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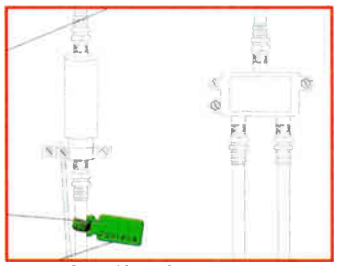
CONTENTS FEBRUARY 1995

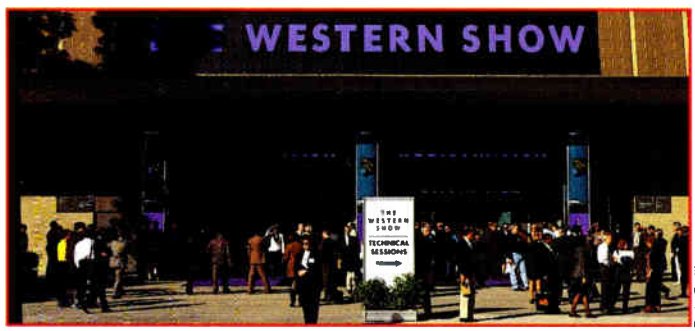
Departments

Courtesy Siecor

Back to Basics 77

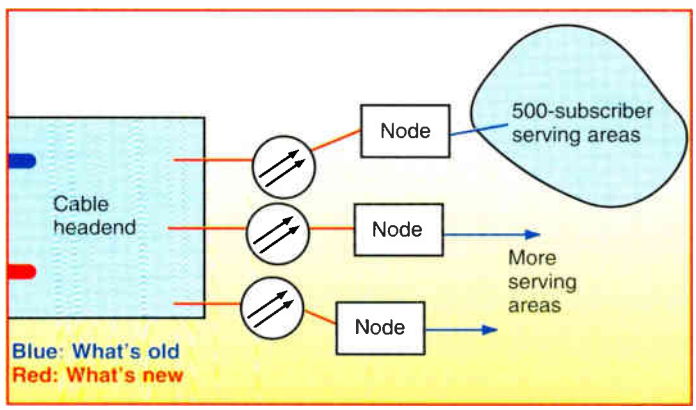


Securing the drop 59



Bob Sullivan

News 10



Enhanced services 34

Features

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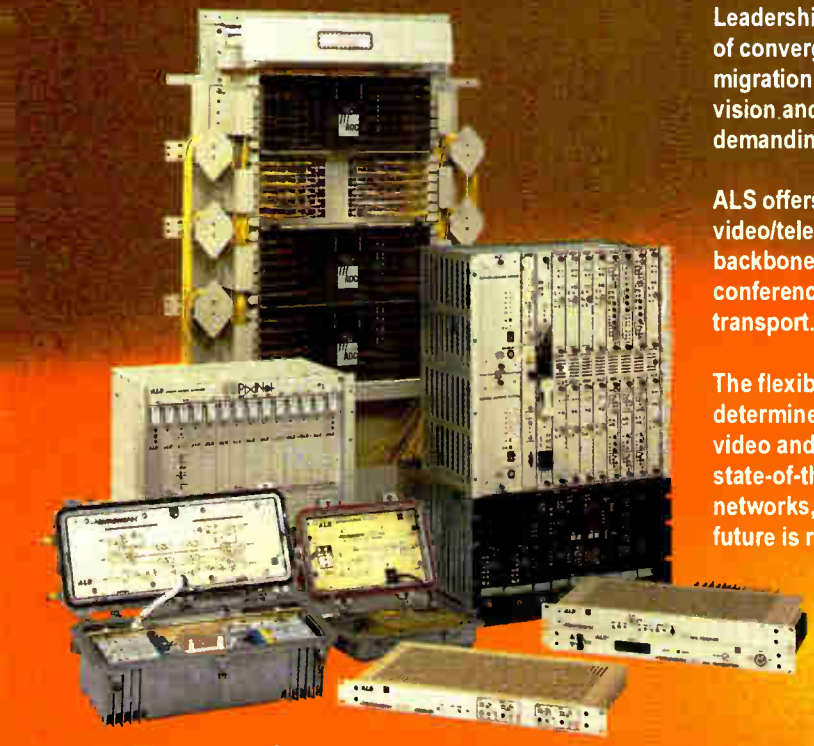

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Call to vote

It's that time of year again: The Society of Cable Television Engineers' annual elections. Election packages were mailed Jan. 15, and if you're a national member, you should have received yours by now. Before you do anything else today — including finishing reading this column — remove that big envelope from in your basket.

Open it, read the instructions, vote and drop the ballot in the mail. Ballots have to be postmarked by March 15, and received by the Society's independent accounting firm no later than March 28.

Why am I asking you to do this? Because your vote really does count. It's your *direct* voice in SCTE's future. Each year about half of you have an opportunity to elect regional directors (this year it's members in Regions 1, 2, 6, 9 and 11), and all of you can vote for at-large directors. As well, this year's ballot includes a referendum to change the Society's name. Every member should vote on this important item! (See "President's Message" in last month's issue of *Communications Technology* for more details.)

Do you know that last year only 24% of SCTE's membership voted in the annual elections? What happened to the other three-fourths? To those of you who do vote, I encourage you to go pester the other Society members in your company and get them to follow your lead. If each of you can get just one other person to vote, we would double participation in the elections. (For the record, the highest participation ever occurred in 1991, when 33% of you sent in ballots.)

"Do you know that last year only 24% of SCTE's membership voted in the annual elections? What happened to the other three-fourths?"

Well done

Did you make it to Orlando, FL, last month for the 1995 Conference on Emerging Technologies? If not, you missed what in my opinion were the best presentations of any industry technical conference I've seen in years. (See "President's Message on page 94.) Attendance was up a whopping 37% too. A big tip of the hat to the SCTE's national staff, the conference program subcommittee, and the folks who presented the material. By the way, extra copies of the conference's proceedings manual are available from the Society's headquarters. Give them a call at (610) 363-6888.

To all hams

This is from Al Dawkins, K0FRP, net control for the SCTE/CATV amateur radio net. Al now has access to a well-equipped station in the Omaha area, including use of a 16-element, 40-foot boom log periodic antenna at 300 feet! Look for the net the second and fourth Wednesday of each month on 7.235-7.245 MHz, with one session for the East Coast at 7 p.m. CST and a second session for the West Coast at 8 p.m. CST. Nonhams who would like to listen will need a shortwave receiver capable of tuning in lower sideband transmissions.

Ronald J. Hranac
Senior Technical Editor

Harnessing the power of convergence

On Dec. 14, over 150 journalists from at least four continents attended Time Warner Cable's launch of its long-awaited Full Service Network (FSN) trial in Orlando, FL. With lighting and production worthy of broadcast TV, Gerald Levin, chairman and CEO of Time Warner Inc., introduced the FSN and its interactive capabilities.

On a stage in the ballroom of the Sheraton Orlando North Hotel, Levin and Jim Chiddix, Time Warner Cable senior vice president of engineering and technology, demonstrated video-on-demand, interactive games and interactive shopping on the FSN. In attendance and speaking at the press conference were executives from Time Warner's FSN technology partners including Silicon Graphics CEO Ed McCracken and Scientific-Atlanta CEO Jim McDonald.

Levin emphasized in no uncertain terms that Time Warner is committed to building FSNs on all its cable systems. Referring to Time Warner as "the world's largest creator and distributor of copyrights," Levin stated: "Digital interactivity is indeed the most powerful instrument ever devised for giving consumers direct, immediate, on-demand access to our libraries of print, film, programming and music. All major producers of copyrights understand that one day they will face the job of figuring out what this transforming technology means for them. They can postpone the day. But they can't avoid it. Sooner or later, every significant player in the information and entertainment industry is going to understand the implications of broadband digital interactivity. As every competitor in the cable industry already knows, sooner isn't only better, it's often everything."

Time Warner's major technology partners for the FSN include Silicon Graphics Inc., Scientific-Atlanta and AT&T. SGI provided the video servers and subsystems for the set-top box. AT&T supplied its GlobeView-2000 ATM (asynchronous transfer mode) switch and S-A provided the headend and distribution equipment as well as the set-top box itself.

Not too costly

Silicon Graphics' McCracken responded to widespread criticism that the FSN is far too costly for real world deployment. "Initial press coverage focused far too much on cost and not enough on how affordable this technology will become," he said. "Everyone on the team knew we had to develop commercially deployable, and that means affordable, technology. The problem was that the technology available to us in 1994 wasn't compelling enough to satisfy the television consumer. So instead we used technology that will be affordable in 1996 when the FSN set-top box costs $300 in volume." Now that the FSN is operational, he said the engineering teams will focus on making the technology cheaper.

McCracken explained that integrated circuit integration will make this technology affordable. Transistors per chip have increased from 35,000 in 1982 to millions on a chip the size of a small fingernail in 1994. The $300 set-top box in 1996 will have more power than a mainframe computer had in 1990. "The question isn't how can these set-tops possibly reach the $300 price point in just a few years. That's a certainty," he said. "The interesting question is what threshold of power will create a mass market. And we believe the threshold of power represented by this trial represents that power."

McDonald of Scientific-Atlanta emphasized the pioneering effort that went into the creation of the FSN. Not only is it the first implementation of MPEG-encoded and -compressed video information using an ATM transport, he said, it is the first deployment of custom 64-QAM technology in a cable environment, the first ATM-based fiber/coax network and the first hybrid fiber/coax network to combine analog and digital signals. "The full service network demonstrates the economies of using a fiber backbone in a broadband network," McDonald said.

Scientific-Atlanta's home communications terminal (HCT) is an addressable, interactive set-top terminal with Silicon Graphics' navigator user-interface software built in. The HCT utilizes Toshiba's digital tuner, giving subscribers control of cable programming, other video entertainment and information services directly through their TV sets. According to McDonald, digital MPEG decoding and analog circuitry permit high-quality service to TV sets, stereos, VCRs and personal computers. "This is the first use of MPEG standards in an integrated analog and digital set-top," he said.

Dan Stanzione, president of global public networks at AT&T and chairman of Interactive Digital Solutions (the AT&T/Silicon Graphics two-month-old joint venture), also emphasized the pioneering nature of the FSN: "Frankly, the technology at work here — high-speed digital switching, network computing, optical transport and interactive video — is both innovative and critical to the success of Time Warner's vision of multimedia networking to and from the home." This first operational FSN is "a real-life laboratory (that will) greatly expand our ability to chart the headwaters of an advanced interactive future for consumers," allowing them to learn what consumers are willing to pay for the services the FSN will provide.

The architecture

Joseph Collins, chairman and CEO of Time Warner Cable, explained the underlying architecture of the network: The core of the system is the underlying fiber-to-the-node architecture. The FSN provides fiber-optic transmission

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to the neighborhood and broadband cable into the home. "We have been installing this system across the country for several years and all of our systems will be upgraded by 1998," he said.

Chiddix described the FSN architecture, explaining how a signal leaves the set-top box in the viewer's home as a broadband RF signal. The electrical RF signal is converted to an optical signal at the neighborhood node. From there it travels to the network operations center where the signal is demodulated, demultiplexed and sent to the ATM switch, which in turn routes the signal to the video servers.

In the forward direction, the video server streams video to the ATM switch, which sends the video to the modulators and multiplexers. The modulated and multiplexed optical signal is combined and transported to the node. The broadband signal contains MPEG-compressed digital video, data, control signals and 6 MHz analog TV channels. At the node, the signal is converted to an RF broadband signal and is transported to the home via coaxial cable. "It may sound complicated but believe it or not I've vastly simplified it," said Chiddix.

Going live

Emphasizing that this was not a rigged demo but real-life use of an active system, Levin and Chiddix put the FSN through some paces. Upon powering up the TV set and the set-top box, SGI's navigational software, named Carousel, appeared on the screen. Levin and Chiddix demonstrated how different individuals in a household can tailor Carousel to their preferences.

Using a Scientific-Atlanta designed remote control, Levin demonstrated VOD by selecting the Sylvester Stallone/Sharon Stone movie *The Specialist*. Upon selection, the movie almost immediately popped up on the TV screen. Levin demonstrated full VCR control including fast forward, rewind and pause as well as the ability to jump forward and backward in 10-minute increments.

Levin paused the movie and selected a second, which he also paused before demonstrating the "interactive mall" shopping feature.

Offered stores include Sharper Image, Chrysler and Warner Bros. Studio One. Video clips of merchandise can be selected at will. With credit card and address information in the data base, the interactive mall has the ability to bill and ship automatically.

An FSN home also can be equipped with a Hewlett-Packard color DeskJet printer. In a shopping application, this printer is used for printing pictures and information about items of interest.

Other services planned for the interactive mall include stamp ordering through the Post Office, to be delivered the next day.

"It doesn't sound very profound," said Levin, "but we're in the holiday season and this is designed for convenience." Levin described another planned Post Office service: "If I wrap a package and need to mail it, I can simply press select (via the set-top box) and, this is our understanding, in three hours the Post Office can send someone to our house to pick up that package."

Levin and Chiddix then went on to demonstrate interactive games including Atari's Jaguar series and a game of gin rummy with FSN customers. Having been on-line with the network since the preceding Friday, the Willards, a family of four, proved far more proficient at handling cards than Levin and Chiddix.

Upon completing his shopping expedition and game playing, Levin returned to the movies and demonstrated that he could pick up both movies from the exact point where they had been paused. Following this impressive demonstration of interactivity, Chiddix accessed traditional 6 MHz analog cable channels by way of the set-top box.

Time Warner has not yet reached any decision on the pricing structure for any of the FSN services. Clearly, the Orlando trial will be an opportunity for it to experiment with different services and pricing structures to determine what is attractive to the customer and what is not.

Levin also made it clear that Time Warner ultimately plans to add telephony to all its cable systems. Currently prevented by state regulations from offering telephony in Orlando, Time Warner expects to ultimately enter both wireless and wireline services throughout its systems. High-speed access to on-line data services such as CompuServe and America On-Line will be added to the FSN in the future. — *Andy Morris* →

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Western Show a vendor's dream

The following news appeared in our daily at the record-breaking Western Show (21,500 attendees), held recently in Anaheim, CA. For more from the Western Show, see "SCTE News" on page 26 for the technical sessions coverage and the daily wrap on page 69 for the first of three parts covering new products introduced.

General session panelists rip regulation, look to future

If cable and telcos don't work together toward effecting positive legislation during the first part of 1995, both industries most likely won't see any regulatory relief until 1997. That was the opinion of opening general session panelist Dick McCormick, US West's chairman and CEO. Other panelists agreed that the time was ripe, with the incoming change in Congress, for the industry to focus on securing something more than this "little bit of relief" recently awarded operators wanting to add new channels. For the near term, however, the only outlet for high concept/higher priced networks is via a la carte carriage as the days of universal carriage for new nets are over. In addition, predicted TBS Chairman Ted Turner, the combination of oppressive regulation and telecom convergence will likely mean that as few as four to five significant cable operating companies may remain in existence in the U.S. by the end of this year.

Discussing competition, Viacom Entertainment Group Chairman Jonathan Dolgen stressed that cable needs to present its products in a more friendly manner. That point was echoed by Tele-Communications Inc. President and CEO John Malone, who noted that increased competition will force cable to pay more attention to developing more consumer-friendly navigation devices as consumers try to make their way through a 150-channel universe. Malone drew laughter when he observed that DirecTv was actually doing cable's digital signal delivery test marketing. "It's great, as long as we don't let them go too far."

Another topic was the delivery date for the next generation digital services. Malone said when they began negotiating with vendors for equipment, they assumed that the costs would drop with volume deployment. "In the short run I don't think we can exactly predict what this will cost us. In the long run I am a believer. This is like we are all waiting around for some miracle drug that killed some bacteria in a rabbit culture, but we have not tried it on humans yet."

For video-on-demand (VOD) to pay, ops will have to make significantly more than they do with current near-VOD (NVOD) equipment. Malone said in a recent TCI trial, they found a NVOD system with lots of choices generated about $8-9 a month in incremental revenue, which was about the same as the revenue generated by a VOD system run during the same trial. Although the customers claimed to like the VOD more, Malone said that it may be hard to economically justify VOD until they have new revenue-generating services which require it.

Bob Sullivan

Industry personnel from cable, telephony, computers and more converged on the show.

GTE mainStreet contracts game shows

GTE mainStreet interactive TV service announced a contract with William Carruthers Co. game show producers and packagers. The contract, the first of its kind according to the company, provides mainStreet the opportunity to use TV game shows *Press Your Luck* and *Designated Hitter,* properties of William Carruthers Co., in two-way interactive play-along formats. The two companies co-produced the interactive versions of both shows, the former offered as of Jan. 3 to subscribers in Carlsbad and Cerritos, CA, and Massachusetts.

Sony installs digital editing for Encore

Sony Systems Integration, a division of Sony Electronics Inc., announced the completion of five Sony Select systems for Encore Media Corp., a subsidiary of TCI. At

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what is now North America's largest serial component digital postproduction facility, Encore produces the majority of the interstitial program material for its Encore, Starz!-Encore 8 and six new thematic multiplex channels.

The installation consists of five edit suites, each containing a Sony Select System Level 6000 component digital editing system, comprised of a DVS-8000C switcher, DME-9000 mix/effects processor and BVE-9100 editor. All are housed in custom cabinetry and surround a centralized machine room containing four DVW-500 or DVW-A500 digital Betacam VTRs that are assigned to each suite.

Zenith and TCI network for schools

Zenith Electronics Corp. and TCI linked an entire Indiana school district to a new networking system that offers high-speed, low-cost data access throughout the district on the cable TV system.

This communications link serving the Evansville-Vanderburgh School Corp. in southern Indiana, eventually can lead to an interactive educational network with creative applications such as work-at-home and distance learning.

Using existing TCI cable TV lines and Zenith's Channel-Mizer, a premises device that connects baseband local area networks to cable systems, all 40 Evansville-Vanderburgh sites (37 elementary schools, high schools and administrative facilities) were linked in August, making it the largest schoolwide network to date in the country, according to the companies.

The system currently offers school administrators and teachers such applications as sharing districtwide information and reports, grade transferring and sending E-mail. Ultimately, this network can be expanded to include a computer-based, educational network that can link students through a PC, a modem and a regular cable TV line in their home. The network effectively eliminates telephone lines from being tied up and splitting in-home TV channel use.

Zenith assisted in implementing the system, which also included participation from IBM. The network's design is a competitive alternative to accessing through telephone lines, offering a potential new revenue source for TCI.

Cablevision, AT&T offer interactive video

AT&T Network Systems and Cablevision Systems Corp. are working together to provide an end-to-end digital video solution for the commercial deployment of enhanced pay-per-view and VOD to Cablevision subscribers in mid-1995.

Cablevision Systems has begun testing the digital server, cable network and a limited number of prototype digital boxes in Long Island, NY, under the terms of an agreement with AT&T. Cablevision has plans to reach a significant number of subscribers with EPPV and VOD services by the end of 1995.

AT&T will supply Cablevision Systems with digital video equipment and system software necessary to deliver the new services, including video server software developed by Interactive Digital Solutions, AT&T's joint venture with Silicon Graphics. High-speed switching of video streams will be handled by AT&T's GlobeView-2000 broadband system.

ALS to run rings around the bay

American Lightwave Systems, a subsidiary of ADC Telecommunications, announced that Viacom Cable will purchase more than $2 million in digital video transmission systems over the next two years as part of an upgrade in the San Francisco bay area to build a fiber-optic ring spanning over 400 km (approximately 250 miles). The network will use the ALS DV6000 digital transmission system, which operates at 2.4 Gb/s and simultaneously transports up to 16 channels of digitized broadband traffic.

The fiber-optic ring will originate at a regional headend in Pleasanton and connect headends in Napa, Petaluma, Pinole, Pittsburg, San Francisco and San Rafael. The network will eliminate Viacom's use of numerous satellite downlinks, creating a consolidated backbone network that will accept video feeds at any serving headend and deliver the signal to the regional headend for broadcast. Viacom also will transport its corporate technology, MIS and customer service traffic over the network using the DS3 (45 Mb/s) interfaces of the DV6000 system. Using ADC's Soneplex access/transport system, the DS3 circuits will be demultiplexed into DS1 signals to interface digital switches in the Viacom network.

Texscan selects technology supplier

Texscan/MSI made a major purchase of MPEG-2 encoders and decoders from Vela Research. The order, in excess of $2

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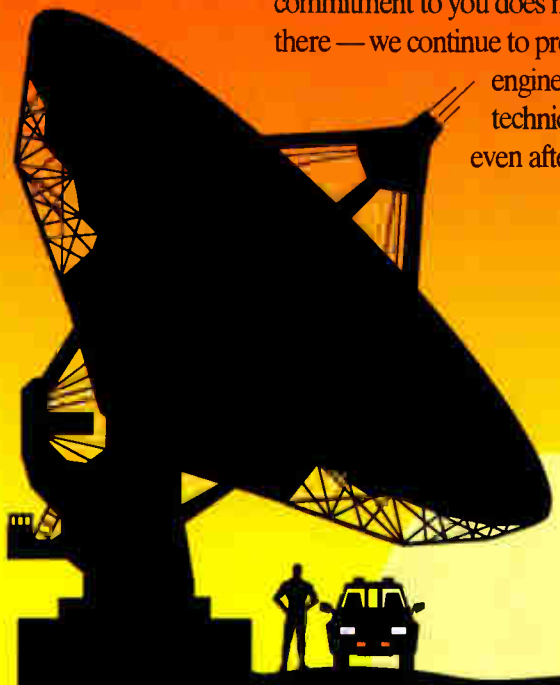

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million, is one of the largest orders received to date by Vela. Vela Research develops MPEG-2 video compression technology, which provides a tapeless process for Texscan's ad insertion applications.

C-COR provides service for VDT system

C-COR announced that Southern New England Telephone Co. has selected C-COR's new 750 MHz FlexNet amplifiers for the first phase (approximately 44,000 homes) of its video dialtone trial system to be built in West Hartford and Fairfield, CT. Construction with C-COR equipment was scheduled to begin immediately and continue through 1995. As part of the project, C-COR will be providing customer services, including installation assistance and technical training.

Contec establishes new repair facility

Contec announced the opening of its Southwest repair center, located in Phoenix, AZ. With the establishment of this new facility, Contec now has six strategically located repair centers throughout the U.S. Other centers are located in Schenectady, NY; Seattle, WA; Bloomington, IN; West Columbia, SC; and Tampa, FL.

The new repair center will serve customers in the region with Contec's internal tracking system to ensure accurate repair and rapid response, according to the company. It is located at 215 S. 28th St., Phoenix, AZ 85034; telephone (602) 275-1656.

H-P inks deals with Integrated Systems, Microsoft

Hewlett-Packard announced plans to incorporate Integrated Systems pSOSystem software into its first interactive set-top box. The software is a real-time embedded operating system and development environment that enables companies to develop embedded products rapidly.

H-P also announced it signed a memo

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The FTB's two operating modes, novice and expert, offer one button fault location and complete trace analysis. At the touch of the screen, you get a comprehensive fault table and a 16,000 point, 28 dB trace that can be analyzed using full OTDR functions.

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of understanding with Microsoft to work together on a future interactive set-top design. In addition, both companies intend to exchange information as they define future-generation hardware and software platforms for interactive TV.

Alpha and Johnson ride again

Alpha and Johnson Controls (who teamed up more than 10 years ago) announced they are joining forces with Interstate Battery System of America to provide more comprehensive powering solutions to customers. The new alliance launched the Alpha Advantage, a program that focuses on a combination of battery design, manufacture, delivery, recycling, ordering and service support.

Antec provides SCTE with scholarships

Antec announced it will provide the Society of Cable Television Engineers with 30 scholarships for 1995 Fiberworks technical training courses in digital telecommunications networks, broadband technology and fiber optics, worth more than $30,000. The grant includes six full tuition scholarships for the fiber-optic systems training course held in Denver, and 12 full tuition scholarships each for the digital networks training and the broadband cable TV technology courses, held in various locations throughout the United States.

Pioneer serves PBS

Pioneer New Media Technologies Inc. announced that it has entered into an agreement with the Public Broadcasting Service to develop a video server system based on its WORM (write once read many) digital videodisc system technology. The PBS video server will be integrated into the Smart School system, a means of providing teachers at educational facilities remote access to PBS programming and other educational material.

The video server system under development with PBS will be the first applica-

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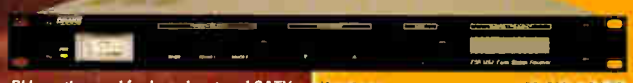

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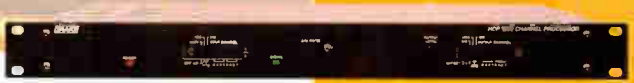

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Bob Sullivan

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tion of this new technology. The PBS server will consist of six dual-headed WORM digital videodisc drives (with expansion capability for up to 12) and storage for up to 500 discs (10 Tbytes). Disc retrieval, loading, unloading, etc., is performed by a computer-controlled robotics system.

In the near future, Pioneer plans to adapt this technology to a four-headed pickup unit for applications such as near-video-on-demand, video-on-demand and commercial insertion for the cable TV market.

Trilogy undertakes expansion project

Trilogy Communications Inc. has undertaken a major project to expand its manufacturing facilities and to sharply increase production capacity. Over 100,000 square feet are being added to the combined Pearl and Flowood, MS, manufacturing sites, providing a 60% capacity increase in the air-dielectric MC^2 product line. The target completion date is this month. Plans are under discussion for further capacity increases in both MC^2 and drop wire, as market conditions warrant.

Novell and GI explore broadband

Novell and General Instrument will explore joint technologies for broadband networking. The two companies will leverage their respective technologies in cable and networking equipment to provide customers with a comprehensive end-to-end solution. GI and Novell will work to develop products that make the integration of various network elements as seamless as possible to network operators.

Reliance Comm/Tec to supply Motorola

Motorola chose Reliance Comm/Tec Corp. to supply equipment based on next generation digital loop carrier (DLC) technology for deployment in its global personal communications services (PCS) system. The three-year multimillion-dollar contract calls for Reliance to deliver initial test bed units to Motorola in early 1995.

The DLC will be adapted in a development project bringing together Motorola's Personal Communications Systems Group and Reliance Comm/Tec's Transmission Systems Group.

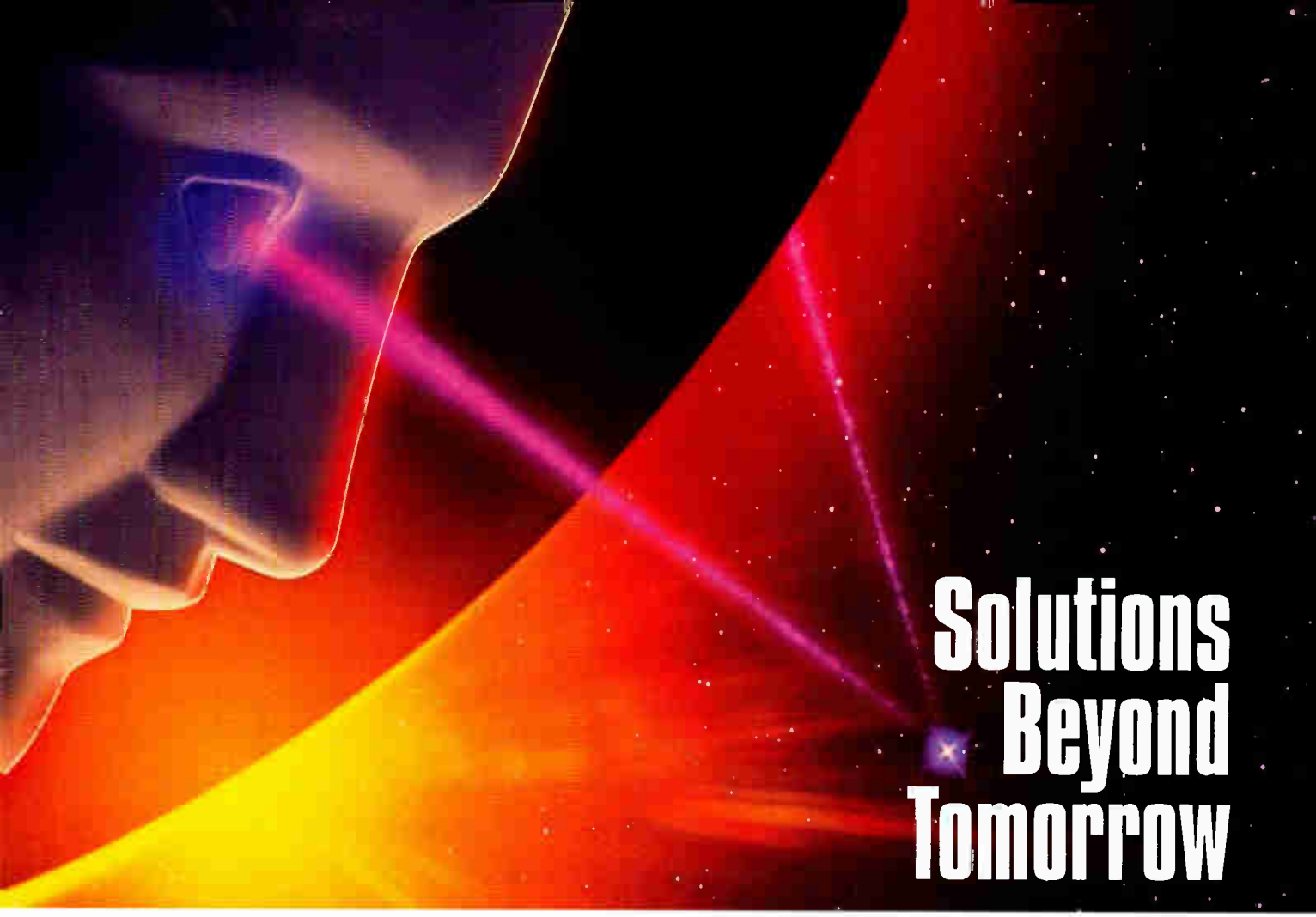
Reliance is offering its DISC*S DLC, which boasts a current installed capacity base approaching 2 million lines with Bell operating companies and independent telcos. It combines integral bandwidth management capabilities with a full array of remotely provisionable, multifunction channel units.

The Motorola system will utilize the technology and has been designed to meet the PCS Joint Technical Committee standards for a PACS system. This technology, introduced earlier this year as TeleDensity, has been optimized for voice and data telephony service implementation in urban and suburban areas. The system provides a cost-effective solution to that portion of the network that has been among the most expensive for operators to install and maintain. The flexible nature of TeleDensity allows it to be configured to serve specific customer needs with services ranging from fixed telephone services to wireless portability in the home or business, to wide area mobility.

Tellabs, NewChannels to deliver cable telephony in trial

Tellabs and NewChannels Corp., a division of Newhouse Broadcasting, announced the two companies will conduct a multiphase field trial designed to test the delivery of telecommunications services to homes and businesses in Greater Syracuse, NY, using the Tellabs Cablespan telephony-over-cable system.

The field trial will continue through the second quarter of 1995. The first phase is a technical trial of the Cablespan sys-



Waiting for the future? Vela Research — a subsidiary of Home Shopping Network, Inc. — has the technology solutions you need, and has them today. Vela has a complete family of innovative MPEG-based compression and video server equipment designed to offer the cable industry a solid migration path to the future.

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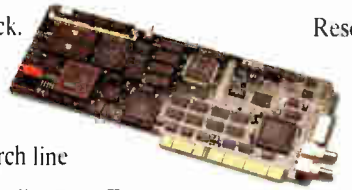
The flagship of the Vela product line, the Perspective 2000™ Video Server answers the need for an interactive multimedia playback solution. It stores digitized video clips, such as movies or commercials, in an MPEG-compatible form, then decompresses the data in real time to support near video-on-demand, ad-insertion and other applications.

MPEG ENCODERS

Vela Research's MPEG Encoder is capable of taking NTSC video and compressing it to MPEG-1 and MPEG-2 video bitstreams. The bitstreams can then be transmitted through a cable TV system, or they can be stored on a digital storage medium (like the Perspective 2000™) for later on-demand playback.



DECODERS

Rounding out the Vela Research line is a complete family of MPEG decoder board solutions that can decode MPEG bitstreams at SIF and CCIR-601 resolutions.

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tem within the cable distribution network. The second phase will gauge customer acceptance of the various telecommunications services that could be delivered by a hybrid fiber/ coax network.

- Viacom Cable of Pleasanton, CA, will purchase over $5 million worth of C-COR amplifiers for installation at several Viacom locations around the country. Equipment will include a combination of 750 MHz FlexNet trunks, bridgers and line extenders and 550 MHz trunks, minitrunks and line extenders.
- Cable AML announced that it has provided Falcon Cable TV with state-of-the-art broadband transmitters, replacing two older channelized transmitters, including the mid-range ITX-015 transmitter, which provides higher channel carrying capacity than the STX-141 it replaces, and a high-powered transmitter to replace the older MTX-132 channelized transmitter.
- Scientific-Atlanta has moved its customer service and technical assistance center into a new, expanded 15,000 square foot facility designed to better accommodate the company's growth in the cable TV and telecommunications industries. S-A also announced its digital video distribution system will carry video images generated within each Olympic venue, as well as those originating at the International Broadcast Center, during the 100th anniversary of the Olympics to be held in Atlanta in 1996.
- Digital Equipment Corp. announced the opening of its first Digital Media Studio in Tarrytown, NY. The company says the studio is the industry's only center that works with content developers to design, develop, encode, test and integrate interactive applications into multiple broadband interactive networks using multiple set-top devices.
- Cox Cable Communications announced that it expanded its test of on-line services through cable. In 1995, full Internet access provided by Prodigy will be introduced to at least one Cox market, rolled-out to 200 additional Cox customers in San Diego, and tested in a new trial of the service via cable in Omaha, NE.
- C-COR Electronics Inc. announced a 15-year lease commitment, with an option to buy, on a 60,000 square foot manufacturing facility in Reedsville, PA, 24 miles from the company's State College headquarters. The plant will be used to manufacture RF amplifiers and line extenders being installed in global communications networks.
- CableData formed the Convergence Technologies Group, comprised of experts from the telecommunications and cable industries. The specialized team will focus on subscriber management and billing support solutions for cable TV, wireline/wireless voice and data services markets and content providers.
- Arrowsmith was awarded its first contract by an RBOC when Pacific Bell agreed to install Fleetcon in its 500-truck special services dispatch operation used throughout the state of California. Other contracts were awarded by Cox Cable Louisiana and Comcast in Baltimore. Cox will begin using Fleetcon with a roll-out of 100 trucks in its Louisiana system, which serves 235,000 customers. Comcast will install Fleetcon throughout its 70-truck fleet, which serves 256,000 subscribers.

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The Society of Cable Television Engineers sponsored the following technical sessions at the Western Cable Show '94 held recently in Anaheim, CA. Further happenings at the confab are covered in "News," which starts on page 10. For details on new products unveiled at the show, turn to page 69.

Telephony on cable's horizon

"As we begin to offer a full slate of telecommunications services, everything that we do and every process that we currently have in place will change."

So said Moderator Chris Bowick, group vice president of technology at Jones Intercable, at the "Introduction to Telephony" session. The cable industry's need to remain focused on all those changes was highlighted by all the speakers.

Dave McCarthy of Bell Northern Research brought up the fact that cable's revenues from traditional services are

flattening out and therefore limiting growth. As well, there is competition nipping at cable's business. The need to find other revenue services is obvious.

"There's a significant possibility that as the cable companies and others encroach on the access market to the interexchange carriers that the local exchange carriers may find ways to reduce access charges," McCarthy said, "Nevertheless, that represents one of the most significant opportunities to go after."

McCarthy also considered second line service (kid's phone line, modems, faxes, etc.) as an interesting opportunity for cable because there are about 7 million second lines in the United States that are growing at about 11% per year. Because these are not "life line" services, McCarthy suggested lower cost technology could be used for these services.

Antec's Director of Applications-Based Technology J.R. Anderson considered the issues with adding the incremental revenue offered by telephony in a modular fashion. He also mentioned the magical figure of 53 minutes of total downtime per year. This is what one carrier currently requires to get certification to haul long distance traffic. Getting that type of reliability doesn't just require excellent technology, but retraining the way our technical

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people work, Anderson suggested.

"One thing I really want to stress is that friend of ours called the drop system," added Anderson, "We really better clean that baby up. If you want to run 64 QAM payloads into the house, you're going to have to address and tackle issues like microreflections."

Jay Junkus, who is AT&T Network's systems switching market manager for CATV, offered up a broad overview of switching and transport to get the CATV-minded attendees accustomed to some terms and general ideas. He talked about why a telecommunications switch is needed, what it does and its functions. Finally he showed how the switch is built and what it looks like.

Telephony management and support systems were tackled by the final speaker, Bob Richardson, director of business development in the customer network solutions organization of Northern Telecom. He focused on processes and systems, cost structure, impact and opportunities. He also brought up the interesting point that cable has an chance to do things right the first time since we're starting from scratch. This could give the industry an advantage because local exchange carriers have a burden today of hundreds of support systems that duplicate data and create the need for many employees to take care of those systems.

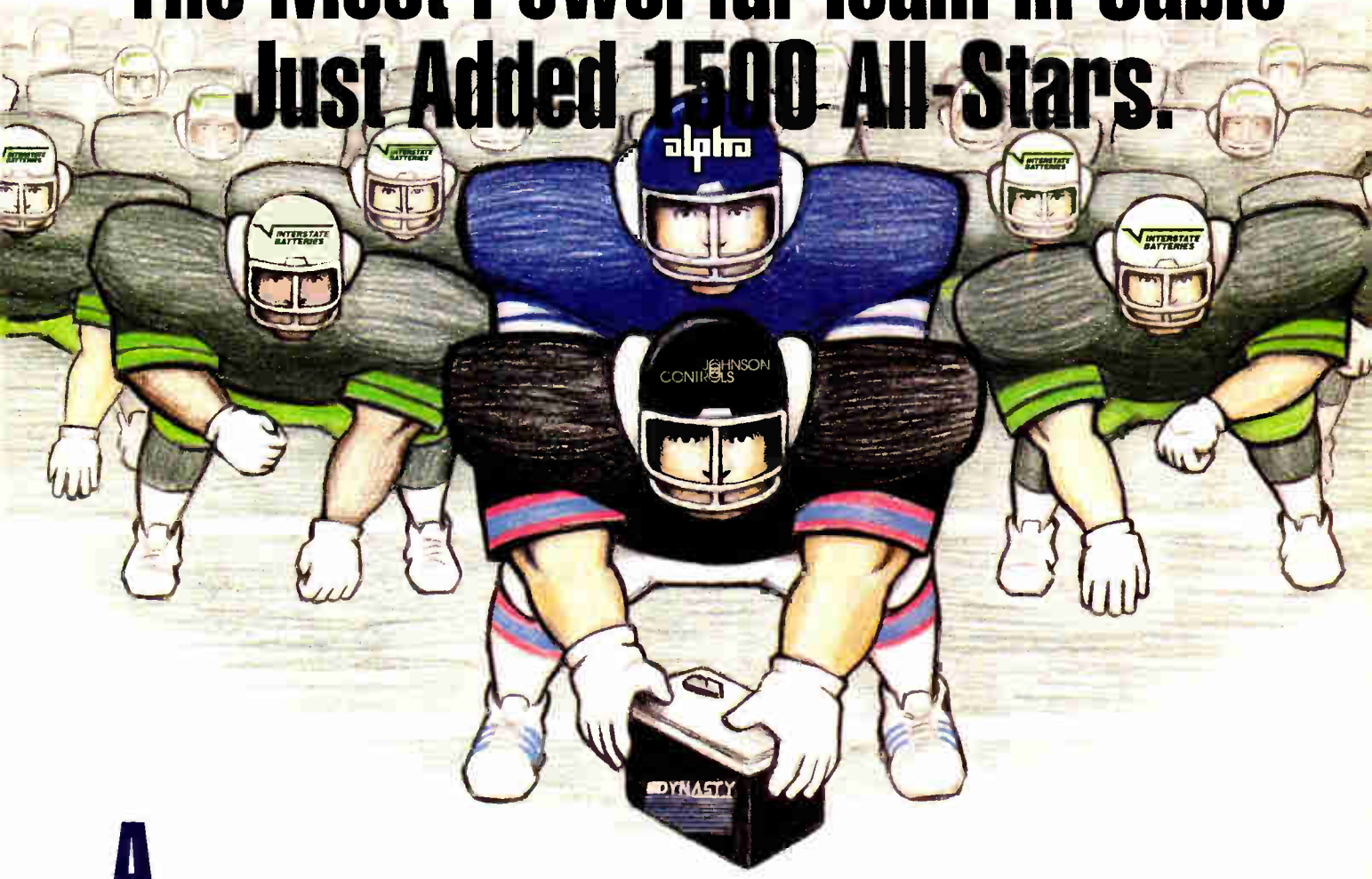
Update: FCC/Washington

The annual "FCC/Washington Update" technical session, moderated by SCTE President William Riker, featured speakers Ron Parver and John Wong of the Federal Communications Commission's Technical Services Team, George Hanover of the Electronics Industries Association, and Wendell Bailey of the National Cable Television Association.

Parver covered two recent commission revisions. An update of the commission's must-carry rule now allows for partial carriage of TV stations that are not must-carry. Also, there will no longer be copyright liability for stations in the same ADI (area of dominant influence) as a cable system.

Wong only touched upon the new requirements for emergency alert service, as its text had yet to be released, but said the commission was resolved to improving upon the previous requirements. This year will see the FCC's proof-of-performance tests in action, of which Wong said both intrusive and nonintru-

The Most Powerful Team in Cable Just Added 1500 All-Stars.



Alpha Technologies and Johnson Controls teamed up more than a decade ago to provide the highest quality cable television power available. Now they announce the addition of a new member to their winning team—Interstate Battery System of America.

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ALPHA TECHNOLOGIES

sive testing were being considered.

Hanover discussed cable-ready TV set requirements for the consumer electronics industry, which are be to implemented by mid-1997. Further, he discussed compatibility problems associated with the coming of digital.

Defending cable concerns, Bailey challenged Washington's wiring reconsiderations, saying they are not about customer ownership of the wire, but allowing telephone companies to run on top of cable drop. He called these reconsiderations dangerous and transparent, "And the fact that the commission has given them any credence at all makes me believe that the commission on this issue was out to lunch, frankly."

Taking issue with the must-carry rule, Bailey contested rewarding the broadcaster of a noisy signal with a channel slot that could be used to deliver a clean signal from another program service. Also bad for the cable industry is the infrared compatibility ruling, which while allowing customers to acquire their own remote controls, essentially freezes market shares by requiring the use of existing IR codes in new set-tops. As for the wrangle with consumer electronics over compatibility, Bailey summed it up as a dispute over the number of commands the customer could invoke through the TV set and into the set back device: cable believes it needs more commands and consumer electronics says it has offered plenty.

Broadband telecommunications

Ralph Haimowitz of the SCTE led off the "Introduction to Broadband Telecommunications" session with a history of cable TV, from its rural off-the-air beginnings to its urban birth with satellite reception.

Gary Kim of the National Cable Television Institute followed with a detailed look at the physical layer of the hybrid fiber/coax network and the revenue streams it offers: personal communications services (PCS), cable phone and video multimedia. Previously, only cable operators and telcos were figured into the competitive scenario. But nowadays, electrical utilities have to be considered as well. In Kim's estimation, there is money to be made for at least two broadband carriers in every market.

Interactivity

"Interactive Case Studies" offered attendees an introductory look at Via-

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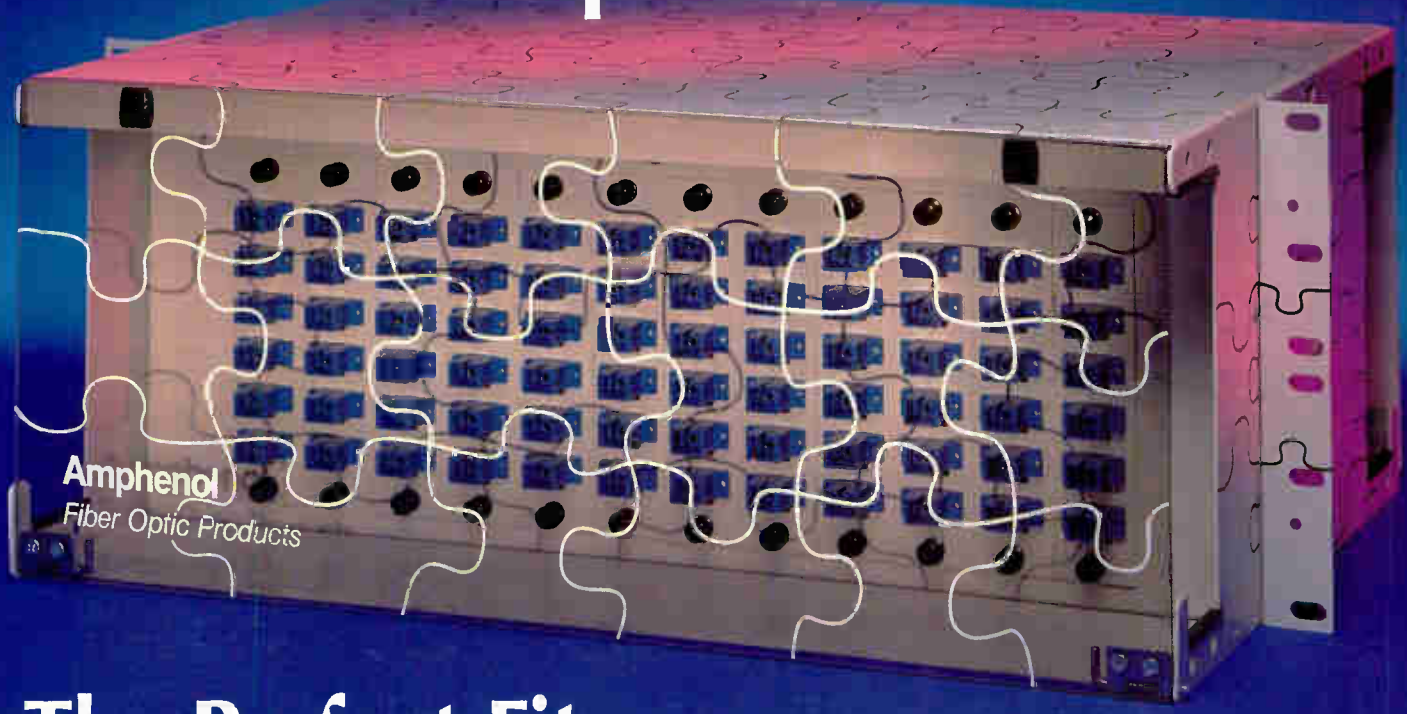

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com Cable's Castro Valley, CA, system designed for enhanced and interactive services. Del Heller, Viacom's vice president of engineering, described the system and the fiber-optic ring being built to interconnect it with other properties in the San Francisco Bay area. Reregulation and the resulting loss of control in the internal wiring, rearrangements and connections in the home will be a problem for any broadband network, telco or cable, says Heller. Viacom's tests make it apparent that high pass filters will likely, if not definitely, be required in the home in order to control return system ingress from inside the home.

Viacom Director of Telecommunications Don Dallas says the company's interest in telecommunications is in the alternative access business. Looking forward, Dallas said the company cannot afford to deploy the switch capacity to provide the dial tone to the end-user customer in the start-up phase. But the ring will allow the company access to remote switching capacity it could share with its other systems or with other companies on a common basis, which is what it expects to do. To make this successful, it will have to interconnect with Pac Bell local end offices.

Mark Dzuban, engineering director of AT&T consumer video services, detailed requirements for the system's return spectrum. For video telephony, for instance, Dzuban envisions a device like a host digital terminal that will allow chunks of 64 kbits to be ganged up to make the call. When using higher levels of modulation, much cleaner plant is required. Dzuban advised reducing node sizes, using filters and making sure everything at the termination is shielded and not dumping garbage back into the system. This opens a whole other discussion on terminal equipment requirements and a lot of issues not yet addressed. So, in the meantime, it seems like QPSK, though not the most spectrum-efficient, is certainly robust and capable of meeting a lot of the requirements.

Video focus: POP testing

With the Federal Communications Commission required proof-of-performance (POP) testing looming just around the corner, Western Show speakers at the "Video Proof-of-Performance Testing" session spotlighted possible pitfalls and offered attendees the opportunity to ask system-specific questions.

Daniel Marz, manager of RF, headend and telephony for General Instrument, led off with a focus on instrumentation at the headend and POP testing. He suggested ways to avoid the problems that many people can get into when making the FCC-required measurements.

Magni Product Marketing Manager Ed Kioyoi briefly covered test equipment needed for proper video signal evaluation as well as examining common distortions that can occur in the video signal. He highlighted automated measurement systems and their advantages in performing some of the POP tests.

John Cecil, cable TV applications engineer for Hewlett-Packard, focused on three of the required measurements: differential gain, differential phase and chrominance-to-luminance delay. He defined each of these specifically as well as talking in detail about test equipment considerations and accuracy.

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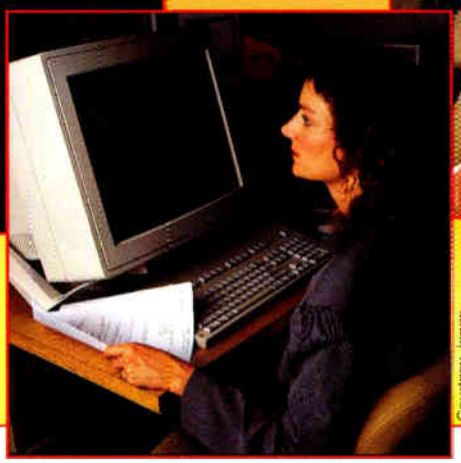

Courtesy Jones Education Networks

Enhanced services over advanced cable networks — Part 1

This article investigates the efficacy of the new advanced cable networks for delivering enhanced TV services to the home. In this part of the article, the failure of a previous attempt by cable to launch two-way interactive services is reviewed and an evaluation of the potential for success for the current plans for new enhanced services is presented. The final installment will describe the subtle features of the new architectures and enhanced services, and offer a supposition of why two-way interactive TV will succeed.

By R.S. Burroughs
Manager, CATV R&D
Panasonic Technologies

Paraphrasing Yogi Berra: "It looks like déjà vu all over again." Will history repeat? During the 1994 Western Cable show in Anaheim, CA, I had flashbacks to an earlier Western Show some 22 years ago. Then it was the "information utility," not the "information superhighway," that was going to enrich our lives. We were creating the "wired nation." The cable TV industry was going to string coax to virtually every home and business in the nation. Interactive two-way addressable systems were the technology of the day and Teleprompter (the Tele-Communications Inc. of the 1970s) was already constructing two-way coaxial networks in several of its major systems. As well, a two-way interactive field trial was ongoing in its El Segundo system.

The first advanced network

The most significant advance to cable networks since the tree-and-branch structure was introduced at that early Western Show in the Disneyland Hotel. Teleprompter showed a satellite downlink for receiving cable programs from centralized studios to potentially all cable systems in the country. In 1972 there was no HBO, no MTV, no CNN. Only public access and local programming were widely available.

As increased capacity two-way systems were being deployed by Teleprompter and others, there were two divergent groups with widely different views of what enhanced services should dominate the cable networks. One camp believed that local origination should be the primary enhanced service. The premise was that local origination would substantially increase penetration and therefore increase revenues. The second camp believed that two-way interactive services also would bring in new subscribers and these services would add significant incremental revenues.

Neither premise was correct because both were too expensive and both miscalculated subscriber demand. In the case of local origination, expensive studios were built and low budgets did not produce programs with sufficient appeal to attract many new subscribers. In the case of two-way interactive, the two-way addressable converters and the computers in the headend were the major expenses. This was not the primary problem. There just were not any interesting interactive services. There were

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Reader Service Number 21

Table 1: Cable TV stats ('70s vs. '90s)

	1975	1993
Number of subscribers	~9.2 million	~58.8 million
Penetration of TV households	13.2%	62.5%
Revenue	~$804 million	~$21 billion
Channels	36 + two-way	150
Services	Basic, pay	Basic, pay, extended basic, PPV, advertising
Competitive threats	MMDS, STV, movies, broadcast (UHF, VHF)	Movies, video rentals, video games, DBS, telcos, MMDS, PCs and multimedia in the home

no home video games and no vision as how to make interactive entertaining.

It is significant to note that pay TV was not thought to be a viable near-term service. This is because the movie studios would not cooperate with cable to make product available. In California there were actually laws against pay movies. Additionally, during the 1970s an operator would have to use VTRs as a source to deliver the movies to subscribers. Furthermore, using tapes in 3/4-inch VTRs was awkward, expensive and produced relatively poor quality by the time the signal got to the TV set (especially without time base correctors, which at the time were extremely expensive).

There were some minor successes with showing X-rated movies as pay events. It was in the early 1970s that movies such as *Deep Throat*, *The Devil and Mrs. Jones* and *Behind the Green Door* were released and actually played in middle-class neighborhood movie theaters. Following these movies, several other low-budget producers made more X-rated titles available and these studios (if you can call them studios) were not particular where their movies sold. Every and any distribution channel would do. Hotels, motels and cable were ideal candidates. The customer was not so interested in the video and audio quality received at the TV set. This was primarily because of the content but also because the audio and video quality of the original film were usually not too good.

The satellite changed the thinking of both cable operators and movie studios. It drove the expansion of cable in the 1980s. Two-way interactive services and local origination were the original motivation for building the 36-channel two-way networks. But it was the new programming opportunities created by satellites that brought cable to its dominant position in TV delivery today. Not only did satellite delivery attract movie studios, as an additional distribution channel for their product, but it also encouraged entrepreneurs to develop new programming exclusively for cable. HBO paved the way but more services were quick to follow because of the ease in entering the new business.

Satellite-delivered programming displaced both two-way interactive services and large-scale local origination. We still have local origination but not to the extent to which it was envisioned in the 1970s. Satellite happened at just the right time. Three of the significant factors in the success of satellite delivery were:

- Cable had networks with excess capacity.
- U.S. aerospace programs had created sophisticated satellite technologies and manufacturers of satellites were looking for commercial applications.
- Conditional access technology developed during the 1970s.

The conditions were right for satellite and cable to merge. In retrospect it seems perfectly obvious but our lesson for today is that until the 1972 Western Show, it was anything but obvious.

What went awry?

Except for a few experiments, such as Warner Cable's Qube system, there have been no significant two-way interactive businesses to date, even though the technology worked and has been available since the early 1970s. A more detailed analysis of what went awry is helpful in determining what is different about today's advanced cable networks and environment.

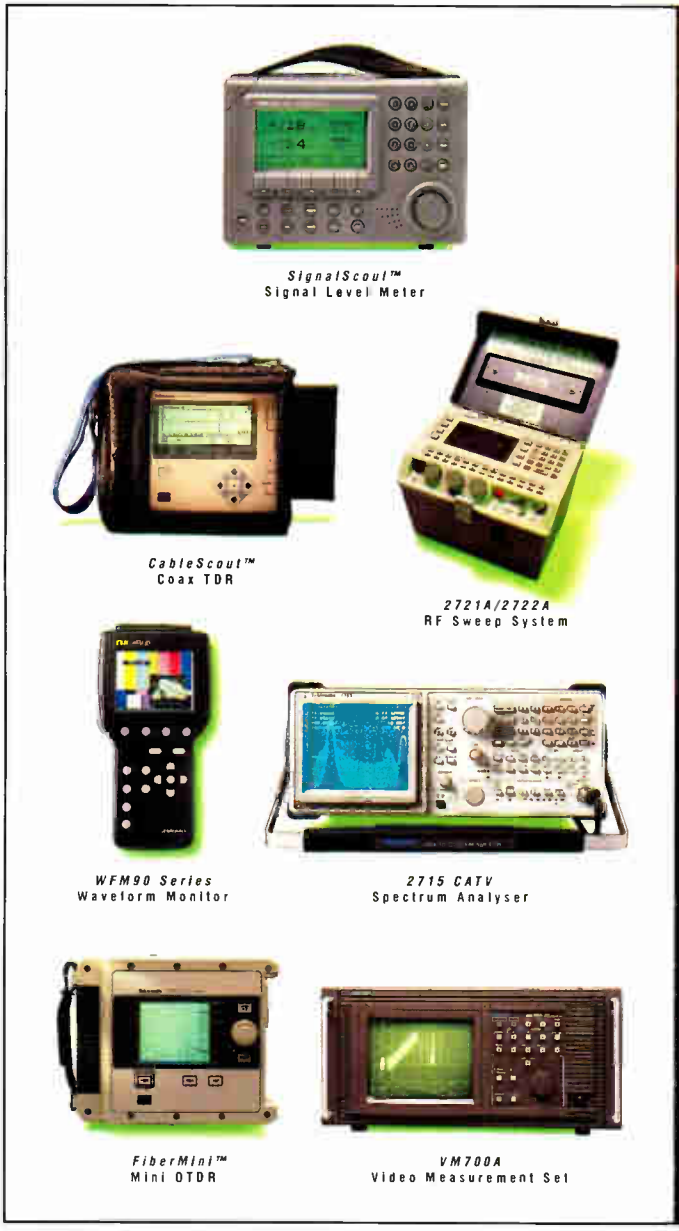
A problem with early interactive services was that they were not very entertaining. Interactivity was new to consumers. There were no video games, no VCRs, no ATM machines and no personal computers. Most of the interactivity of these early services used text extensively (which was hard to read and boring) and only crude graphics. Audio and video were almost never used in the interactive applications because they could not be manipulated by the host computer.

Television is dynamic, alive and entertaining. Interactive services should at least to be as entertaining as other TV programming to be successful. Good audio and video are key elements. In the 1970s, computer software was still an art and it was extremely difficult and expensive for people to create any meaningful, not to mention entertaining, interactive applications. Today software has very powerful development tools and graphics capabilities have increased dramatically. Audio and video are becoming standard features of current PCs. The computing power also has grown exponentially such that PCs today are hundreds of times more powerful than the leading minicomputers of the 1970s and manipulation of audio and video with home computers is now routine.

I speculate that the cable industry in 1972 had not reached the critical mass required to either germinate or sustain growth of two-way interactive TV services. To illustrate this point, Table 1 compares the cable industry in 1975 to the cable industry in 1993. Cable only had 9.2 million subscribers in 1975, which represented only 13.2% of the total U.S. TV households. It was widely conjectured in the 1970s that subscribers had a strong demand for two-way interactive services and virtually every TV household would have a two-way coaxial connection. But, it's taken more than 22 years to get cable penetration to 62.5% and this has been with virtually no interactive services.

Cable's current penetration level is significant enough to attract the attention of Congress and major competitors, but it is not as significant as what was envisioned as the wired nation. With only 13.2% penetration it was difficult to attract capital for the necessary investment in new interactive services. It was, however, attractive to hardware vendors, many of who had no previous experience in cable. Therefore, the 1972 Western Show was populated primarily with vendors displaying the hardware needed for the wired nation but there were virtually no interactive service providers of any significance.

Consumers weren't ready for interactive and the financial condition of cable also was not ready. The yearly cable revenue in 1975 was only $804 million.



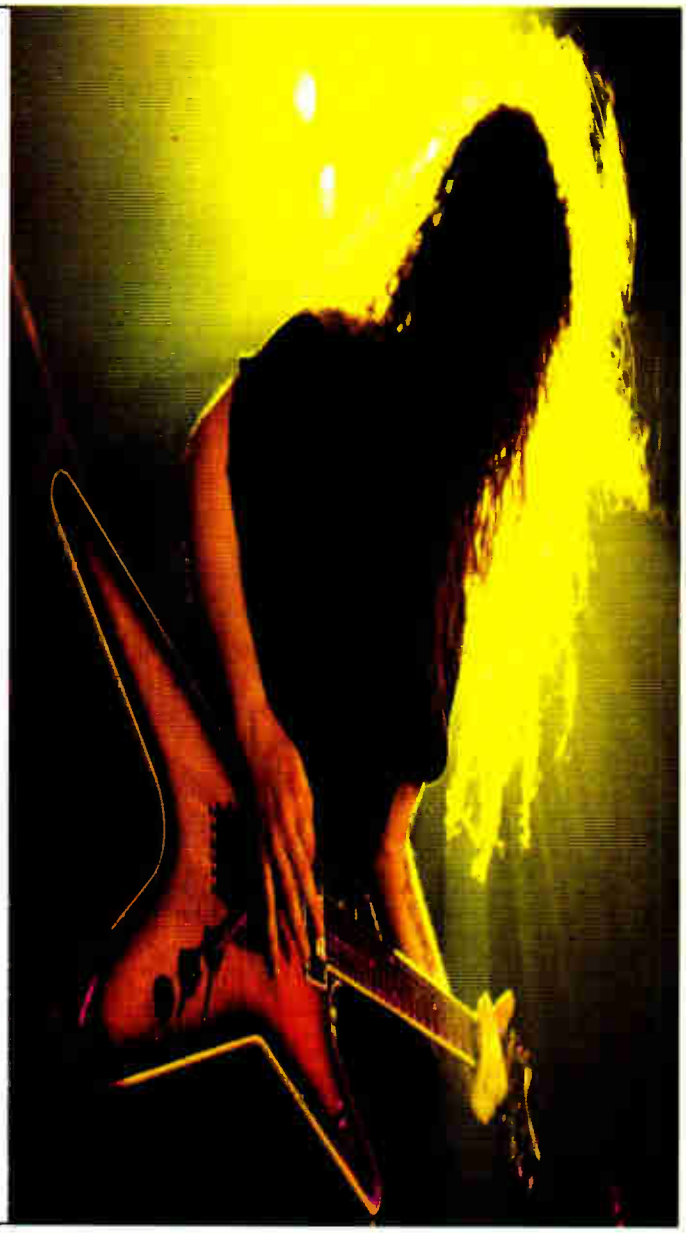


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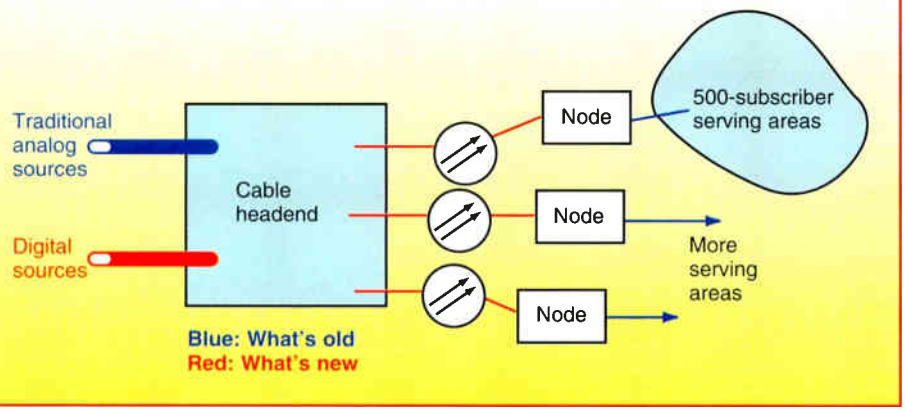
Figure 1: Basic advanced cable network



A full blown two-way interactive cable system of 10,000 subscribers was estimated to cost about $10 million. With the 9.2 million subscribers cable had in 1975 it would cost more than $9.2 billion to deploy two-way interactive systems to just the existing cable base. The newly constructed cable networks did not generate the expected consumer demand and consequently they did not generate enough revenue to attract the capital to build the wired nation.

There was no significant competition to cable in the 1970s. Cable had just been given protective status by the government, limiting competitive pressures. With no competitive pressure threatening to steal subscribers there was not much of an incentive for cable to invest in new two-way technology indefinitely for an uncertain return on investment. This is akin to why the MultiPort setback decoder business failed: No incentive, no pressure, no support, no success. Even without competition, cable was not able to justify the cost of its new systems and services. Today there is competition to cable including the telcos and direct broadcast satellite (DBS). Only cost-effective systems will survive. Just as in the 1970s, there will be economic pressure to only deliver services that can pay their way on the network.

A key indicator that marks the transition from a two-way interactive system focus to a business based on satellites occurred in 1973. In that year Teleprompter had just moved its stock to the New York Stock Exchange. After only a few months, it was required to restructure its operations because it did not meet the financial requirements of the exchange. A freeze was put on hardware purchases and many employees were let go. This was a huge blow to the industry since Teleprompter was the leading builder of the two-way interactive cable systems. In retrospect, the business model for these new systems just did not make financial sense.

Consumers were not ready for interactive in the 1970s. Now that we have gone through a couple of decades of interactive video games and personal computers, at least the young are ready. The lesson to be learned is: many times the dynamic business issues outweigh the marketing hype and unforeseen technologies and applications often become the force that drives an industry forward.

Why now?

From past experience the future of interactive cable TV at first might not look promising. It appears that the same mistakes are being made again. The world was not ready in the 1970s for interactive cable TV. Is it ready now?

Cable has grown significantly over the last 22 years. If cable has learned the lessons of the past, then I believe it is close to attaining the necessary "critical mass." Cable has achieved a level of economic power and widespread consumer acceptance. Digital TV and interactive services are maturing. And most significant, the competition for riding the information superhighway is international with major corporations partnering and positioning for the future.

Why cable?

In 1975 cable could not muster sufficient force to deliver the wired nation. But today, with $21 billion in revenues, with more than 62% of the TV audience and with its networks passing over 90% of the homes, cable is currently in the best position to deliver interactive entertainment services to the home with its advanced broadband architectures. If it takes more than a few years for cable to achieve success with interactive services, then cable may not have such a great advantage over the competition that is breathing down its back. For now, cable seems to be making the right moves to be the first to succeed with interactive TV.

I believe the major reason that this time we will see two-way interactive cable services succeed is because of the competitive pressures in the market. Other key elements will be the standardization and deployment of digitally compressed audio and video products as well as the status of the regulatory environment. If there is a level playing field, then cable appears to have an edge over the competition.

FTTN — the second advance

What has cable done and what is cable doing to be the leader in the coming age of interactive services? What are the key changes cable has made to its networks over the past five years that anticipate the future services?

Figure 1 shows the two most significant changes to cable architecture in the 1990s that will have an effect on what new services can be delivered. (New features are shown in red.) The first major change to the traditional broadband tree-and-branch architecture since the introduction of satellite delivery are the fiber nodes. Cable, by using analog optical transmitters, has found that it's cost-effective to build cable plant with fiber-to-the-node (FTTN) configurations. These configurations leave the traditional coaxial distribution in place (the fabled "last mile").

Cable has demonstrated that the installed coaxial cable to each home can easily accommodate 1 GHz bandwidths, which should be adequate well into the next century. And since the existing coaxial distribution to the home is the major portion of the total cable miles in a system, it is cost-effective to leave that coax in place and bring fiber to a node that feeds these coaxial distribution paths. Each fiber node is currently anticipated to serve about 500 subscribers connected to the coaxial distribution. Each node then defines a specific 500-subscriber serving area. It is not a simple coincidence that the concept of 500-channel systems also has become popular in the press. As I will demonstrate, 500 channels will allow each home theoretically to have a dedicated channel.

The significant advantage of the FTTN architecture is its ability to isolate each node (and related serving area) of

"Consumers were not ready for interactive in the 1970s. Now that we have gone through a couple of decades of interactive video games and personal computers, at least the young are ready."

the network by using individual optical transmitters in each path. By using independent optical transmitters we are able to direct completely different programs to each serving area. In actual practice this ultimate limit is not likely to occur because traditional analog programming is broadcasted and will remain that way for a long time. Even with switchable programming (different programs switched to different nodes) broadcasting provides a significant advantage in reducing the cost of processing and switching equipment. By broadcasting popular programs to all nodes, instead of switching different programs to separate nodes, headend equipment costs and complexity can be reduced. In a competitive environment it will be the most cost-effective delivery systems that will dominate.

The total system channel capacity of FTTN architectures can be theoretically increased by multiplying the channel capacity of each serving area coaxial distribution network by the number of fiber nodes in the system. If we had a 1 GHz analog coaxial service area distribution system with 150-channel capacity, then each node could carry approximately 150 distinct channels. Therefore, a system with 100 nodes (50,000 homes), could theoretically carry 15,000 channels. Note that this example does not assume digital compression.

So why is there so much talk about 500-channel systems with digital compression? Cable already has the capability to go way beyond 500 channels with analog FTTN architecture. One reason is that video-on-demand (VOD), telephony and other interactive services do not make sense if we are constricted to 500 broadcasted channels. Therefore, some switching is necessary for certain system loads and services. By using switched nodes a system could effectively give a separate program

channel to each home, but there is a significant cost trade-off for increased capacity.

Another consideration for FTTN architectures, and there are many variations on the theme, is that with the coaxial distribution we still have problems with the return path. But, not to worry. We also can multiply the return path capacity by the number of nodes. If we use a standard 5 MHz to 40 MHz band for the return path, we have 35 MHz available to each of the 500 homes in a serving area. Another advantage, although it adds significant cost, is that because all the nodes are separate paths, we can process each node in parallel and therefore reduce the access time, which is critical for many interactive applications such as telephony and taking orders for movies or goods during peak audience hours.

Digital — the key advance

In 1990 General Instrument submitted its proposal to the Advanced Television Systems Committee for an all-digital high definition TV (HDTV) system and changed the future of television. And from digital ATV the next logical step was compressed NTSC and the realization that we could put 6, 8, 10 or more programs into a single 6 MHz channel. If you do the calculations on the capability, the figures are staggering. Just multiply the number of channels in the previous analog system example by 10. This gives 150,000 channels for a 10,000-subscriber system, allowing 15 channels per subscriber. But, don't get too excited. Although there is tremendous capability for digital, analog will be around a long time. Full digital systems that can achieve the maximum capacity of the networks will be inordinately complex and expensive and most likely will not be the most cost-effective approach for delivering traditional forms of cable programming.

To see why digitally switched systems are expensive, an analysis of what goes on in the headend is adequate. There are two relatively low-cost ways digital compression can be deployed in cable. You can digitally compress the program sources and then convert to analog at the headend so that existing subscriber equipment does not need to be changed. Or you can take a major leap and deploy digital into your network, requiring digital terminals at subscriber access points. The first approach is being used by systems for ad insertion. And some companies are proposing interactive services using digital processing at the headend and analog delivery to the subscriber. Digital to the headend and analog to the subscriber is the lowest cost approach to adding digital compression to cable.

"A full-capacity digital system will be so complex and expensive, I envision that the majority of headends will not come close to accommodating the additional equipment."

The next way to add digital compression is to take an approach similar to TCI's "headend in the sky," where you digitize your programs at a central location and uplink them through a satellite to all of your systems.

The places you have to add cost at the system level are digital terminals in the homes, demodulation of satellite signals at the headend, and digital remodulation for insertion into the networks. Note that conceptually the digital satellite signals could be received at the headend and inserted into standard analog modulators to be sent through the network in analog form. Also note that we do not have to do any switching of the signals from the satellite. All signals are typically broadcast to all subscribers.

If we now want to switch programs to different nodes and be able to add local content, then several things are needed. We need to add switching from the feeds we want to switch (satellite, video server, etc.). We do this with a transport subsystem that multiplexes the programs to the appropriate nodes and formats the digital signals to endure the trip through the fiber and coaxial networks. The transport layers most frequently proposed are either ATM (asynchronous transfer mode) or MPEG (Motion Picture Experts Group) standard transports. ATM is being proposed primarily by telephone companies and MPEG-2 transport is being proposed by cable and has been selected as the basis for the Grand Alliance's ATV system proposal for digital HDTV in the United States. In addition to the digital transport, switched sources require digital modulators at each node and each node also requires individual lasers.

In our previous FTTN example, at least 70 digital modulators and related transport equipment would be required for each serving area (assuming 6:8 compression ratios). This implies that 7,000 modulators and related equipment are needed for full capacity. This equipment will be typically more expensive than existing modulators and processing equipment. And there is hundreds of times more of it. The financial dynamics of headends will change significantly even without considering the cost of video servers. All of this hardware is very expensive and departs from cable's traditional method of supplying TV signals to subscribers by doing as little processing in the headend as possible.

A full-capacity digital system will be so complex and expensive, I envision that the majority of headends will not come close to accommodating the additional equipment. Cable will surely not deploy a fully loaded system before there are significant revenue-producing services available. This then supports TCI's approach, which minimizes the cost and complexity of equipment at the headends. But, because of the ease of switching and interfacing digital signals, it will be relatively easy to add functionality as new services become available. Initially, two-way interactive services (such as VOD, home shopping, etc.) will most likely piggyback onto the satellite digital services.

Digital means a lot more to the advanced architecture and future enhanced services than just more channels. Because digital is easy to packetize and time-compress, it is easy to interconnect to other networks and systems such as the telephone network and the Internet. Digital also is becoming the standard form entertainment media takes in the home, from digital music, to PCs, to interactive digital CDs. Digital also allows convergence of entertainment media in the home. By "convergence" I mean that if the information media (such as TV programs) are digital, and specifically if it conforms to an international standard such as MPEG, then no matter where, when or who generates the information it is usable across virtually all home electronics equipment. That's whether the equipment is a video recorder, a TV set, a PC, a set-top box or a video game. **CT**

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Reader Service Number 18

The impact of technology advancements on TV programming

The following is adapted from a speech given to the Cable and Satellite Summit in Hong Kong on Dec. 1, 1994.

By Robert M. Zitter
Senior Vice President, Technology Operations
Home Box Office

"Despite the attention given these days to technology, we must remember the fact that consumers do not buy technology. Consumers seek out and buy entertainment and information."

Many people today are focusing on the numerous technological advancements occurring all around the TV industry and beyond. Attention is focused on advancements impacting computers and telephony leading to the so-called "convergence" of these technologies with television. How do these technological advancements impact the programming television carries in the future?

Consumers buy info

Despite the attention given these days to technology, we must remember the fact that consumers do not buy technology. Consumers seek out and buy entertainment and information. While they use various forms of technology to receive it, the technical gadgets and devices used are simply a means to an end. However, the changes in TV technology are modifying the way content or programming is made available. These changes are making programming more convenient and are increasing the quantity and improving the technical quality of programming delivered to consumers.

Past technological changes in television are illustrative of what we can expect. Not too many years ago, most people around the world had access to only two, three or four broadcast channels in their local communities. Cable TV, however, expanded the horizon to provide 50 or more channels of choice to consumers.

The advent of satellite TV brought about a new economic efficiency for those who would create and distribute programming throughout the United States. Instead of building a network of telephone lines or microwave towers nationwide, a program network could distribute its offerings far more affordably by using one satellite transponder.

ENG (electronic news gathering) and SNG (satellite news gathering) have changed the way the world views the events around us. Today anyone in the world can be immediately connected to events happening around the corner or across the oceans, live.

Conditional access and encryption also have changed television significantly. With the ability to secure and control TV

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Reader Service Number 15

signals, the new businesses of pay TV and direct broadcast satellite (DBS) have become possible. The revenues derived from subscription TV have helped support many new forms of programming.

It is my belief, and I suspect one shared by many others, that the greatest technological impact on our industry will come from digital TV. When the history books are written about this era I think digital TV will be considered the single most significant change, and hopefully, improvement in TV technology.

Digital TV provides several attributes:

1) It permits us to improve the technical quality of the pictures and sound we deliver to our viewers. Naturally, this is only true if we do not trade too heavily on the quality vs. quantity equation.

2) Digital TV offers significantly improved security. Adequate security of TV signals is required in the subscription TV business and is mandatory as we consider various forms of transactional TV.

3) It provides increased "throughput" in all media. Through digital compression we are now able to provide four or more signals through satellite transponders, cable channels and soon through multichannel multipoint distribution service (MMDS) and broadcast channels.

4) It makes multimedia convergence possible. Once video, audio, data and voice information are converted to digital 1s and 0s, they can be intermixed on the distribution highway and in the ways we provide entertainment information to consumers.

Around the world digitally

While it has not been around for long, digital TV has proliferated rapidly, particularly in the satellite arena. In 1992, Home Box Office became the first in the world to deliver its programming services digitally to affiliates. HBO's four multiplex services (HBO2, HBO2W, HBO3 and Cinemax 2) began serving headends feeding more than 2 million subscribers.

Today, approximately 45 networks in the United States are delivered digitally as well as the DBS services of USSB, Primestar and DirecTv. Also, Time Warner Cable's Full Service Network (FSN) trials have begun using digital technology as have numerous other interactive trials. This year, digital technology will be brought down to cable set-tops and we expect it to be used with video dial tone and MMDS.

After HBO began using digital technology in Latin America for its HBO Olé and Cinemax services in 1993, more than 80 digital networks now provide programming to cable and MMDS operators throughout the continent.

In Asia, TVB International was the first to use digital transmission for its satellite networks originating from Hong Kong and today, six broadcasters are using digital technology. Next year, the number is expected to grow as HBO Asia and numerous other programmers convert their services from analog to digital. Europe spent 1994 working on standardization through the DVB (digital video broadcasting) industry standards group. The first planned digital services in Europe will appear in 1995.

How does digital change television?

Digital technology changes television in two very significant ways. First, it will provide and almost require a new consumer interface with television. Secondly, it enables interactivity.

Throughout the history of television, consumers found what they wanted to watch by selecting a channel number, and

whether it was 12 channels on a TV tuner or the expanded channel selection "surfed" through a remote control, viewers correlated a channel number to a program or network choice. That type of interface is not likely to exist in the digital world.

The consumer interface of tomorrow will be menu-based instead of numerically based. Consumers will navigate through program choices presented either verbally or graphically from which they can select.

Those who are familiar with computer menuing and decision trees will feel quite comfortable with this. The new menu-based consumer interfaces are required simply because the choices now available to viewers are so great. Anyone who has a C-band home satellite system and has read the monthly program guide covering 200+ channels knows this.

The menu-based navigator will allow consumers to select program alternatives instead of channel numbers. Many systems will allow the consumer to select by genre: movies, comedy shows, concerts, etc. They will even be able to select action adventure movies vs. family vs. adult films, etc.

Obviously, many companies will be developing several user interfaces and taking varied approaches. The successful ones should be extremely user-friendly. One thing that program suppliers must concern themselves with is that the concept of channels can disappear, since the viewer is selecting program choices as opposed to well-known channels or networks.

The second change in television arising from digital technology is that of interactivity. By interactivity I mean the following four categories of new offerings:

- Interactive programming such as the ability to respond, participate in or modify the programming that someone is viewing at any point in time.
- Near-video-on-demand (NVOD)
- Video-on-demand (VOD)
- Transactional TV

NVOD is something that has been tested recently and being offered commercially today. TCI's John Malone calls this "the poor man's VOD." Some of the implementations are multichannel pay-per-view (PPV), whereby numerous channels are used to provide movies shortly after they are selected since start times occur as frequently as every 30 minutes. This concept has been used at Time Warner Cable's Quantum systems in Queens and by DirecTv in its DBS business.

Discovery Communication's "Your Choice TV" is testing another interesting NVOD application. The service offers popular weekly TV shows from broadcast and cable networks repeated continuously after they have been broadcast. For a nominal charge, a subscriber could view a favorite show starting in 60 minutes or less.

Multiplexing is another implementation of NVOD. The successful multichannel HBO and Cinemax services have provided subscribers with significantly increased choice and have resulted in increased viewership and penetration of these services since subscribers value the many screens of HBO and Cinemax from which they can select.

VOD is an easy concept for viewers to understand. From a library of available choices, viewers will be able to watch what they want when they want to watch it. VOD also implies VCR-like functionality without the VCR! Viewers will be able to stop, fast forward and rewind programming without having a VCR. Implementation of VOD is based upon video file server technology along with various other forms of archiving. It is ex-

pected to provide viewers on-demand access to movies, news and sports, amongst other programming.

One question that has not yet been answered is: Will the consumer desire for and revenue potential of VOD justify the expense when compared to NVOD? The former certainly costs more to implement and we need experience to determine whether it will be a viable business.

The last form of interactivity is what I call "transactional TV." This umbrella is used to refer to the new applications such as home shopping, direct merchandising, informational, educational and financial services. Many companies are testing these new concepts. And, only testing will provide us with the knowledge of which services will work with consumers.

It is interesting to understand what is driving this development of digital TV and new program services. Some facts from the United States are illustrative:

1) More than $10 billion is spent each year in the home video category, including rentals and purchases.

2) $60 billion is spent on catalog shopping with consumers, purchasing all sorts of items seen in publications sent to the home.

3) $85 billion is spent on local telephone service. This includes $25 billion that goes to local phone companies that provide access to the various long distance networks.

Electronic distributors are seeking to transfer revenues from the existing suppliers of these services to their own accounts. VOD and NVOD PPV movies are obviously an attempt to move home video spending into coffers of the cable, DBS and other broadband distributors. If they can offer improved value and service, they may succeed. Electronic home shopping has the potential to compete for the $60 billion of catalog sales if it offers the consumers greater convenience and value. Finally, many cable TV operators are already adding telephony to the services available on their wire into the home. Telcos similarly seek permission to add video programming services so that they also may be a full service provider.

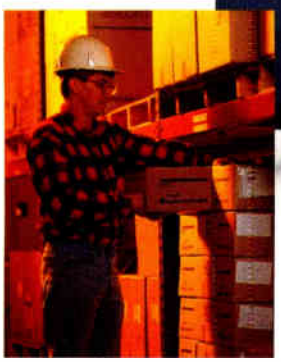
Will all this lead to new TV programming? The common wisdom is that these technological changes will increase the number of niche services (those focused on small numbers of viewers throughout the country). I expect that many services will contain "recycled" programming. By this I mean programming that is first paid for and brought to the public on large mass appeal broadcast or cable outlets. Because vast amounts of money are required to produce compelling, interesting programming that people want to watch, it is not likely that companies will risk millions of dollars to produce attractive programming that will have uncertain transaction revenues as their only source of income.

On the fast track

In summary, I believe the technology advancements impacting television are moving faster than the programming that pays for its existence. This is nothing new, however. Consumer testing of the new services will be required and should be heeded to determine which services may successfully benefit from the technological change. We must learn what is economically viable before millions of dollars are thrown away. One thing is very clear, however. Digital technology is not only changing the structure but also the economics of TV offerings and how they will be provided to consumers. **CT**

After 29 Peaceful Years In The Cable Industry, Wendell Woody Helped Start A Revolution.

Wendell Woody
Sprint/North Supply
Executive Director Cable Television Sales



Meet Wendell Woody. Then again, you probably already know him. His name is recognized throughout the cable industry. His leadership is honored by the Society of Cable Television Engineers. And now, his years of experience have culminated at Sprint/North Supply, right where you'd expect to find him — at the forefront of an industry revolution.

Woody had already helped introduce leading edge advancements to the CATV industry, including FM Fiber Optics, AM Fiber Optics and Cable Alternate Access. So when Sprint announced alliances with major cable operators, Woody's new Broadband Group at Sprint/North Supply was positioned to bring you Cable Telephony. Through his cable experience and Sprint/North Supply's distribution expertise, new technological and distribution doorways are opening for you.

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Reader Service Number 77

Interactive digital cable PC initiatives

By Jim Albrycht
Senior Technical Consultant
Digital Equipment Corp.

Cable is a natural network for carrying high-capacity, bandwidth-intense information. In the age of analog program signals, cable's capacity was a natural transmission media for broadcast color TV and high-fidelity stereo sound programs. In the new digital program signal age, cable's high capacity is a natural network for carrying interactive computer-based, data-intensive multimedia programs.

Figure 1: Business PC installed base (U.S.)

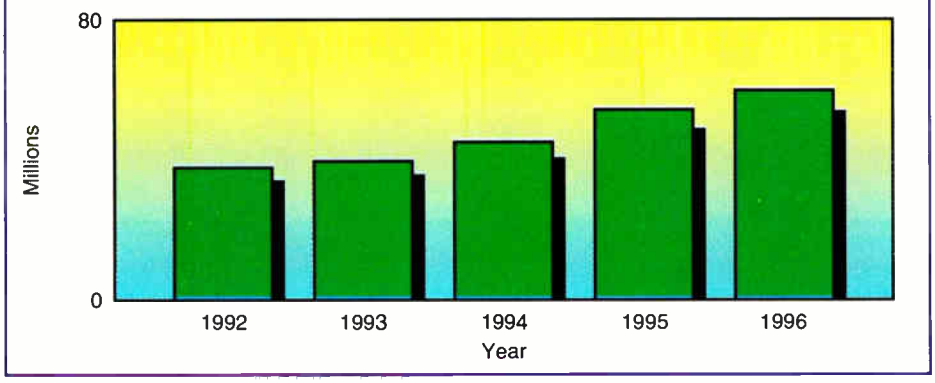


Figure 2: Business PC Ethernet installed ports (U.S.)

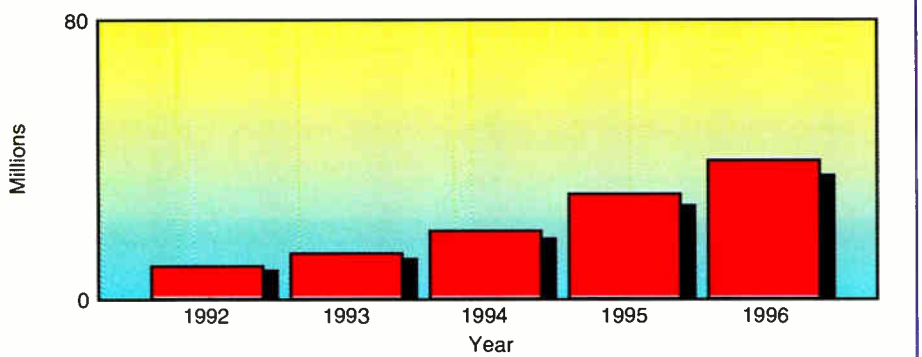
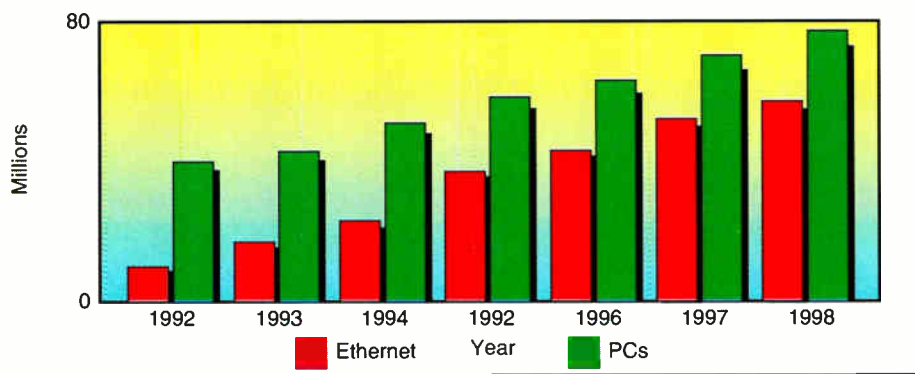


Figure 3: Business Ethernet ports vs. PC installed base (U.S.)



Intelligent peripherals

The family TV set as we have known and loved for over 50 years has been the cable operators final "terminal" of choice attached to the cable's end. The personal computer (PC) will naturally become the cable operator's preferred system of expanded choices attached to the cable's network periphery. This is a natural choice as the cost of transistors reach for zero and their numbers increasingly expand. This migration results in highly intelligent, software-based, interactive personal high-resolution pictures and sound-centered communications systems naturally made for cable.

Two-way optimized

The transition from a broadcast TV receiver to an interactive personal multimedia computer is natural as cable subscribers want to be more involved and communicate directly with people of common interests.

Digital cable means computer-processed programs, which is a natural place for the PC and individual networking with others. Cable has always been a two-way interactive capable medium but has been traditionally maintained and optimized for one-way operation only.

Full cable subscribership

Some of the forces at work that are enabling the movement from cable TV to cable PC are both cultural and technological, plus make good business and economic sense. Culturally, the profile of the subscriber has changed increasingly over the last five decades from people who just want to receive information to people who also want to provide and respond to information. Technology has reached a point where the cost of "cable-compatible" multimedia PCs is currently in the same arena as high-end cable-ready TV sets. Another potential for increasing subscribership is to reach those folks who "don't watch television." They could become cable subscribers via PCs.

More passive cable

Let's review the technical forces and natural laws that are at work pushing

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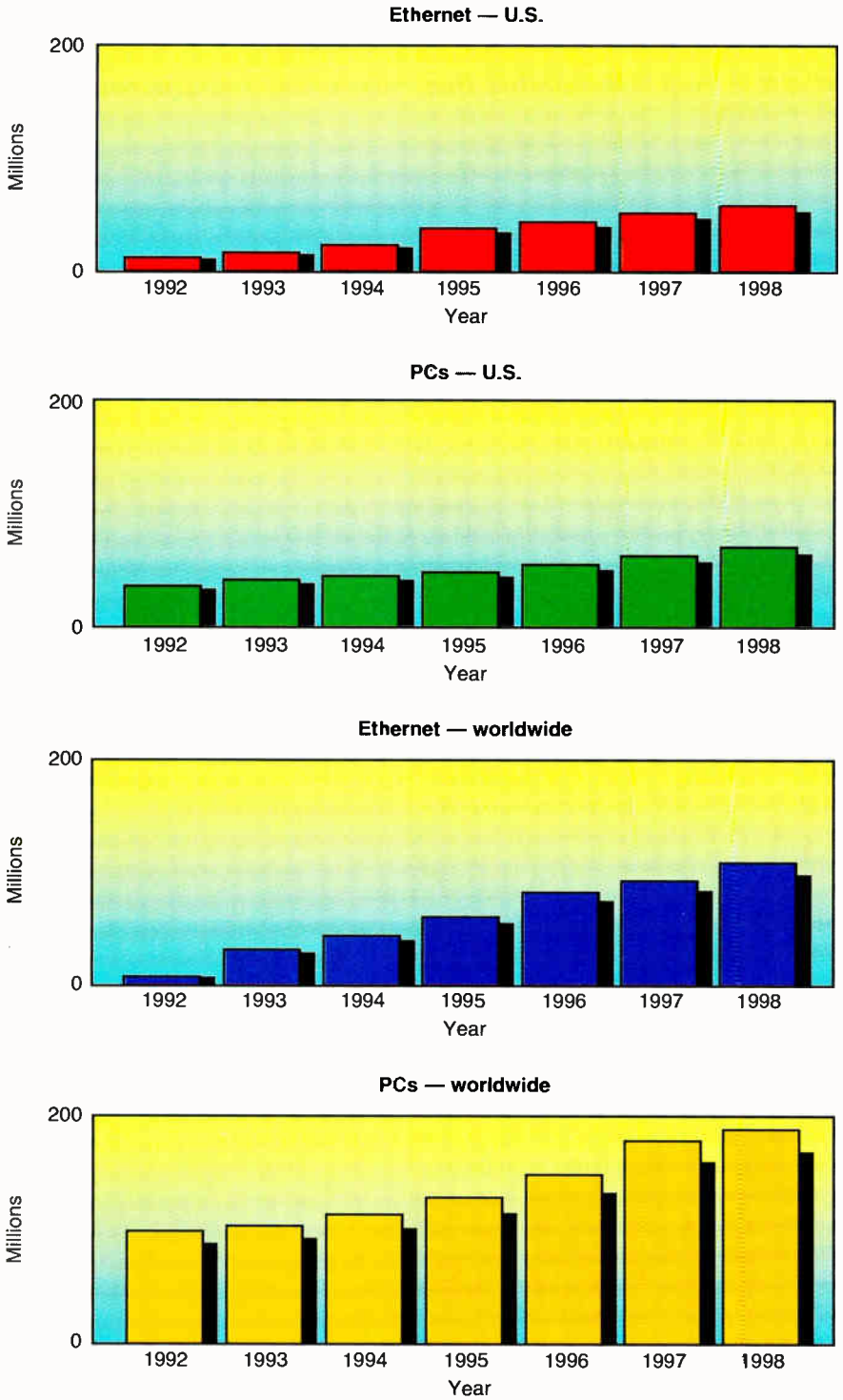
Figure 4: Ethernet vs. PC rates



more and more intelligence toward the ends or periphery of the tree-and-branch coax/fiber more passive cable network. With interactive intelligent digital technology, the end of the cable also is the beginning of the cable, and now what was the beginning of the cable system, or the headend, has much less relevance.

In the analog one-way receive-only era, the cable headend plays the role of a "converter" from wireless to wireline transmission.

In the digital era conversion will turn to "switching," which will take place mostly at the many network smart peripheral systems. Networks will interface with other networks at many locations, where information will come and go directly from people, from portable storage media and from other live network media.

Continual upgrades

As more passive fiber penetrates deeper into the cable plant, and coax cable links becomes more passive, the network centers will become more dumb and dark while the network peripheries will become more smart and bright. This architecture enables reliable and scaleable broadband networking, with constantly changing software upgrades propagating from peripheral to peripheral (all getting smarter and smarter) making better utilization of the cable bandwidth that connects them.

Size of the screen

The home converter is a box from the analog cable era. In the digital era the converter will become the home logical intelligent switcher (bridge, router, smart repeater) that could be an integral part of a standard PC, or take on the form of a home server PC and play in concert with other PC units in the home.

The only fundamental differences between a traditional PC and the family PC (the digital TV set) will be the size of the screen. The analog TV set, VCR, converter/descrambler, game machine, etc., brought to us by traditional consumer units with many remote controls will gradually fade away over the years.

Radio in a pipe

The cable wire itself has changed very little over the years. It's simply "radio in a pipe," a perfect candidate for the cable PC era. AM fiber brought us extended natural radio and light in a pipe. Changed are the active electronics that have been processing the energy and information running through the pipe.

The goal always has been to create more bandwidth in the pipe through more intelligent management of the radio energy. In the analog era we first extended the frequency range of the coax network. Then we add fiber to reduce the amplifier count, further broaden the bandwidth, and reduce noise and distortions. That gets us 150 standard 6 MHz channels.

Four revolutions

Four major "revolutions" are occurring within cable technology simultaneously:

1) AM fiber is enhancing coax backbones, improving reliability, reducing

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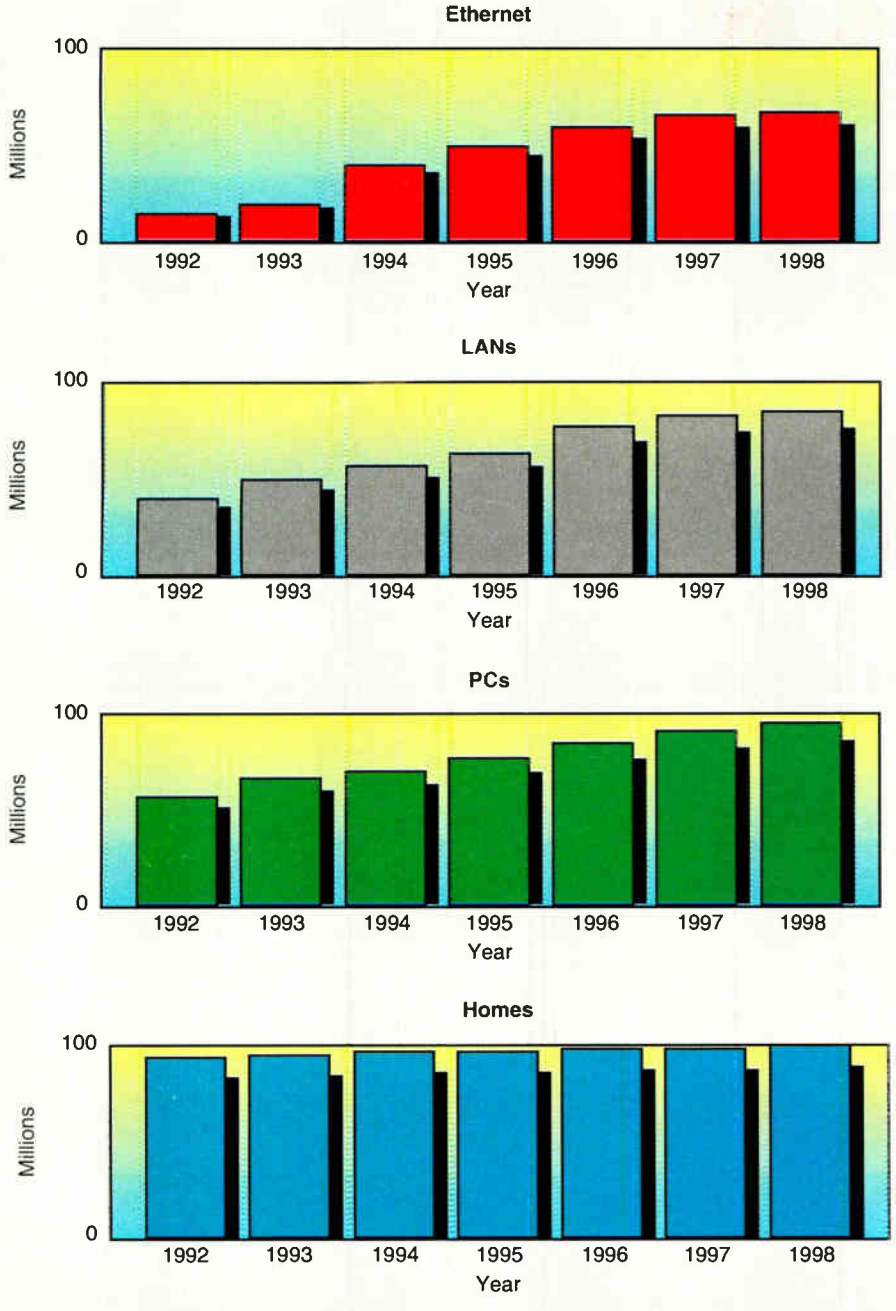
Figure 5: U.S. PCs, LANs and Ethernet



amplifiers, increasing bandwidth and lowering noise floors.

2) Compression is virtually creating bandwidth through computer power, with advanced algorithms yielding intelligent data transmission management.

3) Two-way symmetrical access methods for interactive personal systems with highly efficient modems are available.

4) Personal computers are migrating from a computing platform to a communications system reaching the magic 30% critical mass point as a ubiquitous consumer home system.

One channel

The digital cable era is giving us a side benefit. That is, it takes us beyond receive-only. All of this became feasible within the installed coax tree-and-branch topology, because of aggregated noise reduction, resulting from a more passive cable network.

Interactive two-way symmetrical access method protocols such as those used in broadband tree-and-branch coaxial cable local area networks (LANs), are being revisited, enhanced, extended and cost-reduced because of the global proliferation of inexpensive and powerful PC technology. This now extends the 500 one-way broadcast cable TV virtual program streams (virtual channels) to one two-way cable PC program session for everyone in a distributed statistical information utility.

The conversion to the switching process has changed and migrated to the network periphery because of the ubiquitous availability of large amounts of inexpensive computer power for everyone offered by the PC.

New information marketplace

The result of the four concurrent network revolutions is of quantum proportions, opening a whole new information marketplace, which is finding itself in a unique place in history as we approach the new millennium. The transition from a machine age-based economy to an information-based economy is accelerating rapidly and becoming clearer to everyone, everywhere as each day passes.

The driving forces and natural laws that are opening these new information market opportunities are the rapid expansion of the ubiquitous availability of inexpensive high computing power, global communications and creative intelligent software programming talent. This provides an enormous opportunity for everyone to market and capitalize on the networking of computer systems, which has matured explosively over the last two decades.

New cable peripherals

A number of concurrent industry marketing strategies are unfolding to capture the broadband networked PC opportunity where cable is very well positioned. A full range of new highly intelligent cable networking peripheral components are coming on-line to make up the cable industry's complete suite of digital product offerings from personal home modems to community institutional bridges and Internet connecting routers.

These components will be standard and interoperable, operating in 6 MHz channels with 10 Mbps Ethernet interfaces. This brings together all types of cable networks, LANs and PCs for internetworking to the Internet, enterprise and private/public networks for local and global services.

Distributed computing

The distributed computing marketing strategy is a wise approach for cable op-

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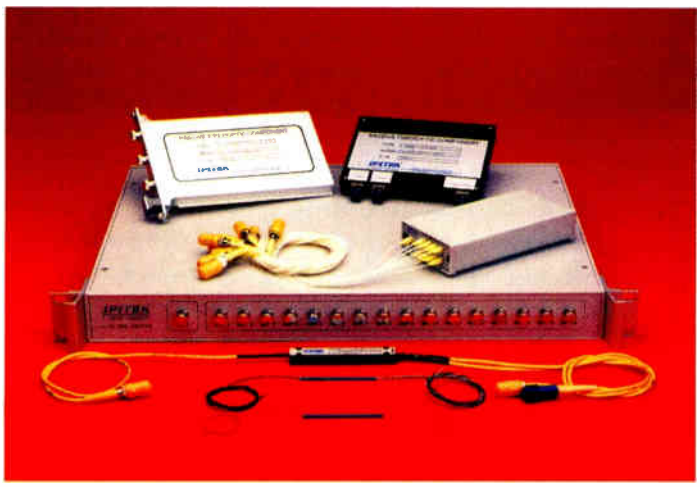

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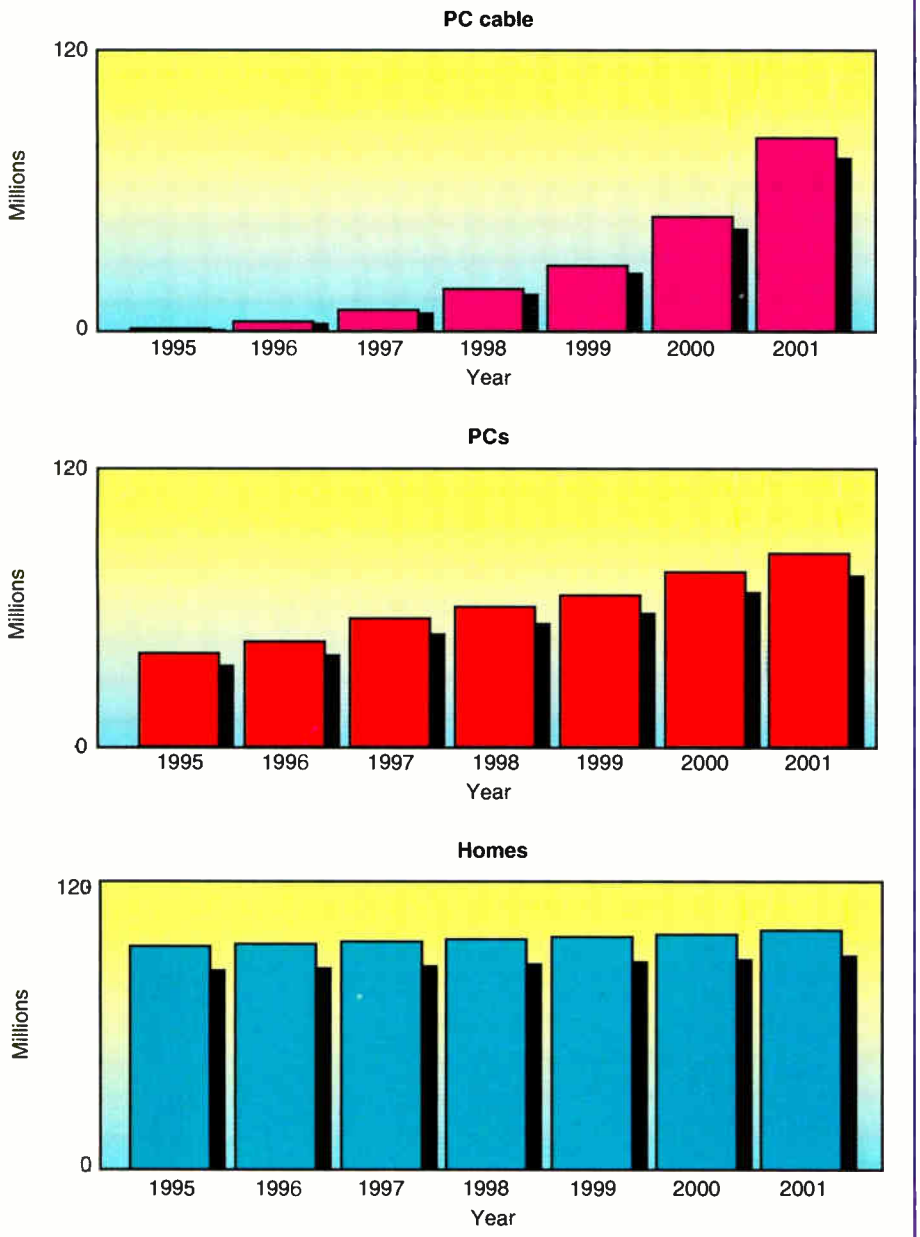
Figure 6: Cable PC opportunity (U.S.)



erations to capitalize on the expanding information market opportunity that is to be where the action is. As we approach the new millennium, the place where the action is is changing. The machine age place and the new information age place are different places. The large physical centralized places reachable conveniently by transportation are now fragmenting into millions of smaller places more conveniently reachable by communications.

This is called distributed computing power and is best networked by the client/server computing and LAN 802 architecture. The combined cable and computer networking technology supports this architecture and distributed changing needs, yielding geometrically aggregating capabilities, heretofore unreachable in any economy.

Computer power going home

Through new cable PC modems, both new PCs and the current institutional PCs (Figure 1 on page 48) can now be more widely distributed and enjoy the combining power of the client/server computing model. The multimedia PCs at home (combined with the institutional groupware PCs able to go home) enabled by newly evolving high-speed cable PC modems will soon be powerfully integrated by forthcoming distributed multimedia groupware offerings by major software suppliers.

Ethernet everywhere

The Ethernet-interfaced cable PC modem industry market strategy is simple: Provide the millions of small business and home PCs with Ethernet 802 LAN capabilities, taking advantage of the growing trends of business in smaller places. Add the home computer entertainment-based market by following and enabling the increasing compute power with broadband networking.

By 1995 there will be 40 million U.S. home workers ready for seamless Ethernet connectivity among them and to the systems in the central institutions. These same workers and many more will look for relaxing entertainment at home using the same network infrastructure. The Ethernet-connected cable PC modem is the driving force for multimedia groupware PC applications convergence. (See Figures 2-4 on page 48 and 50.)

Cable PC modem

The cable extended 802 Ethernet LAN strategy enables the installed base of cable TV networks to bring Ethernet capabilities home, where over 95% of all U.S. homes and small business are passed at the curb. The cable industry is responding strongly to the new computer communications market opportunity. It sees the interactive multimedia PC as the digital replacement for the personal legacy terminals, the TV/VCR and analog converter/descrambler.

The cable industry now sees that home PC penetration (after the first 10 years of introduction) is twice that of what the TV set and VCR were. This makes the PC the most popular and fastest growing high-end consumer device in history, at twice the introductory price.

An IEEE 802 standard cable PC modem with the right price/performance is needed to meet the cable industry's business environment for digital converter scenarios. It also must meet the PC consumer's thirst for high bandwidth PC response as indicated by CD-ROM drive penetration rates. This will be the catalyst for a whole new round of cable business opportunities far into the future.

Cable computer network strategy

With the magic 30% U.S. home consumer product critical mass penetration establishment of the PC, the cable industry now sees the potential for full home subscribership, which has stalled around the 60-70% penetration rate with

"Cable, born to extend broadcast analog TV deep into the countryside, is now changing to extend interactive digital personal computing across countries and around the world via the Internet."

just the TV set and VCR. The role of new broadband digital PC modem technology is to enable the home PC to be "cable-ready" and high-capacity interactive.

Today in the United States there are roughly 200 million TV sets and 200 million VCRs, plus 33 million PCs in 100 million U.S. homes. Cable-ready multimedia PCs will not only make up the 30% additional subscribership for cable homes passed but may slowly displace the TV set and VCR over time. This will result in higher definition digital pictures and sound and personal interactive programming. This all results in continually increasing revenue streams.

Open systems

Today there are about 16 different TV standards in the world, with high definition TV (HDTV) and proprietary digital converters promising more. PCs are open, growing, changing interactive digital communications systems where hardware is continually enhanced through value-added software. Cable, born to extend broadcast analog TV into rural areas, is now changing to extend interactive digital personal computing across countries and around the world via the Internet, with access via the open Ethernet cable PC modem 802 strategy.

Quantum leaping

Traditionally, major transitions and replacement technology don't occur unless there is a tenfold quantum leap in price/performance. The changes to the home digital broadband networked multimedia personal computer is a leap of many orders of magnitudes, such as those experienced with the digital compact disc in the music industry. The Ethernet open cable PC modem-based access method is the one piece of digital technology that will enable a new quantum leap directly into the middle of the new information age.

Internet via cable

A network design choosing the right mix of the 802 cable PC modems, bridges and routers provides a high-performance access infrastructure to the Internet via cable. Fifteen million U.S. PCs are on the Internet (20 million worldwide) with a 15% per month growth rate. On-line services are growing at 100% per year with 3 million users. It is the Internet Society's goal to have 100 million users on-line by 1998 and 200 million by the year 2000, which is just five years away.

It is believed that these goals can be reached based on the rate of PC growth and the assumption that they all will have modems. Currently the modem growth rate is 1,000% per year. Cable Internet routers and the complete suite of cable network solutions coming on-line are significant Internet enablers.

Forbes magazine calls these cable components the true on-ramp to the information highway.

Broadband thirst satisfaction

The broadband, minimum 10 Mbps cable PC modem plays a major role in attempting to satisfy the thirst for broadband multimedia information access for all PC users. (See Figures 5 and 6 on page 52 and 54.) The deployment of CD-ROM drives is a good indication of PC users' thirst for broadband information access. CD-ROMs are known as "broadband sneaker net" to PC users.

The cable PC modem is slated to meet the need of the real-time broadband PC user who has used Ethernet in business and entertainment. PC CD-ROM drive penetration promises to pass 15 million units in 1994, at a current rate of over 5 million units per year. CD-ROMs may soon begin replacing the analog prerecorded videotape. CD-ROM recorders are moving into the consumer price range. Broadband access via cable at high speeds is reaching CD-ROM jukeboxes in current deployment, in both real-time and store-and-forward networking sessions.

Fast modem track

Due to the rapid growth of the PC, now at 55 million per year worldwide, the industry strategy for the cable PC initiative should be to ramp its proliferation as fast and as orderly as possible and to capture as much of the home and

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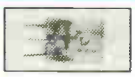

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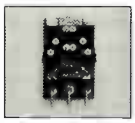

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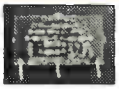

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"The Ethernet open cable PC modem-based access method is the one piece of digital technology that will enable a new quantum leap directly into the middle of the new information age."

small business broadband networked PC market as manageable.

Over 80% of the U.S. work force works in small businesses. This number is increasing daily as large institutions are restructuring into smaller more agile divisions. The cable PC initiative is naturally following, supporting and enhancing this information market-expanding business trend while the cable industry begins to go digital.

Cable modem players come in three basic categories:

1) Extended local area networks
2) Extended converter/descramblers
3) Private broadband LANs

Extended LANs

The current extended local area network category players are Digital ChannelWorks, LANcity LC series and the Zenith ChannelMizer. The cable industry's biggest asset is the installed base of bandwidth on the poles at the curb and in the home, which it must use most effectively to maximize its business process and revenue streams. These players offer Ethernet interfacing at various capacities up to 10 Mbps in 6 MHz channels.

Extended converter/descramblers

The cable modem players who have not been in the computer LAN business and technology development have chosen their traditional converter/descrambler centralized architecture for their digital cable networking products. The interactive cable converter architecture offers asymmetrical bandwidth with much information coming from a central headend, requiring low bandwidth remote control access and remote management of the user's box. Solutions providers selecting this architecture are General Instrument, Intel and Scientific-Atlanta. These are not the traditional computer network solutions.

Private broadband LANs

Private broadband LAN modems using standard cable backbone technology providers have been around for over 20 years. Among those providers are (or have been) ChipCom, 3COM, Hughes, TRW, Applitek, C-COR, Wang, Mitre and others. Their customer base was and is primarily those large institutions with hundreds of mini computers and mainframes in many buildings on university and military campuses.

Much of this early broadband technology was deployed on cable's dual-cable institutional network (I-Nets) in and around major metropolitan areas. While there are players still in this space, many of these firms have refocused their resources or dropped out of the broadband LAN business, thus leaving new opportunities for the cable PC modem product family — specifically in education and government. In many cases these campus-based private cable networks have been extended into the communities, connecting to public cable networks. Today, there is more aggregate compute power on broadband LANs than baseband LANs although there are more baseband LANs in buildings and campuses. IEEE 802 standards are very active and highly deployed in this space.

New opportunities in cable

As computer power heads home and more networks connect, the swing to a consumer-affordable high-speed Ethernet based cable PC modem will follow, as advanced development around the world continues. The new Ethernet-type broadband computer 802 communications networking via cable systems infrastructure will be a major accelerator in bringing the standards of cable and the standards of computer networking together opening new cable revenue opportunity streams. **CT**

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4) ChannelWorks, Digital Equipment Corp., Littleton, MA, July 1994.

5) *Sunday Middlesex News*, Volume 23, Number 362, Farmingham, MA, July 24, 1994, page 1.

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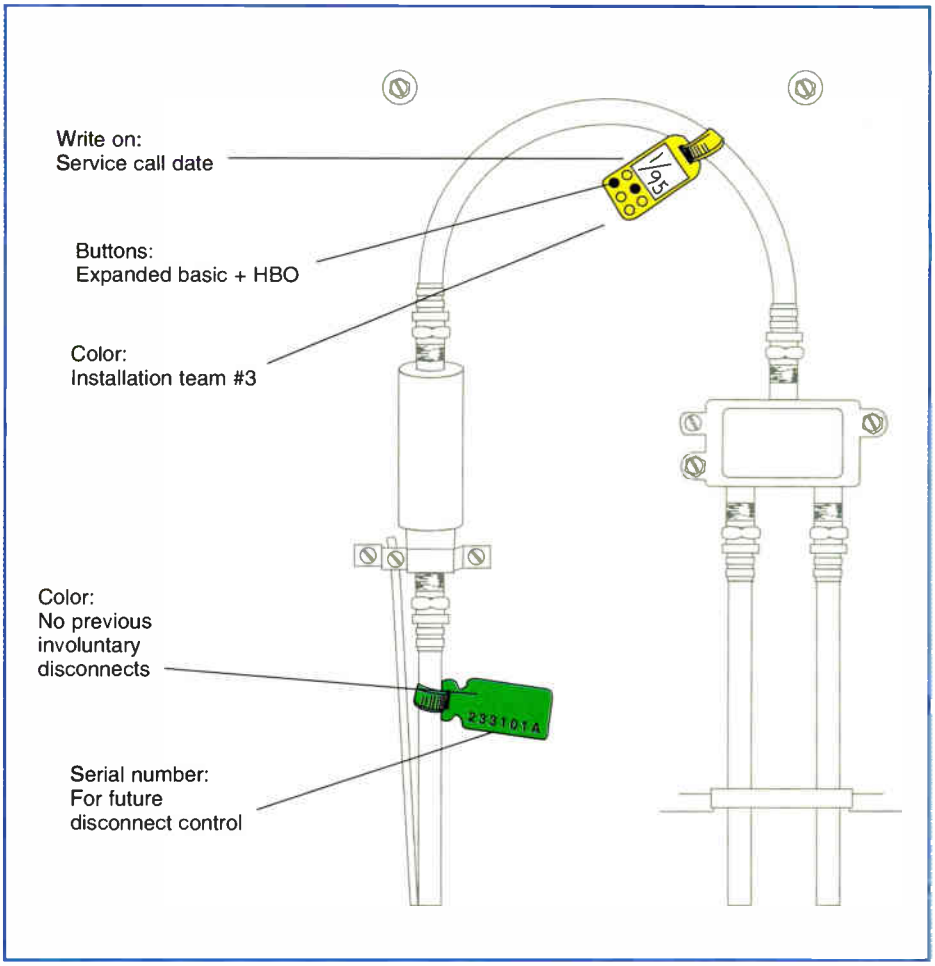
Chairman, Telecrafter Products



Plant maintenance and security is of course a product of good field operations — and good field operations are a product of both good procedures and the implementation of those procedures. When this equation breaks down, it usually isn't for the lack of well thought out plans containing logical procedures, it is due to the inability of the organization to consistently implement those procedures.

What stops many of these good plans and procedures from being implemented to produce serviceable drops with good physical security? How often do we encounter excessive field expenses and costly drop audits then hear statements like: "If only these guys would do what they are supposed to do"?

How much money do we spend on drop audits and trouble calls caused by nothing more than field operations not having been implemented according to plan? How many subscribers do we lose because of poor service?

Info is key

In short, all too often the missing ingredient is information. That is, pertinent information, when and where it is needed. Even as a part of an industry that derives its well-being by supplying information (news, weather, sports, entertainment, data, etc.) to its subscribers we can neglect getting the right kind of information to our own field personnel. We would never dream of asking a relative, let's say, to drive into certain areas of town armed with a map and directions but expecting no assistance from street signs or traffic control devices. But, we still send coworkers out into the field armed with only an address and a work order.

The information contained in work orders comes from requests the company receives from a subscriber or potential subscribers and the company's records of previous instructions given to field personnel who had visited that drop. The work order probably doesn't say much about the particular situation that the field tech encountered on the previous visit, nor does it tell much about the other drops that the field tech is likely to come across. Of course, as a practical matter, it would be too cumbersome to attempt to include all this information in work orders.

This information, however, can easily be made available to field personnel. But first a slight digression. My experience has shown that people start their jobs wanting to do good work. They will do good work if in their minds they feel that their efforts will be in the correct relationship to the results they are trying to achieve and if they don't encounter obstacles that they feel will be too formidable for the resources at their disposal. Sending a field tech on a call with incomplete information can negate many of these good intentions. It may result in personnel having to expend additional efforts (e.g., tracing and verifying) to achieve the same results. This raises the chances that they will get discouraged and don the attitude that with what they have to work with, they simply can't do the job the way it was intended to be done (much less take some initiative and excel).

What is needed to make a system really work is information about the en-

vironment at the drop being serviced (and information about the other drops being fed from the same tap). That is, information about the subscriber, the level of service and a history of previous service calls. Having this information readily available right at the drop is as valuable to the field tech as street signs are to the traveler. This information can make service calls more time-efficient, prevent costly errors, and assist in easily noticing and correcting errors having to do with neighboring drops. It also gives field personnel the ongoing ability to detect and correct discrepancies while performing routine field activities, thus continually enhancing the system's physical plant security.

For example, one early and very effective method of noting discrepancies in a system employing hard traps was to color-code the traps with, in this case, a colored stripe. Each drop then had either a pay service trap or a similarly colored tag. Any time a field tech noticed a drop without traps or similarly colored tags, the discrepancy was logged in. Had tampering actually occurred, the drop was further highlighted with a red tag containing the date of the occurrence and the field tech was rewarded for noticing and reporting the situation. This system resulted in a virtually constant audit especially in high churn areas, and certainly reduced the frequency of having to incur the expense of full-blown field audits.

"Imagine the value of instantly knowing what services are to be received, who installed the service, and when — simply by looking at the tag on the drop."

A second very straightforward method of putting information where it is needed is to use a tag with punch-out buttons to indicate the service level, its color to indicate the installation team, and the write-on area available to note the date of the service call. Imagine the value of instantly knowing what services are to be received, who installed the service, and when — simply by looking at the tag on the drop.

Both of the previously mentioned systems can be combined with a basic serialized disconnect control system for additional security. An example of the second system mentioned, combined with disconnect control tags, is shown in the accompanying figure on page 59.

A corollary benefit that is often overlooked is that such drop information systems allow field techs to respond to trouble calls on weekends (when access to billing information may not be available) and still have all the information they need to service the drop.

There are almost uncountable variations on good drop information systems: changing the color of address ID tags to indicate a rebuild, color-coding tags to indicate voluntary vs. involuntary disconnects, and even monitoring quarterly power supply checks, to name a few. But the principal remains the same: People can and will perform very well when they are given the resources to do so. Field crews assisted by drop information when and where it is needed will be able to implement procedures and make intelligent decisions to build and maintain our drops so they will be secure and serviceable for years to come. It is up to us to put the information where it is needed. **CT**

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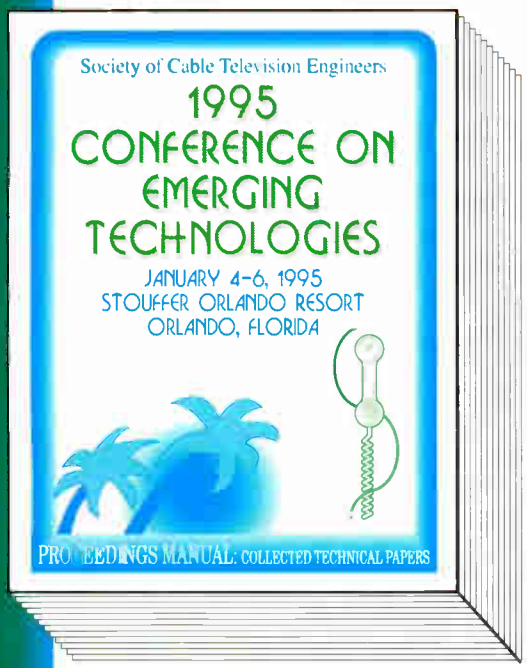

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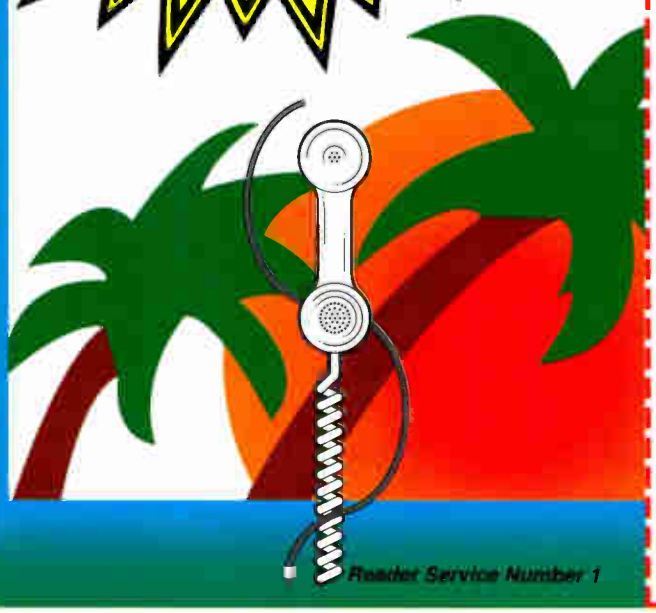

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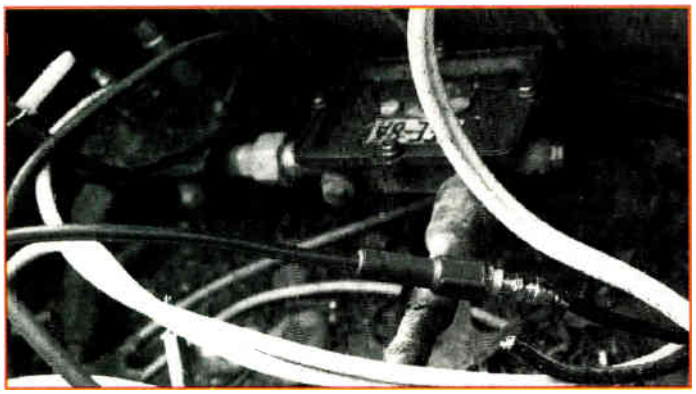

Photos courtesy NCTA

Piracy of cable TV signals has long been a thorn in the industry's side. Security issues loom even larger as we build the "national information infrastructure."

Security is key for the NII

Many major leading media companies, as well as the U.S. government, are working on plans to implement the "information superhighway." Home Box Office, as a national supplier of entertainment programming, is one of those attempting to focus the planners on those issues that are necessary for the superhighway to efficiently handle national program distribution. HBO has a significant interest in the area of security of TV programming. Its opinions were recently solicited by the government's national information infrastructure (NII) planners and were presented before the NII Security Issues Forum on July 15, 1994.

By Robert M. Zitter
Senior Vice President, Technology Operations
Home Box Office

HBO is a division of Time Warner, a world leader in the creation, ownership and distribution of copyrighted material including motion pictures, TV programs, music, magazines, books and electronic networks. HBO and Time Warner fully support the position of the Creative Incentive Coalition. *(Editor's note: Time Warner is a member of CIC, which also presented comments to the NII Security Issues Forum.)* The reason HBO decided to present comments to this forum is to add a dimension to the more general statements on copyright security that reflects our experience as a pioneer in the area.

Pay TV security history

HBO created pay TV in 1972. It was the first program service created to electronically offer entertainment protected by copyright to TV viewers for a fee. From the very beginning, the control of access to our service was and remains critical to the economic life of our business.

"If private industry must bear the risk of security failures, then it retains the incentive and must retain the ability to determine how best to protect program offerings."

As the pioneer in satellite TV as a means of distribution, HBO was the first TV network to encrypt its programming to maintain the security of services and assure that the material it creates or licenses and distributes is received only by HBO subscribers. Following several years of attempts and unfortunately some success by pirates to defeat our encryption, we learned quite painfully that security must be replaceable. By this we mean that only the key encryption circuitry or algorithms should be replaced rather than replacing the entire hardware assembly. This can be done at minimal cost while maintaining effectiveness. Two years ago we implemented replaceable encryption on all our satellite networks worldwide.

In 1992, HBO became the first network in the world to utilize full-time digital transmission. Today, four of our U.S. networks and our three Latin American networks provide digital programming to more than 4 million subscribers. When implementing this digital technology we considered it essential to not only provide for replaceable security, but also to plan for segmentation of encryption between our national distribution links and local community distributors.

Importance of security

Today, HBO's pay TV programming services are offered in the form of scheduled networks and are distributed to consumers through cable TV systems, multichannel multipoint distribution service (MMDS), satellite master antenna TV (SMATV) systems, direct broadcast satellite (DBS) systems and on some of the video dial tone test telephone systems. HBO agrees with the administration that if we and other copyright owners are to serve subscribers through the NII, appropriate security — as with intellectual property protection — is of the utmost importance. In fact, HBO is developing products today that we expect will be offered interactively on full service local networks and eventually on the NII.

Since the security of the NII could pose financial risks to our business, and others like us, HBO believes the following policies must be adopted:

1) *Selection of security technology should remain with private industry.* The security compromise of HBO's first satellite encryption system cost our company more than $25 million a year until it was replaced. The system, though, was one that was selected by HBO and we lived with the consequences.

If government were to determine the security technology used on the NII, would government be responsible for the economic losses suffered by copyright owners when that system is compromised? We doubt it given ever-present budgetary constraints. If private industry must bear the risk of security fail-

ures, then it retains the incentive and must retain the ability to determine how best to protect program offerings.

2) *There should not be one single security system.* When multiple security systems are employed with segmentation between national and local distribution, the damage of inevitable security breaches and the costs to cure them may be contained. Clearly, a single system offers a larger, more valuable target for piracy.

It's important to focus on segmentation for a moment. The reason it is mandatory to copyright distributors like HBO is simple. First, security systems will be compromised and will require replacement. Second, national or regional providers and local programmers or networks may have differing financial interests and incentives about curing security breaches. Local operations may have considerably less at stake (and much higher proportional cost to fix) security problems. They, therefore, would not feel the need to move as fast as broader scale providers, exposing those providers to much greater financial risk.

3) *The levels of security within the NII should be in hierarchical form so that users may determine the level of security required.* Individual content and program suppliers must be able to select a level of security that they believe is commensurate with the value of their services.

High value providers should not be subjected to the risks of less secure technology and lower value providers should not be burdened by the costs of what they believe to be excessive security. For example, when a high-value, world championship boxing event with a limited shelf life is offered live to pay-per-view (PPV) consumers, copyright owners require significantly more signal security than for the delivery of a 20-year-old magazine article or TV program. As a matter of fact, boxing copyright owners have held back distribution of their high-value events from C-band home satellite viewers because of the level of security employed in that arena.

4) *Security should be transparent to a properly authorized end user without compromising the total security of the network.* HBO believes that the NII and local full service networks will greatly enhance the lives of Americans. Those who expect to use the NII, like HBO, will only be able to do so, however, if the NII represents a secure and useful method to reach consumers. **CT**

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Reader Service Number 7

WESTERN SHOW PRODUCT WRAP-UP
CT DAILY IC
PBI From *Communications Technology* and *International Cable* magazines
February 1995

The following is the first of three installments showcasing products introduced recently at The Western Show. Complete Western Show product highlights can be found in the Winter 1995 issue of "Communications Technology Product News." See the "News" (page 10) and "SCTE News" (page 26) sections in this issue for further show coverage.

New 1 GHz Family At Superior

Noninterfering distortion measurements now may be performed with the new Superior Electronics HE-1000 and PC-1000 1 GHz spectrum analyzers at the headend and end-of-line. Both Cheetah products perform noninterfering measurements for composite second order, carrier-to-noise, in-channel frequency response and hum.

Only composite triple beat measurements require a few seconds of channel downtime. With the Cheetah system, this measurement is performed automatically at all test points so total downtime for all RF measurements required for FCC proof-of-performance is a matter of seconds.

A headend spectrum and modulation analyzer, the HE-1000 can perform frequency, level, video depth of modulation

and audio deviation measurements. Frequency measurements are accurate to 1/2 part per million with a resolution of 10 Hz. It also features high-speed video and audio level measurements. The unit is rack-mountable, designed to perform monitoring, performance measurements and FCC compliance tests for headend devices.

The PC-1000 brings spectrum analysis capabilities to an end-of-line monitor. Configured with a frequency agile RF data modem, it may be used in two-way systems for automated distortion tests. In addition to all RF tests required by the FCC at end-of-line test points, the unit may be used for troubleshooting, system diagnostics and alarm monitoring.

Also new at the show was the LC-1000 1 GHz end-of-line monitor specifically designed for status monitoring applications. While transponders provide information on whether the network is functioning, only a line monitor will provide RF levels necessary to evaluate the quality of the signal the customer is receiving. **Reader service #193 (HE-1000), #192 (PC-1000), #191 (LC-1000)**

Digital Insertion At SeaChange

SeaChange Technology demonstrated its newest digital ad insertion gear, including a video wall showing clips from Western Show general sessions. The system's distributed computing architecture enables ad salesman anywhere on the network to make changes to the schedule.

SeaChange has built a library of software programs that manage the whole process of cable advertising, from inputting the video, to scheduling, inserting and reporting. For example, a master cable headend would have encoding equipment and a master video library. Any authorized user on the network could then schedule ads for the entire system on a neighborhood basis. **Reader service #208**

Northern Telecom Targets Cable TV

Northern Telecom unveiled its Cornerstone line of digital fiber/coax access products and applications for cable operators, telephone operating companies and other service providers at the CableNet exhibit. The system targets four applications: voice, data, PCS and multimedia services. Northern Telecom claims the system has a low startup cost for initial penetration and will be compatible with existing and future cable equipment. All of these products are scheduled to be ready for volume deployments in 1995.

The voice system uses a telephone box in the home to modulate conversations onto the coax network in the 5-40 MHz split. A cable modem shelf in the headend transfers the calls to a telephone switch through industry standard TR-008 and TR-303 interfaces. Each equipment bay can support up to 672 voice lines. The system supports custom local area signal services such as call waiting and caller ID.

The data system uses a pair of modems on the customer premises and the headend to transfer data at 1.5 Mb/s in both directions. Northern Telecom claims the system requires no network modification to operate. It uses one or more 2 MHz channels downstream in the 300-750 MHz range and the 5-40 MHz subsplit for upstream data. Customers will plug into the data box using a 10BASE-T Ethernet card in their computers.

The Cornerstone PCS 1900 wireless systems lets cable operators provide wireless voice and 9.6 kb/s data services over their existing coax networks. The system

operates in the 1.9 GHz range, so potential operators will still have to secure access to a chunk of the wireless spectrum from the pending FCC auction. The system uses a distributed antenna technology, so that operators can cover a wider area, without requiring as many base station transceivers. **Reader service #207**

Teltone Directs The Tone

Teltone demonstrated its CableLink box in CableNet, designed to switch calls between a cable network and the local telephone network automatically by listening to the number being dialed. If it is long distance, the call is switched to the coax network, where it connects with the long distance operator. If the call is local, it automatically goes to the local phone company. If the power goes out or an emergency 911 is dialed, the call goes over the local telephone network. If you happen to be on the cable line when someone calls on the local one, CableLink has a call waiting feature to let you switch between calls. **Reader service #206**

Data Over Cable At High Speeds And Low Cost

The new Cable Adapter modem from Intel uses 64 QAM technology to drive data down to homes at 10 Mb/s and back up at 64 kb/s. Intel says that consumers will pay $300-$500 for the box, once it is released. The adapter is undergoing trials with Comcast and Viacom, and should begin commercial rollout this year. These high-speed modems will enable a new generation of consumer on-line applications that incorporate text, sound and video.

Hybrid Networks is working in conjunction with Intel to roll out data services in metropolitan areas across the country. Hybrid has developed the headend equipment that connects the local cable network to wide area data networks like the Internet.

Hybrid Networks indicated that it is willing to either sell its equipment to cable operators outright, or work with them to get the service running. **Reader service #203**

Sony Inserts Disk-Based Ads

Sony Electronics Inc. announced plans to introduce a video file server, its first product to be designed specifically for cable systems. Based on redundant array of inexpensive disks (RAID) technology, the file server combines random access, large storage capacity and high quality compressed video in an integrated, multichannel video transmission system, making off-the-shelf drives an economical storage medium for random access video.

The system incorporates the company's new MPEG-2 encoder and features an open architecture system that is flexible and expandable, permitting simultaneous transmission of up to 12 discrete channels of programming from each media control unit.

The system can be easily and economically expanded to accommodate up to seven media control units for added storage capacity. Any media within the system can play to any available output channel at any time and be accessed instantly, should last minute changes be required.

Each media unit is comprised of six hard disk drives, each of which is capable of storing 2.1 Gbytes of information, for a total storage capacity of 4.5 hours per media unit (more than 500 commercials). A system equipped with seven media units can provide instantaneous access to 31.5 hours of video, or more than 3,800 commercials. Further, the off-the-shelf drives can be interchanged easily as storage technology evolves.

Four separate levels of reliability protection are provided: remote predictive fault monitoring, where a potential error can be anticipated and corrected before it occurs; RAID3 standard nondisruptive faulting, where a fault in any individual component does not affect the system's functionality; hot swapping, which allows damaged components to be replaced while the system is in operation; and background task rebuilding, where data is automatically replaced on a new drive while the system is fully on-line.

In addition to digital commercial insertion, the system can be used for video-on-demand and near-video-on-demand program distribution, time delay, instant on-line access to archived "featurettes" during live program segments (sports, news and financial) and regional programming. **Reader service #201**

CableNet Meets HollyNet

Digital video can greatly simplify the production and editing of new movies and TV shows. Digital video editing is nonlinear, which enables a technician to cut and paste video clips as easy as a word processor cuts and pastes words. The finished product is in a digital format, which can be shipped around electronically in an instant.

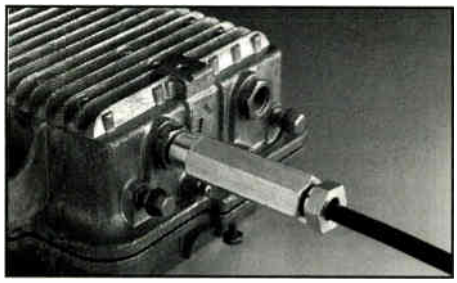
TRW, in conjunction with the University of Santa Cruz Schools of Cinema-Television, took the whole concept a step further with a demonstration of HollyNet. The movie making process has been broken into five steps that can be enhanced by a digital video network. These include development, preproduction, production, on-location filming and postproduction. In CableNet, TRW demonstrated how its server can be used to improve the preproduction and postproduction steps.

In the preproduction demonstration, users were able to select from a choice of costumes and locations stored on the TRW RAMCube computer storage device. In the postproduction demo, users were able to edit and process video stored on the RAMCube in real-time. The RAMCube stores 26 Gbytes of data that can be read and written to at up to 1,600 Mb/s. **Reader service #204**

OptiCon Fiber Management Products Introed By Siecor

Siecor displayed a variety of new products including its Fiber Management System, a modular distribution system (MDS) for its OptiCon fiber management family, and the OptiFit assembly.

The computer-based Fiber Management System is designed to track all fiber components in the central office, headend and premises wiring systems. It provides a system operator with a graphical way to represent fiber products in the network for improved organization. The graphical interface provides tip-to-tip fiber tracking from transmitter to optical receiver. The software is compatible with the company's fiber organization hardware. Detailed information on fiber is provided with the software system, down to individual connector ports. Jumper management and inventory control is simplified. Users can view port utilization on a frame-by-frame basis. As a result, system operators can develop historical test data tracking for individual ports or fibers.



The company's MDS provides for ultra-high fiber density while maintaining excellent fiber management. The unit is a single rack-height, full-front access designed for 19-inch racks. Each shelf can accommodate multiple components, managing up to 36 interconnection points, up to 36 heat-shrink fusion splices and up to 24 optical splitters. A single 72-inch rack or cabinet can accommodate over 1,400 fiber termination and all associated splices and splitters. Full-front access is provided via an 18-inch slide-out shelf design, allowing no-tools access to individual connectors, splitter modules and the splice tray. Fiber management and bend radius controls are provided throughout the product with unique horizontal and vertical cable guides, to ensure signal integrity.

The OptiFit assembly was designed to address emerging hybrid fiber/coax (HFC) network design considerations. This new termination stub is designed specifically to connect the optical network unit (ONU) to the optical drop cable at the receiver node. This makes possible the use of preconnectorized drop at the node location. The OptiFit assembly, available in lengths up to 40,000 feet, eliminates additional splice points and hardware at the node. The assembly includes two parts: the furcation unit, supporting two-12 optical fibers in protective subunits, and the metal fitting that links the furcation unit to the hardware. **Reader service #166 (Fiber Management), #165 (MDS), #164 (OptiFit assembly)**

GI's Newest Terminals Are Interactive Upgradeable

General Instrument introduced and demonstrated its latest generation of analog addressable terminals, the CFT 2200 family.

New features and options include enhanced graphics, feature downloadability, virtual data channels and near-video-on-demand (NVOD) ordering system, real-time two-way communications capability, renewable security via a smart card, Sight & Sound capability via a digital audio upgradeability, an 860 MHz digital-ready tuner, digital compression upgradeability and upgradeability to multimedia via the LinX module.

The basic unit is capable of being configured by operators to offer flexible service options, offering expanded memory dedicated to the storage of subscriber messages. It is also multilingual, contains multiple language character sets and is able to download additional languages to the user terminal.

The units also contain a Smart Card renewable security system for future upgrades to the access control system. These cards contain a microprocessor and associated circuitry that enable changes in the decryption algorithm of the access control system.

Each unit contains integrated tuner technology, eliminating 120 discrete components and 12 manual adjustments through the world's first-ever consumer product use of gallium arsenide technology, according to the company. This enables the tuner to process both analog and digital signals and allows the unit to offer a digital compression upgrade option.

An optional enhanced pay-per-view ordering system supports NVOD services. This enables the operator to provide pay-per-view movies with multiple start times per hour and provides a downloaded data base of movie titles, descriptions and start times to the converter that the subscriber accesses through the on-screen displays.

The feature expansion module also facilitates the delivery of enhanced services such as virtual data channels. The terminal can be equipped with an optional RS-232 serial data port. **Reader service #194**

Pictures On-Line

Kodak demonstrated a way in which tomorrow's emerging networks might be used for "interactive photo finishing." The system starts with the exposed film, which the user drops off at the local film processing shop. After the shots are developed they are scanned into a computer. Then an electronic notice is sent to the consumer over the cable system. The consumer can then view thumbnail sketches of the pictures on a TV set and select some to display full screen. These can be ordered, enlarged or sent to a friend, all from the cable box.

Consumers can even incorporate the pictures into different mats, masks and frames, and preview the finished product on the TV set before they are printed out. **Reader service #196**

Eagle Mutes Offensive Language

Eagle Comtronics announced its solution to the industrywide problem of eliminating offensive language in premium services. Some sync suppression descramblers allow audio to be heard even though the channel is not subscribed to. The solution, says Eagle, is a special split-tuned negative trap where two poles are tuned to the audio, thereby eliminating the offensive language; two poles are tuned to the video, reducing the momentary video lockup characteristic of sync suppression scrambling. By reducing video lockup, undesired video scenes are eliminated.

These traps are versatile (for indoor and outdoor use); economical (only for complaining customers, priced only slightly higher than standard traps); audio-effective (audio is trapped out); and video-effective (lockup tendencies are reduced). An added benefit is that many pirate boxes are deactivated. **Reader service #195**

Trilithic Addresses Return Alignment

Trilithic Inc. introduced the 9557/9558 return alignment system, which enables the CATV operator to balance CATV system return paths quickly and simply, and without placing sweep generators at system extremities. Instead, the operator simply connects a portable, battery-operated upstream signal source, the 9558, to the return path test point at each amplifier.

Signals from the 9558 are interpreted by the 9557 headend transponder, which reports return path balance to the operator via a narrowband downstream signal. The operator can conveniently balance the upstream path by simply observing the transponder's output on an ordinary signal level meter while performing adjustments. The system is available in two frequency ranges: 5-30 MHz and 5-40 MHz. **Reader service #202**

Keeping An Eye On Costs

The CableData division of US Computer Services has designed a real-time billing system that can be used for a variety of new services ranging from telephony to movies-on-demand.

In the CableNet demonstration, a new version of CableData's Intelecable program took in calling records from a Northern Telecom telephone switch and used this data to calculate a customer's bill. In the demo, this data was posted to a PC, but it also could be sent to a subscriber's set-top. In addition to telephony, the system will support interactive broadband service, video telephony and high-speed data services. **Reader service #205**

ADC Supports Hybrid Fiber/Coax Nets

ADC Telecommunications showed a new line of high performance video signal distribution products designed to support the deployment of hybrid fiber/coax networks. These new products include the SC2008 and SC1016 video splitter/combiner panels, the VJ2011 video jacks and panels, and the Analog Video Interface system.

Although these video signal distribution products are designed for implementation with the Homeworx platform, they can be used universally in any hybrid fiber/coax architecture. They fit into the network at the headend, central office or any distribution node.

The SC2008 and SC1016 provide passive splitting and combining of video signals, and are equipped with eight or 16 inputs respectively. These panels split and combine video signals from a range of 50 MHz up to 1 GHz of bandwidth and feature a panel configuration rather than individual components. Both are 75-ohm products and offer high isolation and return loss, and low insertion loss electrical performance.

The VJ2001 video jacks and panels are individual components that provide the capability to monitor or patch video signals and provide a central point to insert a video test pattern into the video network. VJ2001 products also enable in-service cut-overs for equipment upgrades. The switching coaxial jacks perform within a 1 MHz to 1 GHz spectrum, and meet the current needs of CATV's broadband radio frequency. Return loss is greater than 15 dB, with insertion loss at a maximum of 1.3 dB.

Designed to access and monitor individual 4 to 6 MHz baseband video signals and 40 to 50 MHz intermediate frequency signals, Analog Video Interface System panels provide a central point for testing and circuit access for intermediate frequency or video signals from DC up to 50 MHz of bandwidth. **Reader service #170 (SC2008), #169 (SC1016), #168 (VJ2001 jacks), #167 (VJ2001 panels)**

Storage Concepts Demos Real-Time Digital Solutions

Storage Concepts demonstrated real-time storage solutions and technology in interactive digital video applications. The company ran its Concept 71 RAID storage system in a video-on-demand (VOD) environment. The demo served digital media (uncompressed) at rates in excess of standard real-time video rates.

The Concept 71 product parallels 3.5-inch disk drives to achieve sustained video rates of 200 Mb/s (100 video streams). It is a self-contained system with a storage capacity of 100 Gbytes (90 movies or 100 hours of programming) from a single host connection.

The company also introduced its newest high-performance, real-time storage solution for VOD, interactive TV and other bandwidth-on-demand environments, the Concept 910-SW. This technology incorporates a modular architecture that facilitates a high level of scalability, flexibility, field expansion and upgrade, and fault isolation to field/customer replaceable units. **Reader service #177 (Concept 71 RAID), #176 (Concept 910-SW)**

Standard Modulates PAL

Standard Communications Corp. introduced its latest frequency agile, continuous duty, international TV modulator, the ICM470. The unit is an adjacent channel, VSB AM modulator designed for use in all PAL video systems.

The modulator employs extensive use of integrated circuit technology to ensure state-of-the-art performance and reliability. The RF output, which is microprocessor PLL controlled, is frequency agile from 50 to 470 MHz. The module's PLL synthesized tuning provides ultra stable RF output frequencies that are virtually spurious free. Using proprietary high level mixer technology to achieve superior out-of-band noise specifications, up to 77 modulators can be combined.

An easy-to-use, direct thumb-dial on the front panel eliminates the use of look-up charts or hidden BCD control switches. The frequency displayed on the front panel is exactly what is being distributed on the cable system. Also, unlike modular

designs, the tuner satisfies RF design goals without the use of external filtering or an internal switching filter bank.

Also, the company introduced its SCM470, the NTSC version of its international TV modulator series. **Reader service #199 (ICM470), #198 (SCM470)**

First Cable PCS At Adelphia

Adelphia Communications Corp. launched PageTime, the cable industry's first personal communications service (PCS), according to the company. The service will utilize existing paging infrastructures to deliver paging services to consumers, augmenting these established networks with its own infrastructure as it comes on line over the next five years.

PageTime is working with AirTouch Paging on initial market rollouts in the Southwest, southern Florida and Southern California. The service offers cable operators the opportunity to enter the wireless communications market without waiting for future networks to be built.

A national in-bound call center will handle sales orders and service, a national telemarketing center will upgrade subscribers to the service, and a national pager distribution center will drop ship pagers directly to subscribers. The company also is developing software to interface paging headend sites throughout the country with local cable billing systems to fully automate the paging transaction process. **Reader service #197**

Unisys DCSS Helps Overcome Noise

In CableNet, Unisys and CableLabs demoed the use of spread spectrum technology to overcome some of the noise impairments of the cable system upstream path using the Unisys Digital Cable Services System (DCCS).

Spread spectrum technology, originally developed for secure military applications, is very effective for extremely noisy environments. As a result, the communication link provides reliable communications despite high levels of ingress, channel tilt, group delay distortion, common path distortion and impulse noise often found in a cable system's return path (especially in a subsplit return (5 to 40 MHz). In the return path the DCSS spread spectrum modulation uses direct sequence spreading centered at 22.5 MHz and 35 MHz bandwidth and a variable data rate of 8 kb/s to 8 Mb/s. The forward path is QPSK modulation centered anywhere on the 50-750 MHz band with 6 MHz of bandwidth and a data rate of 8.192 Mb/s.

Unisys also displayed a wireless 64 kb/s voice and data link product using spread spectrum modulation. When connected to the cable network, the product is capable of providing a solution for wireless 64 kb/s plain old telephone service (POTS). The product can be connected to the telephone network in the headend or central office or be deployed downstream in the HFC (hybrid fiber/coax) tree-and-branch providing a wireless RF link to the subscriber premises. The system replaces the traditional deployment of twisted-pair copper wire from the LEC central office to the customer premises. **Reader service #162 (DCCS), #161 (data link)**

Connectors Rolled Out By Amphenol

Amphenol announced the Hardline Gold Series CATV connectors as well as the F Weatherseal Series connectors.

The Hardline connectors are designed for many years of installed performance in harsh environments including ozone, industrial airborne pollutants, and salt spray, throughout a temperature range of -40°F to +140°F.

The F Weatherseal Series connectors are designed for fully weatherproof interconnection. These connectors are weatherproofed at both cable attachment and mating face, and no addition sleeves or sealing compounds are required. Offering a minimum of 40 LBF pull-off force, the F-connectors provide excellent cable retention. **Reader service #174 (Hardline), #173 (F Weatherseal)**

Power Guard Intros Extended Power Supply

For telephony considerations, Power Guard unveiled an extended run time standby power supply. This unit has room for six batteries in a pole mount or ground mount configuration.

Also new is a cabinet or vault for batteries only, with an interconnect wiring bus that will link an existing power supply to a second string of two, three or more batteries in parallel. **Reader service #172 (power supply), #171 (cabinet)**

Data Analysis New From Program Timer/Matrix Switch At Monroe

Monroe Electronics introduced the Program Timer Jr., which features a stereo audio/video switch that controls one channel for Syndex, nondupe, or program sharing by timed commands. Setting individual days or an entire weekly schedule is accomplished with only five keystrokes.

Also on display was the Model 630 4 x 1 RF matrix switch, which features 5-750 MHz switching and unused ports terminated to 75 Ω. The unit is designed to be used as a 4 x 1 or a 1 x 4 for fiber-optic input/output switching. The flanged enclosure and screw terminal contact control inputs make installation easy. **Reader service #179 (timer), #178 (switch)**

Trilithic Unveils Return Path Alignment

Trilithic displayed its 9557/9558 return alignment system that enables the CATV system operator to balance CATV system return paths quickly and simply and without placing sweep generators at system extremities. Instead, the operator simply connects a portable, battery-operated upstream signal source, the 9558, to the return path test point at each amplifier.

Signals from the 9558 are interpreted by the headend transponder (9557), which reports return path balance to the operator via a narrowband downstream signal. The operator can conveniently balance the upstream path by simply observing the transponder's output on an ordinary signal level meter while performing adjustments. **Reader service #200**

Electroline Lets The CAT Out Of The Bag

Electroline's new Compact Addressable Tap (CAT) is an addressable multitap that allows remote and automated provisioning of basic cable TV services through on-off control of MDU drops.

An optional tier control capability allows automated on-off provisioning of one or two additional signal tiers. This feature allows automated delivery and termination of expanded basic service tiers, for example. The tier-control feature also can be used to prevent noncustomer access to telephone and data signals that may be carried on the network.

This security feature, not available on passive multitaps, blocks specified frequency bands from delivery over the drop cable to customer premises. That deters theft and unauthorized eavesdropping by telephony service noncustomers because there is no access to the radio frequency carriers bearing telephone and data traffic.

The compact CAT features a form factor one-third the size of the standard addressable tap, a feature especially useful for pedestal mounting. The unit is available in four-, eight-, 12- or 16-port versions and supports on-off control of one or two tiers of service. **Reader service #154**

CM Techs' PC TDR

CM Technologies Corp. displayed its latest PC-card metallic time domain reflectometer, the PCI-3100. It can be used as a testing device to assess the condition of various types of cable and cabling components. With a measurement rate of 6.4 gigasamples per second, the unit has a maximum range of 96,000 feet and can resolve defects to within 1 inch. The card also comes complete with a data acquisition and analysis software package for either DOS or Windows.

The software allows the user to save and recall TDR waveform files for future comparison of up to eight user-selected overlays in the overlay mode, and the ability to zoom in on any portion of the waveform in six steps up to 64x for detailed analysis. As well, the differential waveform analyses mode feature amplifies the differences between any two selected TDR waveforms. **Reader service #175**

Sealed Nonstandby Power New At Alpha

Alpha Technologies showed it newest nonstandby power supply. It was developed specifically for extreme environment applications and consists of an environmentally sealed assembly based on single-ferro design. Available in 8 and 14 amp versions, it is said to be ideal for subterranean installation with high dust, moisture or gas concentrations, as well as applications where flooding is a concern. The new design also allows several mounting configurations including strand-, pole-, rack- and shelf-mount versions. **Reader service #163**

Antec Focus: Laser Link, PowerTap

Antec's new 750 MHz-capacity Laser Link Low Power provides operators with cost-effective means of dedicating a single laser to each individual service node. The new technology will assist operators in taking full advantage of 500-home nodes while putting the infrastructure in place to offer bandwidth-hungry interactive digital services in the future. The low powered Laser Link was designed to help broadband network providers put the platform in place to deliver narrowcasted services, while reducing potential bandwidth contention problems and increased costs in the future.

Also new from Antec is its new Regal 1 GHz PowerTap, said to give broadband telecommunication providers the ability to deliver robust, network-powered services over a hybrid fiber-optic/coaxial cable network at 25% better performance levels than attained by current tap products.

The unit uses a new "Siamese" approach to drop cable that integrates coax and twisted-pair in a single package. From the incoming coaxial feeder, the PowerTap segments the RF signals from the power, delivering the RF signals via coax and the power through the twisted-pair. **Reader service #158 (Laser Link), #157 (PowerTap)**

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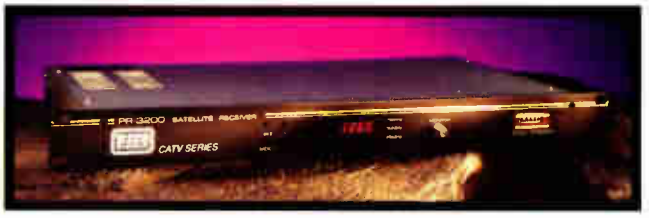

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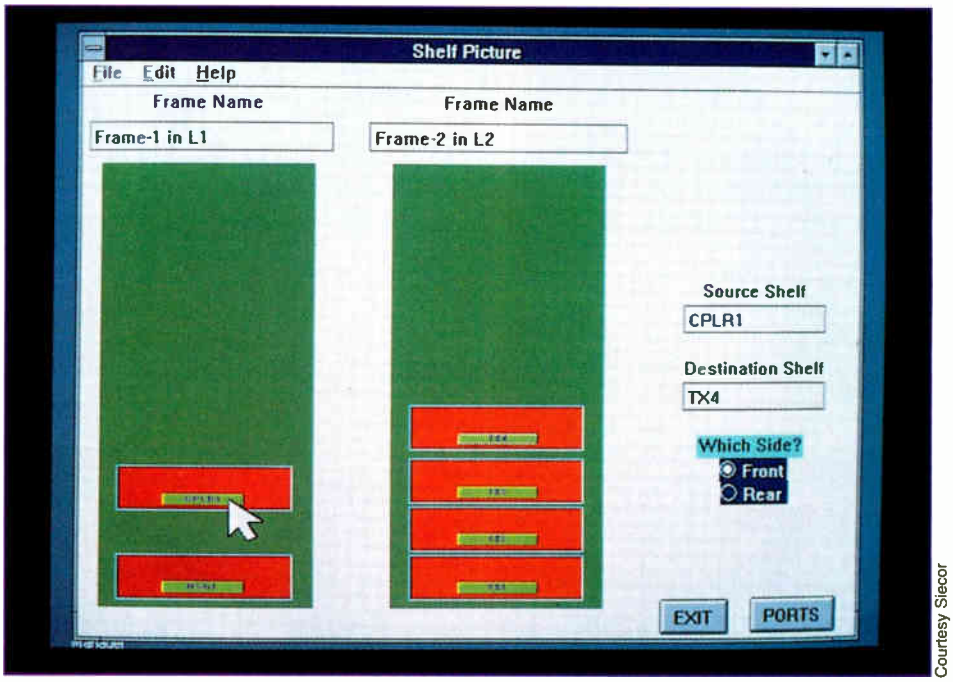
Fiber management and maintenance in the CATV network

By John R. Phillips
Product Specialist, Fiber-Optic Hardware
Siecor Corp.

With the growing use of fiber in CATV distribution, the number of fibers being deployed in the network has grown enormously over the past several years. With this exponential growth has come the complexity of managing and maintaining the fiber terminations and distribution. A key to good fiber management is designing and selecting the appropriate fiber management system for the headend.

CATV fiber management can be broken down into four basic categories: interconnect solutions, passive component solutions, splicing solutions, and administrative solutions. By analyzing each of these areas, the system designer can determine the best overall solution for the application.



Courtesy Siecor

Fiber management and maintenance is simplified with computerized systems.

Interconnect solutions

Interconnect solutions are the backbone of the fiber management system in a headend and serve as the integrating component for the overall solution. Interconnection is the function of providing a method for connecting optoelectronic equipment (such as transmitters and receivers) ultimately to the fiber routed out to a fiber-optic receiver node. By providing a connection rather than simply a hard splice between the two components, rearrangement and test access are more easily accomplished.

When selecting an interconnect solution for headend fiber management, there are several factors to consider to allow for easy maintenance:

1) How much space is available for fiber management hardware?

2) What is the fiber count coming into the headend?

3) Are there existing equipment racks or cabinets that the management system must fit into?

4) What type of connection access is required?

5) What is the fiber-per-node count?

These factors are not all-inclusive but should help you design a complete system that also is easily maintained. You should consider the following issues:

• *Issue 1* — There are a variety of headend fiber distribution systems that fit standard 19- and 23-inch open racks and enclosed cabinets. Standard rack heights include 7, 9 and 11.5 feet while cabinet dimensions vary considerably.

Some considerations when selecting a rack size include whether you are trying to maintain compatibility with existing racks or cabinets and also how many jumpers will be routed between racks. In low (less than 300) to medium (300 to 1,000) fiber count applications, 19-inch cabinets or racks provide adequate space on either side of the installed housings for jumper routing. However, when high fiber counts (greater than 1,000) are encountered, 23-inch racks may provide a more usable system given the extra vertical space on either side of the installed housings. If a 19-inch enclosed cabinet is a standard for your system, using at least 30-inch deep racks also can accommodate fairly high densities.

Another factor related to headend space is whether the distribution system requires rear access in addition to front access. In limited area applications, a full frontal access system may be preferable for quick test and rearrangement access.

• *Issue 2* — Fiber count, in addition to headend space, also predetermines the type of distribution system chosen. High fiber counts, in conjunction with limited headend space, dictate the need for a high-density product. Typically the requirement for over 1,000 fiber terminations per rack is considered a high fiber count application.

High fiber count applications can sometimes limit the usability of the system and make test access and rearrangement more difficult. It is important for the system designer to evaluate the ease-of-use features of any management system being considered. These include access to jumpers,

"Interconnect solutions are the backbone of the fiber management system in a headend and serve as the integrating component for the overall solution."

connections and modularity of components.

• *Issue 3* — In some cases there may already be a rack or cabinet system in place or a particular size may be the standard for a given system. Here, it is important to understand the benefits and limitations to each of the distribution system sizes. Enclosed cabinets allow the system operator to isolate jumper and connectors and greatly reduce the chance of accidental damage. By the nature of the enclosure, cabinets may reduce the usability of the system by limiting jumper routing to the rear or inside portions of the cabinet.

• *Issue 4* — Connection access can mean several things. First, is the access to the connectors themselves from the front or rear of the housing? Second, is the connector individually accessible for testing or rearrangement purposes or are a number of connectors grouped together in a modular form? Modularity and access issues also may determine the system chosen for the headend.

• *Issue 5* — The fibers per node count also can determine the type of system used. It is generally a good idea to match fibers per node to installed module or panel types. Interconnection housings provide a modular system for grouping connectors. By matching fibers per node to module size or module capacity, the system designer can organize and logically separate fibers/buffer tubes. For example, six fibers per node would dictate a six-pack module type for certain solutions.

Passive component solutions

Passive component solutions help integrate optical couplers/splitters and wavelength division multiplexers (WDMs) into the total fiber management system. Coupler/splitter devices are typically dual-wavelength, bidirectional components that split optical power in a variety of ratios. Typically, optical couplers are specified in 5% or 10% power increments with each ratio exhibiting a unique insertion loss characteristic. By concatenating couplers, the system designer can customize output power from a particular transmitter to feed a number of differing distance nodes. On the other hand, WDMs split optical signals by wavelength. This allows the system designer to use two wavelengths (typically 1,310 and 1,550 nm) independently in a variety of applications. By selecting these components in a package compatible with the chosen distribution system, the network designer can optimize the use of the headend fiber management solution and maintain modularity and rearrangement capabilities.

The distribution system chosen for interconnection usually dictates the passive component solution for the headend. A modular approach would be chosen if each coupler circuit must be contained in a discrete package. The benefit of isolating splitters is that rearrangement as the network evolves is easily accomplished by simply rerouting connectorized cable rather than breaking splices.

Splicing solutions

Splicing solutions provide a means for transitioning from outside plant (OSP) cable to indoor cable in the headend and also provide security and protection for splices in the outside plant. Transition splicing in the headend can be accomplished either in the same location as the other fiber-optic components (on-frame) or at a separate location such as where the OSP cable enters the headend (off-frame). In larger facilities, fire codes may require that the OSP cable be spliced to indoor-rated cable before reaching the interconnect frame. (OSP cable is limited to 50 feet of indoor travel.)

Typically, if fiber is spliced to indoor-rated cable at a separate location, a facility entrance splice housing is used. These housings usually have a high fiber count capacity and can be wall- or rack-mounted. The housing should have several cable entrances and allow for buffer tube slack storage. Lockable and environmentally enhanced housings also may be desired. If the headend size makes it possible to splice OSP cable on-frame, then pigtails or transition cables are typically spliced onto the OSP cable and then routed to an adjacent frame or to interconnect or component housings in the same frame.

Outside plant splicing solutions should be evaluated according to ease of re-entry and durability issues. Emergency restorations can be greatly affected by the design of the outside plant fiber splice closure. The system designer must balance ease of use factors with the integrity of the closure.

The number of cable entries into a closure also can be an important factor to consider. As the network evolves, additional splicing may be required at existing locations.

Administrative solutions

Administrative solutions for maintaining the CATV network consists of a fiber management software system for tracking all fiber-optic related components in the headend and outside plant. Although active status monitoring is a developing field, a data base-oriented tool for historical tracking of all of the components of the network also is desirable. Typically, splice plans and diagrams are not consistently maintained and this information can be crucial during an emergency restoration. Also, fiber-optic interconnection and splitter information may or may not be documented in the headend. Finally, optical time domain reflectometer (OTDR) traces of all fiber in the network should be maintained in a data base format for easy tracability.

A good fiber management solution that aids in easy maintenance of the entire system should provide capabilities for the following tasks:

- *System design aid* — This tool would allow the system designer to generate "cookie-cutter" network designs and bills of materials in a very short amount of time. By providing an "expert system" interface that used predetermined criteria for node placement, headend fiber management design and cable layouts, the fiber maintenance and management system would allow the network designer to create a reproducible network design in every new-build or rebuild.
- *Add/drop connection and fiber jumper inventory maintenance* — By providing a graphical point-and-click interface to the fiber management interconnect system in the headend and also from splice closure to splice closure, the system would allow the headend engineer to easily make changes to fiber port assignments as the CATV network evolves. In addition, fiber-optic jumper lengths can be inventoried by the system and be managed as adds and drops take place. This feature allows for quick and easy fiber port assignment maintenance and can be crucial when fiber counts reach into the hundreds and even thousands.
- *Overall network troubleshooting via point and click, iconic circuit representation* — By providing a logical topographical overhead view of a particular fiber network, the system engineer can easily determine the point of failure by associating data from historical and current OTDR traces. The system would automatically determine the distance where a discrepancy has occurred (based on predetermined heuristic rules) and highlight the portion of the network where a work crew should be sent. Also, graphical representations of the particular cable or splice closure could be downloaded to a hand-held computer for reference in the field.

The fiber maintenance and management system also should be designed to allow for central information storage and retrieval. Many of the popular relational data base systems on the market today support such a client/server model. The fiber management system would simply need to be written to interface with one of these data base systems.

Summary

With the growing number of fiber terminations in the CATV network, it has become increasingly more important that good record keeping occur during deployment rather than as an afterthought. Good network and headend design, along with thorough computer-based administrative tools, can make maintenance of the fiber network more efficient. **BTB**

Stories from the world of fiber — What not to do!

By William L. Spies
Director of Engineering
Warner Cable of Greater Cincinnati

Courtesy Maclean Hunter Cable TV

When I first considered writing a "how not to do it" article, I knew that would be difficult. You see, the cable industry has had so many successes in the use of fiber optics. We've been successful at continuing the design evolution of our networks, the depth of fiber in proximity to the home, the adaptation of our operational staffs to meet the new challenges and much more. We've done well. It just seemed like this would be some work. Then I started to remember some situations that could be instructive. Good examples too. The school of hard knocks has been an educational source for some and the lessons were not cheap. I hope to share these lessons in such a way that they'll be both personally educational and good to pass along to someone else. These "incidents" have not necessarily happened to my system, so I'm leaving out the names to protect the innocent and not so innocent.

Lastly, one of my favorite professors once said, "Never show someone how not to do it for surely that's the only thing they'll remember." And then he showed us anyway. There is a ring of truth in that statement so beware and considerate of what is about to follow.

The act of God

The first experience I had with fiber was while investigating a 37-hour outage. I remember the commotion when it happened. Unfortunately for the system, many of the company's bigshots lived in the area that was out. Not a good start for this system as it only had fiber installed for about three months.

A tree, in a very wooded area of the system, was knocked down by high winds. During its fall it caught the power, fiber, coax and strand sending it crashing to the ground. That wouldn't have been so bad except for one thing, a J-hook located 12 inches below the strand. When the mess of wiring and lines came down, it was smashed on the J-hook.

Now with all of this mess somehow the power company made a decision not to let the cable technicians into the immediate area to start fixing the problem. Seems reasonable since live power lines were on the ground. Too bad that this was Saturday about 9 p.m. and 12,000 customers no longer had cable service. Big problem!

So from the system's point of view things weren't going well. And they weren't about to get better. First, the system's repair crew couldn't get in to fix the problem. The power company finally let them in at about 8:30 on Sunday morning. The next problem was the system had no one trained to deal with fiber. The only person that was asked, thought the fiber was probably "shattered for hundreds of feet." It gets worse. When work on the fiber did start, they found that there were no spare closures and service cable. Now they'd have to make a splice jumper.

Okay so now things are going well or so it seemed. Next problem, none of the test equipment was connectorized for this situation so they couldn't use

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19	45	71	97	123	149	175	201	227	253	279	305
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22	48	74	100	126	152	178	204	230	256	282	308
23	49	75	101	127	153	179	205	231	257	283	309
24	50	76	102	128	154	180	206	232	258	284	310
25	51	77	103	129	155	181	207	233	259	285	311
26	52	78	104	130	156	182	208	234	260	286	312

A. Are you a member of the SCTE (Society of Cable Television 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
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13. ___ Financial Institution, Broker, Consultant
14. ___ Law Firm or Govt. Agency
15. ___ Program Producer or Distributor
16. ___ Advertising Agency
17. ___ Educational TV Station, School, or Library
18. ___ Other (please specify)_____

C. Please check the category that best describes your job title:
19. ___ Corporate Management
20. ___ Management
21. ___ Programming
Technical/Engineering
22. ___ Vice President
23. ___ Director
24. ___ Manager
25. ___ Engineer
26. ___ Technician
27. ___ Installer
28. ___ Sales/Marketing
29. ___ Other (please specify)_____

D. In the next 12 months, what cable equipment do you plan to buy?
30. ___ Amplifiers
31. ___ Antennas
32. ___ CATV Passive Equipment including Coaxial Cable
33. ___ Cable Tools
34. ___ CAD Software, Mapping
35. ___ Commercial Insertion/ Character Generator
36. ___ Compression/Digital Equip.
37. ___ Computer Equipment
38. ___ Connectors/Splitters
39. ___ Fleet Management
40. ___ Headend Equipment
41. ___ Interactive Software
42. ___ Lightning Protection
43. ___ Vaults/Pedestals
44. ___ MMDS Transmission Equipment
45. ___ Microwave Equipment
46. ___ Receivers and Modulators
47. ___ Safety Equipment
48. ___ Satellite Equipment
49. ___ Subscriber/Addressable Security Equipment/ Converters/Remotes
50. ___ Telephone/PCS Equipment
51. ___ Power Suppls. (Batteries, etc.)
52. ___ Video Servers

E. What is your annual cable equipment expenditure?
53. ___ up to $50,000
54. ___ $50,001 to $100,000
55. ___ $100,001 to $250,000
56. ___ over $250,000

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

G. What is your annual fiber-optic equipment expenditure?
66. ___ up to $50,000
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68. ___ $100,001 to $250,000
69. ___ over $250,000

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

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88. ___ Repair Services
89. ___ Technical Services/ Eng. Design
90. ___ Training Services

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

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

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4	30	56	82	108	134	160	186	212	238	264	290
5	31	57	83	109	135	161	187	213	239	265	291
6	32	58	84	110	136	162	188	214	240	266	292
7	33	59	85	111	137	163	189	125	241	267	293
8	34	60	86	112	138	164	190	216	242	268	294
9	35	61	87	113	139	165	191	217	243	269	295
10	36	62	88	114	140	166	192	218	244	270	296
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17	43	69	95	121	147	173	199	225	251	277	303
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20	46	72	98	124	150	176	202	228	254	280	306
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an OTDR (optical time domain reflectometer) to test the spare fiber on the reel. (No big deal. There is never anything wrong with fiber.) So they continued. Eventually when nothing worked they suspected something was wrong with the spare fiber. It turned out that the reel had been grabbed off of the construction lot and there was a fiber break in the first 20 or so feet.

That problem got solved early morning — Monday. Finally, the construction department from the contractor arrived, put up the fiber, spliced it and turned the system back on some 37 hours later.

$30,000 can't lie

Another incident happened when erroneous OTDR readings caused quite a flak.

We all trust our test equipment and that was no exception when a technician started to get OTDR readings. The readings indicated that there were big problems. Just about every other fiber that was being shot showed an open. Something was drastically wrong. We'd heard about incidents where only some fibers were damaged but this was even worse. So not trusting these readings, another tube in the patch bay was selected for testing. Most of these fibers were fine but a couple showed high loss. One even showed a problem 481 feet from the headend where the underground crews had been working several days before. Had something gone wrong when they pulled the fiber in? We were about to find out.

Construction managers, fiber crews, local staff, you name it, everyone showed up to see if the fiber got damaged. Five hundred feet of field cable was going to be pulled back into the headend and the damaged portion removed. Two hours later the fiber was ready for inspection. No problem with the fiber. "Couldn't be," everyone said. "We've got bad readings."

They regrouped. First thing that was said, "Let's try a different OTDR." Seemed to make sense, although people were skeptical because we used a $30,000 OTDR earlier. How was a mini ever going to show us the detail? So the mini was brought out. There was the problem with every other fiber in the first tube. But, there was no event 481 feet out from the headend. Wait a minute. Every other fiber? Didn't someone hang those nodes the other day? Those two-way nodes with lasers shooting back to the headend. Isn't the reverse laser active when powered? For crying out loud

you can't use an OTDR to test a fiber with light on it coming back to the headend. And as for the glitch at 481 feet no one saw anything on the mini. A lot of work for nothing. Luckily enough it was before the big turn on of customers.

Haste makes waste

I just heard about the indestructibility of fiber in a recent conversation. Seems that a bulldozer ran over some armored fiber. Now this happened during the construction of a section of fiber on a road that also was being reconstructed. Bulldozers, pickup trucks, payloaders and drivers were all over this area. So were the figure-eights for the fiber construction.

The construction crews were actually very good. They paid attention to detail. They followed all of the safety rules. They did everything right. Even when they figure-eighted the fiber out for the next pull they talked to everyone on that job site, even the bulldozer operator. They coned off the area and told everyone not to touch the fiber or else. They said that they would be moving the fiber right after lunch (it was now lunch time) and to wait until they got back.

Well it was now after lunch and the fiber was being pulled out. Then one of the fiber crew members saw the damage. Some sheath had been ripped off and the cable squashed just feet away. It was not going to be their day. Soon every supervisor would be on site.

It was determined that the bulldozer operator, in his haste to get things finished before lunch, had moved the cable and subsequently ran over it. The cable was inspected and little external damage was found but the squash mark sure looked bad. A splicer with his OTDR was called to setup at the other end of the reel and shoot the fiber. Luckily, the readings showed no damage to the glass itself. No bad fibers. Another bullet dodged.

"I cannot stress it enough: Don't wait until the last minute to train for a fiber emergency, or any emergency for that matter."

Do as I say

Now let's see what wasn't done that led to these incidents.

First, training and emergency restoration is vital to any system. In the first incident fiber was already active but no one was trained. I cannot stress it enough: Don't wait until the last minute to train for a fiber emergency, or any emergency for that matter.

Second, think about connectorization. It's not complex. When you buy equipment get it connectorized with the same setup that is predominantly used in the headends and/or patch panels. Get universal connectors. And get bare fiber adaptors. You will need them.

Never ever trust fiber that's just lying around. Test it with an OTDR. Who knows what happened to the fiber from the time of installation to when the reel showed back up at the warehouse.

If the OTDR gives you bad news, get a second opinion from another device. Don't have another? That's common. Call a local company that specializes in emergency fiber repairs and have them come over. Don't know any local companies that do that sort of thing? Well now's the time to look for them. They may just save you in a time of need.

And what about trying to get OTDR readings with light coming from the other end? Doesn't work too well. Really this is not such an unlikely situation. Most cable systems are one-way today. But more and more are buying and installing two-way equipment. And, when you power up the node in the field, that reverse laser is active. (Maybe we can get the laser vendors to install a power switch on the reverse laser so it's easier to turn that light source off during testing.)

And how about construction? Everyone I've met has been very professional when it comes to fiber construction. We have some of the best fiber crews around. The problem is that not everyone listens (like the bulldozer operator) and we may be too trusting. There's room for some improvement on the manpower side of construction when the placement of cable is concerned. Be it security guards or just a person staying with the cable reel or figure-eights, someone is needed to keep others away from the site.

So as someone once said to us many years ago, "Do as I say and not as I do." **BTB**

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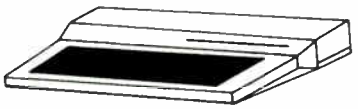

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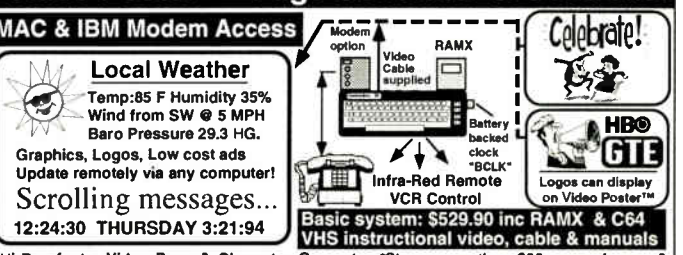

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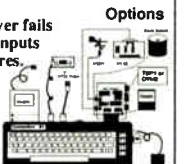

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RR#	ADVERTISER	PAGE#
89	Alcatel	58
27	Alpha Technologies	29
20	AM Communications	11
23	American Lightwave Systems	5
57	Amphenol Fiber Optic Products	31
17	Ando	42
85	Antec Corp.	96
175	Avcom of Virginia	79
57	Cable AML	12
71	Cable Security	6
40	Cadco	93
104	C-Cor	18
93	Coast CATV Supply	24
99	Communications & Energy Corp.	20
38	Comsonics	63
36	Corning	65
29	Dawn Satellite	13
174	DH Satellite	78
86	DX Communications	33
21	Exfo Fiber Optiic Engineering	19
98	Fiber Plus International	8
15	General Instrument	43
18	Harmonic Lightwaves	41
10	Hewlett Packard	17
82	Holland Electronics	32
76	Information Handling Service	39
87	Integral Corp.	26
35	Ipitek	53
78	ISC/Data-Com, Inc.	46
169	Jensen Tool Company	20
78	Laser Precision Corp.	60
47	Leader Instruments Corp.	49
53	Leaming Industries	61
122	Lectro Products	25
69	M&B Manufacturing	60
31	Mainline Equipment	51
95,168,177	Mega Hertz	8,24,81
76	Monroe Electronics	32
	Multilink	Chart
170	NaCom	67
80	Osburn Associates Inc.	18
69	Passive Devices	16
48	Performnace Cable TV	92
39	Pirelli Cables N. A.-Comms. Div.	22
171	Photon Kinetics	67
111	Pico Products	75
7,172	Power Guard	7,68
68	Quality RF Services	56
178	Ripley	90
103	Riser Bond	91
89	RL Drake	21
59	Sadelco	30
1	SCTE	62
2	Sencore	2
91	Siecor	28
77	Sprint North Supply	47
13	Standard Communications	9
173	Supercomm	76
105	Superior Electronics	95
185	Tektronix	37
74	Telecrafter Products	4
146	Trilithic	27
3	Trilogy Communications	3
78,79	Tulsat	44,45
21	TVC Supply	35
96	Vela Research	23
176	Wade Antenna	79
4,51,67	Wavetek	15,55,57

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BOOKSHELF

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

- *Ku-Band Technology and TVRO Calculations* — Paul Heimbach discusses the technical characteristics of this satellite technology and the proper preparations for being able to receive Ku-band transmissions in this workshop from Cable-Tec Expo '87. (1 hr.) Order #T-1036, $35.

- *Interference Elimination with Antennas and Antenna Arrays* — Steven Biro conducts a workshop from Cable-Tec Expo '87 on antenna array and phasing techniques for use in interference elimination at headend sites. (1 hr.) Order #T-1037, $35.

- *Category I Review Course: Signal Processing Centers (Technician Level)* — Category I Curriculum Chairman Alex Best presents a one-hour review course on the technician level of this BCT/E category. This workshop from Cable-Tec Expo '87 offers technicians an overview of material contained in the certification exam. (1-1/2 hrs.) Order #T-1040, $45. **(Reference for BCT/E Category I)**

- *Pole Climbing* — A comprehensive course produced by the Atlee Cullison Training School that develops climbing skills and safety habits. Includes valuable information on climbing apparel and equipment, safe methods of ascending, descending and testing poles to ensure safe climbability. (1 hr.) Order #T-1042, $170. **(Reference for Installer Certification)**

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

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

To order: All orders must be prepaid. Shipping and handling costs are included in the continental U.S. All prices are in U.S. dollars. SCTE accepts MasterCard and Visa. To qualify for SCTE member prices, a valid SCTE identification number is required, or a complete membership application with dues payment must accompany your order. Orders without full and proper payment will be returned. Send orders to: SCTE, 669 Exton Commons, Exton, PA 19341 or fax with credit card information to (610) 363-5898.

Listings of other publications and videotapes available from the SCTE are included in the March 1994 issue of the Society newsletter, "Interval."

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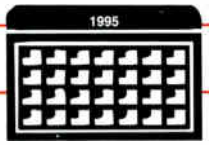

February

6-9: Siecor training course, fiber-optic installation and splicing, maintenance and restoration for CATV applications, Hickory, NC. Contact (800) 743-2671, ext. 5539 or 5560.

7: Idaho Cable Telecommunications Association winter legislative meeting, Red Lion Riverside, Boise, ID. Contact (208) 376-7836.

7-8: Arizona Cable Television Association annual meeting, Sunburst Hotel, Scottsdale, AZ. Contact ACTA, (602) 955-4122.

7-9: SCTE Wheat State Chapter testing session, BCT/E exams to be administered, Great Bend, KS. Contact Jim Fronk, (316) 792-2574.

8: SCTE Bluegrass Chapter seminar, back to basics, Travel Lodge, Elizabethtown, KY. Contact Max Henry, (502) 753-6521.

8: SCTE Delaware Valley Chapter seminar, system troubleshooting and plant maintenance, Williamson Restaurant, Willow Grove, PA. Contact Chuck Tolton, (215) 657-6990.

9: Society of Cable Television Engineers Tele-Seminar Program, *Regulation and the Cable Industry (Part II)* and *Digital Transmission Techniques (Part I)* from Cable-Tec Expo '94 in St. Louis, to be shown on Galaxy 1R, Transponder 14, 2:30-3:30 p.m. ET. Contact SCTE national headquarters, (610) 363-6888.

10: SCTE North Country Chapter testing session, BCT/E and Installer exams to be administered, St. Paul, MN. Contact Bill Davis, (612) 646-8755.

11: SCTE Central Indiana testing session, BCT/E and Installer exams to be administered, Indianapolis. Contact Gordie McMillen, (317) 353-2225.

12: SCTE Old Dominion Chapter seminar, SCTE Installer manual review, BCT/E and Installer exams to be administered, Continental Cable Regional Training Center, Richmond, VA. Contact Margaret Fitzgerald, (703) 248-3400.

14-16: C-COR training seminar, broadband-CATV laboratory, State College, PA. Contact (800) 233-2267, ext. 4422.

15: SCTE Michiana Chapter seminar, OSHA safety and BCT/E Category IV tutorial, Comfort Inn, New Buffalo, MI. Contact Russ Stickney, (219) 259-8015.

16: SCTE Central Indiana Chapter seminar, OSHA safety, Holiday Inn North, Pyramids, Indianapolis. Contact Gordie McMillen, (317) 353-2225.

16: SCTE Northern New England Chapter seminar, OSHA safety, driver and ladder safety, Ramada Inn, Portland ME. Contact Bill DeRochers, (207) 646-2672.

21: Scientific-Atlanta training course, fundamentals of the hybrid fiber/coax network, Atlanta. Contact Bill Brobst, (404) 903-6306.

21-23: C-COR training seminar, broadband-LAN laboratory, State College, PA. Contact (800) 233-2267, ext. 4422.

22-23: Scientific-Atlanta training course, hybrid fiber/coax field test and measurement, Atlanta. Contact Bill Brobst, (404) 903-6306.

22-23: Scientific-Atlanta training course, interactive broadband delivery system overview, San Francisco. Contact Bill Brobst, (404) 903-6306.

22-24: Texas Cable Show, San Antonio Convention Center, San Antonio, TX. Contact Texas Cable TV Association, (512) 474-2082.

24: SCTE Wheat State Chapter testing session, BCT/E exams to be administered, Great Bend, KS. Contact Jim Fronk, (316) 792-2574.

26-Mar. 3: OFC '95, San Diego Convention Center, San Diego, CA. Contact (202) 223-0920.

28-Mar. 3: Satellite '95, Sheraton Washington, Washington, DC. Contact (301) 424-3338.

Planning ahead

May 7-10: The National Show, Dallas. Contact (202) 775-3669.

June 14-17: Society of Cable Television Engineers Cable-Tec Expo, Las Vegas, NV. Contact (610) 363-6888.

Aug. 13-15: Great Lakes Cable Expo, Indianapolis. Contact (317) 845-8100.

March

6-9: Siecor training course, fiber-optic installation and splicing, maintenance and restoration for CATV applications, Hickory, NC. Contact (800) 743-2671, ext. 5539 or 5560.

6-9: WCF '95, Broadmoor Hotel, Colorado Springs, CO. Contact Western Communications Forum, (312) 938-3500.

7: SCTE New England Chapter seminar, BCT/E and Installer exams to be administered, Best Western, Marlboro, MA. Contact Tom Garcia, (508) 562-1675.

7-9: C-COR training seminar, broadband communications technology, Fremont, CA. Contact (800) 233-2267, ext. 4422.

7-9: Scientific-Atlanta training course, hybrid fiber/coax operation and maintenance, San Francisco. Contact Bill Brobst, (404) 903-6306.

7-9: SCTE Wheat State Chapter testing session, BCT/E exams to be administered, Great Bend, KS. Contact Jim Fronk, (316) 792-2574.

9: Society of Cable Television Engineers Tele-Seminar Program, *Digital Transmission Techniques (Part II)* from Cable-Tec Expo '94 in St. Louis, to be shown on Galaxy 1R, Transponder 14, 2:30-3:30 p.m. ET. Contact SCTE national headquarters, (610) 363-6888.

12: SCTE Old Dominion Chapter seminar and testing session, BCT/E Category III tutorial — transportation systems, BCT/E and Installer exams to be administered, Holiday Inn, Richmond, VA. Contact Margaret Fitzgerald, (703) 248-3400.

13: SCTE Old Dominion Chapter seminar, vendor show, Holiday Inn, Richmond, VA. Contact Margaret Fitzgerald, (703) 248-3400.

14: Scientific-Atlanta training course, fundamentals of the hybrid fiber/coax network, Denver. Contact Bill Brobst, (404) 903-6306.

14-16: C-COR training seminar, digital video and fiber-optic networking, Fremont, CA. Contact (800) 233-2267, ext. 4422.

15: SCTE Big Sky Chapter seminar and testing session, BCT/E and Installer exams to be administered, Billings/Laurel Mt., MT. Contact Marla DeShaw, (406) 6324300.

15: SCTE Michiana Chapter seminar, BCT/E Tutorials: Categories II and V, Comfort Inn, New Buffalo, MI. Contact Russ Stickney (219) 259-8015.

15: SCTE San Diego Chapter seminar, San Diego. Contact Kathleen Horst, (310) 715-6518.

15-16: Scientific-Atlanta training course, understanding hybrid fiber/coax design, Denver. Contact Bill Brobst, (404) 903-6306.

16: SCTE Big Sky Chapter seminar and testing session, BCT/E and Installer exams to be administered, drawing for winner of 1995 Cable-Tec Expo trip, Elks Lodge, Helena, MT. Contact Marla DeShaw, (406) 6324300.

16: SCTE Penn-Ohio Chapter seminar, the demanding role of the installer technician, afternoon hands-on vendor show, Sheraton Inn North, Pittsburgh. Contact Marianne McClain, (412) 531-5710.

20-21: Ohio Cable Television Association convention, Hyatt of Capital Square, Columbus, OH. Contact (614) 461-4014.

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The Model 750UHF Modulator is especially designed for single channel full 60 dBmV (120 dBμV) output from 470 to 750 MHz no-compromise CATV professional service utilizing surface mount technology.

SPECIFICATIONS

PARAMETER	SYSTEM M/N	SYSTEM B/G	SYSTEM D/K China*	SYSTEM I
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Input: C3F Neg	NTSC	PAL	PAL	PAL
Input Impedance	75 ohms unbalanced	75 ohms unbalanced	75 ohms unbalanced	75 ohms unbalanced
Frequency Response	±0.5 dB	±0.5 dB	±0.5 dB	±0.5 dB
Bandwidth	4.2 MHz	5.0 MHz	5.0 MHz	5.5 MHz
Differential Gain	2% max	2% max	2% max	2% max
Differential Phase	2 degree max	2 degree		2 degree max
Hum & Noise	-60 dB	-60 dB		-60 dB
AUDIO SECTION				
Input: 50 Hz-15 KHz	0 dBm (.8V)			0 dBm
Impedance	600 ohms balanced			
Frequency Response	±1.0 dB			
Frequency Tolerance, ±500 Hz	4.5 MHz	5.5 MHz		
Frequency Deviation	±25 KHz			
Harmonic Distortion	1% max	1% max		
Preemphasis	75μs	50μs		
IF SECTION				
Video IF Level	+37 dBmV +97 dBμV	+37 dBmV +97 dBμV	+37 dBmV +97 dBμV	+37 dBmV +97 dBμV
Audio IF Level	+22 dBmV +82 dBμV	+27 dBmV +87 dBμV	+27 dBmV +87 dBμV	+27 dBmV +87 dBμV
Return Loss	>14 dB	>14 dB	>14 dB	>14 dB
IF Frequency				
Video Carrier	45.75 MHz	38.9 MHz	38.0 MHz	38.9 MHz
Audio Carrier	41.25 MHz	33.4 MHz	31.5 MHz	32.9 MHz
Video-Sound Spacing	+4.5 MHz	+5.5 MHz	+6.5 MHz	+6.0 MHz
Vestigial Sideband Width	0.75 MHz	0.75 MHz	0.75 MHz	1.25 MHz
RF SECTION				
Output Frequency	470-750 MHz			
Frequency Tolerance	±2 KHz			
Output Level	+60 dBmV max			
adjustable	+120 dBμV			
Output Impedance	75 ohms unbalanced			
Spurious Output	<-60 dBc			
470-750 MHz @+60 dBmV/+120 dBμV Output Level				
Return Loss	>14 dB			
Frequency Response	<2 dB			
MECHANICAL AND POWER				
Dimensions	Standard 19" (48.26 cm) Rack Mount, 1.75" (4.44 cm) High & 14" (35.56 cm) Deep			
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Staying "on top" of new technologies

By Bill Riker
President, Society of Cable Television Engineers

As an organization devoted to the training, certification and standardization of the broadband communications industry, it is only natural that the Society of Cable Television Engineers would emphasize what is new and innovative in this ever-changing communications medium. To promote the awareness of these new ideas, practices, services and hardware, SCTE holds an Annual Conference on Emerging Technologies at the beginning of each new year.

Conference history

Judging by the response at this year's conference, held Jan. 4-6 at the Stouffer Orlando Resort in Orlando, FL, the industry appreciates these annual explorations of vital topics. With over 1,300 attendees present at Emerging Technologies 1995, the Society experienced a 36% increase over last year.

The Emerging Technologies Conference evolved from the Society's Annual Conference on Fiber Optics, which was first held in 1988 in the same location as this year's event. Based around the revolutionary technology of fiber-optic cable, the conference grew each year in terms of attendance and industry prominence. With the 1993 conference, held in New Orleans, the Society changed the name of the conference to its current title to reflect its increasingly wide range of focus and open it up for discussion of any new groundbreaking topic.

This year's conference

This tradition of covering new, cutting-edge issues at the conference, emphasized by the name change in 1993, was continued with this year's program, which featured four panel discussions on the following topics: "Digital Compression and Alternative Transmission Techniques," "Telephony and the Cable Industry," "Broadband Multimedia via Cable" and "Technology Migration into the Future." In total, 20 technical papers were presented over the 2-1/2-day conference by some of the cable TV industry's engineering leaders.

The conference began Jan. 4 with the concurrent presentation of three preconference tutorials: "Full Service Network," "Broadband Cable Data Network Architecture" and "Building a Fast File Server." These were conducted to provide attendees with an in-depth look into several technologies that will be key considerations in the telecommunications evolution.

The conference also included a special demonstration by Time Warner Cable of its Full Service Network (FSN), which is currently operational in the Orlando area. Judging by attendee and media interest in this technology, it was clear to me that this conference truly succeeded in presenting useful information on the capabilities of broadband communications.

This conference saw the addition of 156 new members to the Society's national membership because of the many attendees joining SCTE upon registering at the conference.

The conference also boasted 86 international attendees (over 6% of the total attendance). We were pleased to welcome so many attendees from other countries, and this coincided with our announcement that the Society currently serves over 500 international members from 60 foreign countries.

This year's event marked the first instance in which examinations in the Society's Broadband Communications Technician/Engineer (BCT/E) Certification Program were offered at an Emerging Technologies Conference. While the administration of these examinations has become a staple at the Society's other national annual training event, Cable-Tec Expo, offering this opportunity at this conference was a welcome addition that was appreciated by the many attendees who partook in the testing.

High marks

As documented by responses to the survey completed by attendees at the event's conclusion, this conference rated highly among those present. Comments from the survey results include the following: "The best information ever presented at an SCTE conference,"

"(the) presentations related to cable operators and the future point of view," "well-organized seminars," "friendly and helpful staff," "valuable content in seminars," "topics were varied," "the speakers made candid presentations," "good location," "good accommodations/facilities," "good visual aids," "friendly opening remarks covered sites of local interest, restaurants, etc.," "the proceedings manual was extremely helpful."

Everyone who attended the event received a copy of the *Emerging Technologies 1995 Proceedings Manual*, a 410-page collection of each paper presented at the conference, as well as seven additional papers that were submitted for inclusion. It is currently available through SCTE via mail order, and if you weren't there but would like to learn about what was presented at the conference, please contact SCTE at (610) 363-6888.

The Society's 1996 Conference on Emerging Technologies will be held Jan. 8-10 at the San Francisco Hilton and Towers, the site of Cable-Tec Expo 1988. I hope you will be able to join us at what is becoming the industry's major forum for the discussion and examination of all that is new and vital in broadband communications. **CT**

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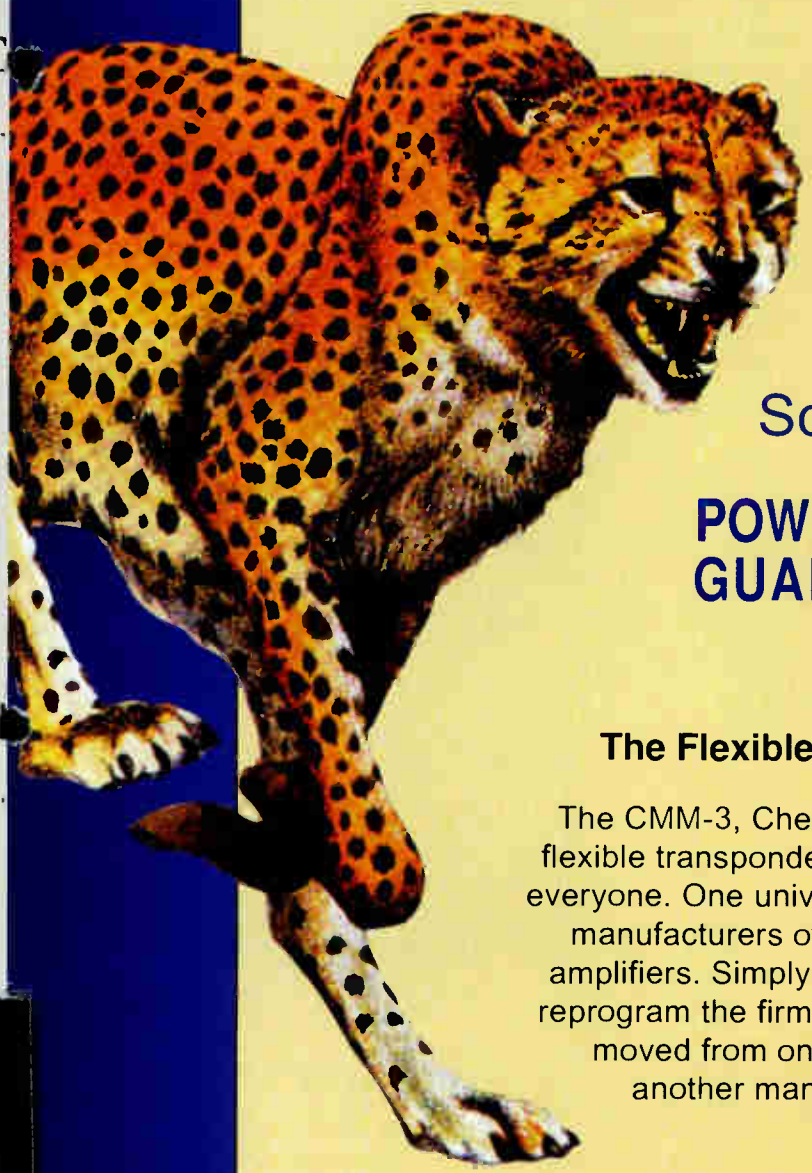

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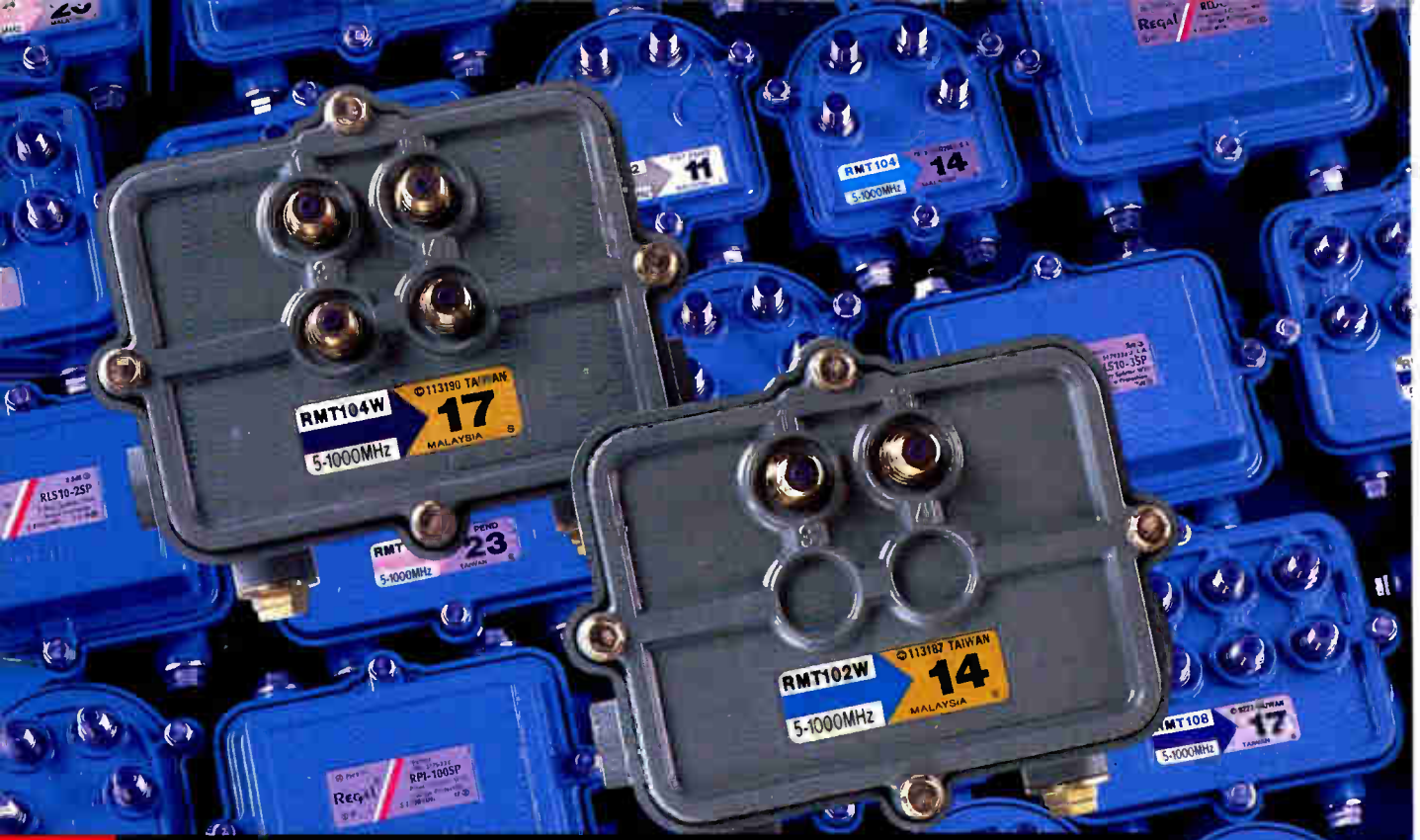

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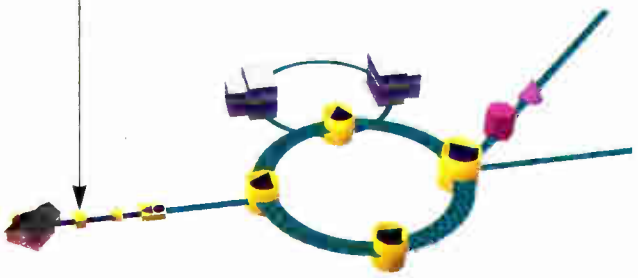

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