Communications Technology

OFFICIAL TRADE JOURNAL OF THE SOCIETY OF CABLE TELECOMMUNICATIONS ENGINEERS

AUGUST 1998

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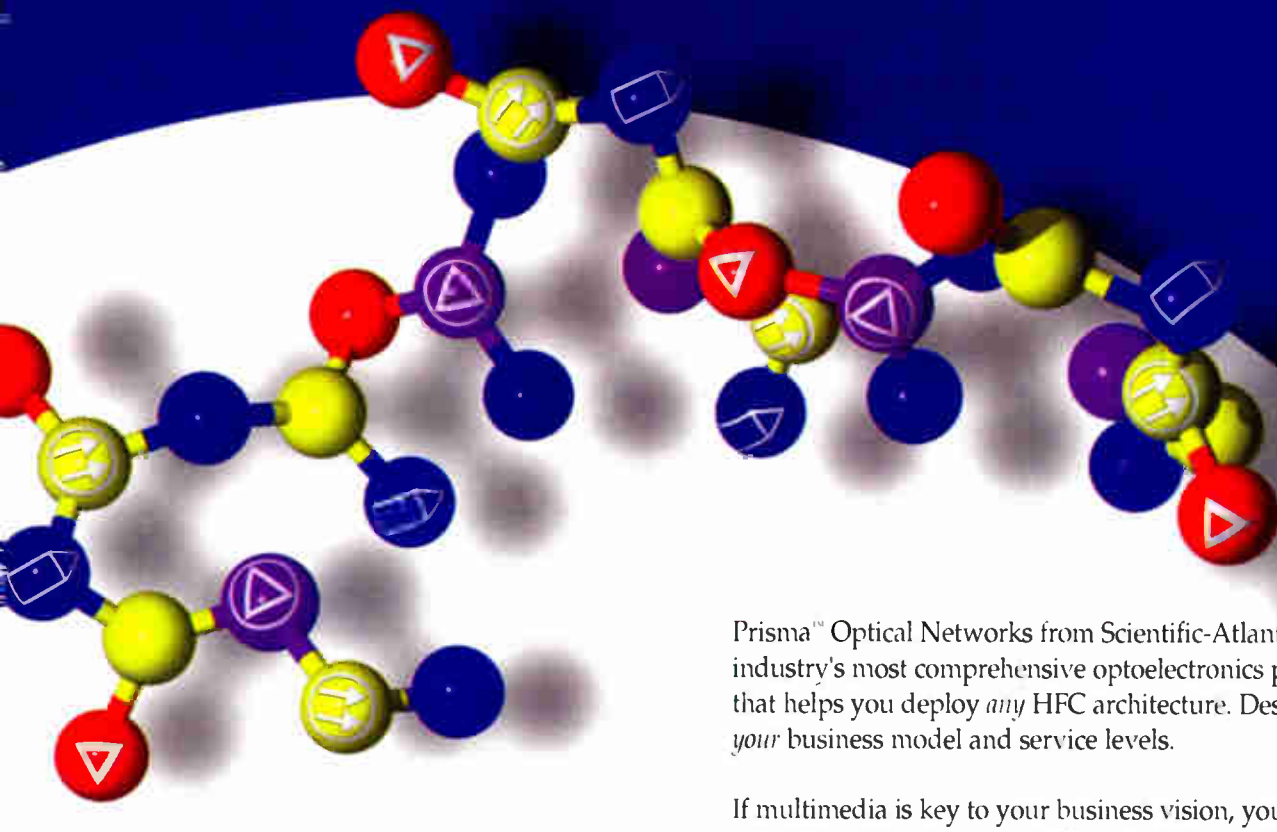

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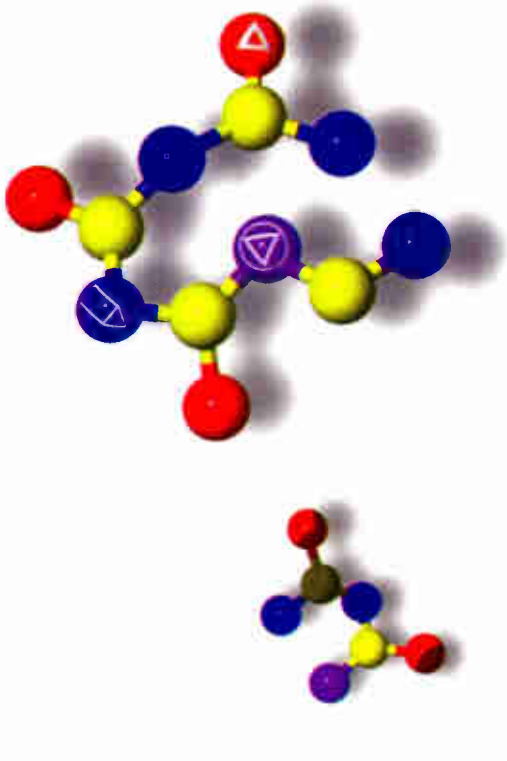

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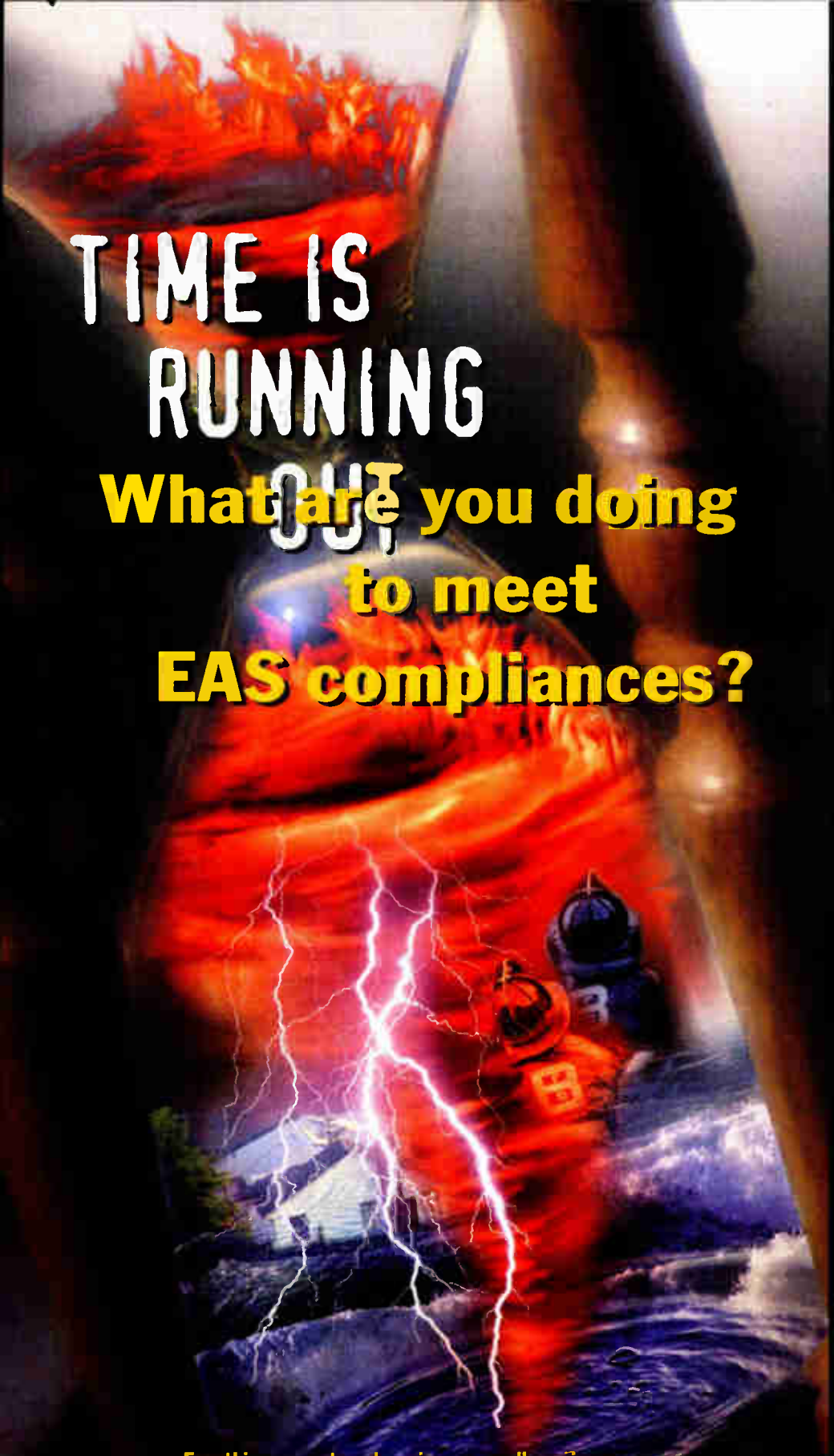

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Photo courtesy of the Colorado Convention Center

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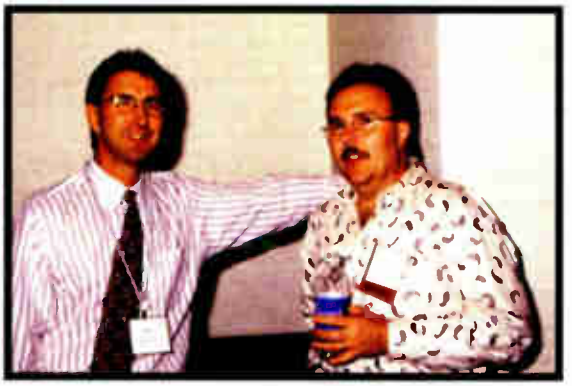

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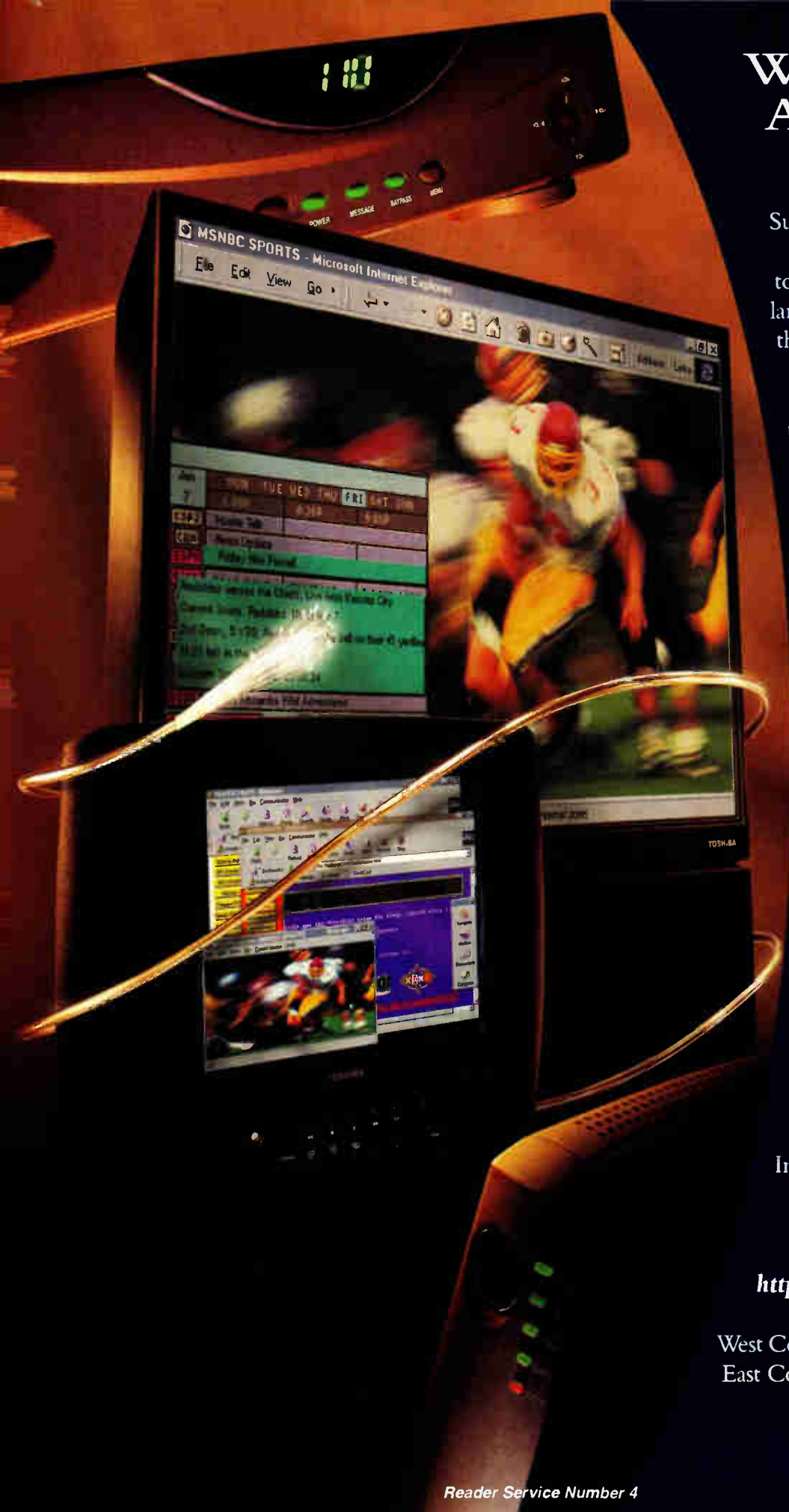

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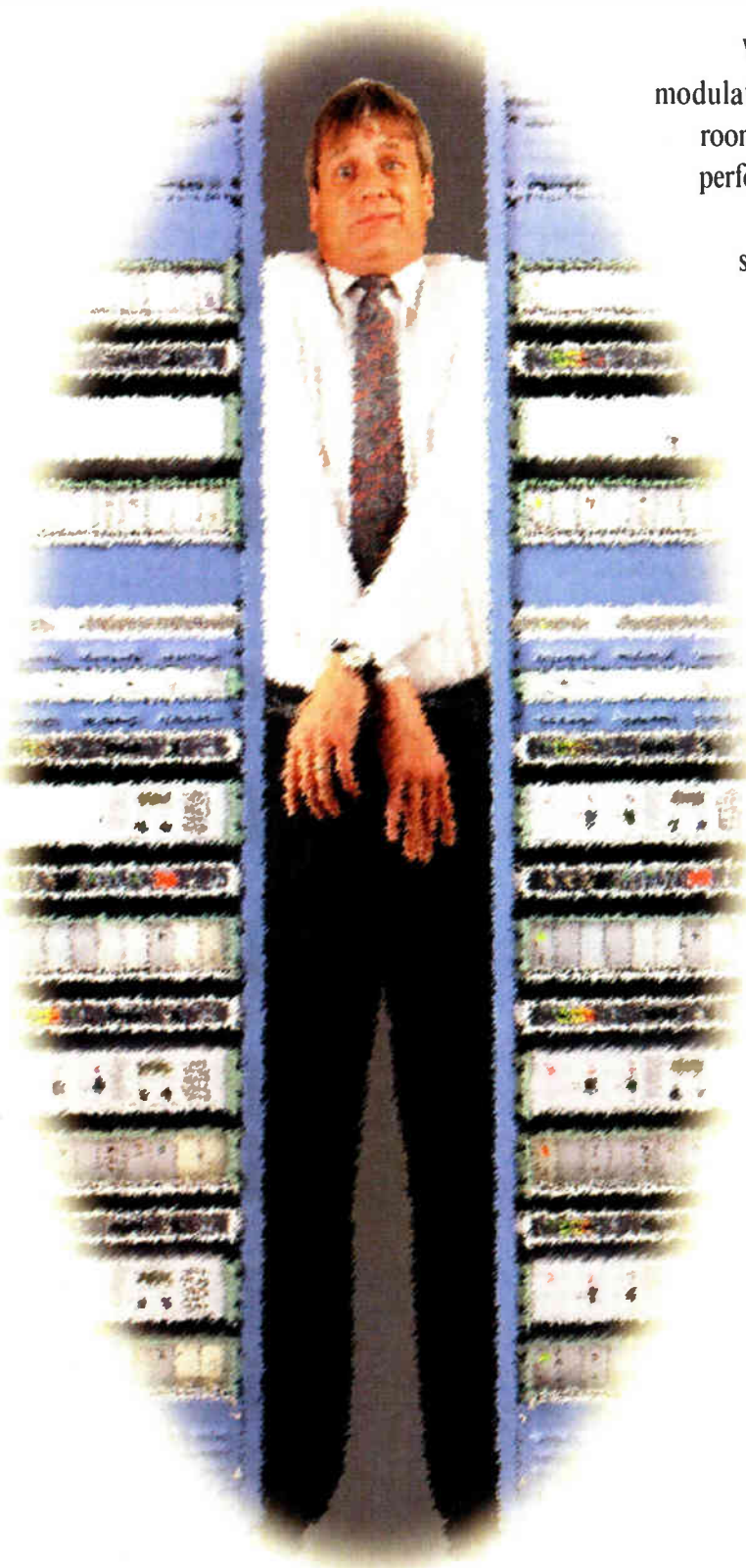

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Reader Service Number 8

By Greta Durr

The Future Is Now With AT&T/TCI Merger

A long-standing prophesy in the telecommunications industry came to life in June when TCI and AT&T announced a plan to synergize their mighty forces in a $48 billion deal that places the telephony giant at the helm of the nation's second largest MSO.

AT&T said that although a precise figure is difficult to determine because of variables in TCI shares, the $48 billion cost should break down to $31.8 billion, for shares of the MSO's A and B stock. AT&T said it also has agreed to assume $11 billion in TCI debt. An additional $5.3 billion is slated to cover the cost of buying back the shares that AT&T would issue to TCI in the course of its Teleport Communications Group Inc. deal and buying TCI's stake in @Home Corp.

News of the deal sent cable stocks into a euphoric frenzy of trading activity that analysts attributed in part to AT&T's assumption of TCI's debt load, which led to a decline in AT&T stock.

The market's rally indicates what the cable TV industry has known all along. Long distance providers craving pre-Telecommunications Act revenues in local phone service and a future advantage in the national Internet delivery arena can capitalize on many fronts by investing in cable properties.

With a pre-existing customer base and high-bandwidth infrastructure, cable companies can offer telcos access to a new array of services for data-hungry residential and business customers.

On the eve of the late-June announcement, investors showed a new confidence in cable TV equipment suppliers' stock, indicating mainstream acknowledgement that Internet, data and enhanced media services will be delivered via cable lines.

Before the TCI deal was officially announced at a press conference, AT&T Chairman Michael Armstrong told analysts that AT&T is interested in forming additional relationships with cable operators. That interest, he said, could extend into franchising, commercial arrangements or branding.

Nortel and Bay: More Merger Mania

In another June stab at creating a new breed of telecommunications giant, Toronto-based Northern Telecom agreed to pay an estimated $9 billion in stock to acquire Bay Networks as a wholly owned subsidiary.

From the transaction will emerge an $18 billion telecommunications superpower upon its close, expected by 1998's fourth quarter.

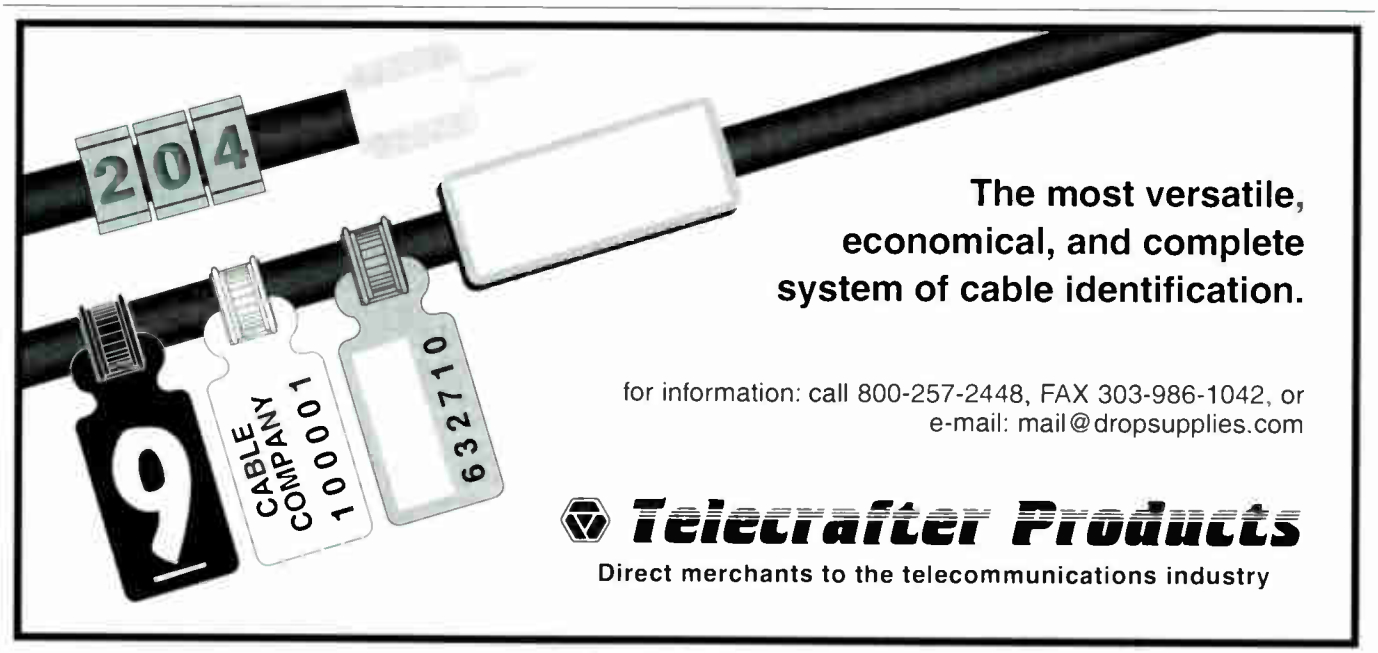
By exploring the brave new world where Internet-driven data and voice networks are expected to converge, combining the two companies will help them redefine the center of the information industry and create an entirely new communications medium, officials said.

By being the first to integrate voice, data, local area network (LAN), and wide area network (WAN) products into seamless and affordable solutions, they hope to get an edge in the market.

Nortel's John Roth, who joined the corporation as a designer in 1969, plans to remain the corporation's chief executive officer.

Three years ago, Bay CEO David House left Intel to join Bay. Now, he's slated to become Nortel's next president.

Earlier this year, Nortel, which is controlled by Bell Canada, acquired Broadband Networks Inc. and Aptis Communications for $716 million. ➤



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and some are not always so obvious.

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Reader Service Number 11

Hybrid's Earnings Reports Questioned

Immediately following an independent accounting firm's proclamation that Hybrid Networks' earning reports were unreliable, two law firms announced suits, support for a pending merger with Pacific Monolithic was withdrawn, and trading was halted as the shares plummeted.

In mid-May, Hybrid announced a delay in filing its quarterly report because of increasing weakness in the broadband wireless access market and the financial condition of several of its wireless cable operator customers.

The company also said its major distributor had returned a substantial amount of inventory over what it had previously requested, forcing the company to review its finances.

Soon after releasing the report in the beginning of June, Hybrid announced that its first quarter sales had been overstated by 350% and that its expenses had been understated by 30%.

By mid-month, Coopers & Lybrand, an independent accounting firm, announced that Hybrid's earning reports were unreliable, approached the Securities and Exchange Commission and withdrew endorsement for Hybrid's pending purchase of wireless networking components supplier Pacific Monolithic.

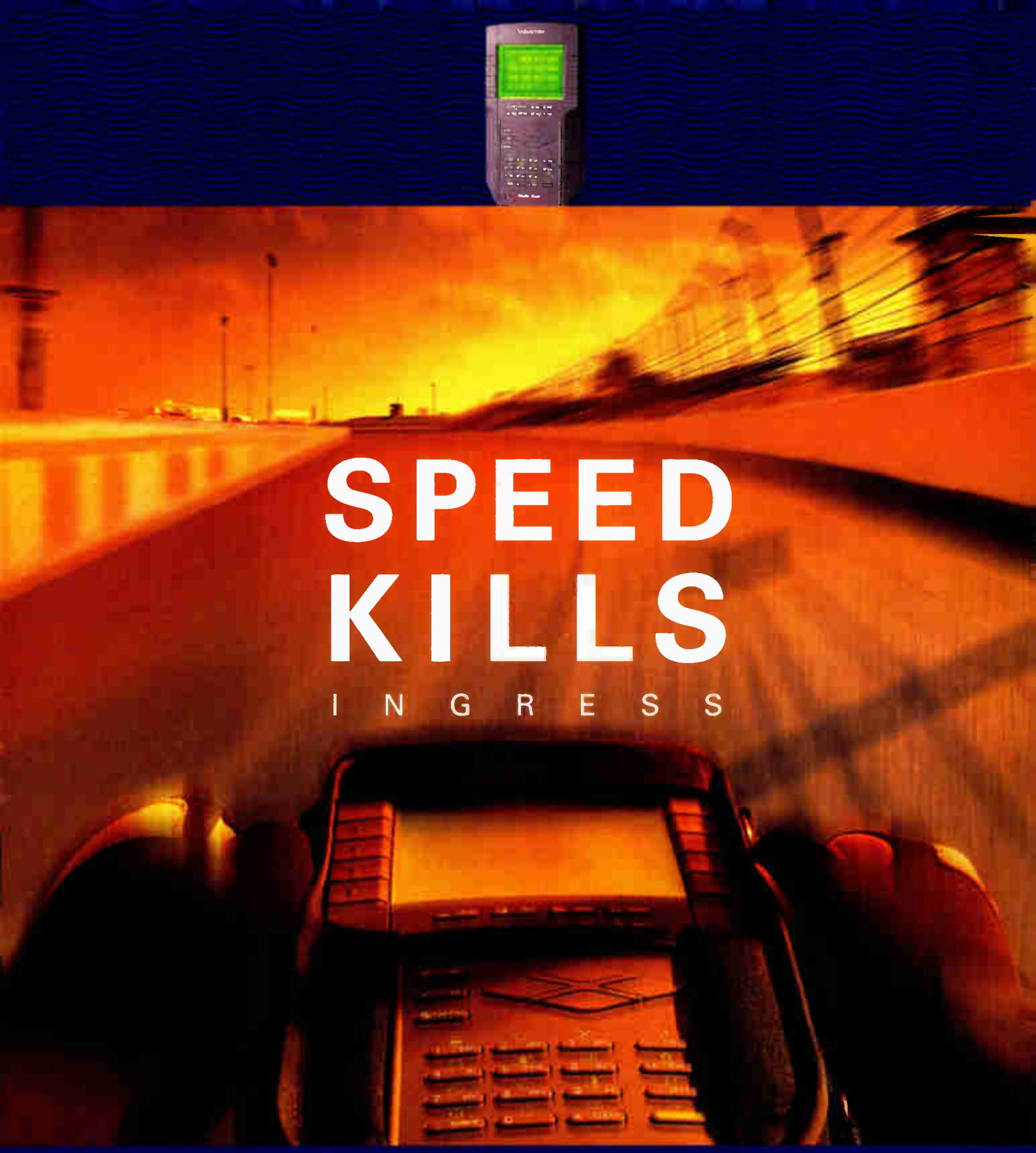
At roughly the same time, two law firms representing Hybrid shareholders filed suits against certain Hybrid leaders and financiers who helped take the company public.

Both suits claimed that after Hybrid's November 1997 offering, their shares rallied to more than $24 per share based on the company's assurance of continued revenue growth.

The complaints allege that Hybrid's actual performance was worse and that the company had failed to generate any real revenue growth. Hybrid's success, the suits claim, was achieved only by reporting "sales" for which distributorswere allowed a right of return.

While wireless operators have been slower to deploy data services than expected, Hybrid officials have said that market variables stifled their ability to compete. CT

Greta Durr is assistant features editor at "Communications Technology" in Denver. She can be reached via e-mail at gdurr@phillips.com.



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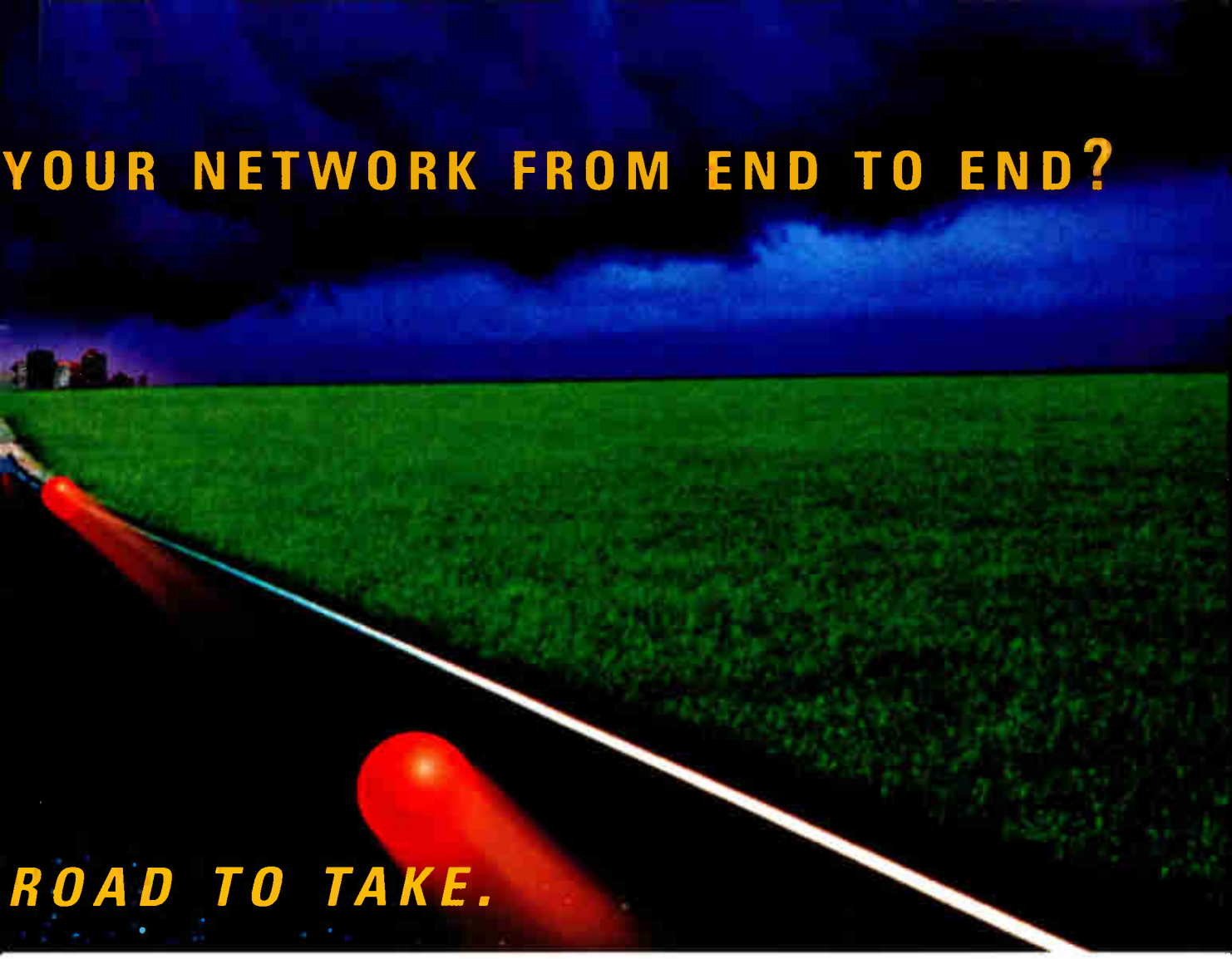

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Reader Service Number 13

SCTE UPDATE

SCTE Offers Technical Training Through Local Partnership

The Society of Cable Telecommunications Engineers will partner with its Bluegrass Chapter next month to present a "Data Technology for Technicians" seminar to broadband professionals in the greater Cincinnati area.

As part of the Society's Technical Training Seminar series, this workshop, which will be held Aug. 19-20 at the Drawbridge Estate in Fort Mitchell, KY, offers attendees an introduction to the concepts utilized in deploying data over broadband telecommunications networks.

SCTE Vice President of Technical Programs Marv Nelson will present an initial review of basic computer operations that will set the stage for understanding data transport protocols over local and wide area networks (LANs/WANs). Program topics include analog-to-digital conversion, modems, multiplexing digital data and more.

To register for this workshop, contact Jessica Dattis in the SCTE National Conferences department at (610) 363-6888, ext. 239. Tuition is $195 for SCTE members and $235 for nonmembers. On-site registration also will be available, but seating is limited to 40 attendees. Registered attendees are responsible for reserving their own accommodations.

For more information about this event or other SCTE technical training opportunities, contact SCTE Director of Training Ralph Haimowitz at (704) 264-8310, or e-mail to rhaimowitz@scte.org.

SCTE Calls for Papers For Emerging Technologies '99

The SCTE is now seeking proposals for technical papers for presentation at its 1999 Conference on Emerging Technologies to be held Jan. 19-21 in Dallas.

The annual conference, which attracted more than 1,300 attendees this year in San Antonio, will kick off the Society's 30th anniversary year with a proactive approach to the most current challenges facing the evolving broadband industry.

During this three-day event, engineering visionaries will evaluate the critical decisions that will determine the future of telecommunications systems.

Submission topics should address critical technical issues affecting the cable business and cutting-edge research and development, including digital TV transmission, as well as other technologies of value to the future of broadband telecommunications.

The deadline for submitting proposals is Aug. 21, 1998. For a specific list of presentation topics, contact Janene Martin at SCTE National Headquarters.

Submissions should include a title, author's name, presenter's name, affiliation, full address, telephone/fax numbers, e-mail address and a one-to-two-page abstract detailing the technology or issue and its significance to the industry.

Proposals may be sent via mail, fax or e-mail to Janene Martin, SCTE, 140 Philips Road, Exton, PA, 19341-1318; fax to (610) 363-5898; or e-mail to info@scte.org.

The SCTE Emerging Technologies Program Committee will announce the selected presentations in September. Accepted authors must be prepared to submit a camera-ready manuscript to SCTE by Dec. 4 for publication, as well as present a 15-20 minute oratory based on their chosen conference papers.

SCTE Announces 1998 Vendor Shows

Local chapters of the SCTE offer industry field personnel unique opportunities to learn firsthand about the latest hardware trends through regional training events.

SCTE Vendor Days were created to bring broadband products, services and information to operations personnel at the local level.

The annual shows, which focus on education rather than sales, provide a wide variety of learning experiences that allow attendees to enhance their professional knowledge with intensive training that's both cutting-edge and cost-effective.

These events feature tabletop displays and hands-on demonstrations, plus comprehensive technical training seminars. For attendees, Vendor Days are a valuable chance to share experiences with industry peers through networking and "problems-and-solutions" exchanges.

1998 SCTE Vendor Days include:

Aug. 12: South Jersey Chapter
14-15: Great Lakes Chapter
18-19: Intermountain SCTE Vendor Show (Idaho Falls, ID)
20: New England Chapter (Boxborough, MA)
26-27: Cactus SCTE Chapter (Phoenix, AZ)
27: Northern New England Chapter (Portland, ME)
Sept. 15-16: Northwest Chapters (Kelso, WA)
15-17: Oklahoma Chapter
16: Piedmont Chapter (Winston-Salem, NC)
18: Lake Michigan Chapter (Mount Pleasant, MI)
30-Oct. 1: Rocky Mountain Chapter
Oct. 3: Llano Estacado Chapter (Lubbock, TX)
20-22: Southern California and San Diego Chapters (Norwalk, CA)
21-22: Central Florida Chapter (Orlando, FL)
22: Gulf Coast Chapter
Nov. 18: Bluegrass Chapter (Elizabethtown, KY), Chesapeake Chapter
Dec. 2: West Virginia Mountaineer Chapter (South Charleston, WV)

For more information about these events, contact SCTE Director of Communications Steve Townsend at (610) 363-6888, fax to (610) 363-5898, or e-mail to stownsend@scte.org. Chapter and meeting group information also can be found on SCTE's web site, http://www.scte.org.

The Society of Cable Telecommunications Engineers is a national nonprofit professional organization serving the broadband industry's technical community. SCTE currently has more than 13,500 national members from the United States and 70 foreign countries and offers a variety of programs and services for the industry's educational benefit. SCTE has 75 chapters and meeting groups and has technically certified more than 3,000 employees of the cable telecommunications industry.

Compatibility

"My hybrid fiber/coax system is a mix of four different equipment manufacturers from the headend out. Where can I find a compatible network monitoring system?"

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Reader Service Number 14

DEPLOYMENTWATCH

By Greta Durr

Welcome to *Communications Technology*'s newest monthly column, "Deployment Watch." Whether it's in the daily news, at the office or in the field, the word "deployment" has taken on new meaning as cable, data and telephony vie for right-of-way on the highways and byways of broadband communications. This column will focus on the industry's latest developments, with this first one covering the fast track to cable modem deployment.

@Home, a 100,000-subscriber Internet service provider, posted a stellar rally following the June announcement that majority stockholder TCI was being acquired by AT&T, indicating the market's willingness to quickly adopt cable modem technology for high-speed, bandwidth-starved consumers.

Recent partnerships announced among Microsoft and Compaq with Time Warner and MediaOne are another fine example of how the industry is successfully positioning cable modems to be at the forefront of high-speed data delivery. Compaq recently announced that by the year 2000, it'll be shipping personal computers (PCs) outfitted with cable modems, standard to new models. Because an estimated 1,000 cable systems have at least tested data communications over their networks and more than 130 of those systems have launched commercial services, cable modem deployment seemed a great place to start this column.

Present numbers, forecasts

Though the industry has installed more than 135,000 cable modems in North America, penetration of the major MSOs' data services averages near 1%. According to analysts at Cable Modem University, who list hundreds of trials and more than 50 deployments involving dozens of vendors, this trend has only just begun.

Prior to the announcement of the AT&T/TCI merger, analysts at San Francisco-based Ryan Hankin Kent telecommunications research firm predicted a 700% hike in the market for cable modem equipment in the next five years as MSOs gear up for serious cable modem deployment. They say that the number of cable modem subscribers in North America will soar from an end of 1997 penetration of 165,000 subscribers to 7.4 million subscribers by the year 2002.

Their report, "Cable Modems: Business Case American Forecast," says that, while subscriber penetration will grow enormously from 1998 through 2000 and beyond, equipment revenues for competing cable modem vendors will decline because of product price competition.

Some cost issues

RHK Vice President Joel Jakubson said he expects MSO costs for cable router and headend gear to fall by as much as 40% from current prices as products standardize and competition heats up.

Multimedia Cable Network System Partners Limited (MCNS) has been working with CableLabs to develop interface specifications and establish industry standards for cable modems to facilitate the industry's transition into rapid deployment of cable modem technology. The group, composed of Comcast Cable Communications, Cox Communications, Time Warner Cable and TCI, has made tremendous strides towards developing a Data Over Cable Service Interface Specification (DOCSIS) that will affect the way the entire industry embraces and transmits data over cable systems.

CATV CyberLabs has estimated current cable modem installations to be at 260,000 in North America. By January, it forecasts that installations will climb to 600,000 globally.

DOCSIS specifications are intended to aid cable operators by allowing compatible products to be sourced by multiple vendors. Having operators and vendors in alignment with DOCSIS in cable modem deployment is expected to unlock revenue potential for both groups, while expediting availability to consumers. CT

Greta Durr is assistant features editor at "Communications Technology" in Denver. She can be e-mailed at gdurr@phillips.com.

Recent Developments: Who's Deploying What

Listed below are some of the industry's cable modem deployments since January 1998, compiled in part using data from Cable Modem University and our sister publication, *CableFax Daily*.

- Adelphia Communications deployed cable modems from General Instrument in Winchester, VA; Niagara Falls, NY; Plymouth Meeting and Bethel Park, PA; Burlington, VT; Macedonia, OH; and Hilton Head Island, SC.
- Bresnan Communications deployed Bay Systems' cable modems in Iron Mountain and Houghton, MI.
- Cox Communications deployed cable modems from Hybrid and Motorola in Humboldt, CA; Providence, RI; and Oklahoma City, OK.
- Marcus Cable deployed cable modems from Bay in Dallas.
- MediaOne deployed Bay cable modems in the Boston area.
- Rifkin deployed Com21 cable modems in Miami Beach, FL.
- Suburban Cable deployed 3Com cable modems in New Castle County, DE.
- TCA Cable deployed cable modems from Terayon in Bryan and College Station, TX.
- TCI deployed cable modems from Bay and Motorola in Alameda Bay, Dublin, Farm Island, and San Ramon, CA, as well as in Garland and Stonebridge, TX.

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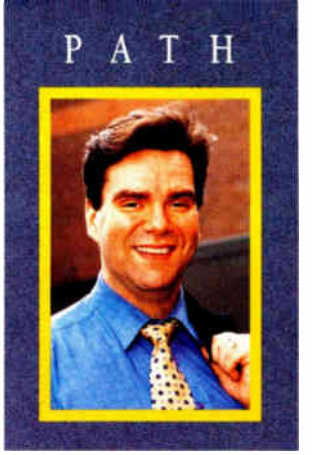


By Alex Zavistovich

The Reluctant Philosopher

Here's a sure-fire way to make a bunch of money as a business consultant. First, you have to understand some simple business concepts. Then, come up with a new word for each of these concepts. Most importantly, don't be afraid to keep coming back to a word if it doesn't take the first time. If you spin it right, almost anything can be evidence that your concept is in action.

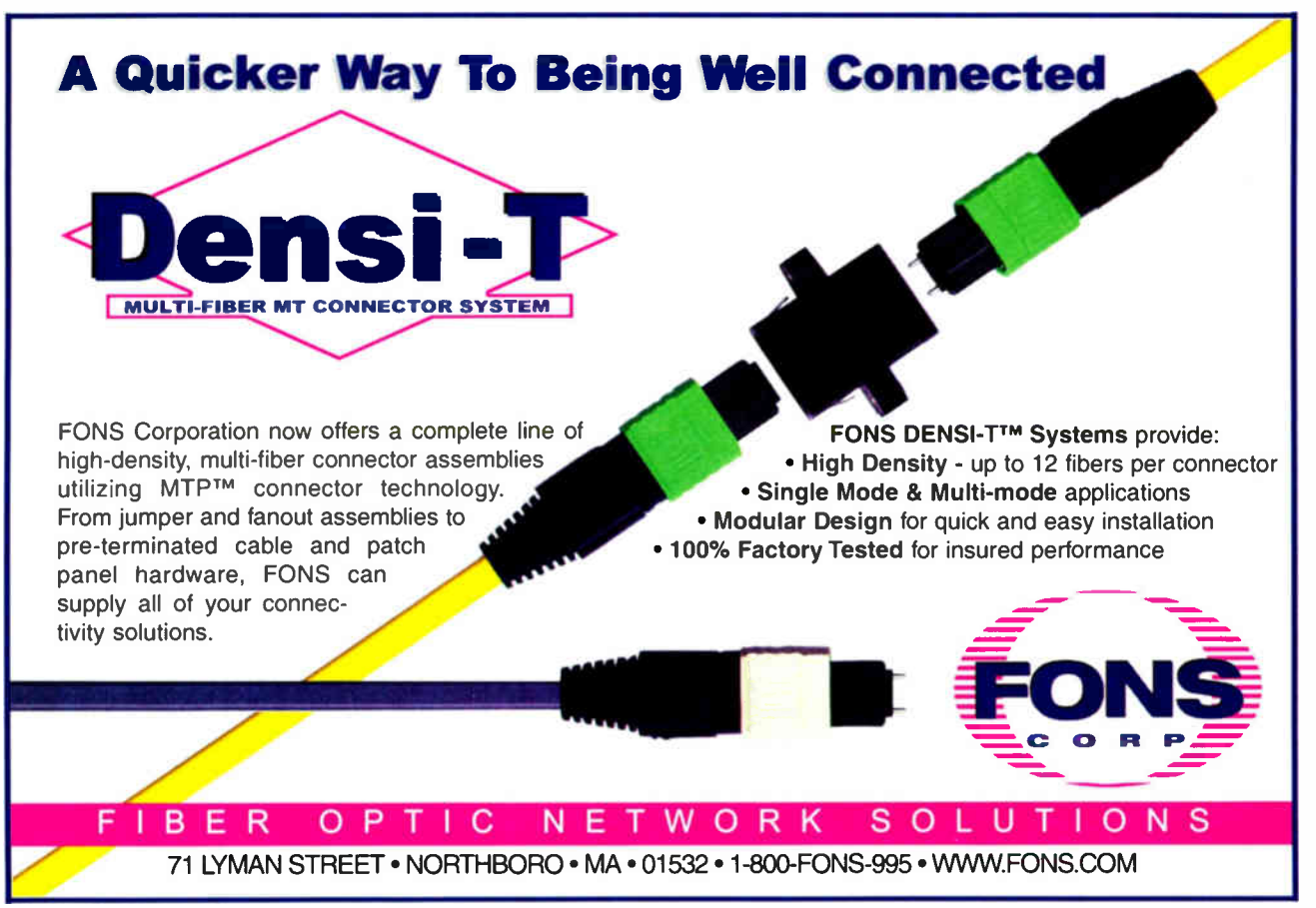
Presto! You've created a "school of thought," and people will flock to hear you speak, or just be close to you to have some of your genius rub off on them.

Here I'm talking once again about the overused word "convergence." Granted, a couple of the latest business transactions in telecommunications—such as the AT&T/TCI deal and the Nortel/Bay news—are so high-profile that a reasonable person might be tempted to think about these developments as convergence.

"Whatever gets you through the night," as John Lennon said. If you step back from the blinding glare of the multi-billion-dollar price tags, though, you'll see that what's going on now still is simple business practice, gussied up with a word that, so far, still has no single meaning.

Telecom tremors

Let's look at the AT&T/TCI deal. When it was first announced in late June, the news spread through the telecommunications industry like a seismic shock: In an agreement valued at anywhere from $50 billion to $60 billion or more, AT&T and TCI will merge. By some reports, AT&T plans to spin off TCI's programming unit Liberty Media as well as TCI Ventures, which holds an interest in the @Home Internet service. That could spell TCI Chairman John Malone moving to the operation of the two divested companies,



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Reader Service Number 17

with TCI President Leo Hindery left running AT&T's consumer division.

The deal means cable telephony finally is off to the races, and Regional Bell Operating Companies (RBOCs) may be left at the gate, sucking wind. In the short term, you can expect a small windfall for manufacturers of cable telephony-related equipment. After all, why do you think AT&T is in this deal? Mostly, it's for the chance to return to local telephone service via the back door—a move that could seriously put the hurt on RBOCs.

In another deal, Nortel agreed to buy Bay Networks Inc. for approximately $9.1 billion in stock. Dave House, chairman and chief executive officer of Bay Networks, will become president of Nortel and be appointed to Nortel's board of directors. The purchase, said Nortel President and CEO John Roth, will create a "new category" of company. "This company is not a telco company. This company is not a data networking company," explained Roth, who will remain Nortel's CEO. "This company is an [Internet protocol] integrated networking company, the first of its kind."

Granted, the Nortel/Bay deal is strong magic for Bay Networks, whose LANcity cable modem product is up against several other proven leaders in the market. Still, it wasn't too long ago that a company like the one forged by this alliance would have called itself a "turnkey" service provider, setting up systems for clients in a soup-to-nuts, one-stop-shopping kind of way.

Not too much earlier than that, other phrases described businesses that tried to grow by acquisition or by looking at alternative revenue sources: "vertically integrated," "diversified," even "thinking outside the box." Whatever school of thought you happen to subscribe to, that's the expression you're going to use. It just happens that the popular buzzword for now is the "C-word."

Reality check

For this word (or *any* word, for that matter) to mean anything, it has to mean the same thing every time you use it. You can't say that convergence means telephony and video in one case, then turn around and use it to mean telephony and data. If you do, you rob the word of any meaning. If everything that happens in telecommunications is an example of convergence, what counts against the concept?

Look, maybe it's time to grow out of this phase we're in. The emperor has no clothes. Engineers know that catchphrases may come and go, but what they'll be thinking about down the road is not vertical integration, diversification or convergence. It's standardization and interoperability. That's what's happening. Those are the words everyone in the engineering community will still be using when the latest new business theory knocks the C-word off its perch. CT

Alex Zavistovich is consulting editor of "Communications Technology." He can be reached in Potomac, MD, at (301) 340-7788, ext. 2134.

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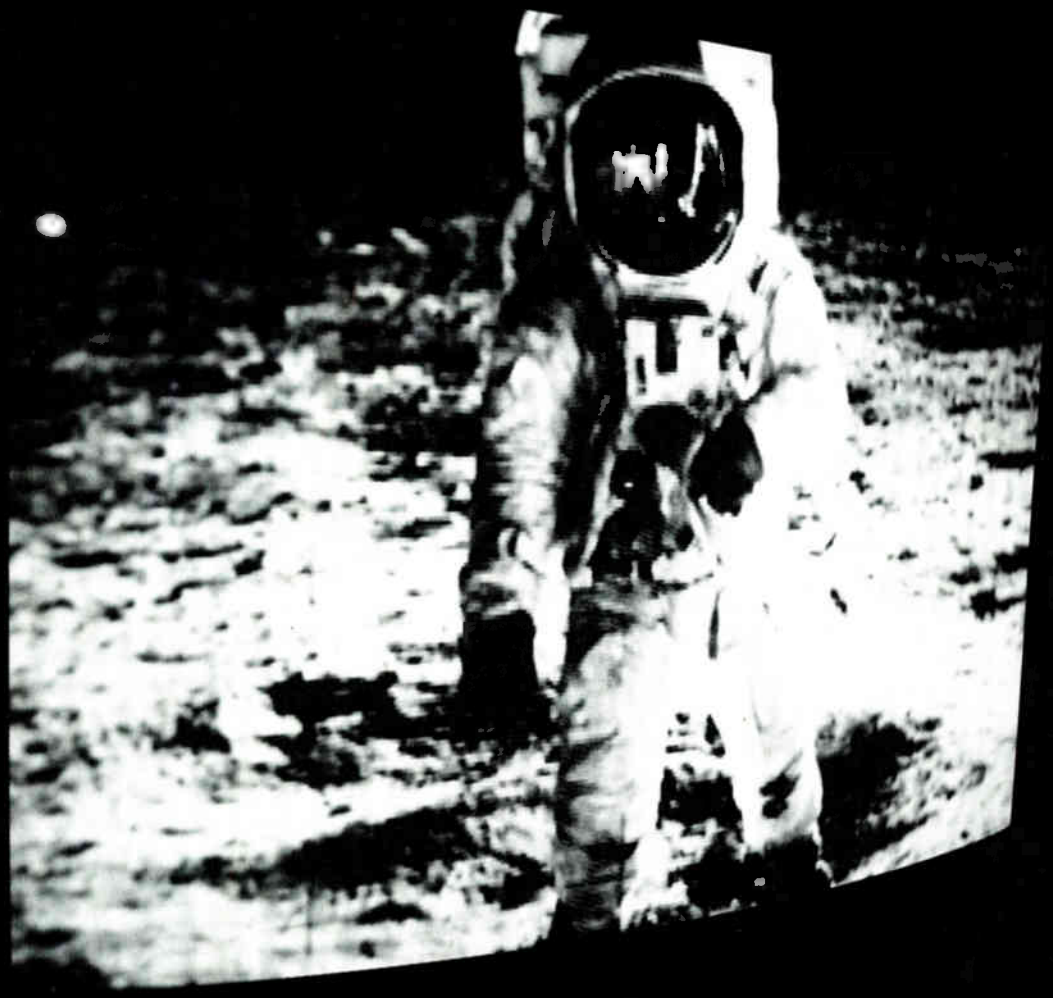

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Reader Service Number 19

By Ron Hranac

Expo Impressions

Cool Stuff from the Floor

I don't know how Society of Cable Telecommunications Engineers manages to do it, but each year's Cable-Tec Expo tops the one before it. This year was no exception, with total attendance hitting a new high of 9,300 and change, up 14% from 1997's Expo. My adopted hometown of Denver hosted this year's confab, and Mother Nature cooperated nicely, providing beautiful late spring weather most of the week.

Between what seemed to be endless meetings, I had a chance to visit several vendors' booths on the 300,000 square-foot exhibit floor. One of the things I enjoy at conventions like this is looking for unusual new products and technology. This year, I decided to focus on what equipment is available (or will soon be available) for digital measurements and reverse path testing. As usual, there was more to see than available time, but the following caught my eye as I wandered around Denver's convention center.

Digital and two-way

Applied Instruments—Applied's 700 and 800 series of cable TV signal level meters (SLMs) will have digital signal average power measurement capability available in another month or so. Anticipated pricing is about $1,000 for the 700 series and about $1,200 for the 800 series.

ComSonics—A novel Global Positioning System (GPS)-based technology called CyberTek Ingressor allows system personnel to identify forward path leakage and reverse path ingress while driving out the system.

The equipment works by receiving forward path leakage (including level and estimated distance from the leak), logging GPS satellite data for accurate physical location and time, and then assembling this information into data packets that are transmitted over-the-air on an upstream ingress test carrier. (The transmitter must be licensed because it transmits an over-the-air signal.)

> "This year, I decided to focus on what equipment is available (or will soon be available) for digital measurements and reverse path testing."

If a reverse path ingress point exists near the vehicle, the carrier will "leak" into the system's upstream spectrum and be received back at the headend. There the received data (GPS information, signal levels and so forth) is processed for analysis. One of CyberTek Ingressor's outputs is a map showing streets with the route driven by the technician, locations of forward path leakage and reverse path ingress. Availability is planned for the end of this year, and pricing has not yet been set.

Hewlett-Packard—The 859+Q quadrature amplitude modulation (QAM) analyzer was on display in HP's booth. This product was originally developed for the European digital video broadcast (DVB) market, and a prototype capable of 64-QAM and 256-QAM measurements was first shown at 1997's Western Cable Show.

The HP 859+Q J91 QAM analyzer, which is based on the HP 8590 series of spectrum analyzers, provides a wide range of forward path RF and modulation quality measurement capabilities. Availability is scheduled for this month, with a $25,000 target price. Of course, I couldn't resist giving my favorite HP engineer, Francis Edgington, a little good-natured ribbing about the need to add reverse path measurement capability to the '9+Q.

Hewlett-Packard also announced plans to introduce an upgrade for the HP Calan 3010H that will allow measurement of return path problems, automated monitoring and return path characterization. This upgrade was scheduled to be available this month. In addition to these new goodies, HP demonstrated the digital measurement capabilities the company has had available for nearly the past two years in its HP 8591C and 3010 R/H. (Yes, you can upgrade older models.)

Hukk Engineering—The CR-1200 QAM Monitor was undergoing a few last-minute tweaks before production and should be shipping by the time you read this. The $4,000 box can measure 64-QAM and 256-QAM digitally modulated

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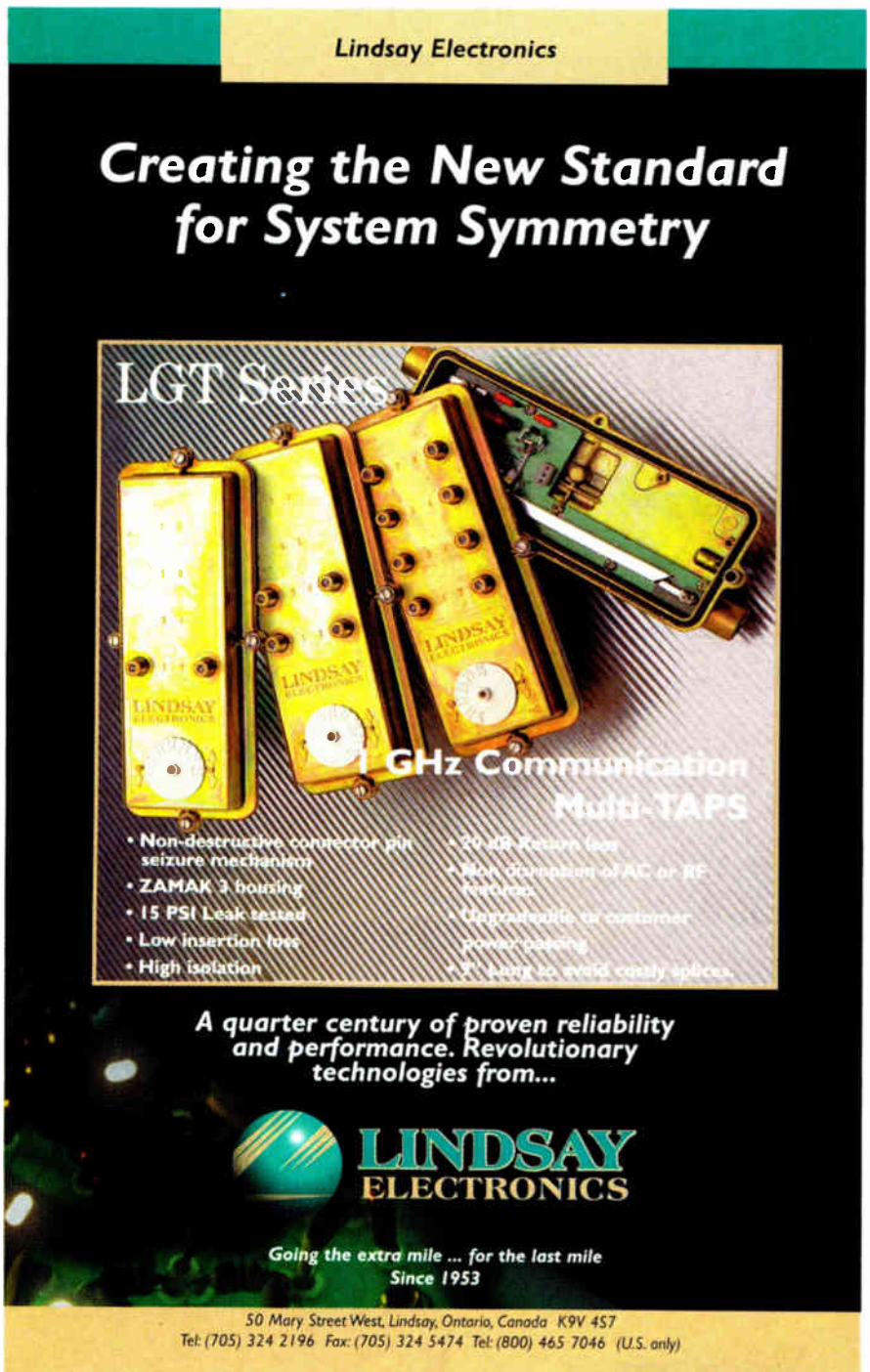
signals and provides the user with a ton of useful measurements, and it's a cable TV SLM to boot. Digital measurement capabilities include pre- and post-FEC (forward error correction) bit error rate (BER), signal-to-noise (S/N), average power level, constellation display, and severely errored seconds.

Sadelco—Sadelco is planning to introduce its DisplayMax scanning SLM this month. Priced at $1,200 to $1,500, depending on whether you want signal leakage measurement capability, this instrument will allow average power measurements of QAM signals. Quadrature phase shift keying (QPSK) capability will be available in the future.

Sencore—The QAM-B 970 ($3,500 single quantity price) performs measurements of 64-QAM signals. Some of its capabilities include average power level, pre-FEC BER (pre/post-FEC measurement capability is planned as a future upgrade), equalizer stress, carrier-to-noise ratio (C/N), and modulation error ratio (MER, which is analogous to S/N).

Tektronix—Tek exhibited its 2715 cable TV spectrum analyzer (about $16,000) and RFM151 Signal Scout ($2,420), both of which can perform digital signal average power measurements in addition to the usual analog signal measurements. Also on display was a new handheld 64-QAM digital modulation analyzer, which is slated for late summer availability. This new analyzer can do average power level, adjacent channel levels, MER (plus estimated noise margin), channel power-to-noise, constellation display, equalizer stress, and pre-FEC BER measurement and post-FEC BER estimation. The price had not been set as of Expo.



Reader Service Number 21

"If you missed this year's show, make plans for next year."

Trilithic—A couple things at Trilithic's booth caught my attention. The first was their I-Stop reverse test probe ($90), an accessory that helps the technician troubleshoot and pinpoint the location of noise and ingress. It works in conjunction with the company's 9580 SST/SSR Return Maintenance System. (A new $4,000 portable version, model 9580 STP Portable Return Analyzer, was the other item I thought was pretty nifty.)

To use the probe, you screw it into a 5/8-24 port on a tap, coupler or similar spot, then connect the 9580 to the probe's -20 dB test point. While watching the reverse spectrum display on the 9580, press a small button on the side of the probe. This introduces a temporary mismatch in the reverse spectrum. (It doesn't affect the forward path.) ➤

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Reader Service Number 22

If the ingress is getting in the system upstream from your location, there will be no change on the display. If it's getting in downstream from your location, the ingress will decrease 4 dB to 6 dB when the probe's button is pressed.

Wavetek—The CLI-1750 home wiring tester ($2,495 for the transmitter and receiver) has available a digital signal average power measurement option, ingress scan test capability, leakage measurement, frequency domain reflectrometry (FDR) function for finding faults, and it doubles as a traditional SLM. The StealthTrak sweep receiver/analyzer (about $6,000) features an impulse detector for testing the reverse path, ingress detection, and can make digital signal average power level measurements. The StealthTrak works with existing 3ST and 3HRV headend units, and existing Stealth 3SR/3SRV/3SRT products can be upgraded to StealthTrak capability.

Other goodies

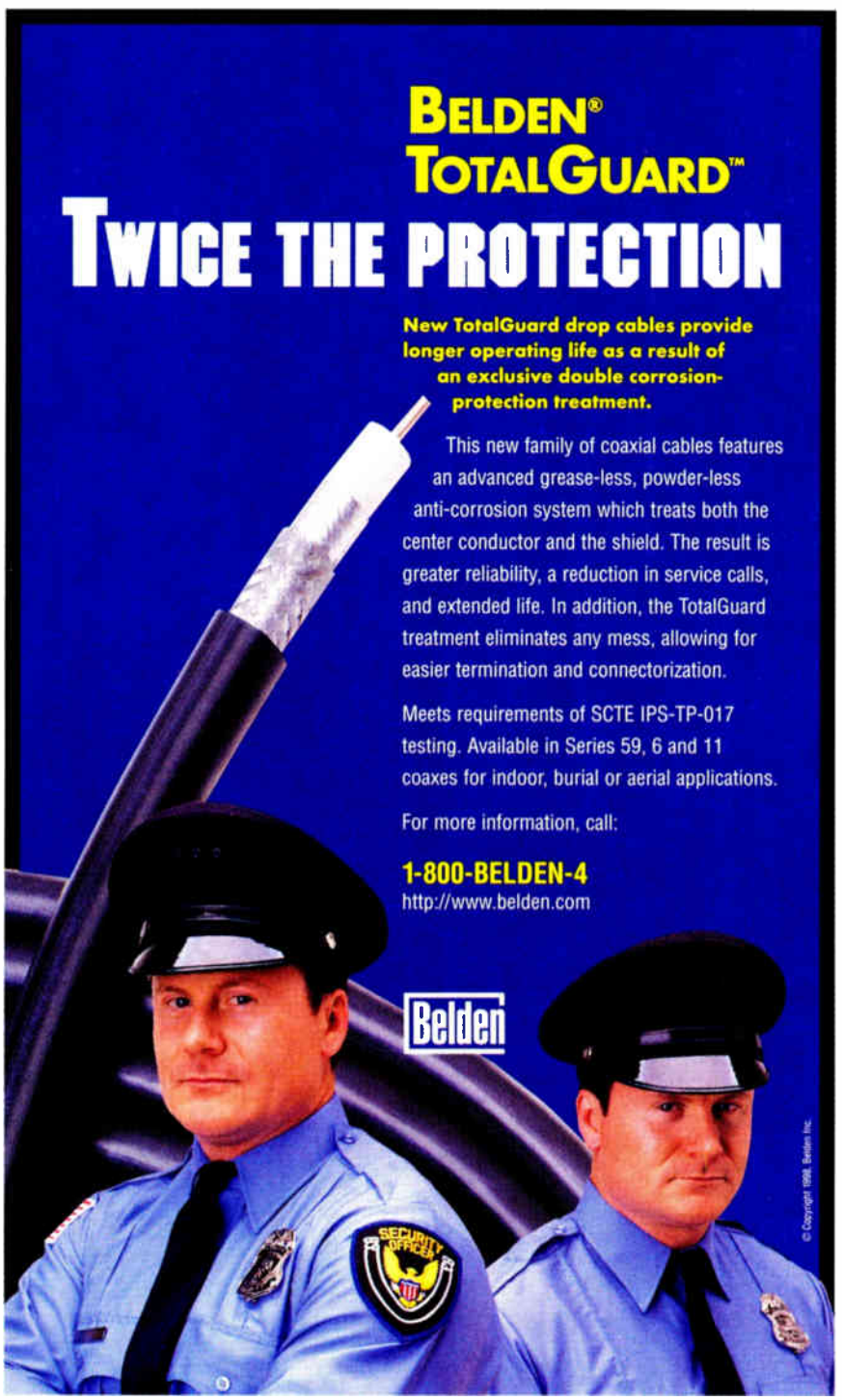
While not directly related to digital and two-way, a couple of coaxial cable manufacturers displayed some new technology. Belden has introduced a new line of corrosion protection for drop cable called TotalGuard. TotalGuard is a unique treatment applied to both the center conductor and shield during the manufacturing process and doesn't use powders or grease-type materials for corrosion protection. Availability is planned for this month, and TotalGuard is expected to cost $1 or less (final pricing had not been determined as of Expo) per 1,000 feet of cable. That's pretty cheap insurance, if you ask me.

Omega One Communications, a relative newcomer to the cable manufacturing ranks, introduced its new Pentabond braidless drop cable. The company, by the way, has Corning Inc. and Elite Technology behind it. The cable design is a departure from what we're used to: There is one layer of foil bonded to the dielectric and a second layer of foil bonded to the *inside* of the jacket. The two foil layers are separated by a thin layer of plastic material. There is no braid.

When preparing the cable for connectorization, a special coring tool removes a small amount of the foil-separating plastic, allowing the connector to be installed between the foil layers. The company claims the design eliminates the need for flooding compounds and doesn't allow moisture ingress. Pricing is about the same as contemporary tri-shield cables.

There you have it, my take on some of the interesting products at Cable-Tec Expo '98. If you missed this year's show, make plans for next year. It will be held at the Orlando, FL, convention center May 25-28, 1999. If tradition continues, it will be bigger and better than ever.

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



Reader Service Number 23

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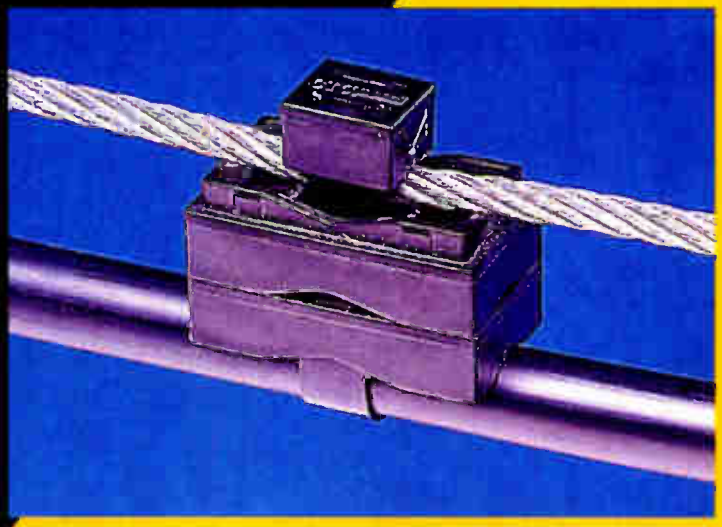

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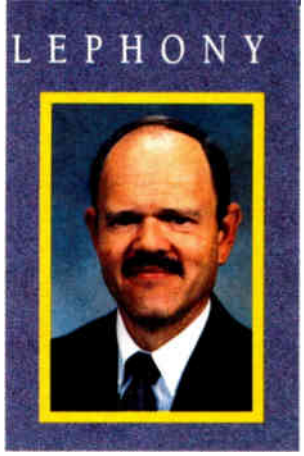
By Justin J. Junkus



Features are the Key To Telephony Business Markets

Last month, this column discussed the revenue potential of some local digital switch features that are aimed at the residential customer. While the residential market is cable's traditional "home" (pardon the pun), many service providers have found the business market to be a more profitable point of entry to telephony.

The reason is, of course, the line multiplier. Telephony for business means not just one or two lines per location, but from one line to several thousand lines, depending upon the business size. Entering this potentially lucrative market requires understanding the reasons a business buys services, rather than individual lines, from a communications service provider, and the types of features that businesses want from a communications company.

Business needs

To begin this understanding, you need to realize that a large business looks a lot like a small community, especially when the number of lines in service grows. Telephone calls need to be switched between internal lines and to the outside world.

The most obvious solution is for the business to purchase its own telephony switch to do the job. When the switch is located at a private business, rather than at the phone company, that switch is called a private branch exchange, or PBX. Unfortunately, purchasing a PBX forces the business to become a phone company, which usually is outside its own area of competence. All the challenges of maintenance, operations and tied-up capital that come with being a telephone company come with switch ownership.

For businesses, one of the selling points of using telephony services from a service provider is the transfer of functions provided by customer premises switching equipment to equipment owned by the service provider. A service provider removes the need for customer premises switching equipment by running phone lines from the business to a location that houses a switch owned by the service provider. The service provider then leases a portion of its switch to the business.

> "Telephony for business means not just one or two lines per location, but from one line to several thousand lines, depending upon the business size."

This service is known as Centrex. It is different from residential or single-line business service in that the business not only subscribes to the public switched telephone network (PSTN) connection, but also to a part of the network itself, within the telephone switch. That subscription includes a dedicated group of lines and associated switch features that may not be available to other users of the same switch.

Even though Centrex solves the problem of the business not wanting to be its own phone company, the business owner will not buy into the solution unless the service provider's switch meets the same telephony needs as a PBX. The service provider's switch features must therefore emulate the features of a PBX.

Give 'em what they want

Herein lies the point of this column. Cable telecommunications companies that are going to try to capture the business market by offering services from their own switch, or from another service provider's switch via their distribution network, are going to need to understand which features those businesses expect from the service provider's equipment.

They must either show that they offer similar features to those available in a PBX or be able to point out why the feature may not be as useful as the PBX vendor may have implied. We will therefore look at some of the more popular PBX features to gain some insight into what businesses expect.

Like switches in the PSTN, PBX switches can have hundreds of features. To simplify, it is helpful to group those features into four categories: system features, attendant features, station features and management features.

System features apply to all users of the PBX, rather than to individual station users, the operator or a system administrator. Attendant features allow a receptionist or "operator" to answer external calls, extend them to stations, serve as coverage or assist in outgoing calls. Station features help the individual station user to communicate more efficiently. ➤

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Reader Service Number 25

Examples are call waiting, call transfer, and call hold. Management features are used by system administrators to review phone usage, the number of calls using specific routes, and feature or service usage.

System features

Because there are so many features to describe, this column will focus on system features and indicate how a cable company could convince a business that it offers equivalent or better value than PBX switch ownership. The features we have chosen are based on a recent business survey, which indicated that the following are among the system features generally required by a large business.

Reader Service Number 26

Toll restriction is the ability to block calls destined to complete outside a chosen rate area. In many cases, it means restricting outgoing access to non-long distance calls. This used to be easy before the splitting of area codes in individual municipalities. Now, the PBX or network switch needs to track geography against area code, instead of just detecting an area code different than the one for the business location.

> "You need to realize that a large business looks a lot like a small community, especially when the number of lines in service grows."

Here's one feature where a service-provider-based solution has a real edge over a PBX-based solution. With a PBX, the business must track which area code is associated with the geography and be sure it has a current database of area codes from the PBX vendor. The service provider does this automatically for the network-based Centrex switch.

Automatic route selection requires the switching system to select the most economical circuit to use on station-initiated outgoing calls. This usually means choosing the least expensive interexchange carrier (IXC) for the particular call destination. With varying degrees of sophistication, the system analyzes the first three or six digits dialed by the station user, checks rate tables in system memory, and selects the route according to a preprogrammed algorithm. Network-based switches can provide this feature in the same way that it is provided by a PBX.

High-speed network interfaces include T-1 trunking for both data applications and voice circuit multiplexing. This one is easy for a service provider,

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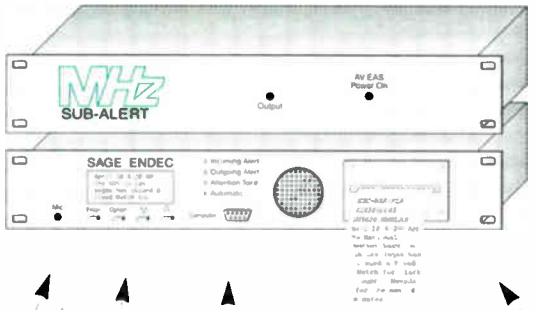

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Reader Service Number 27

especially if the provider is in the broadband business. More likely than not, the distribution network back to the business already will be using some form of multiplexing, and it's just a matter of how the media is packaged for the business.

Automatic call distribution (ACD) and uniform call distribution (UCD) are features commonly associated with customer service departments.

ACD provides uniform call distribution to agents on a random first-in, first-out basis or on a most-idle agent basis. The most-idle agent may be defined as the agent who has been idle the longest since ending the last previous call, the agent with the least total time spent engaged in calls, the agent with the least number of calls in a timed reporting period or by other criteria.

An ACD almost always includes supervisory positions to monitor calls. It also collects agent call time information to allow monitoring and forecasting of incoming and outgoing traffic volume and tracking of agent call-handling efficiency. It may include a connection to a management information system to allow agents to receive customer-specific information at a data terminal simultaneously with coming calls.

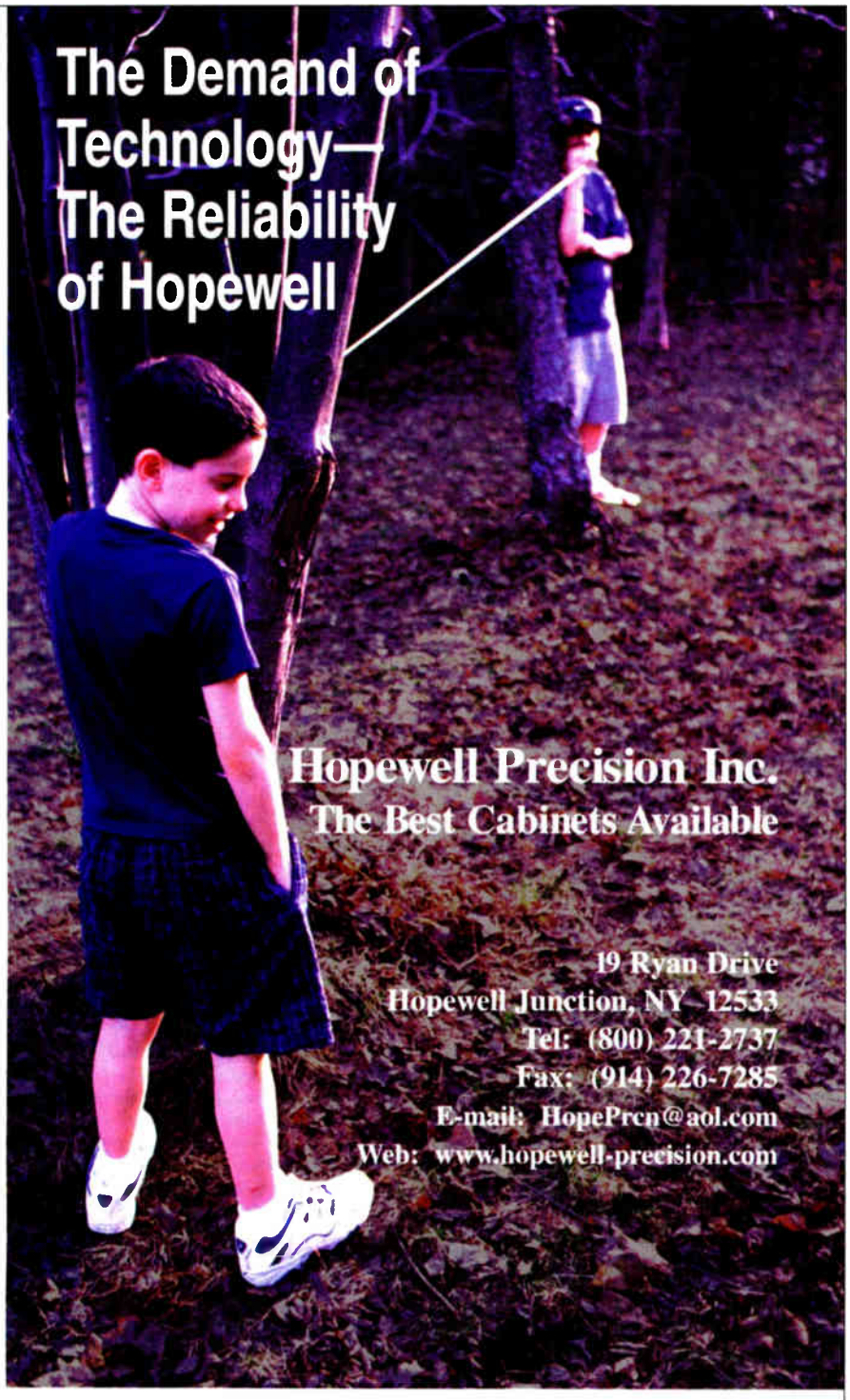
UCD is a sort of "poor man's ACD." It routes incoming calls to the most idle of a prearranged group of stations, and it queues calls when all agents are busy, but lacks the flexibility of call distribution options, agent activity analysis, and interfaces to a management information system.

Once again, a service provider can offer either of these features from a network-based switch and relieve the business operator of the need to maintain equipment and interfaces to management information systems. Furthermore, it often is possible to offer the business an option for work-at-home agents because the ACD and the agents do not need to be at the same location.

Voice messaging already has been discussed in this column, in the June issue. It is a subset of unified messaging. Here the service provider again has an edge over a PBX solution, in that it can provide the necessary linkages between messaging options to provide a truly unified messaging service that includes e-mail, paging and cellular, rather than just voice messaging for the PBX station alone.

As I said earlier, there are literally hundreds of PBX features besides those discussed here. For more detail, I suggest getting a copy of the *Master Glossary of Terminology for Business Communications Systems*, published by the Aries Group/MP&SG, Gaithersburg, MD.

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



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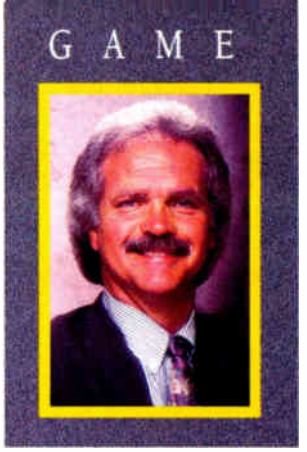

By Terry Wright

Standards: Here We Go (Again)

They Won't Solve Every Problem

It seems I've written about this before. In fact, I know I have. I've heard a number of folks in the industry express significant frustration and confusion lately about cable modem standards. Concerns seem to center on the immediate availability of Data Over Coble Service Interface Specification (DOCSIS) 1.0-compliant products, how vendors plan to migrate to DOCSIS 1.1 and retail product availability. Considering the overall frustration level of many in the industry today, maybe it's a good idea to revisit the standards topic, if only to put things into perspective.

In my last column (April 1998, "Managing the Formless"), I tried to shed something of a humorous light on the task of managing a data services delivery infrastructure. I chose that topic because I figured many of you would be facing that challenge soon. But lately, I'm not so sure.

It all has to do with the notion of cable modem standards and vendors' promises to manufacture and market (ideally sooner rather than later) products that comply with those standards. I also sense that the general mood out there may have something to do with our perception of what a standard is and what it means to the industry.

Dispelling a fallacy

Now don't get me wrong—I'm all for standards. I've spent hundreds of hours on airplanes and well over 1,000 hours in committee during the last several years trying to help create some useful ones. I'm for any legitimate thing that stands a good chance of stabilizing the complex technical dynamics associated with rolling out sophisticated telecommunications services.

But let's not mistake any standard, whether for cable modems or any other technical element, as a panacea that it is not. A standard is not going to generate any revenue for you, open up new business horizons for you, or have much to do with making your high-speed Internet/data service the envy of your competitors. A standard is an enabler. A standard is primarily of value in three fundamental areas:

1) Vendor independence through basic device interoperability
2) Lower-cost products through high volume production of common components (primarily ASICs, but connectors, cables and so on qualify as well)
3) Retail distribution through basic interoperable functionality common to products that implement the standard

> "Let's not mistake any standard, whether for cable modems or any other technical element, as a panacea that it is not."

Benefits and cautions

Based on these benefits a standard represents, the scope of a standard (such as North American only, European only, international and so on) can greatly effect its overall value and utility to an industry, especially in a global market. For example, Ethernet/Institute of Electrical and Electronics Engineers (IEEE) 802.3 is considered an international standard, and compliant products can readily attach to any Ethernet, regardless of location. The reduced costs of today's Ethernet adapters (vs. 15 years ago) aptly demonstrate point No. 2.

With regard to point No. 1, the issue of vendor independence is a strategic one, and the ability to secure standard-featured interoperable products from multiple vendors is of growing importance in this age of mergers and acquisitions.

In addition, regarding point No. 1, I deliberately emphasize the word "basic" with regard to baseline device functionality. I do this to call your attention to a point that may not be obvious. That point is that vendors who produce standards-compliant products almost certainly will build their own proprietary features and capabilities on top of the standard functionality in order to differentiate their products from their competitors.'

An example of this is a triple-media Ethernet adapter that accommodates 10Base5, 10Base2, and 10BaseT media types. The standard requires an interface to only one. Another example would be a DOCSIS 1.0-compliant cable modem that

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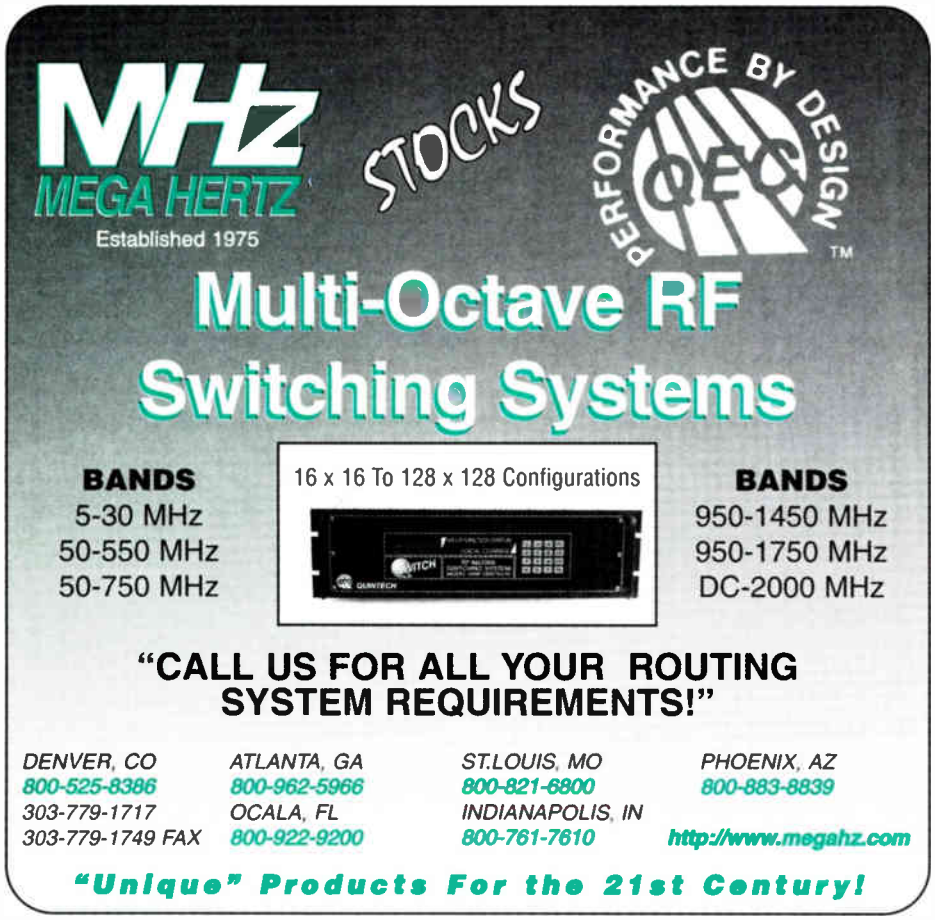


Reader Service Number 32

also implements a proprietary Internet protocol (IP) voice or security card. Importantly, it may just be the proprietary feature of a product that provides the most value to you (such as an IP voice card) in your market.

In the issue of retail product distribution (point No. 3), I see this as more of a two-edged sword than most people do. On the one hand, getting cable modems off the balance sheet no doubt is very attractive to many operators. On the other, keep in mind that in so doing you sacrifice control of a strategic value portal into subscriber homes, while the broadband-based data services industry is still too new to quantify the value potential of that portal.

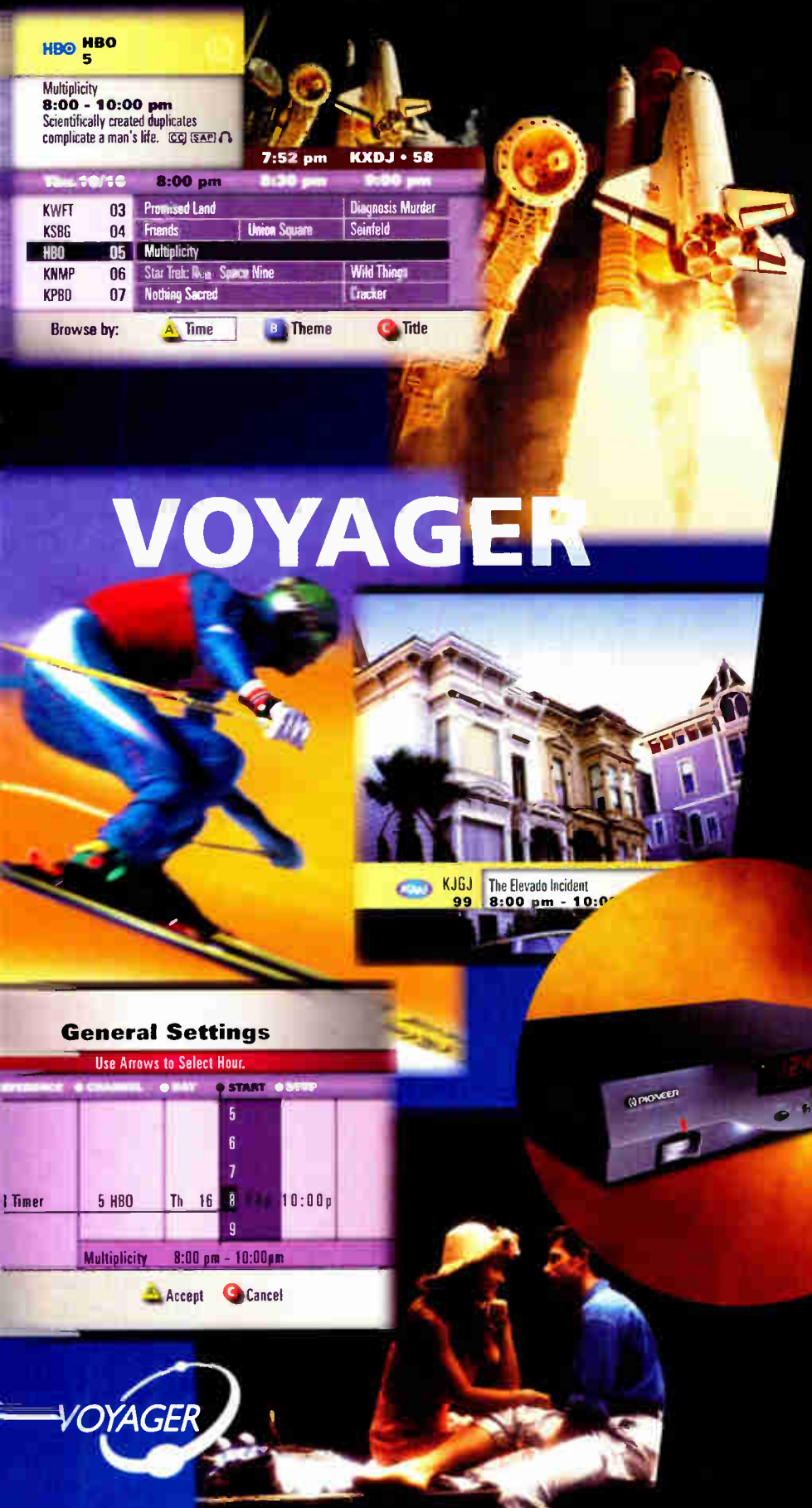
There is a reason Ma Bell owned the telephones our parents and grandparents used for so long. While the government has forced a similar path for set-top boxes, cable modems still are immune at this point. If you retain control of the cable modem, you retain the right to replace it with lower-cost products capable of delivering even greater value as broadband-based data technology evolves.

Along this same side of the sword, the retail model moves your service demarcation point back to the F-connector on the RF side of the cable modem. Depending on how much functionality the standard defines as minimum and just how interoperable different vendors' implementations truly are, delivering consistent services (especially advanced ones) across a diversity of cable modems might keep your support desk phone ringing constantly.

Prepare for change

One final point before I close. Now that the industry has a cable modem standard the vendor community is endorsing, we must plan for this standard's evolution. Just as telephone modems evolved from 300 bps to what they are today, DOCSIS will evolve to version 1.1 and beyond. I hope no one was expecting things to become static. T

Terry Wright is chief technology officer at Atlanta-based Convergence.com Corp. He can be reached at (770) 416-9993 or via e-mail at thwright@convergence.com.



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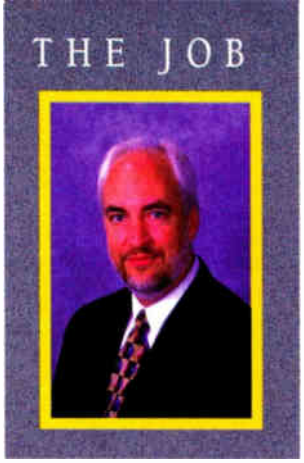
By Alan Babcock



The Value of Video

Last month, I presented some of my thoughts on the benefits and drawbacks of instructor-lead classroom training. You may recall that I suggested that all other training methods could be measured against this tried and true technique. This month I want to discuss the use of video as a training medium. After all, cable TV has been delivering video for years; it only makes sense that video ought to have a place in training cable employees.

My earliest recollection of video as a training instrument comes from elementary and junior high school. When I was in school, we didn't have VCRs and TV sets; we used 16-mm films as sources of video information. Many films were dry and boring, but I vividly remember a series of films created by the old Bell Telephone Co. that dealt with various science topics. The most memorable helped us understand the workings of the brain. I can still visualize a demonstration of how the nervous system works.

Memories

Picture a man touching his finger to the bottom of a hot iron. How does the nervous system react? A nerve is activated in the finger and generates an electrical pulse. The electrical pulse is of a duration and amplitude that corresponds to the intensity and type of sensation experienced. This pulse travels through the nervous system, a network of wires that connects our fingers to Nerve Central (the brain).

> "When done well, video helps us visualize complex events, tasks and concepts."

When the signal reaches the brain, it activates an alarm (much like those in network operations centers or status monitoring systems). The alarm rudely awakens the scientist in control of Nerve Central. The scientist looks at the monitors on the console and begins pulling levers, twisting dials and throwing switches. One lever sends a signal back through the nervous system to the arm, wrist and finger to move away from the hot iron. A switch sends a signal to the mouth to cause the tongue to form the word "Ouch." Another dial causes the lungs to

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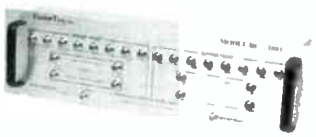

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contract pushing air through the voice box, past the tongue and teeth to cause the "Ouch" to be exclaimed with the proper loudness.

Why do I remember this so vividly? The power of video is incredible. When done well, video helps us visualize complex events, tasks and concepts. Video appeals to the visual learner in all of us and makes an impact on the psyche that sometimes is almost permanent.

Costs

Video can be used to present information in many ways. It is difficult and expensive to create video that will have the impact of the film I described. Actors, animation, sound, lighting and scripting all combine to create a total experience. Time and money are required to do a great job with video. Producers of Hollywood films spend millions, even hundreds of millions, of dollars to create video experiences that we will enjoy and remember. This investment ideally produces an event that people will pay to see.

> "Video appeals to the visual learner in all of us and makes an impact on the psyche that sometimes is almost permanent."

Unfortunately, the reality of the training environment doesn't provide a similar market for training videos. Because great videos require significant resources, producers must cut corners to reduce costs. Does this mean training videos can't provide an excellent or even entertaining way to learn a subject? Absolutely not.

Alternatives

Many training videos have been created with a "Talking Head" format, where an instructor simply sits in front of a camera and talks. The talking head can be effective, but it often is considered boring and nonengaging. However, these types of videos are the least expensive to produce and provide an easy way to provide a verbal message to an audience. The talking head video can be enhanced with graphics and other video to help make a point.

Another type of training video uses an instructor in either a real or simulated classroom. These videos also have their place and provide some improvement over the talking head. Some interactivity can be built into the program with questions and answers from students in the classroom.

One of the best approaches for a training video engages the learner in some type of activity. One method to do this is to build in stop points to steer the learner to another activity. Learners may be directed to a workbook, a hands-on exercise or another activity.

When using video in the training environment, remember that we expect video to entertain as well as inform. We must be careful to avoid silliness and petty humor, but people do expect video to entertain, and that often calls for some humor. At the very least, training videos should use liberal amounts of visual stimulation to illustrate concepts, tasks or ideas. Think about the last movie you saw. What was it? Do you remember the script? Probably not, but I'll bet you remember some of the scenery.

The strength of video lies in effective use of imagery to appeal to the visual learner. How does video compare with classroom instruction? Video can successfully enhance any learning experience. Video even can be used as the dominant teaching method if it includes check points and stop points that engage the learner in other activities. Remember, there are different learning styles: kinesthetic, auditory and visual. The most effective training method is one that appeals to each learning style. CT

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

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SCTE Cable-Tec Expo '98

By Greta Durr

Cable's technical community descended on the Mile High City in early June to discuss serious business affecting the farthest reaches of the Broadband Universe. That quite a bit of fun was had in the pursuit of the industry's future, of course, didn't bother the nearly 10,000 attendees at Cable-Tec Expo '98 in Denver.

The Colorado Convention Center in Denver.

Outgoing President Bill Riker kicks off Cable-Tec Expo in Denver.

Coping with the many modes of transition from analog to digital systems and keeping a tidy return path were at the forefront of discussion at this 100% technical confab. Keeping equipment up to date and employees up to speed in today's competitive and rapidly advancing telecommunications industry were topics that kept everyone busy from conferences and workshops to the show floor.

Because there's nothing else that can begin to meet the size and scale of the Society of Cable Telecommunications Engineers annual Cable-Tec Expo, the event continues to burgeon at an unprecedented rate. Attendance was up 14% over last year's record crowd, and matched nearly one exhibitor for every attendee.

Turn the page for a wrap on this year's Engineering Conference. It features a run-down of the latest words from industry leaders on digital deployment, cable modem technology, product strategy and government regulations.

The Annual Awards Luncheon gave the Society a great forum for celebration and advancement into new horizons. It also commemorated the official departure of Society President Bill Riker from his post of nearly 14 years as SCTE's esteemed

The Technical View From a Mile High

Entrance to Expo.

Registration was booming.

Competition was fierce at the Annual Cable-Tec games.

leader. See page 54 for the accolades.

On page 58, you can learn about the preconference tutorials and technical workshops. If you feel left out afterward, contact the SCTE for a copy of their proceedings manual; it's brimming with valuable information.

Coverage of breaking news and commentary from *Communications Technology* magazine's editors prowling the exhibit floor can be found beginning on page 70.

There were plenty of diversions at Expo '98. To learn more about the special events that personalize the Society's innate technological fervor, turn to page 76.

This wrap-up was written with assistance from the following members of the *CT* editorial staff: Coaxial International's Ron Hranac (senior technical editor), Rex Porter (editor), Laura K. Hamilton (executive editor), Alex Zavistovich (consulting editor) and Ron Hendrickson (assistant managing editor). PBI's Paul Levine and Allan Rubin provided further assistance. All photographs are © 1998 Peter B. Grannis. C_T

Greta Durr is assistant features editor at "Communications Technology" in Denver. She can be e-mailed at gdurr@phillips.com.

A highlight at Expo every year is the opening of the Engineering Conference.

Engineering Conference '98

Follow the Vision

Addressing the technological synergy to erupt from Society of Cable Telecommunications Engineers collaborations with CableLabs, outgoing SCTE President Bill Riker launched Expo '98's Engineering Conference with an emphasis on the fantastic duo's strategic planning sessions—dubbed "SWOT" for "Strengths, Weaknesses, Opportunities and Threats."

With CableLabs' emphasis on interoperability research and the SCTE's pioneering efforts in standardization, cable technology has made great strides—witness the work done with creating specifications for cable modems.

The SCTE's SWOT sessions have led to

From left to right: Tom Southwick of "Cable World" magazine, CableLabs' founder Richard Leghorn, John Malone of TCI, Trygve Myhren of Myhren Media, and Richard Green of CableLabs

Outgoing President Bill Riker welcomes everyone to the conference.

From left to right: Leslie Ellis of Multichannel News/Broadband Week, Alex Best of Cox, James Chiddix of Time Warner Cable, Bud Wonsiewicz of MediaOne, and Tony Werner of TCI

the Society's greater emphasis on standards, including the release of 135 technical standards documents; four have been recognized by the American National Standards Institute and two by the International Telecommunications Union. The latest SWOT sessions have led to a new plan by the SCTE to create marketing programs to embrace other industry segments "with which we will soon be business partners," said Riker.

Visionaries unite

Following Riker's introductory remarks came the day's first panel session, "A Vision of the Future—Discussion with Industry Leaders," moderated by Tom Southwick of *Cable World* magazine. Beginning with a look at the past, Richard Leghorn, founder of CableLabs, explained how the organization got started, which included a study in 1954 by the Rand

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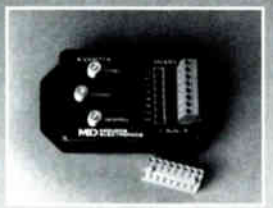

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Corp. of the feasibility of a research and development consortium. Funding for the organization was settled on at two cents per subscriber from each participating operator, and a minimum three-year commitment, with three years' notice of intent to withdraw. That allowed R&D efforts to proceed relatively uninterruptedly.

John Malone, CEO of TCI, said that CableLabs was vital in cable's transition from one-way video to telecommunications. CableLabs was needed, Malone said, to turn the "Balkanized" cable industry into a unified technology service with interoperable equipment.

Turning to cable's future, CableLabs CEO Richard Green focused on three core technologies: cable modems, the OpenCable advanced set-top initiative and packet cable. With SCTE's involvement, Green said, the industry now has an international standard for building interoperable cable modems. The next step is certification of modems and retail sale of the devices.

The OpenCable initiative is enabling a multi-industry forum to contribute to advanced set-top design. Green expects the discussions to move to the SCTE this summer for standardization. As for packet cable, Green said the industry is not likely to hear about developments for "a couple years." He noted, however, that this technology, which integrates digital video transmission, data transmission and packet networking, will create low-cost, highly capable networks.

Regarding service deployment, Malone predicted that data services will explode around Thanksgiving, which in turn will facilitate subsets of the technology, such as Internet protocol (IP) telephony. Increased deployment of service will raise some network latency issues, he noted.

TCI's construction timetable for upgrading its systems, according to Malone, is to have plant work completed by 2000. Headend equipment is a more evolutionary concern, he said, with OpenCable leading to a migration of technology into consumer devices.

As for the issue of price as a barrier to consumer acceptance of high-speed data service, Trygve Myhren, president of Myhren Media, acknowledged that adoption of the service would move more quickly at a lower price. Cable must hurry to get high-speed data into homes, Myhren said, so that other services such

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as IP telephony can follow. Malone agreed, indicating that tiers of pricing based on quality of service (QoS) also will help. He added that, as modems are integrated into personal computers (PCs) and set-tops and become more readily available as stand-alone peripherals, equipment costs will disappear as a barrier to entry.

Asked whether telcos actually will be able to competitively offer high-speed data access over twisted-pair, Green conceded that digital subscriber line (xDSL) technology is competitive with cable's broadband solution. He noted, however, that xDSL is difficult to offer ubiquitously because of geographical obstacles. Cable has a "significant edge" in network capacity, Green said, adding, "We have a superior product; we just need to get it out."

Best embodies cable spirit

With his rapid-fire wit and industry realism, Cox Communications' Senior Vice President of Engineering Alex Best stole the show at the "Technology and Operations—Implementing the Vision" conference.

Celebrating his 25th anniversary with the SCTE this year, no one on the panel seemed more in tune with what engineers need—in the field or in the corporate office. His no-nonsense approach to competition and federal mandates made the crowd roar with approval virtually every time he opened his mouth. Even for an SCTE Hall of Famer, this may be measured as quite an accomplishment.

"I always worry when the government tries to help me run my business," Best told a crowd that nearly broke the sound barrier in response when he was asked about the Federal Communications Commission ruling on regulating navigational devices. Under the Telecommunications Act of 1996, the Commission is required to regulate the devices so that they are available in the consumer market. Among the goals of the mandate is to prohibit any entity in the cable TV industry from establishing a monopoly with the set-tops, which are expected to take cable to places it has never been before.

FCC officials have said that OpenCable specifications set by CableLabs will heavily influence their decision. Industry leaders hope OpenCable will help provide a seamless transition as the industry begins to deploy the new digital set-top boxes widely.

CableLabs, a Colorado-based research and development group, receives funding from throughout the cable TV industry. Establishing specifications for the future of digital set-tops may be among the most significant charges in the history of the industry.

As a member of CableLabs' board of directors, Best is more intimate with the nuances of interoperability and the realities of field implementation than many industry executives.

Government regulations don't seem to daunt Best. His concerns are more entrenched in the realm of consumer satisfaction when it comes to the digital set-tops. The industry simile likening them to personal computers shouldn't go too far, he said.

"I get really nervous when people start comparing the new set-tops to the PC," Best said. "I don't think our customers ever want to see a control, alt, delete button, or get a message asking, 'Do you want to continue?'"

When asked if he had any concerns about high definition TV (HDTV) or the widely-anticipated FCC rulings on digital must-carry, Best's voice assumed an almost defiant tone: "Bring it on," he said and was again met with cheers from the appreciative crowd.

Best joined Cox after two decades at Scientific-Atlanta, where, as principal engineer, he came to oversee virtually every aspect of their cable TV product development and business application.

Part visionary, part pragmatist, Best seems to know what engineers need, whether it's in the most distant field plant or under the more confining auspices of Cox corporate headquarters.

"Offering a service such as video-on-demand requires more than just technology," said the 20-year member and current chairman of the National Cable Television Association's Engineering Advisory Committee. CT

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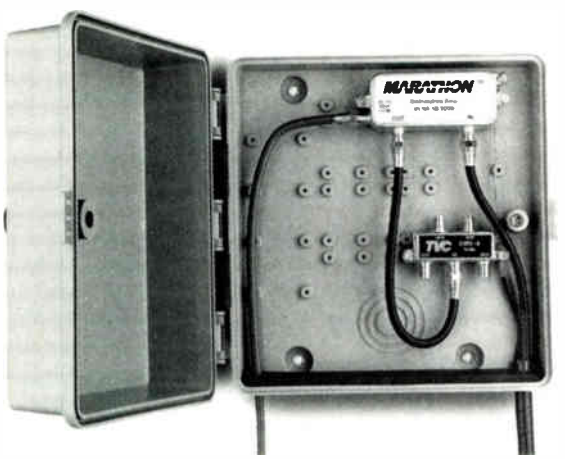

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SCTE Chairman Steve Johnson thanks outgoing SCTE President Bill Riker.

Newly elected SCTE Chairman Hugh McCarley accepts the gavel from Johnson.

Awards Luncheon

The Changing of the Guard

The Society of Cable Telecommunications Engineers recognized some of the broadband industry's top professionals at the Annual Awards Luncheon before announcing the Board of Directors' election picks for new officers.

Outgoing SCTE President Bill Riker shared emcee duties with industry veteran Les Read. Riker kicked off the ceremony, passing the mike to Read, who introduced the 1998 board of directors. Read also offered hearty thanks for the longtime service of outgoing directors Steve Christopher of Region 8, Maggie Fitzgerald of Region 10 and M.J. Jackson of Region 4.

Outgoing Board Chairman Steve Johnson was honored for his work during his 1997-98 term, receiving a mounted gavel. He expressed confidence in the future and his thanks to the SCTE members and their employers for their commitment.

"Expo is the major event in the SCTE calendar," Johnson said, pointing out that attending cuts into work time and free time. Johnson then presented the 1998 Chairman's Award to the *Literature Library* for its outstanding service to the Society and to the broadband industry. Publisher Cathy Wilson accepted the award on behalf of her publication's staff.

Embracing change

Speaking of the state of the SCTE when Riker took the helm, Johnson said, "Bill took a big gamble coming to work for the Society in financially shaky times."

Communications Technology Senior Publisher Paul Levine also commented on the Society's changes since the early days of Riker's term. "When we started *CT* in '84, we thought there were 2,000 (members), and there were three chapters," Levine said. "Look at it now."

Riker, looking surprised about his award, said, "I wrote the script for the awards presentation, and this wasn't in it."

Johnson also presented Riker with a $1,500 check for his daughter's college fund.

Johnson then passed the chairman's gavel over to his successor, Hugh McCarley. The new chairman opened his remarks on a humorous note, saying, "Believe me, my election had nothing to do with Bill leaving."

Putting levity aside, McCarley said he intends to focus his energies on bringing up the attendance numbers at local chapter meetings to increase par-

SCTE Member of the Year Keith Hayes of BellSouth.

Tom Beaudreau and Tony Werner of TCI relax after being presented with CT's Service in Technology Award.

Industry veteran Les Read shared emcee duties with SCTE President Bill Riker.

ticipation and involvement throughout the Society.

Laurels for TCI

TCI received the 1998 Service in Technology Award for its commitment to the advancement of telecommunications technology. Annual honorees are selected by *Communications Technology* magazine; a donation is made to SCTE's scholarship fund in the name of the recipient. Levine presented the award to Tony Werner, who represented TCI.

"TCI has kept its promises," Levine said, expressing hope that the industry will emulate the example of pursuit of excellence. "As TCI goes, so goes the rest of the cable industry."

Werner accepted the award on behalf of TCI, saying that it should go to all 35,000 people on the TCI team. "There's been no greater team project than this," he said. "We're very honored and humbled to have the award, and we appreciate it."

Other kudos

- Brent Lutz was the recipient of the 1998 Milton Jerrold Shapp Memorial Scholarship Award. The award amounts to up to $20,000, provided by General Instrument, toward Lutz's college education.
- Gregory Williams won first place in this year's SCTE Field Operations Award competition. Tim Lent and Carrol Childress placed second and third, respectively.

  The award was created with Telecrafter's help. It is intended to recognize the problem-solving abilities of technicians in the field. Williams won for his temporary power converter, receiving a plaque and $500.
- Robert Nunn and Charles Harper were elevated to the rarefied air of Senior Member status in the Society. The SCTE presently has only 201 Senior Members.
- Richard Covell and Tom Elliot were inducted into the SCTE Hall of Fame, joining such luminaries as Cliff Paul and *Communications Technology*'s own Rex Porter.
- The SCTE presented its first-ever Gold Awards for Safety to Jones Intercable. The MSO received this award for its outstanding dedication to exceeding national averages for safe work environments.

  The Gold Award goes to operators that maintain reportable incident levels at or below 50% of the industry average. The Silver Award goes to operators that maintain incident levels at or below 25% of the industry average.

In pursuit of excellence

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and service to the Society. Hayes also is the SCTE's 124th certified Broadband Cable Engineer.

Last year's winner, David Devereaux-Weber, presented the award. On receiving it from Devereaux-Weber, Hayes said: "I can't believe this. Dave, I'm filling some mighty big shoes here."

Chapter leadership kudos

SCTE Director of Communications Steve Townsend presented a number of chapter awards as well. James Fronk of Multimedia Cablevision and Gary Wilson of Times Fiber each will receive the Society's Leadership Circle Award. The award honors SCTE local leaders who have demonstrated leadership, innovation and commitment in their efforts to achieve the Society's mission.

The SCTE South Florida Chapter received the first-ever Towering Achievement Award for Educational Programming for its SCTE Installer Certification prep program and its efforts promoting the Society's other certification levels. The award recognizes SCTE chapters and meeting groups for outstanding efforts in educational programming, promotion and communication, and effective collaborations with industry organizations.

The SCTE Penn-Ohio and New England Chapters received the 1998 Chapter of the Year Award. Over the last 12 months, both chapters have shown strong support for the Society at the local and national levels, including aggressive promotions and membership support programs, as well as diverse and representative boards of directors.

SCTE officials ascend to new vistas

At a lengthy pre-Expo meeting, the SCTE's Board of Directors elected new officers for 1998-1999, while new regional directors officially assumed their posts in a ceremony to bid farewell to outgoing Society President Bill Riker.

The new officers are Chairman Hugh McCarley of Region 9; Eastern Vice Chairman Jim Kuhns of Region 7; Western Vice Chairman Larry Stiffelman of Region 5; Secretary Bob Schaeffer of Region 6; Treasurer John Vartanian of Region 12; and Executive Committee Member Andy Scott, an at-large director.

The newly elected officers assumed their roles at the close of the Annual Membership Meeting the day before Expo began.

Incumbent Chairman Steve Johnson of Time Warner Cable passed the torch to challenger McCarley of Cox Communications. Johnson will retain his post as director of Region 2.

Incumbent Eastern Vice Chairman Kuhns of Comcast Cablevision retained his position.

Stiffelman, of CommScope, traded his earlier position of treasurer for that of western vice chairman.

Former Secretary Norrie Bush of TCI of Southern Washington relinquished his seat to Schaeffer, who formerly was western vice chairman. Bush will retain his position as director of Region 3.

The post of treasurer, formerly Stiffelman's, now belongs to Vartanian of Viewer's Choice.

Scott, of the National Cable Television Association, gained the position of executive committee member. CT

Reader Service Number 44

Rob Moore of Tektronix helps with the Digital Services Provisioning workshop.

Steve Ross of Ross & Hardies at the Regulatory Update workshop.

Expo Workshops

Eyes on the Future

Before Expo could even begin, Society of Cable Telecommunications Engineers members were conducting pre-conference seminars to get everyone up to superspeed on high-speed data, cable modems and the components of digital.

Key concepts introduced at the "LAN/WAN Basics and the Transport of High-Speed Data in CATV Networks" session included the advent of Internet access, ad insertion, Internet protocol (IP) telephony and other applications, computer networking principles,

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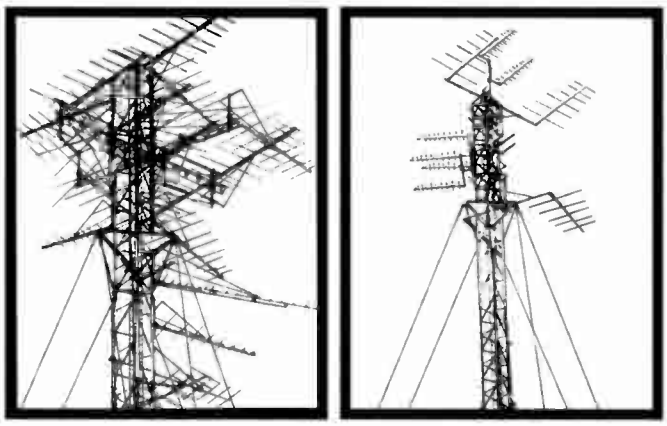

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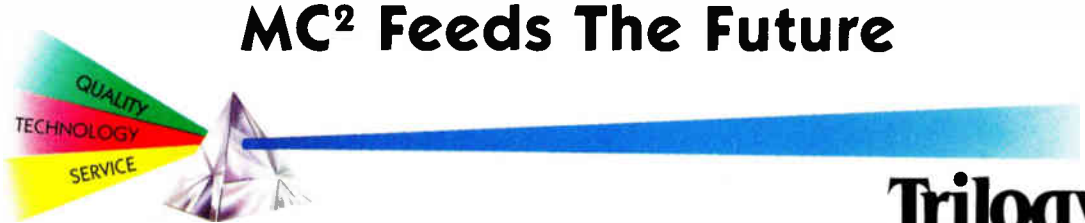

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2nd Place

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Ervin Cable Construction
Birmingham, Alabama

3rd Place

Gary Smith
Ervin Cable Construction
Birmingham, Alabama

4th: **Morgan Lee**
Compass Communications
Englewood, Colorado

5th: **John Nagle**
GLA Design Extender
Town & Country, Missouri

6th: **Jim Lindsey**
Jones Intercable
Englewood, Colorado

7th: **Patricia Vigil**
Integrated Cable Services
Aurora, Colorado

8th: **Tim Gonyea**
Advanced Cable Services
Georgetown, Texas

9th: **Tom Schnell**
A.H. Larenzie
Afton, Minnesota

10th: **Norine Almazen**
Home Cable
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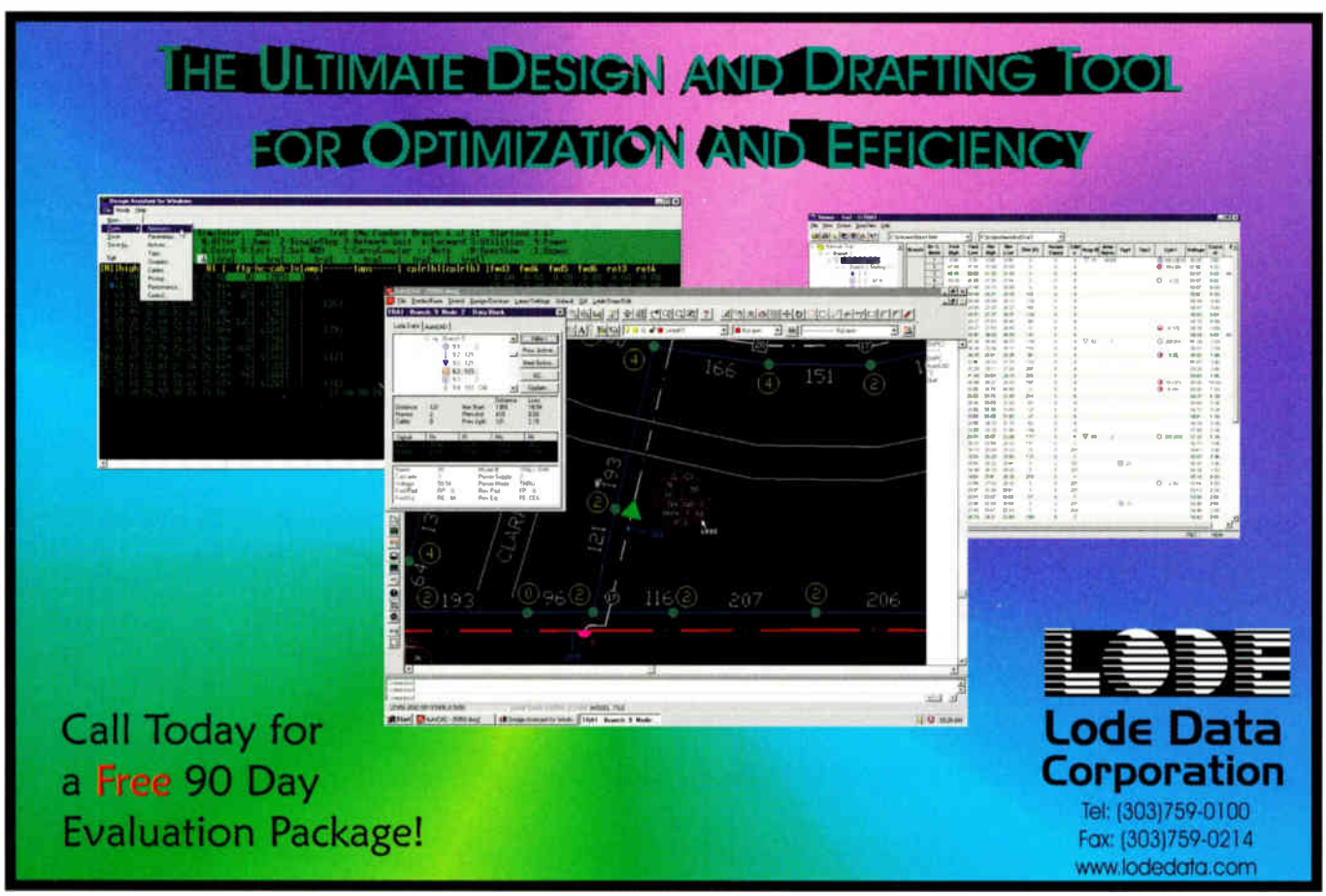
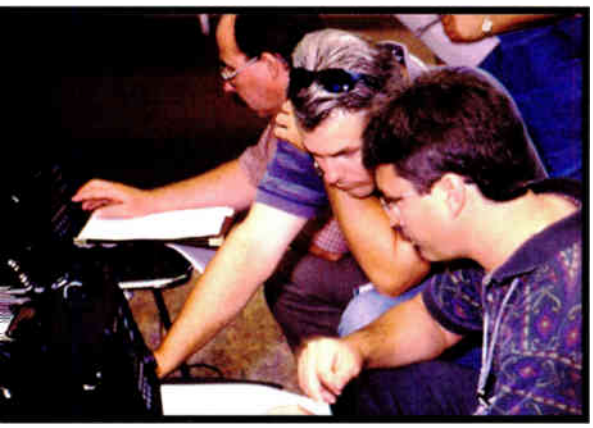




Attendees get hands-on experience at Expo workshops.

and techniques as integral parts of the optimum cable network.

"Components of Digital—An Introductory Course" explained the major categories of multiplexing methods used in a digital cable system, with a high-level overview of how they work and where they are applied. Specifically, Justin Junkus, president of KnowledgeLink, addressed T-1, synchronous optical network (SONET) and Moving Pictures Experts Group (MPEG-2) multiplexing technologies.

Marvin Nelson, SCTE vice president of technical programs, detailed the open system interconnection (OSI) model for networking protocols and how Ethernet and transmission control protocol/Internet protocol (TCP/IP) fit the model. He also covered the contents of the IP header to help attendees understand how Internet traffic is routed over wide area networks (WANs).

"Basics of Cable Modems and MCNS" was your opportunity to learn about the Data Over Cable Service Interface Specification (DOCSIS) and cable modem specifications specific to MSO networks.

Discussion of the RF channel model and modulation types, the MPEG-2 layer, the media access control (MAC) protocol and security schemes used to protect user data kept dialog lively for attendees of all knowledge levels.

Finally, an introductory course on the components of digital taught attendees that digital multiplexing in the cable telecommunications industry isn't a single technology, but a set of multiplexing standards that can coexist in a comprehensive digital system. Comparisons and contrasts of the North American Digital hierarchy, SONET and MPEG-2 illuminated breaking trends.

Forecasting must-carry, EAS mandates

At the "Regulatory Update" workshop Stephen Ross, a partner at Ross & Hardies, likened digital-happy broadcasters to "a dog that chases the fire engine."

"Lo and behold, the dog caught the fire engine and had to figure out what to do with it," quipped Ross.

The cable and broadcasting industries generally have worked out their differences concerning current must-carry and retransmission consent rules, but the issue of must-carry for digital is reawakening tensions, said Ross. Adding to the tension are questions such as "Should a cable operator be required to somehow accommodate a digital signal that is incompatible with its own standards?"

In other words, expect more clashes as

Reader Service Number 49

cable and broadcast work to influence the regulatory process.

Ross also discussed the Emergency Alert System (EAS), saying, "Never underestimate the power of NAB."

The National Association of Broadcasters has filed comments to the effect that broadcasters fare better in emergency situations than local cable systems, mainly referencing better equipment and facilities. Ross maintained that there is nothing in the record showing that broadcasters do it better, and cable needs to continue to keep an eye on what the broadcasters are reporting to regulatory agencies.

Digital services provisioning

The Tektronix workshop on "Digital Service Provisioning" provided hands-on training for anyone who wanted to know more about recent developments in digital service monitoring.

Three different workstations empowered participants with a unique opportunity for personalized instruction from Tektronix staff members on the critical transition processes from providing analog-to-digital services. Attendees from many points in the digital learning curve welcomed the chance to experiment with the equipment, designed especially for digital service needs.

Troubleshooting ingress with a signal meter was explored by Tektronix staff members, who suggested testing solutions and focused on locating over-the-air interference.

Part One of this two-part mission, if you chose to accept it, charged participants with using coax as an antenna to investigate the realities of grounding on the coax.

Part Two honed in on finding sources of over-the-air ingress. Strength mode was highlighted to help track down leaks in the plant.

Digital waits for no one

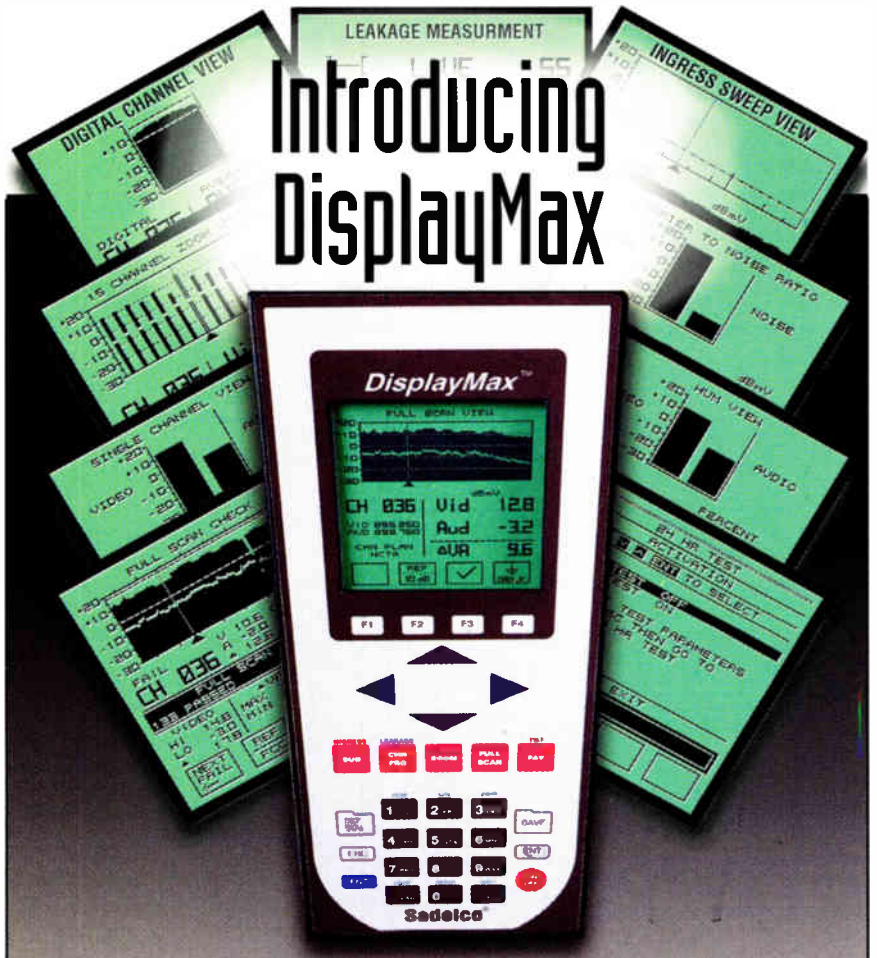
Everyone at the "Deploying Digital Video" workshop agreed that monitoring signal levels and realizing the differences between digital and analog networks are key considerations for virtually everyone associated with implementing the new associated technologies.

"Digital technology is more complex than analog. There's no reason to be intimidated by that either. Digital technology is just different. Key to a successful launch is understanding the differences and coping with them," says Joe Waltrich, of General Instrument's Digital Special Products division.

Waltrich was joined by Rich White, equipment evaluation manager at Cox Communications' Atlanta office, in emphasizing why digital signal monitoring is critical to the network's maintenance.

"The first thing you want to look at is the headend," White said. In doing so, he added there most certainly will be increases in daily responsibilities for operators including monitoring IRT status, Ethernet communications, reverse receiver bit error rate (BER), and picture quality.

All the panelists recommended upgrading additional testing equipment and



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taking advantage of new testing technologies offered by a variety of vendors.

The third panelist, Jerry Harris of Tektronix, used the constellation display to evaluate the condition of a 64-QAM (quadrature amplitude modulation) signal to facilitate impairment identification and repair.

"We really need various types of equipment for testing digital equipment out there," White said.

Technicians need additional training to make the new services run smoothly, White said. Besides a working familiarity with digital measurement equipment and the vendors who make it, a working knowledge of Ethernet is needed as well.

"If your technician doesn't have a background in Ethernet, he needs to get it now," White said.

Excellence through customer service

Let's face it, the cable telecommunications industry hasn't always been exactly commended for its customer service. However, the industry has made a commitment to changing its marred image over the last few years. Expo '98 contributed to the effort by way of a workshop, "Excellence Through Customer Service."

Thomas J. "Coach" Coyle and Rodney C. Bennett's paper "How to Achieve Excellence Through Customer Service" was presented. It highlighted real-world successful techniques of Time Warner Cable's Kansas City, MO, Division. That system uses training modules that focus on customer service, personal development, leadership skills and technical training. Coyle and Bennett discussed who really controls the image of your organization and how to give quality service. Finally, Coyle focused on how to prepare your cable technicians to handle complaints professionally.

Managing your network

Not so long ago, cable systems had no network management or status monitoring systems—there just didn't seem to be much need. Now that cable has entered the realm of two-way telecommunications, including lifeline telephony service, there is a clear price to be paid for network downtime. That understanding drove a workshop on network management and status monitoring.

Byron Hood of Tellabs noted that telecommunications services that involve complex competitive positions, regulatory barriers and technology require providers to deploy management solutions in a fraction of the time that previously had been budgeted. The speed of new service delivery can make or break new market entries, Hood explained.

Tellabs' approach to telecommunications managed networks (TMN) has several different layers, Hood said. The element management layer enables management of the elements comprising the network and systems, such as switches and transmission systems. The network management layer deals with delivery issues such as capacity, diversity and congestion.

The service management layer pertains to the services offered to customers, such as meeting customer service levels, service quality, cost and time-to-market

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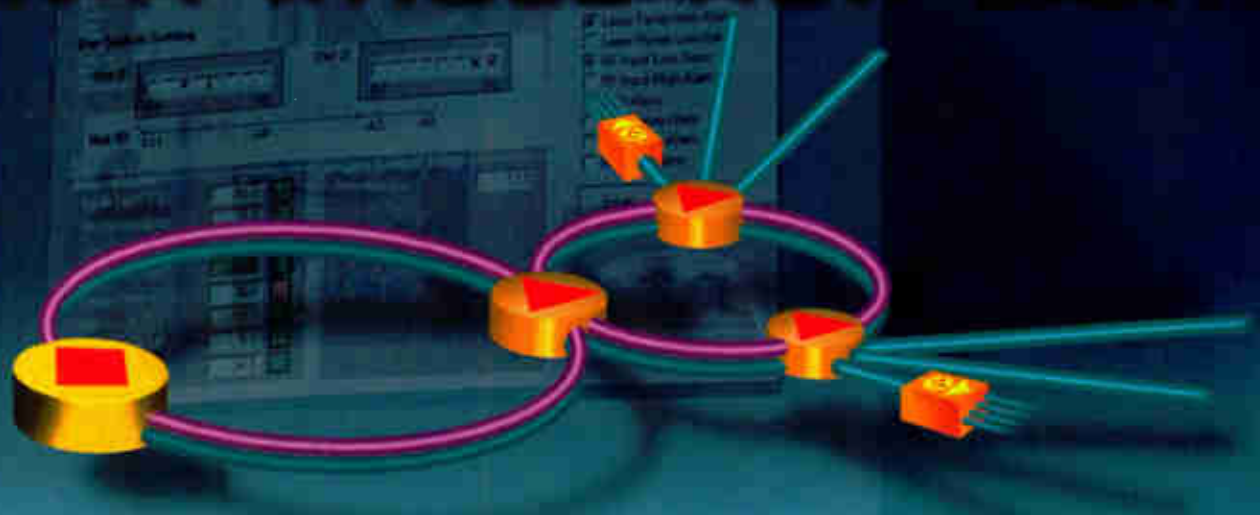

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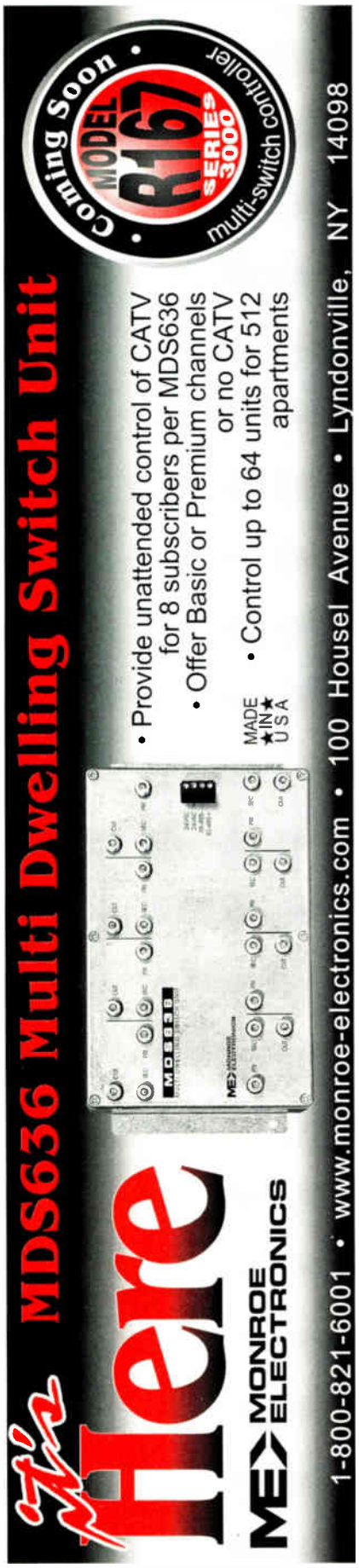

objectives. The business management layer refers to overall business issues, such as achieving return on investment, market share, employee satisfaction, community and environmental goals.

Powering on faith

The Powering Workshop addressed meeting the powering requirements expected from the upcoming Article 830 of the 1999 National Electrical Code (NEC) and on load line design and analysis.

In the code section, the powering issue comes up when cable operators wish to provide telephony service over hybrid fiber/coax (HFC) networks. Achieving the high reliability expected by customers requires considerable power, often 90 V RMS 60 Hz AC of network-powering, which can put as much as 40 V to 90 V RMS in the premise wiring.

Such high voltage levels aren't covered under the existing Articles 800 and 820 of the NEC, so the new Article 830 addresses these different safety requirements. Complying with the new code carries some costs, but there are alternatives.

Pending final approval, the new code would require that powered underground drops be:

- Direct-buried 12 inches deep before the year 2000 according to Article 820 and be protected from ground level to 8 feet high on buildings
- Direct-buried 18 inches deep and protected up to 8 feet
- Buried in conduit 6 inches to 12 inches deep and protected up to 8 feet
- Equipped with a listed fault protection device

Protecting the cable on an individual drop up to 8 feet can cost from less than $10 to several times that figure. Burying the drops costs considerably more, between $5 and $25 more per 100 feet.

A more cost-effective alternative would be a fault protection device set to prevent the passage of 60 Hz through any contacting body. It would be a two-piece arrangement similar to a trap, with one unit installed at the tap and another at the premise end of the drop.

The load line design and analysis section went into detail on steady-state analyses of nonlinear interactions between ferroresonant power supplies (FR-PS) and cable TV loads, including start-up transients, and how it relates to determining and understanding network stability. Steady-state operation, though a large part of a system's operation, does not completely characterize a given system; start-up transients and occasional lightning strikes also are important.

Evaluating a system via the graphical nature of load lines offers a useful method of understanding what goes on, rather than simply an explanation of it.

Scalable nodes and WDM for HFC

A hybrid fiber/coax (HFC) architectures workshop offered two perspectives on accommodating the bandwidth-hungry applications on the horizon.

John Dahlquist of Harmonic Lightwaves presented "Scalable Architectures that Break the Bandwidth Barrier for Directed Services." He said that scalability is a vital consideration in network design, for both upgrades and new construction. Otherwise it will be nearly impossible to keep up with the growing demand for point-to-point data communications. Scalability is most critical in the node, the bridge between fiber and coax.

Complementing scalability is dense wave division multiplexing (DWDM) technology. In terms of cost-effectiveness, DWDM allows the operator to get a lot of complex equipment out of the hubs and back into the headend, thereby reducing duplication and cost.

Don Sipes of Scientific-Atlanta also advocated WDM technology for future expansion in his presentation of "Using WDM to Cost-Effectively Deploy New Services and Maximize Network Performance." He suggested a combination of WDM and 1,550 nm/1,310 nm overlay transmitters as a balanced approach to create a low-cost, flexible network for the future, specifically for directed services.

When mainly digital information is targeted to only a few nodes, an architecture combining 1,550 nm broadcast straight to the node, passed along to subscribers with 1,310 nm DFB lasers via WDM overlays, can reduce costs and increase flexibility.

An immediate benefit is a gain in carrier-to-noise ratio (C/N) and distortion performance that normally would be lost in a 1,550 nm to 1,310 nm relasing process. The improved performance lets the operator use

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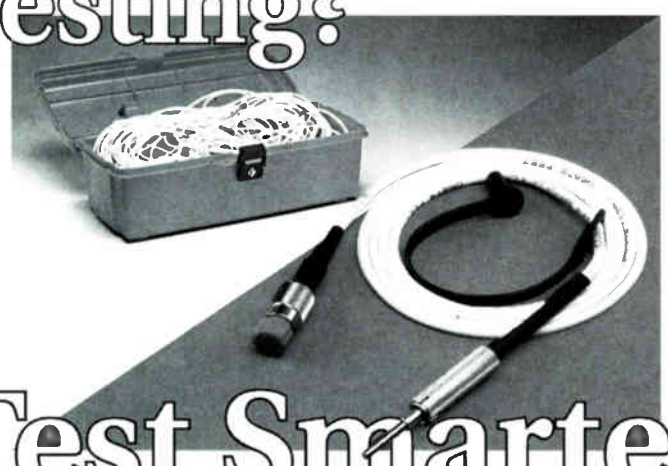
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a single 1,550 nm transmission link to connect between the headend and secondary hub, saving in cost and complexity.

Return path issues

Because enough can never be said about the importance of the return path to tomorrow's cable TV operators today, there were three workshops this year, designed to tackle one of the most pesky facets of modern system operations.

Design, Components and Alignment: What would a technical conference be in today's two-way conscious environment without plenty of workshops about the return path? Expo offered three different return seminars explaining design, components and alignment; ingress mitigation; and return path testing.

Eric Schnettler, electrical engineer from Philips Broadband Networks, presented treatment on measurement techniques, utilizing two existing measurement techniques (6-T channel analog distortion tests and bit error rate tests).

David Slim, staff applications engineer from Scientific-Atlanta's Terrestrial Network Systems, emphasized the three common reverse path enemies as ingress, thermal noise and laser clipping noise and highlighted coping strategies.

Ingress mitigation: This workshop boasted three distinguished panelists addressing this most critical challenge posed to system operators under the heat of intense competition.

Time Warner's Engineering and Technology Senior Staff Engineer Paul Brooks said that future delivery of advanced systems commands operators to provide broadband equalization and reverse plant alignment to reduce interference power levels.

Using a Bedford, NH, system as a case study, Earl Manchester of MediaOne Labs waxed on testing strategies, platforms and types used by his company to manage upstream ingress.

Tom Williams and David Bell of Holtzman Engineering addressed the impact of shield breaks on cable TV services and how the upstream portion of a two-way system is victimized by burst noise.

Testing the return: National Cable Television Association-recommended practices were the basis of a return path alignment workshop presentation by Tektronix Senior Application Engineer Carlton Brown. CT

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The Exhibit Floor

A Technological Carnival

Only a roller coaster was lacking on Cable-Tec Expo '98's exhibit floor, which proved as spellbinding to attendees as a trip to an amusement park for a child just tall enough to ride the Triple-Loop Gut Cruncher.

Aerial lift truck training workshops from Layton Industries utilized a fully equipped, on-site bucket truck to educate attendees on the finer points of learning while having fun. Those who viewed the video demonstration and completed a written exam received certificates of course completion.

SCTE bookstore

Several new books and assorted educational materials were new to the store this year. Among the hot new titles were:

- *The Emergency Alert System and the Cable Operator* (Video)
- *Satellite Analysis and Satellite Wizard Software* (by J. Kuhns)
- *Broadband Telecommunications Technology* (by B.G. Lee, M. Kang and J. Lee)
- *Computer Networks* (by A. Tanenbaum)
- *Principles of Digital Audio and Video* (by A. Luther)
- *High-Performance Communications Networks* (by J. Warland and P. Varaiya)
- *Return Systems for Hybrid Fiber/Coaxial TV Networks* (by D. Raskin and D. Stoneback)
- *Digipoints Volume One*
- *Electronic Communications Systems, Fundamentals Through Advanced* (by W. Tomasi)
- *Data and Computer Communications* (by W. Stallings)
- *Installer Certification Manual (Third Edition)*
- *Installer Certification Program Leader Guide*
- *Broadband Technology Leader Guides*
- *Broadband Technology Student Workbooks*
- *Broadband Technology Tapes/Textbook/Leader Guide* package

Training demos

NCTI and AMP Inc. joined forces to conduct training sessions on "Bonding/Grounding on the Single-Dwelling Unit," to address challenges in installation and safety. "Surge Protection" identified for attendees ways to combat surges and provide protection inside and outside the cable TV plant.

Relic or junk?

Classic cable TV equipment donated to the National Cable Center and Museum was on display. Judges David Wells, Ron Cotton, Austin Coryell and Roger Brown looked at headend and transmission equipment, and assorted vintage tools and accessories and decided what was museum quality.

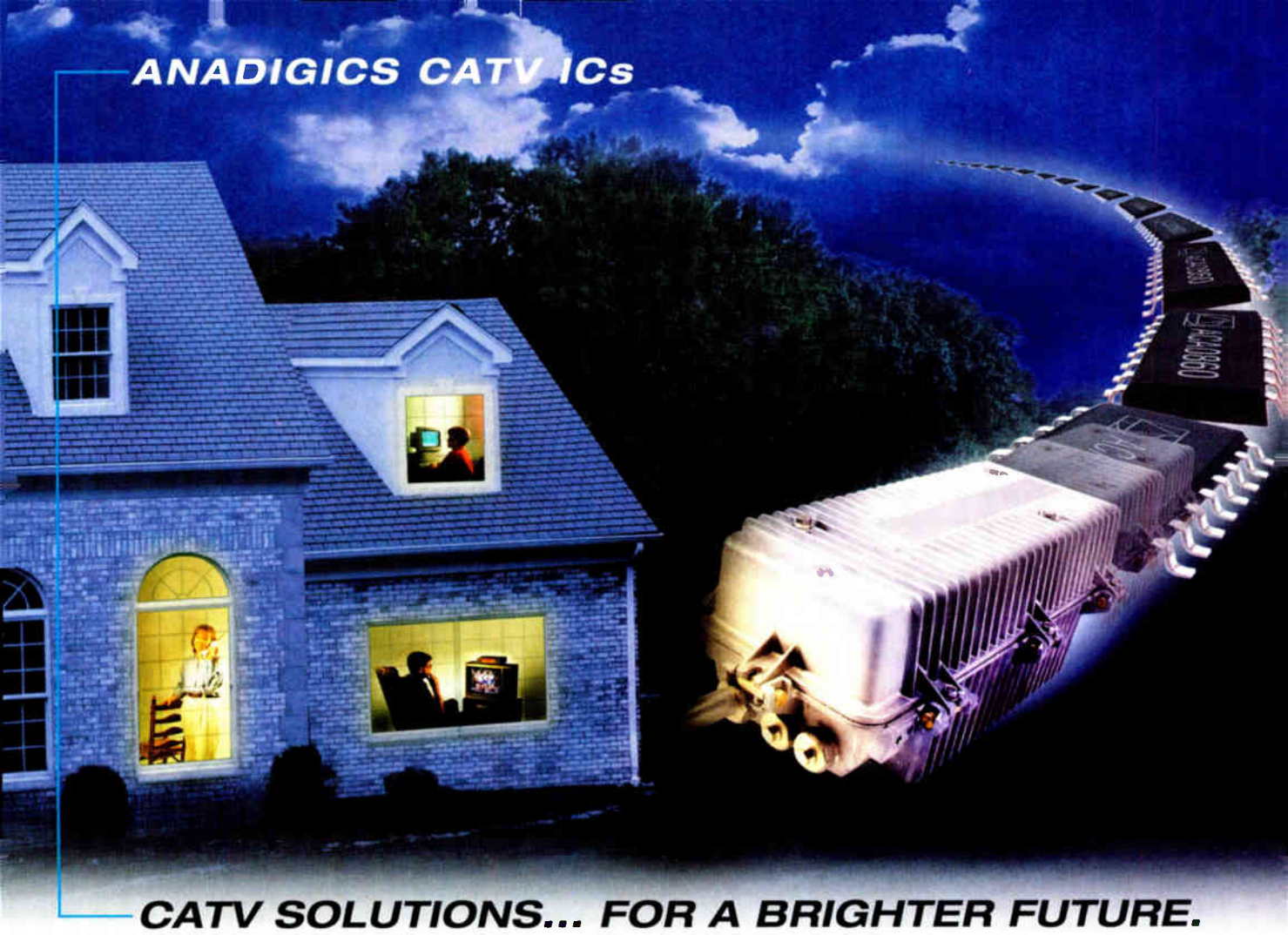
Cashing in

Time Warner's Tim Jackson, of Troy, OH, won the $1,000 Grand Prize in a drawing for Deployment Professionals sponsored by *CT* and Avantron Technologies.

Technical demos

A Technical Training Center in the exhibit hall provided plenty of space for product demonstrations from a vast array of vendors including:

- Fiber survivability—Protecting the Passives, by the Siemon Co. ➤



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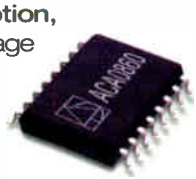

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- Low-cost Implementation of Fast, Ethernet-Based Services over CATV Networks, by ADC Telecommunications
- The Labyrinth Telecommunication Management Information System by INCAD Inc.
- Connectorization Techniques for Expanded Bandwires, by Gilbert Engineering
- Coaxial Construction, by Commscope
- Moving Beyond EAS, by FrontLine Communications
- Fiber-Optic Fusion Splicer, by Alcoa Fujikura Ltd.
- Designing Your Network, by CIS Inc.
- MCNS DOCSIS Modem Provisioning and Registration, by 3Com
- Understanding QAM Signal Measurements, by Sencore, Inc. ➤

Observations From the Show Floor

What's new? Technology to improve the capacity of fiber networks, Federal Communications Commission-mandated emergency alert technology, and a return to the breathless pace of builds and rebuilds of the go-go '80s all seemed to be top of mind with show attendees this year. Following is a cross-section of topics that piqued the interest of engineers visiting the Mile High City for Expo:

"The pace of rebuilds seems to be rapidly picking up. It feels like we're back in the frenzy of the early '80s. We're focusing a lot more on the craft issues of building systems."

—John Reuter, MediaOne, Exeter, NH

"I've noticed a lot more vendors showing EAS (Emergency Alert System) equipment. With the deadline coming up, we have some of our upper engineers working on it now."

—Mike Kloack, TCI, Littleton, CO

"There has been a lot more information on EAS lately. Our system is putting it in this week. I have to say, though, it doesn't make a lot of difference to me. If it wasn't an FCC requirement, I don't think we'd be putting it in."

—Don Lile, Jones Intercable, Independence, MO

"Fiber technology, especially DWDM (dense wave division multiplexing), is hot. I don't know if it's the way of the future, but if Ma Bell doesn't get more competitive, it's going to get hurt by this."

—Patrick Randall, Waldorf, MD

"DWDM and WDM are becoming a bigger part of our fiber work. It makes sense to apply that technology industry-wide. That way we can expand our transport capabilities without having to put more fiber in the system. It keeps our capital costs down."

—John Page, Cox Communications

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Reader Service Number 60

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Reader Service Number 61

- Underground Enclosure Engineering and Safety Considerations, by Strongwell
- EAS Made Easy, by Trilithic
- New Dense Modular Techniques for Managing Your Headend, by Thomas and Betts Corp.
- Off-Air Reception and Videocipher Half-Size and Troubleshooting, by Tulsat
- Customer Promise Devices, by Channell Commercial Corp.
- Return Path Testing '98, by Trilithic
- EAS, by MegaHertz
- Interoperability: Using Wavetek's Stealth and PathTrack, by Wavetek
- Understanding TDRs, by Riser-Bond Instruments
- Digital Video Analysis, by Hewlett-Packard C_T

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Affiliation: ☐ Cable ☐ Telephone ☐ Other:_____

Job Description: ☐ Manager/Administrator ☐ Operations ☐ Financial ☐ Installer ☐ Sales ☐ Construction ☐ Engineer ☐ Technician ☐ Other:_____

Membership Type: ☐ Individual @ $40 ☐ International @ $60* ☐ Sustaining Member Co. @ $250
Applicants from outside the U.S. include an additional $20 for mailing expenses.

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

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☐ YES! I want to receive/continue to receive a **FREE** subscription to *Communications Technology*, SCTE's Official Trade Journal. ☐ NO

Signature_____ Date_____
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B. Please check the category that best describes your firm's primary business (check only one):

Cable TV Systems Operations combined
03. ☐ Independent Cable TV Systems
04. ☐ MSO (two or more Cable TV Systems)
05. ☐ Cable TV Contractors
06. ☐ Cable TV Program Networks
07. ☐ SMATV, DBS Operator
08. ☐ MMDS, STV or LPTV Operations
9A. ☐ Microwave
9B. ☐ Telecommunications Carrier
9C. ☐ Electric Utility
9D. ☐ Satellite Manufacturer
9E. ☐ Satellite Distributor/Dealer
9F. ☐ Fiber-Optic Manufacturer
10. ☐ Commercial TV Broadcasters
11. ☐ Cable TV Component Manufacturers
12. ☐ Cable TV Investors
13. ☐ Financial Institutions, Brokers & Consultants
14. ☐ Law Firm or Govt. Agencies
15. ☐ Program Producers, Distributors and Syndicators
16. ☐ Advertising Agencies
17. ☐ Educational TV Stations, Schools and Libraries
18. ☐ Other (please specify)

C. Please check the category that best describes your job title: (check only one)
19. ☐ Corporate Management
20. ☐ Management
21. ☐ Programming

Technical/Engineering
22. ☐ Vice President
23. ☐ Director
24. ☐ Manager
25. ☐ Engineer
26. ☐ Technician
27. ☐ Installer
28. ☐ Sales
29. ☐ Marketing
30. ☐ Other (please specify)

D. Which one of the following best describes your involvement in the decision to purchase a product/service? (check only one)
31. ☐ Recommend
32. ☐ Specify
33. ☐ Evaluate
34. ☐ Approve
35. ☐ Not involved

Observations From the Show Floor
(Continued)

"Some of the HDTV (high definition TV) products, like the coders, are interesting. Our system is waiting a while; we're not doing anything with HDTV yet. It just doesn't make sense to be forced to put channels on the system for people who don't even have sets yet."

—Scott Hackler, Multimedia Cablevision

"I like seeing the emphasis some companies are putting on improving customer service. GI is putting its purchase order tracking information on the Web. Things like that are really helpful."

—David Boltz, Access Television Network

"Interactivity will make digital technology take off. To enable an interactive network, you need applications that can run on set-tops but reside in the network."

—William Wall, Scientific-Atlanta, Norcross, GA

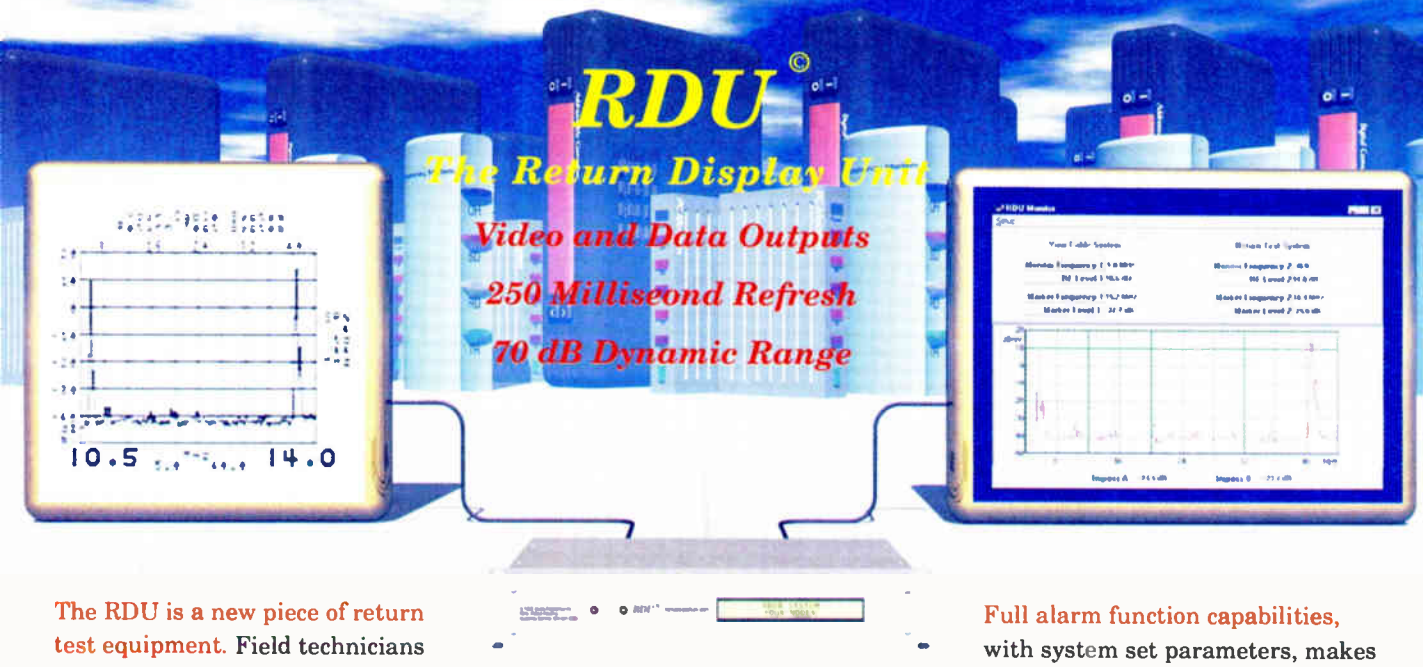
"I've been looking at cable modems and test equipment for QAM-64. Cable modems are especially interesting for me because I work in wireless. We use a transceiver at the subscriber location that brings data downstream through the MMDS channels. Even our return path is wireless."

—Tom Hughes, American Telecasting, Denver

"Although we didn't give them much time to respond, CableServ has provided a quality amplifier that's not only easy to set up, but they've delivered right on schedule, Said TCI's Executive Vice President of Engineering and Technical Operations Tony Werner. "Oleh Sniezko, our vice president of engineering, had worked with CableServ when he was with Rogers in Canada, so when we realized that we needed a solution for our amplifiers, we gave them a call."

—AZ

RETURN TEST GEAR and STATUS MONITORING



The RDU is a new piece of return test equipment. Field technicians "see" the condition of the return cable network back at the HE, from subscribers terminals, amplifiers, taps and fiber nodes.

The RDU provides real time accurate HE RF levels, in dB, from anywhere in the cable system, along with a visual display of the ingress / noise present across your full return spectrum.

No need for a HE engineer on the phone with your field installer. The RDU provides the answers in a simple, easy to understand format. The RDU saves valuable time with minimal personnel training required to implement the system.

The RDU is an effective new tool to maintain broadband networks. Test carriers can be documented from every installation and service call. Create simple benchmarks for a profitable, efficient two way cable system operation.

RDU: patent pending
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I-NAN © 1997, Cable Resources Inc.
ROCK TV © 1997, Cable Resources Inc.

RDU's status monitor ingress / noise, where you designate, by frequency. The RDU averages the energy and displays an *I-NAN* number, real time.

The RDU provides 2 *I-NAN*© frequency plans. Monitor a broad spectrum or zoom in and track the 4 MHz of bandwidth around critical PC modem carriers. Or, have *I-NAN A* track 5-15 MHz and *I-NAN B* track 25 to 40 MHz. The *I-NAN* system offers a flexible way to monitor your return system.

ROCK TV©

New test gear to compliment field service applications of the RDU system. It features a 5" B/W TV with a 800 MHz digital tuner, 2 carrier signal generator and battery power.

Full alarm function capabilities, with system set parameters, makes sure engineering management knows the story when a problem occurs. Auto beep and auto dial functions makes sure the right people are contacted.

See your return system on a video channel and or use the high speed, networked data port and access the RDU over a modem or your intranet.

Up to 32 RDU's can be monitored from a single server. Imagine live return at dispatch, customer service and your office computer. All real time, for complete constant monitoring of the return system during day to day cable system operations. Keep it simple to succeed.

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Reader Service Number 62

Fun in Denver

Shooting outlaws at Expo Evening.

More Than Just Technology

The band at Expo Evening.

Plenty of grub at Expo Evening.

For conventioneers who were able to catch a second wind from the Mile-High City's limited oxygen supply, there were social events and diversions for all at Cable-Tec Expo '98, starting off with Wavetek's traditional opening night kick-off. From there the parties just kept going.

Knowledge crowned at Games

The Eighth Annual Cable-Tec games were a big hit among cable athletes this year, and technical knowledge was passed like so many Olympic torches in a filibuster extravaganza that lasted well into the night.

Dozens of individuals competed on teams in five categories for medallions that symbolize commitment to excellence in the cable TV industry. In the tradition's spirit, job performance techniques were explored by all competitors, giving an extra measure of importance to participation.

The essence of cooperation was perhaps best embodied in the Cable Splicing game, where Thomas & Betts employees worked side by side with Gilbert Engineering representatives in directing and judging the event's challengers for several hours.

"It's a great learning experience in a nonthreatening environment," said Bill Nash, a Thomas & Betts training manager who has been involved with the games for the past six years.

Ron Stonebury of Gilbert Engineering praised his fellow judges and lauded the atmosphere of camaraderie in the Games.

"It's amazing to me how much more efficient the guys have gotten over the years," he said of the cable splicers who have cut their time in half since the event's first run in the very first Games.

The always-popular Cable Jeopardy event is modeled after the TV game show, only using technical questions formulated by industry experts. It was devised by the National Cable Television Institute and sponsored by Riser-Bond and Sencore.

Meter Reading initially was brainstormed at the TCI Training Center and was hosted this year by Trilithic and Wavetek. This event charges contestants with measuring and recording input and output levels on a black box outfitted with a tap, DC and internal splitter. Players used analog and digital meters in this timed event.

The TDR game challenged players to measure the number of lengths of drop cable and determine termination and propagation while racing the clock.

David Devereaux-Weber gives the thumbs-up to the SCTE-List party.

The big party was Expo Evening.

A Cable-Tec Games competitor shows off his cable know-how.

Ron Hranac presides over the door prizes at the Ham Operators Reception.

Go Fetch was by far the noisiest of all the games as judges dumped a box full of cable industry implements onto a table while players scurried to match them with product identification cards.

However the score cards read at the close of this year's Games, there clearly are no losers when it comes to expanding the horizons of knowledge and expertise in cable TV.

Check out the sidebar for the complete ist of winners.

SCTE-List party

Although they couldn't get a sponsor for this year's reception, plans to create an emergency fund were among the hot topics at the Society of Cable Telecommunications Engineers List's party, where members got to chat face-to-face for a change. The List, led by the University of Wisconsin's David Devereaux-Weber, is a priceless forum for members of the cable TV industry to discuss challenges and solutions.

A meeting was held at the SCTE Cable-Tec Expo to discuss the method and means by which an Emergency Assistance Fund could be established to benefit the technical community. This fund was first proposed back in December 1997 and has been the subject of discussions at the SCTE and among the subscribers of the List. The purpose of the fund is to provide emergency assistance to members of the technical community based on a request to an administration committee overseeing the fund. The fund could be used for any benevolent purpose deemed appropriate by the committee.

A proposal will be made to the SCTE board of directors for the establishment of a trust fund to be administered by a board of trustees selected from the members of the SCTE-List. The mission statement and articles for administration for the trust are to be drawn up in the near future and approved by the SCTE Board. At that time, the Emergency Assistance Committee will

Cable Champs

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

Supreme Cable Athletes:
The 1998 Cable-Tec Games Winner's Circle
Overall Winners
- Gold Medallion: Doug Nolan, TCI, Santa Cruz, CA:
- Silver Medallion: Tom Lockwood, TCI, Denver
- Bronze Medallion: Eric Drugan, TCI, Denver

Cable Jeopardy
- Gold Medallion: Tom Lockwood, TCI, Denver
- Silver Medallion: Tom Saylor, Technology Services, Troy, ID
- Bronze Medallion: Doug Nolan, TCI, Santa Cruz, CA

Cable Splicing
- Gold Medallion: Ken Murray, TCI, Santa Cruz, CA
- Silver Medallion: Joel Hutchings, Multimedia, Edmond, OK
- Bronze Medallion: Tom Lockwood, TCI, Denver

Go Fetch
- Gold Medallion: Mike Brackett, Multimedia, Hutchenson, KS
- Silver Medallion: Tom Lockwood, TCI, Denver
- Bronze Medallion: Eric Drugan, TCI, Denver

Meter Reading
- Gold Medallion: Chris Elmore, Multimedia, Wichita, KS
- Silver Medallion: Joel Hutchings, Multimedia, Edmond, OK
- Bronze Medallion: Keith Vandevelde, Multimedia, Wichita, KS

TDR
- Gold Medallion: Eric Drugan, TCI, Denver
- Silver Medallion: Cliff Salamand, status unknown
- Bronze Medallion: Keith Vandevelde, Multimedia, Wichita, KS

approach the List and ask for contributions to the fund.

What a Ham!

The SCTE teamed up with Ham radio aficionados for a special closing night reception.

Annually at Expo, CT's Senior Technical Editor Ron Hranac of Coaxial International joins forces with Steve Johnson of Time Warner in gently twisting industry vendors' arms into sponsoring a get-together and providing a great bunch of raffle prizes. This year was no exception, said Hranac.

The informal door prize committee is comprised of Steve Johnson of Time Warner Cable, Dennis Musser from the Time Warner Training Center, Al Dawkins of Integration Technologies, Hranac and Joel Hayden, also from Coaxial International.

This year, said Hranac, the committee was especially effective in garnering sponsors from the vendor community.

"They've been very supportive of this annual get-together, generously contributing to the cause. Scientific-Atlanta and the SCTE were the co-sponsors of the annual Ham Operator's reception, and a multitude of vendors sponsored the door prizes," Hranac said.

Jack Radzik of Thomas & Betts/LRC won the grand prize, courtesy of Scientific-Atlanta. He won a Kenwood TS-570SG multimode transceiver.

Loyal Order of the 704

The Loyal Order of the 704's private reception boasted several 704 units on center-stage for pioneers to reminisce about and youngsters to ponder. If you don't know what the 704 stands for, you're probably not ready to join this "secret society."

Expo Evening

Sponsored this year by ANTEC Network Technologies, CommScope, General Instrument, Philips Broadband Networks and Scientific-Atlanta, Expo Evening festivities basked in an "Explore Colorado Through the Seasons" theme.

Interactive games, live music and refreshments aplenty celebrated the cable TV industry and Colorado's scenic beauty and western charm.

Golf

Expo '98 went out with a bang and a buck when the shotgun was fired to start the seventh annual SCTE Golf Tournament. A portion of the proceeds from the 36-team Fort Lauderdale-style scramble at scenic Arrowhead Golf Course on Denver's outskirts benefits the SCTE's scholarship fund.

Planners agreed that Arrowhead was the best choice after visiting many metro-area facilities, but sadly noted that since it's merely an 18-hole course, they were forced to downsize the tourney.

"We had to limit the field to 144 players this year. Usually, we have about 230 players," says Hugh McCarley, a director of engineering technology at Cox when he's off the course and not busy with SCTE activities. "Besides," he says, "we found that many clubs were reluctant to give up their courses on a weekend."

Members were all captivated by the course's natural beauty, nestled in spectacular rock formations, bounding with wildlife and equipped with clubhouse facilities to feed a hungry SCTE crowd. "We always try to pick exceptional courses," he said.

Famed golf course architect Robert Trent Jones designed Arrowhead more than 20 years ago when it was intended to be a more exclusive, private club. Since then, it has become a public course, providing nonmembers with a rare opportunity to play such a prestigious course for a reasonable fee. It's listed by *Golf Digest* magazine as one of the top 75 courses in the United States for its beauty and terrestrial challenges. "You've got some serious elevation changes. Somebody could get killed out there," McCarley joked.

Other off-site excursions

Attendees willing to take time out for a two-hour round-trip bus ride to Louisville got to tour CableLabs and celebrate their 10-year anniversary over brunch.

For a sacrifice of one mere hour on the exhibit room floor to ride a bus, TCI's HITS studio facility and uplink were popular attractions. The return trip included a stop at NCTI'S Correspondence School Headquarters Office. CT

Reader Service Number 63

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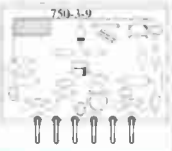

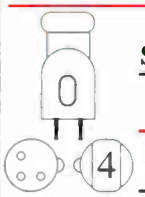

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SXP-T (Blue) 600 MHz, $1.75
0 to 20 dB in 1 dB steps.
SXP-TY (Yellow) 860 MHz
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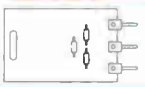
For Pathmaker

QSYL EQ's $10.00
300, 330, 400 & 450 MHz
Nominal Values are:
4, 7, 10, 13, 16, 19, 22 and 25 dB



QSYL-P Pads $4.50
0, 1, 2, 3, 4, 5, 6 dB
9, 12 and 15 dB

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TEXSCAN "T-series" Equalizers - $10.00
Bandwidths are 330, 400, 450 & 475 MHz
TEXSCAN "T-SERIES" PADS - $5.50
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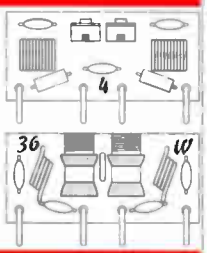
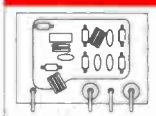


For Philips/Magnavox



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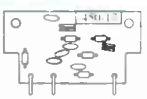
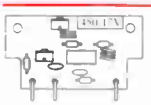
Replacement EQ's for Philips (330, 400, 450 and 550 MHz)
$10.00
330 MHz - 2, 5, 8, 11, 14, 17, 20, 23 dB
400 MHz - 2, 5, 8, 11, 14, 17, 20, 23, 26 dB
450 MHz - 2, 5, 8, 11, 14, 17, 20, 23, 26 dB
550 MHz - 2, 5, 8, 11, 14, 17, 20, 23, 26, 29 dB



QMAG for 5EE Series
Fixed EQ's for Magnavox
(330, 400 and 450 MHz)
$10.00
5, 8, 11, 14, 17, 20 dB values - All frequencies
Return Loss ≥ -16 dB, Insertion Loss ≈ 1 dB



QMAGV for 5CE Series
Variable EQ's for Magnavox
(330 and 450 MHz) **$14.00**
5, 8, 11, 14, 17, 20, 23 dB Values
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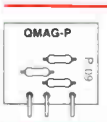

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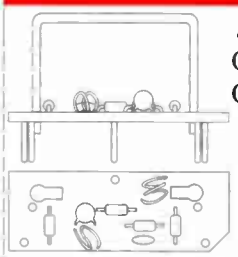
For AUGAT



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QAE 860 MHz EQ
Available in 1.5 dB values, 0 to 21 dB with handle. **$9.50**
QAE top view, shown without #871 handle.

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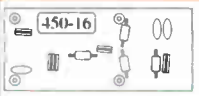

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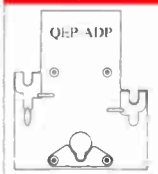

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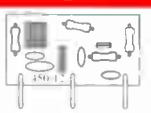

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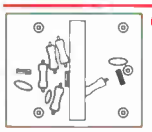

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The Capacity of 16-QAM HFC Returns

Find Out How Big That Pipe Really Is

By Jerry Joyce and Jack Moran

There currently is intense interest and activity within the cable industry in providing exciting new interactive broadband digital services, such as data, telephony, streaming video and video-on-demand (VOD) via hybrid fiber/coaxial cable (HFC) networks.

The Data Over Cable Service Interface Specification (DOCSIS) initiatives are developing standards for interoperable HFC digital services. As with other new information technologies, there is no foreseeable limit on the potential level of digital traffic involved in these services.

While the downstream digital capacity of HFC is fairly well-understood, questions remain concerning the ultimate information capacity of the return path and to what extent cable providers can deliver broadband digital services without another redesign and upgrade of the upstream path.

What's the return capacity?

The usual issue explored for return path digital transmission is ensuring that the transmission will succeed against a veritable pantheon of impairments, including interference, ingress, common path distortion, laser noise, laser clipping an so on. These are solvable problems. Eventually, the return path will be tamed via new plant components and configuration. We envision an optimized reverse path with a flat noise floor and no significant roll-off.

To assess the upstream path information capacity, recall that total capacity for any channel is proportional to the C/N (carrier-to-noise ratio) times the bandwidth (Shannon's Theorem).

For any channel, the total capacity is attained by filling the spectrum with carriers. The modulation format of each digital carrier then is chosen for maximum capacity, that capacity equaling the symbol rate times the bits/symbol. The Nyquist (sampling) Theorem limits the symbol rate to something less than the carrier bandwidth.

The remaining question is what is the most efficient attainable modulation format: quadrature phase shift keying (QPSK) at 2 bits/symbol or 16-QAM (quadrature amplitude modulation) at 4 bits/symbol. Of course, the format depends on the attainable C/N for the channels.

Experimental approach

To illustrate the downstream path capacity, we developed the experiments shown in figures 1-4.

Figure 1 shows the setup for this experiment. The two major parts of an upstream HFC link are provided for independent testing, a coaxial link and an optical link. The coaxial link consists of a unity gain cascade of three actives (with internal pads and equalizers), linked by spools of coax. The actives are nominally rated for two AM signals of 51 dBmV power, with a bandwidth of 5 MHz to 34 MHz.

The optical link consists of a laser transmitter followed by 9 km of single-mode optical fiber and a standard headend optical receiver. There are two 1.3 micron optical transmitters: an unisolated Fabry-Perot (F-P) laser of -4 dBm optical power and an isolated distributed feedback (DFB) laser of 0.0 dBm optical power.

Multi-carrier 16-QAM test signals

Figure 2 shows a set of 13 16-QAM carriers, which essentially fill the entire upstream spectrum. Each of these carriers has a bandwidth of 2 MHz, easily allowing a symbol rate of more than 1 MHz, and a capacity of 4 Mbps to 5 Mbps—enough for any likely service. The total of 13 is a good choice since there are enough carriers that the statistics begin to be well-behaved, with the instantaneous total power approaching a truncated Gaussian.

Twelve of these were generated independently using a digital communications software package. They were collected in groups of four (to optimize resolution) and stored in the three generators. The sampling rate was set to 200 MHz, easily satisfying the sampling theorem. The quantization noise present in each of the three channels adds in the final test signal, limiting any measure of carrier to nonlinear distortion (C/NLD).

A notch filter centered at 19 MHz is placed in the signal path to remove the quantization noise at that frequency. By placing a bandpass filter, also centered at 19 MHz, at the end of the transmission

path, the dynamic measurement range is extended well beyond 60 dB. This means that distortion can be measured at levels more than 60 dB below the carrier level—in other words, levels down to the Gaussian noise floor of the channel.

The general approach is to ramp up the power of the 16-QAM signals, using the "gap" at 19 MHz to measure the true channel noise floor and thus monitoring the ratio of carrier-to-noise plus nonlinear distortion, C/(N+NLD). Eventually the system is driven nonlinear, with the resulting distortion having the appearance of Gaussian noise raising the channel noise floor and lowering the C/N.

There is also a very high quality (35 dB signal-to-noise ratio, or S/N) test 16-QAM signal generated via a digital video broadcasting (DVB) generator. The constellation of the received DVB signal becomes a diagnostic for the effects of distortion generated by the other 16-QAM signals.

22-tone test signal

The 22-tone test signal is a special test signal developed for use in deployed HFC systems. Its purpose is to enable easy field measurement of the distortion resulting from high signal levels, in order to determine a safe operating signal level for the return path optical links. It consists of 22 sinusoids grouped into two compact clusters of 11 tones each.

The 22-tone offers several advantages for plant characterization. (a) Since the modulation power is concentrated in two bands, it is easily observed and measured in noisy systems. The composite triple beat (CTB) shows up as easily measured sidebands. (b) Since the signal repeats every 2.5 microsec, it is not necessary to wait some indefinite time for a suitably "high" peak signal, as with a Gaussian source. (c) The sinusoids go in and out of phase such that the peak to root mean square (RMS) power ratio is 14 dB. Since this ratio is higher than that of typical data channels, the resulting distortion levels are equivalent to a group of data channels.

Distortion and upstream actives

Figure 3 (on page 82) shows the C/(N+NLD) on the cascade of three upstream actives. The output power is that of a single 16-QAM signal. (Note, however, that all 12 of the 16-QAM signals actually were present.) Also shown are the results for identical measurements performed on the individual actives. The distortion actually adds as it passes through consecutive actives, driving down the C/(N+NLD).

Frequently, upstream coaxial plants are specified for carrier signal powers of 20 dBmV. At this power level, the C/N is 48 dB. All that is necessary for 16-QAM is 20 dB (without forward error correction). In principle, therefore, a conventional cable coaxial plant is easily capable of successfully transmitting a fully loaded spectrum of 16-QAM carriers.

Distortion and optical links

In order to evaluate laser performance, we use optical modulation depth

Figure 1: Experimental setup showing signal generators, filters, coaxial and optical links and signal analysis instrumentation

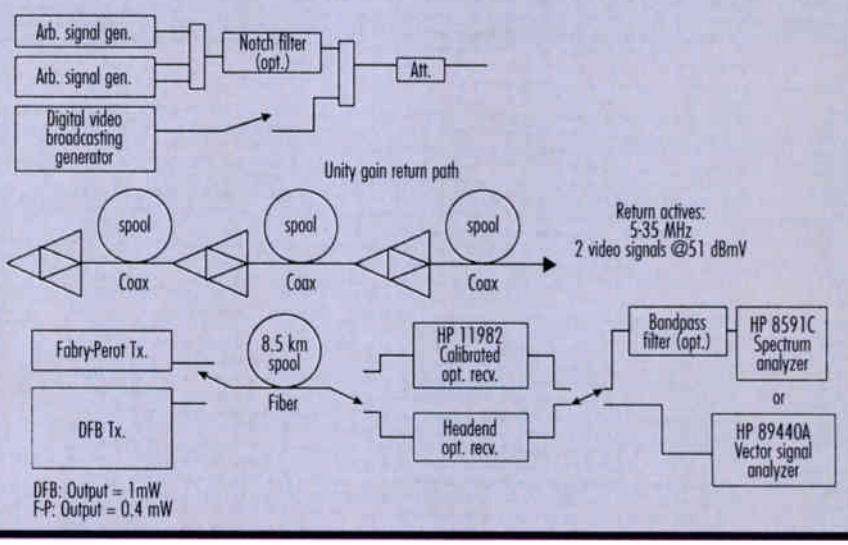


Figure 2: Set of 12 synthesized 16-QAM carriers, notched noise floor and optional high quality DVB 16-QAM signal

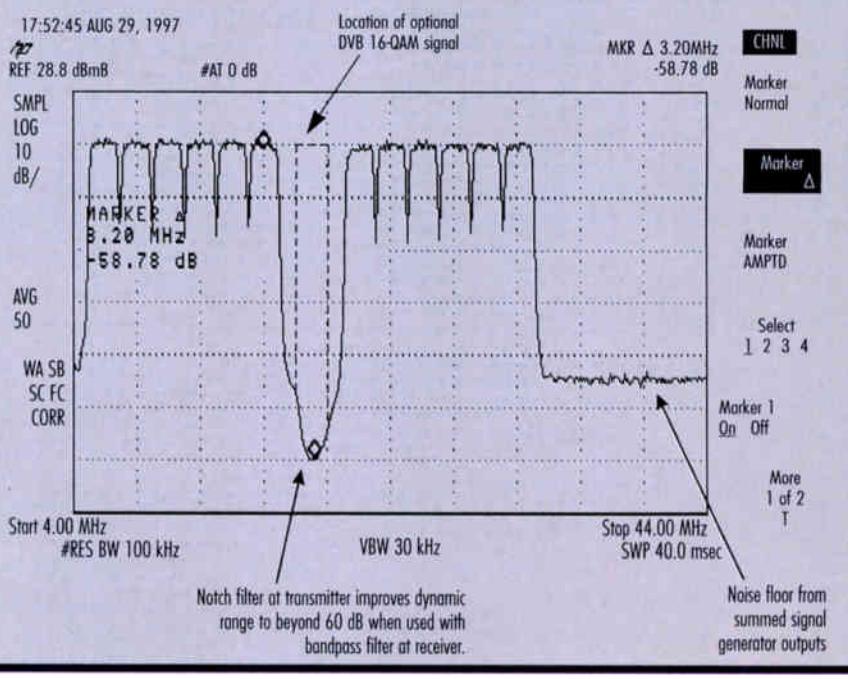


Figure 3: Distortion tests for cascade of three upstream actives with unity gain as well as for individual actives. Indicated power is single channel power

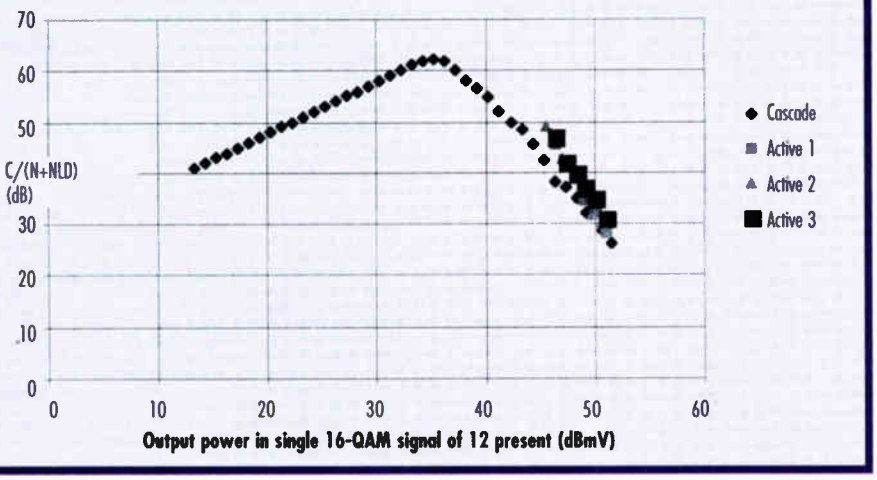
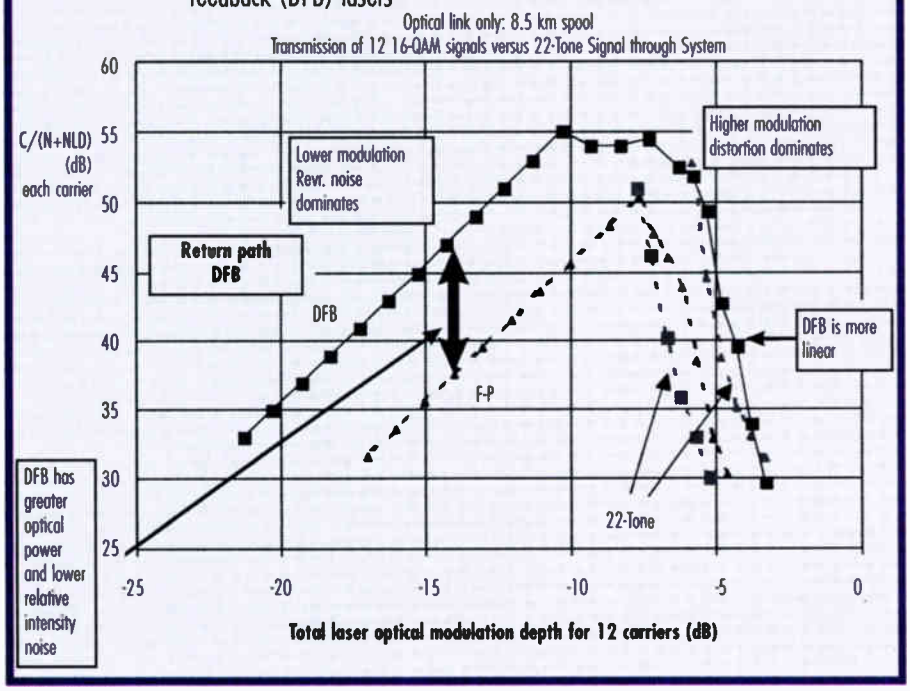


Figure 4: Performance comparison of optical link with Fabry-Perot (F-P) vs. distributed feedback (DFB) lasers



(OMD) rather than the power of the modulating electrical signal. The OMD is a fundamental parameter of the laser, not dependent on the internal drive circuitry of the optical node. OMD is the ratio of the RMS value of the fluctuations in output optical power (due to the modulation) to the mean optical output power.

For N independent carriers (channels), each with $OMD_{channel}$, the total OMD for all N carriers is $OMD \equiv \{\Delta p(t)^2\}^{1/2}/\{p(t)\}$

Figure 4 shows the distortion measurements for the optical link. The C/(N+NLD) is for each 16-QAM signal of the 12 carriers present. Two laser types were tested, a -4.0 dBm unisolated F-P laser and a 0.0 dBm (1 mW) DFB laser, each coupled to the fiber spool and the commercial cable TV headend optical receiver.

The DFB has approximately 10 dB higher C/N than does the F-P laser. This is chiefly due to the higher optical power of the DFB laser. There also is a significant difference in the relative intensity noise (RIN) of the two lasers, with that of the F-P laser being higher.

Note that the RF power out of the optical receiver scales with photo-current2, p(t)2. and OMD2. Thus, a 4 dB difference in optical power leads to an 8 dB difference in RF electrical power (assuming the same OMD for both lasers). At low OMD, the receiver thermal noise dominates. At higher values of OMD, the distortion dominates, and C/(N+NLD) drops rapidly. The DFB laser is more linear, allowing higher OMD.

The 22-tone test signal was used to measure distortion for OMD, with the results closely matching those obtained with the QAM signals. Both lasers will support a full spectrum of 16-QAM carriers. The DFB will even support four-way block upconversion at the optical node.

Jerry Joyce, Ph.D., is a senior staff engineer, and Jack Moran is a principal staff engineer for the Motorola Information Systems Group in Mansfield, MA. Joyce can be e-mailed at lgj002@email.mot.com, and Moran can be e-mailed at ljm026@email.mot.com.

BOTTOM LINE

HFC Return Capacity

It turns out that a typical hybrid fiber/coax (HFC) return link, both actives and lasers, is capable of transporting a full spectrum of 16-QAM (quadrature amplitude modulation) carriers. In modern plant design, this translates to 80 Mbps of capacity shared by 500 homes passed. By upgrading to a 1 mW distributed feedback (DFB) return laser, one envisions four-way block up-conversions at the optical node, a separate upstream channel for every 125 homes passed. The HFC architecture thus is capable of simultaneously providing 600 kbps average upstream capacity to every home passed. This is some pipe.

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Why Interdiction, Why Now

By Emily Nikoo

The cable industry has reached the top of the hill for the roller-coaster ride of the future. That ride includes OpenCable, high-speed data, digital video and telephony over cable. Adding one more thrill to the ride, in June the Federal Communications Commission barred cable operators from providing set-top boxes with integrated security functions, beginning in 2005. The mandate stems from the Telecommunications Act of 1996, which insists that cable subscribers be able to purchase set-tops in retail outlets.

Continued

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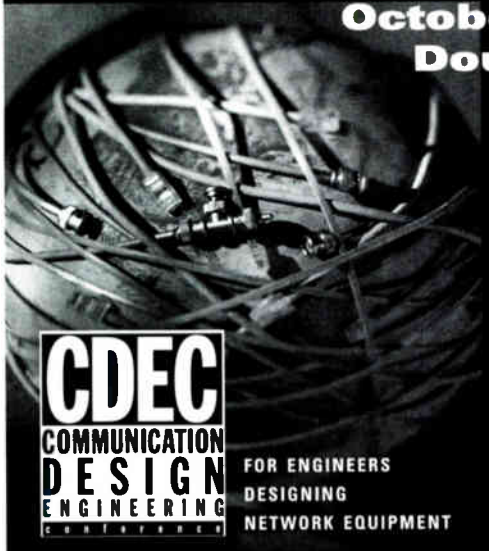

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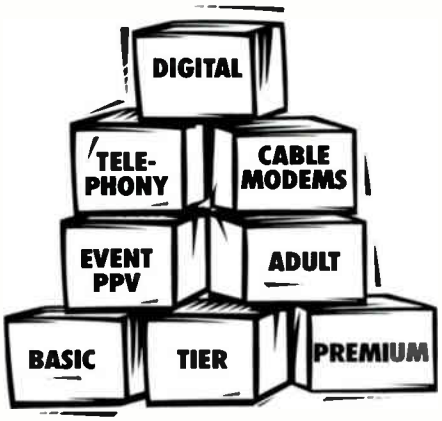

But what happens right now? When an operator has a new build or a rebuild and is selecting equipment, what does he do? Does he have to wait for Multimedia Cable Network System (MCNS)-compatible cable modems? Does he have to wait until the price of digital makes the financial model work? What happens if he chooses an advanced analog set-top that can't be sold or leased by the operator once the FCC ruling takes effect in 2005?

Interdiction

Interdiction is the technology that can effectively carry present services and launch the operator into the future. Moreover, with interdiction, the year 2005 becomes a nonevent.

Interdiction provides the operator with a means of controlling analog services in a sophisticated, customer-friendly environment that is transparent to advanced services when they are added to the system. Interdiction provides the building blocks for existing services and lays the foundation for future offerings.

What is it?

Interdiction is an off-premise addressable device that eliminates the need for analog set-top boxes in the cable system. With a set-top, channels are scrambled at the headend, and those that are subscribed are descrambled at each viewing location.

With interdiction, the RF signal is sent in the clear from the headend, and channels not subscribed are jammed at the tap. The jamming signals are generated by frequency-agile, voltage-controlled oscillators (VCOs) housed in the off-premise interdiction tap.

Because they are off-premise, the problems associated with equipment in the house are eliminated. Like addressable set-tops, interdiction units are controlled from the cable office with a control computer.

For the customer, the interdiction system provides cable services without hassle. Instead of having a set-top box for each TV set, the paid services are at every TV set, without in-home equipment—a whole-house solution. Advanced TV set and VCR features such as picture-in-picture can now be fully utilized, without the added complexity of wiring in a set-top.

"In an interdiction-based system, there is much less complexity, especially in the home: less switches, less fittings and other things that can go wrong," says Richard Carnall, regional marketing director of Greater Media Cable, a longtime user of interdiction.

For operators, one of the most dynamic aspects of interdiction is gaining

BOTTOM LINE

Interdiction is Gaining Momentum

Interdiction is not a new technology. It has been actively deployed since 1991, and the usage has grown every year as new markets open up and new technologies become available. There are more than 800,000 interdiction ports deployed. In 1997, approximately 160,000 ports were deployed; in 1998, that number is expected to grow to approximately 275,000 (a 70% increase).

Markets have changed—traditional cable operators, private cable operators, utility companies and direct broadcast satellite (DBS) are all contending for the same customers. Interdiction provides the operator with heavy ammunition against competition. Further, its consumer-friendly interface for the subscriber and the addressable control of the drop significantly reduce operating costs and increase revenue for the operator.

To top it all off, interdiction provides building blocks to add advanced services when the operator is confident and ready to do so.

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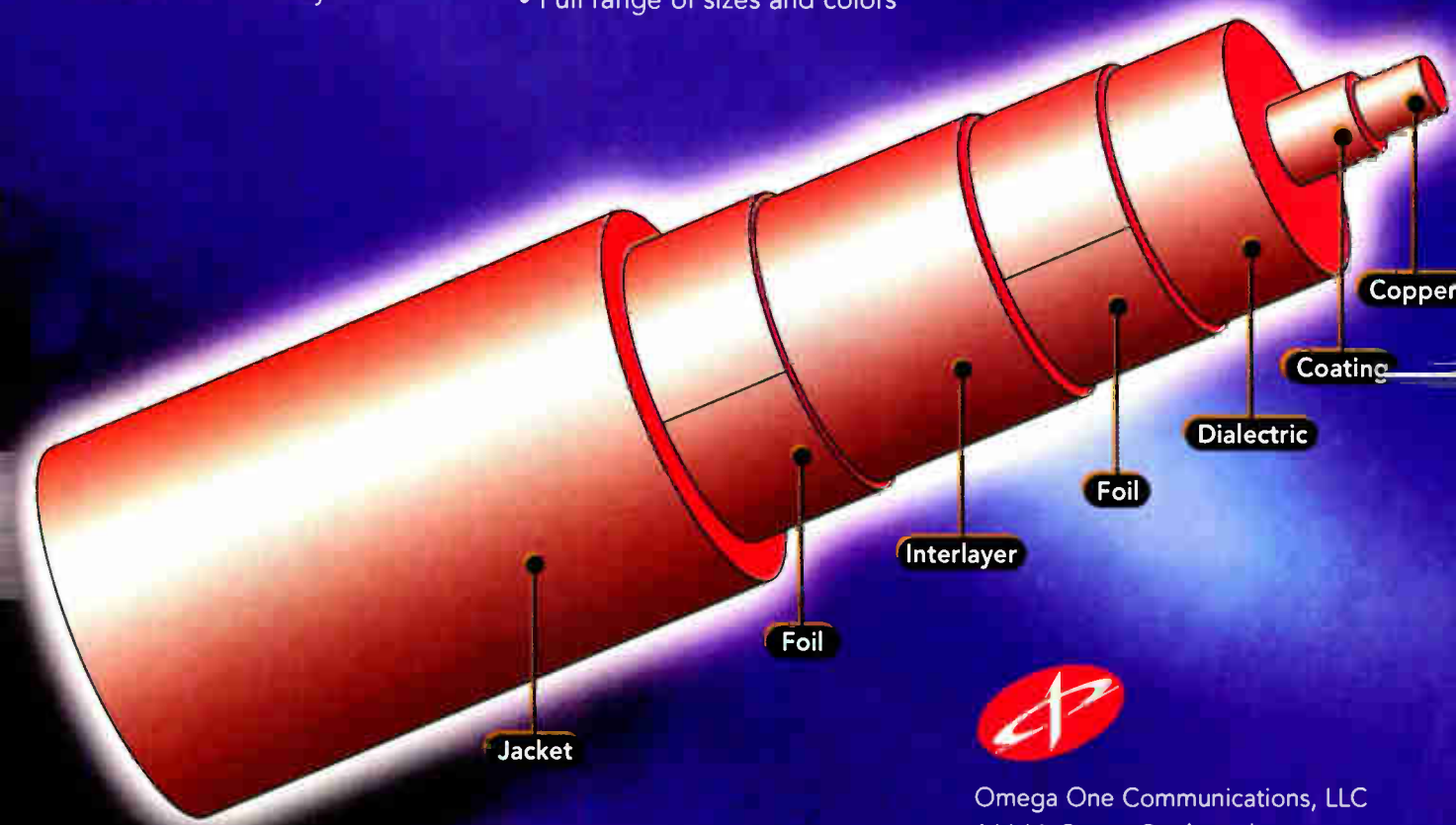

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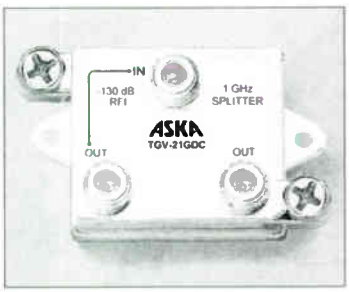

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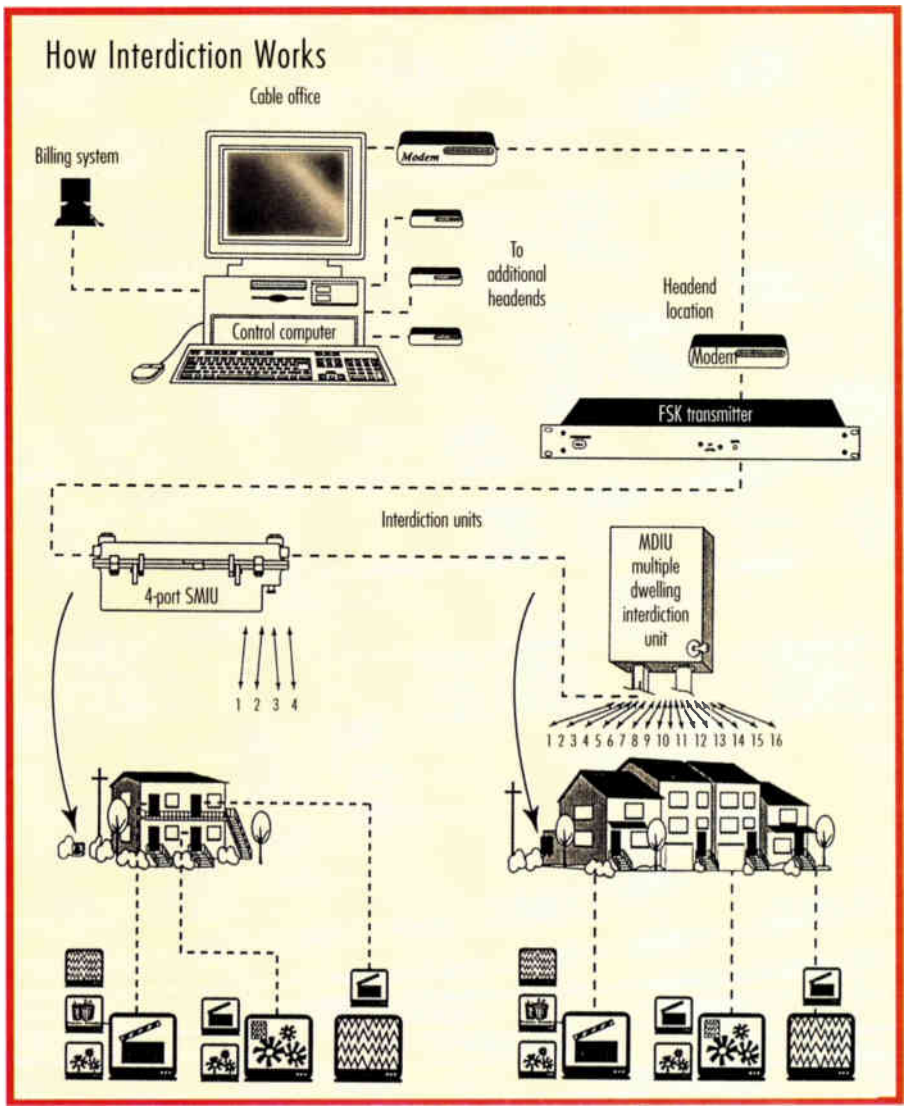

addressable control of the drop. Subscriber connects, disconnects and service level changes are all performed via the control computer in the cable office.

"At Greater Media, 100% of the disconnects and 70% of connections are performed addressably (similar to a phone company)," Carnall says.

Therefore, the operator reduces truck rolls and labor in customer installs and set-top retrieval. Customer scheduling problems are reduced, and by automating the drop, the operator significantly reduces customer service phone traffic and manpower required to maintain a system. Carnall says that with interdiction, his company requires only one third of the maintenance personnel needed previously.

In addition to the customer-friendly interface, interdiction also protects the operator from piracy. One MSO uses interdiction as a piracy deterrent in a set-top system. When a customer discontinues premium service at Cablevision in New York, an interdiction device is added, assuming that piracy may be an issue. Between 50% and 70% of the customers resubscribed to the previous level of service.

Foundation for advanced technologies

Interdiction provides a clear path to advanced technologies while maintaining basic and pay-per-view (PPV) services being offered today. With interdiction, the cable operator can provide analog services up to 550 MHz and save the remaining bandwidth (up to 750 MHz) for additional services. Not only will interdiction gain the operator revenue in analog, but it also is ready for deployment of digital, telephony and cable modems.

Richard Carnall describes Greater Media's success: "Nobody in the Greater Media system has deeper PPV buy rates

than our interdiction system. We are able to achieve a 40% buy rate because 100% of homes passed are addressable, and that's in a market with 85% market penetration." He further notes, "Most people want plain old cable. Save the most sophisticated stuff for those that you have identified want it."

The interdiction units have a passive return path for cable modem and telephony applications (5 MHz to 40 MHz). In addition, current interdiction products have return path switching and powering down the drop, which is imperative for telephony applications.

For Mark Majors, broadband network supervisor of Newnan Utilities, this has become the No. 1 advantage.

"The thing I like the best about interdiction is its return path capability," Majors says. "The return path access can be set up as a service code, so the only customers that can give me ingress problems have had their return path fine-tuned by my lead technician." (See the accompanying figure.)

Interdiction and digital deployment

The road to digital has been a long one. Carnall says: "In 1992, everyone was saying that digital was going to be in the next year. Here we are, six years later, and we're still working it all out."

With interdiction, the operator need not put rebuilds or new builds on hold. Interdiction doesn't compete with digital video; instead, it complements it. By using interdiction to control the analog services of "plain old cable," the deployment of digital can be carefully planned at a much shallower depth. This becomes important for several reasons: the road to digital is still a bit unclear, the boxes are still expensive and direct broadcast satellite (DBS) is a threat.

Carnall comments on digital: "Interdiction is the perfect platform onto which the operator can build digital aspirations. Greater Media has set-tops in some areas and interdiction in others. We'd much rather have interdiction from 1991 than set-tops from 1991. As we roll out digital, I don't need two scrambling types. In almost any digital scenario, one will need digital boxes. These are expensive boxes. Greater Media's strategy is to minimize the deployment...one super outlet in exchange for incremental revenues."

Dave Fingar of Mid-Hudson Cablevision uses interdiction as an antidote to DBS. "With interdiction, we provide services throughout the entire spectrum," he says. "That home is now DBS-proof."

Carnall adds: "We've been tracking our performance against direct to the home (DTH) penetration. The Chicopee, MA, interdiction system has lost less than 2% of its subscribers to DTH. The surrounding set-top system has lost approximately 5%. This is out of the same office, with the same customer service support. Clearly, the consumer-friendly, whole-house benefits of interdiction lower the level of DTH penetration."

Interdiction, telephony and modems

The verdict is still out with hybrid fiber/coax (HFC) telephony. Cox is actively deploying, others have preliminary trials (such as TCI and Time Warner), and the remainder are sitting on the sidelines waiting to see how the technology plays. Issues that remain include unfavorable regulatory issues, technology curves and equipment costs.

Cable modems are a good first step on the way to telephony. There is a smaller learning curve, and the reverse path and basic infrastructure can be set up and tested prior to jumping into telephony.

Majors from Newnan Utilities states: "You have the same issues whether deploying cable modems or telephony; it's the same thing. It's just a matter of setting up the return path right."

Newnan Utilities started with interdiction and cable modems simultaneously, and then incorporated telephony. "We have a typical HFC network with the addition of interdiction," Majors says. "I'm going to change over all of my telephony onto coax. That's how reliable I think it is."

In order to control a telephony or cable modem system, the return path needs to be clean. "90% of ingress is due to the home. We completely rewire the home whether the customer is taking return services or not," says Majors. "That way I avoid trouble calls in the future when the customer takes other services and I activate his return path with the interdiction reverse switch." CT

Emily Nikoo is product manager for Blonder Tongue. She can be reached at enikoo@blondertongue.com.

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Reader Service Number 71

Expo Goodies

Following are some of the products displayed at the Society of Cable Telecommunications Engineers Cable-Tec Expo '98 in Denver.

Sweep Receiver

Wavetek's StealthTrak sweep receiver maintains the size and portability of the company's earlier Stealth units, but it also offers several new features and faster operation.

The new receiver offers an impulse detector, spectrum displays, a built-in low-pass filter and preamp, a PathTrak compatibility option, power level measurements, time domain displays, and an extended-life battery. Also, earlier Stealth models can be upgraded to StealthTrak performance.

Reader Service #312

TDR

Riser-Bond Instruments' Model 1205TX combination short/long range time domain reflectometer (TDR)/cable fault locator is intended for troubleshooting loaded cables up to a length of 80 miles. The dual-function unit is designed to test through load coils for testing both long lengths of loaded (pupin) cable and shorter lengths of unloaded (non-pupin) cable. The unit's automatic testing features allow stepping through predetermined lengths of cable, setting pulse width and vertical gain automatically. The keypad can be used to change independent cursors, alter velocity of propagation (VOP) move the waveform and change display modes.

Reader Service #310

Reader Service Number 72

New Unique Fiber Optic Ethernet System Eliminates Data Collisions

Radiant introduces the most cost-effective and technologically advanced method of connecting remote Ethernet hubs together. The Series DL200 allows transmission distances up to 100 Km and data throughputs of 100 Mbs. It can be used for any size system — large or small. Typical applications include interconnecting large metropolitan school districts or remote college or industry locations. Budgetary cost is less than $3,000 per location.

Reader Service Number 200

Added Features To Your Ethernet System

The DL200 Ethernet System now has a number of new and unique features which have been added. The system is now available using only one fiber for two-way (bi-directional transmission), including a fully redundant Ethernet Ring Topology over one fiber. Most recent of all, video and RS232 data can now be transmitted over the same Ethernet System. Call us with your special applications.

Reader Service Number 201

Fiber Optic CATV Drop Cables

Radiant offers a full line of fiber optic cable plant products. The company guarantees drop cables with back reflections of -65dB for ultra polish terminations and -70dB for angle polish terminations. Available from 2 to 12 fibers with customer specified node connector. Also available are fiber optic assemblies, couplers, WDMs, customer premise cabinets, plus the industry's first and best low back reflection attenuators, both fixed and variable.

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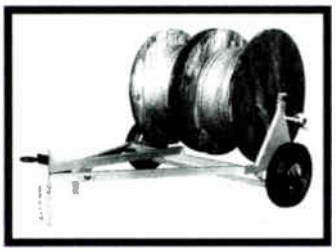

Cable Reel Trailer

Lemco Tool Corp. manufactures six different models of reel trailer, in various configurations offering arbor capacity up to 63 inches and reel diameters up to 102 inches. All are welded of heavy-gauge steel and painted high-visibility orange. Optional accessories include reel brakes, registration tube holders, fenders and wheel chock holders.

Reader Service #309

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Reader Service Number 74

Telephony Unit for MDUs

Philips Broadband Networks' Crystal Line multiple dwelling business unit (MDBU) network termination system is designed to deliver broadband telephony service in settings where highly concentrated twisted-pair lines require an effective interconnection block with a voice telephony carrier.

The system can supply centralized telephony and data connections for up to 32, 64 or 128 locations and offers a variety of enclosures and mounting options for indoor and outdoor use. Accommodating various voice and data services at speeds up to 128 kbps, the system can be powered either through the network or from the subscriber site via 110V, 120V or 50/60 Hz AC outlets. The system's signals also can be interleaved on the same RF carrier frequency as neighboring subscriber interface units.

Reader Service #311

Plenum Coax

Belden Wire & Cable has extended its cable TV cable line-up, adding a series of 75-ohm coax cable intended for plenum installation.

The new cables feature Duofoil braid shield for 100% coverage and maximum shield protection. In addition to the Duofoil foil/film/foil tape, the new lines have an outer braid shield.

Reader Service #308

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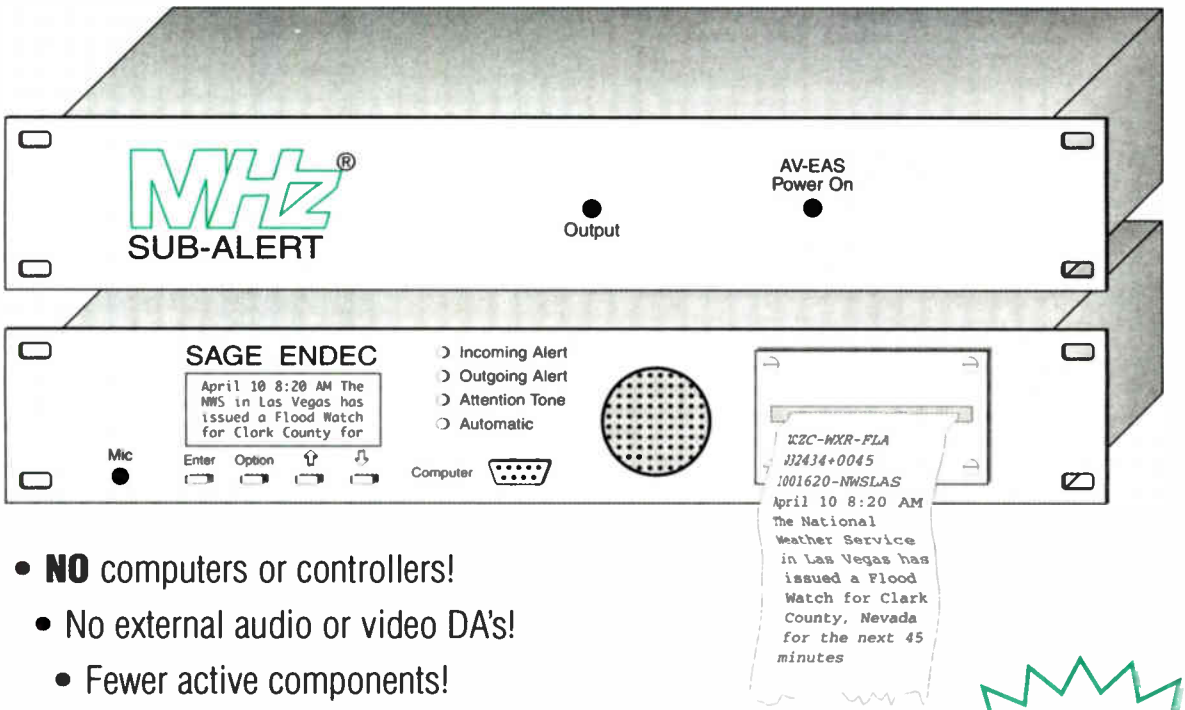

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BOOKSHELF

The following is a listing of some of the books and videotapes currently available by mail order through the Society of Cable Telecommunications Engineers. The prices listed are for SCTE members only. Nonmembers must add 20% when ordering.

- *CLI, Now and Tomorrow*—Featuring Terry Bush, Robert V.C. Dickinson and Ken Eckenroth. This presentation covers Federal Communications Commission Part 76, isotropic radiation, actual leakage response patterns, leakage reflection summing and compensation, impact of the measuring instrument's frequency tolerance, standing wave detection and recognition, monitoring plans, monitoring vehicle pick-up patterns/compensation, ingress testing techniques, ingress testing as a preventative maintenance tool, power line radiation, and FCC 50/50 rules. (70 min.) Order T-1155, $45.
- *FCC Forms Completed with Confidence*—Featuring Michael Lance, John Wong and John Spencer of the FCC. This program presents a summary of cumulative leakage index (CLI) reporting results to date. Also included is a detailed discussion of completing forms 1200 and 1205. These forms deal with the benchmark method of justifying cable system rates and determining equipment and installation costs. (80 min.) Order T-1156, $45.
- *Fault Locating in Fiber-Optic and Coaxial Cables*—Featuring Duff Campbell and Charles Mogray. In this presentation, the speakers begin with the time domain reflectometer (TDR) basics and review a wide scope of fault-locating topics such as explanations of TDR and how it works, waveform and digital TDRs, cursor placement, adjusting sensitivity in digital TDRs, finding hidden faults, handling dead zones, determining velocity of propagation, looking through taps, the most common optical fiber failures (both underground and aerial) and their causes, noncatastrophic failures, developing an emergency restoration plan, optical test equipment, visual fault locating, pulsewidth, resolution, velocity of light, index of refraction, overlength correction factor, and examples of finding faults. (80 min.) Order T-1157, $45. CT

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

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CALENDAR

August

4: Great Plains SCTE Chapter testing session, Omaha, NE. Installer and Broadband Communications Technician/Engineer (BCT/E) certification examinations to be administered. Contact Daniel Karnish, (402) 597-5665.

8: Llano Estacado SCTE Chapter technical seminar, Cox Communications Offices, Lubbock, TX. Topic: "Signal Leakage Problems and Solutions for Installers and Technicians" with speakers to be announced. Contact Bob Baker, (505) 763-4411.

12: South Jersey SCTE Chapter vendor show, location to be announced. Contact Richard Kerr, (609) 467-9333.

13: Bonneville SCTE Chapter technical seminar, TCI Offices, Salt Lake City, UT. Contact: Tom Smith, (801) 466-2922.

13: Music City SCTE Chapter testing session, Nashville, TN. BCT/E and Installer certification examinations to be administered. Contact Rodney Lanham, (931) 645-8296.

14-15: Great Lakes SCTE Chapter vendor show and golf outing. Contact Mary Gilliland, (810) 726-6886.

17-20: Philips Broadband Networks' Mobile Training Center, Boxborough, MA, at SCTE vendor day. Contact Sarah London at (800) 448-5171, ext. 2273.

18-19: Intermountain SCTE Vendor Show, Idaho Falls, ID. Sponsored by SCTE Big Sky (Montana), Bonneville (Utah) and Snake River (Idaho) Chapters. Installer and BCT/E certification examinations to be administered. Contact Richard Walker, (208) 377-2491.

19: Inland Empire SCTE Chapter technical seminar and Annual Golf Tournament, TCI Offices, Spokane, WA. Topic: "Troubleshooting Test Equipment." Contact Laurel Davis, (208) 664-5963.

Planning Ahead

Sept. 22-24: Great Lakes Cable Expo, Chicago. Call (317) 845-8100.

Sept. 30-Oct. 1: Private and Wireless Show, Dallas. Call (713) 975-0030.

Oct. 13-15: Mid-America Show, Kansas City, MO. Call (913) 841-9241.

Oct. 26-28: Eastern Cable Show, Orlando, FL. Call (404) 255-1608.

Nov 17-18: International Engineering Consortium Wireless Engineering ComForum, Richardson, TX. Call (312) 559-4600.

Dec. 1-4: Western Cable Show, Anaheim, CA. Call (510) 429-5300.

20: New England SCTE Chapter vendor show and testing session, Holiday Inn, Boxborough, MA. BCT/E and Installer certification exams to be administered. Contact Brian Bedard, (413) 562-9923, ext. 228.

21: Oklahoma SCTE Chapter testing session, Edmond, OK. BCT/E, Service Technician and Telephony certification examinations to be administered. Contact Tom Heddlesten, (405) 348-5750, ext. 312.

25: West Virginia Mountaineer SCTE Chapter technical seminar, Ramada Inn, South Charleston, WV. Contact Steven Johnson, (740) 894-3886.

26: Miss/Lou SCTE Chapter testing session, Ramada Inn, Slidell, LA. BCT/E certification examinations to be administered. Contact Leroy Naquin, (504) 446-4945.

27: Badger State SCTE Chapter technical seminar and testing session, Menona Terrace Convention Center, Madison, WI. Topic: "Additional Revenue Opportunities from Your Cable Plant." Installer and BCT/E certification examinations to be administered. Contact Robert Shugarman, (608) 238-9690.

28: Wheat State SCTE Chapter testing session, Great Bend, KS. BCT/E certification examinations to be administered. Contact Joe Cvetnich, (316) 262-4270.

30-Sept.1: DVD PRO Conference & Expo, Santa Barbara, CA. For more information, call (800) 248-8466. CT

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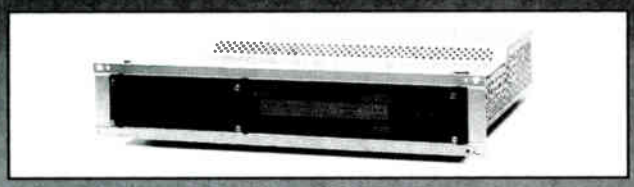

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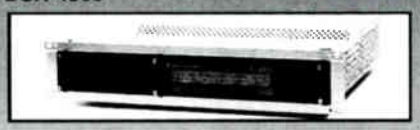

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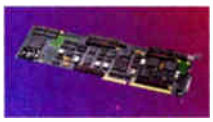

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Troubleshooting Tap Problems, Part 3

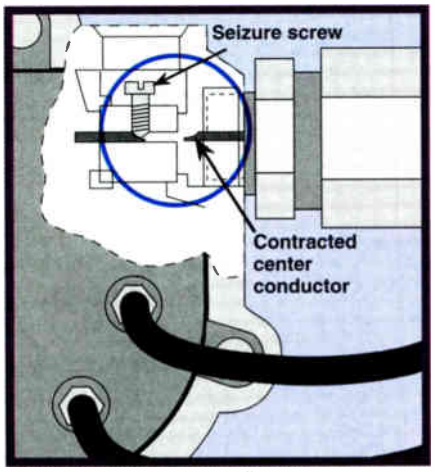
This month's installment continues a series on troubleshooting tap problems. The material is adapted from a lesson in NCTI's Installer Technician Course. © NCTI.

Last month's installment covered troubleshooting a backward spliced tap and loose seizure screws. This month's discussion focuses on two other commonly experienced problems: feeder cable contraction and broken or cracked tap ports.

Feeder cable contraction

In extremely cold weather, coaxial feeder cables are exposed to dramatic temperature changes, typically between the daytime and nighttime hours. These extreme cold temperatures cause the cable to contract beyond the range usually taken care of by the expansion loops built into the cable for that purpose. Because the sheath is aluminum and the center conductor is copper or copper clad, they contract at differing rates. Often, with the continual back and forth motion caused by the expansion and contraction of the cable, the center conductor eventually pulls free of the seizure screw or connector seizing mechanism. This is commonly called a suckout.

Figure 1



Suckout with feed-through hardline connector

A contracted feeder cable can pull or break its center conductor from the seizure screw mechanism of the tap when a feed-through hardline connector is used, as shown in Figure 1. Figure 2 shows a suckout of the cable's center conductor in a pin-type hardline connector. These conditions typically cause loss of AC power and abnormal attenuation of RF signal levels and snowy pictures, especially on channels 2-6 and 14-22. In some cases, flashing pictures occur during intermittent contacts between the feeder cable's center conductor and the tap's seizure screw. (A kink in the cable in an expansion loop can also cause a break in the cable sheath during cold weather contraction.) Resplicing the coaxial feeder cable and connector restores normal picture quality to the customer's TV set. Only authorized system personnel should do this.

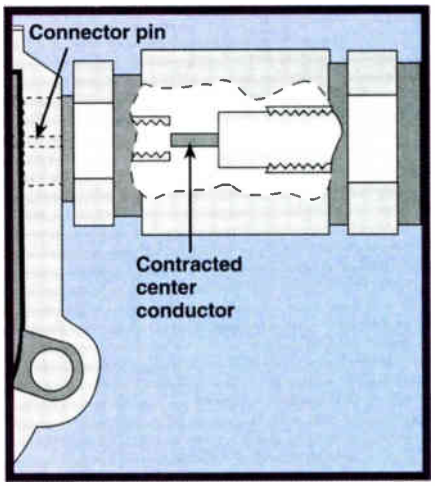
Broken or cracked tap ports

It is common to find a tap with a broken or cracked tap port. If the tap port was broken after installation, all cable-installed TV sets will have snowy pictures and no measurable RF signal levels on all channels. Broken or cracked tap ports can also cause minor to major ingress interference at the customer's TV set and cable signal leakage (egress) at the tap. Ingress on one drop cable can also affect customers' TV sets that are connected to the same tap or other taps on the same feeder cable. In two-way systems, the ingress also can cause interference to return path signals. Do not connect a drop cable to a broken or cracked tap port. Replace the tap's faceplate to provide a good tap port for that drop.

Hands-on performance training

Proficiency objectives: Identify a suckout at a tap and identify/repair a tap with broken or cracked tap ports.

Figure 2



Suckout with pin-type hardline connector

Ensure that you have a sufficient number of signal level meters (SLMs), test TV sets and workstations for the number of students to practice troubleshooting on. Each workstation should have a live broadband signal feeding a tap. If possible, install taps with broken/cracked tap ports in some workstations and others with a simulated suckout at the tap, and have students rotate among workstations.

Demonstrate how to perform measurements and identify impairments on a TV set to determine if a suckout exists, and discuss your system's policy for feeder line repairs.

Demonstrate how to perform measurements and identify impairments on a TV set to determine if a tap has broken/cracked tap ports, and demonstrate replacing the faceplate on a defective tap.

Have students practice troubleshooting a suckout at a tap and troubleshooting/repairing a tap with broken/cracked tap ports.

Verify that each student can successfully troubleshoot a tap to determine if a suckout exists and identify/repair a tap with broken or cracked tap ports. CT

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Reader Service Number 79

By Hugh McCarley

Taking Technology to the Street

Each year, the enormous success of Cable-Tec Expo shows that our industry is literally changing the way the world communicates. But is the world ready for the technology that we broadband professionals can offer?

In spite of its role in shaping today's fast-paced technological and educational environments, the cable industry has not traditionally enjoyed a positive public image. While some dissention between subscribers and cable systems can be justified on both sides, I think we can all agree that our industry's reputation could use a boost.

Cooperation

This theory is not new. As you probably know, the National Cable Television Association launched the "Future Is On Cable" program in 1994 to establish the cable industry as a telecommunications leader and provider of quality service.

This collaborative effort among some of our industry's leading associations, including the Society of Cable Telecommunications Engineers, has fostered improved customer/operator relations through such campaigns as the "On-Time Guarantee" and, more recently, "In the Trenches Week." Such programs have done much to restore public faith in the quality services that cable delivers.

Since then, the industry's public relations efforts also have focused on education, demonstrating that cable TV is much more than an entertainment industry. For example, the "Critical Viewing Project," "Cable in Focus," "Cable's High-Speed Education Connection," and "Tune In To Kids & Family" spotlight broadband telecommunications as a valuable learning tool.

Thanks to such efforts, cable TV is widely recognized as a vehicle that brings critical information to households around the world and builds for the future by helping students gain the knowledge necessary to ensure that we'll continue to grow as a prosperous society.

But while these programs have helped persuade a once-critical public to look at the positive aspects of this industry, there is still room for improvement. Broadband professionals now are faced with the challenge of showcasing the technology that drives our industry as a subscriber's best asset.

Showcasing technology

Let's face it: A piece of coax or fiber may be exciting to us, but it doesn't hold a candle to the latest sports or home improvement programming when it comes to keeping the average customer's attention. What is exciting to everyone is the fact that the technology and equipment we're developing now will make life easier and more efficient, practically putting the world at our fingertips.

Beginning in late September, when back-to-school efforts are underway, the NCTA and SCTE will promote and demonstrate the benefits of broadband technology to the global marketplace in an industry-wide initiative called "Cable Technology Week." Together, our organizations will tell the technical story as it relates to education, our members, the media and public officials.

For those who were unable to join us in Denver for Cable-Tec Expo '98, the Society announced its involvement with this project during the Annual Membership Meeting in June. To begin, we have developed a set of promotional materials and activity ideas for members of SCTE chapters and meeting groups to use in coordinating community educational projects. Such projects will include "Cable in the Classroom" campaigns, technology workshops and sponsorships.

Of course, SCTE itself is a unique blend of education and technology; such a proposal is a natural choice for us. Since its formation in 1969, SCTE has sought to provide technical and non-technical personnel from many industries with innovative technical training, professional certification and industry-leading standards development through its many programs and services.

Because the Society exists as a network of cable employees working at the grassroots level, who better can explain the benefits of new and evolving technologies than the professionals who install and maintain the equipment every day?

Spread the word

As a member of the Society's team for 20 years and now as its chairman, I see the strategy behind "Cable Technology Week" as an extension of the teaching philosophy that SCTE's local groups have practiced for years. The role of our chapters and meeting groups has always been to not only serve as an educational resource for personnel within the industry, but to build public awareness of the good things cable TV has to offer. Now we will take those principles one step further.

While you read this, I hope each of you will take a moment to think about how you can spread cable's positive message in your own area by participating in "Cable Technology Week." It's time to get the word out on the street about what we have known for years: technology will take us far. CT

Hugh McCarley is chairman of the Society of Cable Telecommunications Engineers Board of Directors. He can be reached via e-mail at hugh.mccarley@cox.com.

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