CED

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Inside: Complete SCTE Cable-Tec Expo coverage

Cable TV: multimedia's pipeline?

STATUS MONITORING

POWER GUARD

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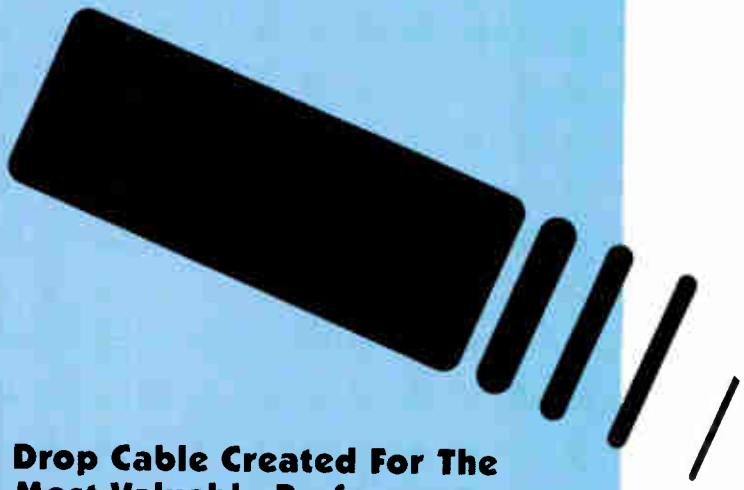

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Circle Reader Service No. 2

July 1992 CED Volume 18, Number 8

Cable and multimedia: a marriage made in heaven? 30

The fiber-rich CATV network of the future has attracted the attention of huge technology conglomerates like IBM and US West, to name just a couple. To what degree will cable be used as an interactive medium as these firms vie to capture more revenue? Bob Wells of the Lennox Group gives a detailed analysis of the multimedia entities struggling to wriggle their way into cable's pipeline to the home and how cable and the computer industry is already working jointly.

SCTE Cable-Tec Expo wrap-up 40

This year's Expo in San Antonio served up several "firsts"—the first time SCTE membership topped 10,000; the first time the group's top official donned a new title ("chairman of the board," instead of "president") and the first time an operator (ATC) won the prestigious President's Award. *CED*'s Roger Brown, Leslie Ellis and Gary Kim report on the event with categories including:

New product announcements 40

Read about the latest product developments, business alliances and personnel announcements in this enhanced version of the *CED* Newsday.

New technical standards review 44

At the Expo, the NCTA debuted the first in a series of traveling seminars on the subject of the new technical standards for cable TV. *CED*'s Roger Brown was there for the eight-hour seminar, and reports his findings here.

Picture quality workshop 53

At one of the Expo's hands-on workshops, CableLabs' Brian James and Pioneer's Rich Annibaldi provided some interesting historical and future information on picture quality. *CED*'s Leslie Ellis reports their findings.

System outages and irate customers 55

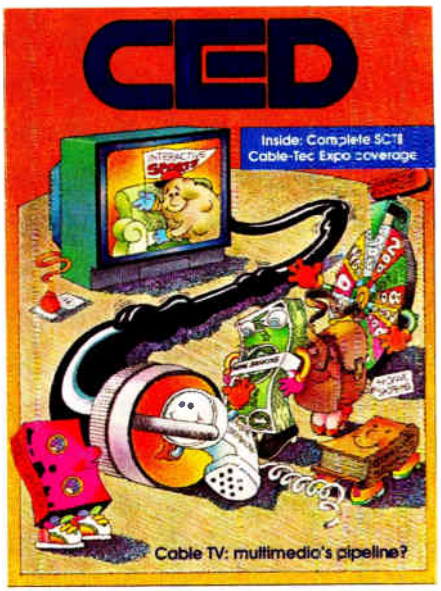
System outages aren't something cable subscribers take kindly to, according to a series of surveys recounted by CableLabs' Scott Bachman and Robert Moel of Viacom Cable. *CED*'s Leslie Ellis was there and reports on the workshop gathering.

Awards, awards and more awards 56

Ron Hranac regained the helm of the SCTE, ATC's Ron Wolfe took top honors as SCTE Member of the Year and ATC was given the President's Award. Several other worthy members were honored as well. *CED* Editor Roger Brown fills you in.

Fiber to the serving area: Upgrading to 550 MHz 59

The FSA architecture is just fine for operators who plan to rebuild their old systems, but what if you just need an upgrade? Scientific-Atlanta's Gregary Hardy submits for your approval a concept known as FSA Variable FITT for Forward Intermediate Terminating Trunk. The concept is explained in detail by Hardy, who notes that most of the conversion can be done after prime time without hardly anyone knowing you were there.



About the Cover:
What does multimedia mean to cable? Illustration by Don Dudley.

DEPARTMENTS

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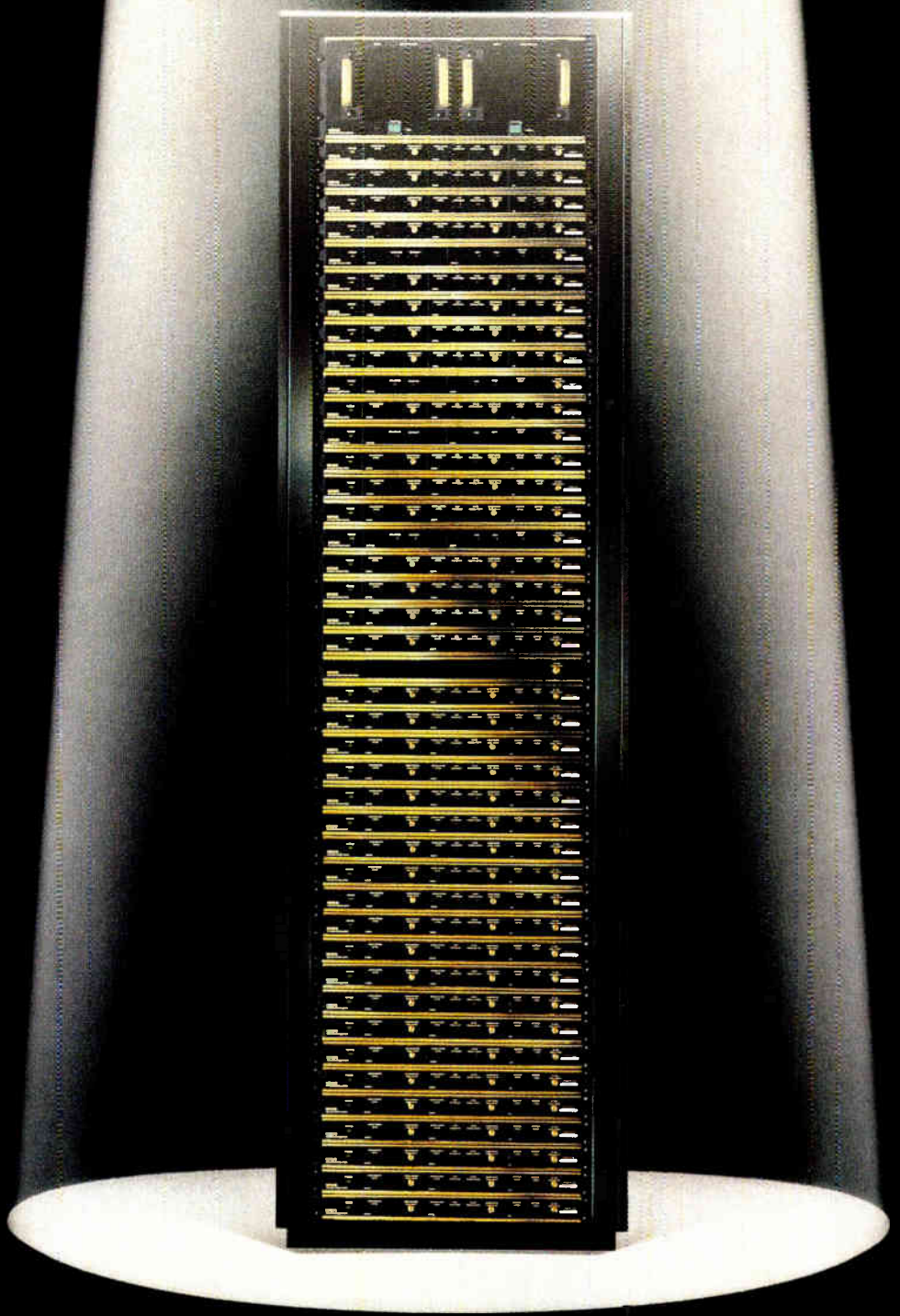

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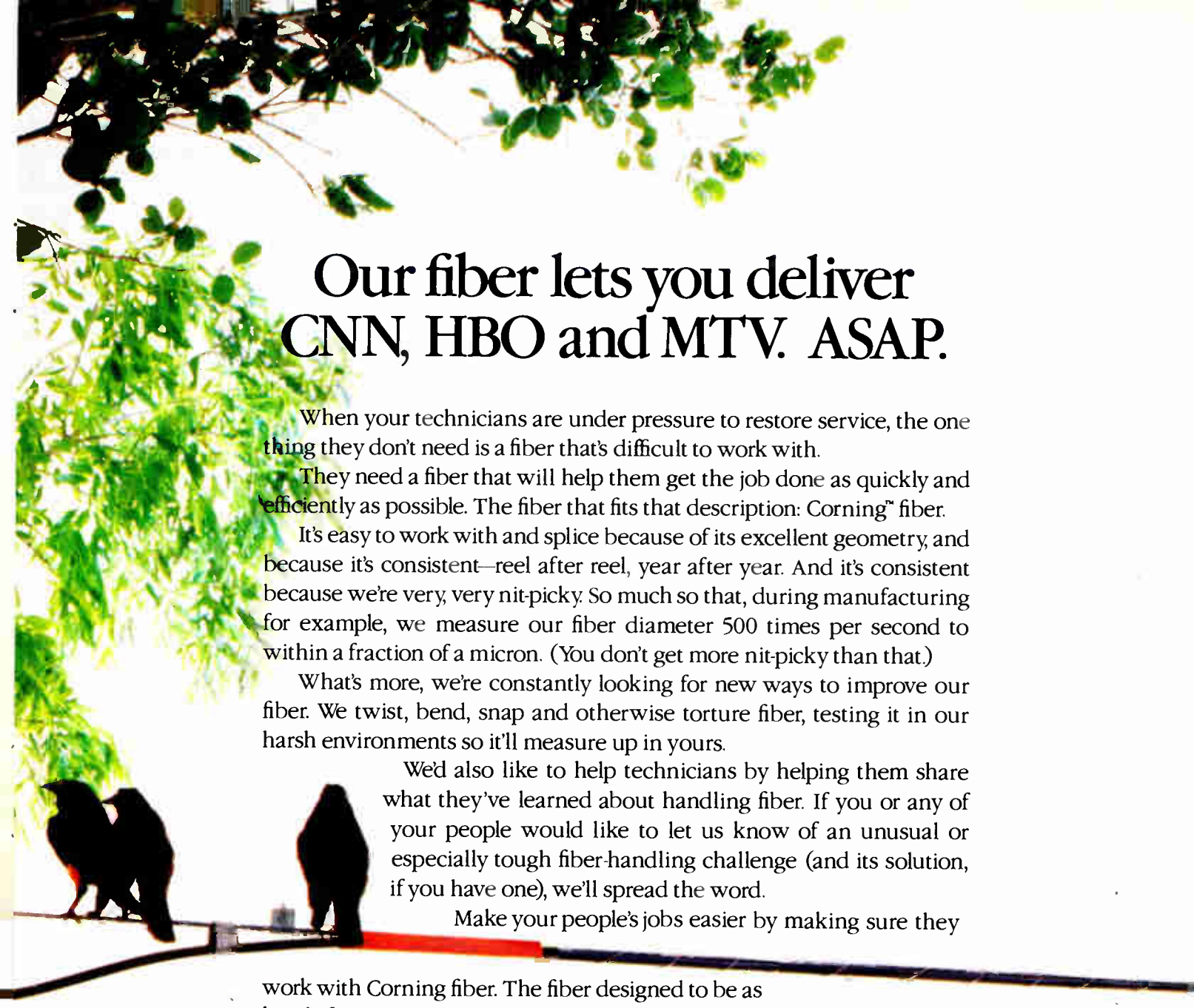

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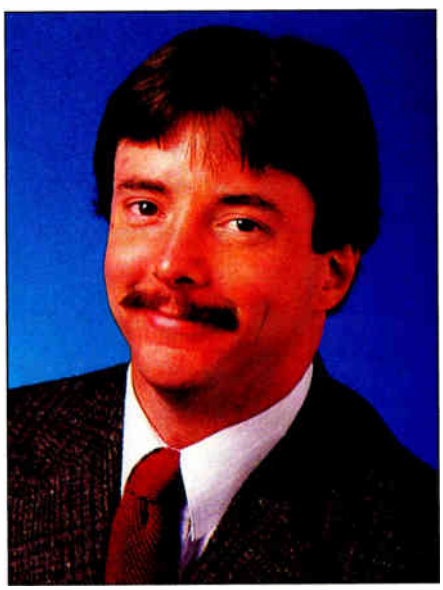
The PCS game: Everyone wants to play

Cable operators who have looked at the explosion of interest in personal communications services (PCS) as an ideal entre into the telephone business had better think again if they think they can simply wait for a green light from the FCC to proceed.

Judging from the discussions during the Third Annual Worldwide Personal Communications ComForum, organized by the National Engineering Consortium, traditional telephone companies and cellular operators are already headed toward serving microcells in the hopes of capitalizing on a market that seems ready to emerge in spite of the FCC's glacial pace of decision-making on licensing and spectrum issues.



The two-day event, held last month in Chicago, was dominated by cellular operators who laid out long-term plans for the market. They were complemented by marketing consultants who predicted phenomenal interest and growth in that market.

For example, Cliff Bean of A.D. Little predicted there would be 50 million to 60 million new users of PCS by 2002 *over and above* the present cellular customers. Telephone companies can play in the game, Bean said, several ways: local loop and long distance transport; subscriber location and tracking; multicarrier network management; multiple provider service billing and revenue sharing; and on-demand service provisioning for multiple grades of service.

It should come as no surprise that those services are some of the options cable operators are looking at also.

However, PCS provision won't be inexpensive. A.D. Little says $20 billion to $30 billion will be needed to support a PCS network over the next 10 years. It's not surprising, then, that Little says one of the keys to success in PCS provisioning is capital acquisition (along with license procurement and spectrum allocation, and distribution and pricing).

It's the economics of the situation that may play into the hands of cable operators who are looking to enhance revenues. Bean said his study shows that the fourth key to success in PCS is forging proper and prudent alliances and partnerships.

Given such information, it's not far-fetched to see the day when cable companies and telcos are closely aligned (at least in some markets) to make PCS a reality. Cable systems don't have the expertise to *be* telcos, but they could ease the financial burden to turn telcos into PCS providers.

The key here is that PCS isn't just going to fall into cable operators' laps. It's going to take a keen vision of what you want your network to do when it grows up. And another thing: technology is moving so fast that I'd say if you're not out there actively testing your system to determine if PCS will pass through your network, it's probably already too late to start.

Roger J. Brown

Roger Brown
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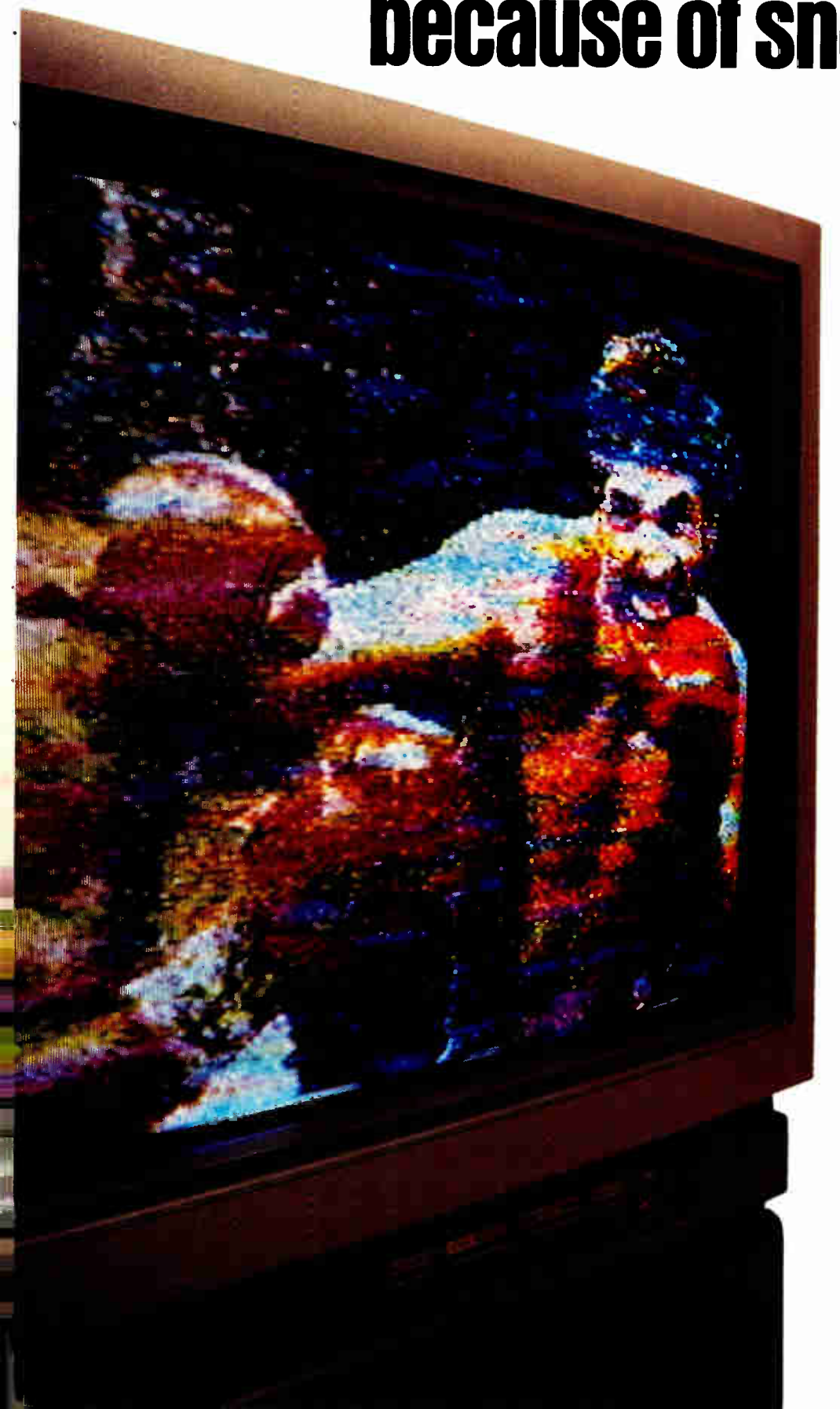
The fight was called in Round 5 because of snow.



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WAVETEK

TVs, computers don't have to converge, say ICCE panelists

Despite several highly publicized predictions taking the opposite viewpoint, the future of television is not inextricably linked to the personal computer, according to several executives of television manufacturing firms. Instead, the computer and television industries will "fan out" and eventually crossover in some areas, argued Vito Brugliera, vice president of marketing for Zenith Electronics.

The comments were made during an evening panel discussion, titled "TV—Where is it going?" held during the annual International Conference on Consumer Electronics in Chicago last month.

Television is clearly going digital, according to Joe Donahue, director of HDTV for Thomson Consumer Electronics. "I think digital is great. It will change our business and our lives," he predicted. Computers and TVs will be similar, but will continue to serve different functions, Donahue said. For example, television will rapidly adopt big-screen formats with wide aspect ratio, while computers will be dominated by small screens with high resolution.

A similar theme was sounded by Craig Tanner, VP of advanced television projects at Cable Television Laboratories, who postulated that television will continue to be an entertainment medium and PCs will be used for information delivery.

The audience of consumer electronics engineers seemed incredulous following the presentations: "I'm disappointed because what I'm hearing is that we'll have more of the same," said one attendee. "Are we in the information management business or the entertainment business? What about (developments like) optical storage? Won't we pass information back and forth over the TV?"

"Your conclusions are wrong," replied Donahue, who said that nothing will preclude manufacturers from taking advantage of developing technology, but the consumer will have to demand those capabilities before manufacturers will incorporate them.

Tanner agreed with Donahue's comments and questioned the need to build everything into a television. "The (television and computer) products are on two different timelines; don't confuse their uses," cautioned Tanner.

The conclusions are in stark contrast to several published prognostications of a future ruled by multimedia workstations that display moving video, data and seemingly do everything except answer the door. That day will come only when the American public becomes comfortable with data delivery and interactive television and demands (pays for) it, said the panelists.

The remainder of the conference was notable because of the attention paid to ghost cancellation methods and systems. During the event, Philips Electronics and the David Sarnoff Research Center/Thomson Consumer Electronics issued a press release stating that their two systems would be merged to provide broadcasters and cable operators with a cost-effective method of canceling ghosts.

In addition, a paper was delivered at the conference by NHK that outlined a ghost canceling synchronous TV modulator that has been made inexpensive enough that it could be adopted by CATV and MATV systems, say the NHK researchers.

The unit demodulates the signal to baseband, separates the audio and video. The video is processed with the ghost canceling GCR signal, re-combined with the audio at IF and upconverted to RF. The unit cancels ghosts on a single channel and co-channel beats are eliminated through the use of phase locking.

June big month for compression

Historians might look back on June 1992 as the watershed month for compressed digital entertainment video.

On June 2, General Instrument and Mexico programmers Multivision announced a deal that has Multivision purchasing and implementing GI compression and decompression hardware for satellite delivery of entertainment to Mexican cable systems and backyard receive dishes.

Multivision plans to initially transmit six channels of video over each of two transponders this fall. The company has future plans to deliver as many as 10 channels over each transponder. Multivision executives said the service plans to implement the hardware this autumn.

Meanwhile, Cable Television Laboratories announced that its digital compression delivery process has advanced to the contract stage. Terming the request for proposal (RFP) process a "resounding success," CableLabs President and CEO Dr. Richard Green said testing of systems will begin in the next few weeks and equipment acquisition will occur in late 1992 or early 1993.

Green said the RFP process achieved two key goals: the acceleration of digital compression usage to deliver NTSC to the home; and facilitation of cross-licensing and interoperability of the technology for eventual use in the home.

CableLabs was joined in the RFP process by Tele-Communications Inc., Viacom Networks and Public Broadcasting Service. Companies responding to the RFP include: AT&T/ComStream/News Datacom; C.Itoh & Co.; Digital Television Consortium (Oak, Leitch Video and C-Cube Microsystems; General Instrument; Macrovision; Philips Broadband and Hughes; Scientific-Atlanta/Zenith; Thomson Consumer Electronics; and Toshiba.

In a separate announcement, Vyvx has issued its own RFP for equipment to transmit television signals over a fiber network at 6 megabits per second (Mbps). Vyvx operates one of the four nationwide fiber networks and presently carries broadcast-quality TV signals at the DS-3 rate (45 Mbps) for broadcasters and cable programmers.

As in satellite transmissions, compression promises to significantly lower the cost of sending signals over the fiber network because more signals could be sent on one DS-3 carrier. Vyvx is searching for a system that can multiplex and distribute signals on a multipoint-to-multipoint basis.

Zenith sends HDTV 75 miles

Late-night viewers of PBS station WMVT channel 36 in Milwaukee received a glimpse of the future (or could have, if they'd had an HDTV

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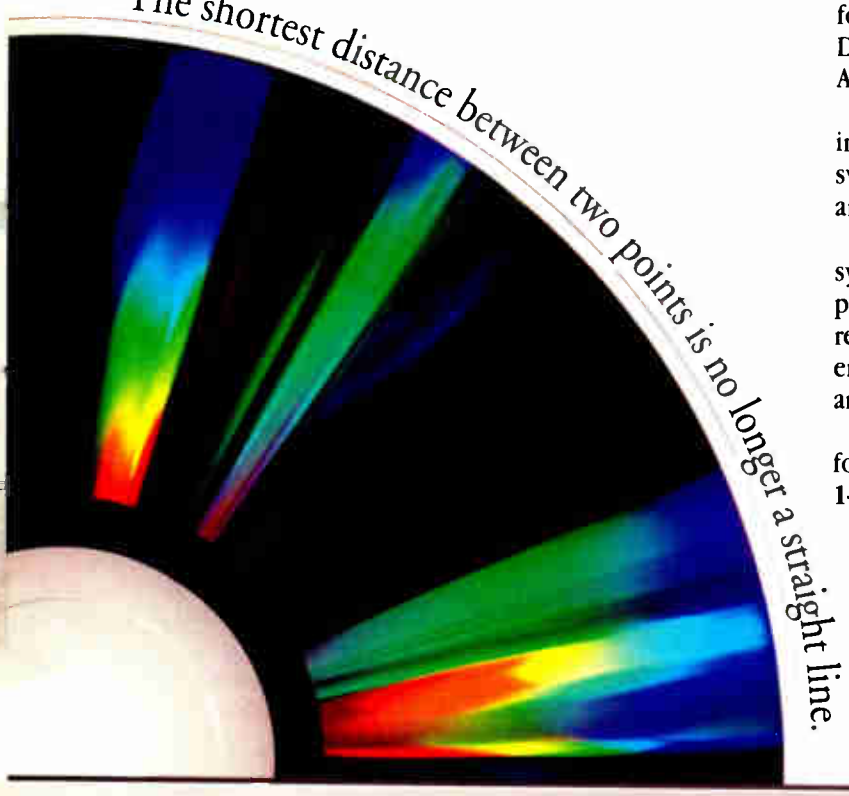

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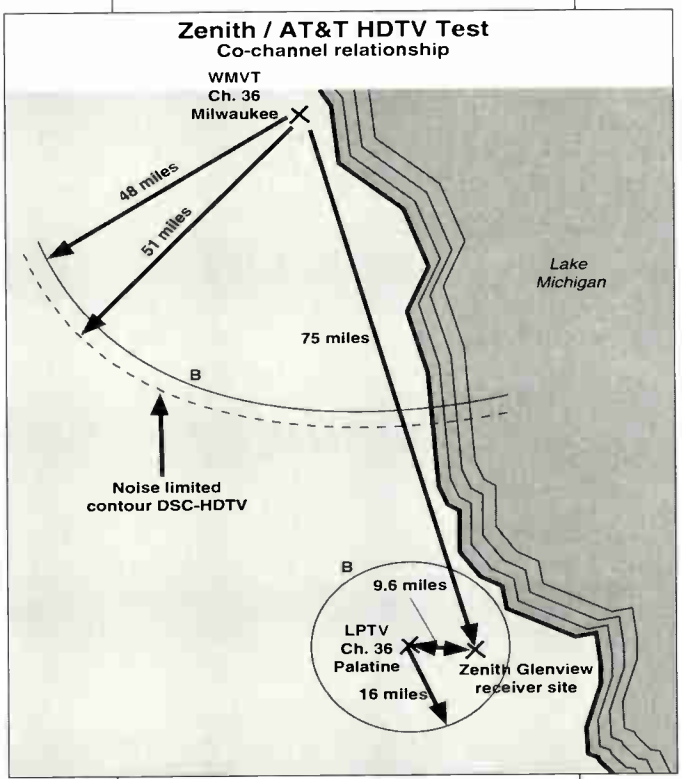
receiver) recently when Zenith and AT&T broadcast digital HDTV over-the-air from the station's transmitter 75 miles south to Zenith's headquarters in suburban Chicago.

The late-night field test of Digital Spectrum Compatible HDTV was the first terrestrial broadcast of digital TV using low power over long distances. The system used less than one-tenth the power used to transmit a full-power analog signal and yet provided pictures free of noise, ghosts and snow, according to Zenith officials.

Significantly, Zenith also showed its ability to avoid co-channel interference. Signals from a low-power analog TV station in nearby Palatine, Ill., which also broadcasts on channel 36, were effectively rejected by a filter used in the system.

The field test used program materials derived from a variety of sources: HDTV studio cameras, still images, 60- and 24-frame-per-second film images, multimedia computer images and fast-motion sports. Segments produced in both the 1125/60 interlaced HDTV format and 525-line interlaced NTSC format were included to test interoperability. Those images were upconverted to the Zenith progressive-scan format.



Cox completes PCS test phase

On the heels of making history by placing the first PCS call over an American cable plant, Cox Cable San Diego demonstrated the "centralized modulation" concept during its second phase of testing personal communications services.

The much-publicized call to the FCC back in February was the high point of Cox's first phase of testing. However, more sophisticated tests were conducted in March, including signal "handoffs" between microcell sites, reliability and propagation tests, and central modulation.

This latter concept moves the complex electronics used to modulate radio telephone signals to a central location. This allows smaller and less expensive cell sites to be constructed, presumably resulting in a less costly network.

During the tests, Cox utilized Broadband CDMA wireless telephone equipment supplied by SCS Mobilecom that operated in the 1850 MHz to 1990 MHz frequency range.

Test results showed smooth, flawless handoffs in which no data or voice conversations were lost. In addition, the cable network was shown to have a "high level of integrity" for data delivery. Cox was granted an experimental license to test PCS concepts in San Diego and New York City by the FCC in February 1991.

NTIA issues NOI on spectrum plan

The National Telecommunications and Information Administration's (NTIA) office of spectrum management has established a new Spectrum Planning Program to help plan the efficient and effective use of the radio spectrum for the next five to 15 years, it was announced last month. The first major initiative of the new program is the issuance of a notice of inquiry to learn more about the future spectrum requirements of both users and manufacturers.

In announcing the program, Thomas Sugrue, acting assistant secretary for communications and information, said: "The best way to conduct future spectrum planning is to collect information and technical data from the radio equipment industry and as many spectrum users as possible to determine their needs."

Sugrue appointed Russell Slye, former head of a spectrum planning advisory committee reporting to the NTIA, as manager of the spectrum planning program.

All spectrum users and equipment manufacturers are encouraged to respond to the NOI. Copies of the notice can be reviewed in the Federal Register published June 12 and may be obtained by calling the NTIA at (202) 377-1164.

Jottings

The National Engineering Consortium has announced its plans for a new National Communications Forum, set for October 12-14 at the Hyatt Regency O'Hare in Chicago. The new format calls for coverage of the hottest topics in communications through more than 40 full-day, three-seminar tracks. Topics of interest to cable operators will include: Fiber in the Loop, Personal Communications, Broadband, Competition in the Local Loop, Emerging Lightwave Technologies and Information Services. For registration information, call NEC at (312) 938-3500 . . . **Sammons Communications** plans to overhaul its 650-mile Waterbury, Conn. cable system with fiber optics. But what's newsworthy is that the system plans to use Jerrold Communications hardware to test video on demand to the 44,000 subscribers it serves . . . Meanwhile, Continental Cable of Fresno has purchased the first Jerrold "SuperStarfire" high-powered DFB laser. According to Paul Gibson, district engineer and plant manager, he was swayed by the high power and the fact the device is a DFB. **CED**

Compiled by Roger Brown

NEW POWER PLAYER

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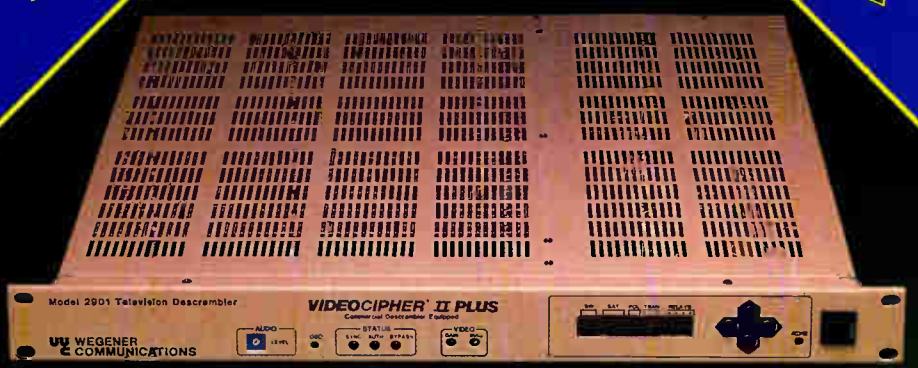

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The face of cable in Europe

The world is a strange and mysterious place, and with the adoption of cable television in most parts of it, it gets more interesting by the day. At the most recent annual meeting of the International Alliance for Distribution by Cable (A.I.D.), which was held in the recently reunited city of Berlin, I heard some truly amazing stories from the delegates who represent the cable industry in various European countries.

The conference itself is quite interesting, because one of the things that gets discussed is the current state of affairs of each of the countries involved in A.I.D. This includes not just western European countries, but some former Eastern-bloc countries as well. The meeting serves to bring all of these operators and their association representatives together to discuss common problems and (hopefully) solutions to operating issues. And, of course, it allows for a healthy exchange of ideas.

Background

As a little background, the first thing you should understand is that there are a couple of issues that make the European situation somewhat different from what we see in North America. For instance, there is a raging battle in Europe about whether cable programmers should receive compensation from the cable operator, or whether the cable operator should receive compensation from the cable programmer.

The various cable operators and cable programmers in Europe are passionate about their various points of view on this one subject. The operators believe that the programmers should be compensated by advertising revenues and not by subscriber fees. The programmers, naturally, believe that their programs have value in and of themselves and that the cable systems should pay them for the product. The situation in North America is noticed and referenced with passion by the programmers—and viewed as somewhat quirky by the operators.

One of the other issues discussed by each and every delegate is one of copyright fees for programs. How much and who gets what part of the payment? (Sound familiar?) It sees that copyright difficulties bedevil everyone in the media business, not just those of us in North America.

And we thought we had it bad

As I listened to each of the delegates speak about their situations, I hear some very interesting stories. One strange case, for instance, occurred or is occurring in a Scandinavian country where a new terrestrial broadcaster is just being launched. As part of the government's package for launching this broadcaster, they decided to carry the signal on a satellite as well as by terrestrial broadcasting.

So far, this doesn't sound too unusual to us. In the country under discussion, the broadcaster would be entitled to must-carry status just like the old U.S.A. rule. In this particular case, however, the government has decided to take must-carry to a new level of meaning.

The government has decreed that the cable operators in that country must receive the television broadcast signal off the satellite and deliver it to homes in their cable community, even if they are not connected to the cable service. In other words, the cable operator is being asked to be the antenna service for homes that do not subscribe to cable. Needless to say, this particular bit of bureaucratic wizardry is under appeal in that country and we'll just have to wait to hear how that comes out.

Another story that was equally interesting as well as somewhat uplifting was related by the delegate from Israel. It would seem that cable television has taken off in that country in recent years.

As one might expect, there is a limited amount of over-the-air television to be carried on those cable systems. There are a couple of television networks in Israel itself, but, for obvious reasons, they don't carry that many of the Arab broadcast networks in the surrounding area (although they do carry some). The feeling there, no doubt, is that they should not have to distribute messages from those who wish them ill.

Deciding, therefore, that they needed additional programming that would be of interest to their subscribers, the cable industry there decided to produce its own programming—and set about to produce four programs which it would then launch by satellite to be picked up by cable systems in the country.

The government looking at this programming effort decided that it amounted to a violation of rules concerning cartels. Naturally, they held deliberations and discussions on how to legally to deal with this entity. Now, if this were a country that looked at its laws on anti-trust and monopolies without any corresponding look at what actually was being done and accomplished, the story might end here with disillusionment of the group that was producing the four programs.

Interesting solution

Instead, the government decided that the correct answer was to demand that they include two additional channels in their efforts—one on folklore and one for children. Now while this imposed an additional financial burden on the cable operators, it did add programming for the systems.

As for how the operators felt, they and the programmers say "well, they didn't break us up and while they asked us to do more, we will do it because that way we are able to serve our investors and serve our subscribers well."

This type of attitude on the part of the operators is what we all need to have if we are able to help ourselves while we help the cable television business move forward. CED

By Wendell Bailey, Vice President Science and Technology, NCTA

ONI
OPTICAL NETWORKS INTERNATIONAL

Optical Network News

The following highlights are from Optical Networks International's quarterly newsletter.

■ Suburban Cablevision activates YAGLink

April 30, 1992 marked the second YAGLink activation at Suburban Cablevision's East Orange, New Jersey system. The Harmonic Lightwaves' transmitter feeds two hub sites, each at 12 dB optical loss, with performance specifications of 54 dB C/N and 69 dB CSO/CTB, says Bob Ritchie, Vice President of Engineering for Suburban Cablevision.

(See related story in the Summer issue of ONN.)

■ New addition gives operators flexibility

ONI's newest addition to the RESTORPAK™ restoration line incorporates AT&T's UCB1 enclosure. The RESTOR-C-PAK™ gives operators added flexibility during an emergency restoration by enabling a technician to secure and protect the restored splice in the field until a permanent fix can be completed. The UCB1 enclosure also gives the option to make the restoration a permanent fixture.

(For more information, contact a member of the TM&R group at 1-800-FIBER-ME.)

■ Supervising the cable network

As cable networks increase in complexity, so too does the need for network surveillance. The Harmonic Lightwaves' SMS 5000 Network Management System, used in conjunction with the YAGLink system, provides a method of detecting network problems, displaying the status on a PC, and storing appropriate data—without operator intervention.

(To obtain literature on the SMS 5000 System, call 1-800-FIBER-ME.)

■ Mark your calendars

ONI is offering its Digital Networks Training Course during the weeks of July 20-24 and August 24-28, 1992. Held at ONI's Denver Training Center, the course covers digital basics, multiplexing methods, network architectures, telephony applications and digital equipment.

(For more information, contact a member of the TM&R group at 1-800-FIBER-ME.)

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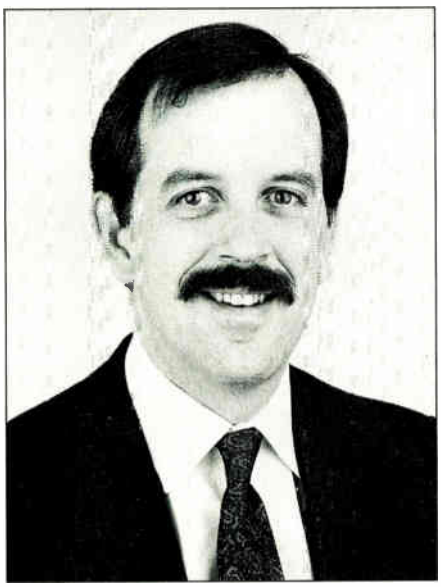


Pete Smith

Full-throttle ahead

Pete Smith, the affable director of engineering for Rifkin & Associates, had a terrific birthday this year. He spent it on a racetrack in Speedway, Indiana.

No, not *the* racetrack, and not in a *real* Indy car, but something like it, anyway. Instead of driving a racing machine flat out at 220 m.p.h., the car Smith zipped around in could only hit a paltry 120 m.p.h. at top speed.

Smith doesn't really look like the motorhead type. He's astute and articulate, probably a reflection of the years he spent in private schooling in his hometown of Columbus, Ohio. His engineering prowess comes in part from Franklin University, where he earned a double-E degree in the mid-1970s.

In fact, conjuring up a mental image of this consummate gentleman tooling around in a souped-down Indy car isn't at all easy. But, he says with a ready grin, racing in a pseudo-Indy car on his birthday was "a lifetime dream come true."

Goal: Cable as service model

Some of his other dreams are less exotic–like his goal to make cable television a leader in customer service. "If I had a dream for cable five to 10 years from now, I would like (cable) to be held up as the model for customer service...that we're the folks everyone else looks to and says, 'if we could only be as good in customer service as the cable industry is.' That would be ideal," Smith muses.

In fact, Smith says the very issue of customer service has been his greatest challenge in engineering during his 20 years in the cable business. To that end, he's implemented a policy that pays Rifkin's installers on a piece rate instead of hourly wages.

"It used to be, at 4:30 in the afternoon, we were lucky if we could even find someone to go out on an install. Now, our people are almost waiting in line for assignments. It's really worked out well.

"Service is especially important now," Smith explains, "because what we're embarking on now is new and different things like compression, HDTV, you name it. The question is whether or not the customers are willing to buy it. That's the key. If we make these things difficult for our customers to use, we're going to have a big problem."

Cable's paycheck was bigger

Smith got his feet wet in cable two decades ago, when he left a campus broadcasting job at Ohio State University to join ATC's Columbus system. "I'm probably the only person in cable who actually joined the industry because the pay was better," Smith laughs.

With ATC, Smith hopped around the country in a variety of positions. In Portland, Maine, he worked as a chief technician; then to Albany, N.Y. as a regional engineer; then his final move in 1979 to Denver (where he lives today) as a project manager.

Then, when ATC went through its divisionalization in 1984, Smith moved to the company's National Division as VP of engineering.

That's when he got a call from Monty Rifkin, whom he had worked with at ATC years before. As Smith puts it, "he had an opportunity for me that was too good to pass up. So I didn't."

At that time, in 1985, Rifkin had roughly 30,000 subscribers, Smith says. Now, they have "about 320,000."

"Most of our systems are what I call 'middle of America.' Middle-sized systems in middle-sized towns."

The move to Rifkin marked a major change in Smith's engineering career. "Up until then, at ATC, I had been doing only newbuilds. When you do newbuild of cable systems, it's kind of like starting with a clean blackboard and being able to draw in anything that you need or want, to a certain extent.

"But when you buy systems, you get what you bought. You have to make do with what you have," Smith says. "It's a lot more difficult, because you have to be a lot more creative in terms of rebuilding and improving those systems."

One man show

Interestingly, Smith says he *is* the engineering department at the Denver-based MSO. "I'm safety director, director of purchasing, VP of engineering and anything else anybody wants me to be," Smith laughs.

Although he admits preferring the variety of his workload, he says there's a reason for it–and once again, it has to do with his genuine concern for Rifkin's customers. "It just makes sense to have our engineering people closer to our customers," Smith explains.

Technical standards

And, Smith says, over the next few years the FCC's new technical standards will start to make sense for customers, too. Although he says his systems are not very much affected–he's mandated specifications equal to or higher than the FCC specs for the last few years–Smith thinks the new standards may be another "blessing in disguise," somewhat like CLI.

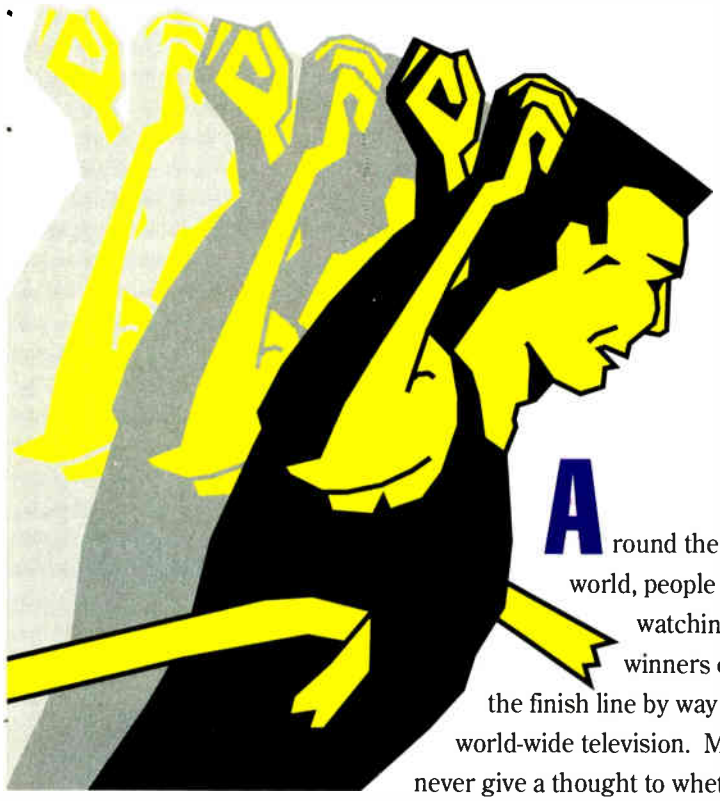
"Like anything else, the first year will be tough," Smith says of the standards. "It will require more work, obviously, in some systems, to bring them up. But I think five years from now, the standards will be just a routine part of the business."

Smith's upbeat attitude toward the standards carries over to his personal life, as well. When not at Rifkin, he's at home relaxing with his high-school sweetheart wife, Nina, to whom he's been married for 24 years. They have two children–Jeff, age 20 and Rachel, age 16. Their hobbies include skiing, running, scuba-diving, photography–and, of course, auto racing.

"I still have a huge adrenaline rush going on," Smith said of his recent birthday excursion. "I think I'll just have to do it again." **CED**

By Leslie Ellis

WINNERS AT WORK.



Around the world, people are watching winners cross the finish line by way of world-wide television. Most never give a thought to whether the all-important signal will be interrupted at a critical moment. Cable operators are also taking uninterrupted cable signal operation for granted. Why is everyone so relaxed when not only the race, but millions of dollars of revenue are on the line? Because, **Alpha Works!**

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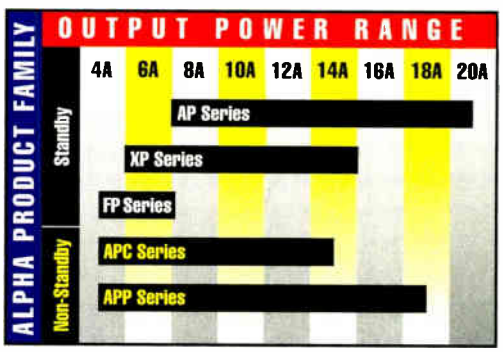

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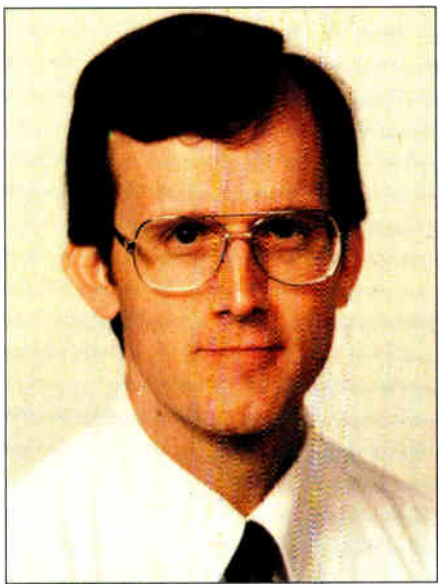

Network telemetry and control

Not long ago, I had the opportunity to visit the AT&T International Network Operations Center in New Jersey. This facility is tasked with monitoring AT&T's long distance circuits, analyzing potential problems, and re-routing information in the event of catastrophic failure of any portion of the network.

The operations center consists of a wall, four stories tall, of video displays detailing the status of every portion of the network—including a real-time display of the number of long-distance calls processed over the last 24 hours, as well as the number of calls that were unable to be completed (blocked) due to network overload, and a graphical display of precisely where that call was blocked (I'd like to have seen the map last Mother's Day!).

Telemetry defined

I define network telemetry and control as the ability to remotely monitor, measure and control the performance and configuration of our networks, assets and personnel for the purpose of improving efficiencies, increasing reliability and improving customer service. It's quite a lofty definition, but it has definitely become a reality for us today.

You might recall the early partial entre into this arena in the mid-1980s with what was called "status monitoring." But this early passive monitoring failed to catch on for several reasons. In the beginning, there was no clear definition of purpose. The industry, at the time, was still growing at an extremely rapid rate and the possibility of improved efficiencies was the least of its worries.

In addition, at the time, there were no clear industry drivers pointing toward the need for these new status monitoring capabilities. Status monitoring equipment that was deployed early-on actually had the perception that it was less reliable than the devices that were being monitored. In addition, monitoring devices within the amplifiers were only a small piece of the overall puzzle. There was no real vision for the integration of this monitoring capability with the rest of the "big picture."

By Chris Bowick, Group Vice President of Technology, Jones Intercable

What drives the need?

In short, the status monitoring of the early 1980s was "before its time." But things have changed! Today, there are many new industry drivers leading us in this new direction. The potential of new, non-entertainment revenue sources such as alternate access, PCN/PCS, two-way interactivity, and multimedia for personal, business and educational use all point toward the need.

As we continue the move forward with the carriage of data for business usage, the ever present threat of liability for loss of that data becomes very real.

Other new potential on-demand revenue sources that will be enabled by digital compression will also clearly require improved network monitoring and control. Video-on-demand and education on demand, as well as demographic segmentation for marketing and digital ad insertion are examples.

Current and future competition is also a very clear driver. MMDS, telco, DBS and MLDS (Multichannel Local Distribution Service) could all potentially claim to have better reliability in their networks just based on statistical modeling; comparing the number of active devices or potential failure points in their networks vs. the number of active devices we have!

We also now have a much clearer vision for integration of various NT&C technologies. Many manufacturers and MSOs, for example, are working together to integrate their customer database and their MIS infrastructure with their digitized system maps, thus providing the operator with the capability of not only pinpointing the source of any outage, but also the capability of identifying each and every customer affected by the outage.

In addition, most manufacturers are now providing the capability of monitoring key information within individual pieces of equipment (headend and plant), allowing the operator to actively identify potential problem areas, and to re-route signals via an alternate path if necessary, even before the customer ever detects a problem with service.

So, what does all of this point to? As we look to the future, we as an industry must take a more pro-active stance on network reliability than we ever have. If we want to be in the telecommunications business, we can no longer rely on our customers to be our network monitors. As we begin to carry data and other telecommunications traffic, we must be able to identify potential outages—before an outage actually occurs, and before any customers are affected.

In order to accomplish this task, we'll need the capability of extensively monitoring our network and assets, the capability of re-routing traffic immediately and automatically in the event of catastrophic failure of the network, or on-demand from a control facility in the event of "soft-failure" of the network.

Integration to infrastructure

Lastly, we need to focus on the integration or marriage of our MIS infrastructure and the various NT&C enabling technologies such that they can all play together and not require separate hardware and software platforms that are unable to talk to each other. This includes such technologies as mobile data terminals in our service vehicles, network monitoring and control, headend monitoring and control, automated leakage monitoring, end-of-line monitoring and GPS vehicle location. These technologies must be integrated into our telecommunications networks with a logical migration strategy to take us from where we are today to where we need to be in the future, without fear of obsolescence. **CED**

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Cable plant design for Metropolitan Area Networks

The technology advancements in the cable television industry and the deployment of fiber optics as a transport medium have resulted in the movement toward providing alternate services in addition to traditional video broadcast. These alternate services are in highest demand in densely populated regions. Designers must consider the architectures required to provide currently envisioned as well as future services in the metropolitan areas.

Networks deployed in the metropolitan area are subjected to a dynamic environment in which equipment must be able to survive and operate with a high degree of flexibility. The majority of the environment is typically outside plant which is exposed to a variety of climatic extremes. Equipment may be sheltered using burial or vault techniques, or be subjected to direct exposure in aerial installations.

Typically, system distances exceed what is often considered to be the Local Area Network (LAN) envelope of one mile and may extend out to 10 miles or more. The primary consideration in designing a fiber optic wiring layout is the inter-connectivity of the nodes and physical constraints of the cable run.

By Marvin D. Ashby, Senior Applications Engineer, Siecor Corporation

Future communication business requirements should be considered even when installing a single cable to meet a specific point-to-point requirement.

Physical wiring

The favored physical architecture to be used in LANs is the star configuration, widely used because of its flexibility in supporting all logical topologies. The system provides for graceful, nondisruptive growth and is modular in nature. The physical star topology is economical from a cable and link-loss standpoint in a local network due to limited lengths.

Routing of the metropolitan area network differs from the campus or new building structure, but still has similarities with cable television architectures in that it is usually confined to existing utility paths or limited private rights-of-way. The system designer typically works within tight constraints and must adapt the system to physically configure with existing facilities. Economics of the system installation often drive the system designer to use a combination of existing and new cable routings.

It is rare that the designer has the opportunity to provide input for future communication systems during facility layout periods. These physical limitations, as well as the distances covered by the network, typically result in point-to-point or ring physical wiring schemes.

Usually, a group of buildings are wired in a ring configuration and then the rings are tied together (see Figure 1). The logical topology favors a star configuration.

Because of the placement of system wiring, the cost of installation and the critical nature of data often transmitted, a high degree of system reliability is required. The metropolitan network, by the nature of its requirement for long-haul telecommunication systems, is designed to last on the order of 25 years or more. This exceeds the design life often targeted for the indoor environment of 10 to 15 years.

Cable requirements

The environment defined by the metropolitan network requires the use of a cable designed for outdoor applications. The cable must be able to withstand changes in temperature on the order of -40 degrees C to +70 degrees C for aerial installations without adversely affecting the integrity of the transmitted signal. It must be rugged to withstand

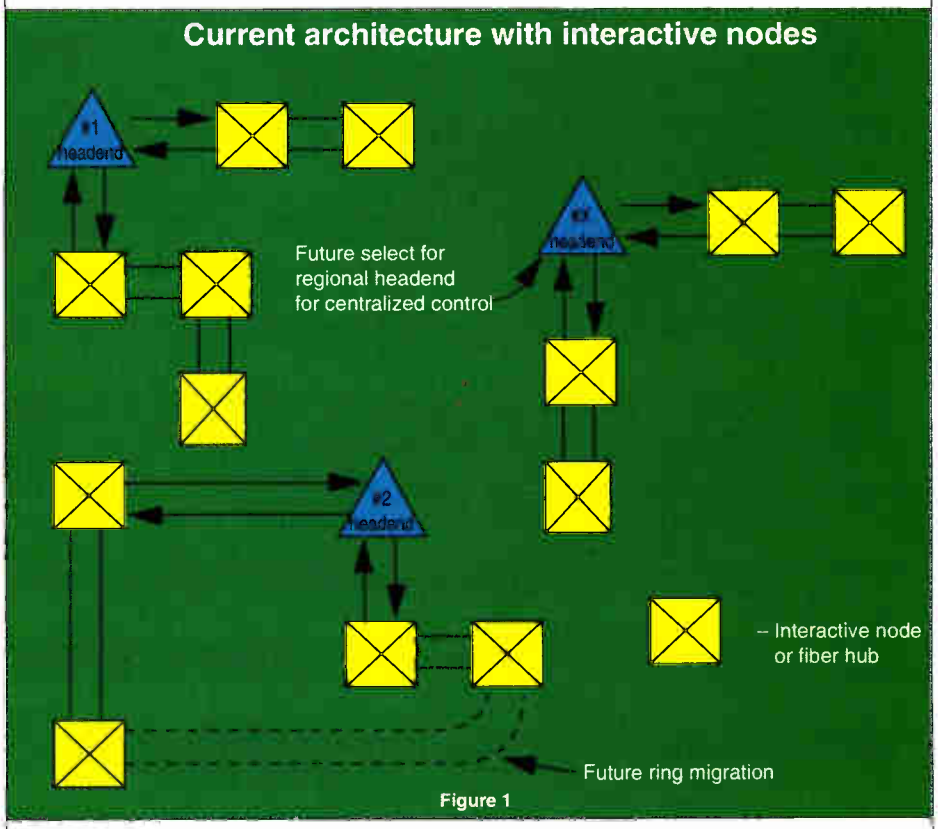

Figure 1

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the forces experienced during installation as well as those that may be encountered during its service life. When distances greater than 10 kilometers are encountered, the use of single-mode fiber is required because of its low loss characteristics.

The use of multimode is limited to the campus environment due to its intrinsically higher loss characteristics and its information transmission capacity limitations. Longer, single-mode transmission systems typically are laser-based configurations supporting transmission rates of 1.7 Gbps (gigabits per second) and beyond with narrow spectral widths, while multimode systems are able to be LED-driven with data streams typically not exceeding 500 MHz.

A clear understanding of the parameters to specify for the network's optical fiber is important to ensure that the finished system meets the requirements of the current users as well as those that may be added in the future. Sometimes the transmission equipment manufacturers have already specified the type of fiber to be used with their apparatus, based on system lengths as well as the type and rate of information to be transmitted.

Fiber

However, most of the time this is not the case, as when fiber selection is made prior to that of active components, existing available fibers must be used, or when designing for future upgrades for which active components are not readily available.

Systems of short length, on the order of 5 kilometers or less, and employing the use of LED transmission devices, will almost always use multimode fiber for the transmission media. The cost of multimode systems is typically less than that of single-mode systems because of the LED sources. Several major factors play a role in the selection of multimode fiber for the LED-based system: operational wavelength, transmission distance and required information capacity.

Knowledge of the longest end-to-end link in the system is required to specify the attenuation grade of fiber to support transmission, along with the number of splices or connectors anticipated

Migration to interconnected ring architecture

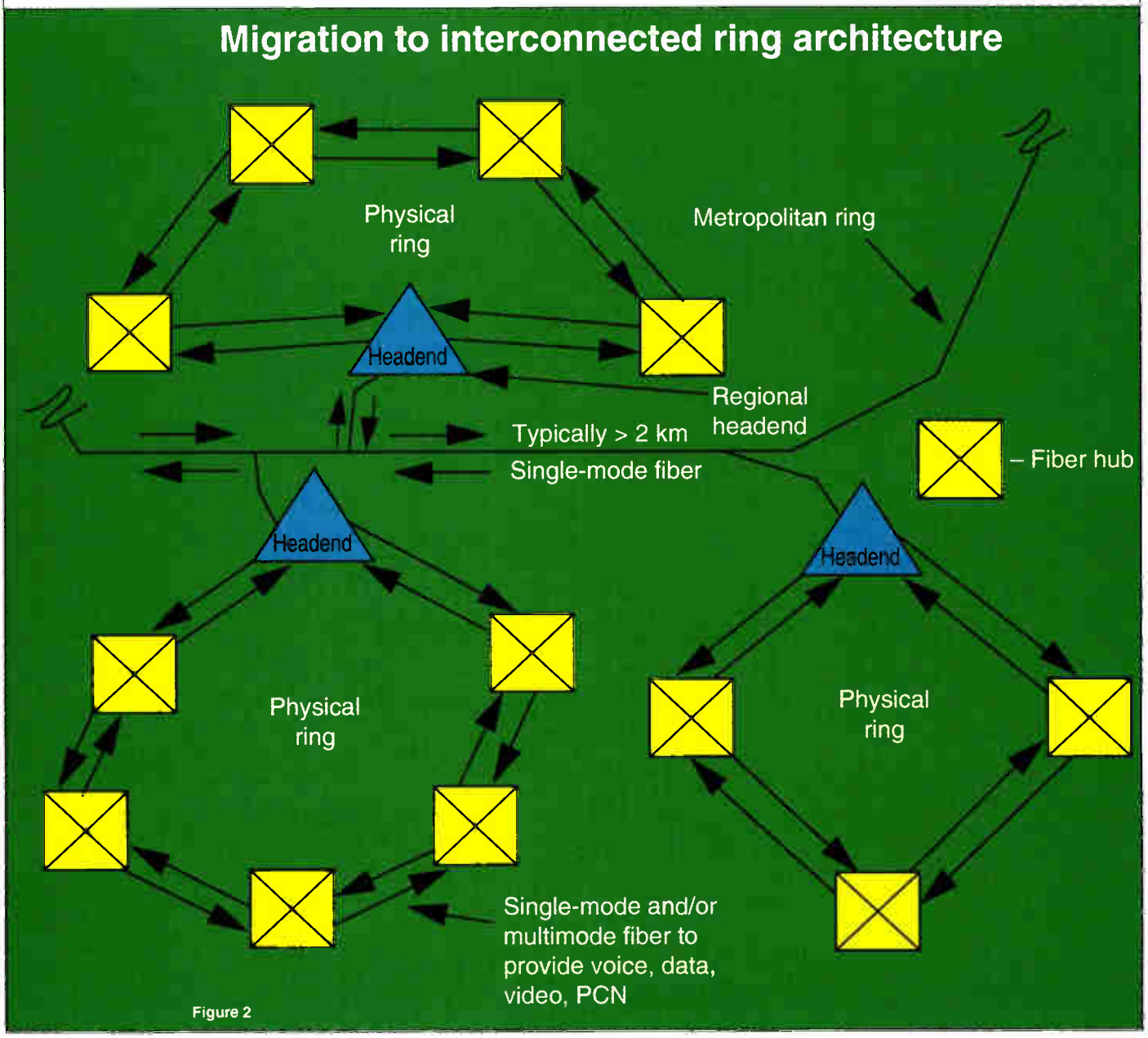
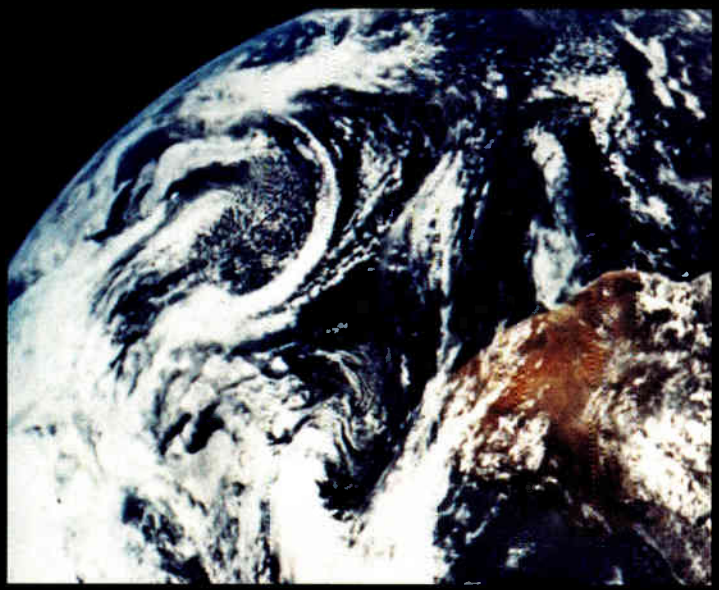
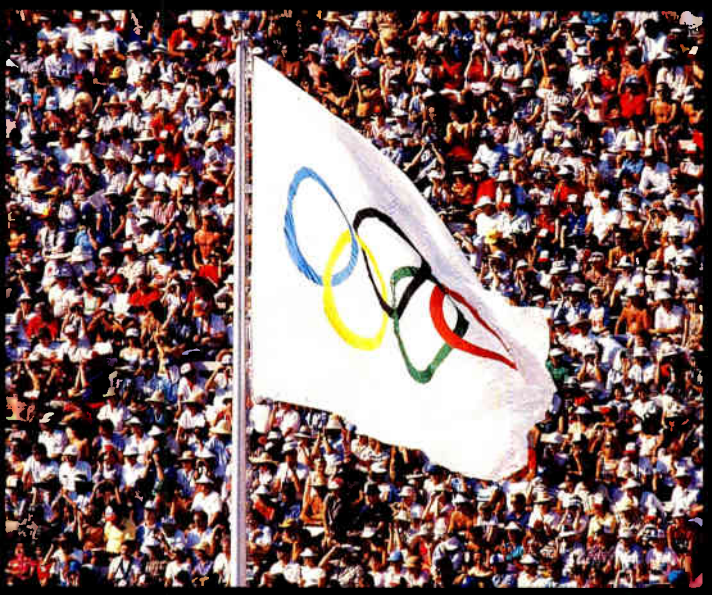


Figure 2

INFORMATIVE, ENTERTAINING MICROWAVES





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which will contribute point losses. Total system length also may affect information capacity (bandwidth) due to dispersion of the transmitted signal.

There are three common sizes of multimode fiber, classified by their geometrical core and cladding diameters. They are 62.5/125 μm, 50/125 μm, and 100/140 μm. Of the three sizes, 62.5/125 μm is best suited for networking applications. It offers the best combination of available attenuation and bandwidth to meet present as well as future requirements. It is endorsed by major OEM equipment suppliers and by Fiber Distributed Data Interface (FDDI) specifications (ANSI X3T9.5).

Most metropolitan systems will be of sufficient length or will require increased bandwidth to dictate the use of single-mode fiber as the medium for transmission. Single-mode fiber is less expensive than multimode, but system costs are usually higher due to the requirement for laser-based sources. Some important parameters to consider when selecting the system fiber are the attenuation coefficient, attenuation uniformity, mode-field diameter and geometrical tolerances.

The same system factors affecting the selection of multimode fiber apply to single-mode fiber, except for bandwidth. Typically, single-mode fiber is characterized by its dispersion at the operational wavelength as opposed to the bandwidth. This value can be used in determining maximum system length dependant upon the limitations of the active devices. The bandwidth of single-mode fibers has been demonstrated to be beyond 20 GHz, sufficient for most system requirements.

Single-mode fiber is also the media of choice for supporting amplitude modulated video applications because of its high bandwidth/low dispersion characteristics. They are usually designed for operation at a wavelength of 1310 nm, and gaining acceptance at operational wavelengths of 1550 nm due to the lower attenuation. Typical performance ranges for attenuation are 0.35 to 0.5 dB/Km at 1310 nm and 0.25 to 0.5 dB/Km at 1550 nm.

Fiber geometry plays a key role in networking applications utilizing increased mechanical connections. Recent improvements in process control and measurement capabilities have led to the introduction of cladding diameter tolerances of 125.0 ± 1.0 μm. These tighter tolerances on the cladding in conjunction with a highly concentric core will provide more consistent alignment of the fiber in terminating connectors to yield improved insertion loss.

Depending on the network design and drop point locations, it is sometimes more cost effective to use a mix of multimode and single-mode fiber for the system transmission media. A group of buildings in close proximity may provide for the use of multimode, in effect being a localized network, which may then be linked to the rest of the system from a central location by single-mode for extended distances (see Figure 1). The feasibility of this approach must be reviewed on a case-by-case basis.

Cable design

Different cable designs exist for specific environmental and transmission requirements. The metropolitan network will normally employ a single-mode, multiple loose tube construction designed specifically for the outdoor environment. This cable design segregates fibers in buffer tubes for stress-free packaging which will help ensure increased system reliability and survivability over a typical temperature range of -40 C to +70 C.

In addition, the fiber segregation feature permits simplified identification of fibers, protection when rerouting fibers, protection of dark (unused) fibers until they are ready for use, and easy midspan access without undue risk to all fibers in the cable. The cable selected should also permit composite construction, whereby single-mode and multimode fibers are placed within the same cable. Final decisions must be made on the cable route so that detailed requirements can be specified on the cable construction. Cables may be deployed aerially, direct buried or placed in existing duct.

Aerial cable is exposed to many external forces. Wind and ice loading can put stresses on cable, and the temperature changes are more extreme than any other installation environment.

Parameters which must be considered before a cable design can be selected include span lengths between aerial poles, whether or not an existing messenger or cable plant is in place, or if the cable will be required to be self-supporting. Aerial pole spans of 300 feet or less are routinely engineered with the use of a dedicated messenger.

In many cases, the cable is overlashed to existing aerial plant. Cable designs are also available which utilize a messenger integrated with the cable outer jacket for direct aerial placement.

Underground cable is subjected to fewer environmental extremes than aerial cable and is better protected. Its placement results in milder temperature extremes and isolation from vehicular accidents and gunshots. However, it is exposed to the dangers of rodent damage and dig-ups.

Usually, the cable is placed in existing cable ducts or direct buried. Direct buried cable requires the use of steel tape armoring to provide mechanical protection and resistance to rodent attack. Cable should be buried as deep as possible, below the frost line (at least 30 inches), to safeguard against external damage induced by construction and frost heave.

Avoiding close proximity with other utilities will further minimize possible sources of damage. The Electronic Industries Association has developed standards for the physical location and protection of fiber optic cable placed underground. Additionally, specific NESC rules must be considered when placing cable near other utilities.

The fiber density of cables employed in metropolitan networks varies widely among different applications. Point-to-point installations may use just a few fibers to meet current demands while networks serving multiple users and designed to accommodate future subscriber growth may employ several hundred optical paths. The economics of some systems require a more cost effective solution for the cable plant as compared to products often used by the long-haul communications carriers. The evolution of new cable constructions which perform to existing industry standards provide a cost effective solution.

At the point of entrance to the building, both the metropolitan and local networks fall under the same constraints. The cable to be used is influenced by state and local fire codes, as outlined in the 1990 National Electrical Code.

Typically there are two choices available for continuing the cable plant. The first is to plan a splice point at the building entrance to transition from outdoor to indoor cable designs, as the indoor cable designs provide fire resistant characteristics to comply with fire codes. The loss contributed by the additional splice is small, and usually insignificant for the total link loss budget. The second option is to enclose the outdoor cable in a metallic conduit or covered metal raceway.

Inside the building envelope, there are additional constraints on the selected cable, depending on the deployment location. Different fire resistant ratings are required for cables to be placed in plenums, risers, or used for general distribution. Article 770 of the 1990 National Electrical Code addresses these requirements in detail along

with local building codes.

Future growth of the system should also be considered when specifying the cable design and fiber count. The cost of installation usually overshadows the cost of the actual cable plant. Spare fibers for additional users and system redundancy for critical data should be of prime importance. The incremental cost of additional fibers diminishes with increasing fiber counts. Additional cable length should also be considered to allow for slack to be used for future drops or splice points, repairs, and relocation or changes in drop locations.

Splicing

The distances associated with most metropolitan networks will dictate that fiber-to-fiber field splicing must occur somewhere along the cable route. It may not only occur as a result of available continuous cable length, but also due to the cable plant layout, raceway congestion, or at transition points to indoor cables at the building entrance. There are two major methods of field splicing actively supported in the installation environment: fusion and single fiber mechanical.

Fusion splicing, used widely by cable TV operators, consists of aligning the cores of two clean, stripped, and cleaved fibers, then fusing the ends together with an electric arc. The fiber ends are placed in the splicer and then aligned either manually or automatically using various precision movement micro- positioners. High voltage electrodes contained in the splicer arc across the butted fiber ends to fuse the two together. Optimum core alignment can be monitored both before and after splicing with local injection and detection devices.

Different fiber types may require different fusing currents and times. The capital investment for a fusion splicer can vary depending on whether it facilitates multimode or single-mode fiber and the level of automation.

There are a variety of single-fiber mechanical splices available for performing field splicing. The most commonly used is the single-fiber grip type splice, which utilizes the auter cladding diameter to physically align the two fibers.

This method makes the core-to-cladding concentricity of the two fibers vitally important to ensure an acceptable core-to-core alignment. The cleaned fiber ends are cleaved and inserted into an alignment tube. Some splice designs include a fiber self-centering feature. The ends are butted together and index-matched to reduce reflections and loss at the splice point. Mechanical splices typically cost $15 to $25 per splice point based on purchase volumes.

While CATV operators prefer fusion splicing, both fusion and mechanical splicing techniques are reliable and suitable for indoor and outdoor installations when properly protected by a splice closure.

Inside a building a splice center is normally used to allow for ease of access to the fibers if necessary. The primary considerations when choosing a splice method are the capital or rental expense for fusion splicers vs. the consumable expenses associated with mechanical splicing, tool kit expense and set-up time, the volume of splices to be performed, the labor costs, and customer preference.

Termination methods

The final step in the installation of the cable plant is the end termination. As with splicing, there are a variety of methods and types of equipment, hardware, and connectors from which to choose. The termination of both trunk and distribution cables can be performed in one of three ways. The different techniques are pigtail splicing, field connectorization, or factory supplied preconnectorized assemblies. There are advantages and disadvantages associated with each method. A key element in end terminations is standardization on one connector type.

Regardless of the termination type used on the end equipment, one type of connector should be utilized throughout the cable plant. Hybrid jumpers—short cable with different connectors on each end—can be supplied to interface with the end equipment.

Several advantages result from standardization. Future changes in end equipment can be made regardless of equipment termination types by simply ordering appropriate jumpers, which will ease installation, thereby reducing system downtime. System maintenance is easier, reducing the variety of spare parts to be inventoried and carried to the job site.

Fiber optic patch panels can also be used at the end terminations for ease of system reconfiguration. The patch panel is an administration point in the cable plant where the cable is terminated. Through the use of jumpers, connections for electronics and routing changes are easily managed. By using these panels, logical topologies can be established and reconfigured through the use of jumpers without disturbing the cable plant.

In addition to administrative flexibility, the patch panel provides protection for the cable plant. Panels vary in size according to the number of cables terminated within, and whether rack- or wall-mounting is preferred.

The pigtail is simply a term used for a fiber optic cable which has been factory-connectorized with a fiber optic connector on one end, and the other end left as bare fiber. The unterminated end of the pigtail is fusion or mechanically spliced to the cable requiring termination (see Figure 2).

This method of terminating is fast and forgiving and uses the same type of hardware employed in the through splicing of the trunk cable. However, it does require hardware for splice storage and the added cost of a factory-installed connector.

Another means of terminating a fiber optic cable is to directly install the fiber optic connector onto the individual fibers in the field. Several efficient methods exist for this installation.

The connector can be epoxied onto the cleaned fiber using primarily heat curable, UV curable, or quick-dry adhesives. The fiber end is then polished to a smooth surface, even with the end face of the connector.

Recent developments have led to a simple "crimp-on" style connector which attaches in similar fashion to its copper counterparts. The connector is pre-polished and houses a fiber stub which the craftsman then essentially mates to with an internal mechanical splice. However, most important is the availability of the connector with a physical contact (PC) or Super-PC finish, which significantly reduces reflections, as required by cable TV operators.

The last termination type to be discussed is the use of pre-connectorized assemblies. When entering the premise environment, their use becomes advantageous. Connectors are pre-installed at the factory on one or both ends of the fiber optic cable to be used. Special pulling grips may be required depending on cable construction to protect the connectorized end, and can be factory-installed. Quality of workmanship and optical performance can be guaranteed.

The advantages include the elimination of the need for specialized skills or termination equipment, eliminating labor costs, and minimizing installation times. However, detailed up-front cable route engineering is usually required, the exact route length must be known, and in the event of damage the required tools for connector repair must be readily available. **CED**

Computer industry's view

Two defining metaphors—Bill Gates's "information at your fingertips" and John Sculley's Knowledge Navigator—are images of a multimedia sidekick ready to perform awesome tasks of communication and information retrieval in a jazzy techno-future.

Gates says his vision is of a system that collaborates with users, helping them find "information of all types, including sound, movies, numbers, graphs, all intermixed together, without the user having to think about the boundaries between those information types, (nor having to) fire off different kinds of applications."

Sculley calls the coming market for digital "personal electronics" devices, which will be connected by radio to the outside world, "the mother of all industries," a market "bigger than anything we've seen in personal computers."

He quotes a Harvard University study which forecasts that the telecommunications, media, publishing, consumer electronics, and entertainment industries will converge into a market worth $3.5 trillion annually by the turn of the century, compared to the computer industry's $217 billion (and the cable industry's $23 billion).

In the computer industry, multimedia means different things to different companies:

- There's a small but growing business in interactive presentations, or using PCs as interactive slide projectors. "Commercial presentations are where the majority of any money is being made in multimedia today," said one Silicon Valley observer.
- Kiosk vendors are placing interactive information booths everywhere from malls and airports to company lunchrooms.
- To PC manufacturers, multimedia means machines that can store and manipulate audio and video, which to a computerist are merely "time-based data types." It's a technology that's now doable, or maybe it's a new hope for product differentiation in a commodity market. Or, maybe, it's more than that.

Technology analyst and *Forbes* magazine writer George Gilder has predicted that "smart TV" markets "will dwarf the present home entertainment market."

Both Gates and Gilder argue that digitization means a convergence of several home entertainment appliances into one. Gilder predicts that what he calls the "telecomputer" will probably "displace" the TV, VCR, game machine and maybe some other devices. Gates, similarly, predicts that "products that used to be considered separate are now simply separate forms, smaller or larger, but with a desire to share user interface and share software technology."

*X*Press Information Services is transmitting six Hypercard stacks each week. This one, on Magic Johnson's warnings about AIDS, includes a nine-second audio clip. (Courtesy X*Press Information Services Ltd.)*

Doubt about timing, markets

Some are less enthusiastic. While front-paging an article on "interactive TV" and the widely rumored IBM-Time Warner talks, *The Wall Street Journal* paused to ask, "Does anyone really want this stuff, especially in a nation of passive viewers who can't even figure out how to set the timer on the VCR?" Another *Journal* reporter noted that the computer industry's multimedia enthusiasts "have had difficulty defining a specific product that consumers want."

Jim Chiddix, senior vice president of Time Warner Cable's ATC unit, called multimedia "intriguing, because it is unbounded by our present definitions of our business," opening the way to home shopping, interactive games, teleconferencing and more. "I suspect," he added, "that these businesses will evolve in ways that surprise us, but I have no doubt that over the next 10 years they *will* evolve."

Chiddix also has cautionary thoughts: "There's lots of room for innovation. But there's also lots of room to do the wrong thing simply because technology lets us."

CableLabs' current analysis lists likely multimedia applications under five general categories: education, training, entertainment, professional information and telecommuting.

One need look no further than CableLabs' active multimedia projects to find the most likely driving application: on-screen program guides.

Cablevision Systems Chairman Charles Dolan said interactive program guides will provide "a totally new impression of the value (of cable)," to a public that's currently "anxious to have a greater feeling of control" over the medium. CableLabs is providing technical help to at least three different program guide developers.

"I believe (a program guide) is *the* killer application on cable," says X*Press's Bennington, who is developing such a guide in partnership with TV Guide Magazine of Radnor, Penn. Bennington says he finds that, among cable CEOs he visits, of all the would-be future businesses, the guide "is the one thing they know they've got to do and do well, especially if they're ever going to have 150 channels and sell pay-per-view."

Videoway's Dufresne believes teleshopping may be a major application, given the huge size of today's direct marketing business.

Digital Equipment Corp.'s focus, growing out of its experience in using Cablevision Systems in Boston to reach its telecommuting employees at home, is

on work-at-home and teleconferencing applications.

Others suspect education may be a driving application, given its political appeal to the cable industry and the clamor to boost America's classroom competitiveness.

Many argue that some multimedia services-to-be are still unknown. John Bringenberg, TCI manager of strategic planning, said he expects contributions from "an enormous number of creative (computer-related) companies," including both major players and "people squirreled away in the hills making up new ways to interact with and 'experience' digital video."

Enabling technologies

Networks. The major focus of cable's network development work is on digital compression to support video on demand or a reasonable facsimile of that concept.

ATC's Chiddix has stated that the company's Queens County, N.Y., Quantum system could be expanded, with compression, from 150 channels to 500. But why bother? By sending customized 150-channel signals on fiber trunks to each neighborhood, "the channel capacity of a given coaxial trunk can be multiplied by the number of fiber trunks in the system," Chiddix said. "So you wind up with thousands of channels, essentially, which is how you wind up being able to do video on demand or switched video."

Video-on-demand can perhaps be seen as a variety of interactive television. However, the interactivity is limited to the command: "Roll the video."

Switching. IBM's well-publicized offer to partner with cable operators in rolling out digital services would take things a lot further. Based on work by Alan Baratz, an IBM networking researcher in Hawthorne, N.Y., IBM's plaNet (short for Packetized Light Architecture Network) is a packet-switching overlay which brings full digital switching to the normally point-to-multipoint architecture of a cable system.

plaNet (formerly known as PARIS) uses redundant digital switches based on special-purpose VLSI chips to route packets through a cable system. Traffic through the switch moves at 1.2 gigabits per second per line—so fast that, with proper routing priorities, even voice or video teleconferencing applications will seem as instantaneous as if they were traveling through a switched circuit.

The system will soon be serving a network of banks on Rogers Cable in Toronto. It will also be tested on telco fiber in partnership with BellSouth Services of Atlanta.

Digital Equipment is also developing networking systems and switching under the umbrella of Community Multimedia Networking. Products cover a range of data speeds and applications, from Ethernet TV (ETV), currently being used in six public schools over TCI's cable system in Millbrea, Calif., to Gigaswitch, which routes gigabit-per-second data over fiber-based Metropolitan Area Networks.

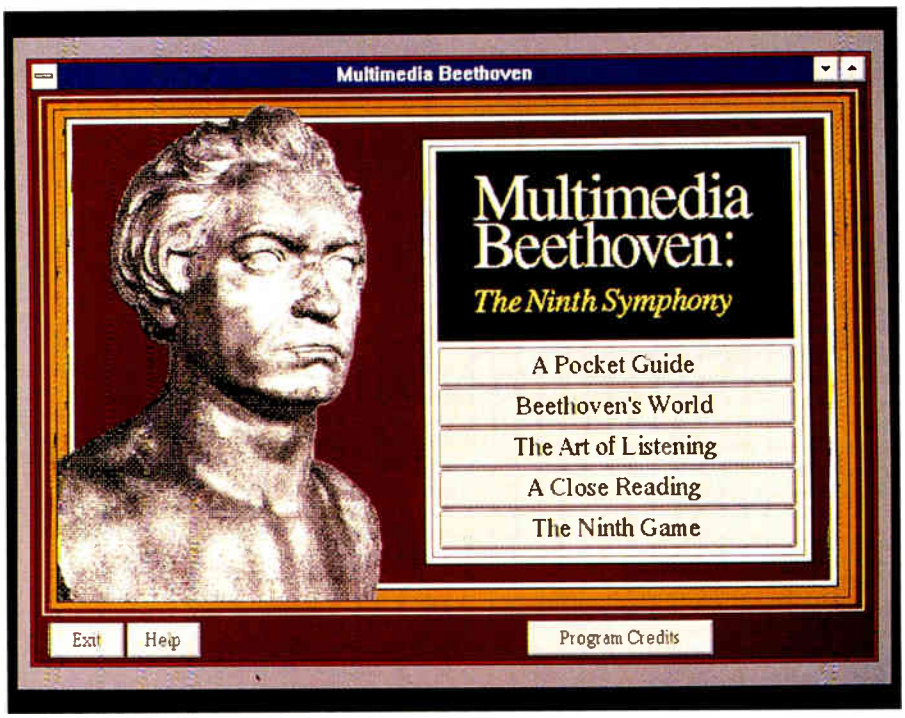
Telco-cable hybrid architecture. With about 1/250,000th of the carrying capacity into the home (4 kilohertz vs. 1 gigahertz) of coaxial cable, telcos saddled with copper twisted pair might seem to be automatic also-rans in the digital services game. Indeed, analyst Gilder, whose past arguments for unleashing the telcos have riled cable executives, recanted in a now-famous April *Forbes*

article in which he ticked off the strategic advantages inherent in cable's broadband pipeline.

However, telco engineers are not standing still. AT&T and others have demonstrated video of seemingly better-than-VHS quality being sent at 1.5 megabits per second, a rate researchers considerable doable over 80 percent of telco twisted pair using Asymmetrical Digital Subscriber Line (ADSL) technology. What these achievements mean to multimedia is not clear. For less demanding applications, a $500 telephone modem can now deliver data at 38K baud over most twisted pair.

Apple's Liebhold sees "tremendous opportunities to mix the technologies" of cable and telcos: "Phone company people realize their system won't let people watch one channel and record another—that it's not really a viable competitor to cable television."

Telcos, Liebhold added, can provide "fabulous interactive directory services, fabulous interactive TV guides, all kinds of supplementary information to the cable network, (and) some transaction management that's going to enhance the value of the regional cable franchises." Enhanced music services, shopping services and game services all can thrive in a hybrid environment, Liebhold said.



Microsoft Bookshelf is a CD-ROM-based multimedia product that includes common reference books. For example, clicking on some graphics brings them to life as animations (Courtesy Microsoft Corp.)

Similarly, Robert Pepper, chief of the FCC's Office of Plans & Policy, predicted "a world of smart boxes, smart terminal equipment, *hanging on multiple networks*" (emphasis added).

Storage media. Wherever the mass storage may reside on future networks, storage technology is "such a volatile field" (in X*Press's Bennington's words) that making even near-term predictions is tricky. Today, computer circles are buzzing about gigabit-capacity laser-optical "compact cards" from Ursham Research Corp. of Los Angeles which (should they actually be manufacturable in quantity) could hold a feature film each. Tomorrow, who knows?

In-home boxes. Tests are underway now, vendor and MSO executives have asserted, of enhanced cable convertors which have digital decoding sophisticated enough to display multimedia program guides. Along with current convertor box makers like Jerrold, Scientific-Atlanta, Philips Electronics and Pioneer, both IBM and AT&T have expressed a desire to make future convertor boxes.

IBM's plan for inside the home, as voiced by spokesman David Harrah, is to have all the high-speed digital encoding and decoding done by a very powerful processor running at 10 to 20 million instructions per second (MIPS)—compared to less than 2 MIPS for today's high-end PCs.

Some TV set and VCR makers, such as Philips and Thomson, have supported putting digital decoding capability inside their devices, an approach which would honor the cable industry's preference for locating expensive circuitry outside the cable plant and inside the hardware consumers buy.

Analyst Gilder notes that U.S. companies still dominate the market for the high-speed digital signal processor chips that will be at the heart of future home systems. Gilder argues that making such systems, which he calls telecomputers, provides a golden opportunity for U.S. firms to move the game to a new playing field, thus breaking the current Japanese chokehold on the U.S. consumer electronics market.

But what seems to be emerging, instead, is a pattern of trans-Pacific partnering, with IBM, Apple and Microsoft all acknowledging the need for Japanese partners both for mass production and for some key technologies like display screens and mass storage.

Both Apple and Microsoft, in recent statements, forecast the presence of an array of in-home devices.

To Apple, these devices support big-screen entertainment at one location and activities like learning and money management at other locations in the home. A personal digital assistant puts computer power in each person's pocket and communicates by radio with other devices.

Microsoft's Gates has said that future devices will all be categorizable by two criteria: the size and resolution of their screens, and whether they're hardwired into a fiber network or have radio links only.

Interface issues. As TCI's Malone observed in Dallas, most people are "still largely afraid of their PCs" and of other high-tech interfaces. Apple, Microsoft and IBM are all deep into pen-based inputting, and Apple is feverishly developing speech-recognition (code name: Casper) as a user input tool as well. Similarly, both CableLabs' Dukes and TCI's Bringenberg stress the importance of interface design.

Dukes contends that everything, including links to service providers, the network itself, and the user interface, must be transparent to the user. "If interacting with multimedia is as frustrating to the consumer as recording with a VCR has been, multimedia will fail miserably," Dukes said.

This time around, Dukes predicts, cable should be able to "avoid the position we're in with the consumer electronics industry, where we're trying to get (our functionality) inside the (TV or VCR)."

In interfacing to service providers, cable must support protocols the providers are already using, not force new ones on them as Dukes says telcos have done. Further, he stresses, cable carriage must be priced right, with customers paying only for what they use.

Authoring tools. Cablevision's Dolan pointed to plunging prices for all forms of video production, which should facilitate an outpouring of new programming. In the multimedia domain, the buzzword "authoring tools" refers to hardware and software that speed the movement of audio and video content into computers and its structuring into interactive content.

Fortunately, tools are emerging. For example Adobe Systems' Premiere multimedia authoring software and SuperMac Technology's Video Spigot video input board are two such tools that are viewed with excitement by multimedia

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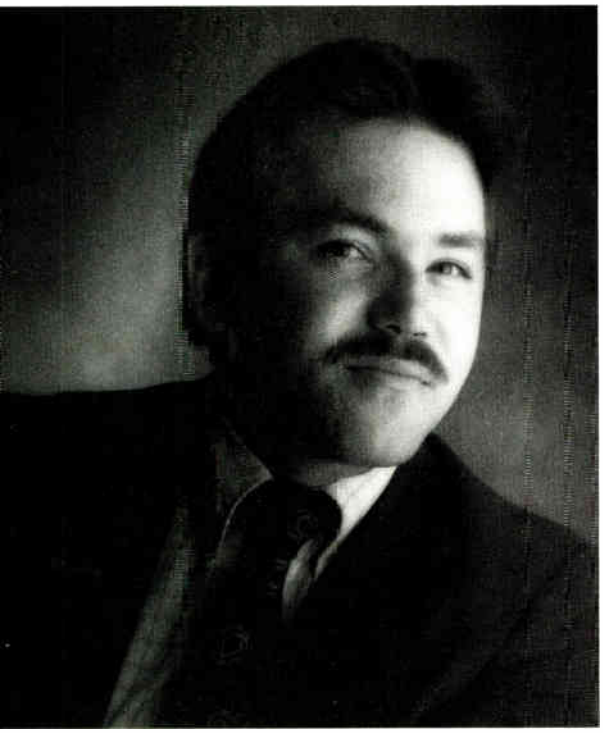

Jerry Neal
Senior Software Engineer
Pioneer Communications of America
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Operating environments. Right now, content developers must choose among computer platforms, probably either the Microsoft/Intel-backed MPC format or Apple's System 7 operating system with QuickTime video compression, and among authoring packages. Portability between platforms is painful, at best, and some authorware software developers have disappeared, stranding their users.

"Developers are tired of sitting on a multimedia picket fence—one they perceive is being rocked by IBM, Apple and Microsoft at will," notes the influential Seaford, N.Y., based *Envisioneering* newsletter, which covers digital video.

Meanwhile, there are hints that Apple may port future Mac operating systems to the Intel environment, and Steve Jobs' Next Inc. talks of porting its NextStep, a powerful multimedia environment, to Intel's 80486.

The dream behind Apple and IBM's Kaleida partnership is to create one standard for multimedia programming that permits easy importing and exporting among all the major operating environments. One of these environments, presumably, will be the RISC-based PowerPCs that Apple and IBM says they will market, with Motorola producing the microprocessors. But the Kaleida venture seems to have fallen behind its own timetable in naming management and getting down to work.

Cable industry strategies

CableLabs' multimedia guideline-setting effort is being supervised by a network development subcommittee, headed by Chiddix, under CableLabs' Technical Advisory Committee.

"The window (for multimedia) is not infinite," says Dukes, who is CableLabs' liaison to Chiddix's subcommittee. "We have a short period in which to determine whether there's a business for us here."

One project that Dukes oversees is seeking to establish a datastream protocol that can be used by near-term services with fairly slow-speed data modulated into open spaces in the analog spectrum. That protocol consists of "a header, a payload and a trailer in some form" and is "application-independent to the extent possible," Dukes said.

The expected high-speed data services to follow, though they may adopt the same protocol, will presumably be on all-digital pathways at much higher frequencies.

At the National Show, Chiddix shared his company's idea for a channelization scheme (see pg. 30). It shows a small channel for upstream data between 5 MHz and 30 MHz, then traditional analog video modulated from 54 MHz to 550 MHz, followed by 500 channels of digital video between 550 MHz and 850 MHz.

From 850 MHz to 1 GHz is a 150-MHz "outgoing telecom" channel that includes both a 500 Mbps (megabits per second) digital datastream and 50 MHz above it allocated to PCS service. The configuration is repeated for "incoming telecom" traffic between 1.15 GHz and 1.3 GHz, with a 150-MHz crossover separating the incoming and outgoing traffic.

Just how well this or other proposed channelizations really work in the field will have to be tested, Dukes said.

Getting ready for PCS, which means designing for a digital service with high reliability and maintainability, is already well afoot under Roger Hay, CableLabs' director of PCS. Once that job has been done, Hay said, "it's a relatively small step to add multimedia. In many ways, they will look identical on the network."

Cable people are now involved in key committees debating transmission standards, Dukes said. "It's extremely important that we watch to not be preempted from (multimedia services) because standards preclude us from using the formats."

Also under Dukes's direction at CableLabs is advocacy and design of regional hubs or "superheadends." Linking headends together on a redundant fiber-optic ring, these regional hubs would support regional sharing of PPV movie playback systems and ad insertion equipment. The hubs also could house host computers for multimedia services or gateways to remote multimedia providers.

CableLabs is already scurrying to put Digital Equipment Corp. multimedia gear into its Boulder laboratory. Negotiations were under way with Apple, Microsoft and IBM at presstime, with some major announcements described as "imminent."

Glenn Edens, a designer of the original Macintosh and now a consultant to Hitachi, said cable's biggest problem in becoming a digital carrier is that different MSOs have been pursuing different approaches to data transport.

"Cable operators have to develop a common protocol and an internetworking capability; they must make all those

little cable systems look like a common service."

Edens thinks alternate access-type data carriage must precede the blossoming of multimedia content delivery. He says computer people are interested in using cable's data highways, in part because they are frustrated with telcos' inflexibility, high prices and ballyhooed services that never quite materialize as tariffed offerings.

Cable can woo them away, but to do so, it must package its data transport services attractively "and not get greedy," says Edens.

The view from TCI

TCI's multimedia ventures include major projects with DEC and indirect ownership, through its Liberty Media spinoff, of X*Press. Through its X*Press Media Center, a Mac-based interface designed for schools, X*Press is already sending out Hypercard stacks, in conjunction with CNN, C-Span and Cable in the Classroom, that contain photos and sound bites—a multimedia product.

Creating an X*Press-based *TV Guide* also means porting X*Press away from its current PC-and-Macintosh display medium and onto TV screens. Systems which pump X*Press through a convertor box are already being tested. In-home prototyping is expected by fourth-quarter 1992.

True, said TCI's Bringenberg, there are disadvantages to TV delivery, such as "losing crispness of the text." But there are advantages: "The main one is that being able to interact, from my couch, with a remote control, is I think the ultimate place you want to be."

The industry's process of ramping up for digital HDTV, which Bringenberg termed "probably the most demanding requirement for a digital system, particularly the in-home device," will open the way, as a fringe benefit, for the "less demanding" delivery of graphics, text and audio.

Bringenberg isn't sure whether the hardware for such services will come from consumer electronics companies or computer companies, or some combination: "Maybe the engine and the user interface will come out of the computer world but some device integration will likely come out of the consumer electronics world.

"Ultimately, as a cable operator, I think we want to see peripherals to the platform that we put in the home. Or, if they can be done inexpensively enough, for them to be simple component add-ins to either the cable box of the future or, better yet, the televisions and VCRs of the future. The bottom line is a digital system which is simple and friendly, which will require enormous computing power in the living room and will be controlled by remote from the couch."

Cable's second-largest MSO, Time Warner, has held a now-famous courtship with IBM (former top executives of each company sit on the other's board). It has close ties to Japan Inc. through high-tech giants Toshiba and C. Itoh, which jointly own part of Time Warner (IBM is partnered with Toshiba in crucial display-screen ventures).

In a luncheon appearance that concluded the Dallas show, Time Warner's Pittman enthused over interactive programming's ability to bring the random-access essence of print to a TV screen. He described a future of how-to tutorials, games and even teleshopping services that will allow shoppers to see images of clothes pasted on the contours of their own bodies.

"These markets are bigger than the television box office that has been our yardstick in the past," he observed. "Interactive is going to be as pervasive as narrowcast cable networks are today."

In the age of smart TV, "people will invent entirely new forms," he predicted. "In the year 2010, people are going to look back and say, 'Weren't the cable guys smart using that come-on about conventional television to get people to put the wire into the home.' "

IBM targets a market

In a February speech that was more pithy than her well-publicized Dallas remarks, Lucie Fjeldstad, IBM vice president and general manager, multimedia, said IBM is courting entertainment and publishing firms and has more than 100 teams at work trying to create new multimedia applications. It also has its own multimedia developers' platform and PCs, known as Ultimedia.

Pointing to IBM's unexcelled strengths in mega-networking, she declared, "Our goal is to achieve a national data—or multimedia—superhighway."

Fjeldstad told *Business Week* she had completely sold IBM's top management on her strategy ("They asked me to turn IBM into a multimedia company") but stressed that the biggest job was firing up the company's sense of vision.

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SCTE Expo "hottest" show in years

Event could be turning point out of recession

Attendees of the 10th annual SCTE Cable-Tec Expo had nothing but high praise for the 1992 version of the event, terming it the most upbeat show since the industry went into recession more than two years ago.

"This is the best show in three years," said an ebullient Jack Forde, president of Times Fiber Communications. Indeed, every exhibitor queried said the event was dominated by operators asking for quotes on specific proposals and others on the brink of opening their wallets.

Indeed, many exhibitors were publicly saying that this event signals that good times are again on their way as operators slowly ramp up new construction projects that are packed with fiber optics and new high-power gear.

Skip Litz, manager, marketing communications for Jerrold Communications, presents Steve Dyche, plant manager for United Video Cablevision, with a certificate for a free gift, courtesy of Jerrold, during the Expo Evening event in San Antonio.

While final attendance figures were unavailable as of presstime, conventional wisdom said that at least 3,000 persons showed up for the engineering conference and expo.

And manufacturers were ready. Several brought new products to the event, further establishing the Expo as an event where smaller hardware vendors can gain attention without being drowned out by large programmers.

Here is the rundown of new products that debuted at the Expo:

ABC Cable Products

Perhaps one of the most closely scrutinized new product at the Expo was ABC Cable Products' "CBLinX" RF-to-fiber converter. The new transmitter (matching receivers are under development) is said to offer a completely transparent transfer function from DC up to 1.4 GHz. It's based on an Indium Phosphide Fabry-Perot diode and apparently requires no linearization circuitry—not at the headend, nor in the box. Inventor Fred West, Spectrum Photonics president, claimed at the show that the transmitter is capable of transmitting signals up to 12 kilometers, with carrier-to-noise in excess of 52 dB, no matter whether the load is four analog channels, 125 analog channels, or any mix of FM, AM and digital.

American Lightwave Systems

In a move that strategically repositioned the company as a supplier of digital local loop systems, American Lightwave Systems introduced the "Networx" family of products for transport of DS1, DS3, Fiber Distributed Data Interface and Synchronous Optical Network signals.

The new product family, provided by ALS parent ADC Tele-communications, includes opto-electronics, fiber organizers and outside plant cabinets, said John Holobinko, ALS marketing vice president. Networx is positioned to carry both entertainment and other types of video, high-speed point-to-point data transport, distance learning and voice applications as well, said Holobinko.

In addition ALS announced the addition of a new, high-power DFB laser to its family of AM fiber family. The new LiteMaster transmitter offers between 10 mW and 13 mW output power. The device is slated for use in the first link of a star/bus/passive architecture. ALS and C-Cor will begin shipping the product in 120 days.

Alpha Technologies

Alpha Technologies took the wraps off its new APC pedestal, a unit designed for systems that require a full-power, compact power supply that has low pole visibility. The smaller size, says Alpha's Bob Bridge, enables more free-climbing space. Also, the modular design allows for custom-tailored powering for any load range.

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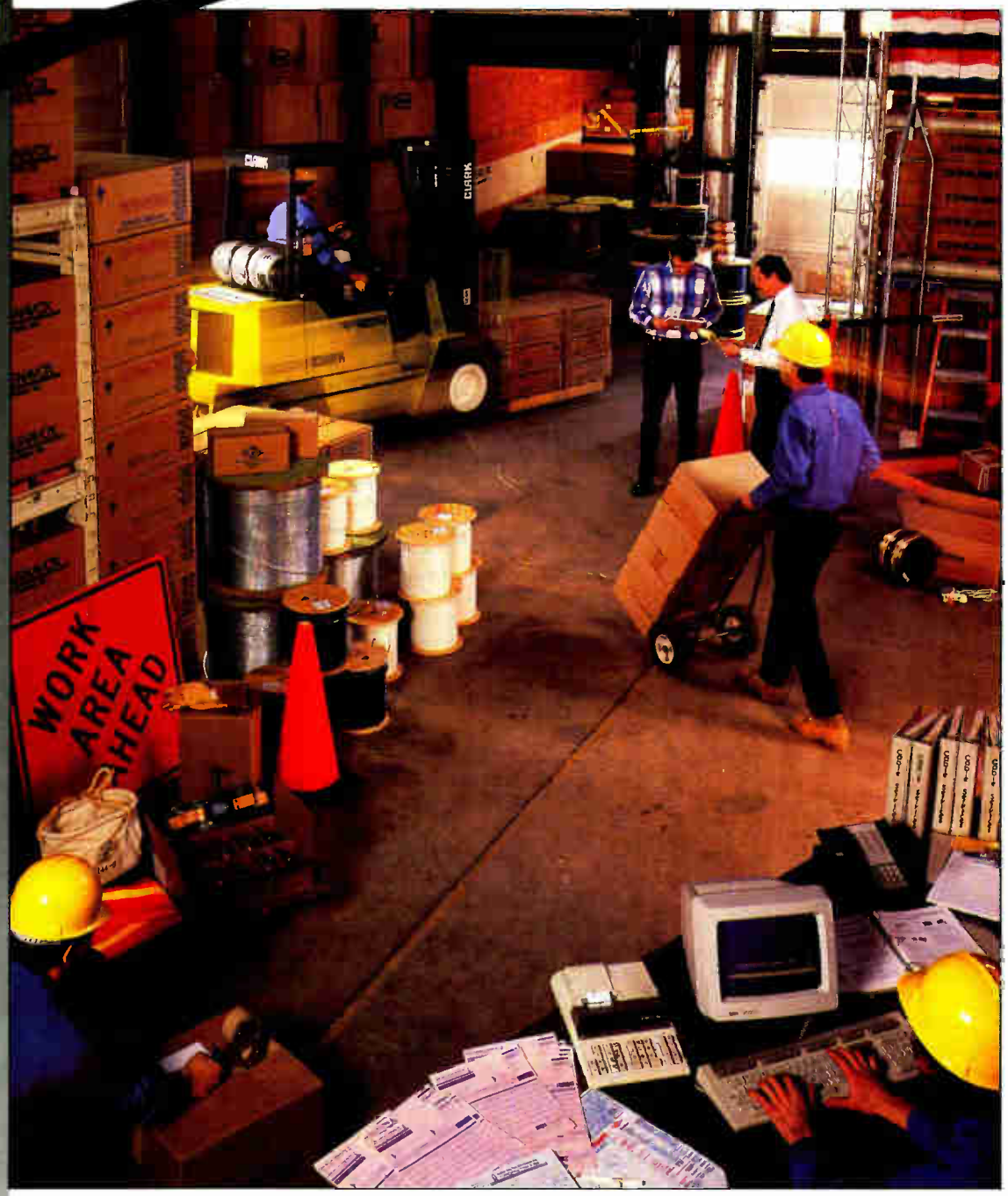

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The new pedestal is similar to conventional pedestals, Alpha officials say, and is manufactured by Champion Products.

AM Communications

AM Communications has developed a low-cost MDU addressable tap that offers per-subscriber costs as low as $15 a port, said company officials. The DGT-MDU-I comes in 4-, 6-, 8-, 10-, 12-, 14- or 16-port versions. In addition, AM announced a strategic marketing agreement with Wavetek (see below for details).

Antenna Technology

New from Antenna Technology is a portable spectrum analyzer, receiver and monitor. The unit weighs nine pounds and features a three-inch compact screen and interchangeable power pack. Built-in features include a field strength meter, multi-standard satellite demodulator, audio/video monitor, spectrum analyzer and reflectometer functions. Called the VI 2.0, the unit operates with an input frequency of 900 MHz to 2000 MHz and powers LNBs through 18 volts.

Belden

The standard 550 MHz/750 MHz drop cable line available from Cooper Industries' Belden division has been upgraded to 1-GHz, officials say. Included in the upgrade are all 59, 6, 7 and 11 series cables for indoor, buried and aerial applications. Belden says it has also upgraded its production line testing capabilities to assure conformance to the 1-GHz standard.

In addition, Belden introduced a corrosion protection option to its line of drop cables. CoreGuard is a protective gel applied between the braid and jacket to keep moisture out. CoreGuard is available on series 59, 6, 7 and 11 cables.

Ben Hughes/Cable Prep

Ben Hughes/Cable Prep has announced its new SCT-715QR tool for use on Comm/Scope's Quantum Reach Cable. The tool contains two parts—a stripping tool, and a jacket strip tool. The housings of the tools, though, are threaded and assembled as one.

C-Cor Electronics

C-COR Electronics Inc. has introduced two new 550-MHz parallel hybrid trunk amplifiers, spaced at 22 dB and 26 dB. Both the new PT509 and PT519 are compatible with C-Cor 8-port housings and standard trunk accessories, including the dual output bridger and the status monitoring transponder.

Also new from C-Cor is an AM optical transmission system covering the 47 MHz to 860 MHz frequency range used in international markets. The new system will be available in August, according to C-Cor officials.

And finally, C-Cor will begin selling the new LiteMaster high-output DFB laser from American Lightwave Systems in 120 days, it was announced. The new device offers output power of between 10 mW and 13 mW.

CableBus Systems Corp.

CableBus Systems, which specializes in cable TV telemetry applications, has introduced a new "Home Bus" system, a low-cost method for monitoring up to 32 in-home devices such as water, electric and gas meters, security and fire alarm systems, said Cliff Schrock, company president.

The new "CDT 8/4 Cable Data Terminal" uses four-conductor balanced twisted-pair wire connections between the in-home controller and other load relays, display panels and meters that might be used inside a home. The system also supports downloading of messages to specific residences or globally to groups of residences.

Comm/Scope

Comm/Scope introduced its new 715 series of Quantum Reach coaxial cable, designed for use in fiber-rich CATV architectures. The new cable can be used as express feeder or as feeder following a fiber link. Comm/Scope chose the new size cable because it offers the lowest cost-per-mile at three different home densities.

Contec

Contec International has named

Richard Monks, a former IBM executive, president and COO. Contec also signed a deal with Seavey Engineering Associates Inc., giving Contec the exclusive right to sell Seavey's line of multiple-beam satellite feeds in the U.S. cable TV market.

Corning Inc.

Corning Inc. has named Kathy S. Rauch as market development manager for the company's cable television division. In her new position, Rauch will direct the engineering, sales and marketing communications team assigned to cable. She replaces Jon Chester, who has gone on to manage a Corning applications engineering group responsible for supporting telecommunications, cable TV and data communications markets.

Digital Planet

Digital Planet has announced the development of a 20-bit signal processing chip that will be installed into the company's audio tuners, providing a standard digital output. The announcement was made in cooperation with Dolby Laboratories. Digital Planet officials say the chip marks the first time anyone has implemented Dolby's AC-1 audio algorithm.

Electroline

Electroline Equipment Inc. showed a new 862-MHz addressable tap system intended for MDU applications. The "MTS" system can secure two basic tiers and as many as 12 premium services as well. Electroline also featured an impulse pay-per-view system for hotels, resorts, campus and hospitals.

Ipitek

Ipitek has announced what it calls the "first member" of its Imtran family of digital video transport products in its CQ-4, a device that can simultaneously send and receive up to four channels of video, 16 channels of audio, four RS-232 signals, and two separate data channels of 25 Mbits/second. All of the information can be carried over a single fiber to a distance of 25 miles.

The meat of the system, Ipitek officials say, is its mux engine card, a plug-in module that accepts digital video, audio and data which is transmitted on a serially encoded beam of laser light. At the same time, it can receive lightwave signals from a distant site and convert that light back into video, audio and data.

"The device is unique because users are able to drop and insert high-quality video and audio in the digital domain at several sites without the cumulative degradation typical of analog systems," said Robert Chalfant, marketing manager for the company.

Jerrold Communications

Jerrold Communications introduced a new Cableoptics mini-bridger during the SCTE Cable-Tec Expo. In addition to the new bridger, Jerrold demonstrated its new LifeLine status monitoring system, the on-screen display capabilities of the CFT-2000 addressable convertor, the new ACC-4000 addressable controller and the TVRC and Buddy remote control units. Also, Jerrold displayed its new digital audio tuner and Song-ID remote control that identifies the songs played on its Digital Cable

Radio service.

Midwest CATV

Midwest CATV annoounced that John Johnson has been promoted to vice president/sales. The former vice president/purchasing reportedly took the new role because he wanted to try his hand at sales. Taking up the purchasing gauntlet is Bill Shearer, who was promoted to senior buyer for both the LAN and CATV divisions of the company. Eric Bryant, formerly in sales, is moving to purchasing to assist Shearer.

On the sales side, Mike Phebus, Midwest's Denver-based sales exec, and Marsha Pleasants will assist the now-salesman Johnson in his new role. Bill Cody was promoted to VP/southern regional sales, and Martin Suder was promoted to outside sales representative for Midwest's Ocala office.

In other news, Midwest CATV has stocked and is ready to ship 750-MHz Antronix taps, including 2-, 4-, and 8-way tap values. Jim McCauley, senior VP/sales for Midwest, said the stocking decision was necessary as customers demand supplies for higher bandwidth projects. As a result, the company has upgraded its inventory of 600-MHz taps.

Nexus

Nexus Amplifier Solutions Corp. has added two new products to its ASL series of cable television distribution amplifiers. The ASL2000HO amplifier, designed for indoor and outdoor MDU applications, offers higher gain performance to 860 MHz while the ASL 1000 offers 550 MHz bandwidth with the gain and specifications of the 2000HO. Meanwhile, Nexus Advanced Cable Systems showed an "intelligent headend" concept that would automatically switch in a backup component should a device fail.

Northeast Filter

Northeast Filter Co. has introduced a line of power passing traps designed for multiple dwelling units. The new devices are designed to handle 10 amps continuous 60-cycel power and are made to order, depending on the combination of negative and positive channels to be trapped.

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300 attend tech seminar on regs

With the new federal cable television technical standards slated to initially kick in at the end of last month, more than 300 persons from cable's technical community sat in on the first in a series of NCTA-sponsored seminars on the subject in conjunction with the SCTE Cable-Tec Expo in San Antonio.

Attendees were told not to look upon the imposition of technical standards as a penalty, rather as an opportunity to improve their operating systems. "These rules are a safety net to give your customers some expectation of minimum performance," said Ted Hartson, VP of engineering for Post-Newsweek Cable. "This is how you stay out of handicapped parking."

Similar thoughts were advanced by Wendell Bailey, VP of science and technology at NCTA: "The payoff for your work on technical standards will be a better system, happier subscribers and improved troubleshooting capabilities," said Bailey.

The audience was reminded that their systems were required to deliver a minimum of 36 dB carrier-to-noise ratio to their subscribers and have a complaint resolution procedure in place by June 30, 1992. Furthermore, systems will be required to test their systems twice annually (in either July or August and again in either January or February), beginning in 1993. Cable systems are required by FCC order to improve the carrier-to-noise ratio delivered to subscribers to 40 dB by June 30, 1993 and then improve it to 43 dB by June 30, 1995.

Cable operators and local franchise authorities were admonished to form some sort of mediation panel and work cooperatively to meet the new FCC cable technical standards. Speaking during the Engineering Conference, John Wong, assistant chief of the FCC cable television branch, said the new standards shouldn't be tough for a well-run system to meet.

Wong offers vote of confidence

"These numbers are not onerous at all," said Wong. "Don't kid yourselves, you guys are better (than you think)," he added. However, compliance won't come without effort. Wong said an engineer from a "major MSO" evaluated the test procedures and determined it would take the equivalent of two man-years of resources to test his largest system, which serves more than 100,000 subscribers and features at least 10 microwave links. On the other hand, the same engineer said a more typical system with 40,000 subscribers would require one-quarter of a man-year, according to Wong.

During the NCTA seminar, a significant debate regarding the number of points required to be tested cropped up during the meeting, with many operators pointing out that it's unfair to impose more test points on systems broken up by microwave links. The subject is currently under evaluation by the FCC as part of its rulemaking process, so Wong withheld most of his comments on the issue.

Later in the day, Hartson, Bailey and Wong were joined on the dais by Jonathan Kramer, an independent inspector and the chief negotiator for the cities during the tech standards process. He said cable operators should work cooperatively with inspectors to minimize confrontations.

Wong's idea of an independent "mediation panel" consisting of representatives from the cable industry and franchise authorities still is appealing to Bailey and Kramer, both reported during interviews following the seminar.

Wong, who said he senses "a rift between the cities and the cable industry," thinks a mediation panel "will go a long way in easing that relationship. You need each other to provide the best service to customers," Wong concluded.

Indeed, both Bailey and Kramer said the joint engineering committee concept is still being pursued. "It's actively alive," said Kramer. The joint committee concept was originally part of the agreement hammered out between the cities and NCTA, but was dropped from the FCC's initial report and order. Kramer said the committee will still be organized and will seek to perform the role spelled out in the original agreement. CED

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Also, Northeast Filter announced that Charles Sliter has been named national sales and marketing manager for the company. Sliter formerly worked for Pass & Seymour/Legrand, a wiring devices specialist.

Optical Networks International

Optical Networks International announced that it has delivered five YAGLink transmitters, to be used for headend elimination, cascade reduction and supertrunking. Recipients include Vision Cable, Albemarle, N.C.; Kingwood Cable, Kingwood, Texas; Dynamic Cablevision, Hialeah, Fla.; United Artists, Mamaroneck, N.Y.; and TCI Chicago.

Also, ONI will supply Comcast with six laser transmitters and 12 receivers to break the operator's Flint, Michigan system into shorter cascades. Finally, a new addition comes to the Restorpak line of product—the Restor-C-Pak incorporates enclosures to enable a technician to secure and protect a restored splice.

Pioneer Communications

Pioneer Communications and Telecommunication Products Corp. have announced and displayed the marriage of their products. In the demonstration, Pioneer's VDR-V1000 rewritable videodisc recorder has been interfaced with TPC's Queue Master, a timed event controller.

The VCR-V1000 is a dual head, broadcast quality component recording system that provides instant start, real-time non-linear playback and virtually instant access to any cue point on a 32-minute disc. TPC's Queue Master is designed to control routing switches, videotape recorders and virtually any other equipment on a real-time basis.

The system is unique, TPC officials said, because it is based on an industrial PC, which enables operators to control functions by entering text into a free form log. The product operates by scanning an event file for scheduled events, then sending a command at the appropriate time to the hardware to execute the event.

Also, Pioneer touted the customer friendliness features of its "VCR Filter," originally developed in 1988 as an add-on for Pioneer's line of descramblers. In essence, the filter allows the decoder to provide a broadband output to TVs and VCRs. It therefore allows viewing of an unscrambled channel while simultaneously taping a scrambled channel. The filter also allows viewing of a scrambled channel while taping a non-scrambled channel, Pioneer officials said. The filter also allows use of "picture-in-picture" TV features.

Porta Systems

Porta Systems Corp.'s Aster division and BT&D Technologies have teamed to provide 1x6 connectors for passive optical network system designs. The connectors will be available for the 1260-nanometer to 1360-nm and 1430-nm to 1580-nm wavelengths, the company said.

Production Products

Production Products Co. debuted its new indoor push-on F-connector. The "Quik-Lok-F" connector comes in two versions (for RG-59 and RG-6 drop cable) and can work on any drop cable specified with 40 percent to 80 per-

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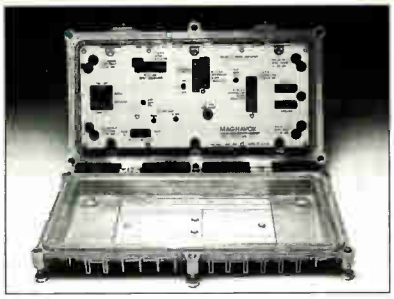

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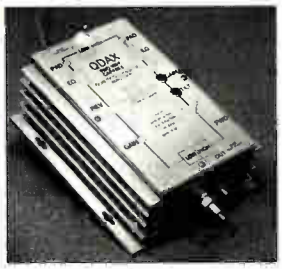

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Picture quality: It just keeps getting better

Thirty-four years ago, participants in a TASO study said television signals with a 28 dB signal-to-noise ratio were "slightly annoying." Anyone who has had the misfortune to see a signal at that level today would likely find the picture incomprehensibly bad, and were it a subscriber, would be making a beeline to the phone book to call in a complaint.

Fortunately, picture quality has improved significantly since then, and at an Expo workshop on the subject last month, CableLab's director of advanced television Brian James recounted a few more recent surveys that showed the remarkable perception changes our nation's public has made.

For instance, James said, a 1983 TASO survey revealed that the same designator—"slightly annoying"—characterized a picture with 38 dB C/N; just last year, a study conducted by CableLabs and Jerrold Communications by Bronwen Lindsay-Jones found that participants were even more selective. In that study, a 45 dB signal was dubbed "slightly annoying."

What does this all mean? Primarily, James said, it means that "the viewing public is getting much more discriminating about the quality of their televisions." That's because other, high quality video and audio sources, like laser disc players, are giving viewers a reference for comparison.

In the CableLabs/Jerrold test, impairments including random noise, phase noise, microreflections, composite triple beat and envelope delay were examined.

"The bottom line is, are *you* delivering 'slightly annoying' pictures to your subscribers?" James asked the group. "This is something you may want to take in consideration when you're planning for the new technical standards on picture quality and for your upcoming rebuilds and upgrades."

Continuing the discussion was Rich Annibaldi, product development manager for Pioneer, who explained the impact consumer electronics advances do and will have on cable television engineering. "You guys have to realize what's happening (on the consumer electronics side)—sets are getting bigger and better, and we need to match that with superior picture quality," Annibaldi told attendees.

Along those lines, Annibaldi said, high-end television sets now have over 800 horizontal lines of resolution.

In the workshop, Annibaldi showed attendees a test set-up in which he used two signal sources—a lab-grade NTSC signal and a consumer-grade laser disc signal—between which he could switch back and forth with various still images to illustrate what he called the "threshold of perceptibility under controlled conditions with best case equipment."

"The bottom line is," Annibaldi said before breaking the audience into small groups for hands-on analysis, "modern televisions and equipment provides extremely good pictures. We as an industry need to understand the equipment that's currently available so that we can keep our subscribers happy." CED

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cent braid and is said to work well on varied braid prep lengths. The new connector offers RFI protection of 85 dB to 90 dB (or drop cable equivalent) and its retention force is specified at between 25 pounds and 35 pounds.

Sage Alerting

Sage Alerting Systems and Dynatech Cable Products Group introduced the first integrated audio/video cable television override system for alerting purposes at the Expo. The Sage I/ACM system takes advantage of Sage's wide area alerting system and combines it with the messaging capability of Dynatech's ACM system to provide an all-channel message system that delivers audio and video on all or a selected number of channels with information from emergency actuation centers.

Scientific-Atlanta

Scientific Atlanta showed off its new "Headend Manager" controller that allows remote backup of any channel in a headend or in the distribution plant. A new data communications bus, to be a standard feature of S-A's new digital headend gear as well as its new "Slimline" IRD, will make possible monitoring and control of modulators, signal processors, receivers and descramblers in a headend as well as optical fiber and distribution gear, said Dave Fellows, S-A president, transmission systems division.

S-A also will be showing a new addressable IRD used for programming blackouts as well as the "LE-II," a new line extender capable of automatic gain control and featuring a high-efficiency power supply. S-A officials say the new LE can be cascaded beyond the typical two or three devices.

Also new: a programmable remote control that works with numerous set-top descramblers, Digital Music Express and Digital Cable Radio tuners as well. The $15 remote works with S-A's 8500 and 8600 series terminals and Jerrold's 550, Starcom CS, XT, VI, 7000 and Tocom 5503 and 5507 series set-tops. The new remote also is compatible with Pioneer 6100 series boxes.

Siecor

New from Siecor is a coupler housing designed to protect optical fibers and couplers used in cable applications. The housing is compatible with various fiber architectures, including fiber-to-the-feeder (FTF), backbone, CAN and supertrunks. Compact in design, the aluminum cabinet occupies one rack space in standard 19-inch and 23-inch frames.

StormWatcher Systems

Cable operators who want to offer local subscribers a customized local weather channel can purchase a complete turnkey system from StormWatcher. Based in Buena Vista, Colo., the system offers all required rooftop instruments for collecting and transmitting info to a studio while the unique software generates striking color graphics via computer.

Tektronix

New from Tektronix is its 2714 Cable TV spectrum analyzer, which the company is touting as the "smallest, lightest full-featured cable TV spectrum analyzer in the world." The device addresses all field measurements for the RF domain required by the FCC, Tek officials said. It weighs 22 pounds, can be carried in one hand and is designed for use throughout the system, from headend to hub site to subscriber drop.

Also new from Tek is a handheld optical power meter with ±0.1 dB accuracy, which they say is the highest accuracy of any handheld optical power meter available. The TFC200 Fiberchamp, as it is called, was designed to address the continuing move from coaxial cable and microwave to fiber optics as a medium for signal distribution. It weighs less than one pound and makes optical power and loss measurements in either a logarithmic (dBm) or linear (watts) scale on single-mode or multimode fiber.

Also new are the DS 1450-1 TV demodulator system, designed to be used by cable operators to demod signals for use with baseband video measurement devices, and the TDC-10 tunable downconverter that provides selectable RF-to-IF frequency conversion to lower CTB and phase noise.

Trilogy Communications

Trilogy Communications Inc. and Sumitomo Electric Fiber Optics Corp. have signed a marketing agreement allowing Trilogy to sell Sumitomo optical fiber products and equipment. Under terms of the non-exclusive agreement, Trilogy officials will work with Sumitomo in design work and price quotations whenever fiber-to-feeder projects are involved.

Sumitomo believes that Trilogy's air dielectric cable offers cable operators the least loss over coaxial cable, providing the best signal level to the end of the network.

Also, Trilogy named James Oldham sales vice president. Oldham comes to Trilogy from Comm/Scope and Times Fiber, where he held various sales management positions.

Wavetek Communications

In a pact with possibly far-reaching implications, AM Communications and Wavetek Communications Division have agreed to explore joint business opportunities in the automated network testing area.

Initially, the two firms will investigate the market for automated testing systems specifically addressing the Federal Communications Commission's new technical standards. Since AM already supplies status monitoring systems for Jerrold, Texscan, Augat and Raynet (and is in discussions with C-COR Electronics), it's conceivable that a common network management platform could ultimately evolve, combining telemetry and control functions.

Separately, for example, Scientific-Atlanta has developed a communications bus allowing remote monitoring and control of headend or plant equipment. The pact further confirms a blurring of the lines between instrumentation and network monitoring, exemplified perhaps most clearly by the Philips Broadband Networks "MLM" system, which combines signal analysis and traditional status monitoring functions in one control system.

A second strategic partnership with Cable Leakage Technologies will result in a leakage measuring system using global positioning satellite technology. The "Wavetracker" system combines Wavetek's CLM 1000 leakage monitor with a GPS receiver that automatically monitors vehicle position and polls the CLM 1000 for leakage readings.

According to Wavetek product marketing specialist Steve Windle, 60 miles worth of plant can be monitored by a single vehicle in one day. **CED**

By Roger Brown, Leslie Ellis and Gary Kim

Outages: Two strikes, and you're outta there

At least in baseball, players get *three* strikes before they're out. Not so in cable TV. According to a Viacom customer service survey, subscribers are twice as likely to downgrade if outages occur more than two times in a three-month span. In an Expo technical workshop on outages, CableLabs director of technical operations projects Scott Bachman revealed this and other outage-related statistics in a presentation that detailed the workings of his company's outage task force.

One of the goals of the outage task force, Bachman said, was to determine the affect of cable outages on customers—and some of the early findings still have cable execs reeling. In the September 1991 edition of *Consumers Report,* for example, 25 percent of the persons polled claimed dissatisfaction with their cable service; 60 percent had suffered outages which typically occurred four or more times per year and lasted less than half a day.

Similarly, a recent Jones Intercable poll revealed that 55 percent of its customers saw outages as their number-one concern. "So obviously, there is a strong linking between outages and overall service," Bachman said.

But there's more. Apparently, duration of outages is a fairly big issue, too. Viacom's study also revealed that 35 percent of the subscribers polled were "mildly to very upset" with an outage as brief as one minute. Fifty-nine percent didn't take a 10-minute outage very kindly, and an outage of one hour sent 79 percent away grumbling.

"Those statistics suggest that if today's restorations take 45 minutes to an hour to complete, the damage has already been done," Bachman told the audience. "You can't just go out there and pull out an amplifier—the impact is on overall service."

To that end, Bachman explained that the CableLabs task force is now looking at methods of outage detection that will bring 24-hour per day, seven day per week functionality to cable systems. Outage tracking, he said, is also a critical issue, as is system reliability modeling.

One initial conclusion of the outage task force relates to reliability monitoring. Systems with cascades of 25 amplifiers or more will likely exceed two outages in three months, Bachman explained.

However, there comes a point when further reduction of cascades won't provide much benefit. Bachman said the point of reduced effectiveness is reached at about 12 amps in cascade.

Also, Bachman said the task force has determined that power supplies should not exceed seven in cascade.

Lastly, Bachman said the group is investigating the protection of outside plant and headends, specifically looking at voltage clamping and crowbar circuits and ensuring that surge and transient protection devices withstand the ANSI/IEEE test of 6 KV/3KA. "This way, operators can go to (power supply manufacturers) and say, 'I want to know how you did on the test.' "

Continuing the discussion on outages and reliability monitoring was Robert Moel, VP of engineering for Viacom Cable, who noted that reliability is becoming as important a factor as carrier-to-noise, because "you want to use it as a design tool before you go out and build that plant."

Why is reliability modeling so important? Because, as Moel explained to the workshop attendees, cable is an industry that is rapidly moving toward serving other, more commercialized clients. "Yes, we serve mostly residential customers now," Moel said. "But I think the time will come when we'll have more commercial subscribers—and they'll have much higher demands on the reliability of our plant."

Because cable system reliability is related to all of its disparate parts, Moel suggested adding up all the failure for all the components within a system to come up with an overall number for system reliability.

"The first question is, what do I want to track? Then, I have to pick the worst-case time for outages and consider an interval in which I want to collect data," Moel said of the data collection process. "Then, just start counting failures and categorizing them."

After that, Moel suggested calculating the mean time between failures (MTBF, which is typically represented by the μ symbol). "Correctly estimating the reliability performance of your plant can be done easily on a PC, and it permits us to remain competitive," Moel said in closing. CED

Hranac named SCTE chairman; Wolfe is member of year

Ron Hranac, vice president of engineering for Coaxial Analysts, was appointed SCTE Chairman of the Board, confirming widely circulated speculation. The election of officers came during the Society of Cable Television Engineers' board of directors meeting held just prior to last month's Engineering Conference and Cable-Tec Expo.

Hranac, who defeated Region 8 Director Jack Trower for the post, will serve just a single term before he is forced to leave the board in accordance with SCTE bylaws. Hranac and Trower are both former Society presidents; Hranac was president of the SCTE in 1988-89 and was followed into that office by Trower a year later.

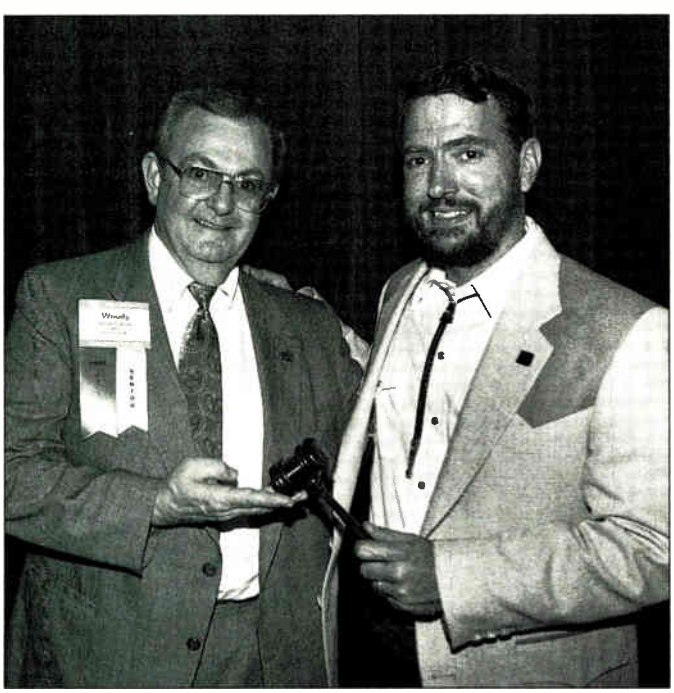
Hranac's new title reflects a bylaw change that elevates the position of SCTE president to chairman of the board and Executive Vice President William Riker to the position of president. The new structure also resulted in vice chairman titles for the eastern and western vice presidents.

In addition to Hranac, the board elected the following officers: Michael Smith of Adelphia Communications was named eastern vice chairman; Tom Elliot, Tele-Communications Inc., western vice chairman; Rich Henkemeyer, Paragon Cable, secretary; and Mark Wilson, Multimedia, treasurer. Walt Ciciora of American Television and Communications was named additional board member on the Executive Committee.

Hranac was presented with the chairman's gavel by outgoing president Wendell Woody during the annual awards luncheon. Woody, who has tirelessly led the Society through two years of sweeping changes, can now settle into his role as director of fiber optics for Anixter Cable TV.

During the awards luncheon, incoming SCTE chairman Hranac briefly outlined a new "mission statement" adopted by the Society as it prepares for the future. Attendees at this year's Engineering Conference were exposed to the familiar SCTE logo accompanied by the words "Training, Standards and Certification." Hranac said this was the result of a recent meeting in which the board of directors identified 36 goals and objectives for the next several years.

It seems that for the first time in its history, SCTE executives are weighing an ambitious long-term strategy that envisions possible ownership of its own training center and potential increases in membership from the current level. Among the near-term objectives is possible revamping of BCT/E course material to reflect changing industry technology. SCTE officials also are weighing possible creation of new certification categories that wouldn't require completion of the full battery of courses and examinations now required for technician or engineer recognition, say SCTE officials.



Outgoing SCTE President Wendell Woody, left, passes the gavel to Ron Hranac, incoming chairman of the board.

Ron Wolfe, manager of ATC's National Training Center, was given the coveted SCTE Member of the Year award in recognition of his training efforts.

As such, the Society will focus its efforts on training its members to understand new, emerging technologies, certify them as competent engineers and technicians, and develop standards for the next generation of technical personnel. Hranac added that the Society plans to continue its exponential growth, and will seek to sign up more of the industry's estimated 40,000 technical employees as members.

Also during the awards luncheon, Riker announced that the Society has officially exceeded the 10,000-member milestone. A series of new memberships spurred by the Expo took the total to 10,023 members as of June 13, Riker announced. The membership is served by 59 chapters and 14 meeting groups now that the Magnolia Meeting Group of Brandon, Miss. has been elevated to chapter status.

Wolfe named Member of Year

In recognition of his efforts in training cable television technical personnel, Ron Wolfe, manager of American Television and Communications' national training center, was selected as the SCTE's 1992 member of the year during the annual awards luncheon.

Wolfe, who has held a variety of posts at both the system and corporate level, came to ATC in 1987. Since that time, he overhauled the curriculum, which led to a quadrupling of enrollments at the training center.

Also, ATC corporate executives

were selected by outgoing SCTE President Wendell Woody to receive the prestigious President's Award. Woody, who noted that a cable operating company had never received the award before, said ATC "earned" the award for its technological leadership, throughout Europe.

In addition, Rex Porter, Jim Stilwell and Dave Willis were inducted into the SCTE Hall of Fame for their efforts on behalf of the cable industry. Also, Jack Gobbo of United Artists Cable of Santa Cruz, Calif.

American Television and Communications was presented with the 1992 SCTE President's Award. Accepting the honor are, from left, Ron Wolfe, Jim Chiddix and Jay Vaughan.

its commitment to training and wide representation within SCTE chapters and meeting groups.

Elliot leads list

Tom Elliot, vice president of technology for Tele-Communications Inc., led a list of special award recipients honored during the annual awards luncheon.

Elliot received the Special Recognition Award, given by the staff of SCTE, for his efforts in organizing and leading the interface practices subcommittee. This subcommittee was the first to work on standards development and just recently settled on the specifications for the female F-port. Those specs have been approved by SCTE and are presently under review by CENELEC for use

SCTE executives are weighing an ambitious long-term strategy.

received took first-place honors in the Field Operations Award competition for his aluminum "jack knife" idea that doesn't scratch the cable center conductor. Gobbo was given $1,000 in cash for his idea, which cost "about a buck." Fred Hall of Cablevision of Hauppauge, N.Y. and William Gorecki of MetroVision of Detroit won second- and third-place, respectively.

Personal Achievement Awards were given to Pierre Cubbage of MegaHertz Sales, James Fronk of Multimedia, Don Gall of ATC, Mark Graalman of Buckeye Cablevision and Mark Wuller of Continental Cablevision. Finally, 22 SCTE members were elevated to senior-member status. CED

Compiled by Roger Brown

Continued from page 39

IBM apparently sees revenue potential not just in selling hardware and operating networks, but in partnering in the creation and selling of services. But, observed the widely read columnist Michael Schrage in the *San Jose Mercury News* recently in a pseudo-memo to IBM Chairman John Akers: "The issue isn't that technology creates convergence; it's where does IBM want to position itself as technologies come together? You don't buy convergence, John, you grow it."

Schrage recalled IBM's costly failures at trying to buy into telephony (Rolm) and consumer videodisks (DiscoVision). And besides, he asked, "Why get cozy with a cable TV outfit when you know that the Baby Bells will soon be able to provide video on demand in competition with cable operators?"

Schrage's advice was to make money selling digital signal processor chips and promote an open "video operating system" cheap enough for everyone.

"IBM's challenge isn't buying up . . . exclusive access to the top 20 cable systems; it's crafting the architectures that make multimedia convergence possible. To be sure, that's what Apple is trying to do."

IBM officials counter that Schrage rather misconstrued their strategy and that the company's focus is *not* on acquiring content but on a broader cross-industry collaboration to make digital interactive television a reality.

Apple, in the opinion of consultant Edens, views multimedia as its "next-step differentiator," having given up its monopoly on the graphical user interface with the emergence of Windows. The way to do that is with enhanced sound and video capabilities.

"I'd predict that within two years the basic off-the-shelf Mac will be able to take TV in and put TV out, as well as computer video, which is quite different. It could even have the CCD camera or Handycam built right into the computer." Video mail, anyone?

Edens says that current MPEG1-quality digital video would be dismissed by the average viewer as "a broken television." To Liebhold, however, digital video is "low definition television," which, he says, "we believe could have as equally important an impact as high-definition television."

In Tokyo last year, Sculley outlined his vision of what he called "P3TV," a third generation of television that is "scalable, interactive and personalized." For scalability, Apple says it's creating downsized versions of its operating systems to go into consumer-targeted products and personal digital assistants.

Liebhold described four places in the home where Apple sees computer power at work: a home entertainment center, centers for work-at-home and home study, and "an alcove in the kitchen" where bills get paid and electronic Yellow Pages are consulted. Liebhold said Apple is interested in bringing functionality to all these venues, adding: "Whether one of those (devices) is a set-top box is a good question."

Apple sees an architecture where "the operating environment is decoupled from the transport channel," said Liebhold, so that content can flow over cable, ISDN, wireless, or whatever.

"We're also doing experiments in scalable image formats so that you can extract lower-resolution images from high-resolution images depending on the channel capacity or the computational power you have."

What is the timetable? VLSI integration takes time, so Liebhold sees a prototyping phase beginning now, followed by implementation in 1995-1996. Others believe that Apple could move faster than that. Full-time Apple-watchers (a major industry) praise Sculley's vision, but describe a company that's often pulled in many directions by competing projects (insiders joke of Apple's "strategy du jour").

Microsoft woos developers

By contrast, unity of vision, albeit with fits and starts, characterizes Microsoft under benevolent monarch Gates.

Microsoft, too, is focusing on scalability. Within its Multimedia and Consumer Systems Group, under Rob Glaser, a team is working closely with cable engineers and others to create interoperable subsets of Windows for consumer devices, known in Microsoft-speak as "digital appliances."

The functionality of the Multimedia Extensions to Windows 3.0 was largely collapsed into current mega-seller Windows 3.1. At a conference for developers in March, Gates touted the company's Multimedia Developers' Kit and its Media Control Interface, which supports diverse input sourcing. He noted that Microsoft also has its own still-unnamed software-only motion video technology—a QuickTime equivalent. He also painted a beguiling vision of a new operating environment, Windows New Technology.

Gates seemed to be veritably *begging* software developers to produce multimedia programming for Windows. At the same time, though, insiders say that Microsoft, true to its pattern with MS-DOS and Windows of selling its own application software as well as operating systems, will spend many millions of dollars developing multimedia applications.

Providing a hint of Gates's in-home pyrotechnics to come, the young billionaire has been buying up reproduction rights to the artwork housed in major museums through a new company, Interactive Home Systems Inc. First expected display venue: Gates's own squillion-dollar home now under construction.

Exploring the TV and cable realm, Microsoft planners and engineers are struck by the virtual absence of standards in such areas as infrared remotes and analog data transmission, said one Microsoft planner who asked not to be named. Microsoft's people working on developing the multimedia environment are vehement in their advocacy of open, developer-friendly standards.

"Digital video will succeed in the way the PC industry has succeeded only if thousands of individuals can develop content for it—if they can pick up a camera and shoot a documentary or a movie," the planner noted.

Conclusion

In this article, some light has been shed on a likely emerging market for in-home, multimedia services delivered by cable and telcos. For years now, futurists and technologists have nurtured the vision of "tele-everything." For the most part, companies have lost millions pursuing that vision too avidly or too fast.

Akira Amano, whose Tokyo-based *New Media* magazine dances on Asia's video leading edge, urges people to look to Singapore to see the world's multimedia future.

There, he argued, companies like NEC, Fujitsu and IBM are creating a does-it-all digital multimedia telecomputing infrastructure in a way that Japanese ministries, jealous of their competing fiefdoms, wouldn't permit in Japan.

Maybe. Or maybe the unifying vision is elsewhere, in some boardroom or laboratory. Or in next week's trade publication, or at the next industry conclave. We wait . . . for more pieces of the puzzle. **CED**

Robert Wells of the Lennox Group, Boulder, Colo., writes trade press articles and market research studies about emerging telecommunications markets.

Fiber to the serving area: Upgrades to 550 MHz and beyond

During 1989 and 1990, major cable operators began utilizing fiber-based distribution architectures. Fiber optics, a key part of a system upgrade strategy, was used to reduce trunk cascades, thereby improving end-of-line specs and overall system reliability.

During the upgrade evaluation and planning process, many operators found a majority of their current distribution plant was stretched: 270 MHz spacing operating at 300 MHz.

The existing coaxial cable was in good shape and was capable of passing RF up through 550 MHz.

However, to maintain existing trunk station locations at 550 MHz would require a 32 dB to 33 dB gain feedforward trunk amplifier, which was not available at the time. In fact, one does not exist today that still provides full auto control range.

Rather than undertake a costly and disruptive trunk rebuild or respacing program, the operator elected to perform a 450 MHz drop-in upgrade utilizing 29-dB feedforward trunk stations. At the same time, the feeder plant was upgraded to 550 MHz by adding and respacing line extenders where necessary.

With the continued development of fiber optics to the cable TV industry, new architectures appeared on the horizon. Some systems decided to "wait and see" if the new fiber-to-the-feeder (FTF) approach might economically get them to 550 MHz.

Fiber-to-the-feeder was introduced as an architecture which eliminated trunk/bridger amplifiers while increasing the extent and cost-effective use of fiber.

By Gregory Hardy, Marketing Manager, Distribution Products, Scientific-Atlanta

Fiber to the serving area

Scientific-Atlanta took the concept one step further by considering FTF in the broader context of fiber-to-the-serving-area. FSA begins with a service area of 2,000 to 2,500 homes and works back toward the headend, using a variety of fiber techniques to most effectively accomplish the system's service goals.

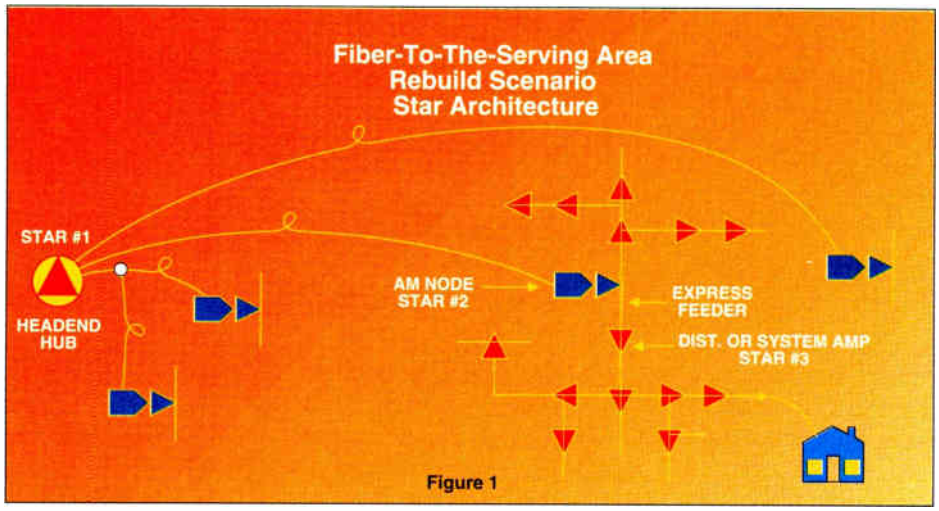


Figure 1

The FSA architecture brings many benefits to CATV operators. By dividing the system into distinct service areas with short amplifier cascades extending from a central AM fiber node, improved end-of-line specs, higher system reliability, and bandwidth expansion to 550 MHz and beyond are now possible. In addition, the FSA footprint allows the cable operator to position for future service and revenue opportunities.

Early in its development, FSA only offered a star architecture option (see Figure 1) which was economically and logistically appealing for a complete system rebuild. But in order to reduce capital outlays, many cable operators wanted to use as much of their existing cable plant as possible. The challenge was to develop an economic approach to upgrades that still provided all the benefits of FSA.

FSA-Variable FITT

To meet this challenge, the variable FITT (Forward Intermediate/Terminating Trunk) architecture was developed. FSA-FITT (see Figure 2) combines the economic value of an upgrade with the subscriber service benefits of a rebuild. The Variable FITT architecture is a version of the fiber overlay approach, similar to fiber backbone. Feeder connections at trunk/bridger locations are maintained by converting existing trunk stations to FITT stations with dual output PHD bridgers. Forward trunk amplification is separated from the bridger function and is now provided by two-port distribution amplifiers or system amplifiers located between the FITT/bridger stations. The FITT module's variable plug-in passive (splitter or directional coupler) controls the bridger input level to adjust for the station's location/spacing relative to the forward distribution or system amplifier.

The architecture also provides an economic upgrade path to 550 MHz. Conversion to 550 MHz is now possible with the existing cable plant configuration no longer a limitation to the upgrade strategy.

Process of conversion

The conversion of a conventional tree-and-branch architecture to FSA-FITT maximizes plant construction efficiency, while minimizing subscriber system outages and downtime. As with all FSA architectures, the system design and construction process begins at the far-

thest section of the cascade or any captive area. The AM fiber node is spliced in between two existing bridger locations at the center of the selected cascade segment. The design size of the serving area and the desired number of amplifiers in cascade determine the final node placement point. A general design guideline calls a maximum of eight amplifiers in cascade from any fiber node (four on the trunk, one bridger and up to three line extenders).

The variable FITT and dual output bridger amplifiers replace the existing trunk and bridger station modules. To achieve the desired direction and level of signal flow in the variable FITT module, the engineer installs the appropriate plug-in passives and sets the directional RF jumpers. Two-port system amplifiers or distribution amplifiers are spliced into the existing trunk cable and spaced for the desired forward bandwidth of 550 MHz.

The above activities are completed during one late evening period, allowing the system to be on-line again in the morning. The feeder plant is upgraded during the daytime when outages are minimized to very small pockets of subscribers. On a neighborhood basis, each bridger leg is converted to the higher bandwidth capability; sometimes line extenders are relocated or added to the cascade.

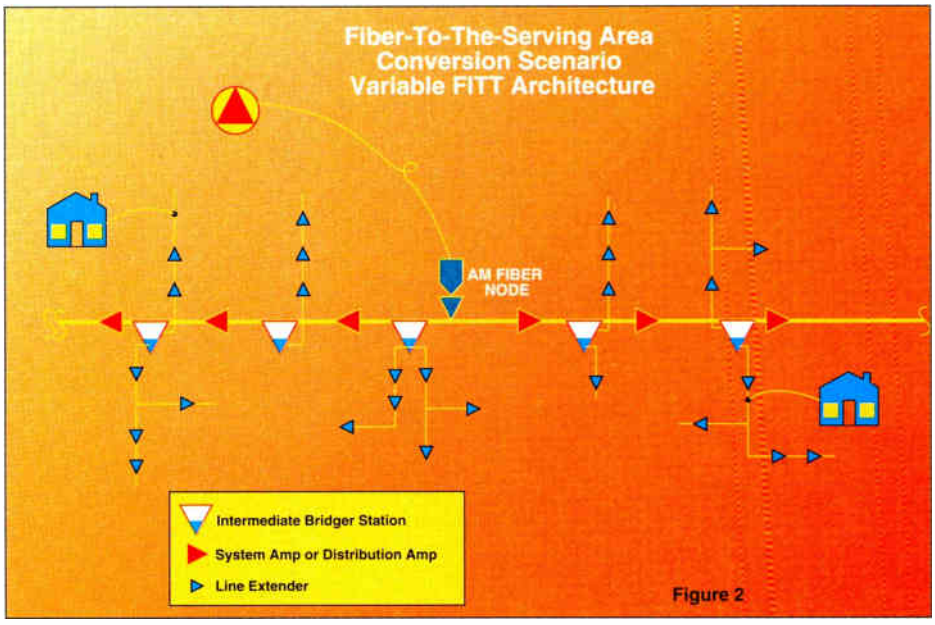


Figure 2

New product requirements

Several new products are required to support the fiber-to-the-serving area variable FITT architecture:

- Variable FITT Module. Fits in the trunk module location of the trunk station. It uses a plug-in passive to divide the RF signal between the through trunk leg and the input to the bridger. The variable FITT also provides RF signal directors to control signal flow from either direction.
- PHD Dual Output Bridger. Fits into the bridger location of the trunk station. The dual bridger contains two output hybrids to provide higher output to the feeder network and support for extended bandwidth.
- Distribution amplifier/system amplifier. Used to provide forward (trunk) RF signal amplification and auto control. These products provide alternatives in RF hybrid technology and allow for increased serviceability and upgradability.

Benefits

With variable FITT, thousands of dollars in labor and materials are saved per mile over a trunk rebuild

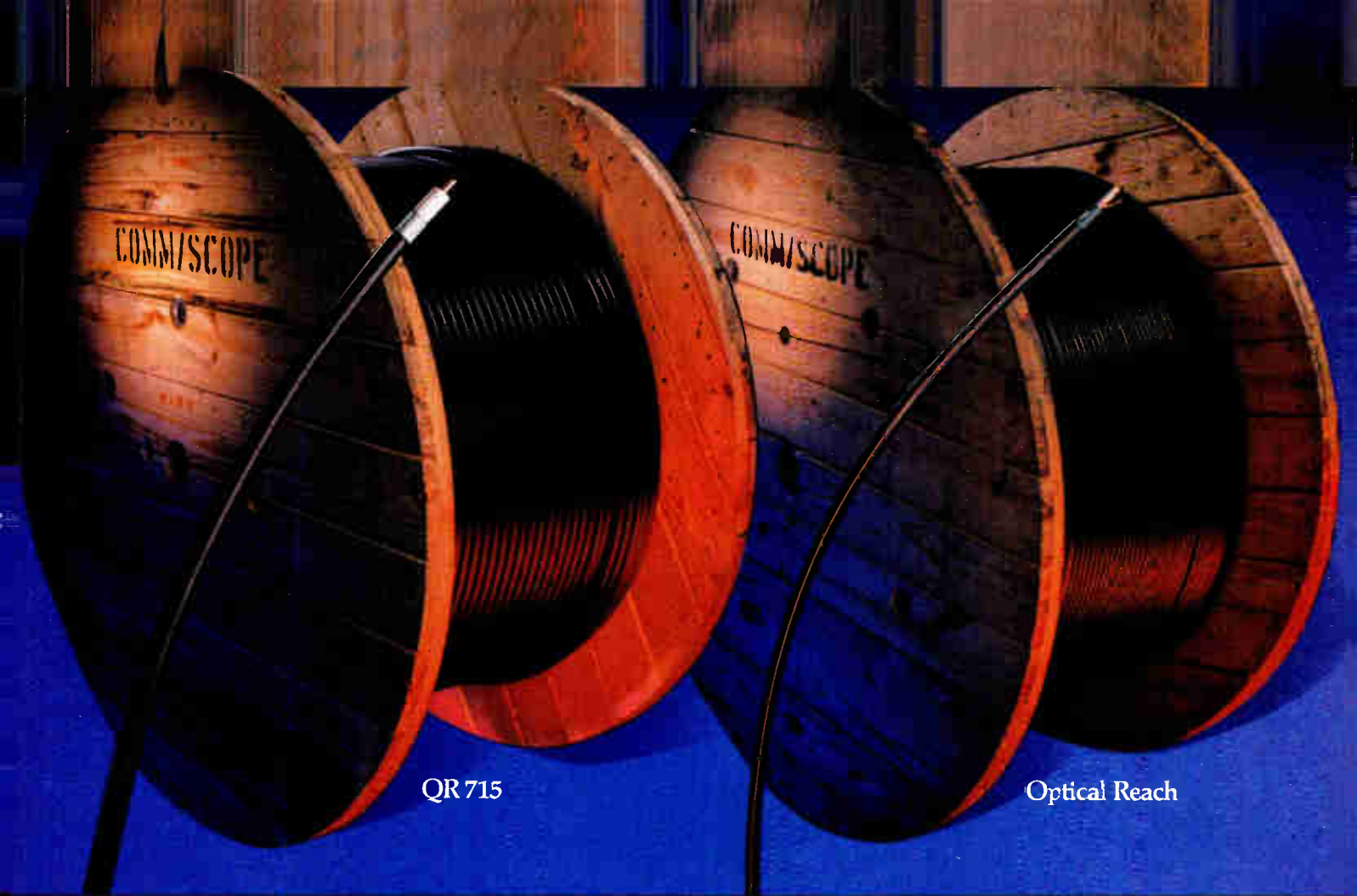
Economy. The most significant benefit of the FSA-variable FITT to the cable operator is the reduced capital requirements for a system conversion compared to a rebuild. In a stretched 270/300 MHz existing trunk spacing, an operator may need to either rebuild the trunk or complete a major trunk/bridger relocation in order to achieve 550 MHz capability.

With variable FITT, potentially thousands of dollars in labor and materials are potentially saved per mile over a trunk rebuild because bridger/feeder interconnects remained in their existing locations. Compared to a trunk/bridger relocation, variable FITT requires less new cable and fewer connectors, and eliminates the need for jumpers and splice bars. This material savings may provide the construction manager an attractive economic alternative.

High performance. The FSA-variable FITT architecture typically calls for an eight-amplifier cascade. When combined with fiber optics, typical end-of-line performance includes 49 dB carrier-to-noise and -53 dB CSO and CTB. With these specifications, the operator can easily provide HDTV and other future services.

Improved reliability. A shift to the FSA-variable FITT architecture will allow the system to recognize significant benefits in CATV distribution plant reliability with FSA-FITT. Shorter RF amplifier cascades promise to significantly reduce the extent of an outage should an equipment failure occur. In addition, the implementation of simpler, less expensive distribution and system amplifiers means a more reliable trunking network. Finally, the through-trunk leg of the variable-FITT is passive, ensuring that an RF hybrid failure in the station will not cause a downstream system outage.

Subscriber service. Another important benefit of the FSA-variable FITT architecture is the short subscriber service outage period during the upgrade. By dividing the conversion process into two distinct phases, the cable operator completes the trunk portion during the evening and pocket feeder upgrades during the day. Because bridger/feeder interconnects are not disturbed during the conversion, total subscriber outages are significantly less than that of other upgrade scenarios that involve respac-



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ing trunk stations and adding more cable.

Simplified construction and maintenance. The deployment of FSA-variable FITT architecture allows construction managers to gain significant savings through efficient construction and coordination efforts. The variable FITT/dual bridger station fits neatly in place of the existing trunk/bridger. No jumpers, splice bars, external splitters or directional couplers are required, so unwanted signal suckouts are avoided.

With the new architecture, the construction activities are segregated into day and evening activities. This two-phase approach, with FITT stations and distribution/system amps in the evening and line extenders during the day, simplifies the coordination efforts and reduces system downtime.

The variable FITT module uses RF jumpers to control signal flow direction through the station. This additional feature eliminates the need to resplice and turn around stations in the future because of increased fiber deployment.

Finally, the FSA-variable FITT architecture design uses constant mid-40s RF output levels throughout the CATV plant.

Expanded bandwidth planning. Through the implementation of the new architecture, cable operators may easily complete a bandwidth jump from 270/300 MHz to 550 MHz without rebuilding the trunk network. Because the trunk and bridger functions are now segregated, an operator may select to space the forward distribution or system amplifiers at 650/750 MHz for very little incremental expense. There will still be a need to deploy additional line extenders at 750 MHz spacing, however, a normal 270/300 MHz to 550 MHz upgrade already requires significant line extender rearrangement.

> PCS, alternate access and switched video are all compatible with the architecture.

Future services. The variable FITT architecture allows the cable operator to divide his franchise area into pockets of subscribers, each served by an AM fiber node. This footprint and its extended bandwidth capability position the cable system to provide not only HDTV and increased entertainment programming, but personal communication services (PCS), alternate access and switched video services are all compatible with the FSA-variable FITT architecture.

Summary

FSA-variable FITT provides the cable operator with the economic value of an upgrade with the subscriber service benefits of a 550 MHz rebuild. The architecture allows the local system to meet its objectives of expanded bandwidth, higher network reliability, and enhanced end-of-line picture quality, while saving the existing coax and the labor to install it. CED

"Standby Power Reliability is a Team Effort."

Bob Gruenstern, Engineering Manager for Johnson Controls

Sunny McCormick, Director of Engineering for Alpha Technologies

Bob Gruenstern, Engineering Manager at Johnson Controls Specialty Battery Division, makers of the Dynasty gel batteries.
"Cable is one of the toughest battery applications there is. The environmental conditions, lengthy stand times, and the maintenance challenge — these make cable a tough place for batteries"

Sunny McCormick, Director of Engineering for Alpha Technologies:
"Which is why we have selected the Dynasty gel battery for our cable powering designs for years. The maintenance-free gelled electrolyte design and the exceptional service life have made it the industry's clear choice."

Gruenstern:
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McCormick:
"It's more than technology, though. We specify that Dynasty gel batteries are delivered to our customers directly from fresh production stock. This again increases service life: you don't receive a battery that's been sitting in a warehouse for months or longer."

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EQUIPMENT REPAIR

IN THE NEWS

Continued from page 65

U.K. marketing strategists **Barclay Dutson Associates**, cable TV law experts **Mintz, Levin, Cohn, Ferris, Glovsky and Popeo, P.C.** and **Survey Research Singapore.**

Professor **Eddie Kuo**, head of the National University of Singapore Mass Communication Department will also assist the study team.

SBC and Singapore Telecom have initiated the joint study as multichannel cable TV has grown in popularity worldwide and is expected to have significant impact on the future development of broadcasting and telecommunications in Singapore, officials said.

Thomson selects encoding system

Thomson Consumer Electronics has selected **Compression Labs Inc.** to develop and manufacture a compressed digital video encoding system for the **Hughes Communications** high-powered U.S. direct broadcast satellite system.

The agreement with Thomson calls for up to $5 million in development funding and encoding systems purchases through 1993, CLI officials say.

The high-powered DBS satellite will be built by Hughes and will carry programming channels offered by both Hughes' DirecTV service and Hubbard Broadcasting's U.S. satellite Broadcasting subsidiary.

The encoding system includes computer algorithms designed by **Sarnoff Research Center** and developed by Thomson, and will be based on the Motion Pictures Experts Group (MPEG) standard. MPEG is a standard of the International Standards Organization and is based on discrete cosine transform technology.

Rep agreements

AM Communications has announced its appointment of two new sales representative companies. In the states of Colo., Kan., Neb., N.M., Utah and Wyo., AM will be represented by **Mega Hertz Sales**, based out of Englewood, Colo.

In the states of Ala., Fla., Ga., Miss., N.C., S.C., Tenn., and the Carribbean, AM will be represented by **John Weeks Enterprises.**

The two companies will represent AM's family of cable system performance monitors for automated FCC proof testing, as well as the company's addressable taps for remote subscriber signal control. For more information, call AM officials at (800) 248-9004.

Trilogy, Sumitomo ink deal

Trilogy Communications Inc. will represent **Sumitomo Electric Fiber Optics Corp.**'s fiber products and related equipment, the two companies said recently. Also, Trilogy's staff will assist in design and quotations whenever fiber-to-feeder projects are desired. CED

Compiled by Leslie Ellis

NTC-7

In "My View", CED, June, 1992, I suggested that television broadcast quality is defined more by voluntary industry standards than by the tenuous provisions of Part 73 of the FCC Rules and Regulations. Report No. 7 of the Network Transmission Committee, better known as NTC-7, is one of those.

Many old-time broadcast station operators recall experiencing noisy or distorted audio on radio network feeds in the 1930s and 1940s; and snowy, streaked, or smeared pictures on video feeds in the 1950s and 1960s.

Calling the Bell System toll desk to report the problem was likely to evoke the remark that: "it left here OK; must be west of Chicago!" The fault was always somewhere else.

The network transmission committee

By early 1970s, it became apparent that finger-pointing was not getting anywhere. Moreover, picture faults needed to be defined in terms that could be measured objectively.

To this end, engineers from ABC, CBS, NBC, the Public Broadcasting Service, and AT&T formed the Network Transmission Committee (NTC). Its Engineering Report, dated June 1975, Revised January 1976,

"...constitutes an understanding between technical representatives of the major television networks and the Bell System, acting through the Network Transmission Committee, *on technical performance objectives for video facilities leased by the major television networks from the Bell System.* The report defines the transmission parameters, test signals, measuring methods, and performance objectives that should be used when checking the performance of these facilities." [Emphasis added]

The NTC-7 Engineering Report is reproduced in its entirety in *NCTA Recommended Practices for Measurements on Cable TV Systems*. It covers 18 kinds of noise and waveform distortion, including:

- field-time, line-time, and short-time waveform distortion
- chrominance non-linear gain and phase distortion
- dynamic gain distortions
- differential phase and gain
- chrominance-to-luminance intermodulation
- random, impulsive, periodic, and crosstalk noise

By Archer S. Taylor, Senior Vice President, Engineering, Malarkey-Taylor Associates, Inc.

> A modern, well-maintained cable TV headend should be able to boast of "broadcast quality."

Definitions in NTC-7 are unambiguous, and measurements are strictly objective. It does not pretend to be a textbook on the causes and cures for these signal defects. You will find that sort of information elsewhere, as in the *NAB Handbook*, Blair Benson's *Television Engineering Handbook*, and scores of papers published in IEEE and SMPTE journals.

It is important for cable operators and regulators alike to recognize and understand that the NTC-7 Report was designed solely to enable the network affiliate engineer to describe, accurately and precisely, any faults observed in the video signal transmitted by the Bell System (now AT&T).

NTC-7 performance objectives

NTC-7 is not designed, nor was it intended to define subjective "picture quality". Rather it describes how closely the network and Bell System engineers believe they can realistically expect to come, under actual operating conditions, to perfect reproduction of the ideal television signal waveforms.

No attention whatsoever is paid in NTC-7 to the subjective impact on viewers of deviations from the ideal TV waveform.

Of course, the engineers were well aware that their ultimate goal is delivering to viewers satisfactory quality broadcast picture signals.

But they also know that network transmission has to be near perfect in order to allow for cumulative degradation in the broadcast transmission facilities, the propagation path, the TV receiver and its antenna, and possibly even in the cable TV network.

NTC-7 performance objectives cannot properly or fairly be used to judge the overall performance of a cable TV network; nor, for that matter, of a TV broadcast signal received over the air on a conventional TV set. Actually, NTC-7 applies only to baseband video signals.

To test accurately the performance of video modulated RF or IF carriers requires the use of an appropriate demodulator, which should have several times better performance than the system under test. That could mean a quality, Rohde and Schwartz, Tektronix or Hewlett Packard precision instrument.

Modern modulators capable

However, I have found that modern cable TV modulators are capable of compliance with NTC-7 performance objectives, or nearly so, even when using a CATV quality test demodulator.

Thus, if the signals received by satellite are themselves of NTC-7 quality, or better, a modern well maintained cable TV headend should be able to boast of "broadcast quality" at least at the headend.

Neither television broadcasters nor cable TV operators are yet able to deliver NTC-7 baseband signal quality to the public.

HDTV will soon be able to deliver, over the air, by cable TV and VTR, even better quality TV pictures than could be displayed on an NTSC video monitor using NTC-7 quality signals.

Nevertheless, the notion that NTC-7 performance objectives might appropriately be applied at the cable TV subscriber terminal must be quickly and decisively torpedoed. CED

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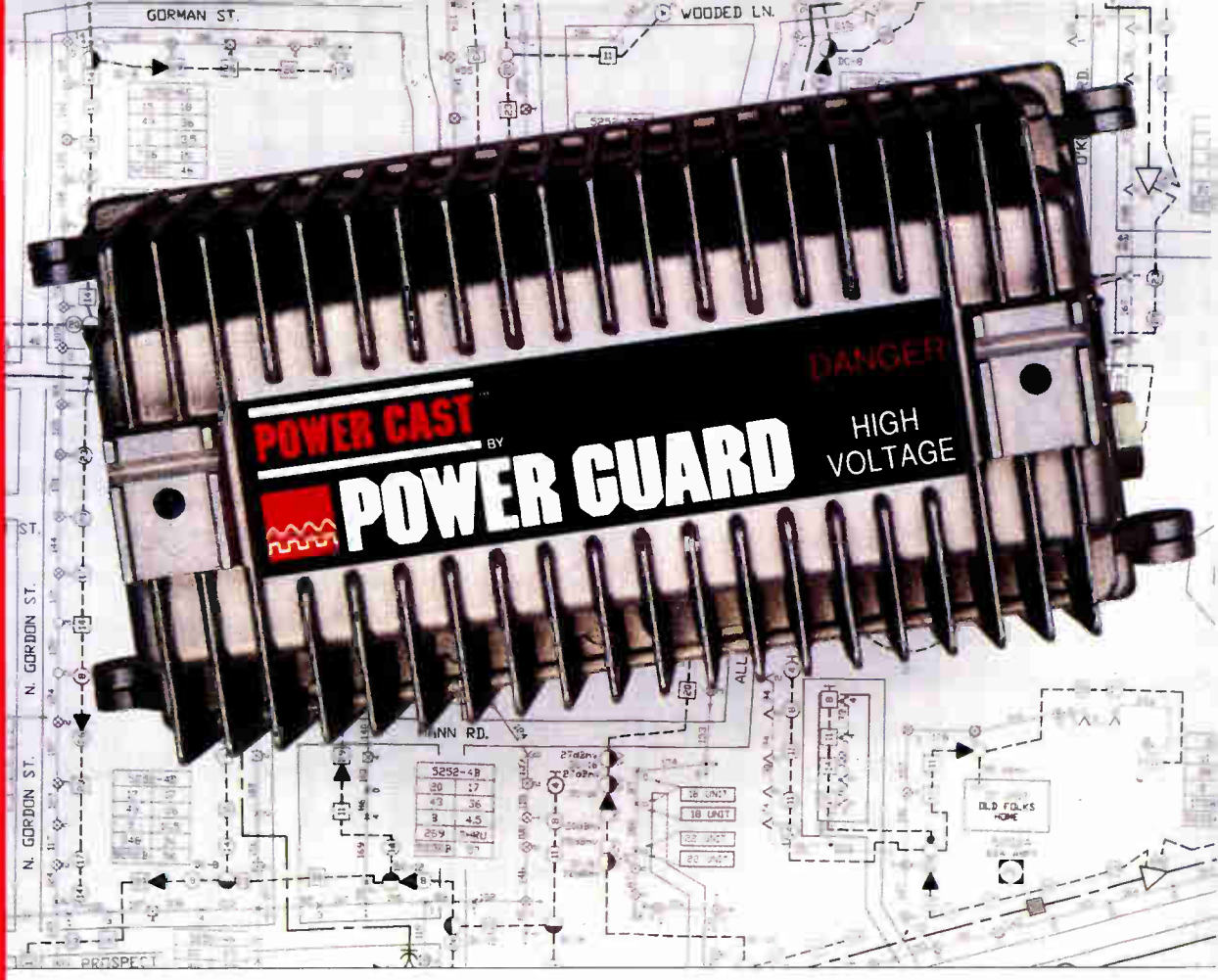

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