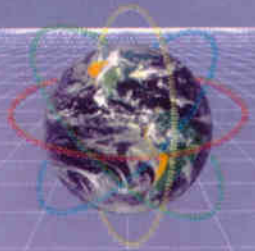

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Reader Service Number 46

Supreme Cable Athletes: The 1999 Cable-Tec Games Winner's Circle

The following were winners at this year's Annual Cable-Tec Games held at Expo Evening.

Overall Winners

- Gold Medallion: Dennis Majors, Multimedia Cable, Edmond, Okla.
- Silver Medallion: Marshall Kurschner, Harron Communications, Caseville, Mich.
- Bronze Medallion: Woody Cash, TCI, San Jose, Calif.

Cable Splicing

- Gold Medallion: Dennis Majors, Multimedia Cable, Edmond, Okla.
- Silver Medallion: Bill Dennis, TCI, Brighton, Colo.
- Bronze Medallion: Woody Cash, TCI, San Jose, Calif.

Cable Jeopardy

- Gold Medallion: Bill Dennis, TCI, Brighton, Colo.
- Silver Medallion: Dennis Majors, Multimedia Cable, Edmond, Okla.
- Bronze Medallion: Kenny Murray, TCI Cablevision, Scotts Valley, Calif.

Winners' Circle: From left, Keith Holland, Dennis Majors, Woody Cash —Photo courtesy of SCTE

MTDR

- Gold Medallion: Keith Holland, MediaOne, Pompano Beach, Fla.
- Silver Medallion: Bill Dennis, TCI, Denver, Colo.
- Bronze Medallion: Dennis Majors, Multimedia Cable, Edmond, Okla.

Meter Reading

- Gold Medallion: Richard Keys, Multimedia Cablevision, Edmond, Okla.
- Silver Medallion: Woody Cash, TCI, San Jose, Calif.
- Bronze Medallion: Marshall Kurschner, Harron Communications, Caseville, Mich.

SCTE President John Clark and his fiancée, Cynthia. Members attending were Bill Karnes, Charles Tepfer, Wayne McKinney, Rex Porter, Austin (Shorty) Coryell, Jake Landrum, Nick Olson, Allen Williams, Ron Cotten and Bob Becker.

Toward the end of the evening, Karnes asked each to speak about his early involvement in cable TV. No one seemed to have made long-range plans to stay in cable. They came into cable from such varied backgrounds as microwave, radio, television or publishing.

Amusingly, several Charter members claimed to have traveled to Roswell, N.M., and rebuilt that cable system. (Three different members seem to have kept this system in a constant rebuild mode.) A unanimous vote was taken to invite past SCTE presidents and board chairpersons to future Charter member dinners. Charter Committee Chairman Karnes presented a plaque to Tepfer in appreciation of his successful efforts to launch the Society in 1969.

What a ham!

One of the many Cable-Tec Expo traditions is the annual ham radio operators' reception. This year's party was sponsored by Scientific-Atlanta and the National

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Cable Television Institute as well as SCTE.

Annually at Expo, *CT*'s Senior Technical Editor Ron Hranac of High Speed Access Corp. joins forces with Time Warner Cable's Steve Johnson and others to rally engineering enthusiasm for the ham community; annually they use terms that outsiders might not readily understand.

"The reception features a chance for industry hams to get together for eyeball-to-eyeball 'QSOs,' swap stories about rare 'DX,' and enjoy a few snacks and beverages." explained Hranac. "As usual, the annual door prize drawing was as much fun as a hamfest."

SCTE-List goes 3-D

In keeping with a growing tradition, there was a Cable-Tec Expo closing night reception for SCTE-List members led by List master and *CT* columnist David Devereaux-Weber.

This year, the party attracted a record number of attendees, said Weber. "People stop by to get acquainted or re-acquainted and get a chance to meet face-to-face with the people whose names they know from discussions on the List. This gives us a chance to get the news behind the messages and share information about computers, e-mail programs and ways to use these resources more efficiently," Weber said.

Virtual treats were provided by Matrix Test Equipment. Drawing winners took home goodies from HSA, *CT* and more.

Loyal Order of the 704

Just as the National Cable Television Association has its own Pioneers Club, engineers have formed their own "secret society" for engineering pioneers. If you don't know what a 704 is, you may still be wondering what they all were doing behind that door.

Engineers and technicians with a minimum of 20 years experience in cable technology were exclusively invited to face fun-filled interviews conducted by Dr. Strangeleak (a.k.a. Ted Hartson) and *CT* Editor-in-Chief Rex Porter.

Thirty-seven new members were allowed to step forward, plead for admission into the Loyal Order and kiss not the traditional pink flamingo but the "stand-in" Tasmanian Devil. Membership now officially numbers 107. Inductees who admitted to having ever trashed a 704 meter were required to kneel before the 704 meter, kiss its backside and plead forgiveness before being pinned. Membership is now sufficient so that future induction will be limited and will require multiple written sponsorship.

Expo golf tournament

On Friday morning after the show floor closed, engineers and sales people found they had enough energy to meet for the Eighth Annual Expo Golf Tourney. A record turnout played the Osprey Ridge and Eagle Pines courses at Walt Disney World. At the conclusion of the event, players were treated to a luncheon, and every contestant was awarded a prize by Tony Finger and Hugh McCarley, this year's hosts. And the winners were? Why, every one of the 260 golfers who participated! CT

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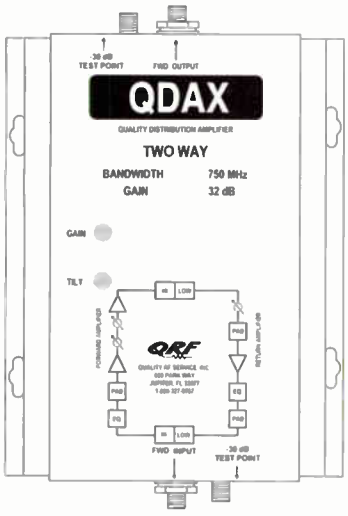

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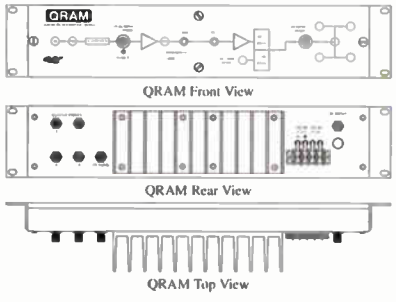

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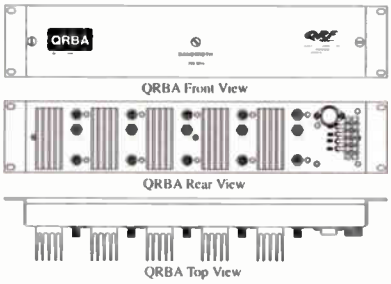

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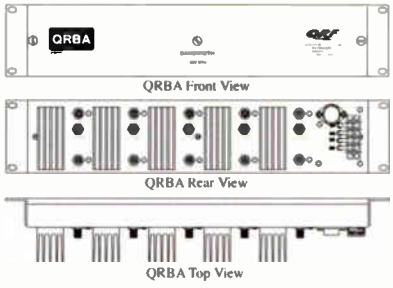

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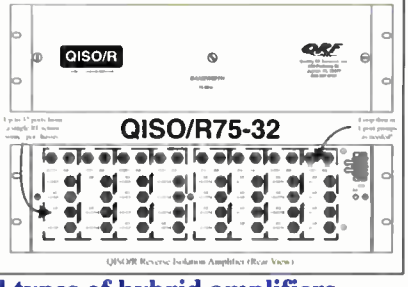

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Will Open Access BURST Cable's Pipe?

Prepare Yourself for the Fight

By Arthur Cole

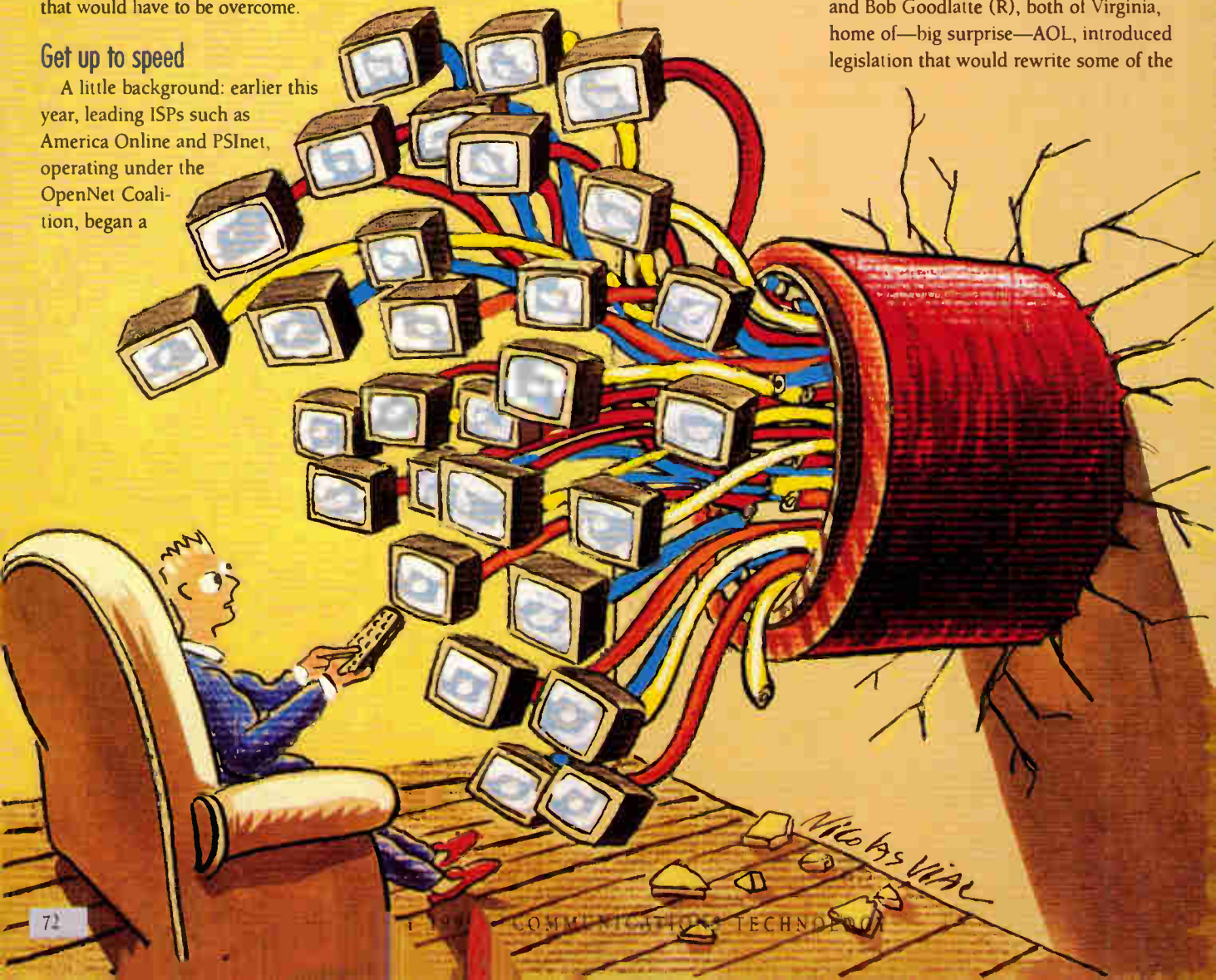
Following years of lobbying the federal government to stay out of the Internet business, major Internet service providers (ISPs) are now looking for government help in cracking open the broadband networks of private cable companies.

However, even though legislation to that effect has been introduced in Congress, it is unlikely to pass muster because of the enormous technical, legal and regulatory hurdles that would have to be overcome.

Get up to speed

A little background: earlier this year, leading ISPs such as America Online and PSInet, operating under the OpenNet Coalition, began a lobbying effort to reclassify cable-based broadband networks as common carriers. This would force cable companies to abide by the same rules as the regional Bells in that they would have to provide a direct connection to any ISP that wanted it. The movement grew largely from efforts to open up TCI's broadband networks following that company's merger with AT&T. After the Federal Communications Commission approved the merger without common carrier requirements, the group took its fight to Congress.

In May, U.S. Reps. Rick Boucher (D) and Bob Goodlatte (R), both of Virginia, home of—big surprise—AOL, introduced legislation that would rewrite some of the



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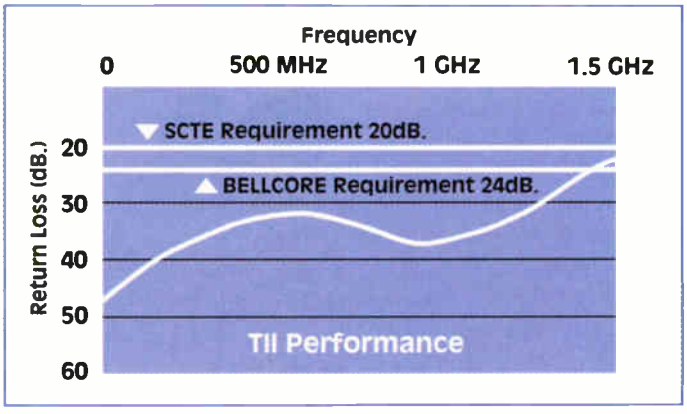

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antitrust laws, but not the common carrier rules, to forbid cable companies from selecting exclusive broadband Internet providers. Specifically, one of the bills would block AT&T's exclusive use of @Home Corp. as its broadband provider.

With the deregulatory climate in Washington, D.C., these days, it seems unlikely the ISP lobby will be able to convince Congress that the broadband industry should be hit with potentially investment-killing regulation. But that doesn't mean leaders of the cable broadband industry should breathe easy.

"People are paying attention to it because it's a well-funded lobbying effort,

FCC: Watch and See

So what does the Federal Communications Commission think about cable's ability to monopolize the broadband market? Right now, it's not too worried about it.

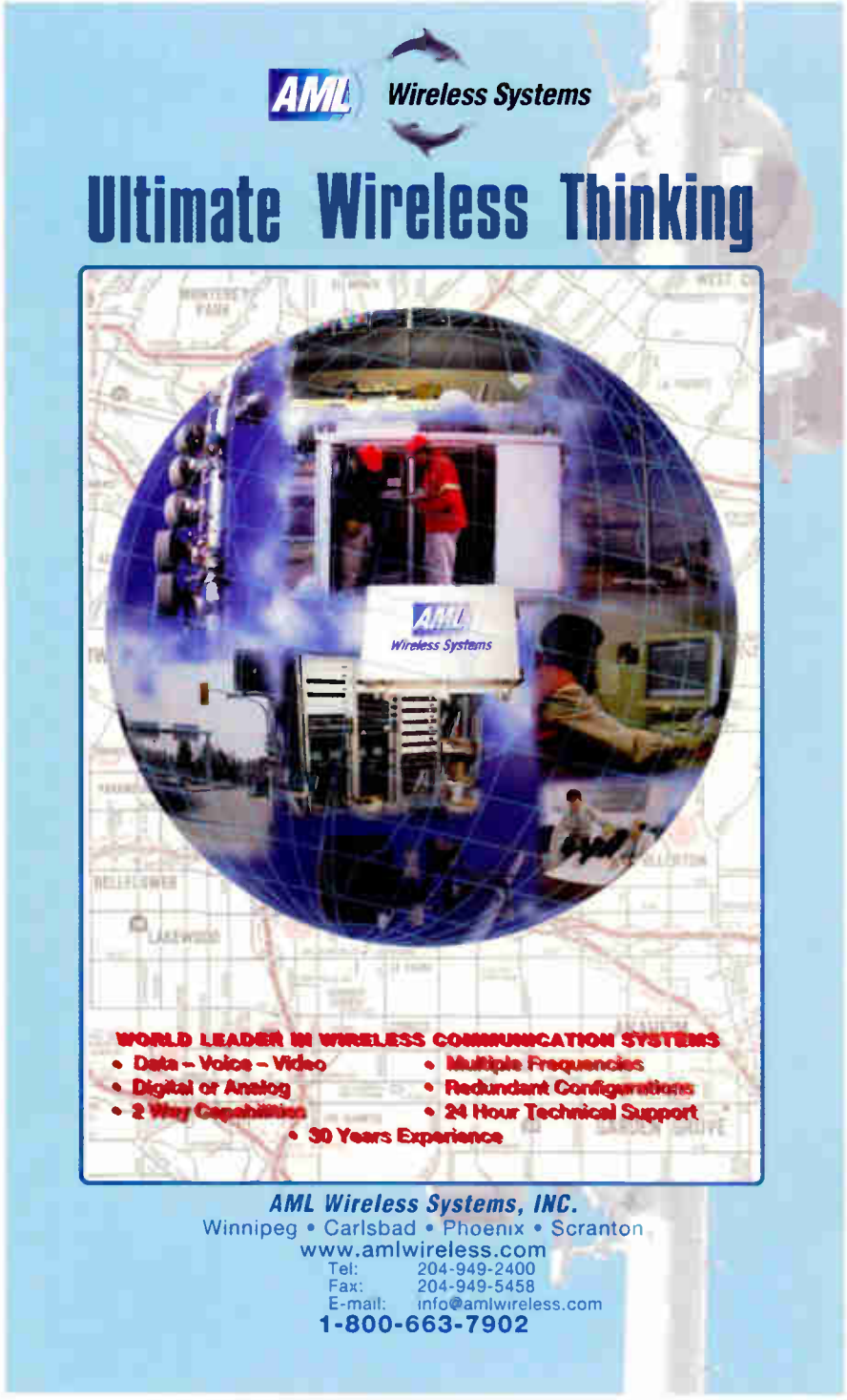
The Commission rejected pleas from the Internet service provider (ISP) lobby to open AT&T's newly acquired broadband systems to other providers than @Home and appears to be willing to let the market evolve a little before deciding whether to give it a tweak.

"What you want is a competitive market that encourages investment," said Stagg Newman, chief of the FCC's New Technology Development Division. "When we looked at the market, we saw that less than 1 percent of the population has broadband access now."

Newman identified four questions that need to be answered before deciding whether regulation is necessary:

- Will there be enough broadband suppliers so that market forces regulate the industry? If cable, digital subscriber line (DSL) and wireless providers take hold, there should be healthy competition.
- Is the technology feasible for the type of regulation the ISP lobby is asking for? This is an open question. Canada mandated open access to ISPs in 1996, but has conducted only some lab tests of the types of switching and routing systems that would be needed. Field tests still are pending.
- Is the Internet protocol that currently connects ISPs suitable for broadband? In Seattle, @Home is working with several ISPs to develop a high-speed access protocol, and the FCC is trying to encourage similar deals elsewhere.
- If the FCC or Congress decides not to regulate the industry now, how hard will it be to regulate the industry if it becomes necessary several years from now?

"We'll monitor the industry closely and encourage the parties to work this out among themselves," Newman said. "At this point, we don't see a competitive marketplace failure."



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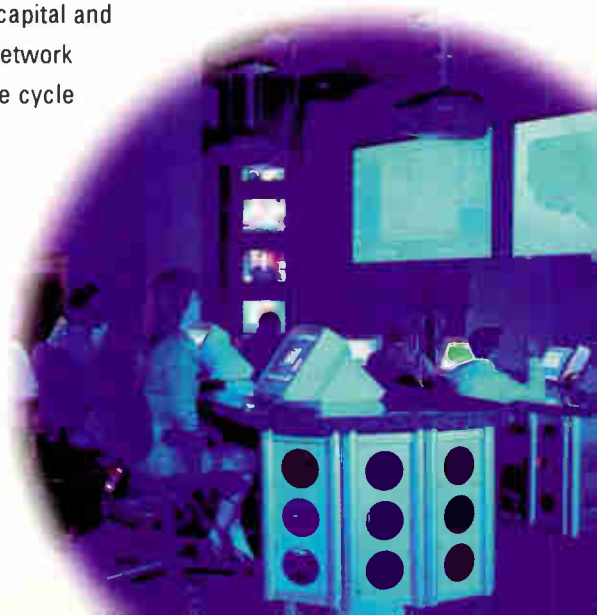

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but it doesn't make technical, regulatory or legal sense," says Jim Chiddix, vice president and chief technical officer at Time Warner Cable, backer of the RoadRunner broadband service.

Even if the federal legislation goes nowhere, it's wise to keep abreast of the arguments against regulation in case the issue crops up in your town. Local authorities have no power to override federal law, but a well-organized lobbying effort could wreak havoc with your business if local assemblies or attorneys general decide they can alter the broadband industry on some level. Time Warner recently had to brief the city of Los Angeles on the arguments against regulation after officials there began floating ideas of regulating that company's broadband services.

Technical problems

First the technical argument: The technology simply does not exist for a cable system to provide a direct connection to every ISP. As a shared network, in which users tap into a steady stream of information, cable does not devote a dedicated switch to each and every household. For ISPs to reach directly to broadband cable users, offering them a choice of providers other than RoadRunner, @Home or some other preferred provider, they will have to utilize a portion of that finite amount of bandwidth. The issue then becomes one of bandwidth allocation.

> "People are paying attention to it because it's a well-funded lobbying effort, but it doesn't make technical, regulatory or legal sense."
> — Jim Chiddix, Time Warner Cable

"Say AOL, Microsoft and @Home are sharing a network. What if @Home gobbles up more of the network, and AOL and Microsoft are not getting enough?" said Milo Medin, chief technical officer at @Home. "ISPs have to be able to turn customers on and off, service them online when there's a problem, provide ISP information back to the customer ... If you can't do that, you can't run a business. It's not just a question of where to send packets."

Could cable become a switched network? Sure, with billions of investment dollars and a reworking of the Data Over Cable Service Interface Specification (DOCSIS) standard for cable modems that was years in development. This would put cable at a tremendous disadvantage to telco digital subscriber line (DSL) rollout.

"Cable is what is driving DSL deployment," Medin said. "If you hold cable

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back, you eliminate a chief incentive for DSL deployment."

Competitive landscape

That brings us to the competition argument. The ISP coalition argues that without federal regulation, cable will hold a monopoly on broadband access. But that assumes there are no other players in the broadband market. What about DSL? What about wireless or satellite broadband?

Granted, each of these industries still is in its infancy, but so is broadband cable.

What industry definitely is not in its infancy? ISPs, which for years courted investment dollars, citing government assurances that it would not interfere until the Internet market matured and there was a clear need for regulation.

"It seems a little disingenuous," said Time Warner's Chiddix. "We have the largest net content provider in the world, AOL, complaining about our industry, which is a fraction of its size."

The regulatory environment

And if it's competition that regulation-prone legislators are worried about, the fact that DSL subscribers will be able to select from a variety of ISPs is likely to emerge as one of the chief advantages over cable.

As for ISP arguments that they will be shut out of the cable broadband market if they are not offered direct access to

BOTTOM LINE

The Argument Against Open Access

New legislation in Congress threatens to kill preferred provider arrangements for broadband services, and a movement also is afoot to have broadband services reclassified as common carriers. Clearly, this would upset the business incentive behind hybrid fiber/coax (HFC) deployment and could derail the cable broadband industry before it even gets off the ground.

But before you jump to the conclusion that this is a fight best left to the major players and the lobbyists in Washington, D.C., beware that the issue could find its way to the local community, where even small operators might have to spell out the objections to regulation.

Aside from the simple fact that it is not technologically possible to give a direct customer connection to every ISP that wants one, and the fact that any and all content on the Internet is still accessible by broadband customers, it still makes the most economic sense at the moment to allow cable to select exclusive providers of broadband service.

Not only is digital subscriber line (DSL) technology emerging as an active competitor to cable, but the entire broadband market also is still too new to come down with heavy-handed regulation that likely would kill investment in what promises to be a revolutionary development in how we all communicate.

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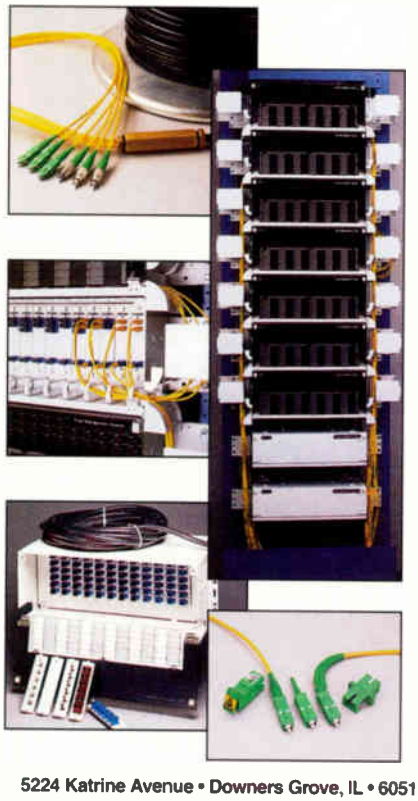

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customers, users still will be able to subscribe to AOL or any other content provider through RoadRunner or @Home if they so choose.

The issue of competition is interesting because it is cable that is feeling the squeeze from new competitors on the video side of the house. If it is to survive at all, it must branch out onto the Internet.

"If cable operators want to remain competitive, one way is to provide other services, such as cable modems, telephony and so on. The cable company is providing that service and enjoying the bulk of the profit from that service," said Ron Hranac, vice president of RF engineering at High Speed Access Corp., a provider of cable modem service. "If a competing service comes in, they get the bulk of the revenue, and the cable operator gets essentially rent."

That sort of return could cause operators, and the investment community, to seriously rethink the value of sinking more fiber into the ground.

Legal issues

Operators facing a fight on the local level also can cite existing federal law that clearly forbids classifying cable systems as common carriers as long as they are providing multichannel service. And because the U.S. Constitution forbids local regulation of interstate services, the case for local regulation has no leg to stand on.

"Is there enough support in the legislature to interfere with cable's broadband service provider arrangements?"

That leaves Congress. Is there enough support in the legislature to interfere with cable's broadband service provider arrangements? At this point it appears to be an uphill battle at best. But that's not to say the federal government can't step in at any time, especially if it feels cable dominance of the market is harming consumers' interests.

"If cable starts filtering content or blocking sites, then we're just asking for trouble," said @Home's Medin.

It behooves cable engineers to articulate clearly the technical infeasibility of open access so their company's top leaders will be prepared when overzealous regulators come to call. CT

Arthur Cole is a contributing editor to "Communications Technology."

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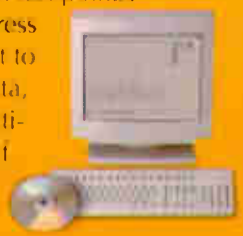

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THE Build

Training and Construction Strategies for Evolving Broadband Networks

BellSouth at Home in Atlanta

By Reed Miller

A 5-year-old dream among many an industry player is just about to become a reality.

BellSouth will exploit passive optical networking technology and fiber-to-the-home (FTTH) to furnish digital video, Internet access, digital audio and telephone services to suburban Atlanta customers.

But far, far better is this little gem: BellSouth not only will conduct a mere trial. No. No. The Atlanta-based regional carrier will deploy a service—untested and unparalleled, but still a likely sign of things to come.

"We envision leaving the (service) in Atlanta for up to a year to iron all the bugs out," said BellSouth Communications Manager John Goldman. "Then after that time, we will start installing the service in some new (neighborhood) builds. In 2001, you will get a massive deployment, going under the assumption that (fiber) cost will be down to a comparable level to copper."

The undertaking will begin as a 400-home rollout, but will invade the BellSouth region during the decade.

BellSouth will continue its 2-year-old effort to deploy asymmetrical digital subscriber line (ADSL) service, but the technology is now seen as more of a stopgap.

"ADSL is whetting the appetite of the public for more bandwidth," Goldman said. "It is a step in the evolution of fiber-to-the-home. ADSL is an interim technology for fiber-to-the-home. Fiber-to-the-home is where everything is headed. The price is coming down, until soon it will be just as cheap, if not cheaper than copper, to install.

"This is the platform for the future," Goldman added. "We have done fiber-to-the-curb (FTTC). We have done ADSL. This is the next step. There are people like Bill Gates developing applications we can't even imagine. We want to be ready for when 30 Mbps is a common demand."

Checking specs

What will make BellSouth's plan "passive" will be the use of optical splitters that require no electrical power. In this case, the protocol on the fiber will be asynchronous transfer mode (ATM).

"What ATM passive optical networking does is allow you to launch high bandwidth signals toward the customer," said Bruce Price, sales director for access products at Lucent Technologies. Equipment from the Murray Hill, N.J.-based vendor will be used to deploy FTTH.

"In this case, we send a 1,550 nm signal out toward the customers and split it using passive optical splitters. These splitters take the light and split it into many paths—32 for 32 customers," Price said.

Tokyo-based Oki Electric Industry will provide equipment to transmit signals from central offices to neighborhoods. Central office gear will be composed of optical line terminals.

BellSouth executives have not yet selected a partner to furnish the passive optical splitters.

Lucent will provide BellSouth with optical network terminals needed in homes to receive signals via fiber. A second networking unit will be required to provide video signals to TV sets.

The initial rollout is scheduled to begin in October. TB

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

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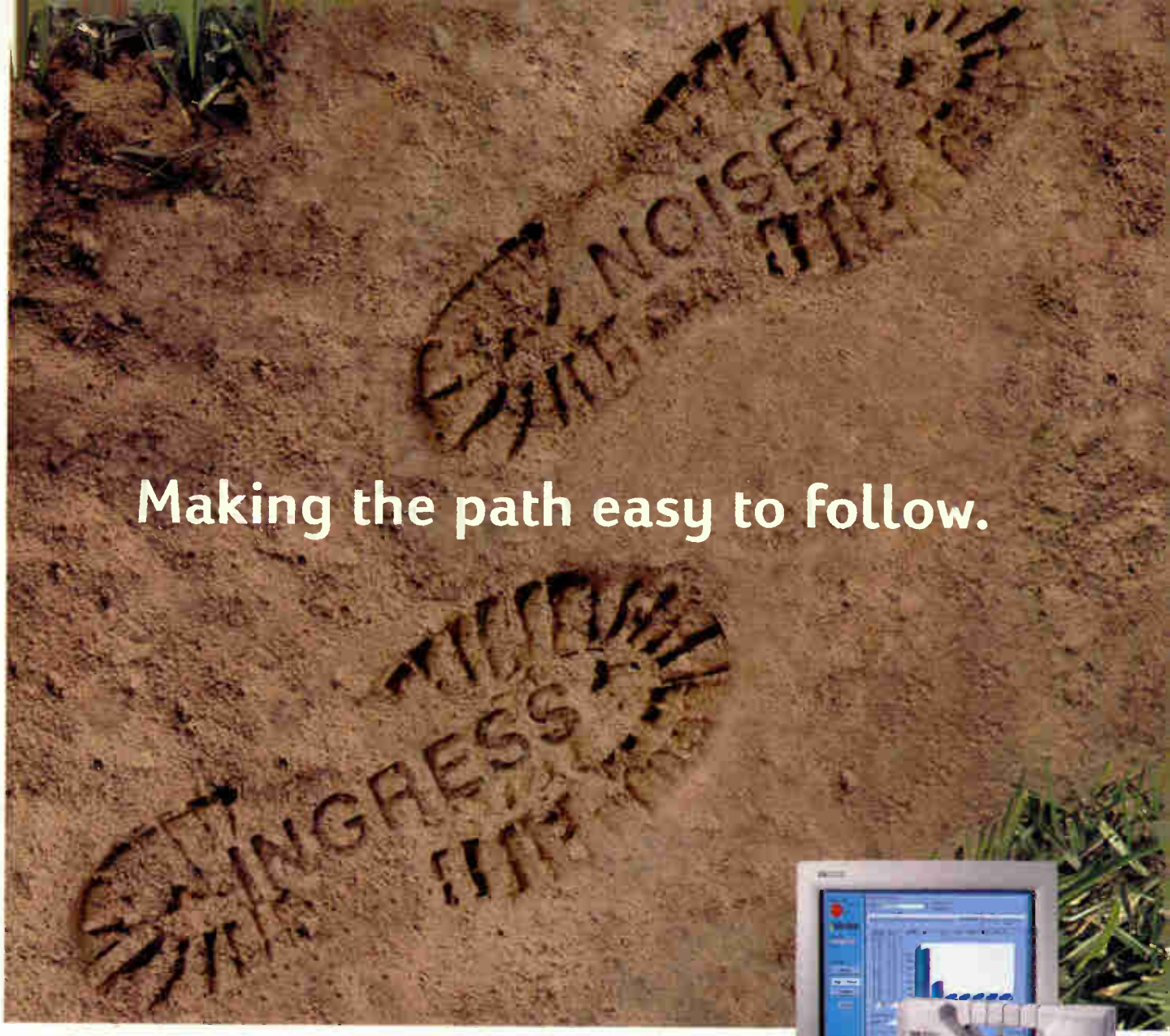

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OTDRs Do It Out-of-Band

Methods for Testing Live Fibers

By Joseph Anello, Jr.

Since its development more than 20 years ago, the optical time domain reflectometer (OTDR) has become the industry workhorse for measuring the length and loss characteristics of optical fiber. Typically, the OTDR is used to determine these characteristics at the operating wavelength when there is no traffic on the glass.

But increasingly OTDRs are being used to perform measurements on "live fibers," fibers that are carrying active traffic, by using test wavelengths that differ from the operating wavelengths. These out-of-band (OOB) measurement techniques provide significant advantages over measurements made at the operating wavelengths.

Live testing

Live fiber testing requires the use of wavelength division multiplexers (WDMs) to inject the OTDR's light pulses into the fiber and to return the reflected light to the OTDR for measurement. A WDM is a special three-port optical coupler that will combine two specific wavelengths onto a single fiber. Used in reverse, it will separate those wavelengths from a single fiber to independent outputs. This is

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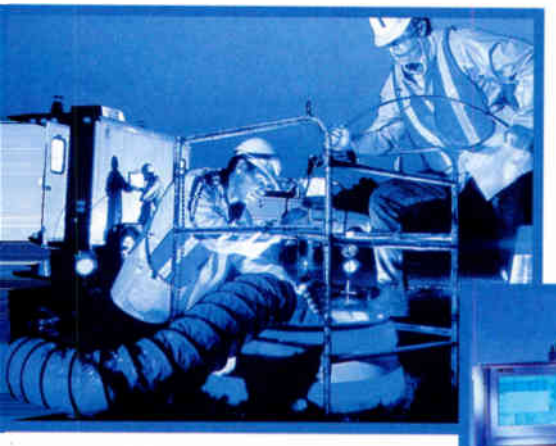

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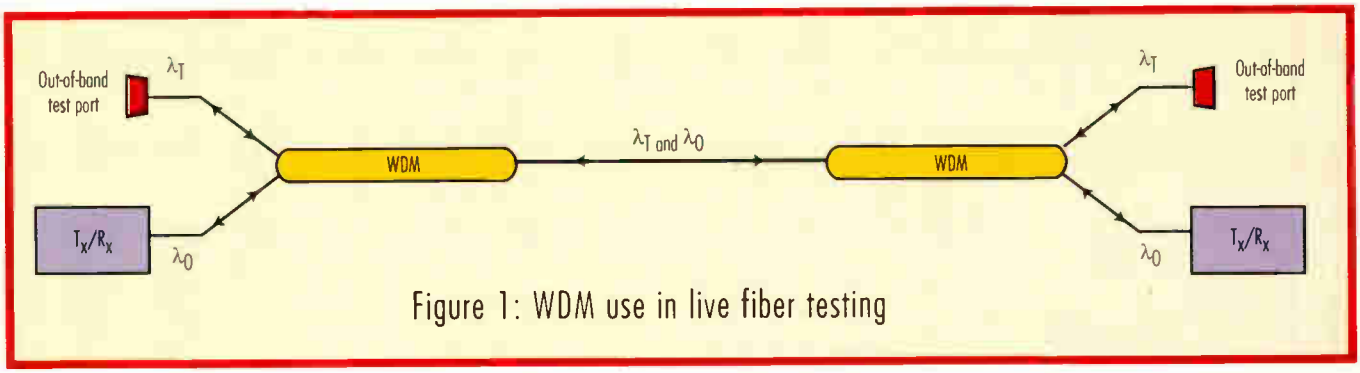

Figure 1: WDM use in live fiber testing

shown in Figure 1, where λ_O is the operating wavelength and λ_T is the test wavelength from the OTDR. It is important to put WDMs at both ends of the link to prevent λ_T from reaching the receiver. This also allows the OTDR to be connected to either end of the link for bidirectional testing.

For a typical single-mode link operating at 1,310 nm, 1,550 nm light from the OTDR could be used for testing and vice versa. This will allow OTDR testing without interrupting the traffic on the fiber. Usually, however, OOB testing implies the use of higher wavelengths, such as 1,625 nm, for testing. This allows testing on systems that already are carrying traffic at both 1,310 nm and 1,550 nm on a single fiber—the forerunner of the modern dense wavelength division multiplexing (DWDM) systems. However, testing at 1,625 nm has significant advantages over testing with shorter wavelengths.

Macrobend losses

Because longer wavelengths are more susceptible to bending losses, testing at 1,625 nm detects losses from macrobends that would not have been seen at 1,310 nm or 1,550 nm. Macrobends generally result during installation as the fiber-optic cable is routed. Macrobends also can result from any number of environmental factors after the cable is installed and in service.

Changes in tension because of thermal cycling, the movement of the surrounding soil and rocks (caused by frost heaves, seismic events and so on), and the stretching of aerial cable all can result in bending losses, which ultimately can affect communication on a fiber. By testing

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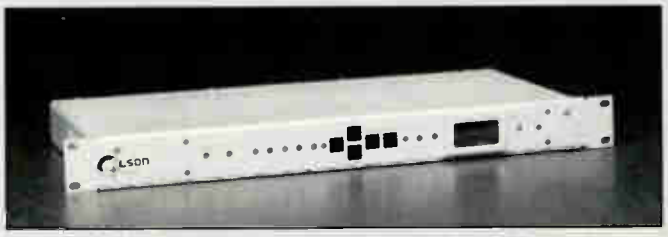

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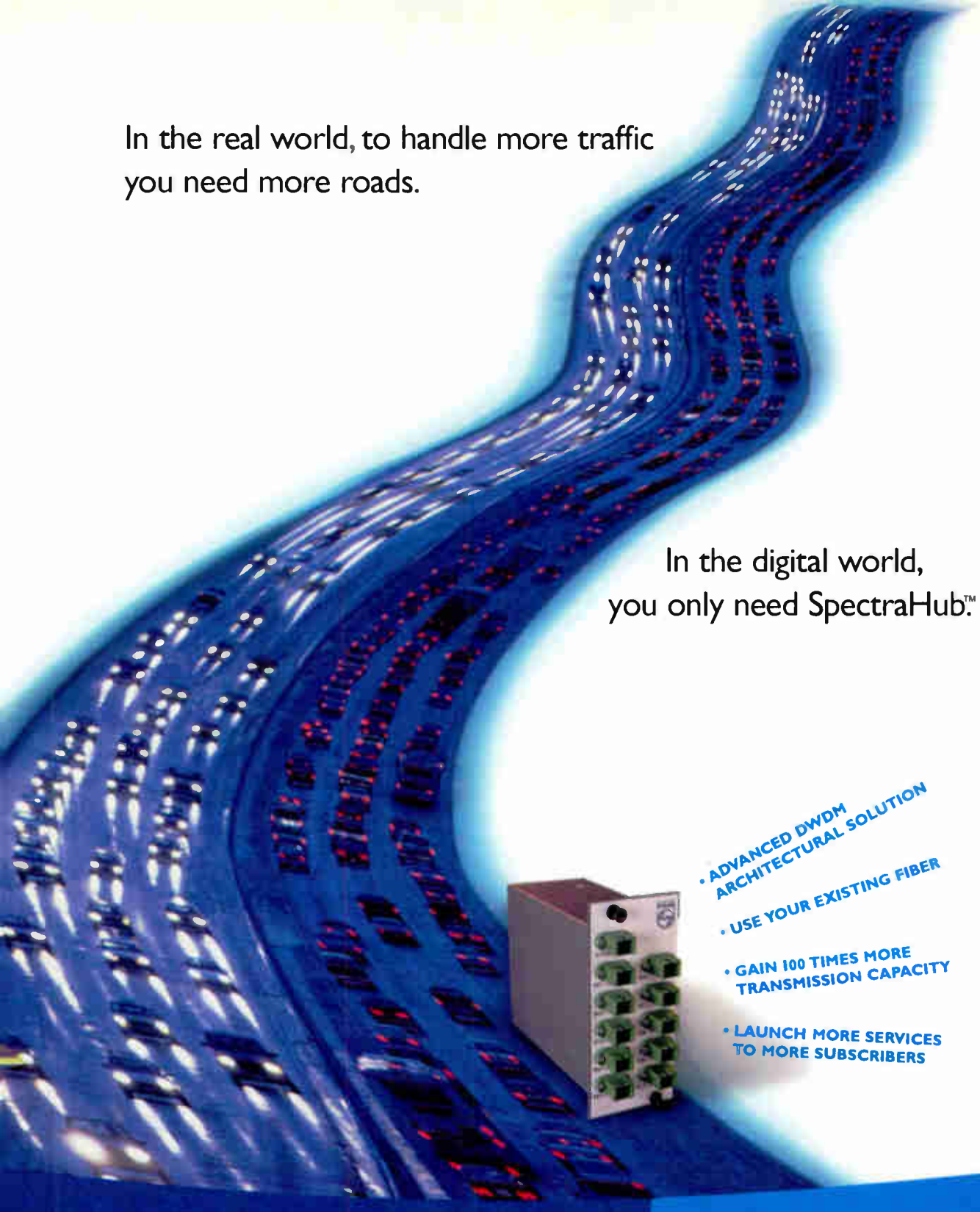

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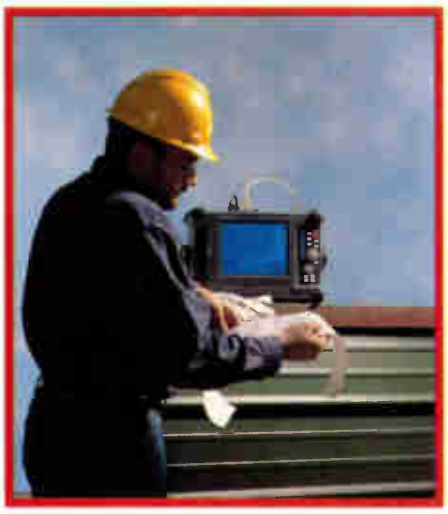

Given the right OTDR and network setup, you need not go offline to test your fiber.

"Because longer wavelengths are more susceptible to bending losses, testing at 1,625 nm detects losses from macrobends that would not have been seen at 1,310 nm or 1,550 nm."

at 1,625 nm, the losses are detected before they induce loss at the operating wavelength, providing an early indication of potential traffic interruption.

In order to implement OOB testing on live fibers, special considerations must be made during the planning stages. Certainly, WDMs will need to be installed at both ends of the link to provide test ports for injecting OTDR signals and to prevent those signals from reaching the communications receiver at the other end. But the addition of in-line components to the traffic path must be planned to ensure that end-to-end loss budgets and other important link characteristics are not exceeded. This requires an understanding of the construction and specifications of the WDMs.

WDM basics

WDMs are made by partially melting two parallel fibers, which are brought together and stretched until their cores have the right amount of taper to couple the desired wavelength into and out of the common fiber. At the crucial point for OOB WDMs, all of the 1,625 nm light is coupled into the 1,550 nm fiber. Similarly, all of the 1,625 nm light entering through the common port is coupled to the 1,625 nm port. In reviewing WDM

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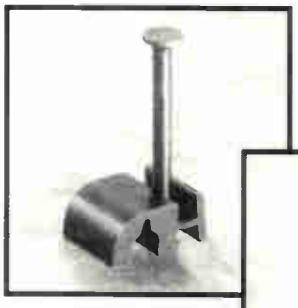

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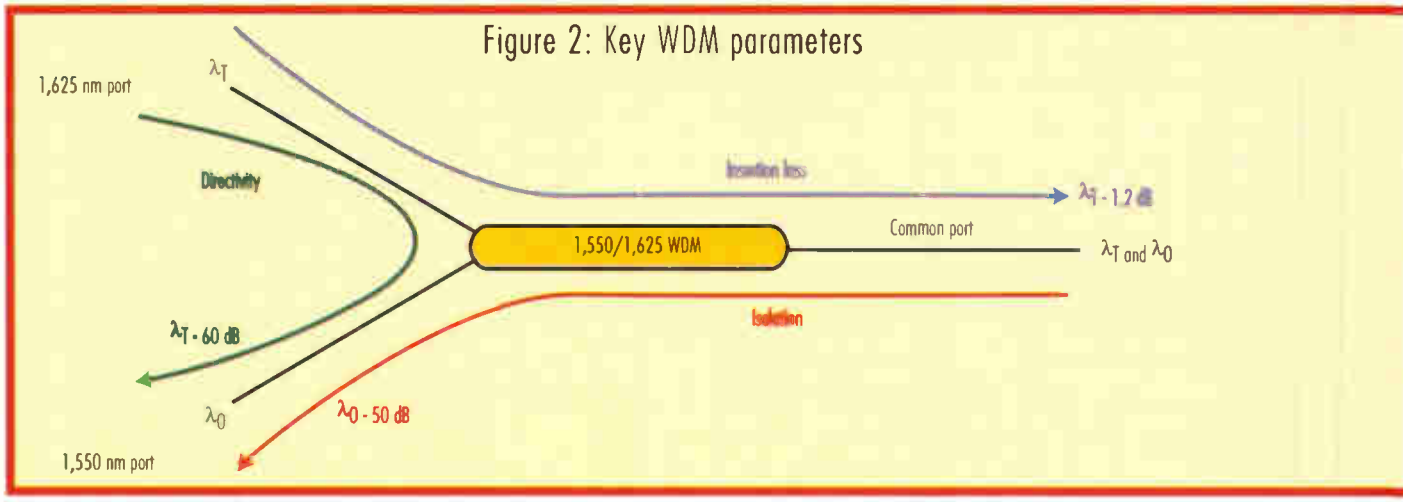

specifications, there are three key parameters that must be considered, as shown in Figure 2.

Insertion loss is the attenuation in decibels for a particular path through the device. Generally, WDMs will specify the insertion loss between each wavelength-specific port and the common port. Typical values are around 1.2 dB. It is important to note that this is the insertion loss for the WDM. If the WDMs will be connectorized and patchcords used to place them into the link, the connector and patch cord insertion losses must be added to the overall loss budget.

Isolation, which also is referred to as far-end cross-talk, describes the amount of light that enters through the common port, but exits through the wrong wavelength-specific port. Measured in decibels, it is expressed as an attenuation value of the undesired wavelength. Typical values for high-isolation WDMs, which must be used for OOB testing on live fibers, are around 50 dB, indicating that 1,550 nm light entering the common port will be attenuated by 50 dB before

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WDM specifications		
Parameter	Measured between	Value
Insertion loss	λ_T - common	1.2 dB
	λ_O - common	1.2 dB
Isolation	Common - λ_T	50 dB
	Common - λ_O	50 dB
Directivity	λ_T and λ_O	60 dB
Bandpass	—	+/- 20 nm
Return loss	—	-50 dB

exiting the 1,625 nm port. Usually, each path has its own isolation value.

Directivity, which also is referred to as near-end cross-talk, describes the amount of light that enters through one wavelength-specific port and exits through the other. Measured in decibels, it also is expressed as an attenuation value. Typical values are around 60 dB, indicating that light entering the 1,625 nm port will be attenuated by 60 dB before exiting the 1,550 nm port.

Other important parameters that may affect communication on the link are the back-reflection or return loss, which describes the amount of input light reflected back along the path of transmission, and the bandpass, which describes the range of wavelengths around those specified that will be passed. All of these will need to be considered during planning with regard to the specifications of the terminal gear and the link characteristics to ensure that the OOB testing will not affect the active traffic. If more isolation is needed, WDMs can be cascaded or in-line optical bandpass filters can be used to increase the attenuation of unwanted signal components.

Condition check

Once these computations have been made and the appropriate WDMs have been added to the network, OTDRs can be used to measure the condition of the link without removing the active traffic. In fact, with a remotely controlled OTDR and an optical switch, many live fibers can be continuously monitored to watch for increased losses.

As mentioned earlier, the 1,625 nm measurement wavelength is more sensitive to losses from macrobends, which typically are caused by external forces acting on the cable. This provides an early indication of potential bit error rate (BER) increases because, as the macrobending continues to increase, it certainly will induce losses at the operating wavelength, causing communication interruption.

Such monitoring can be especially useful on links that have no redundancy, preventing service outages by providing early indications of cable degradation. On high security links, such OOB testing techniques can be used to detect unautho-

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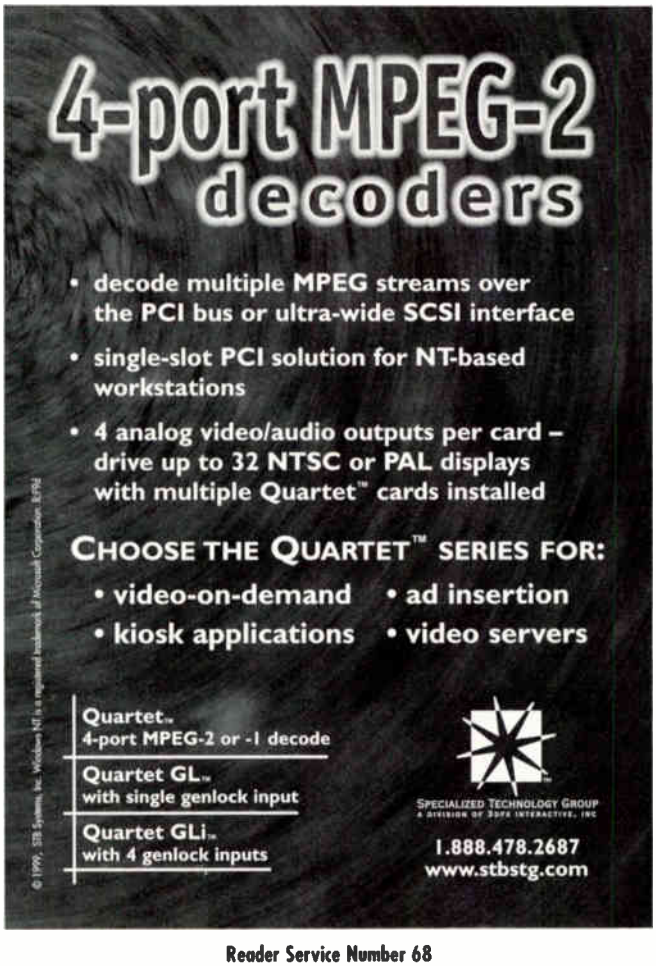

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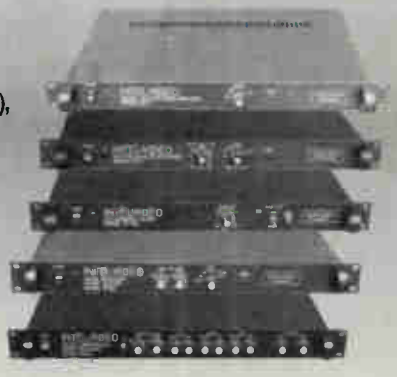

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rized signal interception because bending is a key technique used to extract these signals from the fiber.

In short

Remember, OOB testing with long wavelength OTDRs can detect early degradation of optical fibers by measuring macrobend losses caused by external factors that place stresses on the fiber and cable. These stresses can be caused by any number of environmental elements such as thermal cycling, swaying, frost heaves, ground shifts, rodent intrusions and so on. Using special OOB WDMs permits measurements to be made on fibers carrying active traffic, allowing monitoring and maintenance to be planned before service interruptions occur.

Joseph W. Anello, Jr. is chief engineer at GN Nettest. He may be reached via e-mail at joea@gnlp.com.

The Bottom Line

Out-of-Band OTDRs Reduce Down Time

There are a lot of things that can happen to optical fiber that will degrade or interrupt service, and with today's bandwidth demands, who can afford the down time? By using out-of-band (OOB) optical time domain reflectometers (OTDRs), fibers can be tested even while live traffic is being carried. These OTDRs test at higher wavelengths than conventional OTDRs and can provide early indications of conditions that could take down service. To enable their use, provisions must be made in the network by installing wavelength division multiplexers (WDMs) on the links that are to be tested.

Although WDMs are passive components, it is important to understand how to interpret their specifications to ensure that the transmission gear's link requirements are satisfied. Once enabled, the OOB OTDR's sensitivity to losses caused by external stresses on the fiber provides an early warning indication of links that will potentially develop service-affecting losses or failures.

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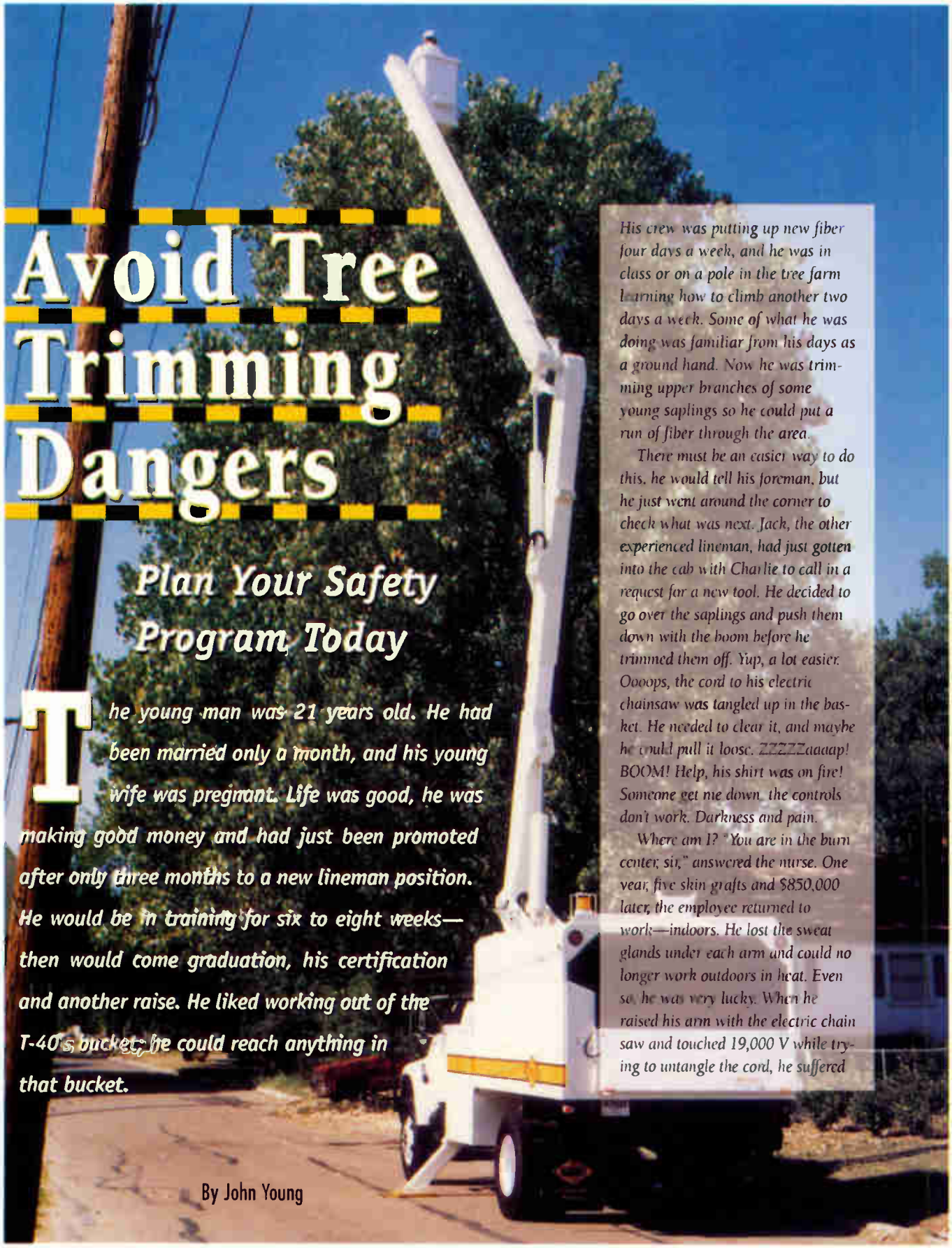

Avoid Tree Trimming Dangers

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The young man was 21 years old. He had been married only a month, and his young wife was pregnant. Life was good, he was making good money and had just been promoted after only three months to a new lineman position. He would be in training for six to eight weeks—then would come graduation, his certification and another raise. He liked working out of the T-40's bucket; he could reach anything in that bucket.

His crew was putting up new fiber four days a week, and he was in class or on a pole in the tree farm learning how to climb another two days a week. Some of what he was doing was familiar from his days as a ground hand. Now he was trimming upper branches of some young saplings so he could put a run of fiber through the area.

There must be an easier way to do this, he would tell his foreman, but he just went around the corner to check what was next. Jack, the other experienced lineman, had just gotten into the cab with Charlie to call in a request for a new tool. He decided to go over the saplings and push them down with the boom before he trimmed them off. Yup, a lot easier. Oooops, the cord to his electric chainsaw was tangled up in the basket. He needed to clear it, and maybe he could pull it loose. ZZZZZaaaap! BOOM! Help, his shirt was on fire! Someone get me down, the controls don't work. Darkness and pain.

Where am I? "You are in the burn center, sir," answered the nurse. One year, five skin grafts and $850,000 later, the employee returned to work—indoors. He lost the sweat glands under each arm and could no longer work outdoors in heat. Even so, he was very lucky. When he raised his arm with the electric chain saw and touched 19,000 V while trying to untangle the cord, he suffered

By John Young

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burns on 60 percent of his upper body. The flash of energy when he made contact set his shirt on fire, did $15,000 worth of damage to the truck, and cost more than $1 million in medical expenses and construction delays.

Don't let it be you

Tree trimming rules, standards and operating requirements would have prevented this accident. Trimming can involve cutting one branch with a handsaw or cutting major limbs back with an electric chain saw. Whether you develop the programs yourself or purchase one (many are available from commercial sources), you need standards and operating procedures.

Standards and procedures need to cover six major areas. The first one is training requirements, which must cover areas such as certified instructors, equipment, maintenance, policies, operating procedures, personal protective equipment (PPE) and equipment safety.

Second, specific requirements must be set for personal protective equipment. Ground safety equipment might include items such as chaps, leather gloves, hard hats, safety glasses, hearing protection and safety shoes. Aerial safety equipment would include insulated gloves, hard hats, safety glasses, hearing protection, fall protection and radio equipment.

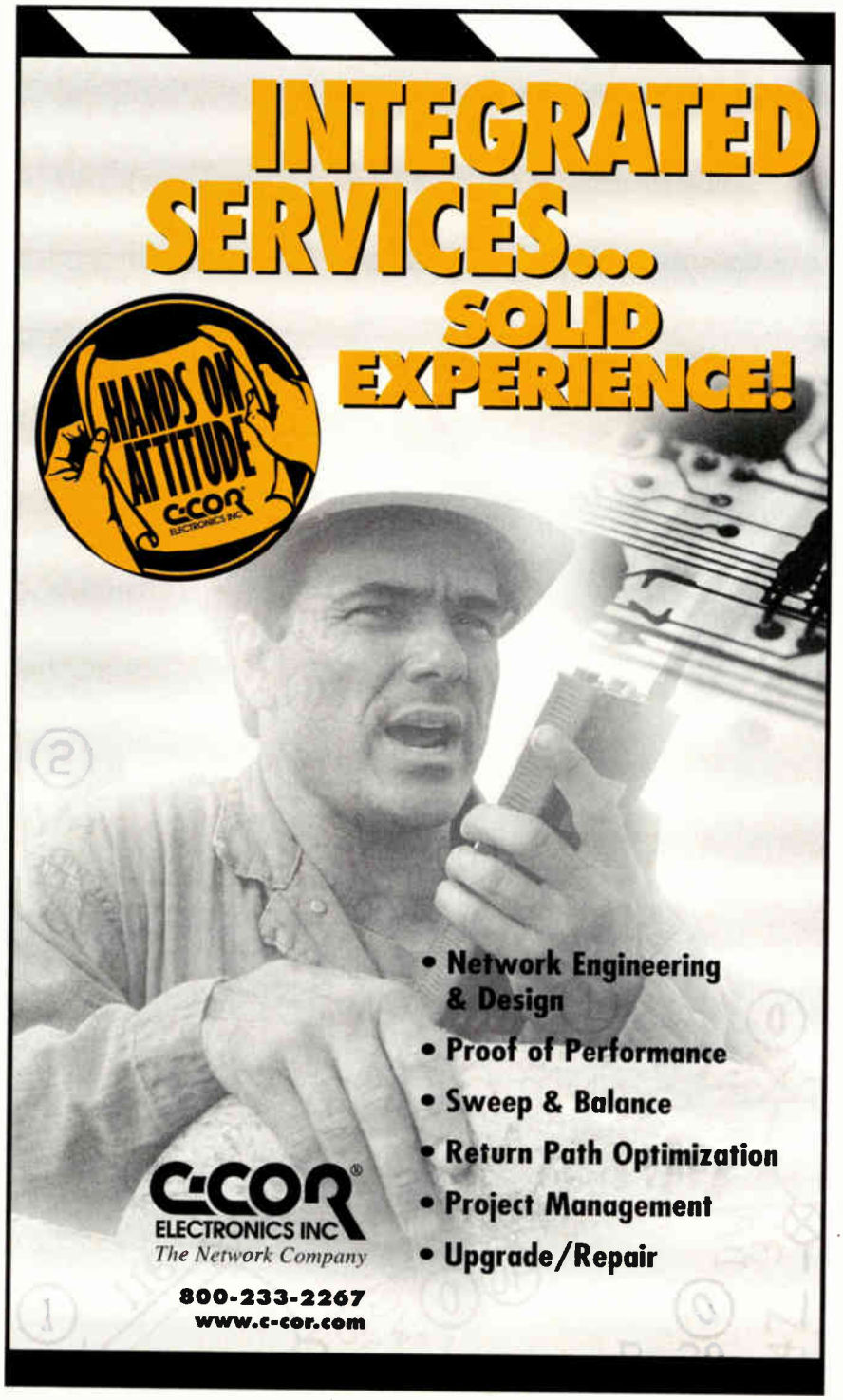
> "Only qualified personnel should climb a tree, and then only for the purpose of attaching the proper rigging for tree trimming."

The third area of concern is equipment safety features for chainsaws and saws. Chainsaw features could include spark arrestors, anti-vibration mounting, gunning marks, dogs, wraparound handlebars, a semi-skip chain, 24-inch bars, wedges, standard nuts and bolts, and so on. Hand saws need hand protection and blades designed for cutting wooden limbs of reasonable size.

Next, you need a quality maintenance and inspection program that includes proper fuel use, regularly scheduled maintenance, saw sharpening, chain tensioning, proper storage of saws and fuel, and electrical safety.

Fifth, saw operations and trimming procedures must be addressed in detail. Be sure and include the following procedures in your plan: starting and operating a chain saw, limb removal, use of wedges, electrical hazards, felling trees, hang trees, rigging trees, tree climbing, trimming from aerial devices, branch control, limbing and bucking, and trimming and pruning techniques.

Sixth, chipper operations need to be



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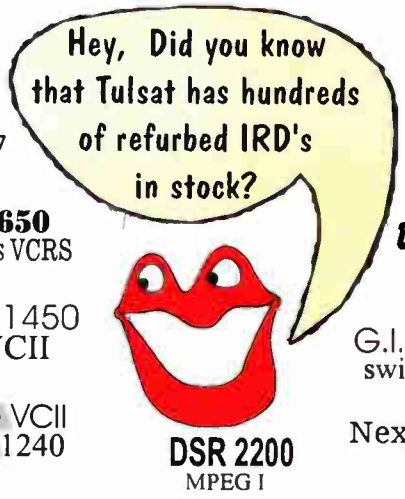

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covered relative to PPE and operating rules and lockout procedures.

Electrical hazards

Let's discuss in greater depth some areas that you must pay particular attention to. The first one is electrical hazards. When removing branches that are encroaching on or interfering with plant or lines, or have the potential to encroach once cutting has started, be sure to take the following precautions:

- Remove the lines from service with the electric company or have them blanketed and obtain a clearance prior to making contact with the tree.
- When trimming branches encroaching on minimum clearance distances, personal protection is paramount. Check for stray voltage. Personal grounds and insulated tools must be used, and workers must wear hot gloves.
- Where necessary, attach rigging to limbs to aid the limb in falling or moving in the intended direction.

Tree climbing

Remember, only qualified personnel should climb a tree, and then only for the purpose of attaching the proper rigging for tree trimming. The employee must have fall protection and be attached to the main trunk of the tree. If a situation

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The Bottom Line

Better Safe Than Sorry

Each year, thousands of people are killed in tree removal/trimming-related accidents. In fact, the Occupational Safety and Health Administration reports that timber cutters and loggers are No. 1 in deaths per year at 129 per 100,000 people. Tree trimming rules, standards and operating requirements can prevent many of these deaths.

Trimming can involve cutting one branch with a handsaw or cutting major limbs back with an electric chain saw. Whether you develop a program yourself or purchase one, you need a standard and operating procedures.

Standards and procedures should cover six major areas:

1) Training requirements, which must cover areas such as certified instructors, equipment, maintenance, policies and operating procedures.

2) Specific requirements for personal protective equipment.

3) Equipment safety features for chainsaws and saws.

4) Quality maintenance and inspection program that includes proper fuel use, regularly scheduled maintenance, saw sharpening, chain tensioning, proper storage of saws and fuel, and electrical safety.

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exists where a tree must be topped or trimmed, accessing the cutting areas of the tree must be accomplished through an aerial device whenever possible.

The following rules apply to climbing trees:

- Proper tree climbing equipment (tree climbing gaffs) must be used for tree climbing.
- Fall protection must be used when in place to trim.
- Attachment is optional when the employee is ascending or descending the tree.
- If it appears possible the tree is in contact with power lines, the tree must be tested for stray voltage with a voltage detector prior to climbing to determine safety of the tree relative to possible electrocution.

Tree trimming from an aerial device

Where possible, all tree-trimming activities performed aloft will be performed from aerial devices as opposed to climbing a tree, ladder or pole to access branches to be removed. Due to the increased hazards, climbing is an option only in cases where a lift cannot be used.

Safety precautions that can be followed when using saws from an aerial device include the following:

- Be aware of slipping hazards while operating chain saws or using saws inside a bucket.
- If electric chain saws are used, take care not to become entangled with the cord.
- If operating near electrical power lines, the employee must not extend the saw above his or her head toward power lines. The saw represents up to a three-foot extension of your arm, which can contact power lines and cause electrocution.
- A noninsulated aerial device can be used only if the electrical line is de-energized and grounded. Where electrical hazards exist (as determined by job hazard analysis) and minimum clearances cannot be maintained, lines must be turned off or blanketed or the trimming should be contracted out.

Trimming technique

Three basic rules apply to tree trimming. These rules must always be followed even if trimming is not being conducted to prevent a conflict between a tree and a transmission line. The three rules are:

- Never top, tip or round over a tree.
- Never remove branch collars or leave long stubs.
- Always remove the entire branch at the node.

Topping, tipping and rounding over: Topping is defined as the removal of tree growth at a specific height with no regard to branch nodes. When trees are toped and left with cuts on branches leaving long stubs, the tree produces many fast-growing sprouts known as suckers. In short, topping stimulates sprouting and sucker regrowth, which

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Evaluating Multiple Outlet Requirements, Part 4

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

The previous installments in this series provided approximate worst-case signal loss values for two-, three-, four- and eight-way splitters that can be used to easily make rough estimates in the field, and combining splitters to customize the number of output ports. This installment provides information on using auxiliary house amplifiers.

An auxiliary house amplifier increases the level of a broadband signal to overcome losses from long drop cable runs and/or passive devices (e.g., splitters) that attenuate (reduce) the signal level.

Identifying house amplifier characteristics

Auxiliary house amplifiers are differentiated by: 1) the amount of signal gain or amplification (expressed in dB), 2) the number of available output ports and 3) the type of input power required (AC or DC). House amplifier gains typically range between 10 dB and 20 dB, with 10 dB gain as the most common. A single-output house amplifier is usually connected by a short coaxial jumper to the input port of a separate external splitter. A multiple-output house amplifier has an internal splitter (four-way typically) built into the amplifier housing, eliminating the need for a separate splitter.

Powering methods for house amps

House amplifiers are active devices, because they require a power source to function. A house amplifier receives its operating power either: 1) directly using a standard three-prong plug or from an AC transformer plugged into an AC outlet (Figure 1) or 2) indirectly through coaxial cable connected to a power inserter and DC transformer (Figure 2). The latter configuration permits mounting the amplifier outside away from any AC source in the premises security box.

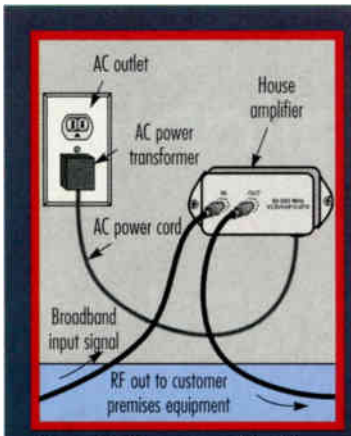

Figure 1: House amp directly powered from AC outlet

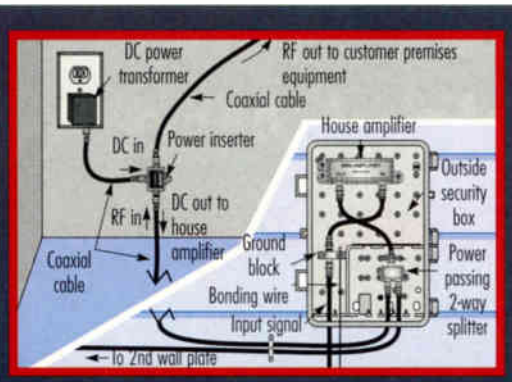

Figure 2: House amp indirectly powered through coaxial cable

Figure 3: Picture effects of too low input signal to amplifier

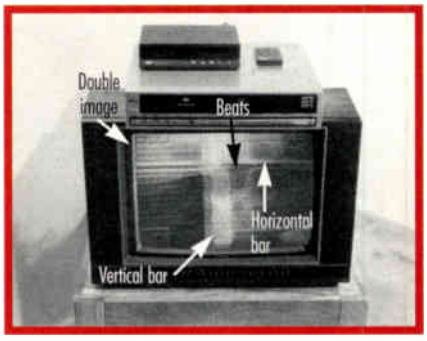

Figure 4: Picture effects of too high input signal to amplifier

Ensuring correct RF input levels

When possible, it is recommended that the input signal level be equal to or greater than the amplifier's rated noise figure (expressed in dB). Input signal levels below the rated noise figure to the amplifier may cause the TV pictures to appear grainy (Figure 3) even though the amplifier increases the signal to adequate levels at the cable outlet. Excessively high input signal levels to the amplifier cause distortions to appear in TV pictures (Figure 4). TB

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- ☐ 19. Public/Private Utility
- ☐ 20. Systems Contractor
- ☐ 21. Hardware/Component Manufacturer/Dist.
- ☐ 18. Other (Please specify) _____

Do you hold a supervisory position?
- ☐ 22. Yes
- ☐ 23. No

B. Check the TITLE that most CLOSELY matches your current position: (check only one)

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- ☐ 31. CEO
- ☐ 32. President
- ☐ 33. Owner
- ☐ 34. Vice President
- ☐ 35. Partner
- Operations Management
- ☐ 36. General Manager
- ☐ 37. Business Manager
- ☐ 38. Operations Manager
- ☐ 39. Product Manager
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- ☐ 47. Regional Engineer
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- ☐ 49. Plant Manager
- ☐ 50. Installation Manager
- ☐ 51. Network Manager
- ☐ 52. Construction Manager
- ☐ 53. Field Services Manager
- ☐ 54. Technical Manager Engineering
- ☐ 55. Engineer
- ☐ 56. Headend Engineer
- ☐ 57. Const. Engineer
- ☐ 58. OSP Engineer Technical
- ☐ 59. Headend Technician
- ☐ 60. Line Technician
- ☐ 61. Bench Technician
- ☐ 62. Sweep Technician
- ☐ 63. Other Technical Title (Please specify) _____

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- ☐ 64. Installer
- ☐ 65. CSR
- ☐ 66. Other (Please specify) _____
- ☐ 30. Other (Please specify) _____

C. Are you a member of the SCTE (Society of Cable Telecommunications Engineers)?
- ☐ 01. Yes
- ☐ 02. No

D. Would you like to join the SCTE?
- ☐ 01. Yes
- ☐ 02. No

E. 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 Supply. (Batteries, etc.)
- ☐ 56. Video Servers

F. 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

G. 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

H. 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

I. 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

J. 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

K. 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

L. 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

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

N. 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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Please answer all questions, sign and date the card. Incomplete forms CANNOT be processed.

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Signature _____ Date _____
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Please Print:

Name _____ Title _____

Company _____

Address _____

City _____ State/Province _____

ZIP/Postal Code _____ Country _____

A. Please check your company's primary business: (check only one)
04. Multiple System Operator (MSO) (operates more than one cable system)
03. Independent System Operator
9B. Telecom Network/Carrier (RBOC, LEC, CLEC, Long Distance Provider, Wireless/Satellite Carrier, ISP)
19. Public/Private Utility
20. Systems Contractor
21. Hardware/Component Manufacturer/Dist.
18. Other (Please specify) _____

Do you hold a supervisory position?
22. Yes
23. No

B. Check the TITLE that most CLOSELY matches your current position: (check only one)

Corporate Management
31. CEO
32. President
33. Owner
34. Vice President
35. Partner
Operations Management
36. General Manager
37. Business Manager
38. Operations Manager
39. Product Manager
40. Purchasing Manager

Engineering Management
41. Engineering VP
42. Engineering Manager
43. Director of Engineering
44. Engineering Supervisor
45. Corporate Engineer
46. Senior Engineer
47. Regional Engineer
48. Divisional Engineer
49. Plant Manager
50. Installation Manager
51. Network Manager
52. Construction Manager
53. Field Services Manager
54. Technical Manager Engineering
55. Engineer
56. Headend Engineer
57. Const. Engineer
58. OSP Engineer Technical
59. Headend Technician
60. Line Technician
61. Bench Technician
62. Sweep Technician
63. Other Technical Title (Please specify) _____

Installation
64. Installer
65. CSR
66. Other (Please specify) _____
30. Other (Please specify) _____

C. Are you a member of the SCTE (Society of Cable Telecommunications Engineers)?
01. Yes
02. No

D. Would you like to join the SCTE?
01. Yes
02. No

E. 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 Supply. (Batteries, etc.)
56. Video Servers

F. 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

G. 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

H. 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

I. 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

J. 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

K. 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

L. 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

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

N. 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
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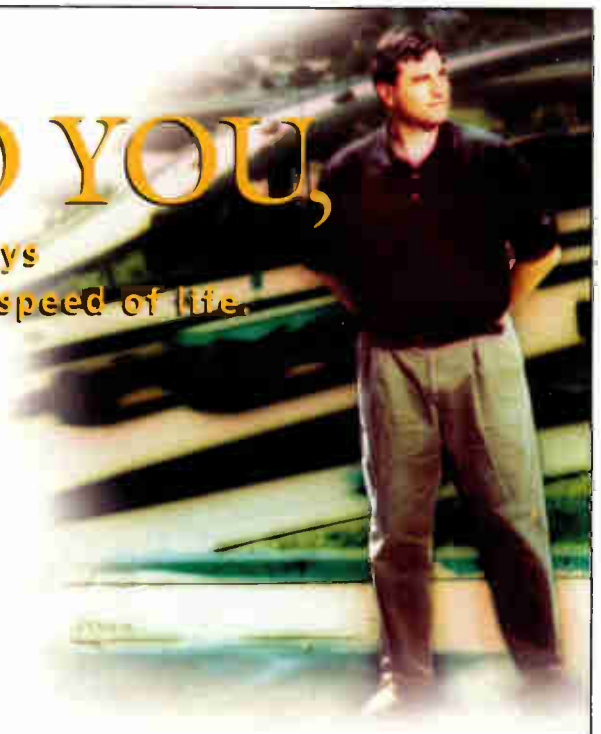

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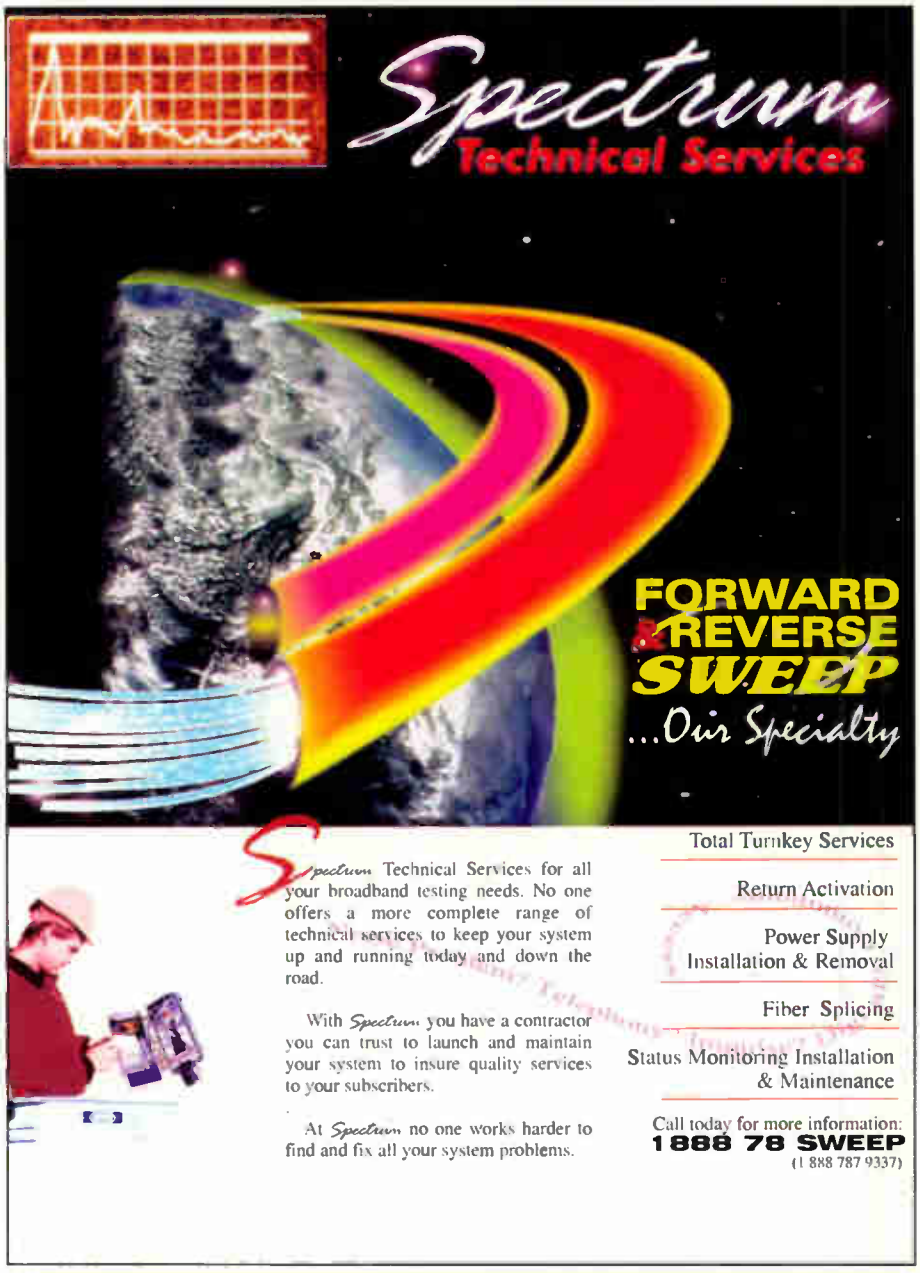

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www.telewiresupply.com
Mark Howard
TeleWire Supply, a division of ANTEC Corp., is a leading international supplier of products needed to build and service a broadband communications network.
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2952 Bunker Hill Lane
Santa Clara, CA 95054
(408) 727-4400; Fax (408) 727-6205
www.terayon.com
John Hamburger
Terayon's S-CDMA-based cable modem systems deliver fast and cost-effective two-way data services over any cable plant. Their advanced QoS capability supports both business and residential data services.
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Copiague, NY 11726
(516) 789-5000; Fax (516) 789-5063
www.tii-industries.com
C. J. Meyerhoefer (516) 789-5000, ext. 419
Tii is a manufacturer of lightening and surge protection products for the CATV, telecom, data, AC, and wireless industries.
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Irvine, CA 92618
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bjackson@trilithic.com
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Lotha James
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(800) 800-5719; (610) 327-2292
Fax (610) 327-9295
Vic Melis
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www.viewsonics.com
media@viewsonics.com
Peter Chunka
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Cable Network Division
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Indianapolis, IN 46203
(317) 788-9351; Fax (317) 614-8307
www.wwgsolutions.com
Gary Culbertson
Wavetek Wandel Goltermann is a leading manufacturer of communications test solutions for customers in the areas of traditional voice and data transmissions, new multi-service networks, local and wide-area network infrastructures, cable television, digital video broadcast, mobile telephony and data. As the world leader in CATV test, WWG offers signal level, analysis, leakage and home wiring meters, sweep systems, return path monitoring, and bench sweep equipment.
Reader Service #10, 40

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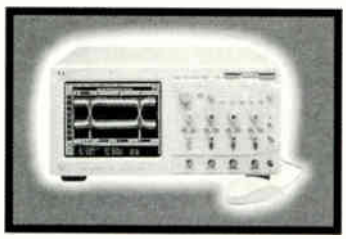
• MARKETPLACE •

Below are some of the products that sizzled on the show floor at the Society of Cable Telecommunications Engineers' Cable-Tec Expo in Orlando, Fla.

Oscilloscope Family Grows

Hewlett-Packard has developed a communication mask test kit for the HP Infiniium oscilloscope family that is designed to simplify compliance testing of communication and networking products. The test kit in-



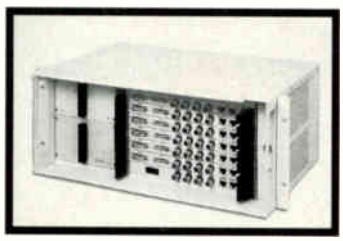
cludes mask testing software and electrical communication adapters to quickly perform American National Standards Institute, International Telecommunications Union and Institute of Electrical and Electronics Engineers industry-standard tests.

The company also has introduced new software updates to increase the performance of its oscilloscope, enhance waveform viewing and provide additional quantitative information at a glance. Updated features include new color-graded persistence to allow engineers to view signal anomalies and quickly determine how often they occur, while waveform histograms provide statistical information about the noise and jitter that occurs in a system over time.

Reader Service #310

MPEG-2/ATM Connectivity

ADC Telecommunications has introduced its AccessPoint Universal Media Access System for the transmission of multiple services over asynchronous transfer mode (ATM), synchronous optical network (SONET)/synchronous digital hierarchy (SDH) or satellite networks.



AccessPoint provides economical collection and transport of high quality, low latency video and other multimedia services for interactive applications such as broadband distance learning, videoconferencing and remote arraignment, in addition to high quality broadcast TV transport applications, according to the company. AccessPoint resides at the "edge" of a network and provides both compression and decompression of video with multiple input or output channels. Standards-based MPEG-2 is used to provide scalable bit rates to 15 Mbps (4:2:0) and 50 Mbps (4:2:2) using I-frame, IB-frame or IPB-frame coding with flexible GOP structures.

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Reader Service Number 84

Indoor Amplifiers

Quality RF Services has announced the new 860 MHz QDAX power-doubled and quadra-powered indoor amplifier line.

The new line features 5 to 40 MHz active return path and 50 to 860 MHz forward bandwidth. The company says the plug-in interstage fixed equalizers provide optimum RF frequency response.

The use of plug-in pads in 1 dB steps helps to provide precise level control.

Reader Service #309

Fiber Splice Closures

Tyton Hellermann has introduced a line of fiber-optic splice enclosures for protection in aerial, underground and pedestal applications.

According to the company, CableTyte closures are compact and work with a

variety of fiber counts; they're designed for installation and re-entry without special tools. The product's non-heat-shrink sealing system provides a watertight seal without a torch. Heat-shrink sealing also is available.

Closures include an optional curved splice tray. Other closure styles and tray options also are available for low and high fiber counts. Accessories include mounting brackets and hardware for stability, a port cutting tool, shield bonding products and fiber splice protectors.

Reader Service #311

Coring/Stripping Tool

Ripley's all-in-one tool will strip the jacket, core out the dielectric, and strip and bevel

the aluminum sheath. The new design attaches the jacket stripper body to the main body of the coring and stripping tool by means of a quick-change rotating ring.

Reader Service #308

Plant Management System

AM Communications has released its QuickStat Plant Management System, a plant management solution for small- to medium-sized hybrid fiber/coax (HFC) network operations.

The QuickStat System is packaged in a single personal computer (PC) client/server station. The station is preconfigured with AM's OmniVu software package, OmniComm cable system interface card and the QuickTest probe.

The QuickStat System can support up to 99 transponders. QuickStat supports AM's entire family of transponders, including power supply monitors, fiber node monitors, amplifier monitors, as well as AM end-of-line (EOL) monitors.

QuickStat enables operators to improve their overall responsiveness. It notifies the user of network problems such as fluctuating RF signal levels or power levels, pinpointing the problem area's location within the plant, and will keep automatic maintenance records in its Omni database. The system also features a graphical user interface (GUI).

Reader Service #305

Times Fiber Adds New Reels

Times Fiber Communications has added 100-percent recyclable reels to its line of semi-flex trunk and distribution cable products.

Designed for strength and environmental longevity, these reels are designed to assist operators in minimizing dollars spent on waste management with added cable protection and custom-designed recycling programs.

Reader Service #306

Gateway Development

The Amecom division of Litton Industries will continue working with MacroDyne Power to produce a residential gateway for hybrid fiber/coax (HFC) networks.

The companies recently completed a six-month feasibility analysis, and the product, now in prototype phase, will allow cable operators the ability to offer single or multiple services by simply inserting a module into a host controller located at the side of the subscriber's home.

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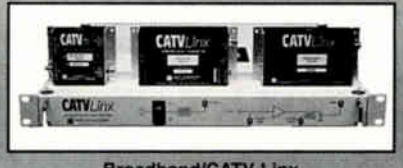

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Reader Service Number 85

By John Clark

The "Know-How" You Need Is in Knowledge Avenue

We all realize that "knowing" is a key part of our lives. Like the stock market—knowing when to buy and when to sell—the cable industry will continue to flourish by knowing what technologies are on the horizon, what capabilities will be necessary and how they will benefit our customers.

The glitch comes when we have to turn that knowledge into action. That's where the Society of Cable Telecommunications Engineers comes in. We can provide the "know-how" for your knowledge.

Paving Knowledge Avenue

Last summer, the Society introduced a new facet to its training philosophy. With the cable telecommunications industry undergoing countless changes, cable systems rebuilding to become hybrid fiber/coax (HFC) networks and service offerings expanding to include high-speed data and telephony, SCTE decided to design new programs to meet the challenge. Thus, Knowledge Avenue was born.

Knowledge Avenue is an integrated approach to training for the knowledge, skills and vision needed in our changing industry. From self-study to classroom training, its modular format allows for flexibility and use in different settings.

What's in it for you

Knowledge Avenue supports the Installer certification program with the *Installer Certification Manual* student textbook and the *Installer Certification Manual Leader Guide*. These products are loaded with discussion topics, hands-on practice ideas, case studies and visual aids. Leader instruction programs such as the "Train the Trainer" regional seminars further define these training components.

The Broadband Technology Course is another path in Knowledge Avenue. This

course has been the backbone of the Society's training at the engineer and technician levels. Based on the *Cable Television* book authored by the late Bill Grant, this course has now expanded to include videotapes, leader guides and student workbooks.

Now onboard

SCTE has conveniently packaged the entire Broadband Technology Course into four technical topics: "CATV System Fundamentals," "CATV System Impairments," "Designing CATV Systems," and "Fiber Optics for CATV." These packages ensure that you won't miss out on any elements that pertain to a given subject, and at the same time, it will cost you less than if you were to buy components individually. You may, of course, still purchase the whole Broadband Technology Course at once. But what the package plan will do is help you get there incrementally, at a pace that your budget allows. There also are student workbooks to facilitate your training.

You may have noticed that these new packages carry the "CATV" title. While in the cable business this term is outdated, these packages include the "CATV" title so as to be easily identified by an emerging partner in cable telecommunications—the telephone industry. As convergence continues, they will need to be acclimated to the inner workings of our industry.

These packages can benefit those of you in the cable industry, too, by expanding your skill levels and keeping you up to date on new technologies as we face the challenges of rebuilds and upgrades.

How to find out more

You'll be seeing a lot more of Knowledge Avenue this summer. A new catalog will be coming out this month with more information. Products and services are available on the Web site at www.scte.org or by calling SCTE's Product Fulfillment Department at (800) 542-5040. How will you know if a product or service of the Society's falls under the Knowledge Avenue curriculum? Just look for the Knowledge Avenue logo.

Out of the ordinary

Knowledge Avenue is more than a product. It is a valuable training approach that accomplishes SCTE's mission of training, certification and standards. Its progressive format is a vehicle for any cable industry professional to continue learning. CT

John Clark is president of the Society of Cable Telecommunications Engineers.

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For more information, call Cheetah Technologies at 941-756-6000, or e-mail phasor@cheetahtech.com

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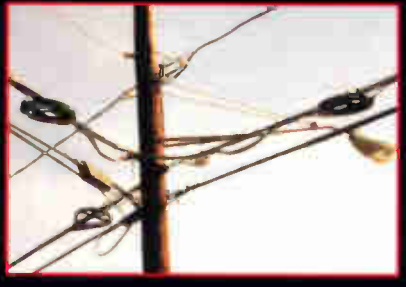

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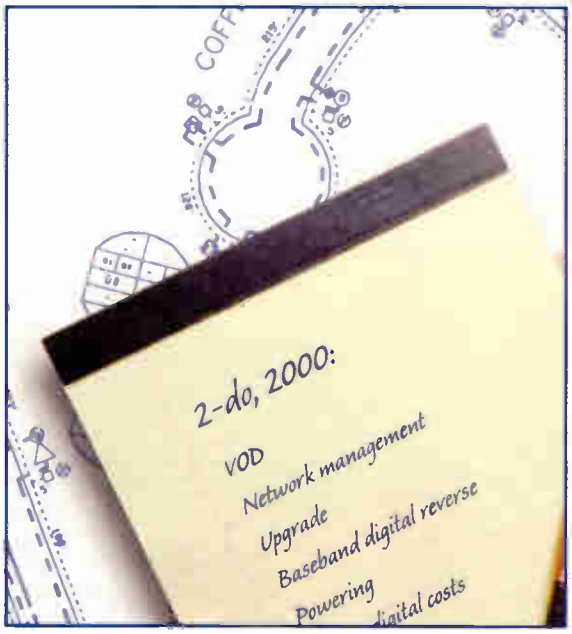

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Cover
Design by Tamara Virshup

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