Communications Technology

Official Trade Journal of the Society of Cable Telecommunications Engineers

November 1998

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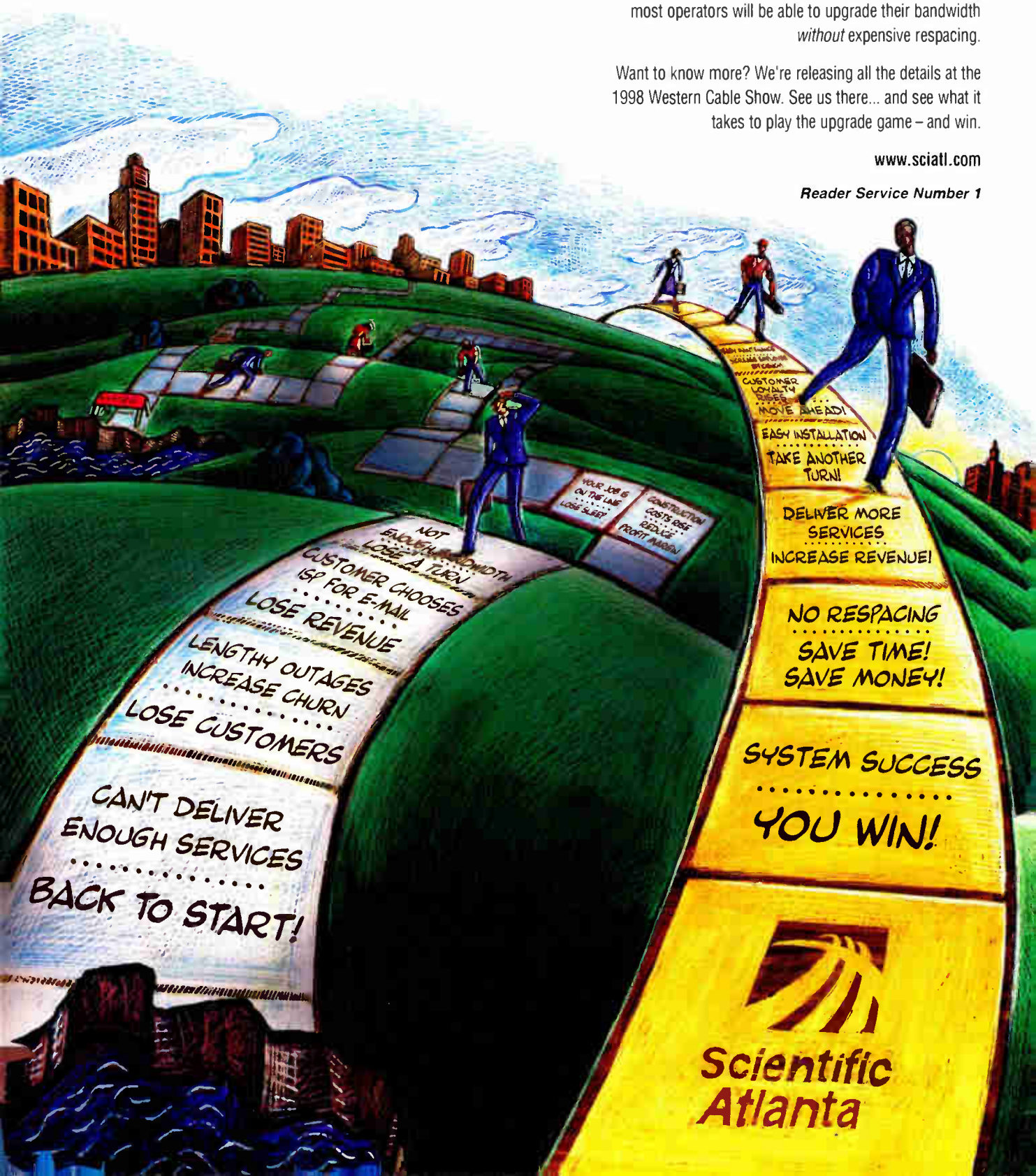

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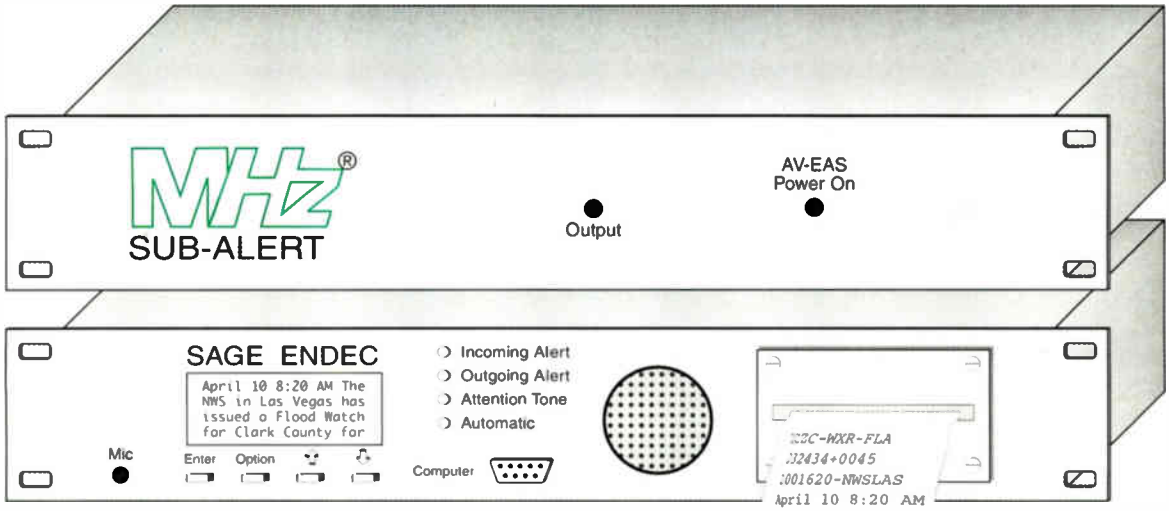

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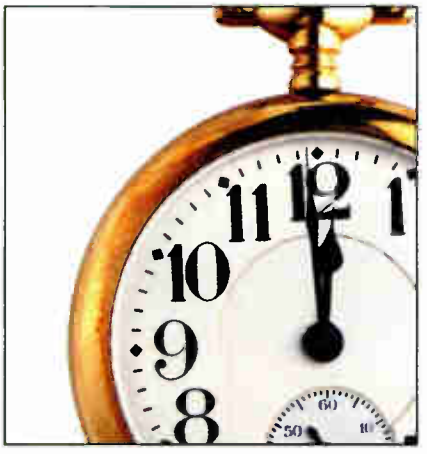

The EAS Clock Is Running Down • 40

Special Report: Planning '99 Part 2 • 40 to 70

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Design by Maureen Gately

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In Touch with Tomorrow
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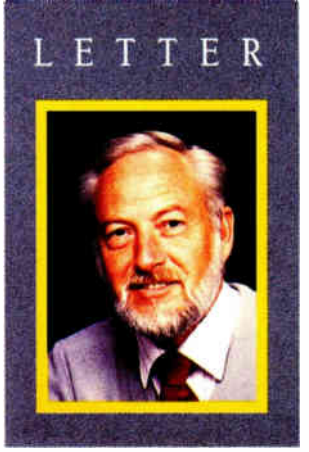
By Rex Porter



The Leading Edge

I've been reading a piece in *USA Today* by David Lieberman, "Direct Broadcast vs. Cable." It looks as if DBS is courting the media while telcos court the financial community. Both are doing a good job of painting their reflections in the mirror with seemingly magic brushes.

A financial study I read this week about asymmetrical digital subscriber line (ADSL) shows financial analysts believing much of the hype being spoon-fed to them by local exchange carriers' (LECs') home offices. But of real interest in the *USA Today* article was a statement attributed to DirectTV President Eddy Hartenstein: "Anything cable claims they can do, we can do. And we'll probably do it first."

I have written about this before, and I will keep writing about it until either Congress, the Federal Communications Commission or the media begin to think about it when they claim DBS is being treated unfairly by its competitors. Here are some of the things cable can do and is doing already. So, since you can do it and will do it, Eddy, get out your pencil.

Cable creates jobs for every community in which it operates. We hire local system managers, technicians, secretaries, customer service reps, installers, engineers and many others. Can you do that? Will you do that? That's called "pumping money back into the local economy."

Cable pays an average of 5% of its gross receipts to the communities it serves. Can you do that? Will you do that? That's called "relieving the tax burden of the local citizens."

Cable has buildings, equipment, trucks and real estate on which it pays an additional set of taxes. That's called "paying your own way." Can you do that? Will you do that?

Cable delivers the signals of every local TV station in the area. That's called "must carry." Can you do that? Will you do that?

Cable has accepted its duties with the Emergency Alert System (EAS) to warn its viewers of impending catastrophes, both visibly and audibly. That's called "serving the public interest." Can you do that? Will you do that?

And cable personnel are members of their local communities. They are involved in their city governments, are active in their local schools and know their customers by name. Can you do that? Will you do that? Or will you continue to operate not as a local business but from a retail electronics store until the politicians, both local and federal, begin to tire of your bombast one day and whining the next?

Rex Porter
Editor

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Reader Service Number 8

By Greta Durr

Pioneer Alliance Aims at Set-Tops

Pioneer Electronics has formed a multifaceted alliance aiming to become a more formidable player in the set-top market.

The arrangement includes adapting CANAL+'s Mediahighway middleware and Mediaguard conditional access systems (CAS) for the U.S. market. Other enhancements are slated to include C-Cube's silicon-based technology for OpenCable-compliant set-tops. DiviCom is supplying the applications and headend gear.

The system will support open standards such as Moving Pictures Experts Group-2 (MPEG-2), Digital Audio Visual Council (DAVIC), digital video broadcast (DVB), Advanced Television Systems Committee (ATSC), hypertext markup language (HTML), JavaScript and Java for interoperability, Pioneer officials said.

The system's client/server applications platform environment will provide digital video and interactive TV applications including Web browsing, video-on-demand (VOD), network games, home banking, online shopping, and data and digital download capabilities.

Although the likes of Scientific-Atlanta and General Instrument traditionally have dominated the markets, Pioneer officials are optimistic that the alliance will stimulate competition and make them a leading contender in the digital arena.

"At this stage, there's still a search for a truly competitive system. Everyone is reviewing market potential right now," said George Applegate, marketing manager at Pioneer New Media Technologies.

The alliance, he said, has grown from the company's participation in Time Warner's Pegasus project, which produced the Voyager advanced digital set-top. The product, he said, is functionally identical to S-A's Explorer 2000, which also grew out of the Pegasus project.

S-A officials said that, as the MSO's main set-top supplier, with nearly a three-year lead on competition, the company expects to keep market advantage.

"We are the primary contractor for Pegasus for Time Warner. We've got commitments for 1.1 million units. We're shipping now. We've shipped already," said S-A's Marketing and Digital Subscriber Networks Vice President Bob Van Orden, noting Pioneer's aspirations to expand their digital line into the headend. S-A, he said, is deploying 25 systems per quarter that offer comparable features to the systems Pioneer hopes to debut next year.

Pioneer's Applegate said Pegasus has led to commitments for more than 200,000 Voyager set-tops over three years. Vice President of Business Operations for Pioneer Digital, Neil Jones, agrees that MSOs will find Pioneer's parallel set-tops and system a viable alternative in the future.

"We're working fast and furiously to make more," he said.

Upgrading the Plant

General Instrument scored a 1,700-mile plant upgrade from Buckeye Cablevision in Toledo, OH, which will take the operation from 450 MHz to 860 MHz and add

Clarification

In the September issue of *Communications Technology*, this statement ran in the "Return Path" column: "After all, when you add return path capability to your network, you're basically doubling the number of components people see on utility poles."

In actuality, the number of components people see on utility poles does not double when return path capability is added to a network. We regret any confusion that this statement may have caused.

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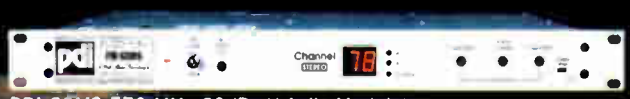

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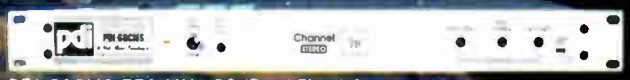
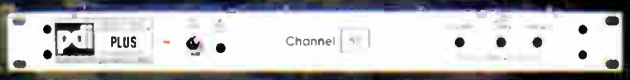


PDI-60CMS 550 MHz 60dBmV Fixed Channel Modulator



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Reader Service Number 10

two-way capability during the next few years using GI's Gallium Arsenide (GaAs) hybrid technology.

The upgrade is designed to provide extended bandwidth and to support Buckeye's new advanced service offerings including digital TV and Internet access.

GI plans to outfit the system with its OmniStar fiber-optic transmitters, SG 2000 opto-electronic nodes, GaAs-enhanced Starline 2000 amplifiers, CFT 2200 advanced analog set-tops, cable modems, digital headend and network hub equipment.

GI plans to supplement its products with support including quality conformance design checking; downstream plant sweep, balance and activation; and testing and certification of the upstream path.

"With our new two-way network, subscribers will be able to choose from a greater variety of services, including advanced video services, Internet access and data options," Jim Brown, Buckeye's director of engineering, said following the deal's closure.

"Because Gallium Arsenide amplifiers significantly improve network performance, fewer actives are required in the network, which translates to lower design, installation, maintenance and operating costs for Buckeye," said Bick Remmey, senior vice president of GI's Transmission Network Systems business unit.

Buckeye serves about 130,000 subscribers in Toledo's outlying areas. The upgrade will double the 30-year-old operator's channel capacity initially and provide a bandwidth reserve for digital.

@Work Launches WebHosting

@Work, the business-focused division of @Home, launched a new service for small- to medium-sized businesses called @Work WebHosting.

Officials said the new set of easy-to-use, secure and affordable Website solutions should leverage @Work's unique high-availability platform and meet the needs of businesses nationwide that want to outsource Web server management and maintenance operations.

"The connection only gets you so far," said company spokesman Matt Wolfrom. "The real money is in the outsourcing." The network's focus, he said, is on generating income by offering enhanced data services, e-mail and telecommuting alternatives to consumers.

The addition of the WebHosting service, he said, adds a critical element to its pre-existing business class product offerings such as dedicated connectivity, collocation, and virtual private networking.

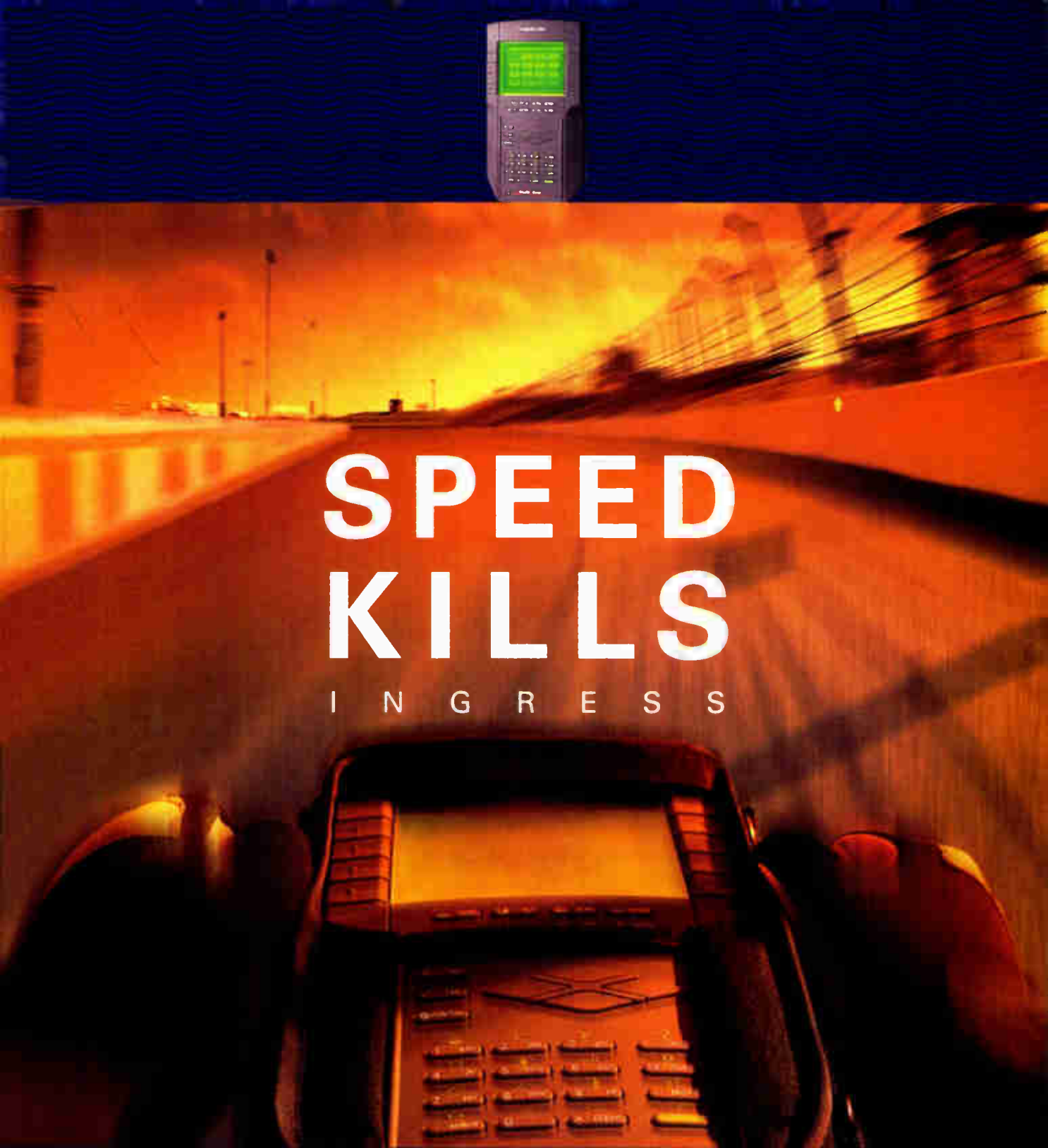
Among @Work's 1,000 installed accounts, only 10% are cable, with the bulk of the services being offered over T-1 lines. This year, he said, single-line digital subscriber line (SDSL) technology will become an integral part of the network's services provisioning.

Cost starts at $50 per month, and it's available in five prepackaged solutions for either mission-critical business or commerce applications. Subscribers can check their account status, upgrade service features and view site statistics 24 hours a day, seven days a week, through the online @Work WebHosting Business Center.

News Bites

- Following lengthy negotiations, Scientific-Atlanta and Concurrent Computer Corp. finalized an agreement to jointly develop and supply video-on-demand (VOD) systems to give operators a slice of the $17 billion video market. By integrating Concurrent's MediaHawk video server with S-A's interactive digital network over the Explorer 2000 set-top, the companies aim to produce an end-to-end VOD system. S-A said it had already received orders from 11 MSOs, including Time Warner, TCI, Cox, Comcast, Adelphia, Marcus Cable and Rogers.
- Wavetek announced a new cable TV technology-based training program, covering everything from cable basics to advanced techniques for managing the return path. By offering local seminars and developing customized training, the company aims to fill the information gap. Seminars can be conducted onsite or at Wavetek's training facility. For more information, call Wavetek at (317) 788-9351.

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



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RETURN PATH OUT

WAVETEK

Reader Service Number 12

Call for Expo '99 Papers

The Society of Cable Telecommunications Engineers is now seeking proposals for technical papers to be presented at its 1999 Cable-Tec Expo, planned for May 25-28 in Orlando, FL.

This year's conference, marking SCTE's 30th anniversary, is titled "Broadband Systems and Techniques for the New Millennium." The show will tackle some of the challenges broadband professionals face as they enter a new era in telecommunications. This year's preconference tutorials and technical workshops will feature presentations on the following topics:

1) DOCSIS Demystified—Issues related to Data Over Cable Service Interface Specification (DOCSIS) modems and other products designed to comply with DOCSIS.
2) Forward and Reverse Plant Maintenance/Design—Topics include nonintrusive plant repair and maintenance techniques, noise mitigation, general setup/maintenance and operational issues in networks carrying enhanced services.
3) Upgrading or Rebuilding Networks for Enhanced Services—Possible topics include design and deployment issues such as new amplifier technologies, bandwidth usage and planning, dense wavelength division multiplexing (DWDM), node planning and sizing, construction techniques, powering strategies and other issues.
4) Systems Integration—Software and hardware interface issues, operational decisions impacting field service and installations may be covered in the sessions targeting the complex issues of integrated products and services.
5) Digital Video Deployment—Possible topics include operational issues related to national vs. local control and the deployment of digital video services.
6) OpenCable Demystified—What does "OpenCable" mean to the technician, the engineer and the customer?
7) Y2K—The millennium bug: How will it affect telecommunications? How is it being addressed?

Submissions should include 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 to be discussed and its significance to the industry. The deadline for submitting proposals is Nov. 6, 1998. Proposals may be sent via mail, fax or e-mail to Janene Martin, SCTE, 140 Philips Road, Exton, PA 19341-1318; Fax: (610) 363-5898; e-mail: info@scte.org.

The SCTE Cable-Tec Expo Program Subcommittee will announce the selected

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presentations in early 1999. Accepted authors must be prepared to submit a camera-ready manuscript to SCTE by April 1999 for publication, as well as present a 15-20 minute oratory based on their chosen conference paper.

SCTE Seeks Subcommittee Members

The SCTE is seeking members for its new Materials Management Subcommittee.

Led by Subcommittee Chairman Bruce Mallalieu, Rogers Cablesystems' director of logistics, MMS is searching for senior purchasing, materials management and inventory professionals from MSOs to contribute to the group's performance measurement activities. Its mission is to conduct comparisons, exchange preferred practices and develop standards on materials management and inventory control for the cable TV industry.

The subcommittee's objectives will include performing comparative studies among MSOs to delineate effective practices for the distribution of a physical product, from forecasting a need to product development to fulfilling customer orders. Materials management practices within the broadband industry also will be compared with other industries.

Mallalieu said, "We've got to learn how to move our materials more effectively without having a lot of inventory sitting around." He added that such studies will result in improved customer service and reduced costs for cable systems.

For more information, or to join MMS, contact Mallalieu at (416) 935-6666 or e-mail bmallali@rci.rogers.com. Those interested in joining the subcommittee are invited to do so at any time. The group is scheduled to conduct its inaugural meeting in December during the 1998 Western Show in Anaheim, CA.

ET '99 Moderators Named

SCTE recently announced the moderators for the technical sessions to be held during its 1999 Conference on Emerging Technologies. The conference, slated for Jan. 19-21 in Dallas, will kick off the Society's 30th anniversary year with a proactive approach to the most current challenges facing the evolving broadband industry. The following sessions will be conducted during the three-day event:

1) "Packet Proliferation: Shifting to the New Cable Environment," moderated by Dan Pike, vice president of engineering, Prime Cable.
2) "Interactive Services: Mapping the 'Whole Broadband House' Approach," moderated by Leslie Ellis, managing editor, *Multichannel News*.
3) "Don't Fail Me Now: Critical Network Reliability Options in a Two-Way World," moderator to be confirmed.
4) "It's Not Just Broadcast Video Anymore," moderated by Tony Werner, senior vice president of operations and engineering, TCI.
5) "Competing Platform/Alternative Delivery Outlook," moderated by Tom Elliot, senior vice president, CableLabs.

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Reader Service Number 16

DEPLOYMENTWATCH

By Greta Durr

It seems there is no escape from the ballyhoo surrounding Internet services provisioning over the high-speed broadband connections that are bound to usher the cable industry into the next century.

Though some are beginning to question some of the numbers being reported by companies attempting to leverage their fledgling products and services into Wallstreet's and Main Street's favor, signs of growth abound.

Cable Modem Penetration

With retail availability a mere heartbeat away, the reigning vendors generally are already offering proprietary systems, and the majority have plans to build Multimedia Cable Network Systems (MCNS) cable modem termination systems (CMTS) and cable modems.

According to one report by Kinetic Strategies, cable modem shipments have exceeded 500,000 units, with a handful of vendors emerging as clear leaders in rapid deployment. Cable Modem University has been keeping tabs on operators engaging in the deployments. The data listed below were compiled from the two sources.

- Half of those deployments were made by Motorola and occurred in the first half of 1998. MSOs on the line include Century, Comcast, Cox, DirectLink, Intercable, OSG Cable, Paragon, Shaw, TCI and Time Warner.
- Bay Networks said that of the 200,000 LanCity cable modems it has shipped, more than 60% of them took place this year. Adelphia, Bell South, Bresnan, CFU, Cable Alabama, CableAmerica, CableVision, Comcast, Cox, Dakota, GTE Media Ventures, Horizon Cablevision, Marcus Cable, MediaOne, Midcontinent Cable, Mitchell Cable, Sioux Falls Cable, Summit Communications, TCI, US West Telechoice, Western Cablevision and more than a dozen international operators have deployed Bay's cable modems.
- Com21 said that it shipped 20,000 of its 30,000 cable modems since April of last year. San Bruno Municipal Cable TV, several international operators and more have already deployed Com21 cable modems.
- General Instrument said it had shipped more than 20,000 cable modems. Adelphia, Coaxial Communications, Daniels Cablevision, MediaOne and some international operators have deployed GI's cable modems.
- Hybrid Networks, Toshiba and Terayon each weigh in at the 10,000-cable modem mark.

MediaOne Rises to the Occasion

Upgrades to MediaOne's domestic plants mean advanced services for thousands of residential and business subscribers.

In Lighthouse Point, FL, enhancements made with Tellabs technology are resulting in two-way cable modem service for 3,000 business and residential customers.

Tellabs' Cablespan universal telephony distribution system has been central to the operator's delivery of integrated telephone and cable TV services throughout the state, for 520,000 bandwidth-hungry customers.

Tellabs spokesman Tom Scottino said that MediaOne plans to use the system for future telephony offerings in upcoming months.

So far, Tellabs has delivered more than 25,000 Cablespan remote service units for hybrid fiber/coax (HFC) networks in the United States and abroad. The system, said Scottino, is best suited for deploying telephone and data services to residential and small-business subscribers.

Recent launches of MediaOne Express high-speed Internet service in the Twin Cities area are serving 585,000 cable modem users in Minnesota. The service also is available in eight of the company's other markets.

MediaOne said it plans continued expansion of the service, aided by a liaison with Time Warner. The companies are teaming up to provide online services with enhanced content and features to consumers under one brand name. The resulting combination of MediaOne Express and RoadRunner likely will emerge as one tough contender. CT

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

The Analyst's Couch

Forecasters can't seem to say enough about the growing need for enough bandwidth to provide new Internet and telephony services.

A **Forrester Research** report predicts that 16 million U.S. households representing 25% of all domestic online use will have broadband Internet connections by 2002. Other trends highlighted by the report are listed below.

- Cable companies will seize 80% of the residential broadband services market by 2002.
- The remaining 20% of the residential broadband market will be served by the local telephone companies using digital subscriber line (DSL) technology. Competition, a lack of standards and high costs will daunt their success.
- Cable data services will boom over the next 18 months, surging from 350,000 subscribers in mid-1998 to 2 million by the end of 1999.
- Falling cable modem prices and rising consumer awareness will stimulate growth.

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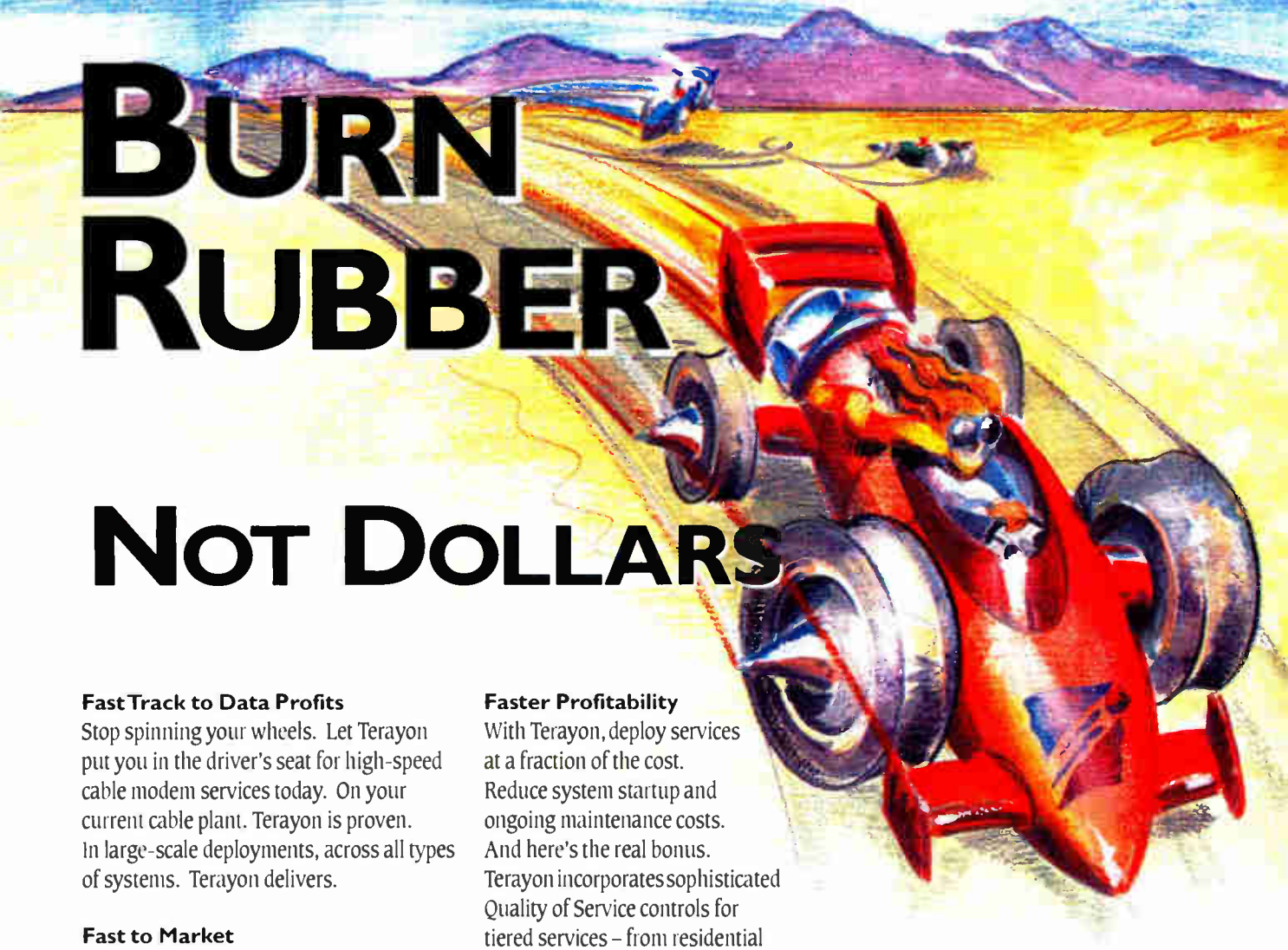

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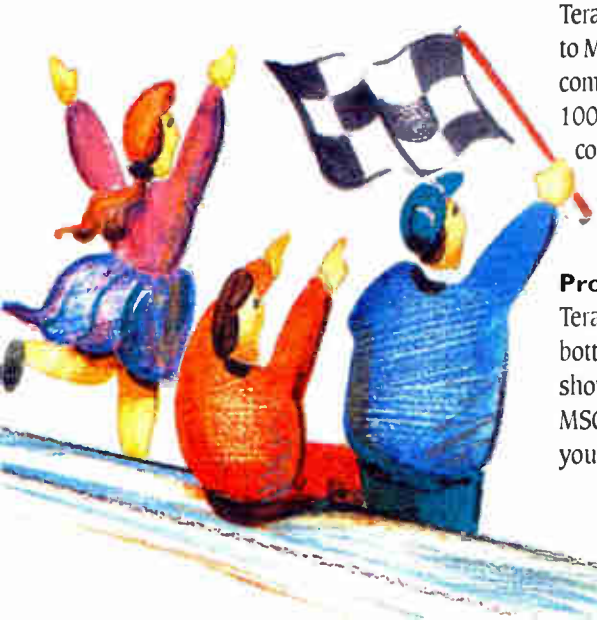

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Reader Service Number 17

By Laura K. Hamilton

Avoid Being an ISP Wannabe

You want to be an Internet service provider (ISP). You know that for sure. What you may not be so solid on is whether you should go it alone or pick a partner to help guide you into this technology of high-speed data delivery.

As you know, many new companies have popped onto the scene in the last few years to assist cable operators in setting up Internet services. Which of these is right for your cable system? How do you make the decision to go it alone as an ISP or contract with someone else?

Those are good questions, and some good advice came by way of a recent conference sponsored by the Society of Cable Telecommunications Engineers and the Institute of Electrical and Electronics Engineers. It provided an excellent gauge as to how much you really know about the technical aspects of becoming an ISP.

This wasn't just a rah-rah marketing meeting on how much money there is to be made. And it wasn't "tech-lite," either. If you're an engineer looking to get into the ISP arena and missed this Data Services Over Cable Systems Third Annual Technical Workshop, you're probably going to want to order the papers. Check the end of this column for more details.

The conference kicked off with a tutorial on Internet protocols (IPs). John Limb, Ph.D., who's a professor and director at Georgia Institute of Technology's Broadband Telecommunications Center, provided this comprehensive survey.

Technology migration

Next up was a technical session on services and technology migration. Backbone traffic prediction as well as broadband vs.

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Reader Service Number 19

narrowband issues were detailed. Also discussed was packet switching vs. RF switching and protocol efficacy with respect to broadband systems. Jim Forster, a Cisco Systems distinguished engineer, spoke on "Catching the Wave for New Services" while Georgia Institute of Technology's Limb took the mystery out of Web trafficking. Microsoft's Peter Ford and CableLabs' David Bukovinsky also presented at this session.

Networking issues

The connection and collection of several IP sources per address (multiple telephone links, upstream modem and terminal traffic) bring up several technical issues, which were explored in another session.

Topics included:

- Home area networks
- Software/tunneling vs. hardware/broadband routers
- Level 3/Edge switching
- IP addressing as applied to user/terminal devices

Esteban Sandino, manager of advanced network technologies at TCI, spoke on prediction of traffic flows in hybrid fiber/coax (HFC) transport networks. TV-centric Internet services were discussed by Scientific-Atlanta's Bill Wall, chief scientist. Broadband Access' Chad Thronburg covered IP addressing and effects on the home user and MSO. Tom Staniec of the RoadRunner Group also presented.

Availability and security

Another session put the spotlight on how suitable the IP framework is to commercial broadband applications. The "Data/Internet Service Availability, Integrity and Security" session detailed quality of service (QoS) issues, latency, administrative/billing issues and transmission control protocol/IP (TCP/IP) vs. alternatives.

Cable-fed Internet

Should the ubiquitous data network of the future involve fiber-to-the-neighborhood and Ethernet distribution within a small residential area, with end use devices capable of Ethernet communication? Nortel's Jack Terry and Elastics Networks' Patrick Stanley and John Brothers considered this question at the "Alternative Media for Delivery of Cable-Fed Internet Services" session. Terry introduced 10/100BaseT as the consumer media interface. Full-speed Ethernet on telephone pairs in the large multiple dwelling unit (MDU) and plug and surf for portable Internet access were discussed by the Elastics' representatives.

How to order papers

To obtain copies of papers presented at the SCTE/IEEE Data Services Over Cable Systems Third Annual Technical Workshop, contact Anna Riker at SCTE, (610) 363-6888 or ariker@scte.org.

Laura Hamilton is executive editor at "Communications Technology." She may be e-mailed at lhamilton@phillips.com.

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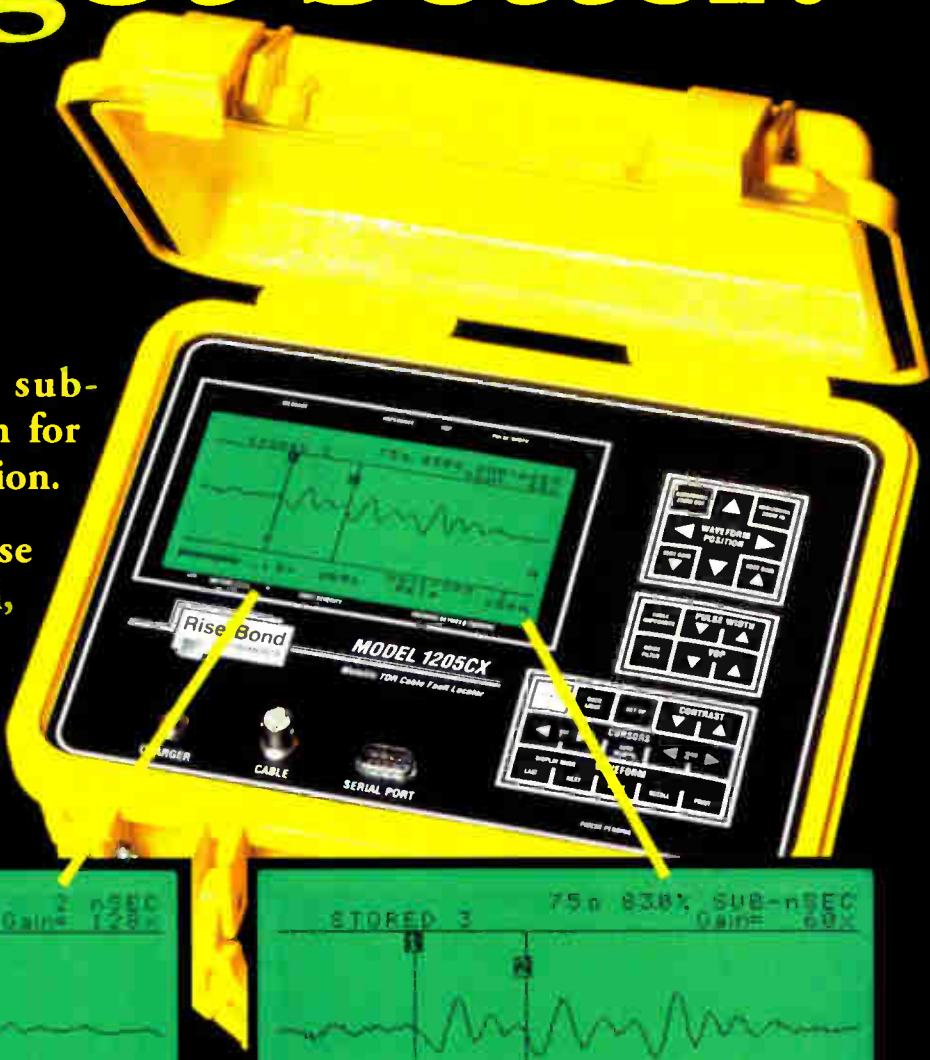

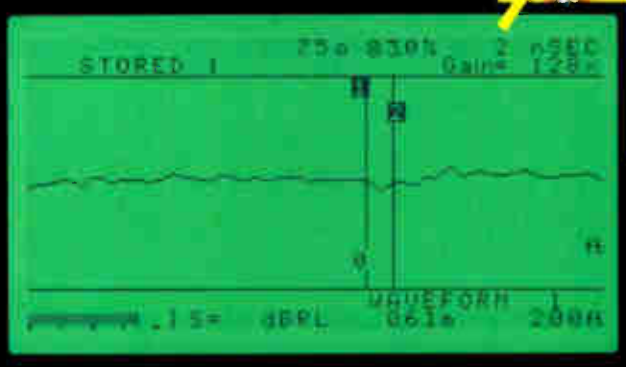

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INSTRUMENTS

By Ron Hranac

What's Happening in DBS?

Checking Out the Competition

It's been about a year and a half since I last wrote about direct broadcast satellite ("Wake up, DBS is making moves," April 1997 *Communications Technology*). At that time, the big news was the announced $1 billion merger between EchoStar Communications Corp. and Rupert Murdoch's News Corp.

This was to bring together The Dish Network and American Sky Broadcasting (ASkyB), creating a 500-channel service to be called "Sky" that included local programming. Fortunately, the merger fell apart. I say fortunately because, had the venture been successful, it would have resulted in some formidable competition. As far as competition goes, we're not out of the woods yet.

It slices! It dices!

I'm sitting here at my desk looking at a full-page Dish Network advertisement from yesterday's *Rocky Mountain News*, one of Denver's local newspapers. The ad is promoting "over 300 all-digital channels available on the TV you have now!" "3 Amazing offers..." it says. (*Editor's note: These quotes are verbatim.*) The first offer encourages consumers to "bring an original cable bill dated no earlier than April 1, 1998, and receive a $100 rebate on your new Dish Network system!" This makes the equipment price just $49.95 after the rebate. The second offer is for a $49 professional installation special (the regular price is $199), or get a free self-installation kit. The third offer announces the availability of local channels in the Denver area.

There is some fine print associated with the third offer, however. Dish Network will provide either a free over-the-air antenna or a free second dish with the purchase of a $49.95 professional installation special and $50 local network installation fee. That will allow a viewer to receive Denver's local broadcasts via a conventional rooftop antenna, or receive one of the Dish Net's local broadcasting networks packages via a second dish in areas outside the local broadcasters' Grade B contour. Fine print aside, this whole campaign is a pretty good offer. And it seems to be working.

> "Direct broadcast satellite (DBS) is our most serious competitive threat, and it will remain so for the foreseeable future."

But wait! That's not all!

According to the September 7, 1998, issue of *Cable World* magazine, DBS in the United States has grown a whopping 41% (2.2 million new subscribers) in the one-year period from August 1997 through August 1998 and now counts more than 7.6 million subscribers.

During that one-year timeframe, DirecTV/USSB gained 38% more subs, EchoStar 124%, and Primestar 13%. By the time you read this, DBS probably will be over the 8 million mark, given that it is adding an estimated 190,000 subscribers per month according to the Yankee Group.

That's not bad for a business that some in our own industry continue to poohpooh as something that's not serious competition. I've said it before, and I'll say it again: DBS is our most serious competitive threat, and it will remain so for the foreseeable future.

In case you missed it, J.D. Power and Associates' 1998 Cable/Satellite TV Customer Satisfaction Study for the second year in a row rated the three DBS companies on top in terms of overall customer satisfaction. Primestar was in first place again, scoring 132. Close behind were EchoStar and DirecTV at 131 and 126 respectively.

The nearest cable company was Cox, which scored 106. The remaining cable companies evaluated in the study ranged from 93 (TCI) to 103 (Jones Intercable). While the study found cable companies are improving, the differentiation between satellite providers has narrowed, and they're staying way ahead of cable operators.

Bottom line here: DBS is kicking our butts in customer satisfaction, and although we're getting better, we do have significant room for improvement.

And you also get....

DBS providers are not simply sitting back and basking in all of this glory. DirecTV, for instance, recently cut a deal with an upscale neighborhood in the Dallas suburbs to provide satellite TV to every home in the subdivision.

Apparently unhappy with the incumbent cable operator's service and rates,

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homeowners looked for an alternative. So far, more than 700 of the subdivision's 870 occupied homes have opted for the bulk-billed satellite service. Homeowner association representatives negotiated a 50% bulk service discount ($195 per year for DirecTV's 85-channel "Total Choice" package), including a free set-top receiver, free installation, and an over-the-air antenna for local broadcast channels.

The Dallas sales agent for DirecTV claims to be negotiating similar arrangements with other master-planned communities. This was certainly a creative move on DirecTV's part and is supposedly the first of its kind in the nation. Look for more deals like this in the future.

Should all of this have us quaking in our boots? Probably not, but our industry needs to take DBS far more seriously than it has in the past. Even more emphasis needs to be placed on quality and reliability, and especially customer service.

One of the major complaints the Dallas subdivision homeowners had regarding their cable service was frequent outages. Sheesh! Maybe it's time to dust off CableLabs' 1992 publication *Outage Reduction*. CableLabs' Outage Reduction Task Force had a lot of great ideas and recommendations, and most of them still apply today. Unfortunately, few systems implemented those recommendations on a widespread basis.

If you're a CableLabs member company, you should have a copy of *Outage Reduction* on the shelf somewhere, or at least have access to it. For nonmembers, the first four chapters of *Outage Reduction* appeared in edited form in the December 1992 and January, February and March 1993 issues of *Communications Technology*.

That's STILL not all!

There's a somewhat bizarre twist to all of this that's hard to keep in perspective. Primestar, the second largest DBS provider, is owned by a consortium of cable companies. This could change in the near future because Rupert Murdoch's News Corp. and a TCI affiliate may purchase Primestar. Too, it seems surprising for a cable-owned DBS service to take the J.D. Power and Associates customer satisfaction study top spot two years in a row, while the cable companies that own Primestar fare much worse. What gives?

As much as it appears DBS is our avowed enemy, DirecTV has signed deals with a number of small cable operators to provide a satellite programming package as part of those companies' cable service. In those cases, we're allies of sorts, or perhaps it's just a bit of sleeping with the enemy.

No matter which way you look at it, DBS clearly has been successful. Its nearly 8 million subscribers are equivalent to approximately 12% of the U.S. cable market's subscriber base.

There was a time when the initials "DBS" were jokingly interpreted as "don't be silly." Early attempts at launching DBS in the United States probably earned that moniker, but since DirecTV got into the business a few years ago, it's no longer a laughing matter. This is particularly true for those systems that have lost subscribers to the little dishes.

The only real failure to date was the loss of DBS provider AlphaStar, and they went under when their subscriber count was around 45,000. I believe one of the other big players picked up those subs.

Those of you who are regular readers of this column know that I've been a DirecTV subscriber since it first became available in the Denver market. During that time, I've watched picture quality improve as compression algorithms were tweaked, and as the technology moved from so-called MPEG-1+ (Moving Pictures Experts Group) to full MPEG-2.

Reliability has been much better than I ever expected it to be, with loss of signal occurring only a handful of times during heavy rainfall or the occasional wet, sticky snowstorm. (Most of Colorado's snow is the fluffy powder that skiers love.) The competition is for real, and we're past the wakeup call. CT

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

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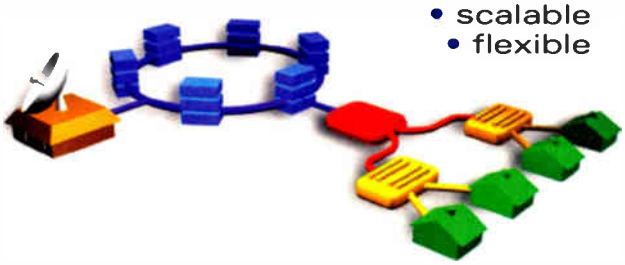

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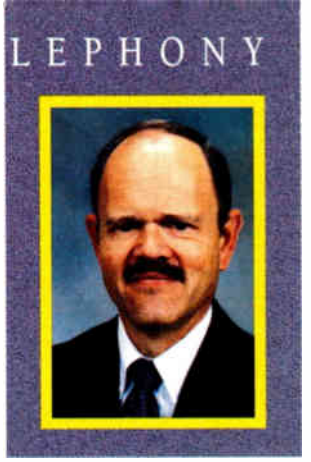
Reader Service Number 24

By Justin J. Junkus

Network Management Provides A Lesson in Convergence



When you say the word "convergence" to telecommunications professionals, it sometimes brings visions of an industry suddenly populated by competing companies that all provide a similar set of services—video, data and telephony.

I believe there's a lot more to convergence, and it involves factors apart from the services themselves. Some of it actually involves cooperation, rather than competition.

Network management is perhaps the best example of this type of convergence that I have seen. It is a discipline that has made its way into separate telecommunications industries as needed to support services the market demands from those individual industries.

The telephony industry was one of the first to have the need, and the data industry was one of the first to provide a standard solution. Today, telephony, data and cable all implement versions of the same solution for their respective industries. The solution didn't appear overnight—it grew in response to the needs of all the markets, beginning with telephony.

Roots of network management

Telephony always has been networked. Telephone calls are first processed at a local switch and then routed as determined by the called telephone number to another local switch, or a switch belonging to an interexchange carrier (IXC).

In the days before divestiture, the Bell system created national network operations centers (NOCs) to monitor the entire country, mainly to watch for congestion in any part of the network that could propagate across the system.

Operations support systems (OSSs) became part of this network monitoring and added the capability not only to remotely reconfigure but also to maintain parts of the network by activating backup components. Since everything was owned and manufactured by the Bell system, the communication links between individual switches and the operations center used proprietary protocols.

Unlike telephony, data processing started as a centralized discipline. It grew into data communications because business enterprises have multiple locations. Initially, information was processed on mainframes and then distributed to regional and branch offices, either by paper copy or by real-time transmission to a remote terminal.

> "Today, telephony, data and cable are all implementing versions of the same solution for their respective industries."

Enter the personal computer (PC) and distributed processing. It became easier to have certain tasks performed by local computing power and have the individual computers exchange the results of the data processing. Several classes of networks evolved as the processing of information became more distributed. Today there are local area networks (LANs), wide area networks (WANs) and high-speed backbone networks. These networks can be public, such as the Internet, or private, such as a business's network.

For reasons similar to those driving telephony network monitoring, data networks also require monitoring. Avoiding traffic congestion is one factor, but so is security. Privately owned networks include monitoring systems that receive information from each node in the network.

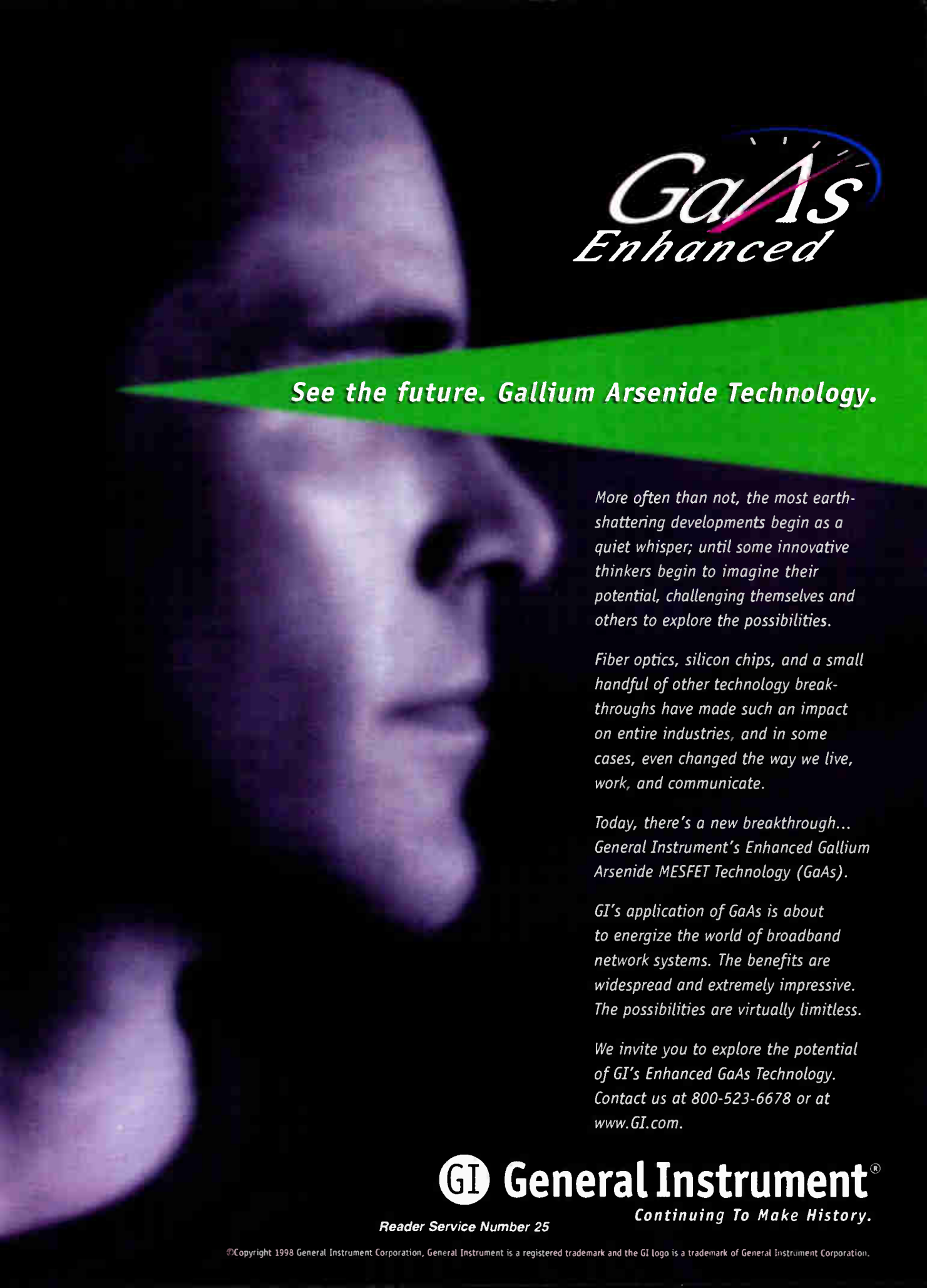
This is more of a challenge than telephony faced in building the original NOCs, since data grew as an open, competitive industry, with multiple equipment suppliers. A standard protocol for communicating network conditions was rapidly accepted by most vendors because they and their customers recognized it was impossible to build full systems without it. The protocol's simple structure is one reason for its acceptance. Hence, the standard's name: simple network management protocol (SNMP).

Cable is the latest entrant in network monitoring. For years, our monitoring needs were minimal because our systems were one-way broadcast only. Now that we have realized the potential of broadband distribution as a two-way medium, we also need sophisticated systems that can perform the functions of both the telephony NOC and data network monitoring systems.

Our initial systems often are called element managers, and they monitor groups of equipment, or network elements, that perform specific functions, such as hybrid fiber/coax (HFC) distribution, telephony or high-speed data.

What all three industries have discovered as they implemented network monitoring is that it is only part of a total system that must include service and business management, as well as the management of network elements.

While we hope that our monitoring systems will automatically detect and correct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troubles before they become noticeable to our customers, we still need to dispatch technical support and coordinate customer records, trouble calls and billing information.

Because this need exists across the board, all three industries are embracing versions of a standard called the telecommunications management network (TMN), which covers not only communications between nodes in a system, but also the type of information that should be communicated.

TMN is specified by the International Telecommunications Union. It was created by drawing from the experiences of both the telephony and data industries and is applicable to telecommunications systems in telephony, data or cable. TMN groups the needs that must be met by network management into five generic categories and builds a system that solves these needs in five levels.

Letter of the needs

The needs are collectively called FCAPS, an acronym created by the first letters of the need category.

The "F" in FCAPS stands for fault management. It includes alarm surveillance, testing and trouble administration.

The "C" in FCAPS stands for configuration management. Activities such as provisioning subscriber lines for various services and managing moves and changes are included.

The "A" in FCAPS is for accounting management. Here's where the bills are rendered and equipment is cross-referenced to subscriber addresses.

The "P" in FCAPS is for performance management. There are two parts to performance management: traffic measurement reporting and performance monitoring. Performance monitoring is similar to fault management, except that it is concerned with predicting and preventing failures, rather than responding to a failure that already has occurred.

The "S" in FCAPS is for security management. Security management pertains to the methods of ensuring that only authorized personnel can access the network management system. This is an extremely important area in network management systems. Unauthorized access gives an intruder the ability not only to steal services or eavesdrop on confidential data, but also potentially to control the operation of the entire system.

TMN levels to meet the needs

TNM architecture has five levels: network element, element management, network management, service management and business management.

Network elements are the pieces of equipment that are being monitored.

The element management layer is responsible for translating the physical implementations of the network into a form that can be processed and displayed by a mathematically-based computer model.

The network management layer oversees the entire operator's network, based on information provided by the various element managers. This is the layer where NOCs are implemented.

The service management layer is the point of contact with subscribers for provisioning, accounts, quality of service (QoS) and fault management.

Finally, the business management layer is the highest layer of TMN and is where planning, budgeting, goal-setting and business decisions in general are made. The standard protocol for communicating between the layers of TMN is common management information protocol (CMIP).

Today's solutions

Many companies offer products they call network managers. As you might expect, the data industry is the furthest along in implementation of the full TMN model, since that industry has the background not only in the networks, but also in the support systems in the upper layers of TMN. OpenView from Hewlett-Packard and NetView from IBM are two examples.

Most of the work in cable is still at the element management layer, and thus it tends to focus on particular subsystems, such as HFC distribution or telephony.

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 to find out more about KnowledgeLink, you may e-mail him at jjunkus@aol.com.

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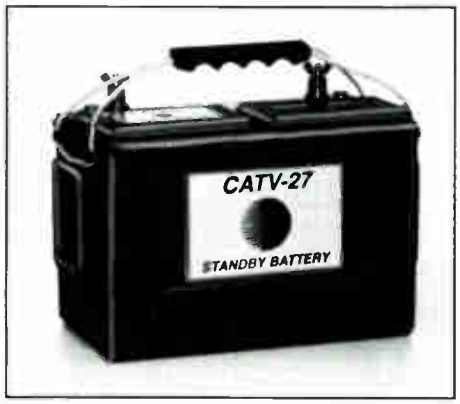

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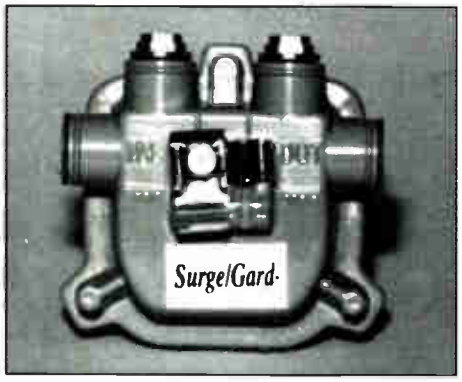

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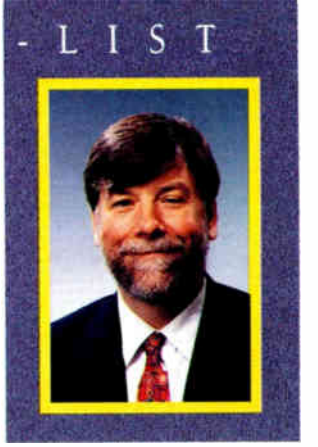
Reader Service Number 27

By David Devereaux-Weber



Someone's Happy With The FCC!

Every so often, an exchange occurs on the SCTE-List that makes the value of the List crystal clear. In an industry as complex as cable telecommunications, clear, direct and fast communications among the people with a stake in the industry are becoming more important over time. The following selected messages (edited for size) tell the story.

Date: Tuesday, Aug. 18, 1998
From: Jim Kuhns, k8ft@ix.netcom.com
Subject: FCC forms

The last two times I requested 320 forms from the Federal Communications Commission, I received forms that were printed/copied crooked on the page and looked like they were copies of copies of copies—you get my drift.

Since the condition was that bad and difficult to type on due to the crooked page alignment, we scanned a copy and electronically cleaned it up (same font, lines, wording and such, but not crooked). After several years of submitting this form without complaint, I am now being told that the FCC is refusing this form. They want it on their form even if it is crooked and illegible.

If all the trash marks on their "official" 320 form are "whited out," do you think they would accept it if it was still crooked? What is everyone else doing? Are you just sending the 320 forms in "as is," or are you cleaning them up?

Date: Tuesday, Aug. 18, 1998
From: Scott Madison, JCPLPSM@aol.com
Subject: Re: FCC forms

Jim,

Each year, the Commission shorts me a 320 or two. I generally take one of the correct copies, copy it on the copy machine, white out the CUID and system number, recopy it and then type in the information. I have never had a problem with this but am just filing this year's forms as I type. I'll let you know if there is any problem.

I too have requested that the Commission put a PDF (portable document format) copy on their Web site, and they have responded to me in the same manner. Additionally, I think that it's ridiculous that the software companies have not been allowed to integrate the form into their leakage management programs. Think of the reduction in work that would effect.

Date: Wednesday, Aug. 19, 1998
From: Jim Kuhns, k8ft@ix.netcom.com
Subject: Re: FCC forms

I received a call this afternoon from Mike Lance of the FCC's cable bureau in response to my previous posting about trashy 320 forms. He spent a good bit of time with me listening to my complaints and addressing them.

Mike expressed his concern about the condition of the documents and assured me that this is not accepted practice. He took my address and is sending me clean copies via the U.S. Postal Service.

The information I had been given about the acceptance of my remanufactured 320 forms was incorrect. The FCC will accept a form if it has been examined and approved by their office prior to submission.

This pre-approval process is not to merely to be picky but to ensure that the form wording is correct and has not been altered, thereby changing the meaning of the document. Quite honestly, it had not crossed my mind to alter the wording. Once Mike explained the reason for pre-approval, it made sense to me.

He also indicated that the FCC does listen to the people they serve. They will be putting the 320 form on their Web site (www.fcc.gov) for downloading in the near future. Some time down the road, they hope to be able to go electronic filing, too.

Mike and the FCC showed me an excellent example of customer service this afternoon. When I brought it up, Mike said a List posting about his response was not necessary. I disagree. Since I was quick to complain in public, it is only fair that I publicly say "thank you" just as quickly.

Date: Friday, Aug. 21, 1998
From: Jim Kuhns, k8ft@ix.netcom.com
Subject: FCC 320 forms online

Dear Listers,

Mike Lance told me two days ago that the FCC would put the 320 form on their Web site. True to his word (and in very quick order, I might add) the FCC Web page now has the 320 form available. Check it out at www.fcc.gov/Forms/Form320/form320.pdf. Just when I was sure you couldn't count on the government to come through for you....

Thanks, Mike.

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

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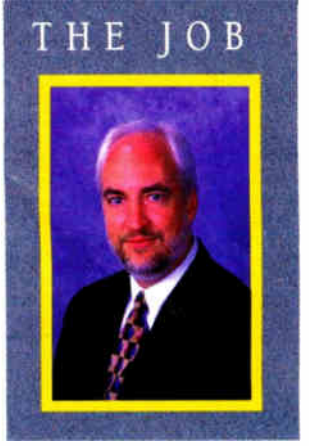
By Alan Babcock



Train More for Less

I have a friend who has been challenged by his boss to "Train our people."

My friend responded, "Great, what is my budget?"

He got the dreaded response: "Budget? You don't have a budget."

My friend called me to ask how the Society of Cable Telecommunications Engineers could help. I responded by helping him strategize how to show his manager how much it would cost to train the technicians without a budget. You see, as we say today, "I've been there, done that."

Rolling your own

The first reaction many have to this dilemma is to develop training themselves. I call this making "home brew." And like a lot of home brew, it ends up not tasting so good. The first thought is that if you develop training yourself, it doesn't cost any money.

Wrong.

First, understand that your boss saying you don't have a budget for training doesn't mean you don't have options. You see, most budgets have dollars for travel, dues and subscriptions, conference attendance, and so on that may be able to be re-allocated to training.

Your job is to work with your manager to figure out how to allocate the money to get the most benefit. Your role is to help accomplish the "train our people" task while helping your manager meet his budget. Let's take a look at how we might attack the problem.

Most people don't realize that training will cost money. Somehow, somewhere, money will be spent to train people. Many managers don't realize that if you develop your own training to "save money," it may actually cost more in the long run. Your job is to educate your manager on how to acquire training for less than it will cost to develop it yourself.

It'll cost you

If you think you can develop your own training without spending money, wait a minute. It can't be done. Sure, you can pull information from company policy and procedure manuals, equipment operating instructions, manufacturer brochures and so forth. You can do a brain dump of your own understandings and write some of the material. You may even plagiarize other training programs or books. Many cable technicians have been trained with this type of home brew.

> "Many managers don't realize that if you develop your own training to 'save money,' it may actually cost more in the long run."

Are they good programs? Maybe, maybe not. Some home brew is pretty good, but most times, professionally developed programs are better and will result in real performance improvement.

Did you spend any money creating the home brew? Sure you did. The question you have to ask is, "How much did I spend?"

You spend money copying materials, writing down information and putting copies in binders. If you illegally copied information from copyrighted sources, you even exposed your company to potential lawsuits.

The large cost in this (other than potential lawsuits) is your time. Not only did you spend time creating the program, but that time cost double because you weren't in the classroom teaching. Some might even argue that your time could be multiplied by the average number of students who would have been in the classes.

Let's calculate how much you spent creating the program.

Some assumptions

First, we need to make some assumptions. According to the American Society of Training and Development, the benchmark for training development time is 40 hours per hour of finished training. (This was discussed in more depth in my April 1998 column.)

Let's assume for our example that you used only half of that time, 20 hours, because you were pulling information from various sources and basically cutting and pasting it into your course. Based on these figures, it would take 800 hours to develop a 40-hour training program. Even with a conservative approach, we need to double this time to account for your time not spent teaching. Consequently, you have effectively "lost" 1,600 hours.

The second assumption we make is that you make $35,000 per year. This may be high or low, but it's a good average to start with. Remember, you can do these calculations yourself with your real numbers to get a more accurate picture. For this example, we won't add on the costs of benefits, which could add 50% or more to the base salary. To calculate the hourly wage, we will take $35,000 and

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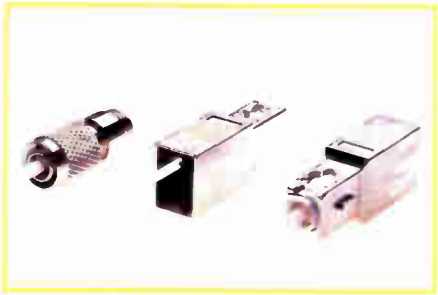

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Reader Service Number 102

divide by 2,080 (the number of work hours in an average year). This results in an hourly wage of approximately $16.80.

Multiplying 1,600 hours by $16.80 equals $26,880. You spent nearly $27,000 creating a training program because you didn't have a budget.

A better option

Here comes the good part. Bargain with your boss to find half of that money to provide training. The argument you need to make is that you can get existing programs and spend time in the classroom training and improving technician skills and performance rather than developing the material yourself. Look at how far $13,500 will go in each of the following SCTE training options. You can:

- Purchase a *Leader Guide* and workbooks to put 437 technicians through SCTE Installer certification.
- Purchase a *Leader Guide*, videotapes, workbooks and text books to put 47 technicians through the Broadband Technology course.
- Provide approximately 540 visits by technicians to local chapter training meetings (including local dues).
- Enroll 337 people as members of the SCTE. As members, they receive trade publications, *Literature Library* and discounts on many types of training and certification activities.
- Provide approximately 150 technicians with the opportunity to participate in SCTE certification programs.
- Enroll approximately 45 technicians in SCTE regional seminars, Emerging Technologies Conference or Cable-Tec Expo.

As you can see, a lot of training can be done for a relatively small amount of money. Your job is to be creative enough and persuasive enough to show your company how you can do that training without a huge budget.

The secret is in the hidden costs resulting from your development of training. I believe the secret is in asking, "Do you want me to develop training or *do* training?" 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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The EAS Clock Is Running Down

MSOs Install for Compliance as Deadline Looms

By Andrew Morris

As the December 31, 1998, deadline for Emergency Alert System (EAS) compliance rapidly approaches, most cable systems with 10,000 or more subscribers have installed, or are taking steps to install, the equipment required to meet Federal Communications Commission requirements.

Steve Johnson, Time Warner Cable's director of engineering and technology explains: "Some systems implement EAS because it is a government requirement with rules saying they have to do it. Other systems look at EAS as a marketing tool enabling them to provide a useful service to the customer while differentiating themselves from competition such as DBS (direct broadcast satellite). The primary challenge is in getting information to our subscribers and getting it to them in a minimally disruptive manner."

Johnson states that Time Warner is not managing its EAS deployment in a centralized manner. "We have 40 different divisions with clusters of cable systems, and each makes their own decision as to which vendors' equipment to use and what kinds of bells and whistles to put in.

"Time Warner plans to be in compliance, and the majority of our systems have ordered and are installing their EAS equipment."

Frank Lucia, director of the FCC's Emergency Communications Compliance and Information Bureau, addresses one definition of compliance. "When broadcasters had to meet their EAS deadline two years ago, there was a rush on manufacturers' products," says Lucia. "If a broadcaster showed a purchase order to an FCC field representative, we accepted that as working toward compliance. I assume we'll carry that position forward for cable operators."

Override

As of this writing there remains one last outstanding rule-making issue before the FCC that may effect EAS deployment. Lucia explains the industry is waiting for a decision on selective override by cable systems of state and local EAS warnings generated by over-the-air broadcast stations.

Lucia states that current rules call for "a cable system and a local TV station to enter into an agreement regarding cable override of local TV stations with EAS announcements. The National Association of Broadcasters petitioned the FCC to prohibit this override if TV stations meet certain operational specifications."

These operational specifications call for a broadcast station to certify that it originates local news at its studio facility, has weather equipment that supports the station's weather department, has the ability to run video crawls over programming, and that its master control is manned at all times when the station is on the air.

The FCC issued a Notice of Proposed Rulemaking and has not yet made a decision on this issue. Lucia stated that a decision likely will be made by end of September 1998 *(Editor's note: prior to the scheduled deadline for this article)*, and he further explained this ruling might very well impact decisions cable systems make on the type of EAS equipment they choose to purchase.

Michael Smith, Adelphia's director of engineering for Virginia states: "Defining the word 'local' is key. This needs to be carefully reviewed."

A cable viewer may live 50 to 60 miles away from the local TV station he is watching. An emergency could take place that warrants viewer notification, but if that emergency is far from a broadcaster's market, that TV station might not transmit an EAS warning. Rules prohibiting a cable system from overriding a TV station could prevent that viewer from getting a much-needed and much-welcomed warning.

Smith is responsible for systems that range in sizes up to 50,000 subscribers. "All 10,000-subscriber and greater systems have been surveyed, and it's been decided which EAS system will be used for each particular location," he says. "Some cable systems have had their EAS equipment installed earlier this year; in other cases equipment is on order, and in some cases orders are just now being placed."

"We expect to be operational by mid- to late October. We've looked at

using composite IF (intermediate frequency) equipment as well as crawl systems, but because we've got relatively small systems, we are mostly going with the Idea/onics comb generator, which interrupts all programming.

"Some systems such as Idea/onics allow for a simpler install by putting a switch on output of the headend. The modulators are isolated from the EAS equipment, and you don't have to wire each channel individually," explains Smith.

Smith acknowledges that EAS is a "good public service" and indicates that some franchise agreements require an audio override, and they will comply with those agreements.

EAS and marketing

Smith says Adelphia does not view its EAS equipment as a marketing tool, mainly for operational reasons.

Steve Grossman, Mega Hertz sales and marketing manager, elaborates on cable operators' using EAS for competitive advantage. "DBS cannot provide this type of service. They cannot get a message out on a tornado. Saving a few lives is worth a lot of PR, and it makes the cable operator part of the community."

Bill Robertson, Frontline

chief technical officer, expands on the idea of using EAS as a marketing tool. "You can use a crawl-based system for other messages. You can tell your customers about problems like system outages and sun outages so that you don't get unnecessary service calls. EAS can be a tool to improve customer relations."

Terry W. Bush, Trilithic vice president of sales and marketing, states: "The cable industry hated to have to do this. It is a non-revenue-generating part of their system. But they have to do this by FCC regulation, and EAS does offer benefits not available to competing services such as DBS and MMDS (multichannel multipoint distribution service).

"IF systems are the most common, but they replace programming with an EAS message," says Bush. "They are relatively inexpensive and easy to install, but they are full-page disruptive. Some systems are using IF for their less-than-premium carriage, but with premium and pay-per-view (PPV) channels they are using character generator-based systems."

Ken Wright, executive director of technology for InterMedia Partners, emphasizes the altruistic benefits of EAS. "EAS is, of course, a government requirement, but it is also a good thing to do for our communities—saving lives, minimizing property damage. It is a fairly low-cost way to contribute to our communities.

"We are installing a number of systems between now and December 31," continues Wright. "We have about 20 systems

BOTTOM LINE

Make Your Deadline

The end-of-the year deadline for Emergency Alert System (EAS) compliance for 10,000-sub or greater systems is upon us, and most (but not all) of these cable systems have their equipment ordered if not installed. Most cable systems plan to install just the equipment necessary to meet minimal Federal Communications Commission requirements.

Meanwhile, most vendors of EAS equipment are encouraging the use of EAS as a value-added marketing tool for providing enhanced EAS and non-EAS information to their subscribers. Just utter the magic words "DBS" (direct broadcast satellite) and "competitive advantage" in the same sentence, and you're bound to arouse some interest in a cable system's general manager.

On the horizon lies EAS over digital channels with Web-enhanced emergency messages, which opens up the potential for all sorts of innovation in this area of government-mandated emergency services.

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with greater than 10,000 subscribers. In some cases, we are purchasing new systems, but equipment options have changed enough that we are taking a fresh look at the leading contenders."

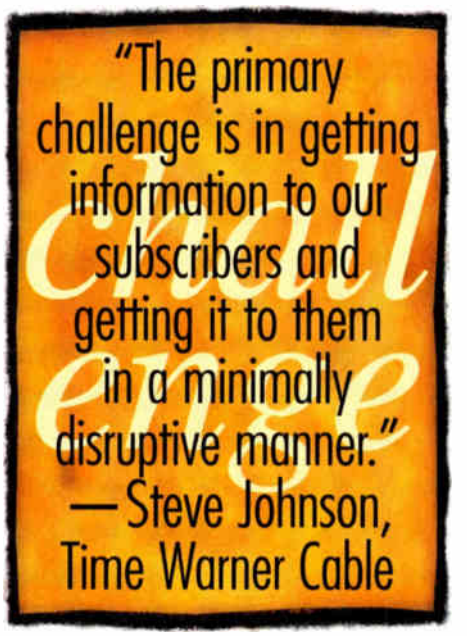
Protecting commercial insertion

Dave Halperin, vice president of HollyAnne, says: "The single most asked-about feature is local commercial insertion protection. Locally inserted commercials are an ever-increasing revenue stream for a cable operator."

HollyAnne offers equipment that holds emergency messages (except for an EAN—the dreaded and never yet generated federal Emergency Action Notification for national emergencies—that must be transmitted immediately) for up to seven minutes in order to avoid disrupting locally inserted commercials.

Spectrum offers an addressable trunk switch that works in conjunction with a comb generator to serve multiple locations out of a single headend. Doug Shearer, Spectrum sales manager, explains: "With this system, you can address cities independently with a single comb generator. It can save you from having to buy multiple comb generators."

Spectrum has a co-marketing deal with Mega Hertz for the Mega Hertz Sub Alert system as well as Spectrum's EA Spectrum product.



Down the road, EAS equipment will need to adapt to the digital world. Time Warner's Johnson states: "The next challenge is how do we do EAS on a digital stream. For digital, cable systems are meeting the December 31 deadline with generation one of EAS equipment in order to make bare-bones compliance. In the future, I am sure we will see links to Web sites where you'll be able to do things like pull in additional information on what to do when facing a tornado. It will be a much more enhanced system with extra features. I'm excited about this, and we'll probably start seeing this during 1999." CT

Andy Morris is a free-lance writer based in New York. He may be reached via e-mail at amorris@msn.com.

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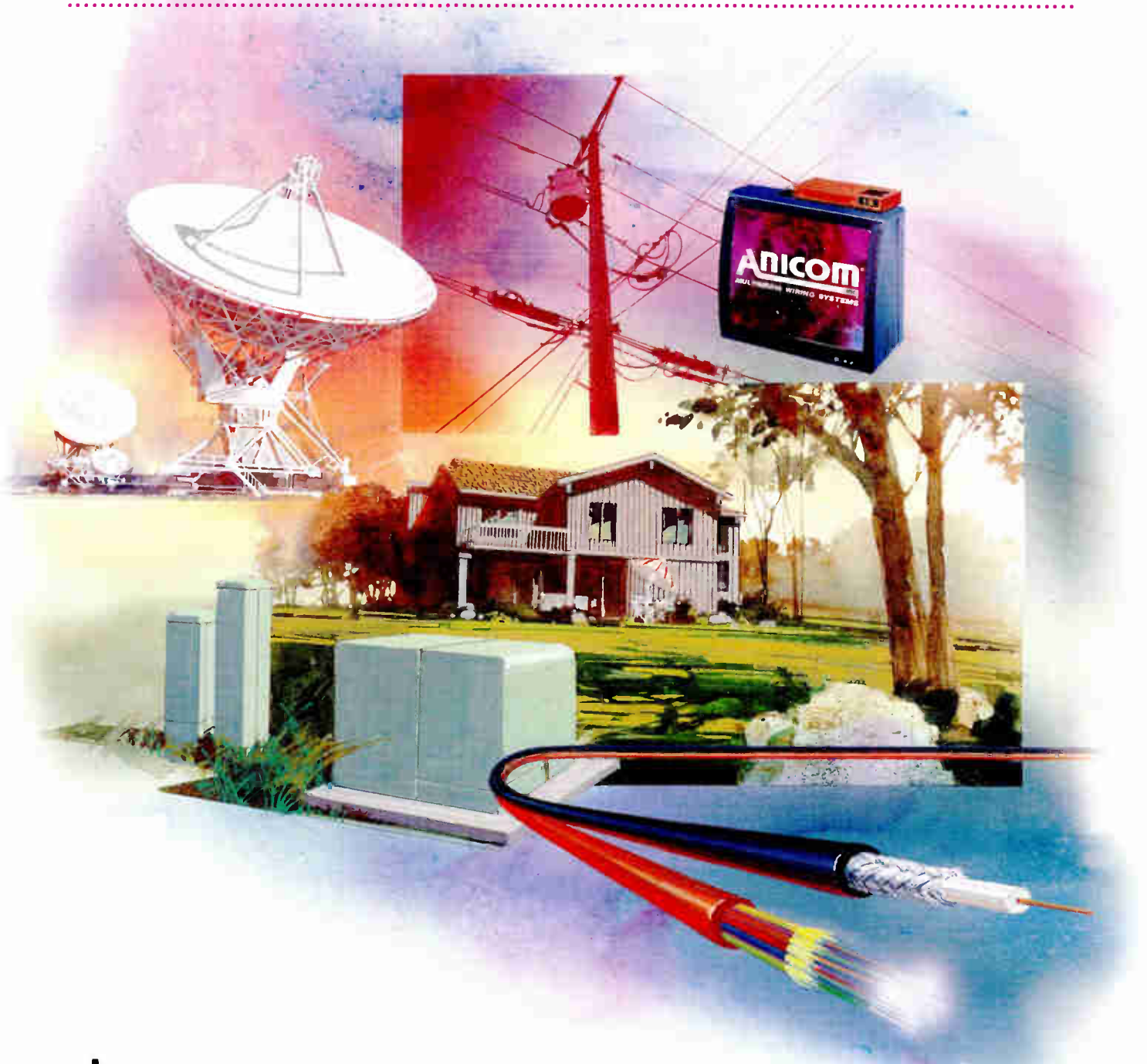

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Reader Service Number 35

FLASH MEMORY

What It Is and How It Will Change Set-Tops in 1999

By Charles A. Anyimi

Digital TV (DTV) is poised to become the next major inflection point in the broadcasting industry. With this technology, cable service providers are in the unique position of supporting two-way communication with the viewer via the TV set—a device that already occupies a majority of most people's leisure time.

How can the cable industry take advantage of this? How can cable capitalize on the Internet's rapid growth and deliver it to a TV audience? There are a number of potential solutions, but no clearly "right" answers.

Among the factors yet to be determined is the capability of the set-top box, particularly over the next five years. Demands of cable consumers over this period of time also are far from certain. Such a dynamic business environment demands flexibility in set-top box design. This article addresses how flash memory enables that flexibility, making feature additions and future enhancements to the set-top box easier and less costly for cable system operators.

What it is

Simply stated, flash memory components are reprogrammable memory devices that retain their content after the power source is removed. Flash memory offers lower cost and better performance than competing memory alternatives. Unlike a hard disk drive (HDD), flash memory is a solid-state device. It has no mechanical parts and therefore provides "appliance-type" instant-on performance without suffering from long seek times, noisy rotations, or hard failures.

Flash memory is based on a technology similar to electrically erasable programmable read only memory (EEPROM), but unlike EEPROM, flash is more scalable and cost-effective. With today's production densities of up to 8 MB, flash memory is used in applications where moderate amounts of nonvolatile storage are desired: from personal computers (PCs) to automobile engine control, copiers and printers to digital cameras, cellular phones to networks and servers. Flash is a ubiquitous memory device with broad application usage.

How it will be used

Digital cable set-tops in 1999 will include basic Internet access and an electronic program guide (EPG) to help viewers navigate the many program offerings. These set-tops will primarily use flash memory to store the system firmware.

This firmware can include the operating system, EPG software, and middleware for different standards (OpenTV, OpenCable and so on). When the set-top first powers up, the firmware typically is loaded from flash to dynamic random access memory (DRAM) and executed in DRAM. Slower flash memory access times, compared to processors or other system components,

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Some Memory Terms Defined

Dynamic random access memory (DRAM): The temporary storage of data in many electronic devices (PCs, notebooks, and so forth). When the power is turned off, all data stored in DRAM is lost.

Electrically erasable programmable read only memory (EEPROM): A type of memory used for permanent storage of small amounts of data. It is limited in storage capacity and data access speed.

Nonvolatile memory: A memory device that retains its data even after power has been turned off. Random access memory (RAM) is volatile, whereas flash memory is nonvolatile.

Hard failure: An unrecoverable error that permanently damages all or part of an electronic device. If, for example, one sector of a hard disk drive suffers a hard failure, you can never write data to that sector again.

Write performance: The rate at which data is written to a device. With respect to memory devices, it is the length of time it takes to transfer a byte or word of data to the memory array.

Memory partition: A physical separation within a memory device that enables read access to one portion and write access to another portion at the same time. The usefulness of a memory partition depends on the size of the partition and the intended application.

Zero wait-state performance: The ability to connect a device directly to the system processor without impacting overall performance. A zero-wait-state system means all components connected to the CPU bus can operate at the same frequency.

Memory density: The storage capacity of a memory device. The size of a memory device typically is measured in millions of bits (megabits—Mb). System memory requirements, however, are specified in millions of bytes (megabytes—MB).

have pushed set-top designers to this boot and download scheme.

A more refined approach, however, is the use of fast access flash memory to enable direct code execution. A flash device with an access time that is an integer multiple of the Moving Pictures Experts Group (MPEG) decode frequency (27 MHz), or the set-top processor frequency, is ideal for a zero wait-state set top design. Direct code execution minimizes the need for large amounts of DRAM, thereby reducing system cost and guarding against fluctuations in DRAM price/supply.

Sooner or later, the system firmware will need to be updated. The operating system alone is between 1 MB and 2 MB of memory. Adding an improved interface, such as an enhanced Internet browser, is another 1 MB of code.

With features such as audio/video telephony, 2D/3D games and voice recognition all earmarked for development over the next five years, code updates will become a way of life. Consider a scenario

where the service provider desires adding online banking, including encryption, to its cable service offering. This update can be done in either the foreground or the background.

Foreground vs. background

A foreground firmware update is very intrusive to the viewing experience. A message normally appears on the TV screen notifying the viewer that a code update is available. If the viewer chooses to proceed with the update, the system is taken off-line (rendered unresponsive to viewer inputs) while the firmware update occurs. First the old code is erased from the flash memory; then the updated code is written to the same device. Foreground firmware updates can take as little as two minutes or as long as half an hour, depending on the write performance of the flash memory and the amount of code to be updated. Set-tops designed for foreground updates require less flash memory and often rely on a single flash component.

By contrast, a background firmware update does not interrupt the viewing experience. The viewer is not even aware an update is taking place. In this case, the set-top typically contains two flash memory devices. The first device stores the existing code while the second is used for updates. The system switches to the flash device with the new code when the power is cycled. (An on-screen display will notify the viewer of the new features now available once the set-top is turned on.)

> "A cost-effective flash memory solution for future set-tops would combine high performance, high density and appropriate memory partitions."

While this method is more robust and elegant, it also is more costly. Fortunately, the decreased selling price of flash memory minimizes some of these cost impacts. The write performance of the flash device also is less critical because the update is occurring in the background. A still better solution is the use of a partitioned flash memory. This allows new code to be written to one segment while old code is maintained in a separate segment of the same device.

Store viewer-specific info

Besides firmware storage and/or execution, flash memory also can be used to store viewer-specific information. Every time you make a purchase or visit a site on the Internet, for example, your profile is captured for marketing purposes. ➤

As more features become available to the cable subscriber, the ability of advertisers to determine buying habits/trends of a household or neighborhood is invaluable in targeting products and services to a particular group. In addition, as more interactive content is made available, viewer personalization will increase—think personal Web pages, Saturday morning viewing preferences, bookmarks and so forth.

Large user data files may be kept on a server at the headend or distribution center, but small- to moderate-sized user information can be captured and stored in flash memory. This is an implementation choice left to the service provider. Like Internet sites that offer space on their servers for personal home pages, cable service providers may choose to offer server space to subscribers for similar purposes.

As functionality increases, set-tops will require higher performance processors and decoders to keep pace with increased data throughput. But while features drive flash density upward, consumers will continually push set-top costs lower. These symbiotic forces will further clarify the need for a single-chip, multifunction solution. Foreground updates will decrease in favor of the less intrusive background update. Here again, a low cost per bit coupled with an ability to scale in density make flash memory a good fit. A cost-effective flash memory solution for future set-tops would combine high performance, high density, and appropriate memory partitions to enable direct code execution and real-time firmware updates via flash management software.

Digital technology will enable many new opportunities for service providers as well as consumers. Preparation is the key to market success, and a flexible set-top box design is an integral part of that preparedness. Utilizing flash memory in any set-top box design makes possible "just-in-time" market response to changing technical and consumer needs. This means less disruption to the subscriber and increased revenue for the provider.

Digital TV promises not only two-way provider-subscriber communication, but also more programming content. As viewers decide how they want to spend their precious leisure time and service providers look to add revenue-generating services, the digital set-top can expect to undergo any number of market-driven changes. Incorporating these constant design changes is easily managed with a flexible, affordable memory solution like flash memory. CT

Charles Anyimi is senior applications engineer at Intel Corp. For more information, call Intel at (800) 628-8686 or hit Intel's Web site: www.intel.com.

BOTTOM LINE

Flash Memory and the Set-Top Box

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New Ways
To Address Telephony and Data

A Look at a Unique 750 MHz HFC Upgrade

By Tony Rossi and Charles McBrayer

Otelco, an independent cable TV and wireline provider for a region of rural Alabama, operates both twisted-pair and hybrid fiber/coax (HFC) video distribution networks. It enjoys a reputation as an industry leader among cable/telco operator combos. As the 1990s wore on, however, the company faced a two-pronged problem.

First of all, Otelco's twisted-pair network was nearly at full capacity in certain areas. With the lack of available copper, the company was challenged to add service to its 7,600 telephone and 3,400 cable TV subscriptions. There had been an unexpected influx of residents in remote areas several miles from the headend/central office (CO), and copper in the area was very scarce. The company could not add additional lines without installing a second copper plant. It set the stage for a potentially costly upgrade.

Second, the company needed to equip itself to respond to a changing future. Otelco's customers were headed onto the Internet in droves. An operator that could not provide fast, reliable Internet access able to support online services, videoconferencing, telecommuting, long distance learning, and the like soon would hand over its market share to one that could.

To complicate matters, Otelco's service area experiences frequent lightning strikes, so any feasible plan would have to be based on extremely robust equipment.

After reviewing the issues, Otelco defined two possible options to extend telephony into new communities and provide new service offerings:

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Reader Service Number 40

- Add more twisted-pair to the system.
- Deploy a broadband telephony and data system over the HFC network.

Weighing the options

Adding twisted-pair to Otelco's infrastructure would pose several distinct disadvantages. Copper's limited availability, combined with the labor and time involved in installing a second copper plant, would make this option quite costly.

Should the area and its customer base continue to grow and demand projections prove the slightest bit incorrect, the company could find itself in the same position in the future. Overpredicting demand would result in wasted capital.

On the positive side, a copper upgrade is the traditional solution, used and proven before other options became available.

Another factor in the decision was the existing cable TV plant. It was aging and in need of upgrade. Deploying a broadband telephony and data system over the upgraded HFC network would require a greater capital investment up front but could provide a greater return in the long run.

As Otelco extends its HFC network into outlying areas, existing copper could be

Figure 1: An HFC network solution for data and telephony

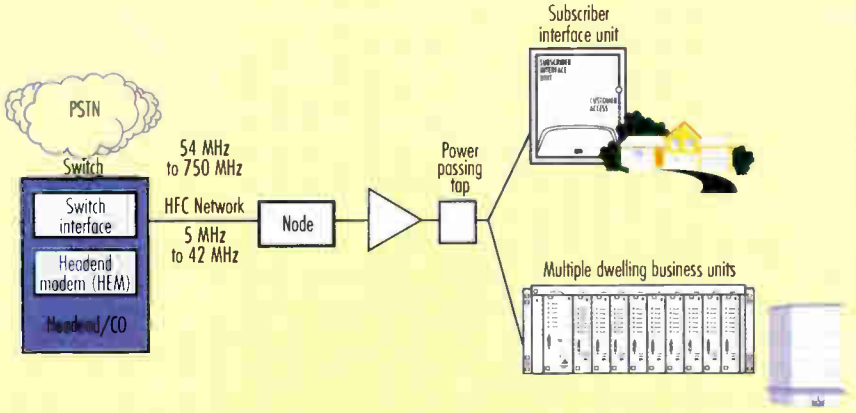
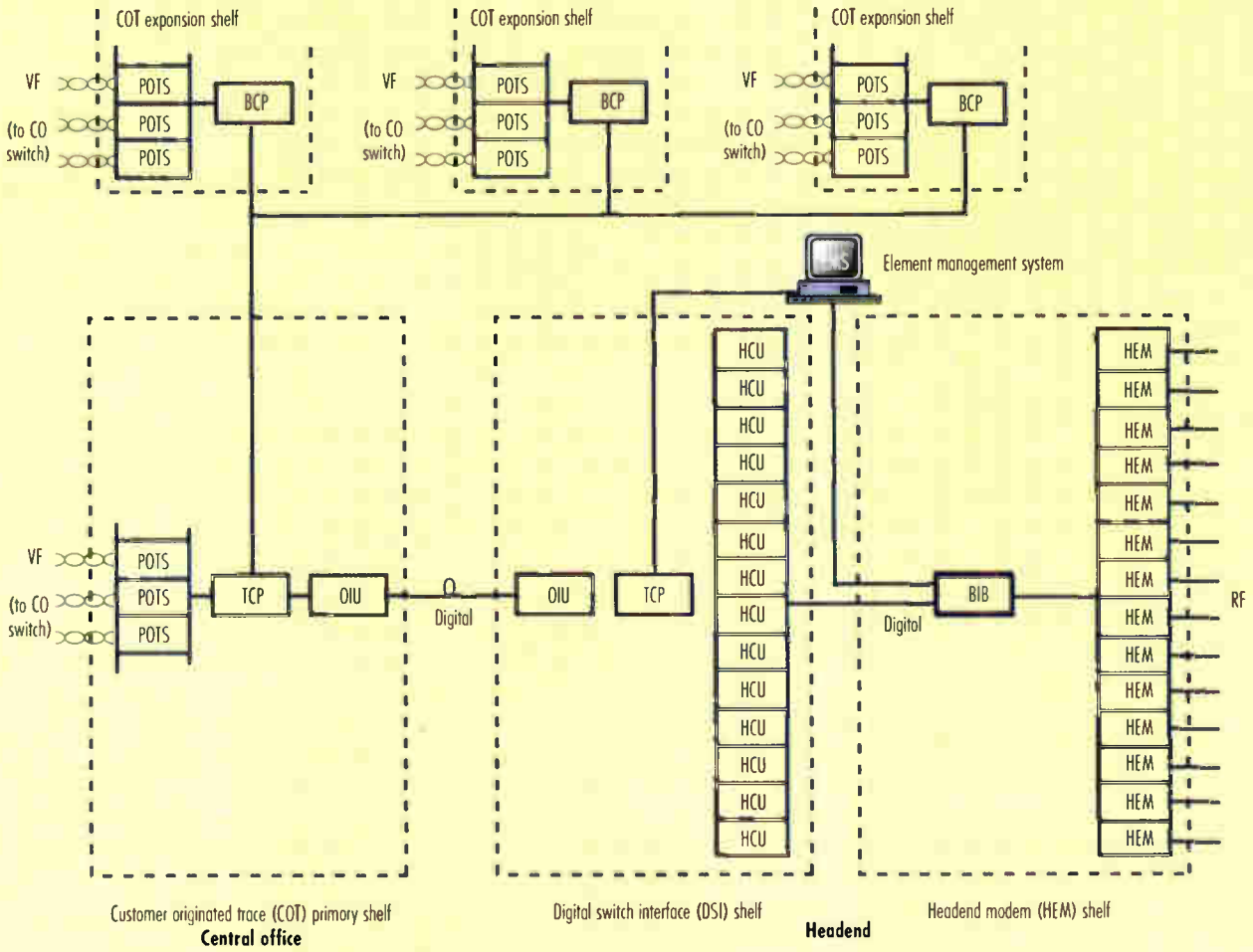


Figure 2: Basic communications loop at the headend/CO



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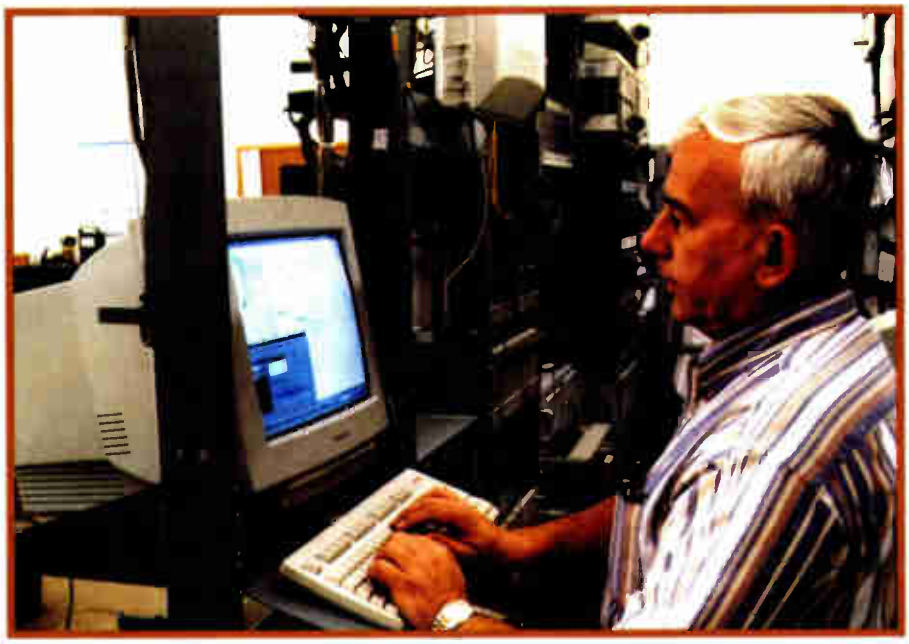


Plant manager Charles McBrayer monitors the historical and current performance of Otelco's HFC network components with an element management system (EMS).

reused in new installations closer to the headend/CO. Overall maintenance costs would be lower for a single plant serving outermost customers than the two that a copper upgrade would require. Also, new subdivisions were under construction, and building a single broadband plant eliminated the need to build new copper facilities.

After lengthy consideration, the choice seemed obvious: Otelco would push its HFC plant out rather than upgrade existing copper lines.

The solution

The deployment began in June 1997 and, owing to its success, has since become a permanent addition to Otelco's plant. The test area was set in a small rural town with outlying clusters of homes in residential developments, scattered widely across a hilly landscape.

Encompassing 500 homes, both in rural areas where the coax plant had been upgraded to HFC and in new subdivisions with new coaxial HFC plant, the trial had deployed more than 80 broadband telephony lines by last winter. Otelco continues to deploy the system as its plant is upgraded, and by July 1998, 115 lines had been deployed.

The new HFC system includes the following equipment (also shown in Figure 1 on page 54):

- Headend equipment—including digital switch interface (DSI) equipment and headend modem (HEM) equipment
- Optical/electrical RF transport equipment
- Subscriber interface units (SIUs) and multiple dwelling business units (MDBUs)
- Element management systems (EMS)

The deployment required one rack-mounted bay equipped with voice frequency (VF) DSI equipment and HEM equipment. For Otelco's purposes, the system is fully redundant. One HEM modem handles active lines to feed the three separate node areas in the trial. Five additional HEM modems are used to expand the deployment to four more nodes.

The EMS, integral to this application, is accessible via a main EMS computer remotely on the internal local area network (LAN) or via laptop personal computers.

Figure 2 (on page 54) illustrates the basic communications loop at the headend/CO for the trial.

One advantage to this headend/CO configuration is that data will be "peeled off," or removed, before signals enter the switch. This is significant, since Internet connections typically are lengthier than normal telephone conversations and exceed the capacities of ordinary telephony switches.

Also from the headend/CO, Otelco services the HFC plant for the trial using rack-mounted fiber-optic transmitters to feed the node locations and rack-mounted fiber-optic return receivers to accept return signals from the node.

HFC plant

In the trial area, Otelco's HFC plant has a forward bandwidth of 54-750 MHz, and a return bandwidth of 5-42 MHz. The coax is powered at 60 VAC from the network.

The system uses seven nodes, each serving a maximum 120-home area, to feed the distribution plant. After the node, the HFC system uses up to five amplifiers in cascade for a designed end-of-line performance of 50 dB for carrier-to-noise ratio (C/N) and 52 dB for composite triple beat (CTB) and composite second order (CSO).

Each node has a standby power supply that is used as the main power supply for all equipment within the node. Using a small node enables Otelco to localize outages and use power generators for extended outages if necessary. In the field, 99 SIUs provide a total of 115 lines for the trial—one or two telephone service lines per subscriber.

The system as deployed will allow Otelco to offer medium-speed data transmission services without any special equipment. By contrast, the best that copper can attain is switched 56 kbps on specially treated pairs, and only with the addition of expensive telephone modems.

Benefits

Customers, apparently, are pleased with the new network—or at least unfazed. An informal survey of those affected revealed that half did not even notice a change in

BOTTOM LINE

An HFC Twist on Twisted-Pair

The problem: Otelco, a cable TV and wireline provider, had too little copper, too much service demand, and unknown future market requirements.

The solution: Pull back twisted-pair to outlying areas of the cable TV plant and replace it with hybrid fiber/coax (HFC) telephony. Then, upgrade the existing HFC network to 750 MHz and enhance the return path to enable two-way services such as high-speed data.

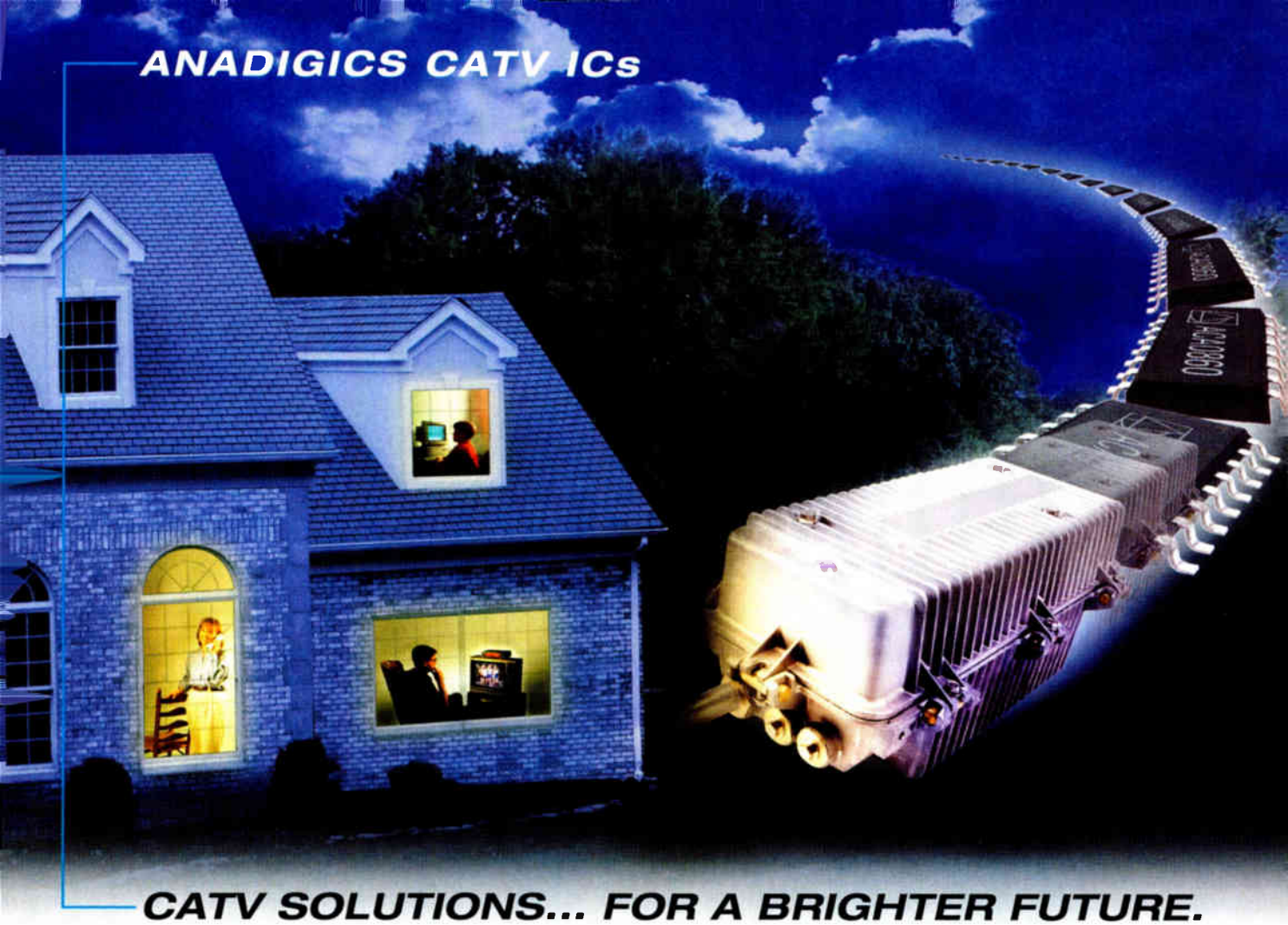
The result: A "dual infrastructure" in which HFC bolsters the more traditional twisted-pair network and replaces it in others. Otelco now adds more customers each month to its network without running any more copper while preparing the way for HFC data services to come. The one-time "trial deployment" is now a permanent part of the network.

The benefits: Increased efficiency, broadened service offerings, expanded customer base, the capability to expand the network as needed, and customer satisfaction.

their service; one customer even noted clearer telephone sound.

Troubleshooting, servicing, activation, and deactivation all can be handled from the headend/CO, minimizing disruption, and in some cases allowing operators to address problems before customers are aware of them. And the system has proven itself capable of withstanding the usual lightning strikes without service disruption.

Tony Rossi is cable telephony manager at Philips Broadband Networks. He may be e-mailed at tony.rossi@pbn-us.be.philips.com. Charles McBrayer is plant manager at Otelco, a cable TV and wireline provider. He may be e-mailed at mcbrayc@nacell.net.



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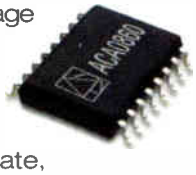

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Reader Service Number 44

DWDM Lessons Learned

How to Design for 1,550 nm in the Real World

By Harj Ghuman and Keith Kreager

Transmission in the 1,550 nm domain is gaining popularity for cable TV applications. This growth can be attributed to its low fiber loss and ability to use optical amplifiers at 1,550 nm. The declining costs of Erbium-doped fiber amplifiers (EDFAs) and externally modulated transmitters also have led to the widespread acceptance of 1,550 nm in the cable industry.

Traditionally, applications for 1,550 nm in cable TV systems included AM supertrunk, hub interconnect, redundant fiber loops and simply feeding remote nodes up to 100 km and beyond.

Today, operators are beginning to embrace a new technology, dense wavelength division multiplexing (DWDM), to add narrowcast services to 1,550 nm broadcast services. (See Figure 1 on page 64.)

At the headend, an externally modulated 1,550 nm transmitter, in conjunction with an EDFA, transports broadcast services through a single optical fiber. A second fiber link transports multiple narrowcast optical signals generated by 1,550 nm directly modulated transmitters, each carrying several digitally modulated RF carriers.

At the hub, the narrowcast signals are optically amplified and demultiplexed. Then, each wavelength carrying the narrowcast services is optically combined with the broadcast optical signal and transmitted to the node.

A DWDM architecture has many benefits, including:

- **Flexible network:** The system can be expanded cost-effectively by adding narrowcast transmitters at different International Telecommunication Union wavelengths.
- **Minimal hub size:** The optical signal at the hub does not have to be converted to electrical and back to optical, thereby eliminating host digital terminals (HDTs) and optical transmitters at the hub site. As a consequence, real estate costs are reduced significantly. By centralizing digital

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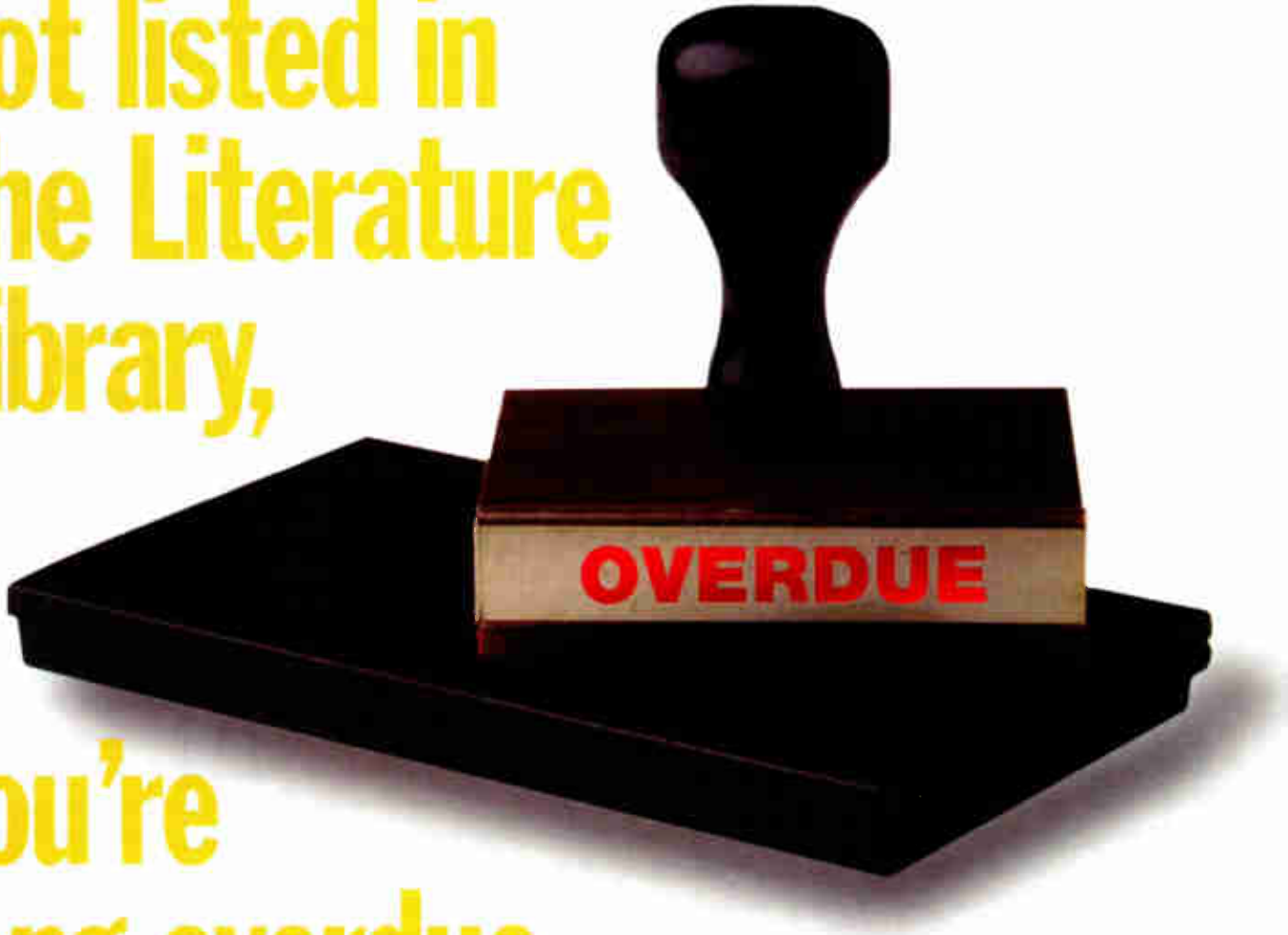

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processing in the headend, hubs are reduced to small optical transition nodes (OTNs), further reducing real estate costs.
- Targeted services: This architecture is ideal for targeted services such as modems and digital video because the cost per home passed for DWDM architectures is significantly lower than other technologies.

Design parameters

Several optical and electrical design parameters must be reviewed when considering 1,550 nm/DWDM architectures, including:

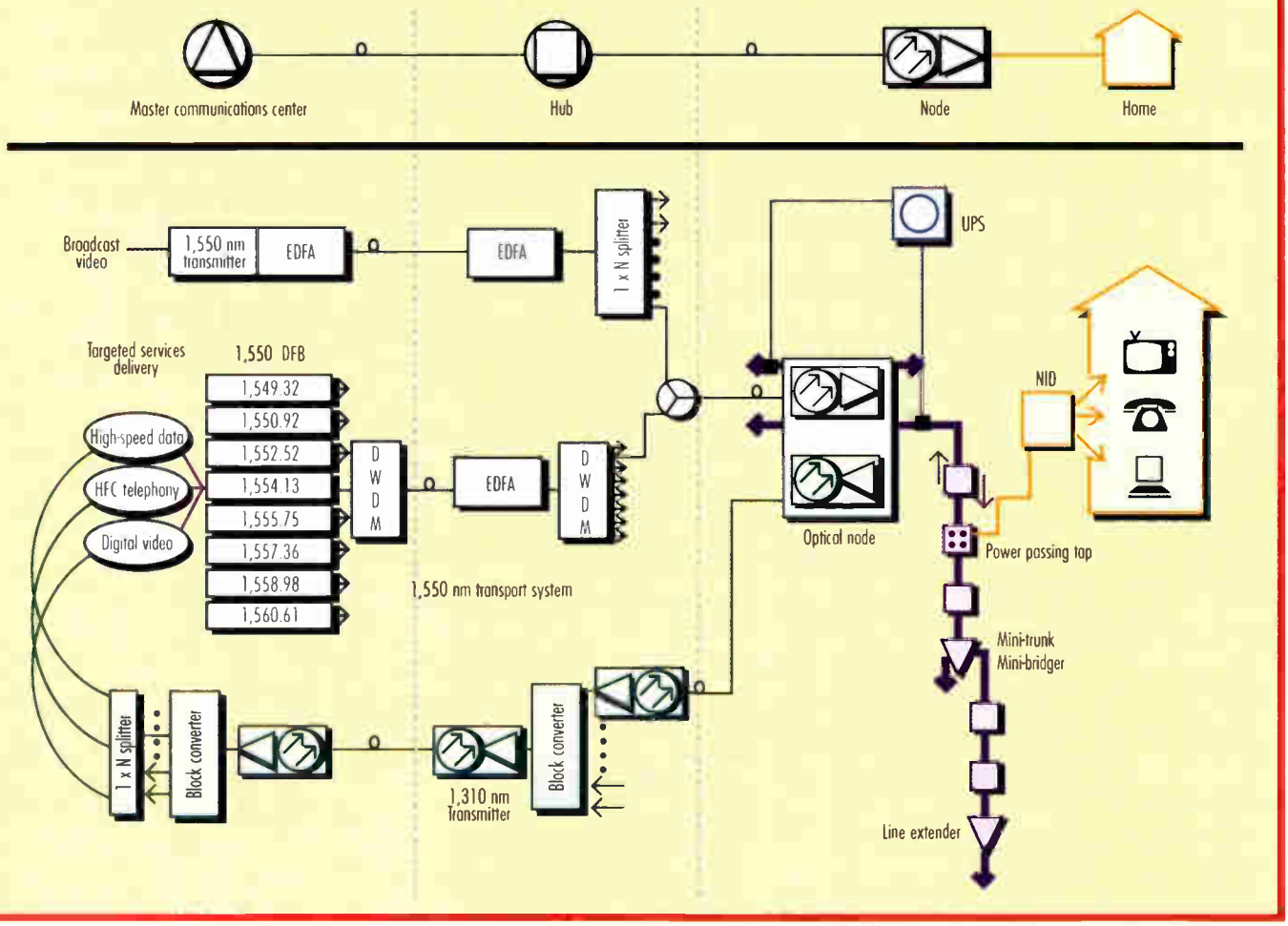
- Laser chirp/dispersion: Laser chirp, when coupled with chromatic dispersion of a standard fiber at 1,550 nm, gives rise to unwanted composite second order distortion (CSO). Therefore, externally modulated transmitters must be used when a large number of analog channels are transmitting broadcast services. Laser chirp is a critical parameter in the design of narrowcast directly modulated transmitters. The chirp/dispersion generated distortions must be controlled to reduce noise-like distortion products.
- Stimulated Brillouin scattering (SBS): SBS is a nonlinear effect that occurs in optical fibers at high launch powers. This results in reduction of the forward beam intensity and an increase in noise, degrading the received signal's carrier-to-noise ratio (C/N). In standard fiber, for narrow line-width sources, the SBS threshold is about 6 dBm, but can be increased to greater than 16 dBm by spreading the optical spectrum.
- Stimulated Raman scattering (SRS): SRS is a nonlinear process that can cause crosstalk (XT) between optical channels. The magnitude of the XT depends on launch power, polarization, channel spacing, number of optical channels, chromatic dispersion and fiber length. To minimize SRS crosstalk below 40 dBc, the launched power per wavelength should be less than 7.5 dBm.
- Self phase modulation (SPM) and cross phase modulation (XPM): SPM is caused by the change in refractive index of the glass in the fiber because of the intensity of the launched light of a single optical carrier. XPM is the phase modulation of one optical carrier by another optical carrier. In both cases, phase shift of the signal combined with fiber dispersion leads to CSO distortion.

Factor in real-world requirements

After reviewing the optical and electrical parameters, it's necessary to examine some of the real-world operational aspects of implementing the DWDM system. Figure 1 (on page 64) eatures a broadcast 1,550 nm transmitter feeding one or more hubs with a generic 80-channel lineup.

While researching the design requirements of one system, it was apparent that some large hubs will require multiple broadcast feeds because of node segmentation. The critical factors that are driving the node segmentation are Emergency Alert System (EAS) warning areas; public, educational and government (PEG) channels; channel lineup; and ad insertion segmentation. ➤

Figure 1: DWDM to add narrowcast services to 1,550 nm broadcast



EAS

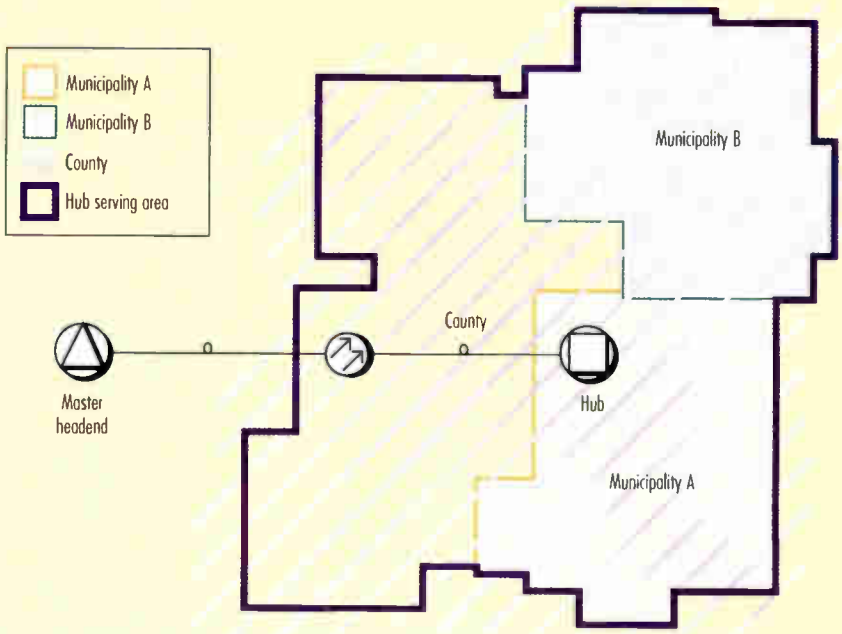
The government requires cable operators to include EAS on their systems to warn viewers of disaster. The timing and type of warning depends on the size of the cable operator and serving area.

For example, a large MSO in a metro area can be required to override all broadcast video and audio carriers. In one recently encountered scenario, the hub serving area encompassed one county and two municipalities. (See Figure 2.) The county required its own alert system, and the two municipalities also required their own systems. Since the EAS overrides all broadcast video and audio carriers, the operator had to locate its equipment at the headend, which required three separate broadcast feeds to the hub.

PEG

PEG channels are utilized by individual municipalities and/or counties for public, educational or government programming. They are individualized on a city and/or county level, much like the EAS areas.

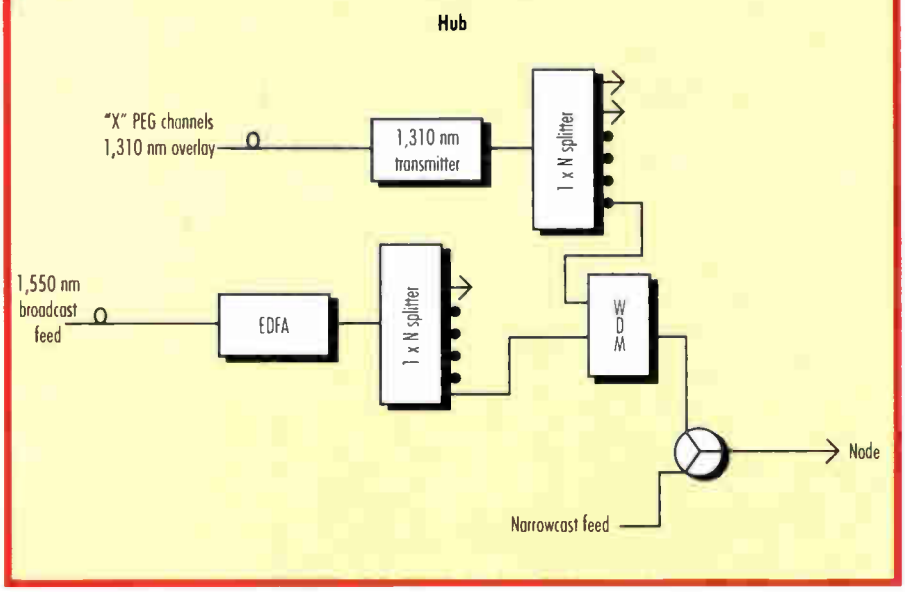
Figure 2: Metro area MSO scenario



The channel requirements are low, usually one to five channels.

The operator has several choices for carrying the PEG channels. If the areas

Figure 3: Inserting PEG channels at the hub



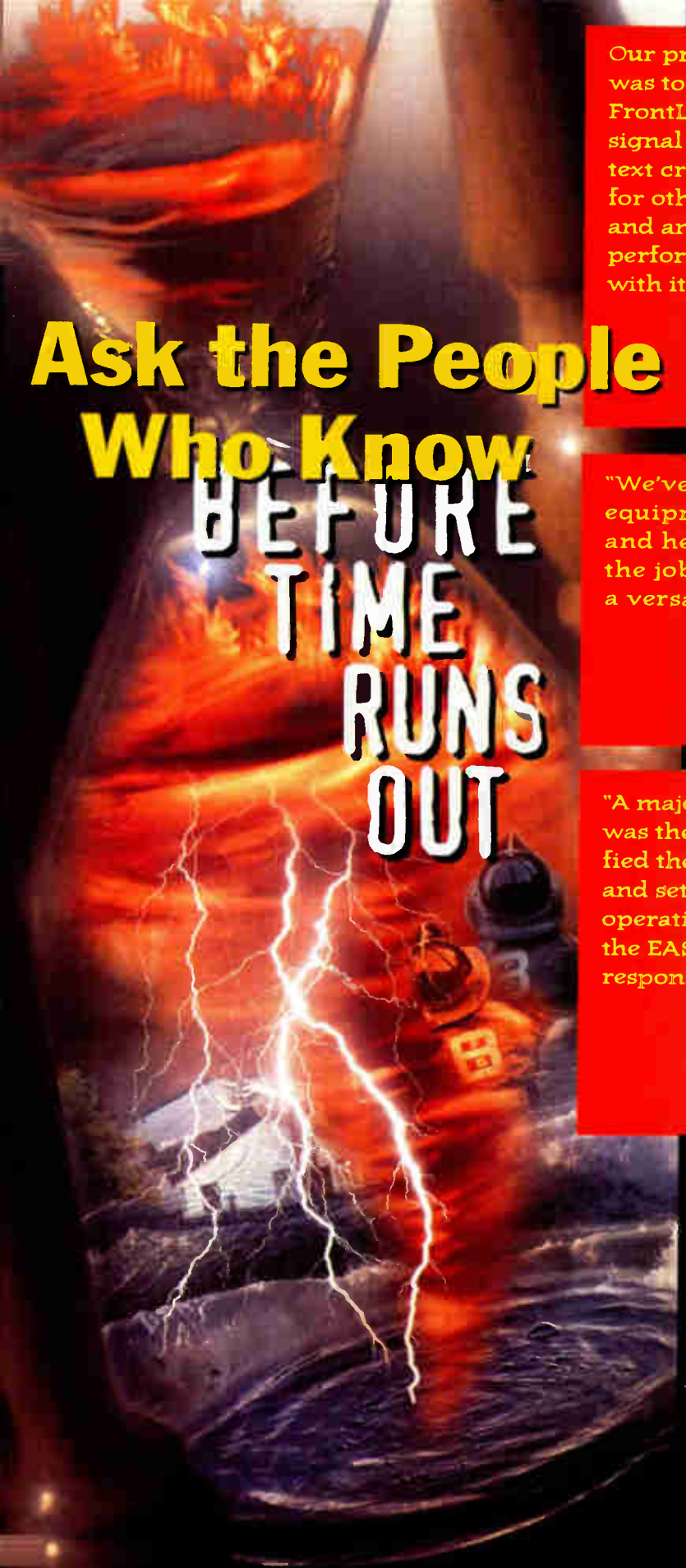
don't require separate EAS feeds, separate channels could be dedicated to each serving area. In Figure 2 (on page 65), for example, the county and each municipality require three separate channels. Therefore, the operator must leave nine channels open in the broadcast lineup for PEG.

An alternate choice is to assign all the PEG channels on the same channel numbers and insert them at the hub, where a 1,310 nm overlay can be combined with the broadcast 1,550 nm signal. (See Figure 3.) Now, the operator must leave only three channels open in the broadcast signal feed.

Lastly, if the operator (see Figure 2) had separate broadcast feeds because of EAS, the individualized PEG channel could be inserted in each separate broadcast feed with the EAS. Therefore, each serving area would have an individual EAS and PEG lineup.

Channel lineup

The recent consolidation of systems in metro markets has impacted channel lineup. In Figure 2, for example, the county and municipality A use one MSO with its own channel lineup, which includes one type of addressable converter and controller system. However, Municipality B was obtained from another operator, so it has its own channel lineup and a different converter and controller system. If there weren't a requirement for separate EAS



Our primary goal in choosing an EAS system was to minimize the impact on the viewer. FrontLine's system met our high standards for signal quality while offering a non-disruptive text crawl solution. As a bonus, we can use it for other applications, such as logo insertion and ancillary switching. With that kind of performance and flexibility, we were pleased with its competitive pricing.

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Dick Snyder
Area Engineer
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feeds, the operator would have two different channel lineups, which would require two different broadcast feeds to the hub.

Ad insertion

Currently, many operators are zoning their ads down to a hub level rather than the node. However, if the operator subdivides the hub to different advertising zones according to demographic boundaries, the number of broadcast feeds from the headend to the hub will increase.

An alternate design is similar to that of the PEG, thereby utilizing a 1,310 nm overlay for channels that carry different advertising, assuming the number of ad channels is low.

Node segmentation for an EAS serving area, PEG channels, channel lineup and ad insertion play an important role in designing a 1,550 DWDM system. These parameters will determine the number of broadcast feeds from the headend to the hub and the viability of utilizing overlay systems. It is imperative to arrange each node according to its different serving area prior to designing a 1,550 DWDM system. This can be accomplished by using the accompanying table on page 70.

It's also important to consider the segmentation of the narrowcast feed. For example, how many nodes do you feed off each narrowcast optical signal? The services that are being transported and their penetration rates determine this.

If the services are digital video for near-video-on-demand/video-on-demand (NVOD/VOD) or high-speed data, the node segmentation for low penetration can be as high as 10,000 homes passed. When penetration increases, the number of narrowcast feeds also must increase so the subscriber doesn't see a difference in throughput.

It's critical to properly plan for the growth of narrowcast optical signals so that fiber won't run out—a key advantage of the scalable 1,550 DWDM design.

Implementation

It's equally important to consider the type of optical connectors that are used in conjunction with 1,550 equipment, fiber loss and the type of hub. Angle polished connectors (APC) are recommended for high-power 1,550 nm systems because of their inherent high return loss (more than 65 dB). By contrast, ultra polished connectors (UPC) have a return loss in the greater than 55 dB range. However, UPC connectors can suffer from poor physical contact between mating connectors.

Be cautious when determining fiber losses for a 1,550 design. A common error is to report the fiber loss in 1,310 nm, rather than 1,550 nm. Further errors can occur when the designer converts the calculated fiber loss in dB from 1,310 nm to 1,550 nm.

It's important to specify which attenuation was used at 1,310 nm (reports have ranged from 0.32 dB/km to 0.40 dB/km) and the calculated fiber splice losses. Moreover, the attenuation of fiber at 1,550 nm can range from 0.21 dB/km to 0.25 dB/km.

A calculated loss budget of 12 dB for 1,310 nm may equal a 1,550 nm range from 6.3 dB to 9.37 dB. If possible, the best approach is to run an optical time domain reflectometer (OTDR) check on the

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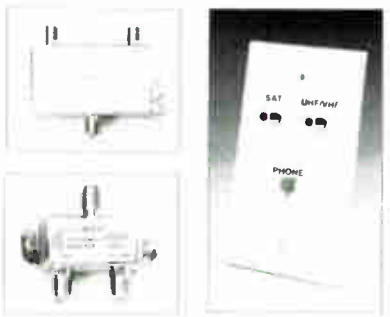

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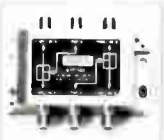

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links. This will provide a true distance and loss budget at 1,310 to calculate the 1,550 loss budget. It also will ensure continuity between locations and indicate possible anomalies.

Lastly, the hub must be an environmentally enclosed and temperature-controlled unit because of the temperature requirements of the downstream EDFA and the upstream optical receivers and return transmitters. Fortunately, a key advantage of DWDM technology is small hub size requirements.

Increased service penetration, narrowcasting, targeted services delivery and scalability are all byproducts of 1,550 nm DWDM technology. The best route to achieving these benefits is to carefully plan for all operations in the system.

BOTTOM LINE

Real-World DWDM

The electrical and optical specifications of 1,550 nm dense wave division multiplexing (DWDM) equipment are important parameters in designing a system.

However, carefully planning across all operations in the system will ensure proper design and installation. Items such as Emergency Alert System (EAS); public, educational and government channels (PEG); ad insertion; and channel lineup play an important role in designing the correct number of broadcast feeds for the system.

Also, looking at simple things such as the type of optical connector and actual loss budgets will ensure that your design parameters will match the system's requirement for activation. This article addresses issues in the forward path.

Reference

Dogan A. Atlas, John Kenny, ANTEC Corp., "Multiwavelength Analog Video Transport Network," *1998 NCTA Technical Papers.*

Harj Ghuman is product manager for 1,550 nm transmission systems at ANTEC Network Technologies. He can be reached via e-mail at harj.ghuman@antec.com. Keith Kreager is vice president of technical operations at ANTEC. He can be reached via e-mail at keith.kreager@antec.com.

Node serving area segmentation

Customer: "X"
System: California
Hub: #1

Node number	EAS area	PEG lineup	Ad insertion area	Channel lineup	Fiber loss budget/ft.
A1	County	Cty PEG	Zone 2	County/GI	10,210
A2	County	Cty PEG	Zone 2	County/GI	15,624
A3	County	Cty PEG	Zone 2	County/GI	24,015
A4	Municipality A	Mun. A PEG	Zone 2	County/GI	15,068
A5	Municipality B	Mun. B PEG	Zone 2	Mun.B/SA	35,068
A6	Municipality A	Mun. A PEG	Zone 2	County/GI	22,154
A7	Municipality A	Mun. A PEG	Zone 2	County/GI	24,982
A8	Municipality A	Mun. A PEG	Zone 2	County/GI	20,876
A9	County	Cty PEG	Zone 2	County/GI	12,068
A10	Municipality B	Mun. B PEG	Zone 2	Mun. B/SA	32,588
A11	Municipality B	Mun. B PEG	Zone 2	Mun. B/SA	30,647

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CableLabs Working Group Helps Defuse the Y2K Time Bomb

By Greta Durr

Amid the manic global panic and denial of a Year 2000 problem emerges a common ground for cable operators concerned about keeping the millennium bug's time bomb from detonating in their systems. CableLabs' Y2K Working Group is striving to provide cable operators and broadband vendors with a means to end concerns about how the bug may affect their systems and their futures.

Attaining Y2K compliance is the Holy Grail to many industries using computers and microprocessor-based equipment. Although newer equipment is outfitted to register the year in four digits, older equipment reading only two digits could present a host of problems for unwary operators when '99 rolls over to '00.

Symposium

CableLabs and its Y2K Working Group led efforts with the National Cable Television Association and the Canadian Cable Television Association to conduct a two-day symposium in September for cable operators and to discuss how they're preparing for Y2K.

CableLabs organizers say that the session, held in Denver, did a remarkable job of stimulating collaborative involvement among the entities it attracted. Discussion focused on potential Y2K threats to addressable set-top boxes and controllers, billing systems, automated response unit (ARU) systems, commercial insertion systems, headend switching equipment and Emergency Alert Systems (EAS).

"Sometimes you can't separate the technology from the policy side," says Doug Semon, event coordinator and director of network operations at Louisville, CO-based CableLabs. He says it's gratifying to see competing broadband vendors and operators working together and comparing notes on obstacles they've encountered on the road to Y2K compliance.

"I'm impressed, relieved and grateful to see the level of cooperation that's going on here," Semon says. "I think we're much more proactive here than in any other industry I've seen."

Representatives from more than 25 cable operations, eight major broadband vendors, their attorneys and members of the personal computer (PC) industry attended the session. Presentations and discussion groups led to a decision to form a contingency plan.

Organizers say that the plan, once it's formalized and an official title is approved, will facilitate Y2K compliance for participants. Semon and Y2K Working Group Chairman Patrick Vertovec say that the plan will allow members to maximize the benefit of their efforts and dollars.

"Our collaboration is a best practice demonstration in terms of due diligence," Vertovec says. "It's good business."

Good news

Following the session, Semon says the cable industry's major concerns regarding Y2K preparedness have been identified and solutions are well at hand for those who are scrutinizing their systems for potential glitches. Few of those solutions, he says, have been implemented to date.

"There's a lot of good news out there. We're not aware of any catastrophic threats," Semon says, so long as electrical power to operate the systems isn't compromised by the bug.

For example, although controllers of addressable set-tops may need to be replaced, the set-top boxes should safely remain in service. "That was a pardon from the governor right there," Semon says.

"The good news is that it's doable, so (operators) shouldn't worry about quitting or opening a tropical fish store in case it doesn't work," Semon added.

Many of the more pressing concerns for operators seem to lie in equipment that was manufactured by companies that are no longer in business, or that's been modified in the field and may not be a part of daily operations.

"I'm not aware of any legacy time bombs, but there is an awful lot of legacy equipment out there," Semon says.

Some things to watch for

Vertovec, after two years of leading Jones Intercable's Y2K effort, has firsthand experience with such instances. He cautions operators to closely examine "homegrown" network management devices and other equipment that may be hiding in their systems.

Following advice from CableLabs, NCTA and other organizations about making your system Y2K compliant is an important step for operators to take, Vertovec says, but additional efforts also must be made at the local level.

"You'll still have things about your shop that only you can fix," he says. For Jones, he says, one of the major issues is the potential for service interruption caused by unforeseen minor glitches.

"There could be a number of simultaneously occurring small things that overwhelm our ability to respond to them all effectively," Vertovec says. Such minor problems could be worsened by potential interruptions in power or phone service, he says.

Managing the perception of the Y2K bug in your system, and educating employees at all levels about the reality of the problem beyond the headlines, is an important part of Y2K preparation, Vertovec says.

In addition to the prevalent technical concerns felt by the broadband industry, keeping a healthy perspective is key to keeping operations running smoothly, Semon says. The best means of doing so, he advised, is by opening lines of communication.

"Fear of the dark is universal," Semon says, "but the dark is different for everyone." CT

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

Surfing For Solutions

Listed below are a few solid starting points for cable operators interested in learning more about planning for the millennium bug.

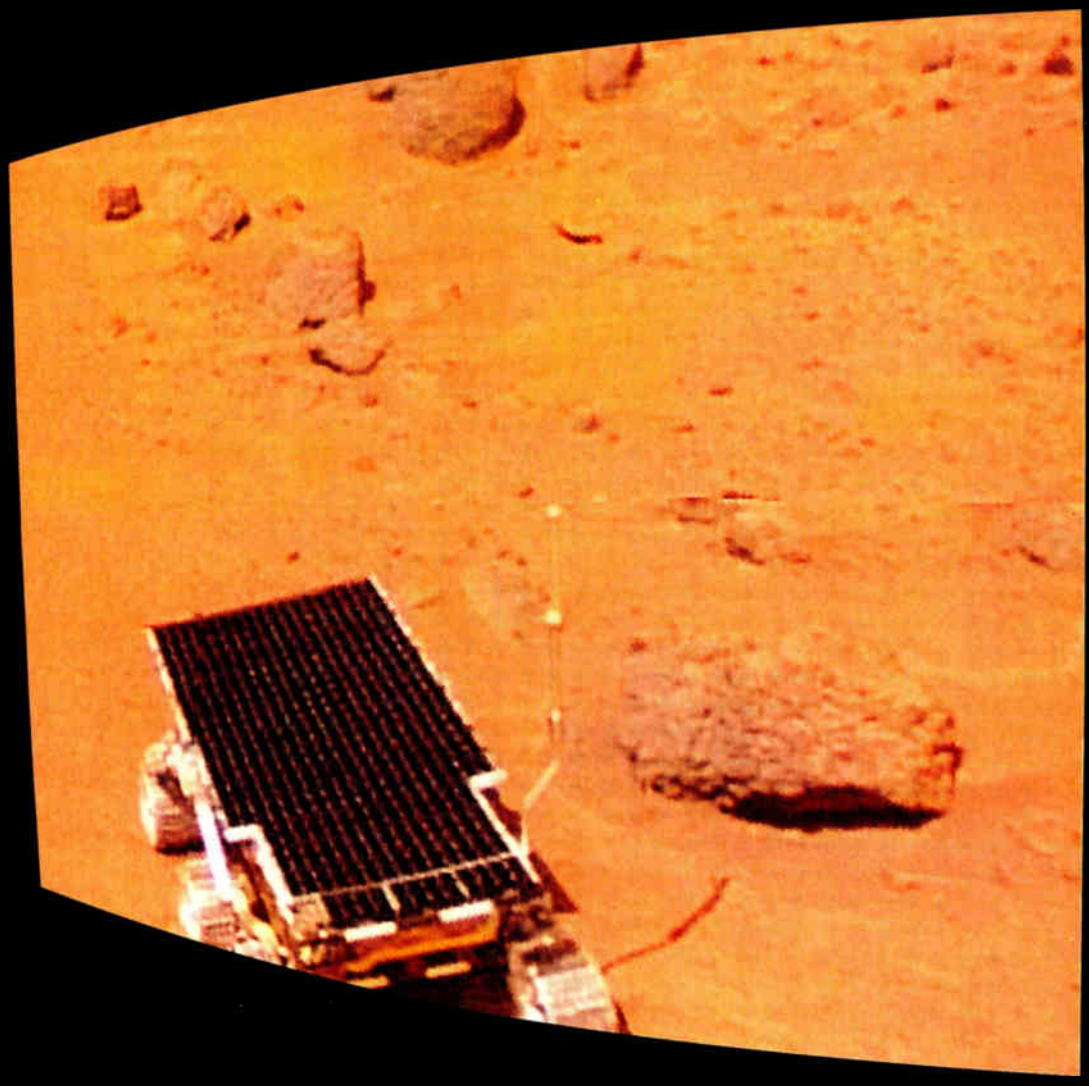
- American National Standards Institute
www.ansi.org
A brief search will reveal the latest developments in this standards organization's plan for its "Year 2000 Family of Services."
- CableLabs
www.cablelabs.com
Members may access the organization's Y2K data, and nonmembers can learn more about how to become involved.
- Clover Cable Vendor Index
clover.doit.wisc.edu/vendors.html
Find comprehensive links to cable telecommunications equipment vendors on the World Wide Web.
- Federal Communications Commission
www.fcc.gov/year2000/
Get all the public wisdom the FCC offers on Y2K and the broadcasting, cable, satellite, telephone and wireless industries. It includes testimony from governmental Y2K committees.
- National Cable Television Association
www.ncta.com/y2k_challenge.html
This site explores the nature of the Y2K millennium bug, discusses compliance and lists sources of additional information.

Cable and Computing Are Converging

Why a Cable Guy Joined Microsoft

By John Canning

Sometimes, the only way to get the whole picture is to shift your perspective. That's what I've done and what I hope to share with you through a series of articles here in *Communications Technology*. ➤



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Network Technologies

Reader Service Number 57

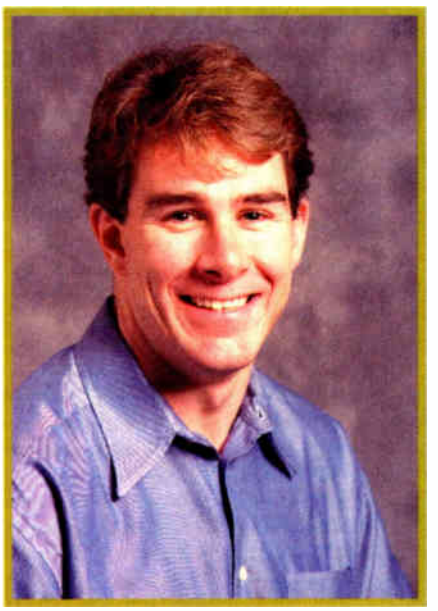
To some of you, I'm a familiar voice. I wrote an article for *Communications Technology* two years ago on the deployment of cable modems.

Back then, I was still in the middle of a 10-year career with Scientific-Atlanta, a hardware vendor that enjoys a longstanding reputation throughout the cable industry.

Now I am writing again, but from a different perspective.

In future articles, I will share the views and insights of a software vendor in Redmond, WA. Could it be...Microsoft?

It could be, and it is. This job move, which I made at the end of last year, has been interesting.



Microsoft's John Canning

Where once I was the "data guy" working for a hardware company, I am now the "cable guy" working for a software company.

Common question No. 1

It seems that no matter where I travel these days, many folks have the same two questions for me. The first is generally along the lines of, "After 10 years at Scientific-Atlanta, why make the radical switch to a software company—and why Microsoft?"

Of course, Seattle is gorgeous, and the skiing can't be beat. But those aren't the only reasons. The fact is, my move really wasn't the radical change you might think.

To invoke a much-abused concept, it was convergence that did it. At one time, the cable and software industries were two different—very different—industries. But that was then, and this is now.

The distinctions between these two industries have shrunk and blurred. Perhaps you've seen those changes yourself.

I certainly did in my final two years at Scientific-Atlanta, working for the broadband data networks group. I spent more time with a router and a Web server than I did with modulators and spectrum analyzers.

There are clear signs that the cable industry is changing and will continue

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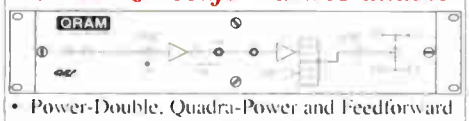

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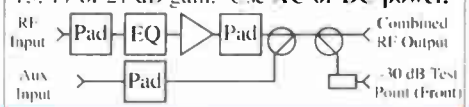

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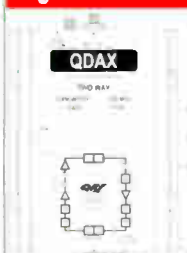

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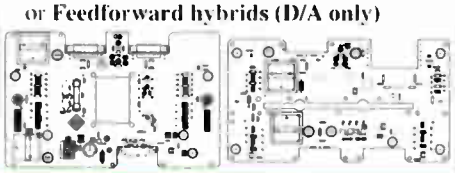

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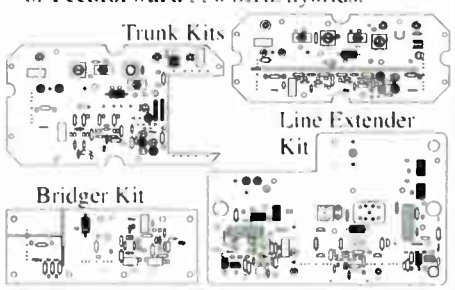

QRF converts 5-MC chassis to *550 MHz!*

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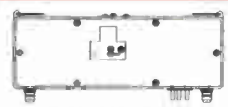

- Ask about our return amplifier for all the Pathmaker models.

- Full **450 MHz upgrade** from 300/330 MHz.
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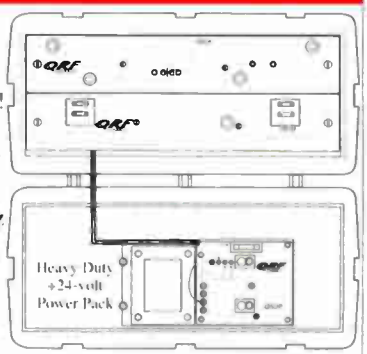

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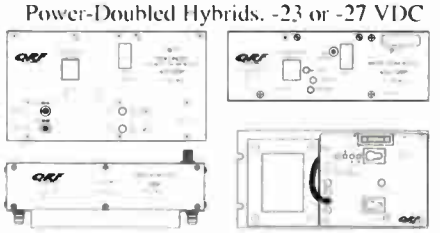

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to do so. You only need to hear discussions on topics such as shelf space, retail opportunities, "surfing," "spamming," T3s and user self-provisioning to be aware of the changes. Or take a spin around any cable trade show floor and notice the booths of vendors such as Cisco, 3Com, Motorola, Sony, Samsung and others.

> "At one time, the cable and software industries were two different—very different—industries. But that was then, and this is now."

You can see the convergence between the cable and computer sectors virtually anywhere you care to look within our industry.

Companies such as Sun, Oracle and Microsoft are continually jockeying for the attention of the MSO, and their names increasingly are mentioned in connection with the likes of traditional cable vendors such as Scientific-Atlanta and General Instrument.

Common question No. 2

So I didn't make a radical shift in my career; I followed a natural progression. And now that I'm here at Microsoft, my job is to try to answer the second question I get all the time, "What is Microsoft doing in cable?"

Microsoft believes in what the cable industry is creating—one broadband network that is the gateway into the home for not only video but also data and voice services.

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that work with the analog and digital video systems of today requires key relationships with systems integrators, independent software vendors, hardware suppliers and content from many services.

Many of these companies you already know and work with. The RoadRunner joint venture with Time Warner, MediaOne, Compaq, Advance/Newhouse and Microsoft is a key example of our approach to the broadband business.

"As a technology supplier to the industry, Microsoft is committed to channeling resources into innovation."

Our goal is to use all the strengths of the personal computer (PC) industry along with Microsoft's technology focus within the broadband arena.

As a technology supplier to the industry, Microsoft is committed to channeling resources into innovation.

For example, areas include developing technology for high volume, low-cost receivers, creating broadly supported application-development environments and establishing industry standards.

That's a look at why I made the shift I did, as well as a quick summation of Microsoft's commitment to the success of the cable industry.

Over the coming months, we'll take a closer look at specific products and services and continue to explore the idea that our industry is evolving.

I hope to see you at the Western Cable show!

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

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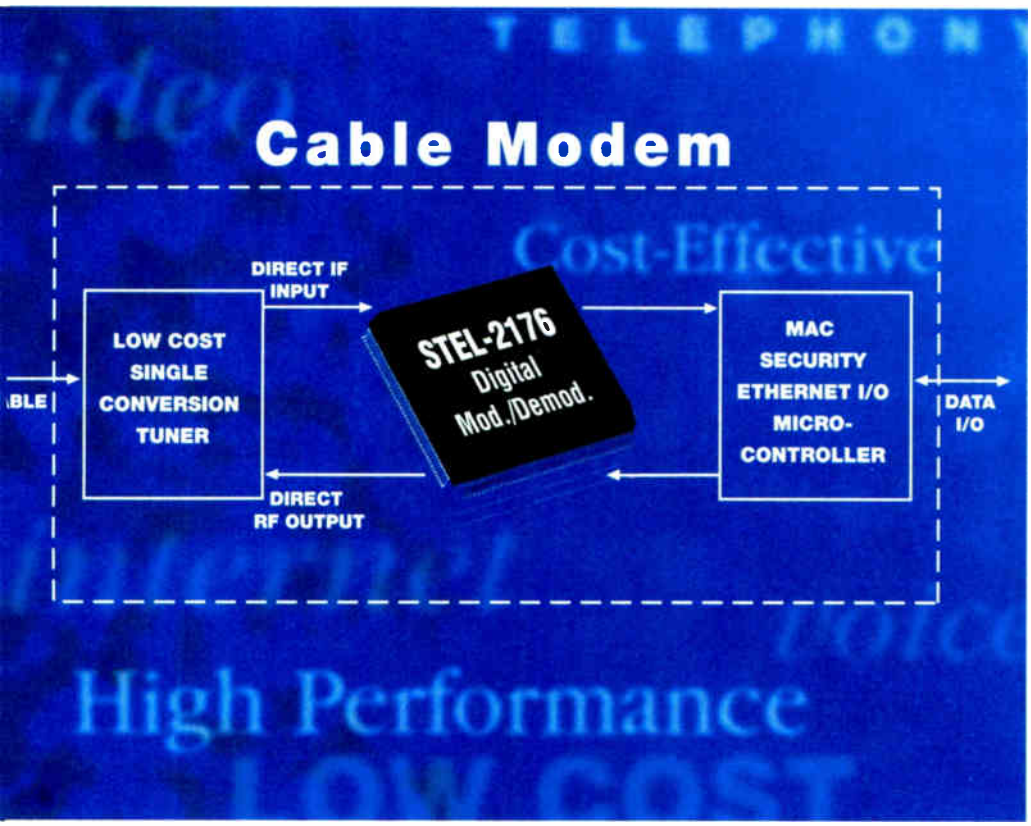

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  - Efficient utilization of upstream spectrum
- On-chip 10 bit DAC and ADC
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Reader Service Number 64

Communication Is Key To Safety

This Is No Place to Ad-Lib

By Kevin McDevitt

Remember when you were first out on your own and tried to make a meal from scratch, kind of ad-libbing the recipe? The meal ended up tasting like...bug spray. Many people tend to look at a safety program the same way, kind of ad-libbing it. A balanced safety program is made up from a specific recipe, just like a good meal.

A balanced safety program consists of five basic components, each of which is made up of different elements. The components also have an order of importance. To illustrate this, we will put them in the shape of a pyramid, with the most important at the foundation. (See the accompanying figure on page 86.)

Communication

Although we work in the communications business, I wonder sometimes just how much communicating with our associates we really do. Do we look our people

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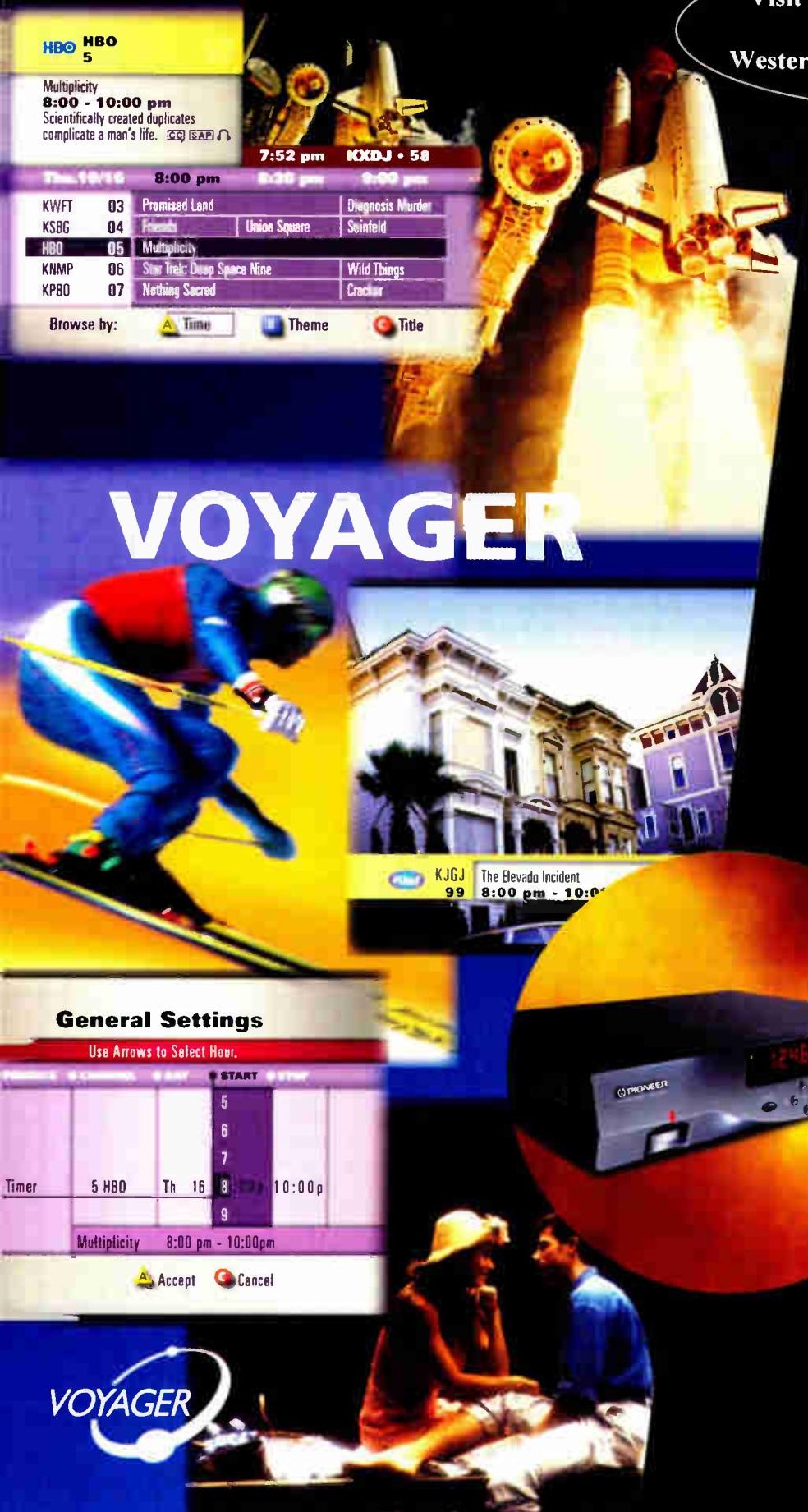

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the following things.

- Prevent the medical cost of injury (both to our employees and the public)
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- Prevent damage to equipment
- Prevent the cost of litigation
- Prevent rising insurance costs
- Prevent public relations problems
- Improve morale
- Improve quality
- Improve company image

Once management has embraced the safety effort, three things need to happen. Management must give monetary support

for safety equipment, training materials, safety awareness programs and so on. This may sound like a lot, but statistics indicate that every dollar spent on a safety program returns $7 by reducing the costs mentioned earlier. Next, management must commit training time to the safety program. Last, but not least, management must lead by example. Yes, you have to practice what you preach.

Safety committees

Joint committees seem to be the norm in the industry. These consist of both management and employees, and the representation from both groups should be equal. Safety committees should exist in an environment of continuous improvement for the system and work together to achieve this goal. These committees are responsible for:

- Planning improvements to existing safety procedures
- Reviewing and updating existing work

> "Communication is critical to a safety program. In fact, without it the program will not survive."

practices and hazard controls

- Field testing personal protective equipment (PPE) and making recommendations for its use
- Actively participating in safety programs and evaluating their effectiveness
- Soliciting comments and feedback about safety issues

Safety coordinator

Each system should have a designated safety representative who coordinates or

manages the safety efforts. This person is a part of, but separate from, the safety committee. The safety coordinator should be in charge of the day-to-day safety responsibilities of the system. This could involve coordinating safety meetings, gathering information for them, arranging safety inspections, or conducting safety audits.

For the sake of accountability, the coordinator needs to be the single contact for safety in the system. With multiple contacts, things easily get lost in the shuffle. This position should be held by a volunteer who has credibility in the system. By no means should the position be "dumped" on a new hire. The safety coordinator also should be scheduled time for these tasks, which is important if he or she has another job as well.

The safety coordinator job is simple; it's to make sure no one gets hurt on the job. It sounds easy, but it's a constant struggle to make sure safety procedures are followed. People tend to think, "It can't happen to me," which quickly turns into, "I can't believe it happened to me," after an accident.

Safety 101

Safety needs to be proactive, not reactive. Examine your operational tasks and practices for safety flaws, and then correct them. Often, small things, such as wearing safety glasses, will go a long way toward preventing accidents and injuries.

The key is to address safety before somebody gets hurt. I don't know how many times I've heard, "We just had an accident; what do we do?" Once the accident has already happened, there is nothing you can do...except react. After treating any injuries and applying appropriate damage control, examine the circumstances and set up preventive measures so this particular type of accident doesn't happen again.

Being proactive with a balanced safety program will help prevent accidents in the first place, so you won't have to be reactive.

Safety policy statement

What does your company believe in when it comes to safety? Does your company have a safety policy statement? Is safety considered a part of the corporate or company goal? Is it some hollow sentence that no one can remember, or is it valuable and constantly used?

A company safety policy statement needs to do just that—make a statement. It needs to let everybody know where the company stands on safety and what is and is not acceptable. Lastly, the policy statement needs to bring vision to the company so that everyone can work toward a common goal.

Safety flashes or bulletins

If a serious accident happens in your system, do you let the other systems in your company know? If not, you should. Remember, safety is a learning process, and we can't learn if the information is unavailable. Other systems can learn from your experiences, and they can take precautions so that the same accident will not happen to them.

It is unfortunate to have an accident in the first place, but even worse not to learn from it. So communicate with each other; it's the best learning tool you have.

Safety communication network

At Jones, we emphasize communicating safety. One of my first

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acts in my current position was to establish the Safety Communication Network. This is a series of conference calls dedicated to safety awareness, training, upcoming Occupational Safety and Health Administration regulations and so on.

We divided the country up into regions, and all the systems in a given region formed a team or committee and chose a chairperson. We all meet once a month and discuss current safety topics and strategy in relation to our goals. The chairpersons then take the information back to their teams and present it to them for discussion.

This has turned out to be a tremendous way to pass on information to the systems and keep everyone in the loop. One topic we discuss at every meeting is "accidents that happened" and what the accident investigation results were. The results are passed on to every system so they can learn and ideally avoid the same kind of accident.

Safety forum

Once a year at Jones, we bring in all our safety personnel from the systems and hold a safety forum. This is a three-day conference on safety issues, training, certifications, new safety equipment, regulatory compliance topics and more.

Brainstorming and breakout groups attack vital issues and come up with resolutions, and we hold training, certification and train-the-trainer sessions. We also give out safety awards, including "Most Improved System Award," "Extra Mile Award" and the "Safety Associate of the Year Award."

The goal at the forum is to give the safety personnel knowledge, training and programs to take back to the systems.

Conclusion

If nothing else, I hope that you have discovered that there is more to safety communication than hanging a poster in the hallway or having a safety meeting once a month. Communication is a critical component of a balanced safety program—so critical, I believe, that without it the program is doomed to failure. But once it's embraced, it can start a ripple effect that can unite a company or system in their safety endeavors. CT

Kevin McDevitt is corporate safety manager for Jones Intercable. He can be e-mailed at kmcdevitt@jic.com.

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MDUs from A to Z

A Primer for Multiple Dwelling Units

By Ted Chesley

Multiple dwelling units (MDUs) are grouped housing, including apartments, multiplexed single-family houses or condominiums. A sub-grouping, probably better termed multiple drop units, would be hotels, motels, institutional facilities and commercial buildings, all requiring high-density cable outlets. Wiring techniques are similar in all these cases.

The number of units that defines a given location to be considered either an MDU or an individual residential unit for wiring (and accounting) purposes is determined by local or company policy. The break is usually between six and eight units per building. "Fourplexes" or smaller are considered single-family dwellings and are individually wired as such. This is by no means a fast rule, but it is generally the norm throughout the cable TV industry.

This places a vast number of wiring situations in the MDU category. Along with the almost infinite number of differing MDU configurations, numerous wiring schemes and designs accommodate them. It is difficult to define a firm set of standard wiring practices, as every situation is somewhat different, and local company policy and building regulations often dictate the methods to be used. However, standard criteria can be applied to most MDUs, and common wiring practices can serve as a guide.

MDU design

The MDU, even in its simplest form, can be visualized as a vertical cable TV system, a high-density distribution plant located on a limited amount of real estate. As such, in the average MDU situation, we use a high signal level, distribution-only design. Little if any trunk will be required. This greatly simplifies active device requirements, as the principal portion of the system is passive.

The MDU, or MDU complex, is generally designed as an integral unit or area. A directional tap or splitter on the main cable TV distribution provides the input signal to be further amplified and distributed within the complex. In the case of some major complexes, a dedicated feeder from the trunk system, or a fiber node, is used to provide the input signal.

Home-run vs. distributed wiring

The design of choice for an MDU is to use "home-run" wiring. This is an individual cable from each residential unit to a centralized distribution point, also termed a hub or node. (See Figure 1 on page 94.)

This method allows easy access to each drop for trapping and connect/disconnect purposes and can generally be located in a secured enclosure, such as a locked room or cabinet. It is the simplest method of wiring, as only the cable is located between the distribution point and the customer's TV set. Most new MDUs are prewired in this fashion, and it is desirable to wire existing buildings the same way, except that the mechanics of the situation or the desires of the property owners often dictate compromise.

Another method of wiring MDUs is "distributed" wiring. This is where the signal is routed in a single cable and tapped at each service location using a quality indoor directional coupler, much like a tapped residential cable distribution plant. (See Figure 2 on page 96.) This method is used extensively for new wiring in multiple-drop locations such as hospitals and hotels/motels where there is no need to provide individual services.

Distributed wiring requires less cable but more components; due to the insertion loss of the components, more frequent amplification is required.

Esthetically, the distributed method is less obtrusive than big bundles of individual cables for post-construction wiring in existing buildings, but it is more subject to mechanical failure due to the number of connectors and components. A failure in a single connection can affect all the following drop points; in the home-run system, connection failure usually affects only the single drop involved.

An older method of wiring frequently encountered is the "looped" system. This type of wiring is often found in older MDUs that have been wired for an over-the-air antenna system or a satellite master antenna TV (SMATV) system. This involves looping the cable through the apartment outlet with a matching circuit used for coupling. (See Figure 3 on page 98.) These systems originally were used to carry over-the-air broadcast TV, and the loss at the higher cable frequencies is substantial. The leakage potential also is very high due to the unshielded nature of the components and the older cable used. These systems normally are not acceptable and must be replaced.

The requirements for signal level in an MDU are the same as any residential drop. The input to the customer's set must be above 0 dBmV (Federal Communications Commission rules) and ideally as high as +10 dBmV to allow splitting for multiple sets. Drop length

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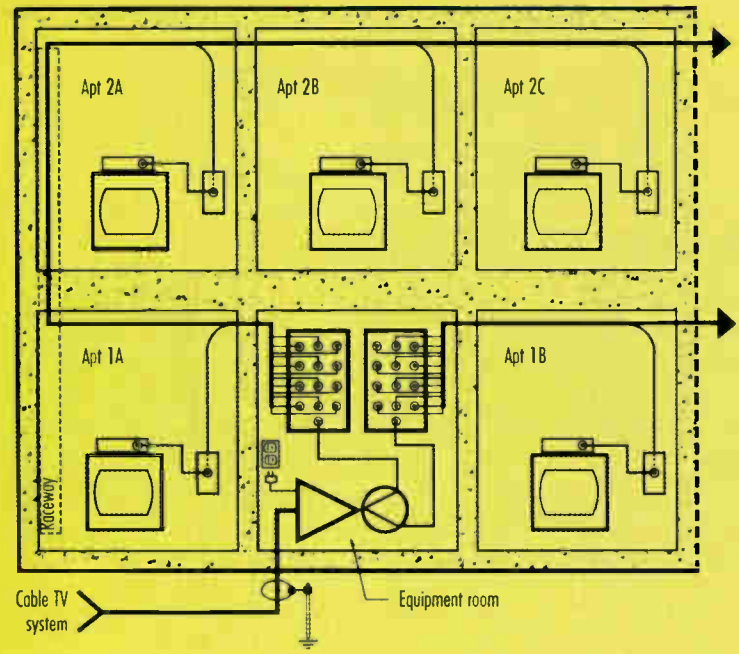
Figure 1: Home-run wiring



usually is 100 feet or so, but can be as short as 20 feet. On very short drops, slope will be within an acceptable 4-5 dB at the set. In large MDU complexes, amplified or passive distribution points should be located on each floor to keep drop lengths down and to balance the wiring. This is particularly important in distributed wiring situations where insertion loss can be substantial in a long run with numerous tap points.

The main cable TV feed to the MDU runs to a central distribution panel. In a smaller complex, this can be a simple multiple outlet splitter in an outdoor enclosure. In a larger complex, this usually involves one or more distribution cables to panels at each main building.

The design often is pretty much dependent on the layout and local design procedures. In smaller applications, a passive splitting network will suffice. For larger applications, amplifiers are necessary. In very large installations, a network feeding several amplifiers in different buildings or on separate floors is the rule. These larger applications often require a dedicated cable TV distribution coaxial feed or fiber to a

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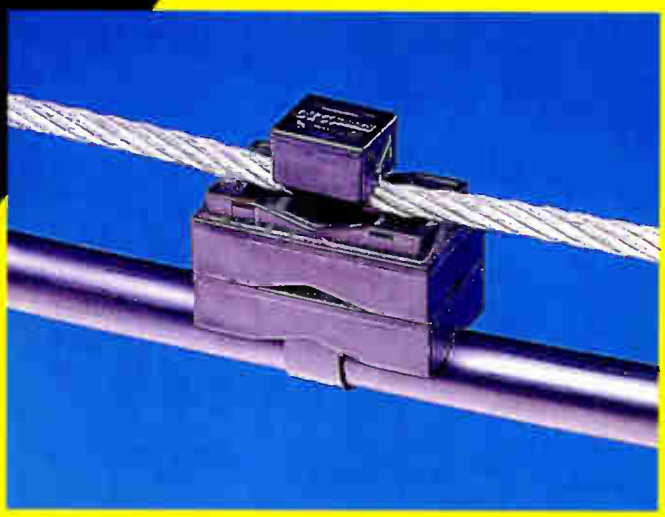

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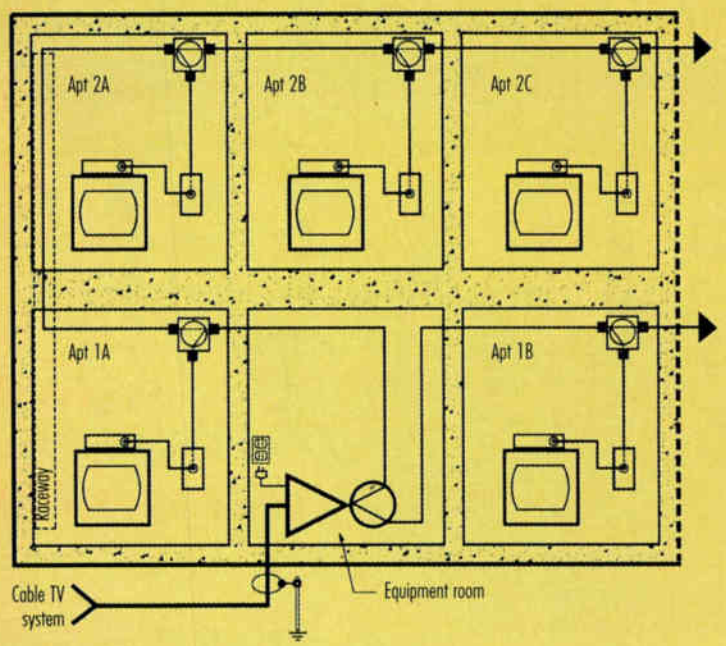
Figure 2: Distributed wiring



terminating bridger or fiber node, particularly if return spectrum use is required.

Signal-level criteria are fairly simple. For internal MDU amplifiers, ensure the recommended signal level input. This is generally about +10 dBmV to +20 dBmV on the highest channel, depending on the amplifier used. Input slope should be flat or within 2 dB. If slope is greater, the amplifier must have equalization capability, or an in-line equalizer should be used prior to the amp. Most manufacturers have MDU distribution amps powered either from the 115 VAC line or 60 V/90 V from the plant. These amplifiers are designed to have relatively high gain, outputs of +++ dBmV to +++8 dBmV, 7 dB slope and good distortion specifications. Normal bridgers and line extenders also can be used. Ideally, only one amplifier exists between the distribution line and the customer, or if a terminating bridger or fiber node is used, two in cascade. If the internal system is well-designed, amps at the customer premises will not be needed except in unusual circumstances.

In the home-run design, the high-level output of the distribution amp is fed to an

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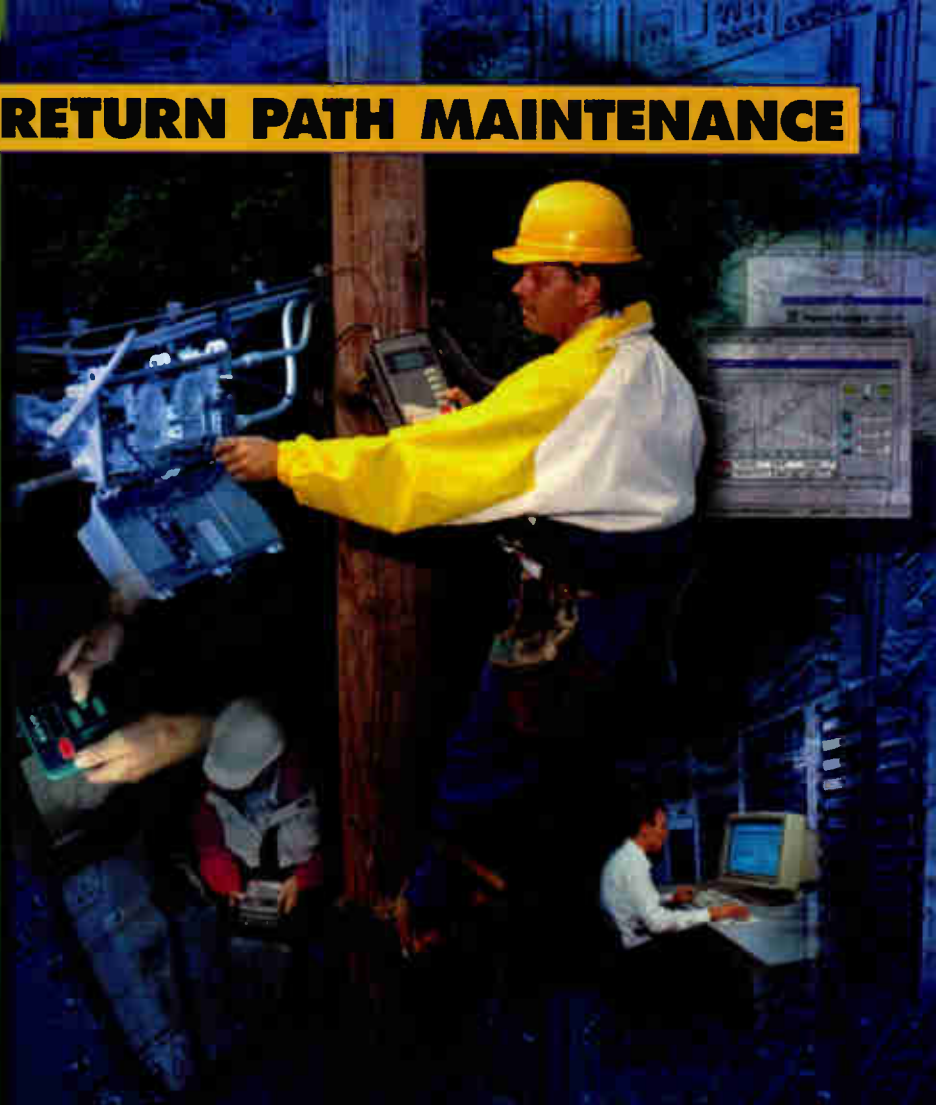

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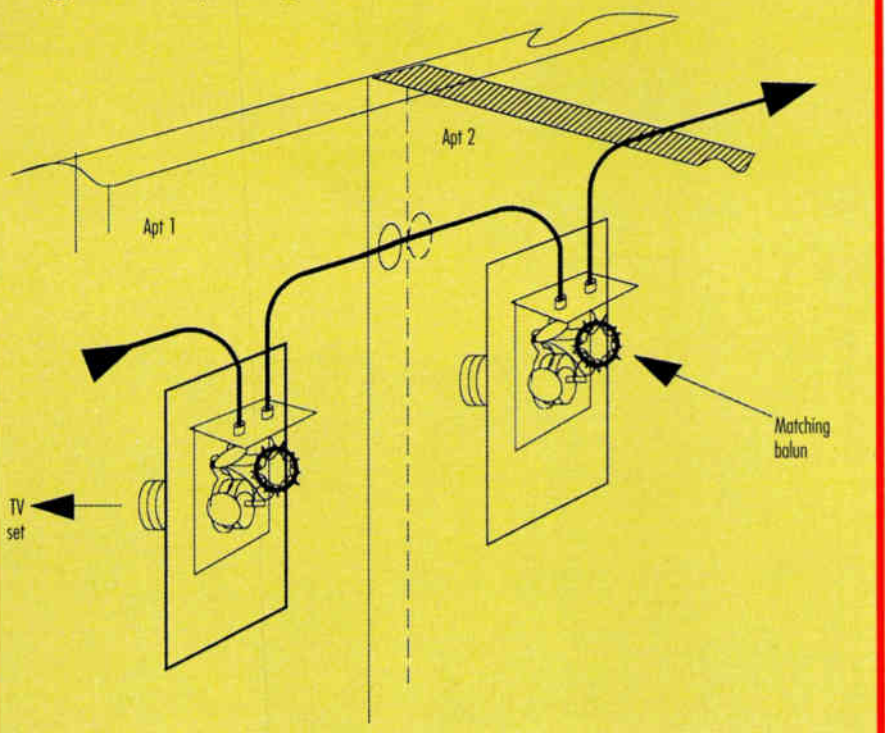
Figure 3: Looped wiring



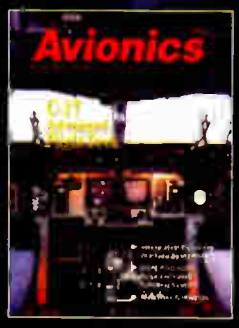
MDU splitter. This device splits the high input signal into many multiple outputs at a nominal +12 dBmV to +15 dBmV. The output ports can be viewed identically to a distribution tap where we install locking terminators, traps, filters and the like.

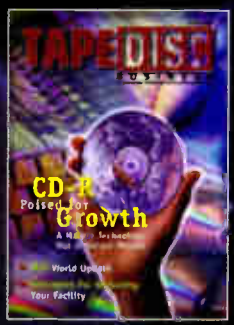
For distributed systems, the output of the distribution amp is a single output (or several split outputs) feeding tapped distribution lines. The number of taps (units) fed with any single line should be kept to a reasonable number, just as on a distribution line. The line should be terminated when the last tap of minimum value cannot provide the required level. Tap values should provide a minimum of +10 dBmV.

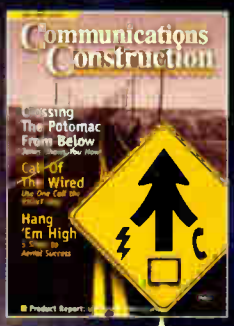
MDU wiring mechanics

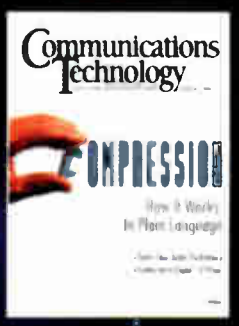
One major difference between residential wiring and the wiring of MDUs is the type of wire required. To meet fire protection standards, particularly to prevent vertical movement of fire up raceways and plenum shafts, the National Electrical Code Section 820-15 requires that coaxial

Soar Higher









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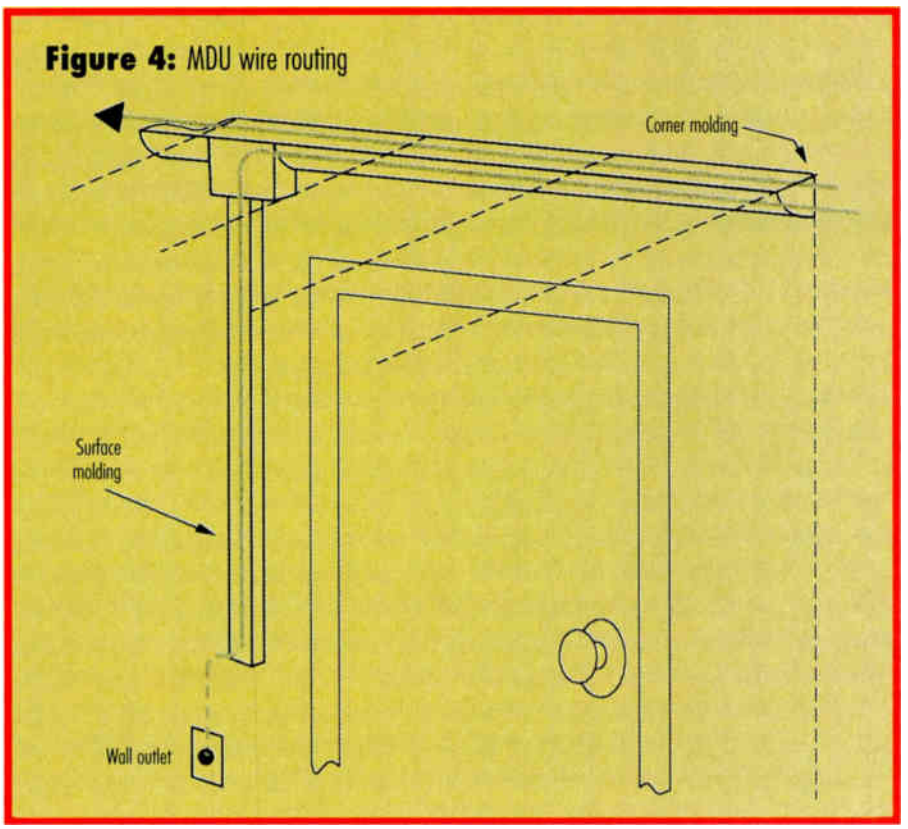

wire utilized for internal wiring meet the following criteria:

- CATVD—Normal drop wire, not marked
- CATVX—Fire retardant RG 59 or RG 6 for residential use
- CATV—Fire-retardant type cable over 3/8" diameter used in residential or non-residential (apartments or commercial) installations (not for vertical shafts or plenums)
- CATVR—Fire retardant-type cable of any size for residential or commercial use, to include vertical shafts.

The appropriate wire must be used in all new installations, and in earlier installations it might be required by local code as an upgrade. In any case, any wiring in MDUs must take these requirements into consideration, especially when running cables in vertical shafts. It is important to ensure electrical contractors are aware of the National Electrical Code (NEC) provisions and the proper type of wire. ➤

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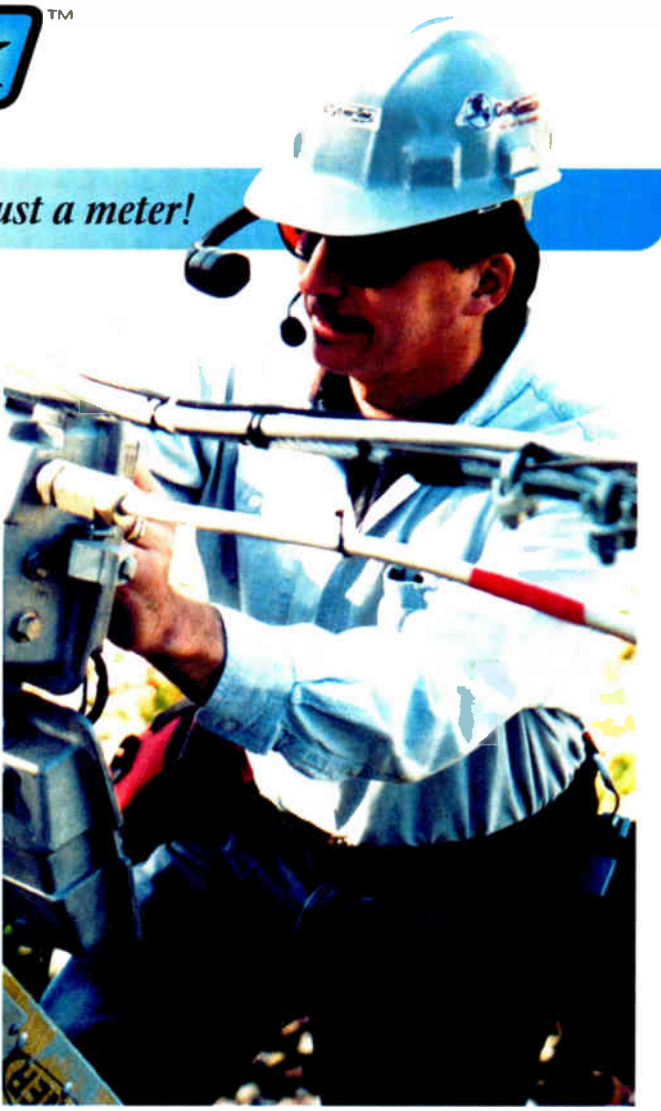

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Reader Service Number 88

Installing cabling and components, particularly in existing buildings, can tax the ingenuity of the designer. The simplest and easiest solution is, of course, to have home-run wiring installed during building construction. Ensure that the prewiring contractor, who often is the building electrical contractor, is using the correct type and quality of wire and routing it to the specified location in the apartment. Placement of this outlet usually is determined by apartment layout, and in a prewired situation the flexibility exists to wire inside walls. An inherent convenience of prewiring in new buildings is that it provides a second outlet in the bedroom (or any other room) with a splitting point in the primary wall box.

Post-construction wiring is a different situation entirely. In most of these buildings the ceilings are enclosed or have limited access, and exterior or interior surface wiring is required. This is where the building owners or management group often dictate what can be done, and how.

Popular wiring schemes

The most popular method of interior wiring is using molded cable raceways. (See Figure 4 on page 100.) Molded raceways and conduit are available in a variety of styles from several manufacturers. A widely used variety is the angled corner molding, which is less obtrusive than surface mount.

In post-construction wiring, point of entry of the cable usually is limited to either the inside or outside walls. If the TV set is located in another location, or a second drop is needed, cabling must be routed along baseboards or across the floor inside the room. This, like any residential wiring, has both esthetic and safety considerations. There should be no loose wires across doorways and the like.

Most demanding are drops that must be run on the outside of the building. In small, low density units, this isn't much of a problem, as the wiring is similar to standard residential methods. In high-rise complexes, however, this can be daunting. The wire usually is split on the roof and routed over the side and down an exterior molding or conduit, with a drop pulled in through the wall at each apartment. In very high buildings with a large number of apartments, the logistics are difficult and best handled by specialists.

Regardless of how the wires are run, consideration should be spent on esthetics for the building owner's satisfaction.

MDU leakage and theft

Because of the highly dense nature of MDU wiring, the higher signal levels involved and signal theft, MDUs are one of the greatest sources of signal leakage in the cable plant. Particularly bad are older complexes to which the cable system has been connected without upgrading.

Frequent sources of leakage are motels and hotels using loop-through wiring practices. Most home-run systems have fairly good drop integrity except when illegal connections are made to add outlets or hook up the neighbor. Residential MDUs are notorious for signal theft. The wiring, particularly if it's post-construction surface wiring, is accessible, and distribution panel locations are easily broken into. The method of connection to the cabling usually is crude, such as twist splicing zip cord to stripped coax. This creates substantial signal leakage, not to mention interference. Signal ingress also is created.

Policing of MDU signal quality and leakage, as well as system auditing, is a constant process. All unused MDU splitter ports should be securely terminated and locked, as should as any disconnected drops. All drop cabling should be clearly labeled, and most importantly in large installations, an up-to-date diagram should be available for reference. CT

Ted Chesley is a staff engineer with Century Communications. He can be reached at (208) 687-9712.

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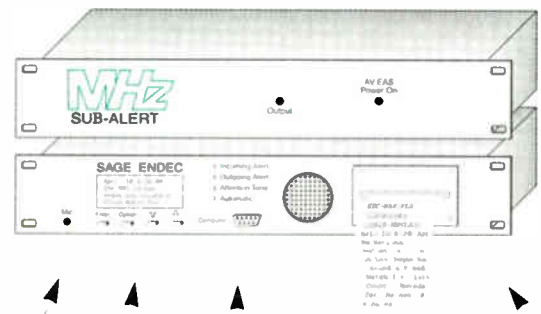

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Fusion Splicer

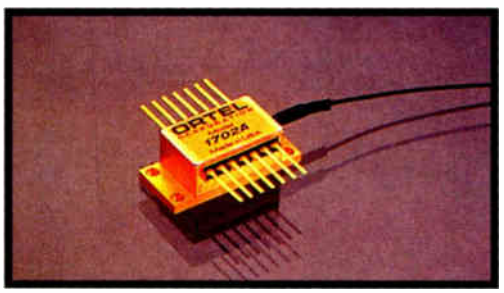
Aurora Instruments has introduced its Fusion 3500, a dual-mode profile alignment system (PAS) fiber-optic fusion splicer. It combines PAS and local injection/detection (LID) technologies in one unit.

The unit offers two simultaneous x and y views of the fibers, and the monitor tilts through 270°. The PAS system operates in both axes at once to reduce alignment time, and average splice loss with matched single-mode fibers is less than 0.02 dB. The entire process of alignment, arc fusion and loss estimation takes 15 seconds or less. In LID mode, the splicer achieves average splice losses of 0.016 dB on matched single-mode fiber.

The unit includes a carrying case, battery, charger, cleaver, heat oven for heat-shrink sleeves and an RS232 port for splice data downloading.

Reader Service #304

Analog WDM Lasers



Ortel has added analog wavelength division multiplexing (AWDM) lasers to its line of optical transmission products for hybrid fiber/coax (HFC) systems.

The model 1750A 1,550 nm forward path AWDM laser modules are designed for high performance and linearity to ensure signal quality. The units are available in standard International Telecommunications Union wavelengths. They're also intended to provide wavelength stability for consistent performance over time and temperature for dense wavelength division multiplexing (DWDM).

The Model 1702A 1,550 nm cooled return path AWDM laser modules are intended for high-performance transmission of return path signals over long distances. Like the Model 1750A, the return laser operates at standard ITU wavelengths.

Reader Service #305

Patch Coupling Adapter

Alliance Fiber Optic Products has introduced a line of fiber-optic patch coupling adapter components for high-performance single-mode applications.

The units allow users to mate different connector and coupling adapter styles with nearly 0 dB insertion loss. Intended for test instrument and wiring closet applications, the devices can eliminate the need for hybrid cable assemblies in many cases. They are available in SC to FC or FC to SC types and are constructed with zirconia components.

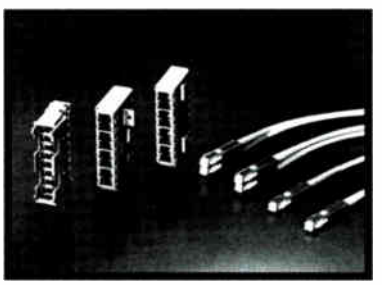
Reader Service #306

UPS Battery

Yuasa has introduced its NPX-25 12 V sealed rechargeable battery for applications where dependable high power is needed for short duration, such as portable power equipment and uninterruptible power supplies (UPSs).

The battery provides 23 watts per cell for 15 minutes, a 50% increase over the company's NP4-12 unit. Case size is 4.17 inches tall by 2.75 inches wide by 3.54 inches long, and its energy density at the 10-hour rate is equivalent to 1.54 Wh/cubic inch.

Reader Service #307



Miniature Fiber Connectors

Hirose Electric has added its HMU Series of MU-type fiber-optic connectors to its line.

MU connectors are miniature versions of SC connectors, meeting the same specifications but at half the size. The new connectors are intended for high-density applications such as optical terminal equipment, measuring instruments and optical relay racks or back panels.

Reader Service #308

Field Communications Device

Harris Corp. has introduced its AD2000, an open standards-based wireless/wireline tool to allow field technicians to access their company's corporate database or embedded test systems via a graphical user interface (GUI).

It features a 50-hour field battery life and can handle trouble-ticket management, computer-aided dispatch, field data collection, global positioning and online training. The unit is compatible with Harris' Line Test System and can be customized to other systems as well. It also has a built-in modem and connects to a cellular phone or wireless modem.

Reader Service #310

AC Adapter for Handheld Instruments

Rifocs Corp. now offers its 90ACK AC adapter kit and 90AC power converter for its line of handheld fiber-optic test equipment.

Both units replace the existing battery covers and batteries of current Rifocs handheld instruments, including the 250 Series laser sources, 260 Series laser sources and 550 Series optical power meters. Eliminating the batteries allows these instruments to be used for extended periods and for long-term stability tests.

The 90ACK adapter kit includes a power converter module and universal voltage AC adapter capable of 90-260 VAC operation. The 90AC is the power converter only, intended for users outside the United States with different power outlet configurations.

Reader Service #309

Capstan Drive

GMP's Capstan Drive allows mobile hydraulic equipment to operate power reels and capstans for various pulling and hoisting applications, such as long cable pulls.

At maximum flow of 15 gallons per minute and operating pressure of 2,250 psi, the unit's shaft can achieve 58 rpm and develop 13,000 inch-pounds of torque. It features a 2-7/16-inch bayonet shaft and roller-bearing planetary gear reduction.

Reader Service #311

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- 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)

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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
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- 28. ❑ Sales
- 29. ❑ Marketing
- 30. ❑ Other (please specify)

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- 31. ❑ Recommend
- 32. ❑ Specify
- 33. ❑ Evaluate
- 34. ❑ Approve
- 35. ❑ Not involved

Network Management System

Hewlett-Packard has introduced its AccessFiber fiber network management system, which can integrate with legacy systems and can be customized and expanded over time.

The system consists of one or more remote test units (RTUs), an Oracle database server and a Windows NT-based graphical user interface (GUI). Each RTU contains an optical time domain reflectometer (OTDR) and checks the fiber links periodically. The server stores and processes measurement, fiber routing and customer data according to HP fiber network management business logic. The GUI includes a topology navigator, geographical information and workflow applications.

Reader Service #312

Gigabit Ethernet Extender

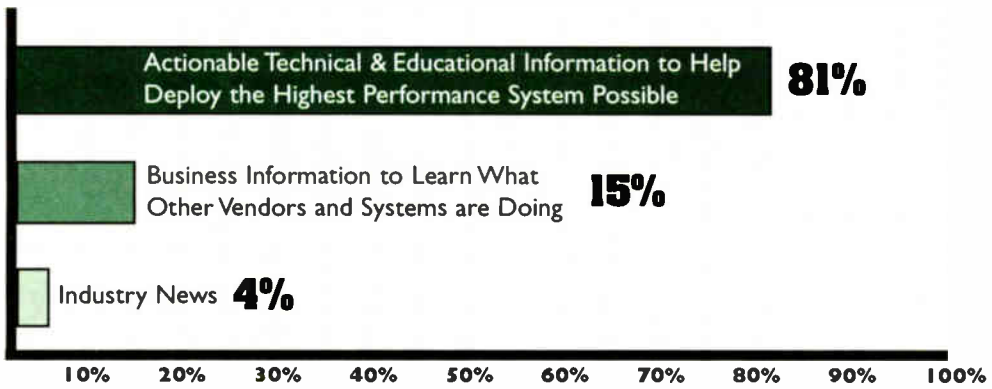
Broadband Communications Products has introduced its Model 1280 GbX Gigabit Ethernet extender, which increases the maximum interconnect distance from 3 km to more than 100 km.

The GbX provides a regenerated single-mode fiber-optic signal for long distances. Independent transmit and receive functions allow a Gigabit Ethernet network to use 2 Gbps full-duplex bandwidth.

Reader Service #303

'He Who Educates the Market Owns the Market."

What Type Of Industry Information Is Most Important To You At This Time?*



* Survey of 378 *CT Pipeline* subscribers, August 11, 1998

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The following listing covers several 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.

- *Campus Communications Networks: A Potential Land of Opportunity*—This program explores the economic and educational benefits of a collaboration between local cable systems and some 1,000 college communities nationwide. It was created to raise awareness of cable service opportunities on college and university campuses while helping those schools understand the capabilities of the cable operator. This 40-minute videotape provides a step-by-step assessment of three real-life scenarios in which cable operators have successfully partnered with local colleges or universities. Order T-1227, $52.
- *The Emergency Alert System and the Cable Operator*—This video was created by the Federal Communications Commission, FrontLine/IAS, MegaHertz, Sprint North Supply and Trilithic representatives to educate cable operators in the intricacies of the Emergency Alert System (EAS) requirement. It covers who must participate, what participation entails, when you must participate, the nature and content of the EAS message, and more. Order T-1228, $30.
- *Optical Cables and Devices*—Chapter 27 of the third edition of *Cable Television* by William Grant is covered in this video seminar. Together with the textbook, this presentation provides an understanding of optical cables and devices. Topics covered include prisms, mirrors, dichroic filters, diffraction filters, graded index filters, couplers and splitters. Also covered are micro-bending, macro-bending, fiber buffering protection, typical optical cable constructions, fiber splicing and connectorization. Fiber testing and construction techniques also are discussed. (50 min.) Order T-1174, $45.
- *Hybrid Fiber/Coaxial Systems*—This video seminar covers Chapter 28 of *Cable Television* and combines the basics learned thus far into the design of a hybrid fiber/coaxial (HFC) transmission system. This type of design is compared to traditional trunk/feeder systems. Topics discussed include review of coaxial system design, incorporating optical transmission, choices of optical transmitters and receivers, node size, new two-way services, two-way operation of hybrid systems, coaxial cable system extensions, lightwave link performance, applying link loss budgets and distribution system specifications. (80 min.) Order T-1175, $45.
- *Operation and Maintenance, Terminal Devices and Construction Techniques*—Chapters 29, 30, and 31 of *Cable Television* are covered in this video seminar. Topics discussed include transmission quality assurance, simplifying maintenance by design, sweeping, RF carrier level measurements, spectrum analysis, picture evaluation, maintenance test points, evaluating test data, fault location, subscriber terminal equipment and construction techniques for optical fiber placement. In this program, author William Grant completes and summarizes the *Cable Television* series. (70 min.) Order T-1176, $45. CT

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CABLE TRIVIA

Our history guru (aka Editor Rex Porter) has provided these trivia questions on the cable industry. Answers to the last test appear first. (The last "Cable Trivia" ran on page 192 of the June issue.) The person supplying the most correct answers will be awarded a special Trivia T-shirt. You may win only once per calendar year.

To be in the running for a prize, your answers need to be postmarked or faxed to us by the 20th of the month of the issue date in which the specific trivia test appears. Good luck! Send your answers to: The Trivia Judge, *Communications Technology*, 1900 Grant St., Suite 720, Denver, CO 80203 or fax: (303) 839-1564.

Trivia #23 answers

1) In a SAW filter, the acronym "SAW" stands for: surface acoustic wave
2) In June, 1990, a San Diego-based division of this major company announced an industry "first"—its all-digital system for transmitting a full high-definition TV (HDTV) signal in original format over a standard 6 MHz TV channel. This major company is: General Instrument
3) Gary Shapiro is: president of the Consumers Electronics Manufacturers Association
4) Since 1993, all TV sets manufactured or distributed for sale in the United States with screen diagonals of 13 inches or greater must: provide closed-captioning capability
5) In 1992, Philips (Magnavox) began offering a product named Vector. Its function was: cancellation of ghosts
6) The SCTE changed its name from the Society of Cable Television Engineers to Society of Telecommunications Engineers in the year: 1995
7) General Instrument held the first successful field tests of advanced 256-QAM (quadrature amplitude modulation) transmission over hybrid fiber/coax (HFC) networks in 21 different systems owned by: Rogers Cablesystems
8) In 1996, an experimental trillion-bit asynchronous transfer mode (ATM) switching technique was tested around a 20 gigabit per second ATM switch manufactured by: Lucent Technologies
9) A digital error protection code based on blocks of data with added redundancy capable of correcting burst errors up to a limit set at design time is the: Reed-Soloman code
10) In order to allow NTSC to be interoperable with HDTV signal sources, alternate frame rates will be available, at least during the transition period, based on the NTSC field rate of: 59.94 Hz

Trivia #24

Editor's note: We are pleased to have a guest guru from the great state of Texas, Ben Conroy, Jr. Not only is Ben a cable pioneer, but he also is one of the founding members of the National Cable TV Pioneers. Ben hopes you will enjoy his Trivia and hopes Southwestern readers (as well as others) will send in a record number of responses.

1) What was the designation of the first Jerrold venture into five-channel amplifiers?
   A) Split-Low

B) T-Sub
C) Sub3/Sub5
D) LB-Amp

2) Which company made the first transistorized cable TV amplifier?
A) Jerrold
B) Ameco
C) Benco
D) SKL

3) Which company made the first all-band distribution amplifier in the United States?
A) Jerrold
B) SKL
C) Ameco
D) Holt

4) Which two major manufacturers were in litigation in the late 1950s over a set-top converter?
A) Entron and Jerrold
B) Jerrold and Viking
C) SKL and Oak
D) Oak and Jerrold

5) Which major manufacturers of TV sets were selling cable TV line equipment in the 1950s?
A) Zenith and Magnavox
B) Philco and RCA
C) Dumont and RCA
D) Zenith and Philco

6) Who was the first person to use the term "CATV" to denote a cable TV system in 1948?
A) Milton Shapp
B) Irving Kahn
C) Bill Daniels
D) Strat Smith

7) Where was the first annual Texas Cable TV Association meeting held?
A) Dallas
B) San Antonio
C) Kerrville
D) Mineral Wells

8) Which company's set-top converters were used in Warner's QUBE system in Columbus, OH?
A) Pioneer
B) Oak
C) Jerrold
D) Scientific-Atlanta

9) Related to Warner's QUBE system in Columbus, which company filed suit for patent infringement?
A) Oak
B) Regency
C) Ameco
D) TOCOM

10) The first interactive cable TV system in the state of Texas was in which town?
A) Irving
B) El Paso
C) Woodlands
D) Mineral Wells

And the winner is...

The winner for "Cable Trivia" #22 (which ran in the May 1998 issue) is Priscilla Wu of the Federal Communications Commission in Washington, D.C.

The winner for the Cable-Tec Expo '98 "Cable Trivia" (which ran in Day 1 of *Cable-Tec Today*) is Robert J. Greiner, Jr., of DIVA in Manlius, NY. Congratulations, Priscilla and Robert!

As of press time, there was no winner for "Cable Trivia" #23, which ran in the June issue. The winner will be announced in an upcoming issue. CT

UNITED STATES POSTAL SERVICE — Statement of Ownership, Management, and Circulation

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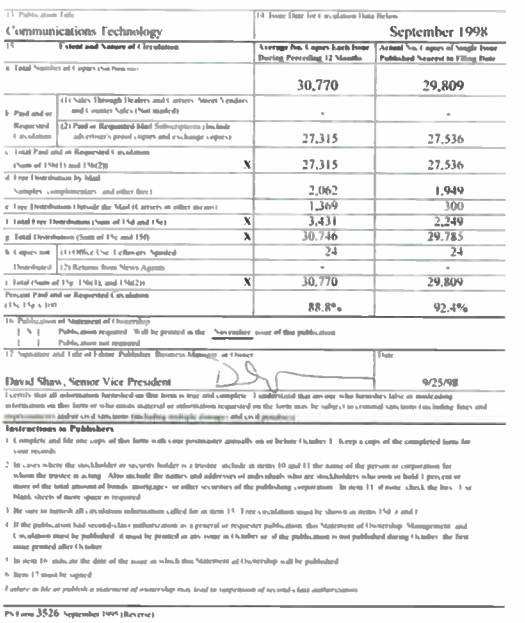

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PS Form 3526, September 1998 (Reverse)

CALENDAR

November

3-5: Philips Broadband Networks' Mobile Training Center, Charlotte, NC. Contact Sarah London at (800) 448-5171, ext. 2273.

4: Tektronix Leading Innovative Design Solutions seminar, Atlanta. Call (800) 426-2200, ext. 4.

4-5: OSP Expo '98, Cincinnati. Fax (847) 639-9542.

9-11: SCTE Regional Training Seminar Ramada Inn, Little Rock, AR. Sponsored in cooperation with the Society of Cable Telecommunications Engineers Razorback Chapter. Topic: "Technology for Technicians II" with SCTE Director of Regional Training Ralph Haimowitz. Contact SCTE headquarters, (610) 363-6888.

10-12: Philips Broadband Networks' Mobile Training Center, Savannah, GA. Contact Sarah London at (800) 448-5171, ext. 2273.

11: Badger State SCTE Chapter testing session, Fond du Lac, WI. Installer and Broadband Communications Technician/Engineer (BCT/E) certification examinations to be administered. Contact Robert Shugarman, (608) 238-9690.

12: Magnolia SCTE Chapter testing session, Jackson, MS. Installer, BCT/E, Service Technician and Telephony certification exams to be administered. Contact Bob Nunn, (800) 874-5649.

12: SCTE Satellite Tele-Seminar Program Galaxy 1R, Transponder 14, 2:30-3:30 p.m. ET. Topic: "Cable Modem Technology (Part Two)" and "Inside Wiring Issues (Part One)." Contact SCTE national headquarters, Janene Martin, (610) 363-6888.

14: Chaparral SCTE Chapter technical seminar, Jones Intercable, Albuquerque, NM. Topic: "Fiber Optics." Contact George Kennison, (505) 761-6205.

16-17: SCTE Regional Training Seminar Charlotte, NC. Sponsored in cooperation with the SCTE Piedmont Chapter. Topic: "Cable 101" with SCTE Director of Regional Training Ralph Haimowitz. Contact SCTE headquarters, (610) 363-6888.

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

17-19: Philips Broadband Networks' Mobile Training Center, Orlando, FL. Contact Sarah London at (800) 448-5171, ext. 2273.

17-20: Bay Networks Hub Connectivity course, Chicago. Call (919) 461-8600.

18: Chesapeake SCTE Chapter vendor show, Golden Bull Restaurant, Gaithersburg, MD. Contact Chuck Wilkinson, (410) 451-3290, ext. 717.

19: Ohio Valley SCTE Chapter testing session, Columbus, OH. Installer certification examinations to be administered. Contact Beth Humphrey, (800) 875-2225, ext. 18.

19-20: SCTE Regional Training Seminar Charlotte, NC. Sponsored in cooperation with the SCTE Piedmont Chapter. Topic: "Data Technology for Technicians" with SCTE Director of Regional Training Ralph Haimowitz. Contact SCTE Headquarters, (610) 363-6888.

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

21: Cascade Range SCTE Chapter testing session, Salem, OR. BCT/E certification examinations to be administered. Contact Randy Love, (503) 370-2745. CT

Planning Ahead

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

Dec. 10: SCTE Satellite Tele-Seminar Program Galaxy 1R, Transponder 14, 2:30-3:30 p.m. ET. Topic: "Inside Wiring Issues (Part Two)". Contact SCTE national headquarters, Janene Martin, (610) 363-6888, ext. 220.

Feb. 24-26: Texas Cable Show '99, San Antonio. Call (512) 474-2082.

March 10-12: Northern California Vendor Show and Golf Outing, Hilton Hotel, Concord, CA. Contact Steve Allen, (916) 786-4353.

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26	52	78	104	130	156	182	208	234	260	286	312

A. Are you a member of the SCTE (Society of Cable Telecommunications Engineers)?

01. ___ yes
02. ___ no

B. Please check the category that best describes your firm's primary business (check only 1):

Cable TV Systems Operations

03. ___ Independent Cable TV Syst.
04. ___ MSO (two or more Cable TV Systems)
05. ___ Cable TV Contractor
06. ___ Cable TV Program Network
07. ___ SMATV or DBS Operator
08. ___ MMDS, STV or LPTV Operator
09. ___ Microwave
10. ___ Telecommunications Carrier
11. ___ Electric Utility
12. ___ Satellite Manufacturer
13. ___ Satellite Distributor/Dealer
14. ___ Fiber Optic Manufacturer
15. ___ Data Network
16. ___ Commercial TV Broadcaster
17. ___ Cable TV Component Manufacturer
18. ___ Cable TV Investor
19. ___ Financial Institution, Broker, Consultant
20. ___ Law Firms or Gov't Agencies
21. ___ Program Producer or Distributor & Syndicators
22. ___ Advertising Agencies
23. ___ Educational TV Stations, Schools and Libraries
24. ___ Other (please specify)_____

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25. ___ Vice President
26. ___ Director
27. ___ Manager
28. ___ Engineer
29. ___ Technician
30. ___ Installer
31. ___ Corporate Management (Chairman, Owners, Presidents, Partners, Executive/Senior Vice Presidents and Treasurers)
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36. ___ Other (Company Copies & Other Titles & Non-Titled Personnel, please specify)

D. In the next 12 months, what cable equipment do you plan to buy?

37. ___ Amplifiers
38. ___ Antennas
39. ___ CATV Passive Equipment including Coaxial Cable
40. ___ Cable Tools
41. ___ CAD Software, Mapping
42. ___ Commercial Insertion/Character Generator
43. ___ Compression/Digital Equip.
44. ___ Computer Equipment
45. ___ Connectors/Splitters
46. ___ Fleet Management
47. ___ Headend Equipment
48. ___ Transmission/Switching Equipment
49. ___ Networking Equipment
50. ___ Vaults/Pedestals
51. ___ MMDS Transmission Equipment
52. ___ Microwave Equipment
53. ___ Receivers and Modulators
54. ___ Cable Modems
55. ___ Subscriber/Addressable Security Equipment/Converters/Remotes
56. ___ Telephone/PCS Equipment
57. ___ Power Suppls. (Batteries, etc.)
58. ___ Video Servers

E. What is your annual cable equipment expenditure?

59. ___ up to $50,000
60. ___ $50,001 to $100,000
61. ___ $100,001 to $250,000+

F. In the next 12 months, what fiber-optic equipment do you plan to buy?

62. ___ Fiber-Optic Amplifiers
63. ___ Fiber-Optic Connectors
64. ___ Fiber-Optic Couplers/Splitters
65. ___ Fiber-Optic Splicers
66. ___ Fiber-Optic Transmitter/Receiver
67. ___ Fiber-Optic Patchcords/Pigtails
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69. ___ Fiber-Optic Cable
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H. In the next 12 months, what cable test & measurement equipment do you plan to buy?

74. ___ Audio Test Equipment
75. ___ Cable Fault Locators
76. ___ Fiber Optics Test Equipment
77. ___ Leakage Detection
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80. ___ Spectrum Analyzers
81. ___ Status Monitoring
82. ___ System Bench Sweep
83. ___ TDRs

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87. ___ over $250,000

J. In the next 12 months, what cable services do you plan to buy?

88. ___ Contracting Services (Construction/Installation)
89. ___ Repair Services
90. ___ Technical Services/ Eng. Design

K. What is your annual cable services expenditure?

91. ___ up to $50,000
92. ___ $50,001 to $100,000
93. ___ $100,001 to $250,000
94. ___ over $250,000

L. Do you plan to rebuild/ upgrade your system in:

95. ___ 1 year
96. ___ more than 2 years

M. How many miles of plant are you upgrading/rebuilding?

97. ___ up to 10 miles
98. ___ 11-30 miles
99. ___ 31 miles or more

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20. ___ Law Firms or Gov't Agencies
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22. ___ Advertising Agencies
23. ___ Educational TV Stations, Schools and Libraries
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70. ___ Fiber-Optic Closures & Cabinets

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90. ___ Technical Services/ Eng. Design

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

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

M. How many miles of plant are you upgrading/rebuilding?
97. ___ up to 10 miles
98. ___ 11-30 miles
99. ___ 31 miles or more

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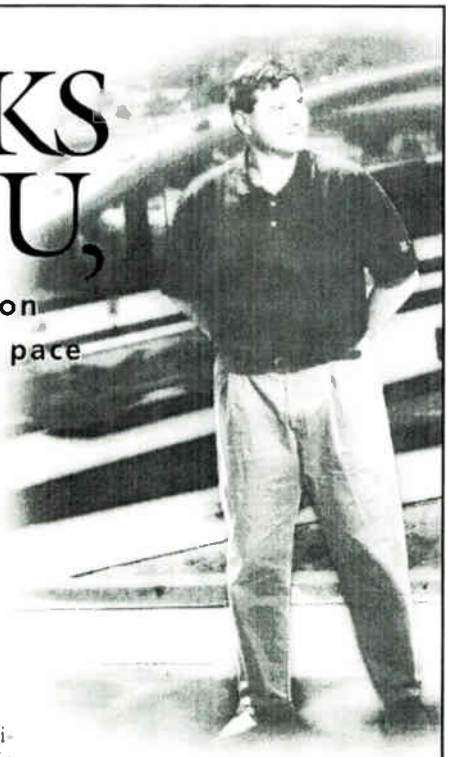

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We're seeking a technically astute individual to be responsible for the technical performance of assigned network facilities, including the system Telecom Center, digital headend and analog hub facilities. Responsibilities include ensuring that facilities signal processing and environmental equipment are tested, repaired and maintained in accordance with both company and regulatory standards, including semi-annual FCC proof-of-performance testing.

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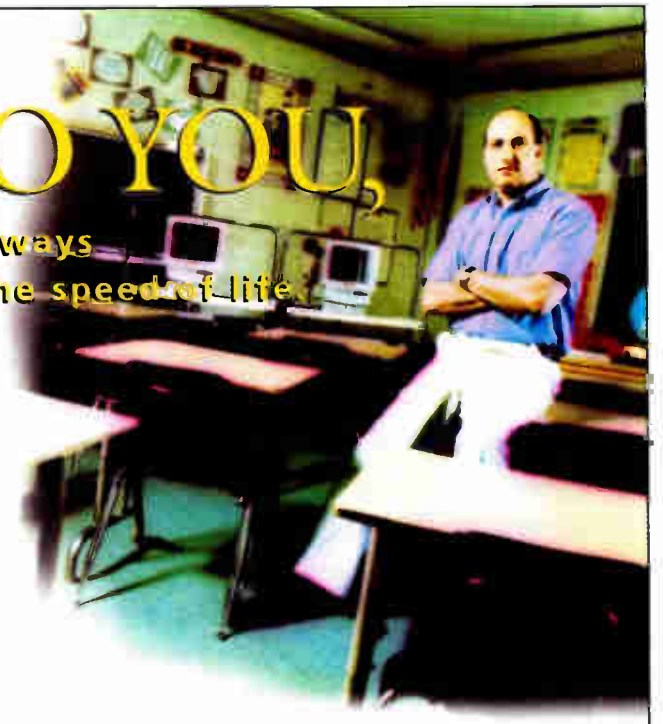

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You will be responsible for managing and overseeing engineering and design of hybrid fiber coax (HFC) plant, and the engineering and maintenance of master headends and fiber optic network. A 2-year technical education or equivalent and 8+ years' direct experience in managing cable engineering or design functions required.

CONSTRUCTION MANAGER

You will be responsible for developing, organizing, coordinating, directing and supervising all construction activities. You'll need a high school diploma/GED, 5+ years' direct cable construction experience, and 5+ years' in a supervisory role.

MAINTENANCE TECHNICIAN SUPERVISOR

You will be responsible for supervising one-way and two-way plant technicians, monitoring technical performance and making adjustments, and identifying and resolving problems. You'll need a high school diploma/GED, 5+ years of cable experience, and 2+ years' in a supervisory role. Knowledge of advanced electronics and proper CATV technical applications, and advanced skill in the use of test equipment are required.

MAINTENANCE TECHNICIAN/ NETWORK CERTIFICATION

You will perform signal level testing and video quality checks, deploy new technologies and services by facilitating the construction, installation, and maintenance of the expanded network infrastructure. You'll need 2+ years' CATV experience and working knowledge of video systems and earth station operations. Contract positions available.

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You will be responsible for the development of HFC design, review of architecture maps, and ensuring the deployment of appropriate power supply. You'll need 2+ years' design and CAD MicroStation/AutoCAD experience, and knowledge of current Broadband architectures.

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Utilizing FOCUS, CAD design and drafting tools, you will design and draft fiber distribution systems of new construction, plant extensions, upgrades, and rebuilds. You'll need an Associate's degree or equivalent in civil engineering technology or related field and 4+ years' experience in cable television or fiber optic telecommunications.

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You will perform daily field inspection of crew activity, including extension, rebuild, aerial upgrade, and underground or multiple dwelling unit plant. You'll need a high school diploma/GED, 1+ year direct experience, and knowledge of CATV multi-unit and single family design and construction and fiber optic construction.

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Position will have overall responsibility for supervising the build out in a given city. Should have knowledge of ROW, Building Entry, Fiber Construction and OSP Engineering. You will work in conjunction with Facilities Coordinators and OSP Coordinators. In-depth knowledge of vendors, contractors and government regulations in the target city is preferred.

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The following positions are available in our Pittsburgh, PA location.

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Individual will work with IXC's and ILEC's in a given territory to coordinate collocation agreements, interconnects, etc. Experience as a business customer service rep or account manager at an IXC or Telco is ideal. Individuals with large equipment or circuit installation experience will also be considered.

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You will project manage and track vendor progress as they complete installation and turn up of various types of communication and power equipment throughout the country.

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ANTEC Network Technologies, the Atlanta-based manufacturing division of ANTEC Corp., designs, manufacturers, distributes and markets a wide range of active transmission, powering, passives, and interconnection products for fiber optic coaxial and twisted pair networking, worldwide. ANTEC Corp., headquartered in Rolling Meadows, IL, is an international communications technology company.
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TRAINING

By the NCTI

Troubleshooting Hum Modulation, Part 2

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

Recognizing hum modulation was covered last month. This installment identifies the possible causes of hum and begins the procedures for systematically isolating a specific cause of visible hum bars.

Identifying possible causes of hum

Hum modulation can occur in any active or passive device (cable system or customer premises equipment) through which AC voltage passes. In the cable system, abnormal hum can be generated by 1) a defective set-top terminal, 2) a faulty system-provided active RF switch, 3) a defective DC power supply in an amplifier, 4) low AC input voltage to an amplifier's DC power supply, 5) a corroded or water-damaged power-passing passive, 6) a defective system-provided house amp or 7) poor drop system grounding. Customer-owned equipment that can cause abnormal hum includes 1) a defective TV set, 2) a faulty videocassette recorder (VCR), 3) a defective house amp, 4) a faulty active RF switch, 5) defective electrical house wiring or 6) a defective electrical appliance. (See accompanying table.)

Isolating the cause of hum

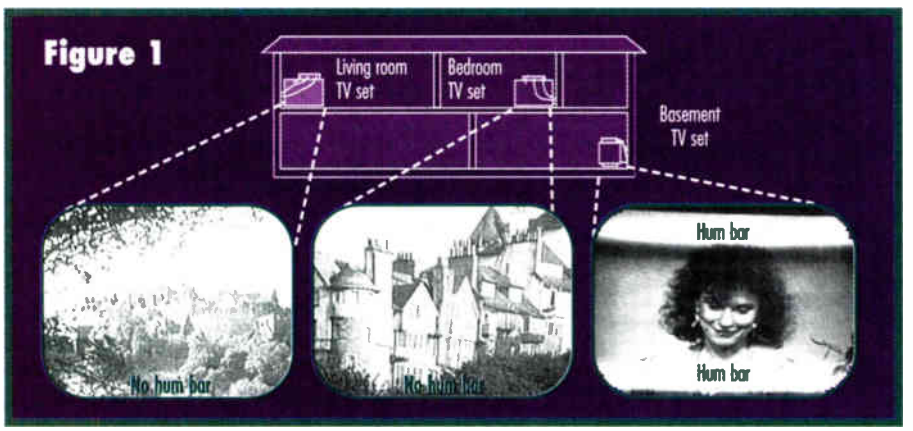
You should now understand what hum modulation is, what it looks like, and what can cause it. Next, you must learn how to use the recommended test equipment to systematically isolate the specific cause of the visible hum bar(s) rolling through the customer's TV picture. *A note of caution:* Because an electrical shock hazard may exist when troubleshooting a hum modulation problem, always carefully observe all appropriate safety precautions.

- *Check for hum bars on all cable-installed TV sets.* When there is more than one cable-installed TV set in the customer's house, first check each of these TV sets for the presence of one or two hum bars. The findings from this quick check will indicate whether the excessive hum is occurring before or after the drop splitter that commonly supplies signal to all the cable-installed TV sets. Visible hum on only one of the TV sets indicates a problem with that TV set or any active device (set-top terminal, VCR, active RF switch) connected to it. (See Figure 1.) Visible hum on all cable-installed TV sets indicates the problem is either with the drop grounding system, a house amp, the tap, the feeder system, the customer's electrical wiring or an electrical appliance.
- *Measure percentage of hum at cable wall plate with a signal level meter (SLM).* To isolate the cause of visible hum when there is only one cable-installed TV set in the house, measure the percentage of hum at the wall plate with an SLM. (See Figure 2.) Tune the SLM to an RF carrier with no video (an unmodulated carrier) to measure hum modulation. If the percentage of hum is normal at the wall plate but abnormal at the input to the TV set, there is a defective device between the wall plate and the TV set.

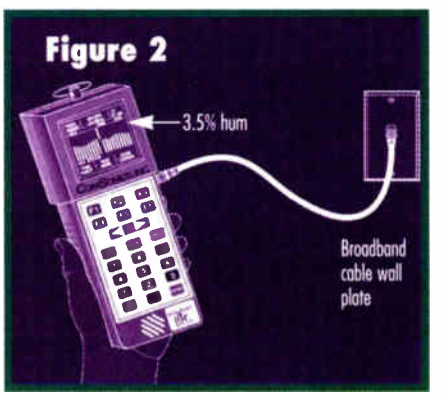
The next installment will continue with procedures for systematically isolating a specific cause of visible hum bars. CT

Causes of abnormal hum modulation

Drop system	Feeder system
TV set	Trunk/bridger amp
Set-top terminal	Line extender amp
VCR	DC power supplies (low AC input voltage, defective filtering)
Active RF switch	Corroded housing connector
House amplifier	Power-passing passive (coaxial cable, splitters, directional couplers, taps)
Grounding system (corroded connection)	
Corroded F-connector	
Top face plate	
Other customer drops	



Checking for hum bars on all cable-installed TV sets



Measuring hum modulation at cable wall plate

CHAIRMAN'S MESSAGE

By Hugh McCarley

'Tis the Season for SCTE

Ah, November. The long, hot days of summer are far behind, football season is in full swing, and the holiday rush is about to begin. Professionally speaking, with this month's arrival comes the reassuring calm (let's hope) of another well-planned budget under your belt and the security of knowing that your 1999 agenda is in place and ready to go.

It's time to step back, take a breath and say, "Let's see what the New Year brings."

Of course, this business moves so fast that no one really can afford to sit back and wait for anything. Lightning-quick technological changes mean you barely have time for well-deserved back-patting, let alone the time to relax and enjoy the next two months. What's hot today will be old news tomorrow. That's the nature of the cable telecommunications beast.

Instead, now is a great time to plan for the projects and activities in which you'd like to get involved in 1999. What training will you need to keep up with next year's technology? What information will be essential to you in the months ahead? Are you ready to cross industry borders as cable TV meshes with other industries?

On the horizon

The Society of Cable Telecommunications Engineers can help you answer these questions and more. We are gearing up for a very busy year in 1999, beginning with our first-ever "Member-Get-A-Member" campaign in January. Through "The Power of Connection," you will have the opportunity to expand your knowledge base even more by introducing your colleagues to the Society's many benefits.

Of course, this initiative has some exciting incentives that can help you boost your own career, but the real motivation for you to participate in this campaign is the knowledge you'll gain through an ever-expanding network of broadband professionals. By signing up new members, you'll not only open yourself to new perspectives and ideas that may help you perform better in your own job, but you'll also be helping your peers get the training and information they need to succeed.

Some of that training includes a lineup of national, regional and local training opportunities. For starters, our annual Conference on Emerging Technologies, a favorite event among engineering visionaries, will kick off on Jan. 19 in Dallas.

This three-day conference will offer insider tips, solutions and projections for the challenges ahead as we enter into a new era of communications. An updated list of the moderated sessions is included in "SCTE Update" in this issue of *Communications Technology*.

Another annual training favorite among broadband professionals is Cable-Tec Expo. The 1999 show will be held in Orlando from May 25 to 28. Billed as our industry's premier hardware trade show, Expo '99 will be a four-day foray into the technical information you won't be able to get anywhere else. From demonstrations to certification tests to lectures and seminars, to panel discussions and workshops, you won't just go to next year's Expo; you'll experience it.

If Texas and Florida aren't in your travel plans, SCTE's regional seminars will bring the information to you. Among them are "Train the Trainer," "Data Communications," "Broadband Technology for Technicians," "OSHA (Occupational Safety and Health Administration) and Safety," "Fiber Technology for Technicians," "Introduction to Telephony" and "Cable 101."

On the local level, SCTE is strengthening our support of our more than 70 chapters and meeting groups. As I said in my September "Chairman's Message," these groups have experienced a decline in meeting attendance in recent months. One way we're turning that trend around is by restructuring our internal support team in Exton, PA. We plan to establish a running dialogue with each of these groups; if we serve them to the best of our abilities, then they can serve you to the best of theirs.

We are also looking to expand our local group network outside the United States. Our main international thrust for now is on increasing our Canadian presence. The dues change implemented this year makes that the best outlet for our international efforts. Next year, when we release our newest Spanish language version products, the Society will attempt to make inroads in Mexico, South and Central America as well as the Spanish Caribbean.

EAS reminder

In case you've forgotten, the Emergency Alert System (EAS) implementation deadline is fast approaching for systems with more than 10,000 subscribers. If you haven't done it already, pick up a copy of SCTE's "The Emergency Alert System and the Cable Operator" (Item T-1228).

This program has all the information you need on regulatory and technical requirements to prepare to purchase and install your system. Even if your system is smaller and not required to participate until 2002, now is a good time to begin preparing for implementation.

For more information about this and other SCTE training materials, contact the Society's product fulfillment department at (610) 363-6888, or visit the Society's Web site: www.scte.org.

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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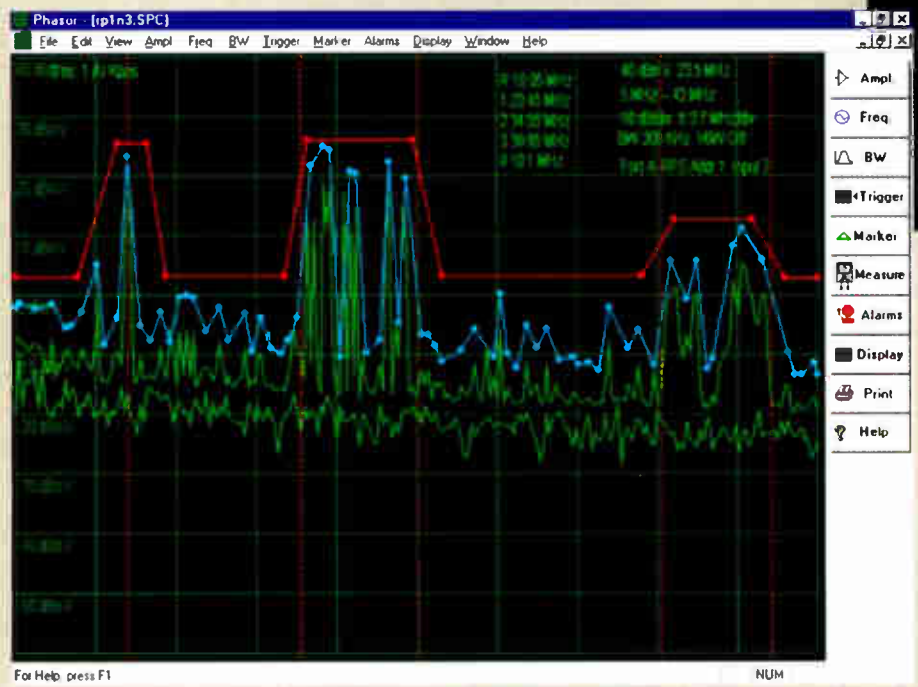

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