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CED

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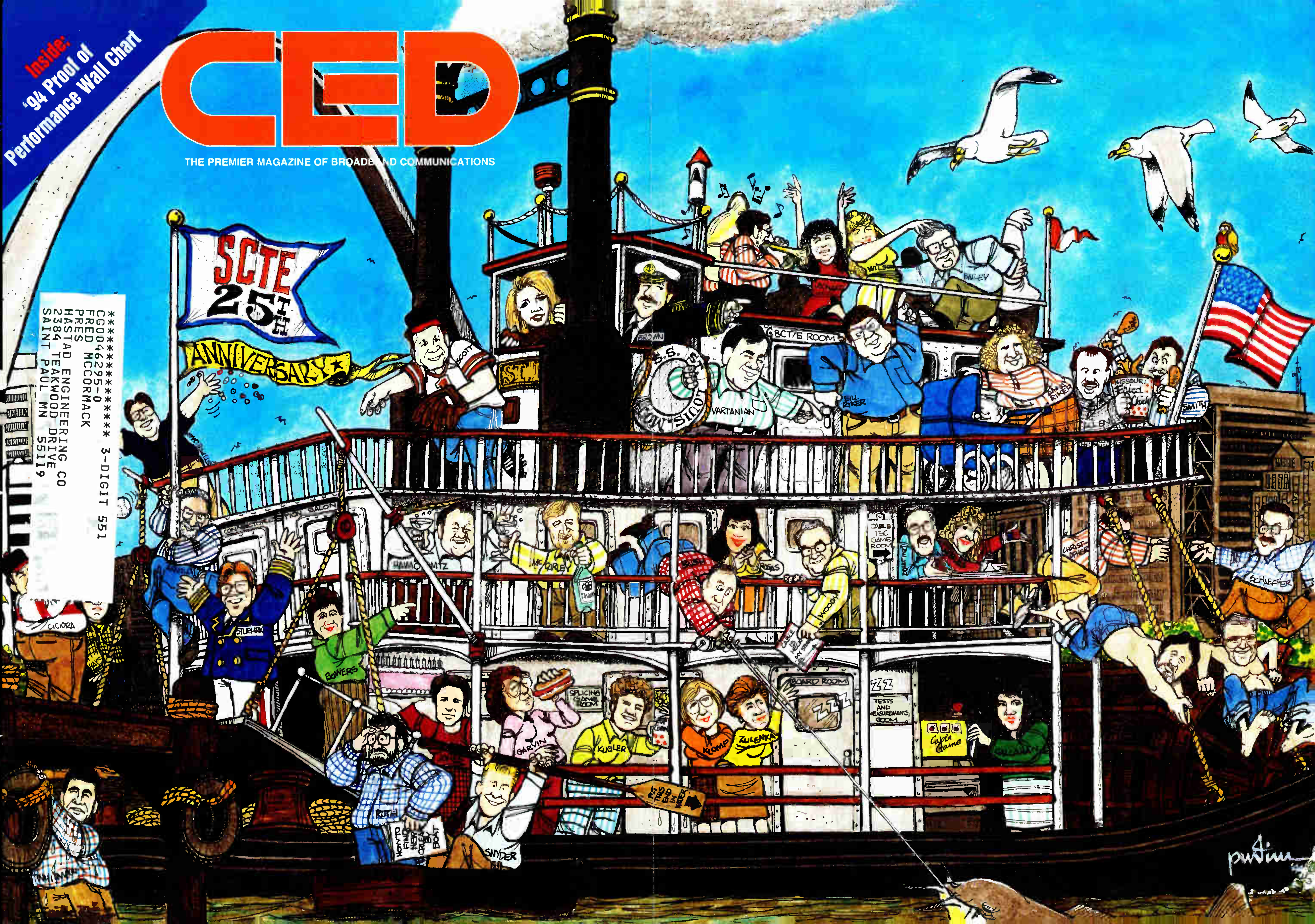
Inside: '94 Proof of Performance Wall Chart



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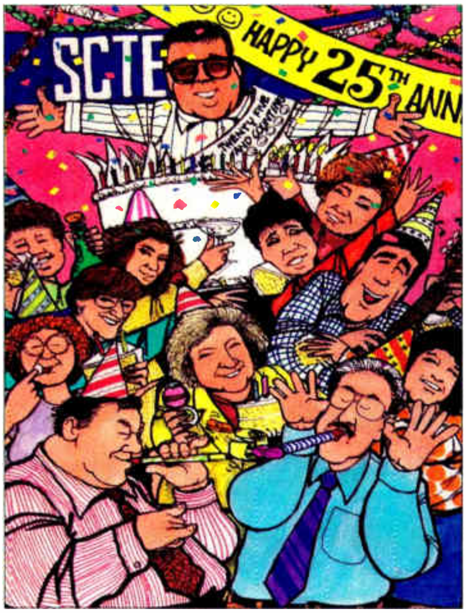

38 SCTE celebrates silver anniversary

By Leslie Ellis, CED

This year marks the SCTE's 25th anniversary–but it's unlikely the staff of the cable industry's largest trade group will even have time to bask in its quarter century of accomplishments. These days, the SCTE is steeped in planning how to manage the training, certification and standards needs of the cable and telecommunications technical community.

52 Training in a new world

By Roger Brown, CED

What's new in technical training? How about a big plate of new programs from the vendor side of the house, for starters. Equipment manufacturers who have had little to do with classroom-style training are formulating non-product specific classes.

58 Another foiled pirate in L.A.

By Mike Bates, Continental Cablevision, and Robert Depweg, L.A.P.D.

In one of the biggest cable piracy busts in the history of cable television, Continental Cablevision of Los Angeles recently nabbed more than 70,000 illegal cable boxes.

66 Big stakes competition in Vegas

By Roger Brown, CED

Beyond the clamor of the nation's gambling mecca, glitzy Las Vegas is shaping up to be a competitive battleground between cable television, wireless MMDS and DBS service delivery. Prime Cable has an aggressive strategy, described here.

80 Digital carriers' effect on analog

By Jeff Hamilton and Dean Stoneback, General Instrument

Digital carriers over cable television distribution plants introduce a new set of impairments, resulting in a reduced signal-to-noise ratio on analog channels. The authors discuss optimum signal level transmission for minimal impairments.

94 Color tests: Get ready

By Francis Edgington, Hewlett Packard

Next summer, cable operators will be forced to comply with the headend color tests, marking the beginning of the third phase of the FCC proof of performance tests. What are the tests, and how are they made? The authors address those issues here.

104 Focus on hybrid fiber/coax

By Roger Brown and Leslie Ellis

Last month, telecommunication executives met in New Orleans for SuperComm, the telephone industry's biggest show. This year, a slew of cable vendors also showed up, and video oozed from literally dozens of booths.

110 Continental's unique headend

By Leslie Ellis

It's been talked about a lot, but not done until now: splitting a signal 16 ways from the modulator's output, for a pick-and-choose channel lineup customizable to each optical node. The concept is being deployed in Pompano Beach, Fla.

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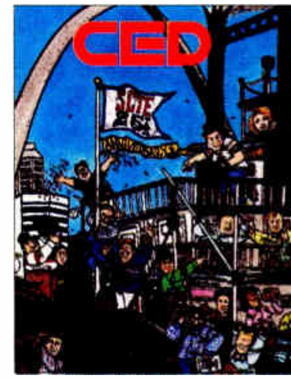

About the Cover

The SCTE staff and board frolics in St. Louis. Illustration by Rob Pudim.

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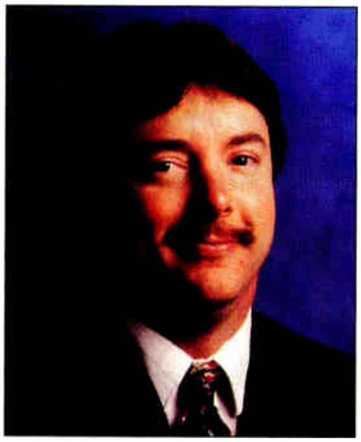

Cable can teach a few lessons, too

Like many other industry observers, I often find myself thinking about how the "cable" and "telephone" industries will evolve five years from now. Questions I ask myself include: Will the two truly merge? If so, how traumatic will the culture shock be? If not, who will prevail in delivering switched broadband networks to a critical mass of consumers? Which industry can more readily pay for the upgrade?

It is often while considering this last question that I think the RBOCs will prevail in swallowing up many of the smaller MSOs and become dominant suppliers of video content. As one cable equipment vendor noted, any one of the RBOCs represents as much business as the entire cable industry. With revenues that have been traditionally protected by regulation, the RBOCs and GTE have deep warchests they can tap to fund new projects and develop new technologies.

But increasingly I believe that the telephone companies will have a difficult time elbowing their way to the bar if they intend to do it by brute force. There are many subtle lessons to be learned about video delivery, whether it's digital or analog over either fiber, twisted pair copper or coaxial cable.

This became obvious during last month's SuperComm show in New Orleans, where several cable equipment manufacturers and suppliers, including Zenith, General Instrument, Scientific-Atlanta, Power Guard, Trilogy and ANTEC made their debuts.

Manufacturers that have served the telephone industry, including Reliance Comm/Tec, Northern Telecom, BroadBand Technologies and others were there showing their vision of how telecom providers can deliver video services. But as one cable MSO engineering executive said, the real interest was in what *wasn't* there.

For example, in at least two booths, it took several seconds for the video to change when a menu item was selected. In another, the inoperative set-top terminal on display was there just for looks even though the vendor did his best to provide the perception it was working.

The "cable guys" making the rounds commented that consumers won't tolerate lengthy channel access times or deep menus that have them pointing and clicking before they get want they want. They know what subscribers complain about. And while the technical glitches mentioned above will be overcome, it points out how closely details must be watched.

Similarly, SuperComm pointed out several issues telecom providers and manufacturers must sort out before they leap headlong into video. As Fred Dawson notes in Telecom Perspective, those issues include return band modulation formats, in-home wiring that threatens to destroy digital signals, operations software, and gateways between the analog video and voice networks.

Like building a set-top, telecom companies are learning that the knowledge and experience cable companies have built up is not easy to emulate. While some of this stuff may look easy on the surface, in reality, it's much more complex than that. However the future may unfold, I doubt the cable industry will simply disappear.

Roger J. Brown

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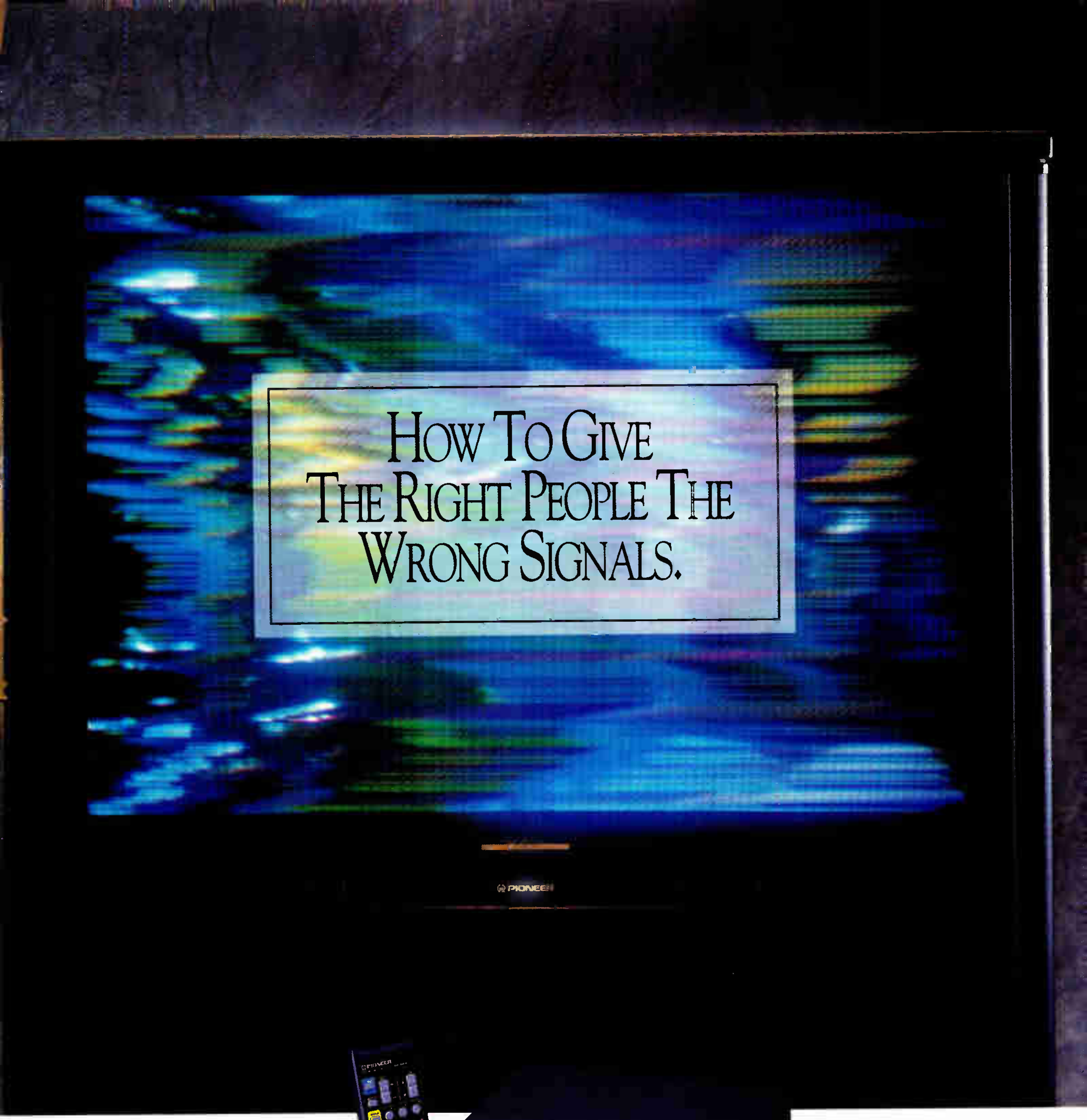

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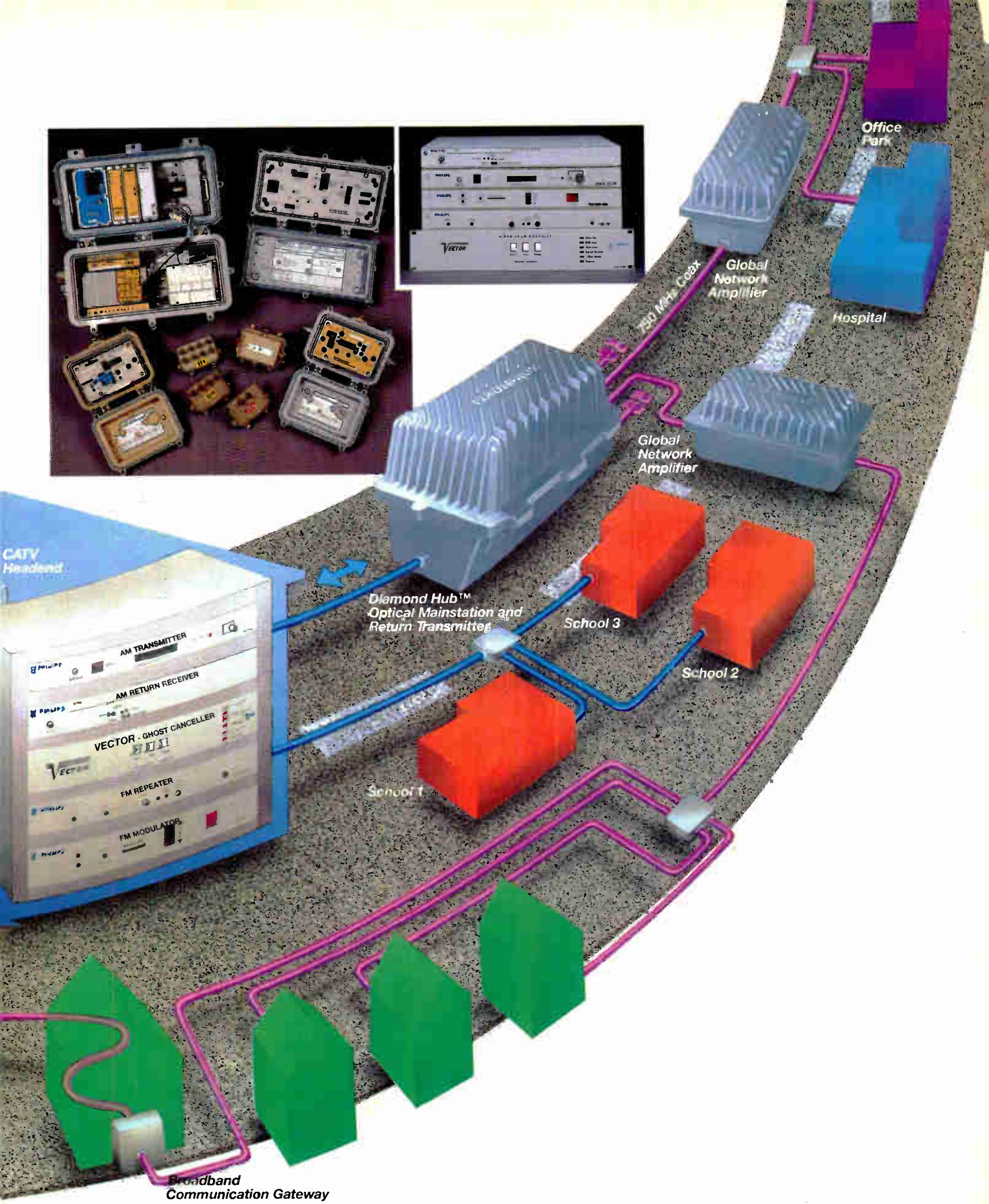

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and video conferencing to high speed transmission of large amount of data across the state and around the world via Internet," said William Richmond, Continental's director of business development.

CableLabs undertakes MPEG rights project

To help spur the adoption of MPEG technology as a worldwide digital television standard, Cable Television Laboratories is cooperating with an MPEG-related licensing entity that will attempt to provide access to intellectual property rights surrounding the technology. It is hoped the effort will result in widespread, nondiscriminatory and reasonable patent rights licensing of the core digital compression technology for MPEG.

Although the MPEG standards-making process has been heralded as a significant achievement, the core technology includes many patents that have been granted to a wide variety of persons and companies. To date, the property rights surrounding those patents has not been dealt with.

During a recent MPEG meeting in Paris, more than 50 companies met to discuss the issue of intellectual property. During the meeting, the group agreed on a two-phase action plan for establishing a licensing authority. The first phase will be to identify which patent holders are will to participate in the effort and whether they own patents necessary for implementation of MPEG core technology. The second phase will determine the group's structure as it works with new licensees and licensers.

Interested patent holders are asked to fill out a form letter stating their interest in developing such an entity and providing a listing of their patents they believe are necessary. The form must be submitted to Baryn Futa at CableLabs by June 10, 1994.

Consortium formed to develop interactivity

The big, megamergers may be out of vogue, but alliances between smaller companies will still be necessary to bring interactive services to televisions and personal computers. To illustrate that postulation, BroadBand Technologies, Compression Labs, Digital Equipment Corp., Microware Systems and Philips Consumer Electronics have joined forces to deliver a standards-based, turnkey system for interactive video on demand services.

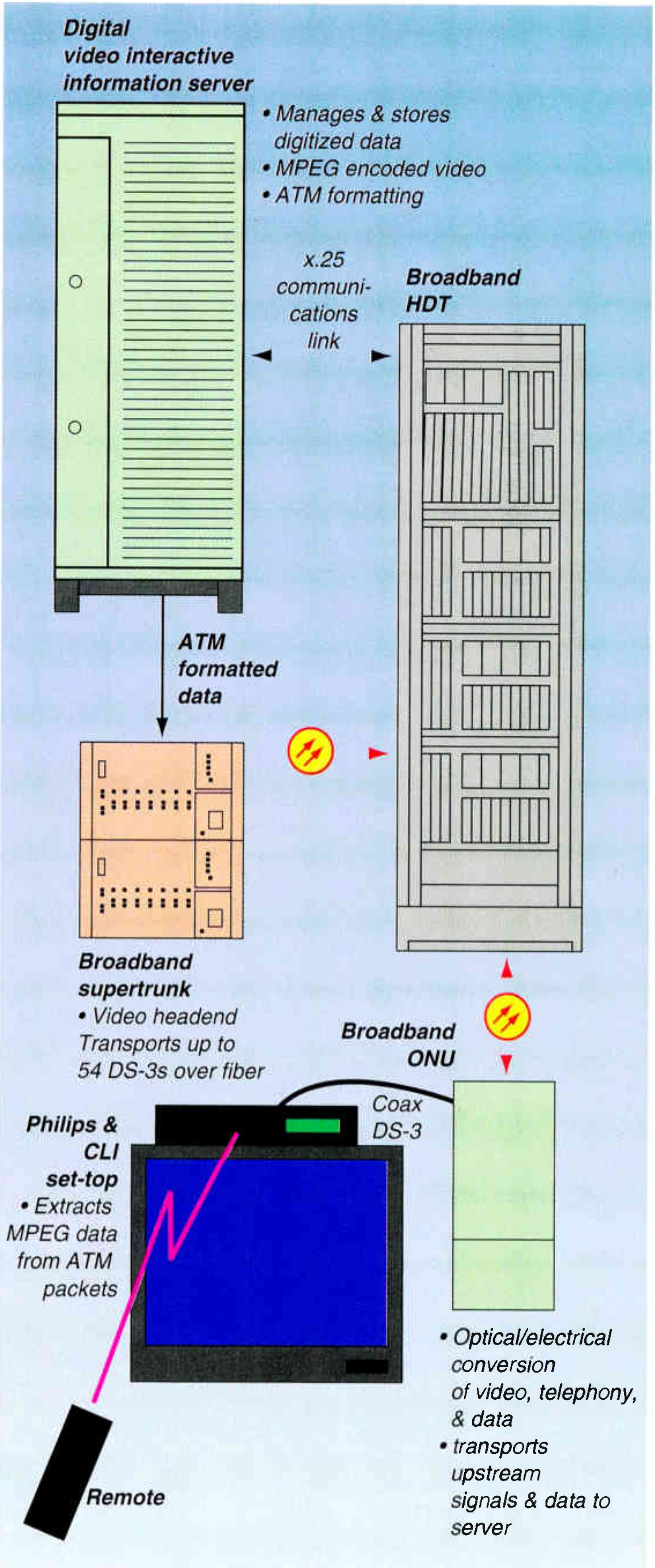
The system shown at right incorporates DEC's video and interactive information server, BroadBand's Fiber Loop Access switched digital fiber to the curb network, and set-tops built by Philips and CLI that incorporate OS-9 operating software from Microware known as DAVID.

The DEC server platform incorporates its Alpha AXP processors, StorageWorkds disk storage arrays, an interactive gateway unit, server management, a tape library system, a high-speed networking switch linking the various elements and a software system that manages the server platform and the interface to the set-top.

BBT's FTTC platform incorporates ATM switching and transport that allows advanced services like impulse PPV, home shopping and more. The set-tops built by Philips with CLI chips are based on MPEG-2 video compression and Musicam audio. They also have more than 5 megabytes of RAM.

The Microware DAVID (Digital Audio Video Interactive Decoder) operating system is based on the OS-9 real-time operating system that supports multi-tasking.

The system is based on industry standards such as ATM and MPEG to "ensure consumer accessibility to programming from different service providers," the participants said in a statement.



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The system delivers ATM packets at DS-3 speeds over coax between the broadband optical network unit and the set-top located in the home. This will allow the system to deliver up to 1,500 channels of interactive programming on demand.

Philips awarded Australian contract

Speaking of Philips, the company's Broadband Networks division has been named the principal supplier of distribution electronics for the construction of Telecom Australia's information highway in a contract worth $100 million over the next five years.

Philips will provide 750 MHz, two-way cable TV transmission equipment, including fiber transmitters and receivers, RF network amplifiers, 1 GHz taps and passives and a network management system to Telecom Australia.

The network construction has already begun. Initial use of the network will be for pay television, but Telecom officials have designed it to migrate into a fully interactive system that can offer telephony, video on demand, home shopping, banking and other services.

The Philips gear was chosen by Telecom over seven other equipment manufacturers and suppliers following a four-month review and field trials.

New company formed to develop IVDS system

A new company called Interactive Return Service Inc. has been formed in Herndon, Va. to develop a new method to utilize the Interactive and Video Data Services Radio Spectrum. Interactive Return Service is headed by Dr. Fernando Morales, an electrical engineer who founded TV Answer (now EON Corp.) in 1986. While leading TV Answer, the company was successful in petitioning the Federal Communications Commission for a portion of the RF spectrum around 218 MHz for over-the-air interactive services.

Eighteen licenses to use this IVDS spectrum are being awarded in nine markets, including: New York, Los Angeles, Chicago, Philadelphia, Boston, Washington, D.C., San Francisco, Houston and Dallas.

Interactive Return Service is presently designing a system that eliminates the need for a set-top box by including all interactive control functions, personal identification mechanisms and the information return transmitter into a hand-held device.

The roll-out of the TV Answer (and now EON) interactive services has been hampered by the need for an expensive set-top as well as numerous transmit and receive cell sites that must be built to cover a metropolitan area.

According to Morales, the new system he is designing will feature a hand-held control device that receives program and advertising information from audio tones delivered either through the TV receiver or the AM/FM radio stations, while sending viewer responses over the IVDS radio frequency.

In the case of on-screen menus, they can be accessed through a laser beam that will allow the viewer to point the device at a specific point on the screen and select any choice made available. In addition, the hand-held, as presently conceived, will be able to scan bar coded information and send responses to advertisers.

Ortel study finds passive coax design cost-effective

Ortel Corp. said results of a recent study it conducted find passive coaxial networks to be the lowest cost hybrid fiber/coax design, in which fiber optic receivers feed 60 to 70 homes with coaxial cable reaching beyond every home with no additional amplifiers in the network beyond the optical receiver.

Cost advantages of the passive coax design arise from the reduction in active components, the elimination of RF amplifiers from the network, and from the reduction in life cycle costs associated with powering and maintaining the network, Ortel officials said. Calculations of the network cost plus the net present value of power and maintenance costs indicate that today, for new system construction, passive coaxial networks present lower lifecycle costs than other network designs, said the Ortel report.

CATV, SCTE forums set on CompuServe

Hey! Wanna bet interactive with other people who work in the cable TV industry? The on-line computer system CompuServe now has a dedicated conference and library area for cable TV engineering and SCTE information.

Just type GO BPFORUM at any "!" prompt and voila, you're in. Cable TV and SCTE info is in Section 3 and cable TV engineering and SCTE info is located in Library 3.

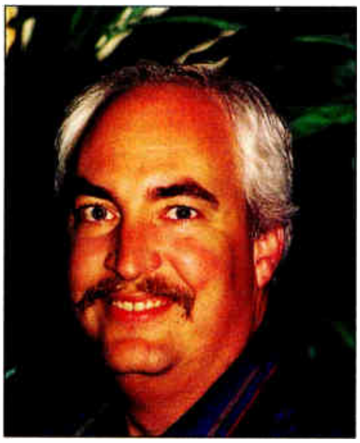
Also, if you're an SCTE member with an on-line E-mail address on CompuServe or any other on-line service including the Internet and you'd like to be listed in a public data roster posted on CompuServe and E-mailed to others, simply send your name, company info, E-mail address, SCTE member number and chapter affiliation data to SysOp Jonathan Kramer. His CompuServe address is: 73300,2161. On the Internet, you can find his E-mail at: "SCTE.Roster@CableTV.com".

Jottings

Congratulations go out to **Vito Brugliera** of Zenith Electronics for winning the annual NCTA Vanguard Award for science and technology. Vito has been active on the joint EIA/NCTA Engineering Committee for years hammering out agreements between cable and consumer electronics . . . **Harmonic Lightwaves** has received a multimillion-dollar order from Rogers Cablesystems of Canada. Initial deployment will serve about 80 nodes and will include transmitters, receivers and full return path capability . . . **TCI** has invested in a Seattle-based company called Virtual I/O Inc., developer of a 3-D personal video and computer display headset. Virtual I/O will manufacture the eyeglass-sized device later this year . . . **Mind Extension Institute** has completed two new video training modules on troubleshooting. "Customer Service Through Troubleshooting" is aimed at anyone who talks to customers, while "The Technical Troubleshooting Challenge" is geared toward service techs, installers and technical supervisors. MEI also offers seven other videos . . . **Arrowsmith Technologies** will install its Fleetcon integrated fleet management system in Continental Cablevision's Elmhurst, Ill. system as well as Time Warner's New York City system. These contracts bring the number of systems served by Arrowsmith to five, including Paragon's Minneapolis and Portland systems and Cox Cable in Omaha. The Fleetcon system uses real-time GPS tracking and a mobile data link tied to a sophisticated management system to provide field operations information . . . Here come the digital consumer electronics: agreement was reached on the technical specs for a consumer **digital VCR** during a meeting of the high definition (HD) Digital VCR Conference recently . . . NYNEX has selected **ADC Telecommunications, Zenith** and **Stratus Computer** to provide the essential network elements of the RBOC's New York video on demand trial. ADC will supply its Homeworx integrated digital access platform to transmit signals to Zenith digital set-tops that will decode the 16-VSB signals and feed them to the TV. Stratus will supply the computing platform . . . .

– Compiled by Roger Brown

Babcock: Technical training is his niche



By Leslie Ellis

Alan Babcock is the kind of guy you'd want to have for a neighbor. He's pleasant and wholesome; the kind of guy who would probably take a few swipes over your lawn with the mower while clipping the edges of his own. He's not the slightest bit hung up on who he is or what he does, but describes himself as the typical guy–"two kids, a dog and a minivan," he laughs.

But actually, Babcock is a lot more than that. As director of technical training for TCI's Central division, he runs five training facilities located in Denver, Tulsa, Oklahoma and Corpus Christi, Dallas and Houston. These days, most of his time is spent developing curriculum. In process at the time of this interview was a new installation course, a fiber optics course and lots of heavy thought about how to handle digital compression training.

"We're getting very, very near to the time when we'll need to have a program to handle digital video compression training," Babcock muses. "Things are already coming up, like the Sega Channel and DMX. Even though full rollout of 500 channels won't be for a little while, and we have some time to prepare, we still need to start thinking about it."

Babcock says most of his job is to ensure that TCI's training programs fit the needs of the systems–which can be difficult, given the breadth of the giant MSO's system portfolio. "In this division alone, we have everything from large metro areas to small, 100-subscriber systems. It makes curriculum development a real challenge," Babcock admits.

Decade of training

Babcock's involvement in cable television technical training spans a decade of service in that area, starting in 1984, when he moved from technical operations into training for ATC (now Time Warner Cable). "At the time, I was an area engineer for the Denver suburbs," Babcock, a native Iowan, recounts. "A position came open at the National Training Center, and I took it." Just three years later, Babcock had been elevated to manager of the Center.

When a similar opportunity arose within Warner Cable (remember, this was all before the merger), Babcock jumped on it and moved to Dublin, Ohio, eager to develop the technical training programs needed there. He spent three years with Warner as its manager of technical training; when news of the Time-Warner merger hit the streets, he decided it was again time to consider a move. "I figured the merger would probably equate to there being only one technical training center," Babcock correctly assumed, "so I moved back into technical operations for a while," as a district manager in Columbus, Ohio.

But Babcock's thirst for training returned, and last November he returned to Denver, under TCI's shingle. "Training is definitely my niche in life," Babcock says when asked why he chose to become a technical trainer. "I don't really know why. I guess I feel I have an aptitude for it."

Babcock says his nemesis is the lack of tools available to measure training effectiveness. In fact, it's one of the key things he aims to fortify at TCI. "It has always been my goal to find ways to measure training effectiveness, using methods more sophisticated than testing," he says. "I've always believed that if you're going to do training, you ought to have some concrete results after people have participated in the training."

At ATC, Babcock addressed that by evaluating technical staff performance following a training program. "For example, if an installer went out to install something following a training session, how soon did that customer call for service? We tried to correlate any improvement or change with the training, to see if we really had a before-and-after impact. Indeed, we did," Babcock says. He hopes to institute a similar program within TCI. "It's a real challenge to find ways to measure training, because there are so many variables."

Education vs. training

Babcock says his biggest concern revolves around the digital future. In his mind, the cable television technical community needs to take a bigger stab at its own higher education needs, particularly with digital compression right around the corner. "There's a big difference between on-the-job training and education," Babcock emphasizes. "With a converged telecommunications marketplace, the technician in the house is going to have to be a whole lot smarter than we are today."

Babcock follows those comments by discussing the SCTE's scholarship committee, of which he is chairman. "I don't think enough people are cognizant of that group," Babcock laments. "It's an excellent source for cable's technical community who want an education."

At home with the dog and minivan, Babcock and his wife, Linda, have the aforementioned two kids: Michael, age 10, and Stephanie, age 8. Babcock says he's an avid skier, "tries to play golf," and is a proud Cub master for his son's Cub Scout pack.

And, on the evening of the interview for this article, Babcock was scheduled to take the stage as "Dirty Jake LePhew," a leading albeit nefarious character in a church-sponsored melodrama. (He played opposite a character named "Mayo Naise.")

Perhaps the training thing is just a front for a frustrated actor? "I don't think so," Babcock shrugs. "I'm just comfortable in front of people." CED

Professor Crook: Inventor of CATV

By Archer S. Taylor, Director and Senior Engineering Consultant, Malarkey-Taylor Associates

Louis H. Crook (1888-1953) was a professor of aeronautical engineering at the Catholic University of America in Washington, D.C. On November 18, 1937, Professor Crook filed an application for a U.S. patent entitled: "System and Method for Sending Pictures Over Telephone Wires." Three years later on November 26, 1940, he was granted Patent No. 2,222,606, assigned to The Second National Bank of Washington, DC, as trustee. The following quotation is from the preamble describing the patent:

> *I provide a complete shielding, not only of the wires and the instrumentalities employed for sending and receiving sound messages and pictures, but also of the ends of the wires where they are joined to said instrumentalities.* ***In other words, I make use of insulated electric transmission lines . . . as one conductor for picture transmission, while the complete metallic shielding or covering constitutes the second conductor for picture transmission.*** *(Emphasis added)*

This is not only a clear, although primitive, description of coaxial cable, but also of topological shielding; i.e. complete shielding without surface discontinuities.

The patent description continues:

> *Supposing now that one of the houses . . . desires to have television transmission installed, all that is then necessary is to provide the arrangement . . .where the telephone conductors . . . are enclosed in a metal tube . . . one end of which is soldered or tightly secured to the metal lining . . . of the distributor box . . . . The other end of this metal tube . . . is similarly tightly secured to the metallic casing . . . containing a conventional television receiving instrument . . . .*

So, the 500 or so CATV systems operating in 1957 and earlier (including the one my associates and I built in 1953 in Kalispell, Mont.) may have infringed the Crook patent. Fortunately, we are protected by the statute of limitations.

In 1938, a lengthy staff report was issued by the Federal Communications Commission detailing the findings of 125 investigators over the three-year period from 1935 to 1937. By remarkable coincidence, with the 1937 Crook patent application, the FCC staff report, in a single obscure paragraph buried on page 239, clearly anticipates the possibility of transmitting television to homes by means of broadband coaxial cable, as well as over-the-air. An excerpt from that paragraph follows:

> *Transmission (of television) may be by air . . .or conceivably it may develop into some sort of wire plant transmission utilizing the present basic distributing network of the Bell System, with the addition of coaxial cable or carrier techniques now available or likely to be developed out of the Bell System's present research on new methods of broad-band wire transmission. The prior development . . .by the Bell System, and their patent control of these new devices while they are being adapted to their own existing investment in permanent wire plant, constitute an advantage of intangible nature, but one having far-reaching effect upon the probable commercial success attending independent research upon methods which might become operative* ***independently of the Bell System plant.*** *(Emphasis added)*

The FCC evidently recognized as early as 1937 that the Bell System might use its patent position on broadband coaxial cable to delay or thwart the development of independent wired TV systems.

To put the Crook patent in chronological perspective, television developments in the mid 1930s were moving out of the laboratory. In June, 1936, the FCC announced hearings that would consider the television standards proposed by the Radio Manufacturer's Association (RMA). RCA had already begun testing transmissions from the Empire State Building, using the Zworykin iconoscope with 343 scanning lines (changed to 441 in the RMA proposal). In February 1937, the British Broadcasting Company (BBC) rejected the 240-line mechanical scanning system developed by the popular John Logie Baird, in favor of the Marconi-EMI 405 line electronic system.

BBC Television officially opened November 3, 1936, with regularly scheduled entertainment programs. On April 30, 1939, RCA began regular noncommercial television programming with a speech by President Franklin D. Roosevelt at the opening of the New York World's Fair. Eight hundred television sets were sold in 1939-40, at $395 to $675 (probably at least $5,000 in 1994 dollars!).

An intriguing question arises as to whether Louis Crook had knowledge of the FCC report prior to applying in November 1937 for his patent. He died in 1953, but the following information was obtained from his daughter, Miss Charlotte Crook. CED

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Circle Reader Service No. 15

of working fibers. During regular maintenance activities each month, personnel should examine this documentation and ensure that it reflects any changes in personnel, procedures and fiber reassignments. Keeping this information up-to-date is just as important as developing the document in the first place, Harrigan notes.

Harrigan did discover that each restoration kit required a more complete listing of splicing priorities. He has since included a copy of the restoration kit's fiber color coding scheme to allow both restoration teams to get together early in the process to establish which fibers will be spliced first.

"The idea," says Harrigan, "Is to pull the fiber restoration team together just before splicing commences, to orchestrate as precisely as possible not only which fiber has the highest priority, but which color combinations will be spliced. Broken fiber and the color coding of fiber in the restoration pack will not always match. This carbon copy form will help to ensure that both teams are playing from the same sheet of music.

"It also helps to try to deal with outage situations in the same relatively relaxed manner as demonstrations. Haste," Harrigan adds, "still makes waste."

TCI now stores longer lengths of fiber for backup restoration of 600- to 800-foot spans.

For example, splicing restoration of just one fiber during the first restoration simulation could have brought nearly 60 percent of the subscribers back into service, Harrigan says. "Establishing priorities and training personnel about how the documentation is used goes a long way toward refining the restoration plan."

Preventive maintenance

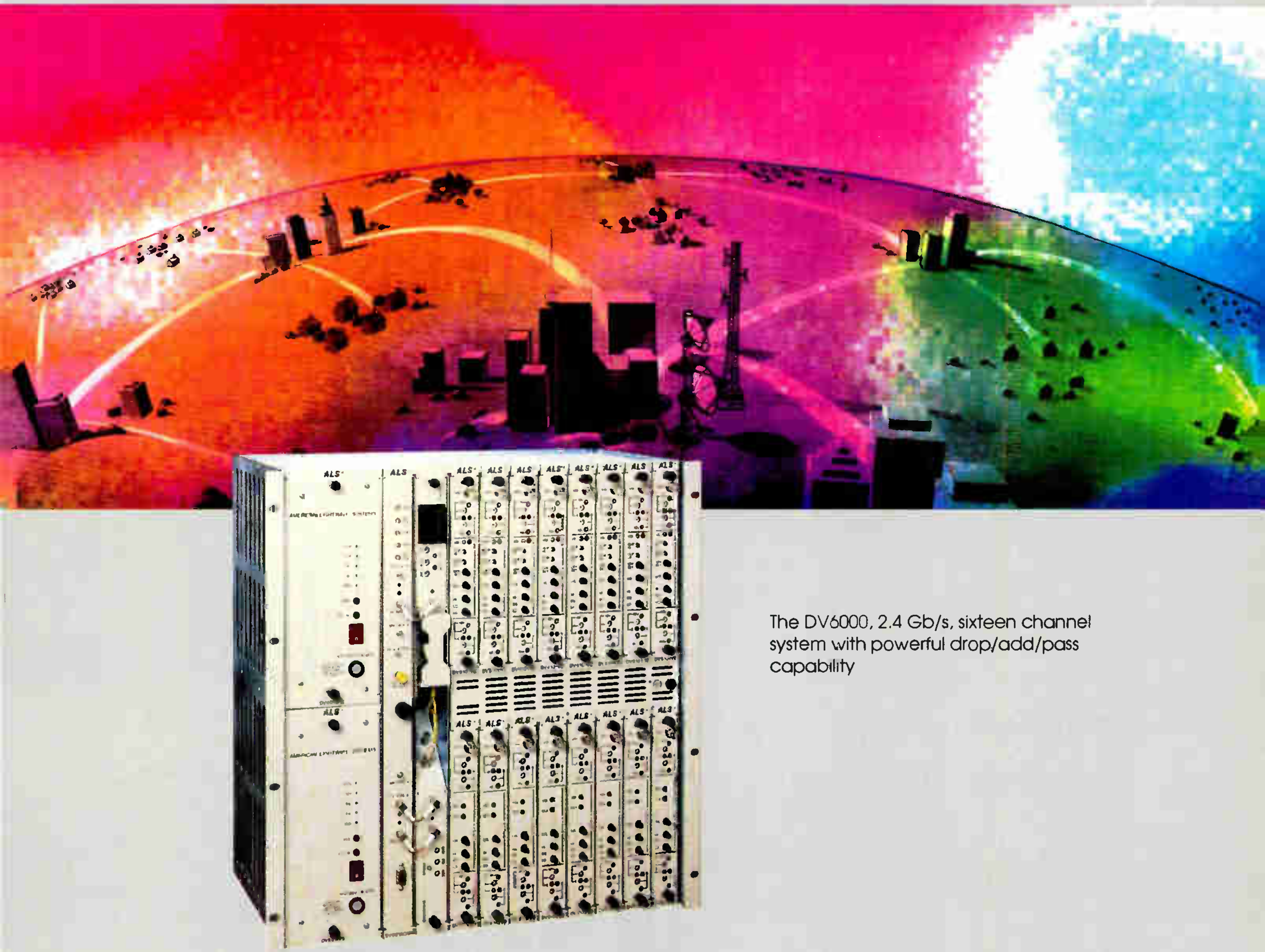
Other worthwhile exercises during routine and/or preventive maintenance processes include checking restoration kits, test gear and fault locators each month. Battery levels, splicing equipment and related supplies can then be monitored to ensure that everything needed for emergency repair is available. "You never know when someone might have used the splicing gear out of one of the kits," Harrigan laments.

In addition, Harrigan stresses the proper use of safety equipment, such as hard hats, cones, and gloves, regardless of any rush to re-establish service. "When in a stressful situation, we often tend to forget that safety is our very top priority."

The bottom line with regard to safety, Harrigan says, is that a fiber break is "still only telecommunications," even if service to 500,000 subscribers is at stake. "I'll take the heat for a safety-related delay any day of the week over an unsafe but perceived time-saver." CED

This article is dedicated to the memory of Gene Bray, an ANTEC technical trainer who pioneered fiber restoration planning and was instrumental in teaching TCI California personnel about fiber.

THE FUTURE IS REAL



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Circle Reader Service No. 21

SCTE celebrates 25th with little time to look back

At a quarter of a century old, SCTE is poised for convergence

By Leslie Ellis

Like a well-tended garden sprinkled with plenty of rain and sunshine, the grass roots of the Society of Cable Television Engineers have flourished to an unprecedented level in this 25th anniversary year. Fertilized by an ever-increasing number of local chapters (more than 70) and enriched by programs including the Broadband Communications Technician and Engineer (BCT/E) certifications, the SCTE has swelled to a size that literally dwarfs every other cable television industry trade group. At 11,500 members, the 25-year old technical society has nearly doubled in size since it celebrated its 20th anniversary, just five years ago.

Such growth–averaging just over 1,000 new members each year since 1989–is clearly a good thing. It's also a significant challenge for SCTE President Bill Riker. "It's mind-boggling, how much we've grown over the past five years," Riker muses. "Trying to manage this kind of growth has been difficult, but rewarding."

TCI's Tom Elliot, chairman of the SCTE's board of directors and VP of engineering and technology for TCI, sums up the SCTE's blossoming technical role this way: "We're in an exponentially increasing rate of technological change in the world, that I sense could go on for a long time. Consequently, a technologically-oriented group should be very well positioned to benefit by that, and benefit the industry it's involved with."

The benefits of SCTE growth are obvious; the exponential growth of the Society could easily be classified as one of those "good problems to have." An even larger challenge than the onslaught of new SCTE members, however, may be the management of change, in general. With disparate communications networks starting to resemble each other more and more closely, could there be an SCTE-like entity out there already serving another industry–like the telephone business, for example? And if the telephone industry purchases its way into broadband video delivery, then what happens to the SCTE?

These are all questions Riker says tend to "keep him awake at night"–or at least they did, until 1992, when he decided to hire a professional meeting facilitator who helped guide the SCTE's board of directors into planning for the future. Beginning in March 1992, a meeting took place at the SCTE's Exton, Pa. headquarters that forced the board to think long-term.

Riker called it a "SWOT" meeting because it called for the board to assess Society "strengths, weaknesses, opportunities and threats." Born at that meeting was the SCTE's know readily-recognizable mission statement: "training, certification, standards."

Also at that meeting, the SCTE board identified and prioritized over 20 objectives. Now, two years after that thinktank meeting, more than half of those original objectives have been implemented, Riker reports. "We


SCTE
HAPPY 25TH ANNI!
TWENTY FIVE AND COUNTING
BY ROB RUDIM

Haag. "The standards process is fundamental (to the SCTE). We need a common ground to meet on, to agree on the interfaces and standards, so that we can afford to make the investments. It's an enabling issue that can't be over-emphasized, because standards are fundamental enablers to the business community to make investments."

In the EBS subcommittee, led by Ken Wright, Jones Intercable's director of technology, activity will likely come to a head at this year's Cable-Tec Expo, when the FCC is scheduled to make its final Report and Order on the revised national emergency broadcast system.

In the ruling, the FCC will likely make the cable industry a full partner, along with existing broadcast partners. The effort could translate into an industrywide cash outlay of between $100 million and $500 million, depending on the severity of the ruling. Wright hopes for a final report and order in which operators comply via an audio-only override of all channels, and not a audio/video or all-channel text scroll, for cost reasons.

Operations Committee

Headed by Diana Riley, senior account manager at Jerry Conn Associates, the SCTE Operations Committee is responsible for the "day to day" operations of the Society. Subcommittees under Riley's direction the Cable-Tec Expo Program, Executive Review, Fellow Membership, Field Operations Award, Hall of Fame, Personal Achievement Award, Scholarship and Senior Member groups.

"As chairman, I work very closely with the SCTE staff, to oversee their activities," says Riley. "Mostly, though, the Operations committee works to recognize members for their contributions to the industry."

Planning Committee

At the heart of the SCTE's forward motion is the Planning Committee, which, as the name suggests, plans the direction and focus of the SCTE. It is the Planning Committee that facilitated the recent "SWOT" analysis, for example, and it is Steve Allen, chairman of the group, who will relay the findings of that meeting to the SCTE board of directors.

"Our prediction is that the cable companies will gain employment, while the phone companies reduce employment," says Allen. "That's happening now."

Still, though, Allen fears a "brain drain" on cable's technical flock. "Competitive industries are a threat not only because they take customers, but because they take personnel," says Allen.

In all, Allen says, his committee is "working hard on the future," by continuously trying to determine immediate needs. "Our first objective is going to be gaining telephone industry membership," says Allen.

The recent mind-meld was needed to formulate that plan and others, says Allen. "We needed 'SWOT.' We were starting to lose a little bit of direction in an industry that's changing fast. Hosting a meeting like that helped us enormously."

Planning aside, however, Allen says his favorite part of the recent mind-meld came when someone delivered this news: Since the advent of cable re-regulation, Congress has received 5,000 letters of complaint about rates. During the same time, Congress received 17,000 letters reporting UFO sightings.

"That tells you something," Allen ruefully laughs. CED

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Vendors don their training caps

Increased role in training noted

By Roger Brown

The bloom may be off the convergence rose now that two of the big mergers between cable and telephone companies have been called off, but as companies that run training seminars are finding out, there's no shortage of people who want to learn about broadband technology.

In fact, there's a marked resurgence in interest in training seminars of all kinds as cable systems begin to feel heat from competitors like Direct Broadcast Satellite, MMDS and in a few cases, the telephone companies.

Many industry strategists cite a need for better-trained field personnel as operators shift their focus from gaining subscribers to better customer service and subscriber retention. While myriad options exist for training, including the Society of Cable Television Engineers, National Cable Television Institute, Mind Extension University and others, equipment manufacturers too are getting into the mix.

Companies like General Instrument, Scientific-Atlanta, C-COR Electronics, Sachs and Antec all are devoting significant resources to the build-up of new training programs, covering such subject matter as basic installation practices to how to deliver telephony over coaxial cable.

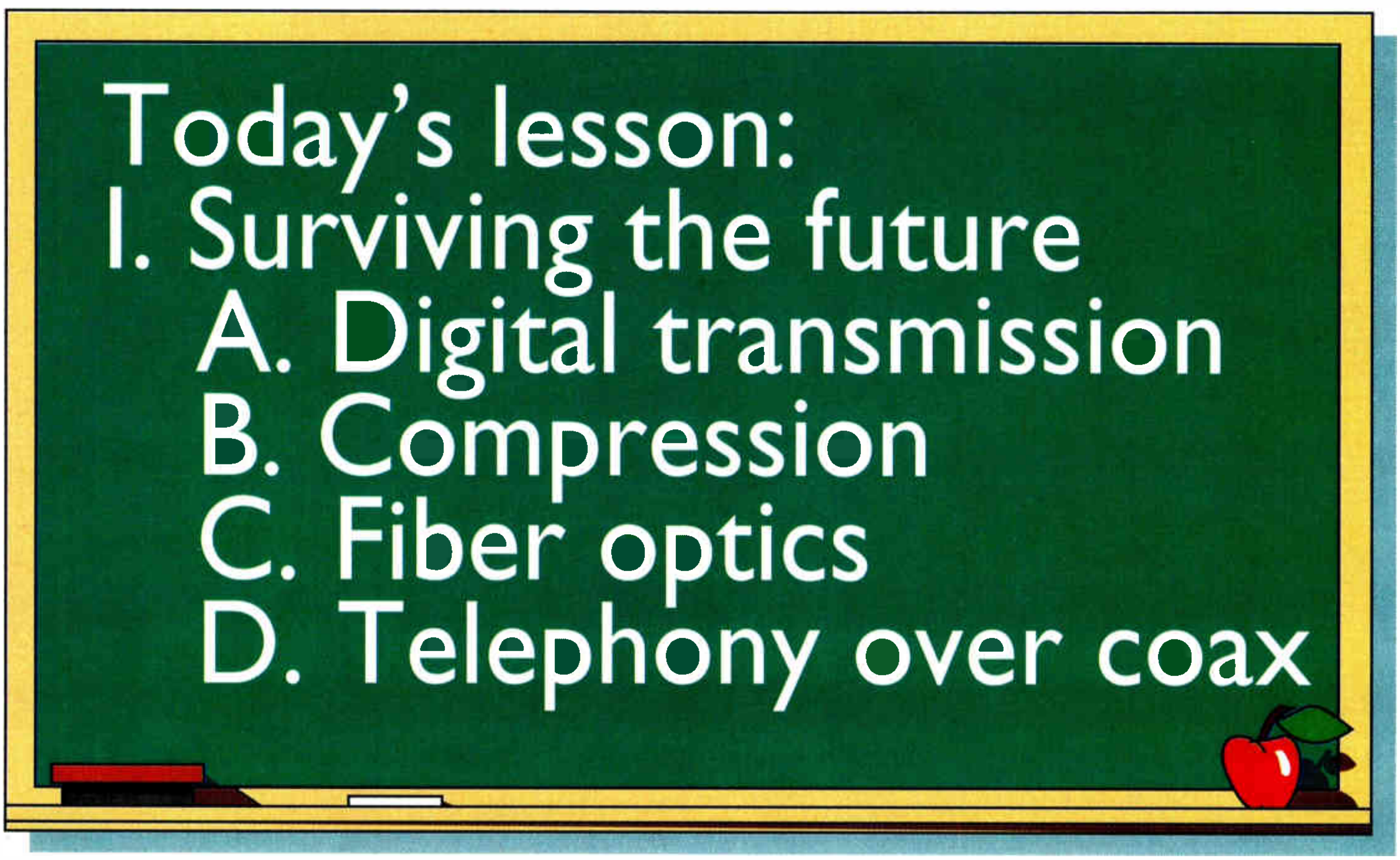
More well-rounded

Indeed, what was once given away with a product sale has transformed into a mini growth industry, with many companies capitalizing on their own internal knowledge and now charging fees to attendees of lengthy seminars devoid of product-specific curriculum. Instead, along with the fees comes a more well-rounded education featuring state-of-the-art teaching methods that is often brought right to the operator's back door.

"Technology is changing so fast that we don't think cable operators can afford to use training that is third- or fourth-generation," says Dana Eggert, director of training at Scientific-Atlanta. "We think it's moving fast enough they need to be as close to the point where technology is generated as possible. The proximity to the technology is a key point in our ability to provide training."

For example, S-A began about a year ago teaching a class on sweep and balance that is completely generic. By getting away from product specificity, attendance has jumped. "We were caught off-guard with its popularity," admits Eggert. "But that proves there's a customer need for skills training, process training and maybe even career path training."

To fill that perceived need, S-A has radically altered its approach to training, moving away from product-oriented classes to more



The ADC Channel

Broadband Connectivity Solutions from
ADC Telecommunications

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Link to the Future: A New Generation of CATV Networks

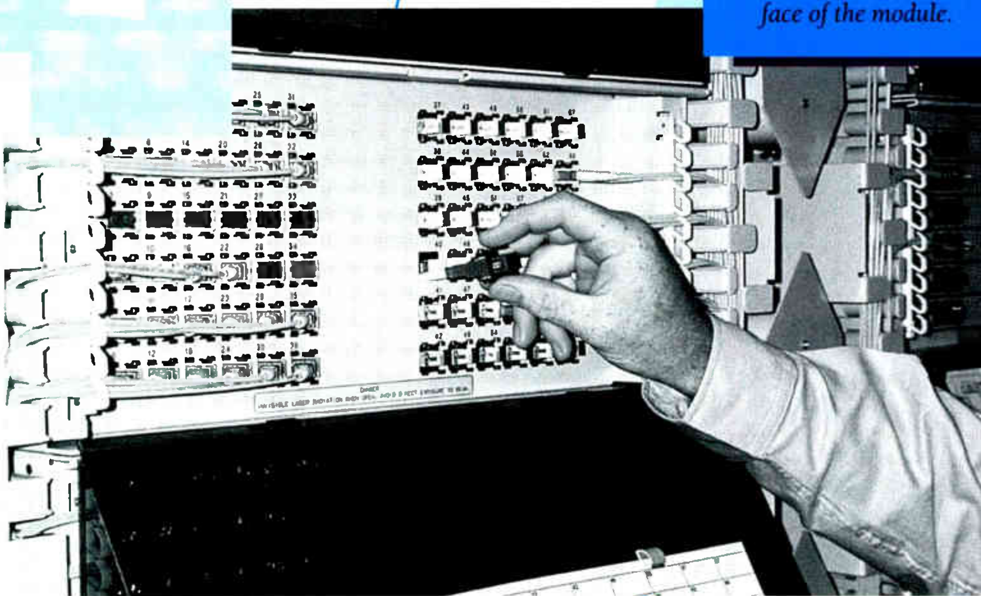
Manage your fiber, and eliminate breaks in the connectivity chain.

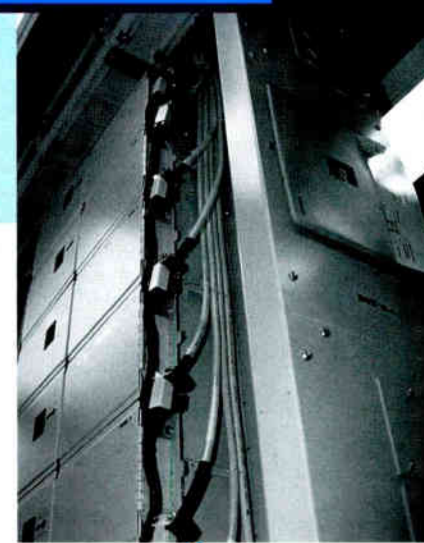
Headend Fiber Management:

The tumultuous growth in the cable television industry has led network planners to reconsider many standard arrangements and practices. They know that what worked well on a small scale won't necessarily hold its value as part of a larger scheme. This is particularly true with the cable itself. When networks were initially developed, fiber-optic cables were strung together in the most straightforward way. Installations were associated with simple AM fiber-optic link design; if there were less than 12 fibers, cables were attached to nodes with a direct fusion splice or mechanical connector.

As the market has matured, CATV companies have vigorously expanded their networks. A natural consequence of this expansion is that the number and size of fiber-optic cables and the complexity of their interconnections has increased drastically. Continued growth also is transforming the nature of network facilities and the weight of the burdens they bear. The CATV headend, for example, will become the hub for AM-VSB CATV channel transport, digital video transmission, switched services and competitive access. With the evolution of the services and the proliferation of fiber-optic nodes in star-star-bus and fiber-to-the-feeder architectures, CATV companies are wise to introduce fiber cable management into their network.

In some networks, engineers are finding that direct fiber connection, a common practice, leads to more and more splicing in increasingly congested splice cases. By ignoring sound cable management practices, CATV companies may end up with more work for technicians,





With an ADC connector module, front access to optical fibers is provided by optical adapters mounted across the face of the module.

Fiber-optic cables are terminated to the rear of the connector module, where protection and strain relief are provided.

A Strong Link in the CATV Network Chain

unnecessary service interruptions and limited access to their networks. Because the consequences can be so costly, a cable management system not only will make life easier, it also can pay for itself simply by preventing the problems from occurring. A closer look at the risks involved will make this evident.

Lost Productivity

Consider a job that requires a fiber-optic link to be moved, say from fiber #1 to fiber #12. Working with direct connections, a technician would have to do the following:

- Physically disconnect fiber #1 and fiber 12 from the transmitter
- Resplice them to the appropriate terminal equipment (i.e. receiver and transmitter)
- Perform a "tone and tag" operation to locate #1 and #12 at each location (if the fibers were not under the supervision of a management system)

This work is time-consuming, and the impact is compounded when the procedure is frequently required. With a simple, logical cable management system, cutovers can be performed at a patch panel in just a few minutes without using special test equipment, splicing gear or unusual materials.

CATV companies can profit from this approach at the headend or in the field. For example, they can isolate fibers from terminal equipment in an outside plant environment using strategically located cross-connects, or they can install any number of fiber management frames at the headend to simplify current and future operations or changes, which may include adding or transferring fiber-optic nodes. Quality equipment manufacturers such as ADC Telecommunications offer CATV operators a large variety of panels and frames to meet their individual needs for service and growth.

Unnecessary Service Interruptions

The threat of service interruptions alone justifies an investment in quality cable management systems. When a fiber-optic hub or node feeds several thousand subscribers, even a brief spell of down-time can trigger a revenue loss and customer dissatisfaction. In their attempt to avoid these disruptions entirely, network managers need to attack the most prevalent and dangerous problems. Repeated splicing and rearrangement is a

continued on following page

prime concern; it can leave fibers damaged, worn out or "lost," when further maintenance is not deemed worthwhile. Similarly, congestion in the splice case complicates maintenance and can lead to the fracture of accidentally jostled fibers.

A good cable management system will protect the fibers in use — as well as those left "dark" for network growth and future services such as telephony and video-on-demand. It will provide a physical access point for periodic testing and service; these access points also form the building blocks of architectures that offer diverse routing and other protection schemes. With such a system, technicians can:

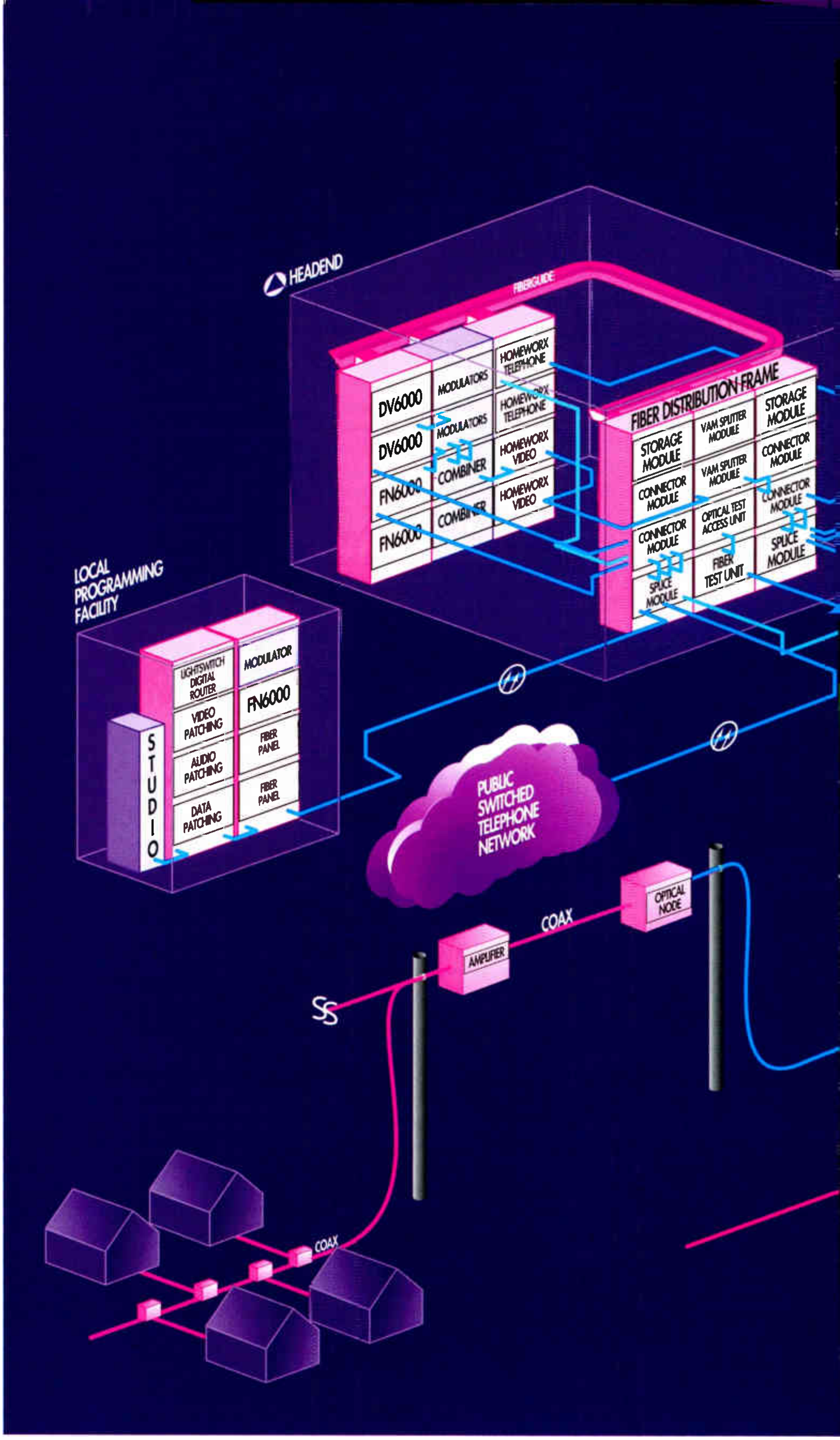
- Identify fiber-optic cables easily
- Terminate cables reliably
- Connect and disconnect test probes to and from the management system quickly

Limited Plant Access

A cable management system doesn't simply protect and manage the cable; as mentioned above, it also gives CATV companies extended access to their networks. With access comes flexibility, which is not a hallmark of networks that rely on direct connections. And with flexibility, network operators can do more things to satisfy customers and increase their revenues. For this reason, ADC builds flexibility into its cable management products by stressing modular designs, which let CATV companies build affordable, customized networks.

Placing a modular fiber frame at the headend, network operators can do the following:

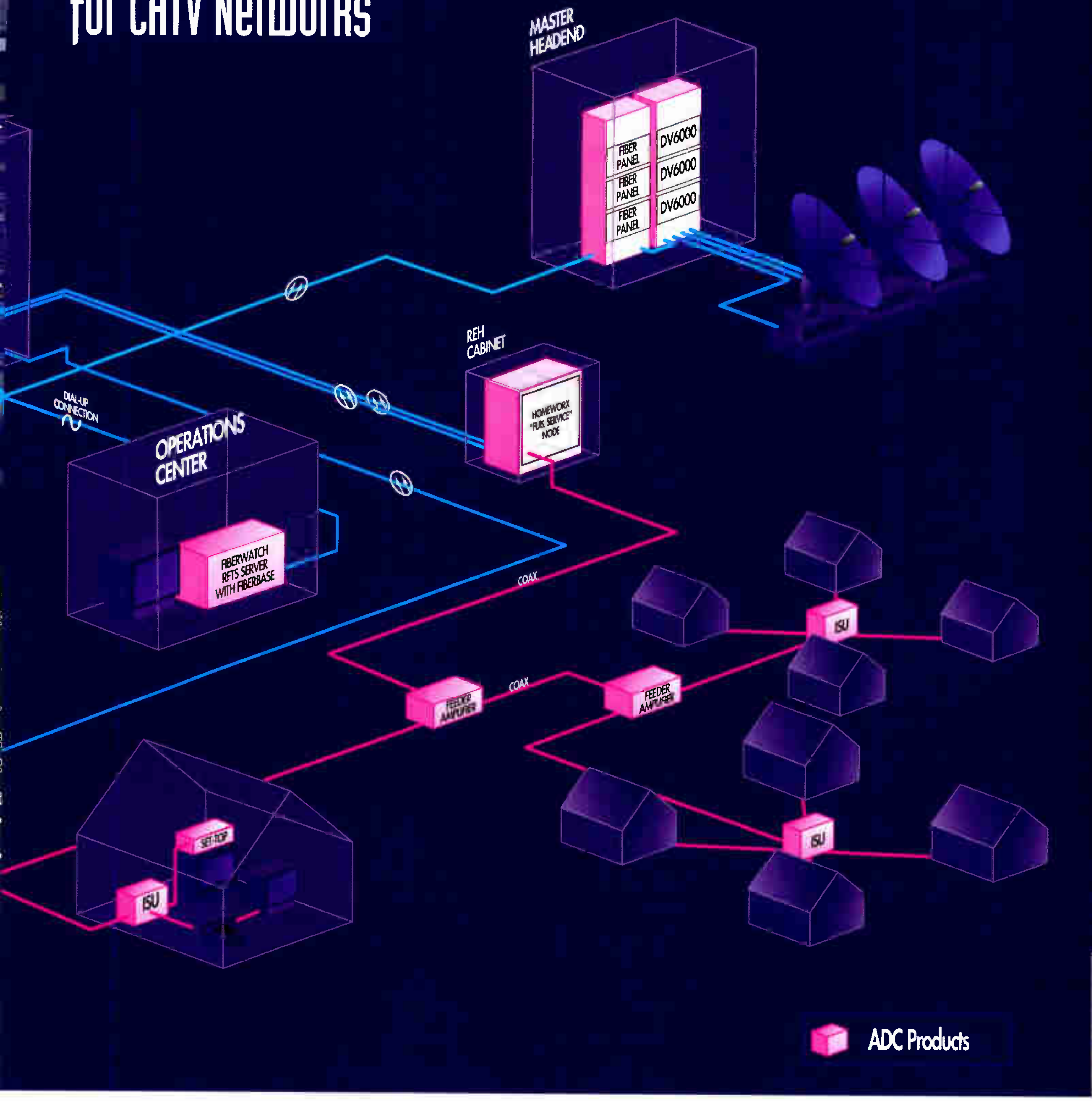
- Combine signals from a 1310 nm analog video stream and a 1550 nm digital video stream using a wave-division-multiplexing module
- Install the variable attenuation module for adjustable attenuation of the optical signal
- Split the optical input into a multiple path configuration and add short fiber nodes using an optical tree module
- Manually switch inputs between several output paths using an A/B switching module; this can be used to provide redundancy and to test or activate the "B" side of the network



Tending the Network

As providers of communications services pass through an era of extensive transformation, they might be tempted to

End-To-End Connectivity for CATV Networks



gloss over things like cable management and concentrate on more glamorous matters, such as fiber electronics. But figuring out how to arrange cables and connections is a fundamental issue. Networks will grow, and it's up to those involved to determine whether they'll grow like a patch of weeds or a carefully tended garden. The choice can lead to a network that blossoms or one that chokes itself. CATV companies seeking to implement proven connectivity solutions will be well positioned to reap the potential revenues that will be up for grabs from a new generation of services.

Signal Security

How Continental of L.A. thwarted complex piracy ring

Multi-state theft ring stopped

By Mike Bates, director of security, Continental Cablevision; and Robert Depweg, detective, Los Angeles Police Department

***Editor's note:** Each year, CED magazine publishes the winning papers selected by the NCTA's Office of Signal Theft to exemplify leadership against cable signal piracy. This year, two papers were selected as winners. The second will be published in a subsequent issue.*

Continental Cablevision of Southern California passes approximately 800,000 homes and serves approximately 320,000 customers. The majority of homes passed and customers are within Los Angeles County. To counter the high crime rates associated with large metropolitan cities and to take positive local action against the ever-increasing national issue of "pirate activity," Continental Cablevision formed its own regional security department.

The primary objectives of the regional security department are as follows:

✔ To establish awareness throughout Continental's employee population base and franchise areas that connecting, modifying or tampering with company equipment or related services for the purpose of receiving unauthorized cable service is illegal, and anyone found to be in violation of these acts will be prosecuted to the fullest extent of the law.
✔ To initiate community understanding with city officials and law enforcement officials of the financial losses and detrimental effects theft of service has upon the city itself, as well as others.
✔ To shut down unauthorized equipment distribution modification rings through investigation resulting in criminal prosecution and/or civil remedies.
✔ To establish and make available for public use a toll-free theft of service tip line.
✔ To reduce the unauthorized end user rate to homes passed.

In March 1992, the formation of the regional security department consisted of an experienced director, familiar with cable theft investigations who had a proven relationship with local law enforcement agencies, and one similarly experienced field investigator. The combined experience of these two individuals included a comprehensive background of skills in investigative and surveillance techniques, as well as an up-to-date working knowledge of California state laws.

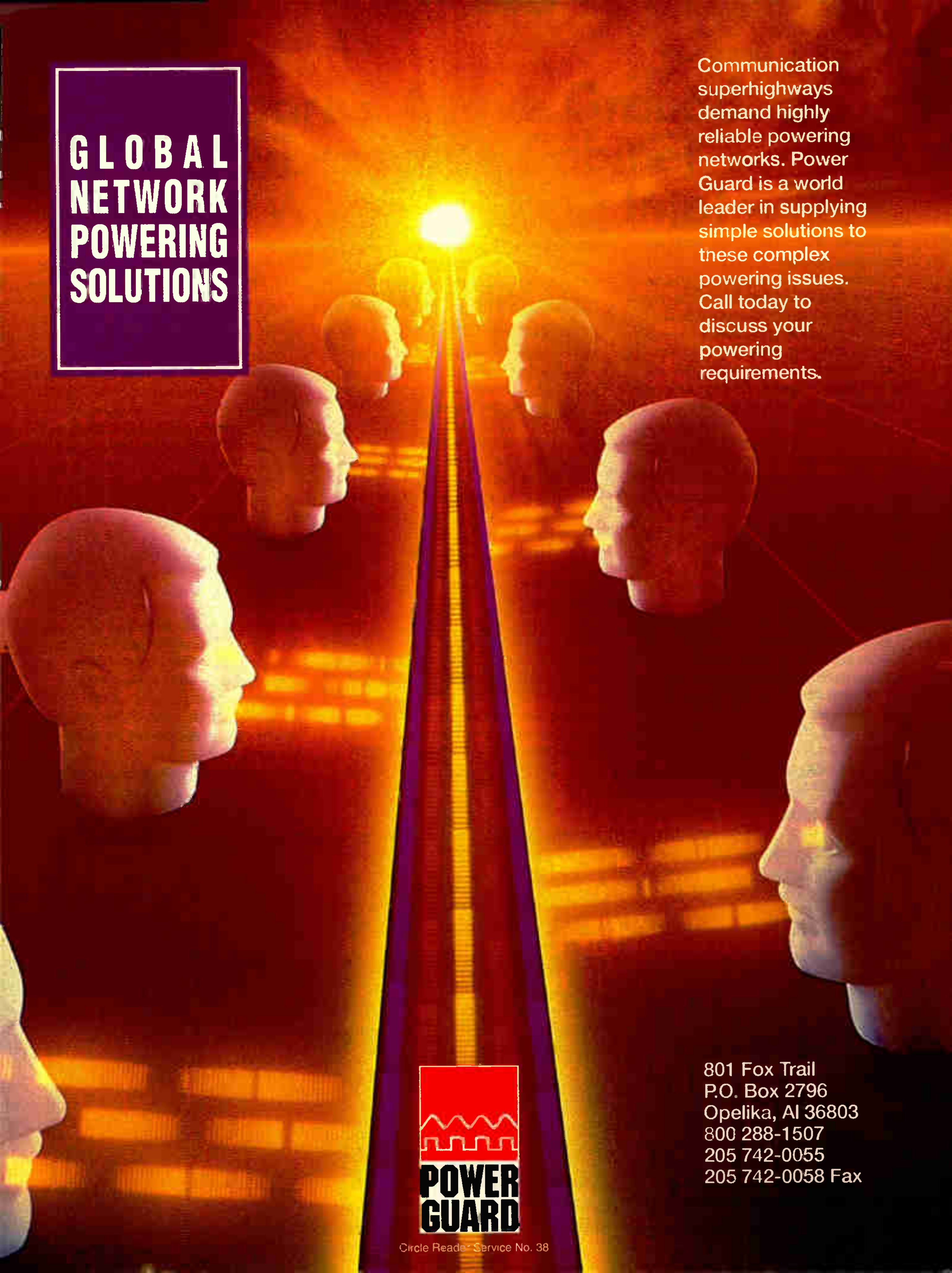
Creating theft of service awareness throughout Continental's employee base and franchise areas is a constant, ongoing endeavor. Our regularly conducted employee awareness meetings serve to remind and educate employees on such signal theft issues as:

✔ unlawful modification and distribution of convertors/decoders,
✔ current state and federal laws,
✔ demonstrations of modified convertors and/or decoders,
✔ procedures to follow upon discovery of unauthorized devices,
✔ how unlawful devices undermine the industry and affect jobs,

Cable television fraud and piracy interview questions

The following questions are asked by Continental's auditors during an interview with a suspected cable pirate:

1. What is the name of the business(es) you work for?
2. Who is the owner?
3. Who is your supervisor? Who do you report to?
4. Who is the manager?
5. Who is the bookkeeper?
6. Who pays you?
7. What are your job duties?
8. How are you paid? (cash, check; weekly, monthly?) Are taxes taken out of your paycheck?
9. How long have you worked for this company?
10. Where did you work before?
11. How long has the business been located here? Other locations? Has the business gone under any other names that you know of?
12. Where are the shipping and receiving locations?
13. Where are the records for shipping and receiving kept?
14. Who has access to the computer?
15. Who else do you know in this type of business?
16. Are there any cable company employees involved? Do you know who they are and which cable company they work for?
17. How are the boxes modified to receive all the cable channels? Who modifies the boxes? Who is the technician?
18. Where are the boxes modified? Is there a separate location where modifications take place?
19. Are there any off-site storage locations with additional cable television equipment?
20. Who trained you to do convertor modifications?
21. Where do you get raw boxes to modify?
22. How many boxes do you sell per week, on average?
23. Why are the serial numbers removed from the cable boxes? Who authorizes you to remove the serial numbers?
24. How much do the modified boxes sell for, on average?
25. Who do you sell the boxes to? Do you sell to out-of-state buyers or just to California users?
26. Where do the orders to buy boxes come from?
27. Are the modified convertor boxes guaranteed?
28. Where are the sales records kept?
29. Do you know modification of convertor boxes is against the law?
30. Do you have legal cable TV service at your residence?
31. What else can you tell us regarding the operation of the business?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Signal piracy: special project auditing and how it works

Special project auditors (two-person teams) focus primarily on lowest tier basic customer accounts. Each month the system in which the auditors are working supply a printout of the new lowest tier customer accounts to the auditors, broken down by numerical residence number, alphabetic street name and census tract. The auditors use this printout to generate daily lead sheets. Working from lead sheets, the auditors will attempt to gain access into customer homes for inspection of company-issued convertors. If the auditors find a convertor which has been modified to receive all channels, the customer will be asked to surrender it.

If the modified convertor has a serial number on it and the serial number matches the convertor we issued, the customer is charged a $90 damage/replacement fee. If the modified convertor has had the serial number removed or the serial number does not match what we issued, the customer is charged a $90 replacement fee. This damage/replacement fee is collected in one of two ways: the full amount at the time of the convertor swap-out, or half at the time of the swap-out and half on the customer's next billing cycle.

In some cases, the customer refuses to pay the damage/replacement fee or does not have at least half the fee to pay. In these cases, the auditors inform the customer that their service will be terminated until full payment can be arranged through the security department. If the service is disconnected, the audit team notifies the designated customer service personnel to stop billing and flag the account as "unserviceable security department." Should the customer call in for re-connection, the CSR will know to direct the customer to the security department for handling of the account.

Accounts passed by auditors are coded within the billing system for future information retrieval, as follows:

1. Removed modified convertor
2. No access/not home
3. Customer refused access
4. Access granted/account OK

Customer or non-customers in possession and using a modified convertor which the audit team recovers are sent a demand letter within 10 days of the discovery or recovery. The demand letter is similar to the demand letter that is sent to commercial establishments found to be in violation of cable theft laws. Customers or non-customers who do not settle with Continental within a reasonable time frame are sent a second demand letter from a local legal counsel. If settlement still isn't reached through demand letters, the legal counsel files a federal civil complaint.

It is in the resident's best interest to settle the case quickly, because each action taken by Continental will void previous settlement conditions and increase future conditions. If the auditors discover a modified convertor at a residence and the resident refuses to surrender the convertor, a call is placed to the police department.

Field observations are of the utmost importance in these cases, and each modified convertor recovered must be accompanied by a report. Reports are completed by auditors directly following the recovery of a modified convertor. Information contained in the report includes date and time of observation, names, descriptions and statements of persons preset at the residence, and an investigative summary. The field observation is then used to help settle cases in or out of court.

After roughly three months of these audits, we tracked the following:

- Active accounts accessed: 490
- Modified convertors recovered: 174
- Accounts OK: 316
- Modified/damaged convertor fees collected: $6,200.


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CONTINENTAL CABLEVISION REGIONAL SECURITY

Residential Unauthorized Reception
Field Observation Report

Date of Report: ______________ CCI# ______________

Account #: ______________ Installed Date Account Status: ______________

Service Address: ______________

System Office: ______________ Time of Observation : *From* ________ *To* ________

Service Downgrade: From________ To__________ Date:__________

Description and Comments of Resident/Customer:______________

Investigative summary

Continued from page 60

gation indicated communication and camaraderie between unauthorized device distributors. With the combined effort of Continental Cablevision personnel and other industry experts, Depweg was able to file felony criminal charges of conspiracy to commit cable theft on 12 individuals.

Continental Federal civil suits on three of the individuals and their companies. Currently, one individual and his companies has settled with Continental for $2.75 million and has been ordered by a Federal judge to immediately cease all sales, manufacture and storage of modified box decoders. Federal civil suits are ongoing with two others.

Initial results have confirmed the use of modified equipment by lowest basic tier customers to average about 35 percent. Upon discovery of a modified device, the customer is asked to surrender the device and pay a $90 damage fee before service is restored. As with commercial establishment theft of service violators, we will commence filing Federal civil suits on these end user.

Continental's security team provides field investigators with leads on a regular basis, and follow up on leads generated through Continental's toll-free cable theft tip line. Tap audit teams are scattered throughout the region within the different systems and indirectly report to the security director. The unauthorized drops to homes passed rate, on average, is 15 percent during the audit team's first pass through an area. Conversion rates run between 30 to 35 percent, on average. Second sweep auditing usually results in at least a 10 percent reduction in unauthorized to homes passed ratios.

Notably, the regional security department has found that in-house personnel are not immune to the temptation of unauthorized service activities. In fact, a good place to start investigations is at your system. Sting operations are set up routinely at various systems and the results can be surprising. These stings are most often set up by acquiring an apartment, installing hidden video and audio equipment, and placing an undercover operator within to play the part of the customer. In-house personnel are then routed to the location with a dummy work order in hand and a specified job task to perform.

Since the October 1992 investigation and seizures, Continental has successfully investigated and brought about criminal charges to numerous other "cable pirates" distributing their wares locally and nationally. CED

Prime Cable bets it all in Vegas

How to beat back competitive threats

By Roger Brown

The video marketplace is poised to become one of the hottest competitive landscapes now that Direct Broadcast Satellite services are set for introduction, telco video dialtone trials and commercial roll-outs are announced, and the level of competition brought on by new MMDS licensees surges.

Cable operators profess readiness to take on competition, citing years of experience in video delivery to consumers. But do they really know how to compete–or have years of virtual monopolistic luxury made them sluggish?

Prime Cable of Las Vegas is one cable system that is already beating back competitive threats in hopes of surviving the coming firestorm. The system is pouring considerable resources into new plant expansion in hopes of becoming the service provider of choice as new residents settle in this gambling mecca.

Harris Bass, a 15-year veteran of cable television and the vice president and general manager of the system, says his construction crews are building 200 miles of new plant every year, passing 22,000 new homes that spring up annually. His system has grown in subscribers 100 percent between 1990 and 1994, from 125,000 subs back then to more than 240,000 today. "I've never seen anything like the level of activity we have here in Las Vegas," he says.

While those who recall the wild franchising days of the late 1970s and early 1980s may differ with Bass, it's doubtful that any system is growing faster than Prime in Las Vegas. The desert gambling town leads the nation in housing starts and new-resident growth–and most new residents apparently want their MTV too.

Bass's system has been battling Super Channels of Nevada, a wireless operator, since 1991. Bass admits the arrival of the competitor spurred his system's new growth, which lately has been fueled by the area's fast-paced growth.

To keep competition at bay, Bass and his crew have made a concerted effort to improve relations with local developers and franchising authorities. "I think there's something to be learned here, with DBS coming on line now," he says.

Bass says his key to success has been garnering joint trench agreements with housing developers. This allows cable lines to be placed in the underground duct simultaneously with telephone cable and other utilities. "This has been extremely important for us," Bass reports. He says it costs Prime about $3 per foot to place the cable when the trench is open, but the cost balloons to $10 per foot if they miss the open trench and have to place cable later.

Consequently, his staff of 22 designers make sure they track the status of myriad construction projects. Bass says they routinely have between 600 and 800 projects on the board at any given time. "With that much activity, you could miss a trench in a heartbeat," says Bass. "We do a good job of not missing any open trench. It takes a lot of scrambling around to make it all happen, but we're the equivalent of Henry Ford's assembly line."

How can he afford to place cable in the ground long before the house is occupied? To Bass, the answer is in the question. He simply can't afford to wait because competition is out there lurking. "The days of having the luxury of deferring expenses (until an area is more heavily occupied) are gone forever," Bass warns. Now, when a new home is occupied, no one who orders cable has to wait more than two weeks to have it installed, which is sometimes faster than the telephone company activates a line, he says.

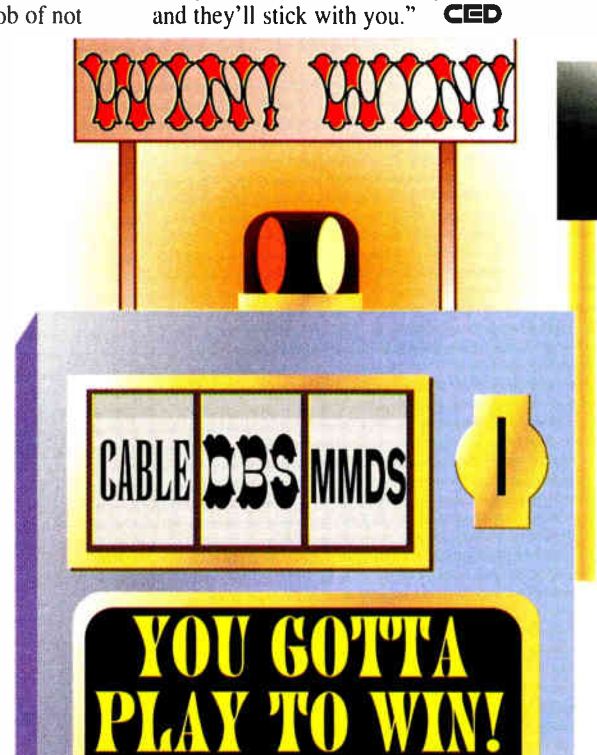
Of course, it wasn't always this way. As recently as 1992, Prime routinely activated plant when occupancy of a newly developed area reached about 40 percent (that is, when 40 of every 100 new homes had someone living in them). Today, Prime fires up plant even before occupancy reaches 10 percent.

Prime of Las Vegas is a 1980-era all-coaxial system that offers 52 channels of programming over its 3,000 miles of plant. A special 75-mile fiber plant serves about 50,000 downtown hotel rooms as well as the University of Nevada at Las Vegas. Penetration is about 56 percent overall, and about 52 percent for all new homes.

Prime's wireless competitor, however, appears to be less successful. According to Bass, the local MMDS service has about 4,500 subscribers who pay $4 less per month for 33 channels. About 20 percent–or 1,000 subscribers–live in Prime's service area.

Prime has aggressively sought arrangements with housing developers to promote homes as "cable ready" by supplying pre-wire equipment for the first two outlets at no charge. But it's a strategy the competition likes, too. According to Bass, the same policy is also being pursued by DirecTV, the DBS provider. He suspects that the local home developers may attempt to offer DBS service at a deeply discounted bulk rate.

Bass admits DBS will be a "substantial competitor," but he says competition need not be feared. "Competition has made us more responsive to the customer and better focused," he notes. "What I have learned is that you have to take care of your customers and they'll stick with you." CED



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A tutorial on FCC compliance

Aural carrier center frequency measurement

By Steve Johnson, Senior Project Engineer, Time Warner Cable

***Editor's note:** In the summer of 1993, CED published a draft of the NCTA Recommended Practices for Measurements on Cable Television Systems, which was being revised to reflect the new technical standards imposed by the Federal Communications Commission. That document was not meant to serve as a tutorial on testing procedures, but instead was a discussion of the specific Rules adopted by the FCC.*

This month, we continue with the second installment of an eight-part series that focus on specific test parameters and more fully explain how and why they are performed.

In late 1993, the NCTA Engineering Committee completed the revision of its *Recommended Practices for Measurement of Cable Television Systems* to reflect the FCC's requirements for proof of performance testing. The Technical Standards adopted by the FCC in 1992 can be found in Part 76 of the FCC Rules and Regulations, beginning at 76.601. One of the 13 required tests is measurement of a cable channel's aural carrier center frequency; or the difference frequency between the visual and aural carriers.

Why is this important? The primary reason is that aural carriers which are out of tolerance can cause interference to upper adjacent video signals, especially if the audio carrier's level is too high.

Secondly, if the aural carrier center frequency strays too far from the 4.5 MHz standard, it causes tuning problems for cable compatible consumer equipment and with our own convertors.

For stereo signals (BTSC), the frequency accuracy can also have a bearing on the audio quality and stereo separation.

What exactly does the rule require? The FCC rule 76.605(a)(2) states:

"The aural center frequency of the aural carrier must be 4.5 MHz, ±5 kHz above the frequency of the visual carrier at the output of the modulating or processing equipment of the cable television system, and at the subscriber terminal."

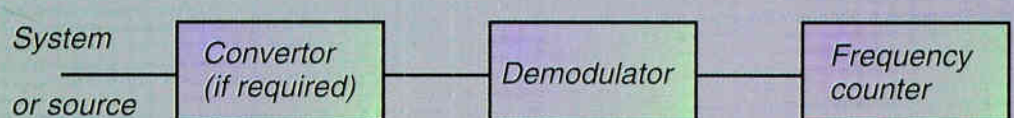
At any point in the cable system, the frequency difference between the visual and aural carriers must be between 4.495 and 4.505 MHz.

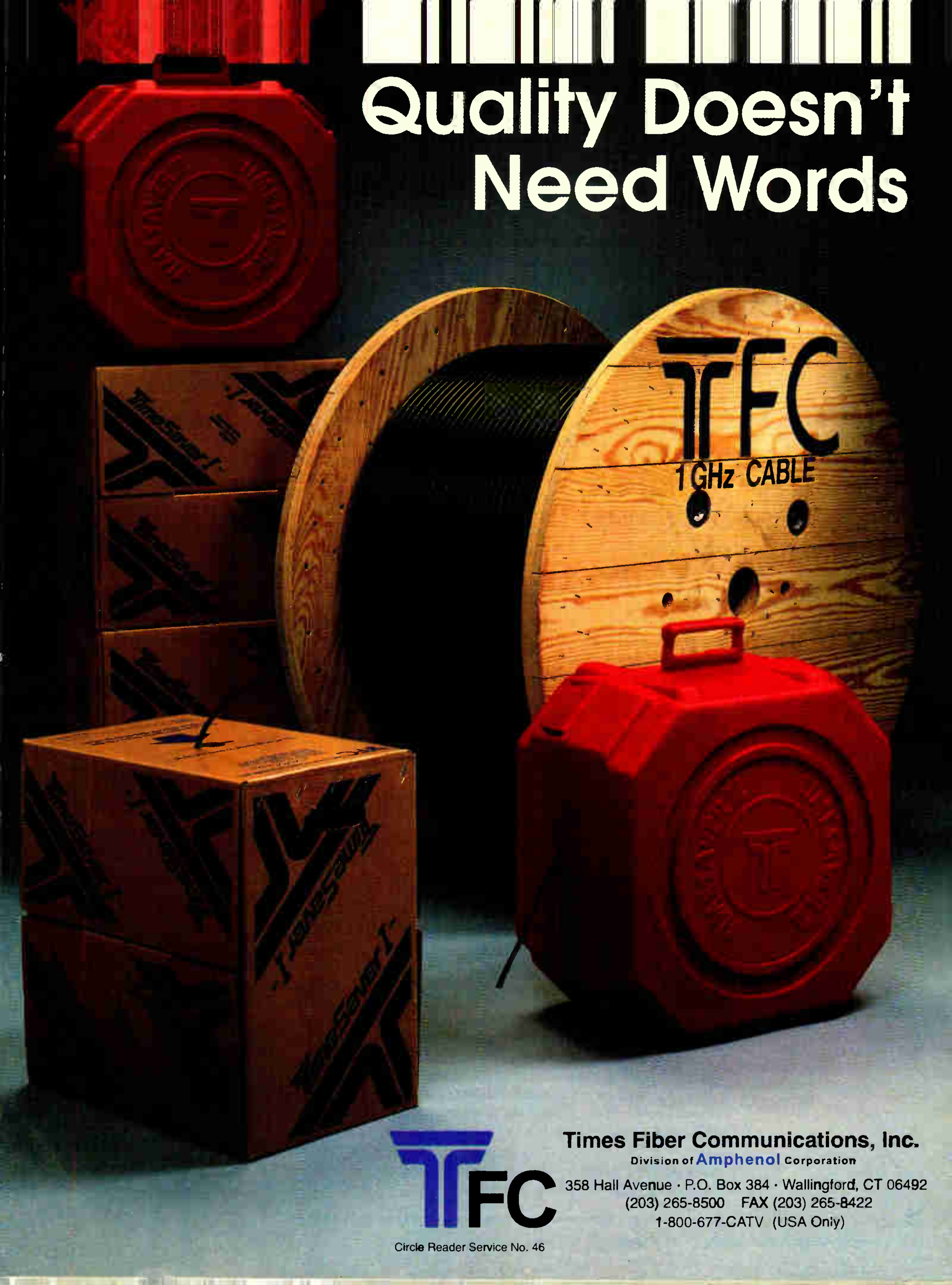
What factors affect the aural carrier center frequency? For an over-the-air broadcast signal, the broadcaster's transmitter controls the frequency accuracy up to the point where the signal is received at the cable television system's headend. If the signal is processed

Procedure: The following test equipment is required:

- *A frequency counter covering the direct frequency range to be measured.*
- *A demodulator with 4.5 MHz audio subcarrier output.*
- *A channel selector (if a convertor is used, it must be an RF non-volume-control type.)*

1. *Connect the equipment as shown below.*
2. *Read the frequency of the 4.5 MHz subcarrier output of the demodulator directly on the frequency counter.*
3. *Best results are obtained with no modulation on the sound carrier. If this is not possible, choose a long gate time on the frequency counter.*

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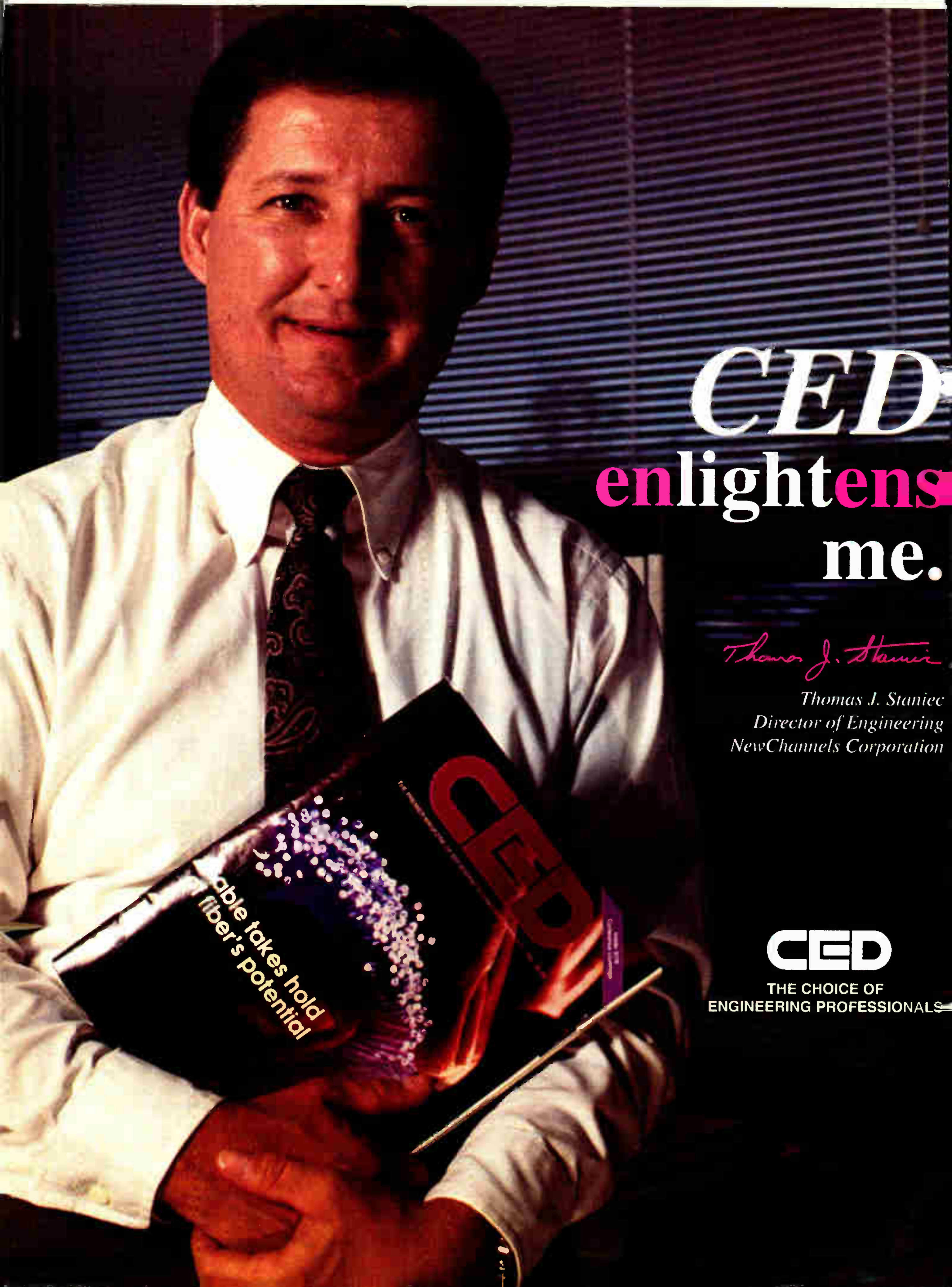
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Can the telcos wait for HFC?

Or does ADSL pick up the slack?

By Fred Dawson

A number of local exchange carriers (LECs) are exploring a path to broadband communications that combines hybrid fiber/coax video overlay networks with next-generation copper- or fiber/copper-based ADSL.

Rather than waiting for resolution of the many technical issues surrounding implementation of integrated hybrid fiber/coax (HFC) networks, these companies see an opportunity to compete with cable operators by delivering core cable product while offering an ADSL (asymmetrical digital subscriber line) interface that provides a full slate of on-demand, interactive and multimedia video services in combination with advanced narrowband. "I'm spending an awful lot of time on ADSL these days," comments a strategist at one RBOC widely associated with HFC technology.

Next-generation ADSL, if it pans out in forthcoming technical trials, provides LECs the option to offer a standalone service that is supplementary to cable, whether or not the telco provides the basic cable services. Ameritech, Nynex and US West are looking at the ADSL/HFC option, according to informed sources. Bell Atlantic, a long-time supporter of ADSL as an interim step to fiber broadband, had not announced its video network equipment selections at press time but was taking a hard look at HFC options, sources said.

Not an easy design

Conceptually, integrated HFC, where all services go over the fiber/coax facilities, has become the leading candidate to serve as the conduit into the broadband communications era for telcos and cable operators alike. But the range of design decisions that must be made to satisfy integrated broadband network requirements is mind boggling.

"You'll see a lot of testing, most of it in conjunction with the already announced trials, before there's serious deployment of fiber/coax full service networks," notes Charles Dougherty, director of telephony marketing at General Instrument Communications. "That's going to push some telco broadband agendas back at least a year."

The myriad technical challenges facing the local exchange carriers in the shift to delivering the full service slate over star/bus topology include: figuring out the best modulation techniques for upstream signals; choosing a digital video modulation scheme robust enough to deliver the downstream signal through the microreflection zone of premises wiring; dealing with the question of operations software, from transport layers and switching fabrics to APIs (application programs interfaces); determining how services are routed and processed at the customer premises; building the right bridges between the analog media entertainment system and telecommunications networks; finding an appropriate regional tansport system for AM video, and etching all these solutions onto silicon.

Of course, there are other concerns, such as the amount of bandwidth to allocate to different types of services and the extent to which server-based on-demand services must be accommodated in early iterations of the network. These are issues tied more to cost and marketing strategies than to technical resolution, but working them through will be time-consuming.

ADSL not DOA yet

Meanwhile, next-generation ADSL is on a fast lane to widespread trials which could trigger ramp-up to production of microprocessor-based solutions at any moment. "We've reached our limit for meeting ADSL trial orders," says Cortland Wolfe, an engineering manager at Northern Telecom. "A lot of companies are going to be testing the system."

The NT system in question operates at 7 bits per hertz over 12,000 feet of twisted pair copper, supporting 7 megabit per second (mbps) throughput, including overhead. The Bell carriers' ad hoc ADSL task force has overwhelmingly endorsed the discrete multitone (DMT) modulation technique used by NT as the foundation for next generation ADSL. That service will support various channelization schemes for video at a cumulative rate of 6 mbps together with full ISDN, standard analog telephone and an upstream data channel, all operating simultaneously over a single twisted-pair line.

Apparently, the DMT solution has answered criticism that ADSL would be impractical because crosstalk from other lines would prevent bundling of ADSL and non-ADSL lines in the same sheath. In a demonstration at Supercomm, the telephone industry convention held in New Orleans last month, NT operated its ADSL system over a 12,000-foot link with a crosstalk load equivalent to 24 high-capacity digital subscriber lines (HDSL at 750 kilobits/second per line) grated HFC as a long-term solution, the ADSL option as an interim tie-in with HFC overlays has been largely obscured.

At Supercomm, announcements of integrated video/data/voice HFC systems were the standout feature, with commitments to product development from ADC Telecommunications, Raynet Corp., Northern Telecom, Scientific-Atlanta, AT&T (alone and in alliance with Antec Corp.), an alliance of DSC Communications and General Instrument Corp. and a new alliance between Reliance/CommTec and Philips Broadband.

The question for

comes with "market-ready software."

With ADSL poised on a faster track than the higher capacity integrated HFC, the question for long-term deployment strategists is, when will the market for advanced services start? If on-demand video is a market winner and enhanced digital phone services linked to phones with small screens begin to drive transactional services, waiting for integrated HFC to come on line could be a problem.

"You'll see the overlay networks such as we're supplying to Ameritech go in pretty much on schedule," said Jack Reily, VP and GM for access platforms at

◆ EFFECT OF DIGITAL CARRIERS

How digital carriers affect analog plant

A look at distortion products

By Jeff Hamilton and Dean Stoneback, General Instrument

The technology distributing analog video carriers through a CATV plant has been developed over many years. Specifications, test methods and performance criteria are all well established. Much of this technology is based on practical experience and the logic is not always obvious.

Distortion performance, for example, is specified as composite second order (CSO) and composite triple beat (CTB) and is measured with unmodulated "CW" carriers. In an operating system, however, the carriers are modulated. This drops the distortion beat power substantially below the specified levels. If only one carrier was modulated with video while performing the distortion test, a system meeting the -53 dB specifications would create a terrible picture on that one modulated channel. Only when the rest of the carriers are modulated will the visible picture beats and patterns disappear. Proper cable system operation depends on the effect of lower beats when the carriers are modulated. The specifications were set based on operating the plant with modulated carriers while testing with CW carriers.

The way CATV distribution plant is specified and designed will require some new thinking as digital carriers are introduced into the mix. In particular, the basic physics of how digital carriers behave with amplifier distortion offers new opportunities and risks to distribution plant design.

As plant bandwidth is extended with analog video carriers, the number of distortion products or beats increases exponentially. Distribution amplifier power output levels are reduced to keep the composite of all these beats, CSO and CTB, below an acceptable threshold. This means closer amplifier spacing, more amplifiers, better coaxial cable and higher cost plant.

Adding digital carriers to a distribution system does not add new CSO or CTB beats. Instead, distortion beats of digital carriers generate the new impairment, "intermodulation noise."

Determining its impact

As the analog carriers are switched over to digital modulation, the distortion beats rapidly become intermodulation noise. In a 750 MHz system with 77 analog and 33 digital carriers, only 30 percent of the carriers are digital but 67 percent of third-order beats on the last analog channel are intermodulation noise.

This paper describes efforts to quantify the level of this new impairment to analog transmission and how to minimize its impact.

Digital transmission spectrum

Using an advanced 64 QAM modulation and error correction technology built upon the art developed for HDTV broadcast testing, a 27 mbps (megabits per second) information rate can be provided in each 6 MHz cable channel. This high density modulation in 6 MHz channels makes optimum use of cable spectrum while offering maximum compatibility with existing CATV equipment, practices and procedures.

In the frequency domain, these QAM digital carriers will look like 5 MHz bands of white noise. The modulation is balanced double sideband suppressed carrier. Transmit filtering is square-root raised cosine with an excess bandwidth under 0.2 and a symbol frequency of just over 5 MHz. The compressed video multiplex is bit scrambled to ensure the data stream is sufficiently random to maintain this noise-like appearance by equally exciting each of the 64 modulation states.

One advantage of this balanced modulation is the absence of residual carrier. The distribution amplifiers are not loaded by unnecessary carrier power as they are with analog video modulation and other forms of digital modulation. All of the transmitted power is in the modulation sidebands which carry the information. This avoids generating additional dis-

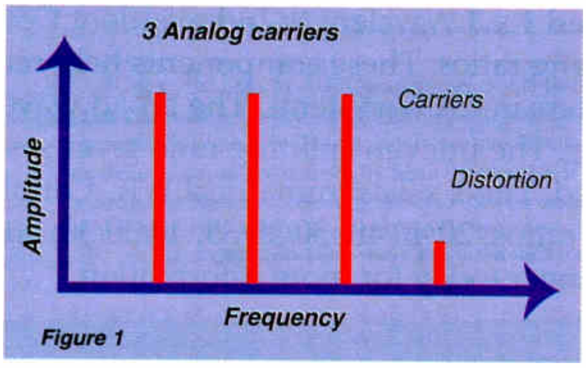

Figure 1

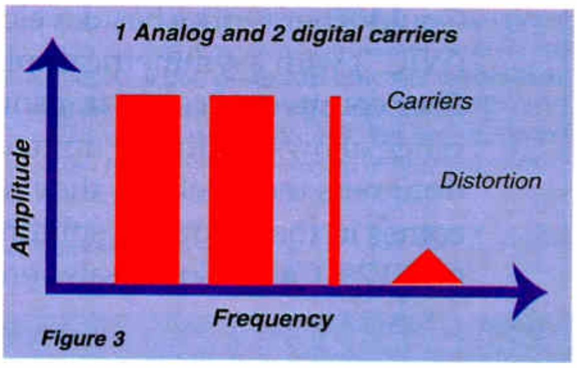

Figure 3

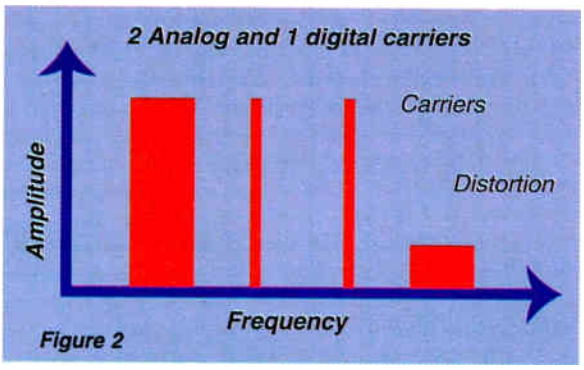

Figure 2

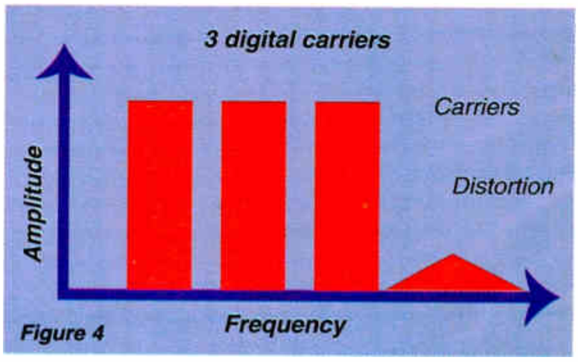

Figure 4

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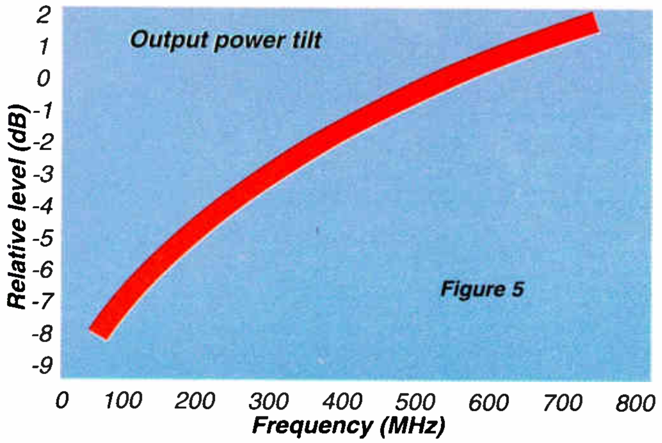
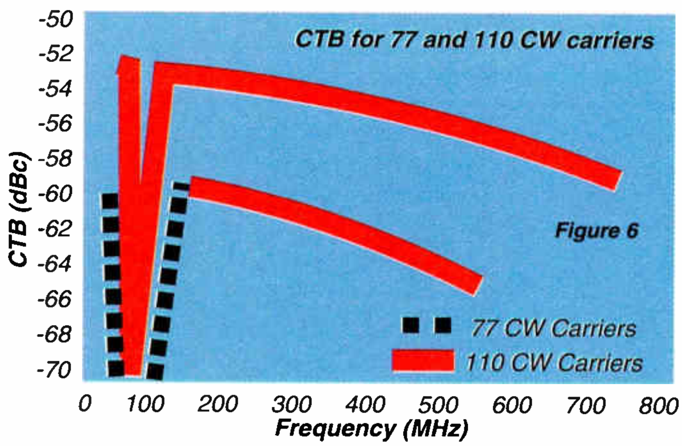
crete CTB and CSO beats, increases amplifier headroom and reduces analog carrier distortion levels by operating further from the knee in the curve of amplifier non-linearity (crash point).

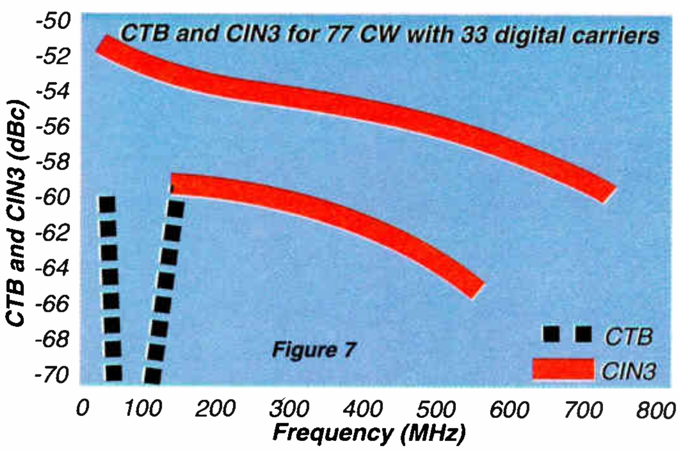
Distortion beat theory

Individual (single) beats. When CW carriers mix with each other through amplifier non-linearity, they produce second- and third-order beats. Some of these beats contribute to CSO and CTB in the transmission band. These "ISOs" (individual second order and "ITBs" (individual triple beats) are the result of multiplication of the carriers in the time domain, which is convolution in the frequency domain. Because the CW carrier spectra is all impulses, the beats also appear as impulses in the frequency domain.

Because of the DC bias used in AM video modulation, most of the analog video carrier power remains at the frequency of the CW carrier. Analog modulated video carriers have lower average power, but the same peak power and aproximately the same impulsive spectral shape as CW carriers. The spectrum of ISO and ITB from analog modulated carriers look like impulses. (See Figure 1.)







This is not true for digitally modulated carriers. The 64 QAM modulated carrier looks like a 5 MHz band of white noise (a pulse in the frequency domain). See Figure 2. When this "pulse" is convolved with two analog carriers, the result will be a "pulse" of noise. This is called intermodulation noise. If the digital carrier is at the same average power as the CW carrier, the intermodulation noise beat will have the same total average power as the ISO or ITB of the CW carriers.

If the distortion beat involves two digital channels and one analog channel, the resulting distortion energy will appear as a triangle of noise in the frequency domain (See Figure 3). The triangle will have twice the width of the pulse-shaped distortion and will have the same amplitude. The spectral broadening is from each spectral component of the digital carrier beating with each component of the second digital carrier.

Finally, if the distortion is the result of three digital channels beating against each other, the distortion will appear as a band-limited Gaussian shape (See Figure 4). The width will be three times the digital carrier width, or 15 MHz. The height will be three-quarters as high as the pulse-shaped distortion and the total average power will be the same as a CW carrier beat.

All the results above assume that all channels are transmitted at the same total power.

Multiple beats. Just as many discrete beats of CW carriers add to produce CTB in an all-analog system, the various intermodulation noise beats will add to produce "composite intermodulation noise" (CIN). The level of this noise will depend on the location of both the analog and digital channels, and on their level. "CIN3" is the composite of all the third-order beats involving at least one digital carrier and so giving the beat one of the above-described spectral shapes. The second-order digital beat composite is "CIN2." Since the principle significance of either type of CIN is as an impairment to analog video transmission, levels are normalized to a 4 MHz noise bandwidth.

Calculated CIN performance

A computer program was written to calculate all the beats produced by carriers. These carriers can be any combination of CW or digital and may have any amplitude assigned to them. The output of the program contains both the total number of each type of beat and the total amplitude of the beats at every frequency. If digital carriers are involved, the computer also produces the total CIN2 and CIN3 at each channel.

This program was used to predict the performance of 550 MHz and 750 MHz channel loadings for a hypothetical device which has a flat distortion vs. frequency characteristic.

The simulations were done with tilted output spectrums. In order to establish a baseline for a mixed analog/digital system, all output levels are referenced to the level at 547.25 MHz. For ease of measurement, this reference is called 0 dB (See Figure 5).

This tilt was used in the computer program to produce the levels of the beats for both 77 and 110 channel CW loading. When these beats are compared to the carrier level at that channel, the results are given in dB below carrier (dBc). The results shown in Figure 6 have been evenly scaled across the spectrum to produce a worst-case CTB of -60 dBc for 77 CW carriers. As expected, significant CTB performance degradation occurs as more CW carriers are added.

If instead of adding more CW channels, digital carriers are used above 550 MHz, the

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discrete beat levels will be the same as they were for 77 CW carriers. This is because no new discrete beats are produced as digital carriers are added. However, intermodulation noise will be produced. The levels of CTB and CIN3 are shown in Figure 7 for a channel loading of 77 CW carriers from 50 MHz to 550 MHz and 33 digital carriers from 550 MHz to 750 MHz.

It is unlikely that the digital channels will be operated at the same power as the analog channels. Figure 7 showed that the CIN3 is very bad under these conditions. Since digital transmission requires less carrier-to-noise to maintain picture quality, the digital carriers can be lowered by several dB. Figure 8 shows the output levels of a system with digital carriers above 550 MHz. The digital carriers are 8 dB lower than the equivalent analog level.

The CTB and CIN3 for the reduced digital levels is shown in Figure 9. Note that the CIN3 performance has improved significantly from Figure 7.

Real amplifiers

Frequency dependence of distortion. Figures 5 through 9 are for a hypothetical device with a flat distortion vs. frequency curve. In order to account for the perofrmance of real amplifiers, several 750 MHz power doubling amplifiers were characterized for distortion with CW carriers. These results were tabulated so that the behavior of the amplifiers could be determined. Since different numbers of beats contribute to the CTB at different frequencies, the CTB results of the amplifier tests were converted to their equivalent ITB performance. The number of beats at each channel was determined by the computer program described previously.

Beat size is not strongly influenced by the frequencies of the carriers which caused the beats.

To simplify computation, we hypothesized that the amplitude of the distortion at a particular frequency depends only on the frequency of the each ITB, its type (A±B±C, 2A±B, 3A) and the number of beats adding at that frequency and not on the frequency of the original carriers that mixed to create the ITB. Furthermore, since intermodulation beats (2A±B) are 6 dB smaller and occur much less often than triple beats (A±B±C), they are insignificant. Based on these assumptions, the ITB performance at a given frequency can be estimated as:

ITB = CTB - 10log(# of beats) + 3

Correction factor

The +3 term corrects for a response error in the spectrum analyzer. When the analyzer is subjected to large numbers of carriers (or beats) in close proximity to each other, the detector and video filter create an error. The correction factor of 3 dB was determined by experimentation (test results are shown in Figure 10.) Data was taken for both 77 channel (550 MHz) and 110 channel (750 MHz) CW loading. All amplifier output levels were +44 dBmV flat. The measured CTB and calculated ITB are shown for both tests.

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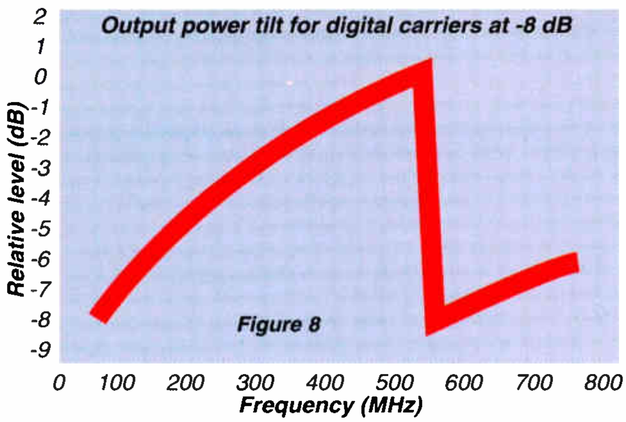

Figure 8

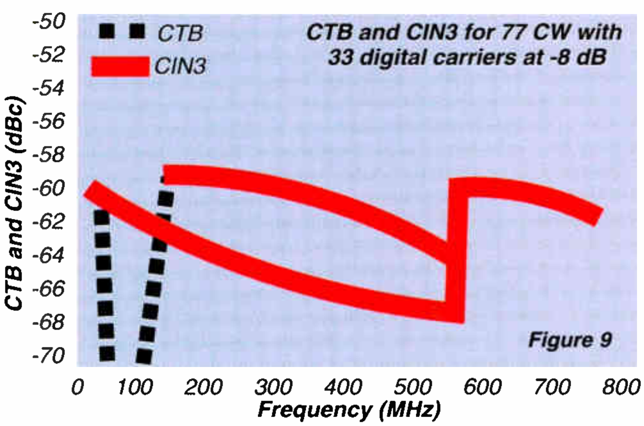

Figure 9

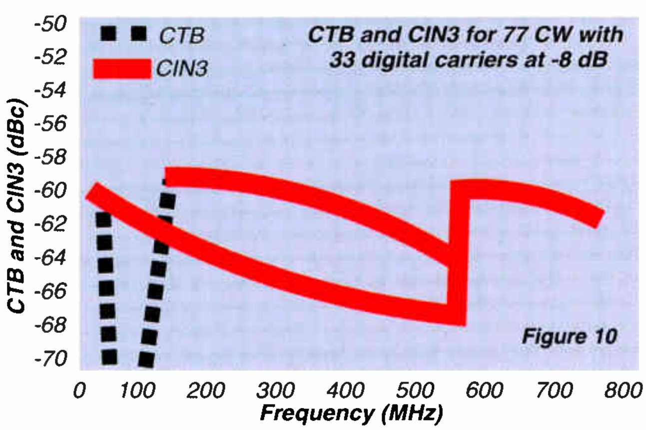

Figure 10

The ITB curves closely match. This supports the hypothesis that the beat size is not strongly influenced by the frequencies of the carriers which caused the beats. Notice that the ITB is not flat across the frequency band. Instead, it has a strong frequency dependence, increasing with increasing frequency. This effect should be factored into CIN3 projections.

Test method. In order to conduct testing of mixed analog/digital systems, the device under test was driven with a combined spectrum designed to model analog carriers from 50 MHz to 550 MHz and digital carriers from 600 MHz to 750 MHz. Twenty-five digital carriers were simulated by bandpass filtering the output of a broadband noise source. In order to accurately make measurements at the highest likely analog carrier, 547.25 MHz, the noise was band limited to between 600 MHz and 750 MHz.).

The digital carriers were 6 dB below the CW carriers, although they appeared lower than this on an analyzer. The power in a digital carrier is distributed over the channel so it's apparent power on a spectrum analyzer display is highly dependent on the resolution bandwidth setting. This is the same effect as exhibited with broadband noise. Digital carrier power is measured with the noise power measurement facility of the analyzer and normalized to its 3 dB bandwidth of 5 MHz.

Projected and measured performance

The next step in determining actual system performance is to combine the calculated beat levels with the ITB frequency dependence. A similar procedure is followed for the second-order beats. In order to produce the best possible prediction of CIN, the third-order and second-order beat performance curves were scaled to provide an exact match to the CTB and CSO performance of the amplifier under test. The measured thermal carrier-to-noise of the amplifier was also used in the prediction of total carrier-to-noise.

The predicted performance of a single amplifier is shown in Table 1. The output level is +47 dBmV with a 10 dB tilt from 50 MHz to 750 MHz. The total carrier-to-noise is the sum of CIN2, CIN3 and thermal noise on a 10*log basis. The total carrier-to-noise of the amplifier was then measured. The predicted and measured results for 55.25 MHz are shown in Figure 11. The results for 547.25 MHz are shown in Figure 12.

The figures show a very good correlation between the calculated and measured results.

Crash point. Under normal behavior, CTB is expected to get 2 dB worse for every dB increase in output level. As the amplifier is driven into compression, the performance will deviate from this expectation. With 77 CW carriers, the amplifiers are operating with a certain total load and driving a range of peak-to-peak output voltages. This increases CTB on the 77 CW carriers as the amplifier is driven further beyond its "well-behaved" range. The crash point is defined as the point at which CTB deviates by 1 dB from the expected 2:1 behavior.

A line extender was tested with 77 channel loading with a 10 dB cable equivalent tilt between 50 MHz and 750 MHz. The CTB distortion was measured at 547.25 MHz. The test was then repeated with noise added between 600 MHz and 750 MHz. The noise was adjusted so the noise power in any 6 MHz bandwidth was equal to the power of one of the analog carriers. The test was then repeated with the digital channels (noise) 6 dB lower. The test results are shown in Table 2 and Figure 13.

The crash point is seen to be +51 for the analog-only system; +50 for the digital carriers at -6; and between +48 and +49 for the digital

Table 1 Cascade carrier-to-noise performance prediction

Digital level below analog level	55.25 MHz				547.25 MHz			
	CIN2 (dBc)	CIN3 (dBc)	Thermal C/N	C/N total	CIN2 (dBc)	CIN3 (dBc)	Thermal C/N	C/N total
0	64.8	60.0	65.2	57.9	65.2	56.3	68.9	55.6
2	68.7	62.2	65.2	59.8	67.2	59.3	68.9	58.3
4	72.4	75.3	65.2	61.4	69.2	62.1	68.9	60.6
6	76.0	66.4	65.2	62.5	71.2	64.6	68.9	62.6
8	79.4	68.4	65.2	63.4	73.2	66.9	68.9	64.2
10	82.6	70.5	65.2	64.0	75.2	69.1	68.9	65.5

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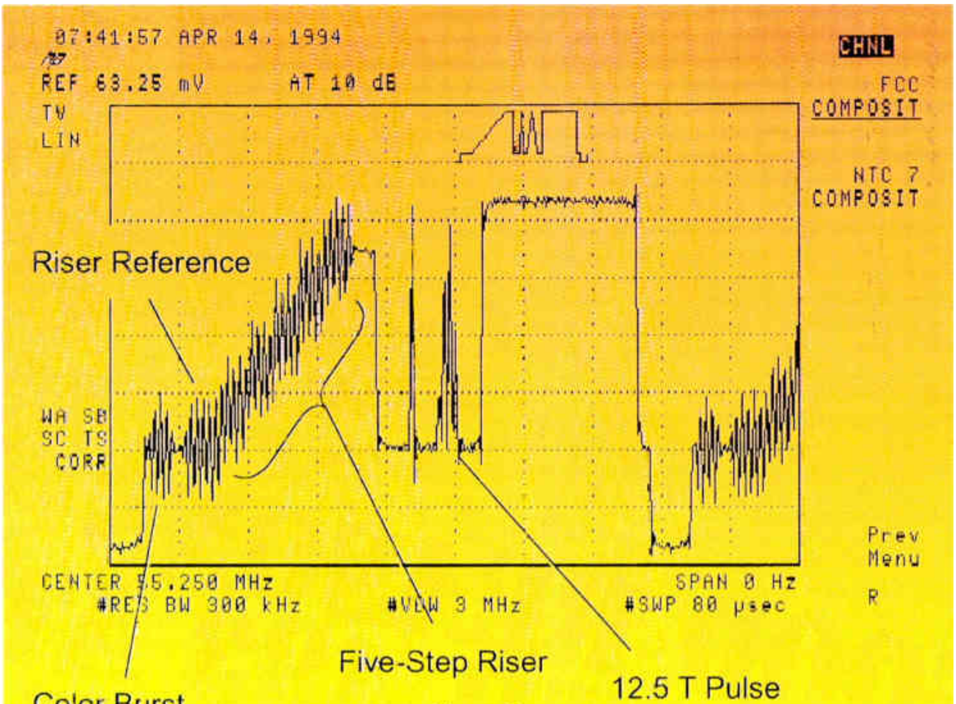

Figure 2

even field has been painted, the beam is again blanked and reset to the top of the screen, and the painting of a new frame begins.

While a television set prepares to receive a new field, the first 21 lines are not displayed in the picture. During this time, which is referred to as the vertical blanking interval, the blanked electron beam is retraced from the bottom to the top of the screen, and the vertical sweep generator is resynchronized. The FCC requires that broadcasters include special vertical interval test signals (VITS) in their transmissions. These VITS are most often inserted in lines 10 to 20 to allow in-service testing of TV broadcast equipment.

The FCC Composite test signal (also called the "Composite Radiated Signal" and intended for use by terrestrial broadcasters) and the NTC-7 Composite test signal (intended for testing video facilities leased by broadcasters from the phone companies) have the video signal components needed to perform the three FCC video tests. The main difference between these two test signals is the sequence in which the video signal components are presented. Figures 2 to 4 illustrate the 5-step chroma riser and the 12.5 T composite pulse components of each composite signal type. (See Figures 2 through 4.)

Key to in-service testing is having instrumentation that can demodulate and analyze these composite test signals. A traditional approach combines a down converter, a demodulator and a waveform monitor to translate the signal from RF to IF to video.

Measurements can be taken manually on the waveform monitor using markers and visual interpretation. The operator may need to calculate the results manually using the displayed measurement values.

The one-box approach uses a TV receiver/demodulator circuit card installed in a spectrum analyzer. The TV receiver provides horizontal line and field triggering functions, which allows an operator to make non-interfering, time-synchronized tests. The analyzer automatically locates the composite test signal in lines 10 to 20 of the transmitted television signal. All video measurements are then run automatically and numeric results displayed. The operator has only to enter the channel number and the desired test. (See Figure 5.)

Differential Gain test

The peak-to-peak amplitude of the 3.58 MHz color subcarrier determines the color saturation or intensity. The differential gain test measures the chroma subcarrier magnitude linearity vs. the luminance power or brightness level.

Poor differential gain affects the TV picture with a change in color saturation as the DC level or brightness changes. For example, as the luminance level of the picture changes from shade to bright sunlight, a field of grass might change from deep green to a pale, washed out green.

Differential Phase test

The phase of the 3.58 MHz color subcarrier relative to the color burst at the beginning of each horizontal line determines the color hue. The differential phase test measures the chroma subcarrier phase linearity vs. luminance

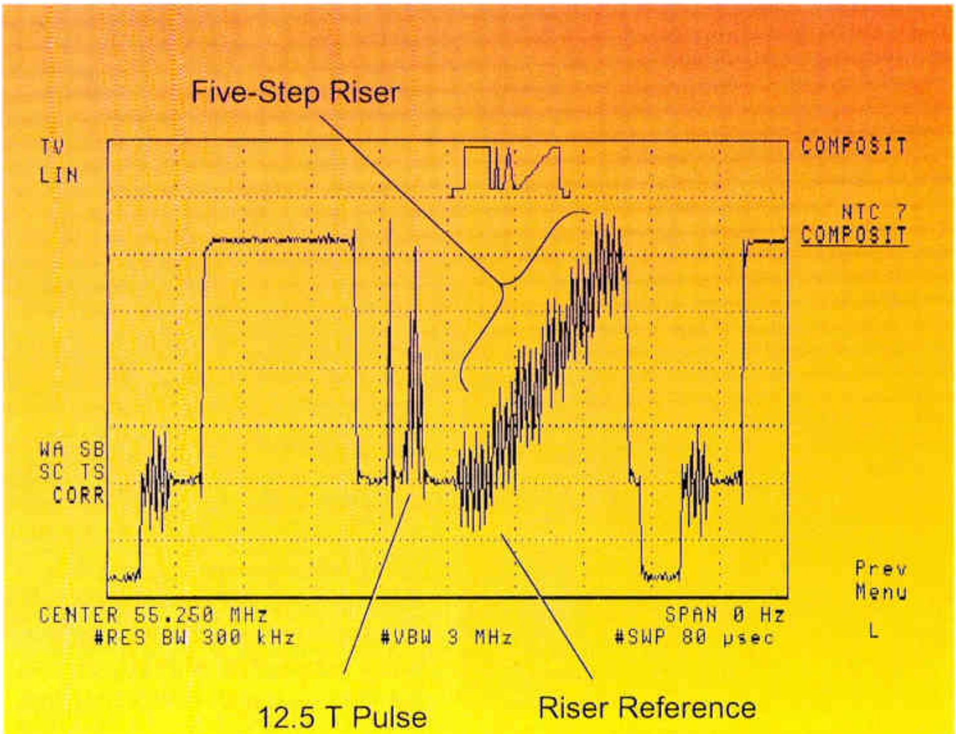

Figure 3

power or brightness level.

Poor differential phase affects the color hue as the TV picture changes between shade and bright sunlight. For example, as the luminosity or brightness changes, our field of grass might appear more blue or yellow, depending on the direction of the phase shift under the shady or sunny conditions.

Computing the results

The differential gain and differential phase tests are both made on the 5-step chroma riser present in the FCC or NTC-7 composite signals. We examine the test process using the TV receiver/spectrum analyzer, which makes the tests simultaneously.

The analyzer performs a fast Fourier transform (FFT) on the time domain samples of the 5-step riser to find the magnitude and phase of each step. Then, the magnitude of each step is normalized as a percentage of the reference magnitude of the blanking-level riser. The analyzer finds the maximum and minimum of the normalized packet (stair step) values. It calculates percent differential gain using the formula:

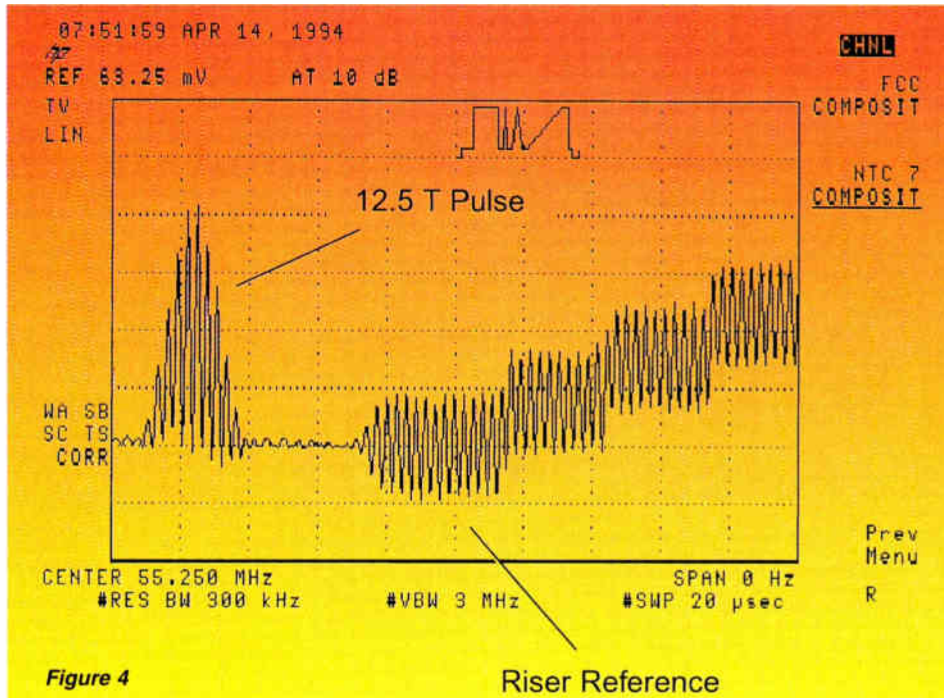

Figure 4

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DG=[(max-min)/(max+100)]*100

The phase of each step in the 5-step riser is normalized to the blanking level riser reference phase. The peak-to-peak degrees is expressed as the maximum minus the minimum of the normalized packet values:

DP = max-min

The analyzer displays the numeric results of these calculations for comparison to the FCC limits: 20 percent for differential gain and 10° for differential phase. It also provides easy access to the information for each signal packet. (See Figure 6.)

Chroma-luma delay inequality

Chroma-luma delay inequality (CLDI) is a measure of the time delay between the luminance (black and white) information and the chroma (color) information. Poor CLDI shows up in the picture as a horizontal misregistration of the color and the black and white information. It is sometimes called the "funny paper effect." In extreme cases, when a dark red vertical bar is viewed on the white background of a television screen, the bar appears to have one gray vertical edge and one bright red vertical edge. The dark red color is composed of a gray luminance signal and a red color signal. When the color is shifted by a time delay (or advance), the misregistration is seen at the vertical edges of the bar.

Broadcasters are required to pre-correct for the home TV receiver delay by advancing the chroma.

The CLDI test is a group delay measurement performed on the 12.5 T pulse present in the FCC or NTC-7 composite VITS. The 12.5 T pulse is composed of sine-squared-shaped luminance and chrominance pulses of equal amplitude. The sine-squared shaping of the pulses reduces the bandwidth that is required to accurately pass them. Thus, in the frequency domain two identical pulses appear: the luminance component centered on the visual carrier and the chrominance component centered on the color subcarrier. Each pulse is 1.2 MHz wide. The relative difference in the time-of-occurrence between the two pulses is the chroma-luma delay inequality.

The spectrum analyzer measures the relative time delay between the horizontal sync pulse and the chroma and luma pulses. The TV receiver provides time-synchronized triggering. In this procedure, the analyzer first tunes to the luma component and measures its center in units of time. Then the analyzer tunes to the chroma component and performs a similar measurement. Finally, it calculates the time difference between the two pulses and displays the result as the CLDI.

CLDI time results can be positive or negative. Positive results occur when chrominance lags behind luminance, and negative CLDI results when chrominance leads luminance.

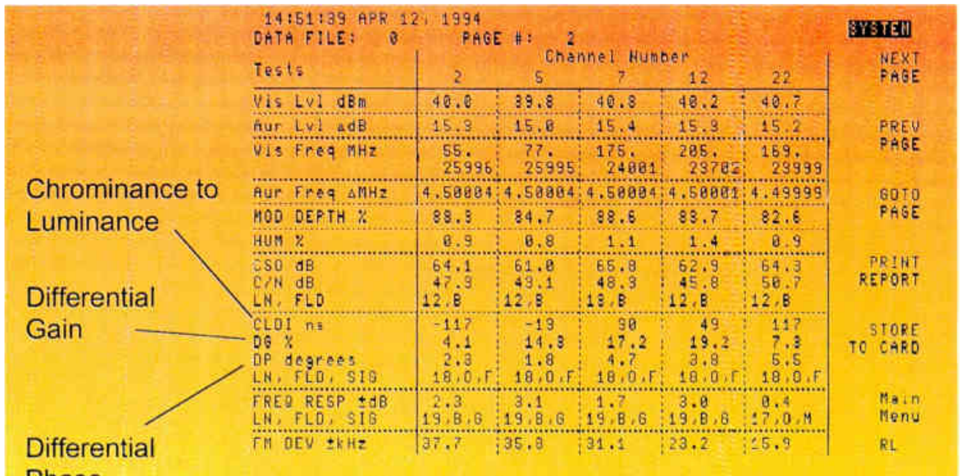
Broadcasters are required to precorrect for home TV receiver delay by advancing the chroma 170 nanoseconds (ns). The spectrum analyzer references its measurement result to this precorrection and will give a readout of 0 ns if chroma leads luma by exactly 170 ns.

The FCC limit for CLDI is ±170 ns relative to the precorrected value.

Relative measurements

Because the programming source, such as local broadcast or satellite transmission, can contribute to degradation of the TV signal, it is important in FCC compliance testing to be able to separate these contributions from that of the cable TV headend equipment.

The contribution of devices to the total differential gain, differential phase, and CLDI can be found using relative measurements. Relative measurements are especially critical when the



Tests	Channel Number 2	5	7	12	22
Vis Lvl dBm	40.0	39.8	40.8	40.2	40.7
Aur Lvl ΔdB	15.9	15.0	15.4	15.9	15.2
Vis Freq MHz	55.25996	77.25995	175.24001	205.23702	169.23999
Aur Freq ΔMHz	4.50004	4.50004	4.50004	4.50001	4.49999
MOD DEPTH %	88.3	84.7	88.6	83.7	82.6
HUM %	0.9	0.8	1.1	1.4	0.9
CSO dB	64.1	61.0	65.8	62.9	64.3
C/N dB	47.9	43.1	48.9	45.8	50.7
LN, FLD	12,B	12,B	13,B	12,B	12,B
CLDI ns	-117	-19	90	49	117
DG %	4.1	14.8	17.2	19.2	7.3
DP degrees	2.3	1.8	4.7	3.8	5.5
LN, FLD, SIG	18,O,F	18,O,F	18,O,F	18,O,F	18,O,F
FREQ RESP ±dB	2.3	3.1	1.7	3.0	0.4
LN, FLD, SIG	19,B,G	19,B,G	19,B,G	19,B,G	17,O,M
FM DEV ±kHz	37.7	35.8	31.1	23.2	15.9

Figure 5. All tests on five channels using automatic mode.

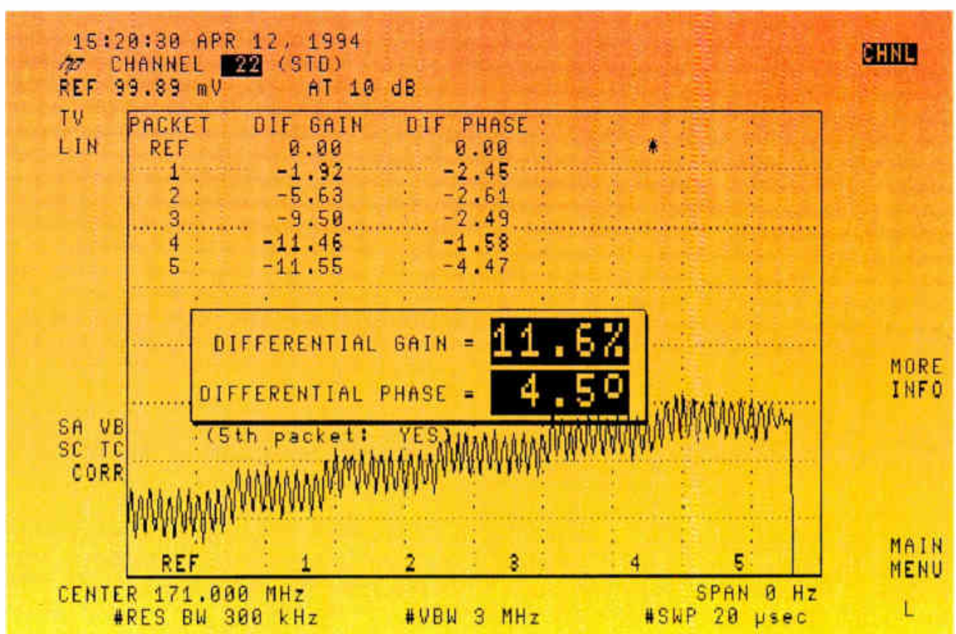


Figure 6. Differential gain and phase packet values.

total measured value is close to the FCC limits. (For channels that do not include the FCC or NTC-7 composite test signal and which are converted to baseband, a VITS line insertor can be used to test the contribution of subsequent equipment in the system. In this case, relative measurements are not necessary because the source doesn't contribute to the total differential gain, differential phase, and CLDI.)

The basic procedure involves measuring the differential gain, differential phase, or CLDI at the input and the output of the headend. The two results are subtracted using the steps in the following example to find the headend performance.

A technician using the spectrum analyzer runs the differential gain and differential phase measurement at the headend processor input. After the measurement is completed, he or she presses a key to obtain the values of the individual packets, and records each value.

Next, the technician repeats this procedure at the headend processor output. Then each input packet value is subtracted from its corresponding output packet value to find the differences.

For the resulting differences of the differential gain packets, the maximum and minimum packet values are found. (See Figure 8.)

To find the relative differential gain, the change in differential gain is computed using the following equation:

Relative DG=[(max-min)/(max+100)]*100

For the example above, max= +1.4 and min= -1.5, so:

Relative DG= [(1.4-1.5)/(1.4+100)]*100=[2.9/101.4]*100=2.9%

This compares with the absolute measurement of 14.8 percent.

For the differences of the differential phase packets, the maximum and minimum values are again found and the peak-to-peak changes are computed by subtracting the maximum from the minimum. (See Figure 9.)

In the example above, max = 0° and min = 2.3°, so:

Relative DP=max-min=0-(-2.3)=2.3°.

This compares to the absolute measurement of 3.8°.

For the CLDI test, the same procedure can be followed. The technician runs the CLDI test at the headend processor input and records the result, then runs the test at the headend output and records the result. The input result is subtracted from the output result to yield the difference:

result at output	110 ns
minus result at input	60 ns
difference	50 ns

Relative CLDI = (100-60) ns = 50 ns.

As these examples demonstrate, using relative measurements to determine the headend contribution to the video test results is an easy procedure.

It is important to determine the effect of the measuring instrument on the final results. The spectrum analyzer specifies differential gain and differential phase as maximum values using 50 averages over the 0° to 55° C operating temperature range. One-hundred percent of the analyzers meet this specification. The typical values using 50 averages are for room temperature operation. Measurement-to-measurement repeatability is a function of random noise and therefore can be minimized with more averaging.

Increasing the number of averages from 50 to 200 improves measurement repeatability. Relative measurements normalize much of the measurement equipment error, leaving us to consider the measurement repeatability. Because measurement repeatability is the applicable characteristic for relative measurements, better measurement accuracy is achieved. (See Figure 7.)

For our example, the improved accuracy of relative measurements can be shown. Since we made two measurements, the repeatability for one measurement is doubled for a worst-case situation.

Then, for 50 averages, our example results can be given an accuracy tolerance for differential gain of 2.9 ± 4 percent; for differential phase of 2.3 ± 2°; and for CLDI of 50 ns ± 40 ns. These values are all well within the FCC regulations, even though the initial measurement of differential gain was 14.8 percent.

Figure 8	Ref	1	2	3	4	5
value at output	0	-0.6	-3.2	-4.9	-7.3	-14.8
minus value at input	0	-0.9	-3.4	-6.3	-8.6	-13.3
difference	0	+0.3	+0.2	+1.4	+1.3	-1.5

Figure 9	Ref	1	2	3	4	5
value at output	0	-1.3	-1.9	-3.0	-3.8	-2.9
minus value at input	0	-1.0	-1.8	-1.9	-1.5	-1.8
difference	0	-0.3	-0.1	-1.1	-2.3	-1.1

Conclusions

Cable television system operators have several ways of meeting the 1995 FCC requirement to measure differential gain, differential phase, and chrominance to luminance delay inequality. Software-driven instruments greatly reduce the time required to make these tests and maximize the accuracy of the results; relative measurement techniques more accurately show headend equipment contribution. This solution also minimizes the cost of new capital equipment and specialized training. CED

References

1. *NCTA Recommended Practices for Measurements on Cable Television Systems*, 1993.

2. "The measurement of linear chroma distortion in NTSC TV facilities," Hans Schmid. IEEE Transactions on Broadcasting, Vol. BC18, No. 3, September 1972.

3. "The 12.5T modulated sine-squared pulse for NTSC," Charles W. Rhodes, IEEE Transactions on Broadcasting, Vol. BC18, No. 1, March 1972.

4. Television Engineering Handbook, Benson and Whitaker, McGraw-Hill, 1992.

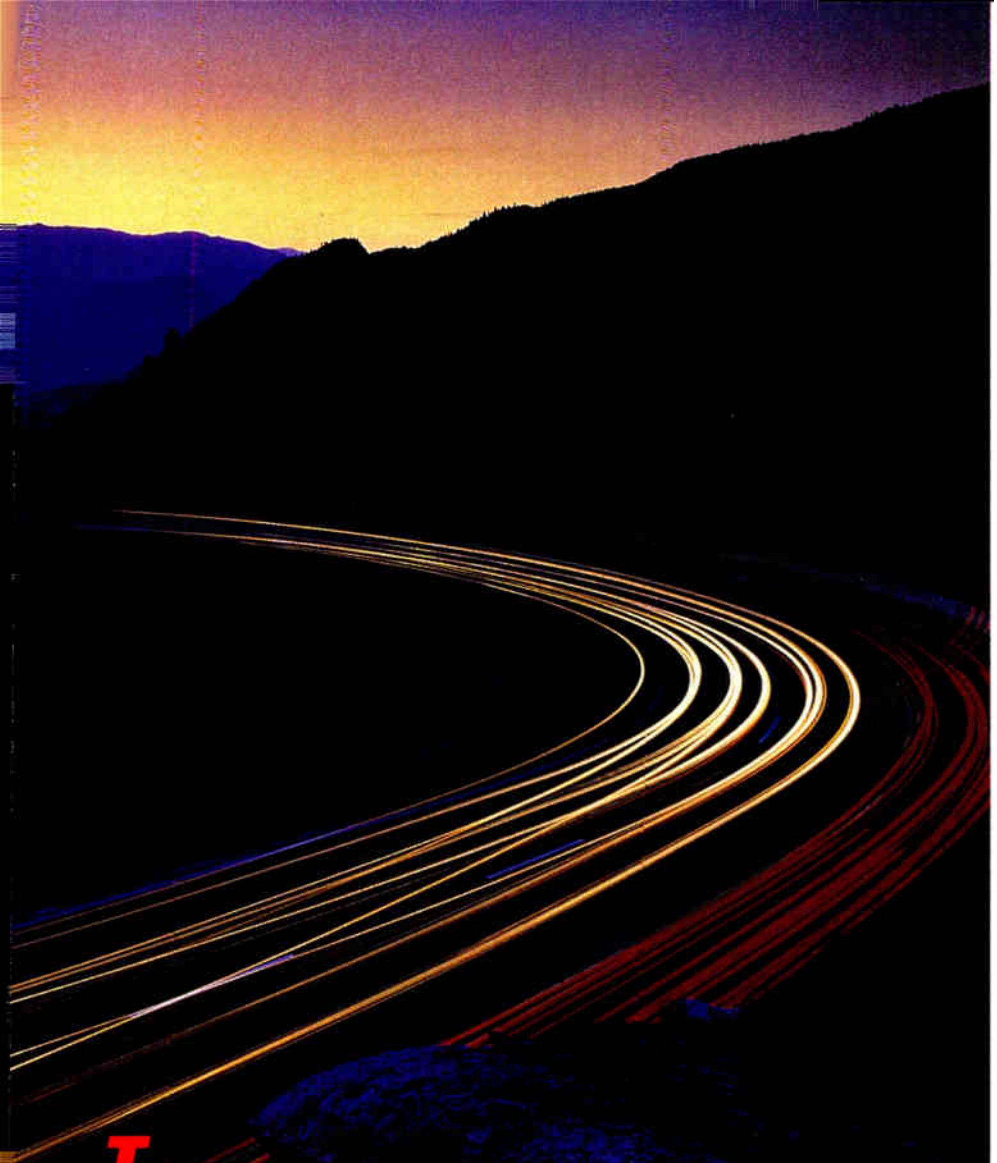
Note: Relative equations are adapted from *NCTA Recommended Practices*, 1993.

# of averages	12			50			200		
	Max	Typ	Repeatability	Max*	Typ	Repeatability	Max	Typ	Repeatability
DG (+/-%)	8	6	4	6	4	2	5	3	1
DP (+/-) degrees	5	3.5	2	4	2.5	1	3.5	2	0.5

FCC or NTC-7 Composite			Repeatability same test signal	
	Max*	Typ	all channels	same channel
CLDI (+/- ns)	45	32	20	10

*Specification

Figure 7. Spectrum analyzer specs and characteristics



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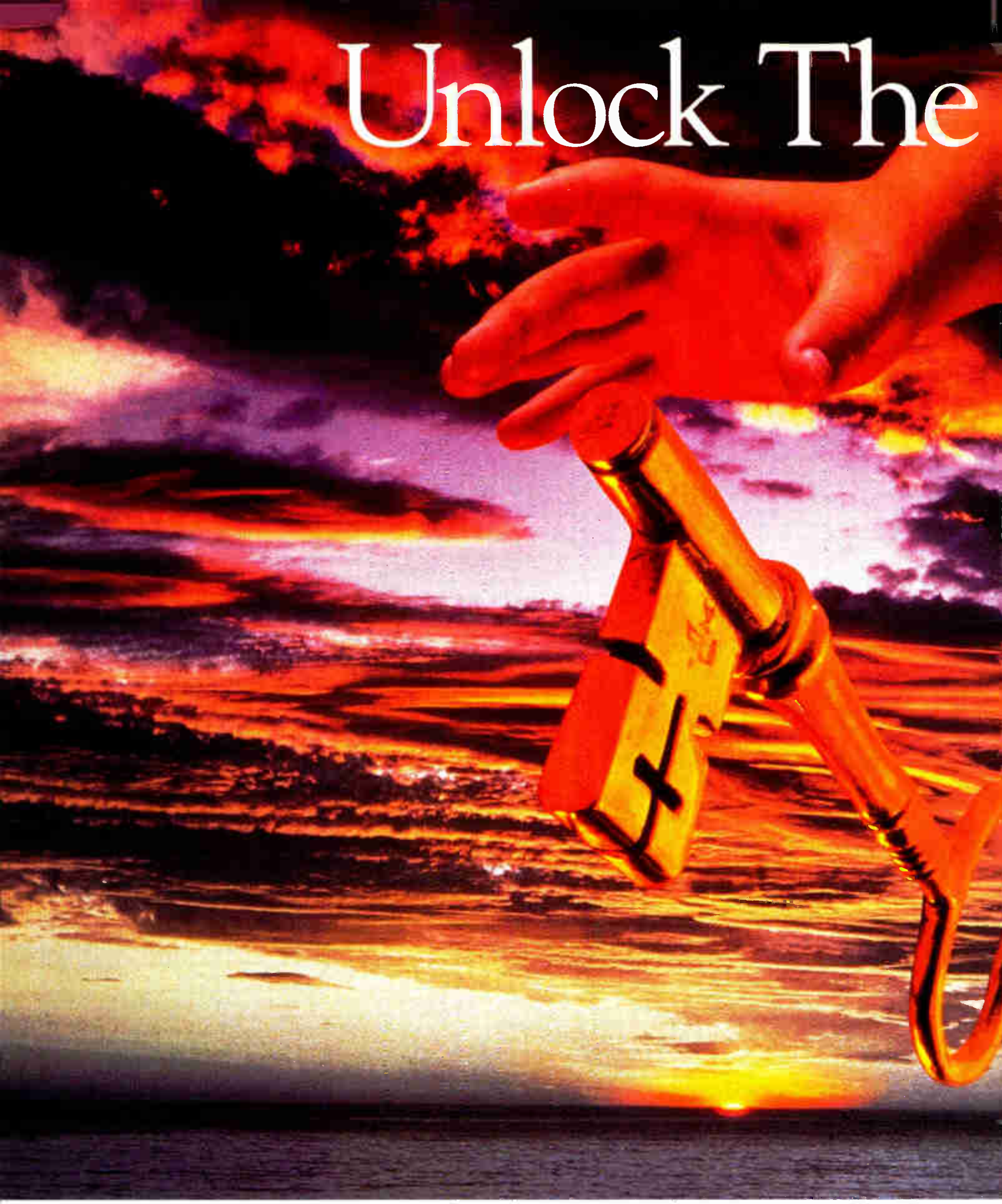
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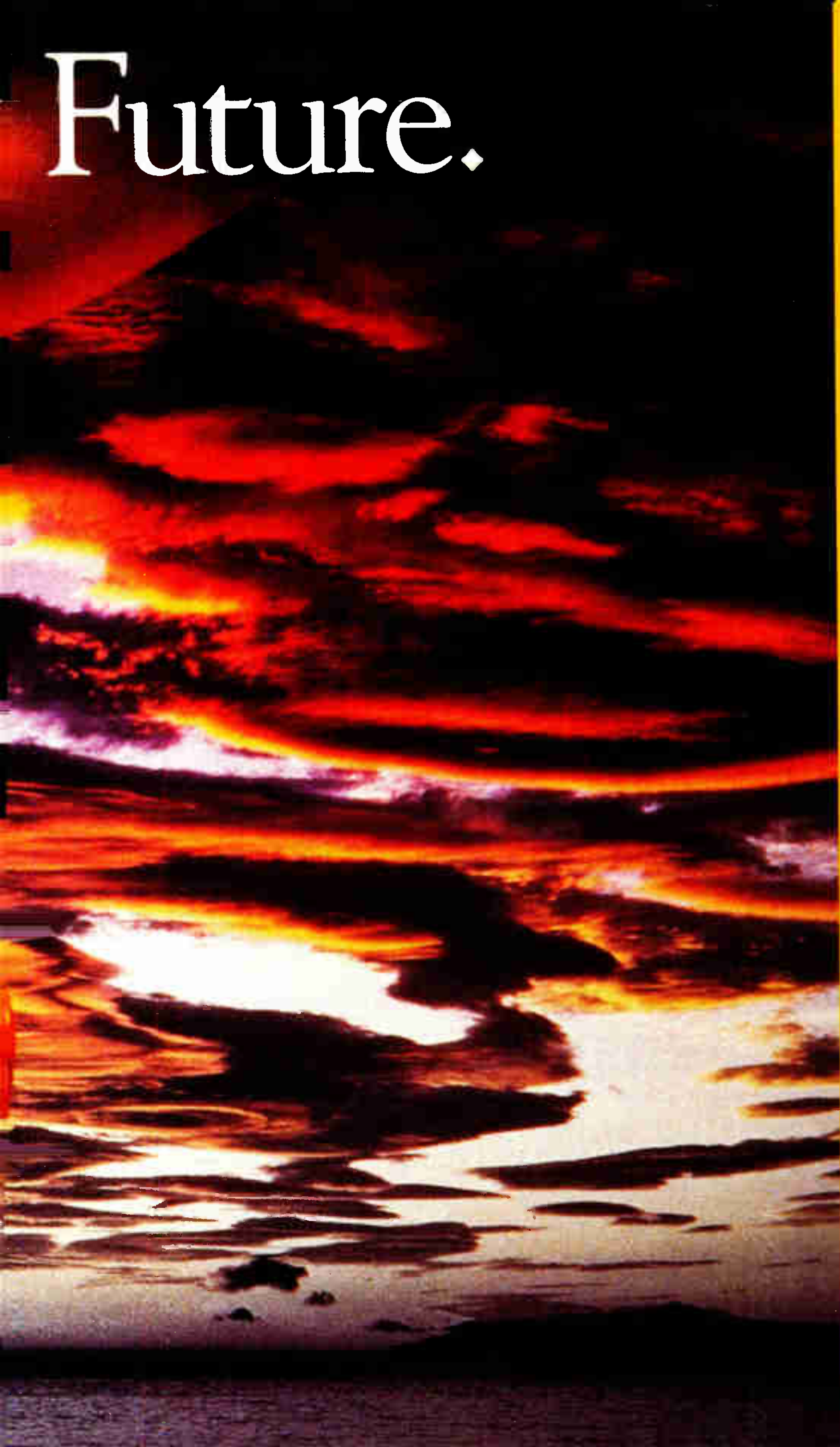

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SuperComm focuses on video systems

Cable TV meets telecom

By Roger Brown and Leslie Ellis

Telephone equipment manufacturers and operating company executives met in New Orleans last month at SuperComm '94, where they were greeted with a dizzying array of new products and enhancements. But the real theme of the show appeared to be based on advancements in ATM (asynchronous transfer mode) and a focus on understanding hybrid fiber/coax (HFC) architectures.

(HFC is telco parlance for the FTF or FSA architecture that has been embraced by the cable television industry, with the addition of telephony services over the same plant.)

Along with the traditional telecommunications vendors, several mainstay cable equipment companies made their debut at SuperComm, which attracted nearly 500 exhibitors overall. Among those exhibiting for the first time: General Instrument, Zenith Electronics, Power Guard, Alpha Technologies, Scientific-Atlanta, Antec and Trilogy. C-COR Electronics, a veteran of past SuperComm shows, was also in attendance.

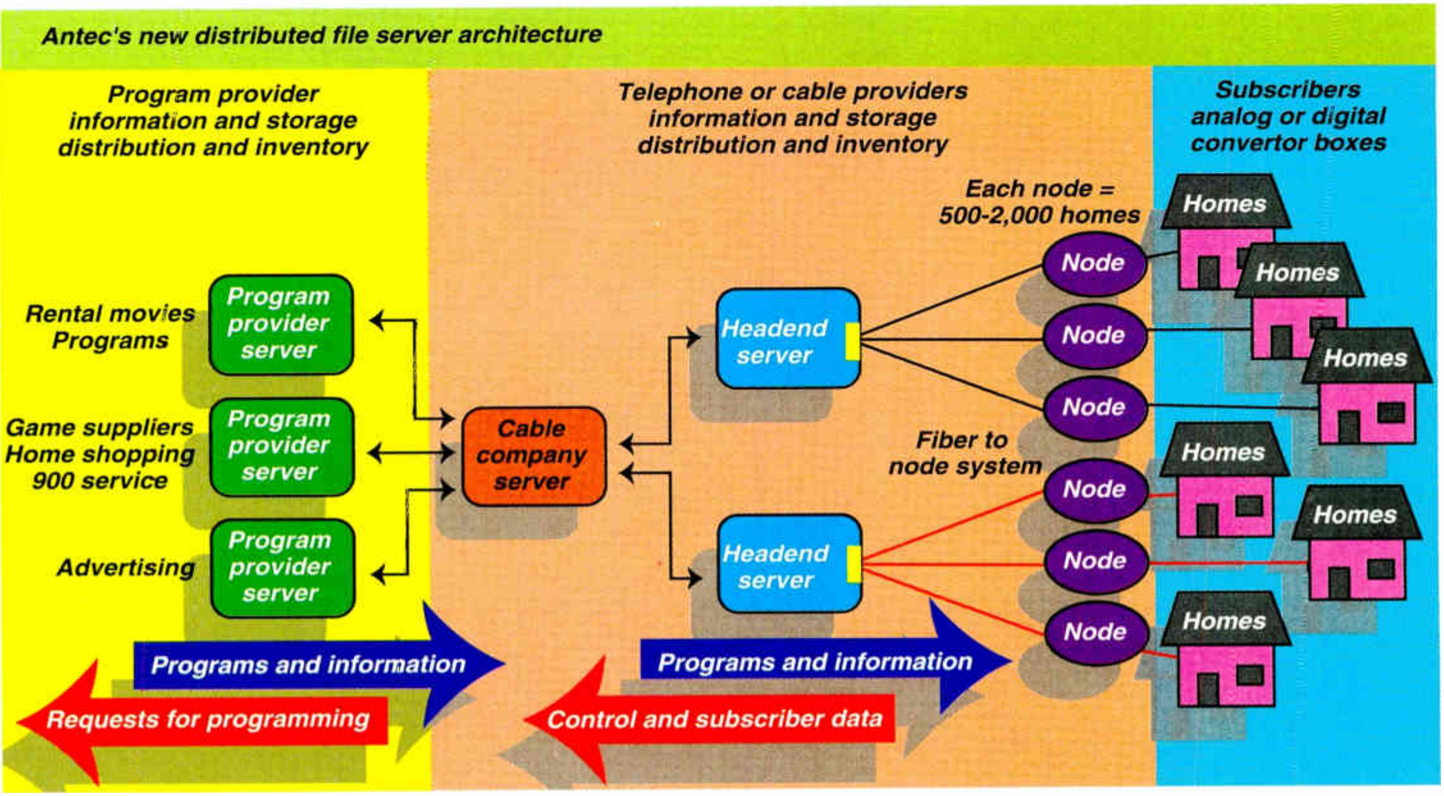
ATM demonstrated

In a demonstration reminiscent of the CableNET '93 display at last December's Western Cable Show, the ATM Forum organized a link between vendors displaying products at SuperComm with others located in Las Vegas at NetWorld+Interop, which was running simultaneously.

At SuperComm, Newbridge Networks, GTE, General Datacomm and Fore Systems all provided switches which were linked to a Sprint DS-3 ATM link with vendors in Vegas. Hanging off those switches were several vendors who were there to tout primarily the data applications made possible by ATM's high-speed packet switching.

Among the vendors participating at SuperComm were: Fujitsu, DSC Communications, Northern Telecom, Hewlett-Packard, AT&T, IBM, Digital Equipment Corp., Siemens Stromberg-Carlson and Sun Microsystems.

Some of those companies, along with others including Alcatel, Ericcson, BroadBand


Antec's new distributed file server architecture
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Homes
Homes
Homes
Homes
Homes
Programs and information
Requests for programming
Programs and information
Control and subscriber data

Technologies, Tellabs and NEC, also highlighted ATM capabilities within their own booths, with a particular emphasis on video-on-demand capabilities.

Most of the companies mentioned above offered up new switches, network managers, test devices and other hardware designed to speed the deployment of ATM technology. ATM is widely considered to be the leading protocol for delivery of high-speed data and video across networks and wide areas.

Cable engineers attending the conference must have felt vindicated that the network designs they have been implementing for the past two or three years were on display in several booths, including Raynet, ADC Telecommunications, DSC and others.

Raynet, which for years has offered telcos a fiber-to-the-curb video solution, unveiled its scalable HFC architecture for the local loop that allows telcos to migrate to a broadband network that supports video on demand, interactive games and data services, among others.

In the Raynet scheme, telephone signals are routed through a narrowband (voice) host digital terminal (HDT) to a broadband HDT, where the voice signals are mixed with video. They are then transported over fiber optics to a broadband optical network unit, which converts the lightwave signals to electrical. From there, the signals are transported via coaxial cable to a subscriber network unit, which segregates the video and telephony signals, and to multitaps, which split the video to individual homes.

Antec goes Digital

Antec, one of the first-timers at SuperComm, used the venue to make several technology announcements, including the creation of a new division, Digital Video, which will seek ways to build a migration path from analog to digital video distribution. Early applications will include advertising insertion, near video on demand (NVOD) and video on demand (VOD).

The first manifestation of that migration path is a video file server-based architecture, where digital video file servers are layered in the network starting at the regional headend and working backward as far as the program origination point.

Four file servers currently embody the Antec distributed server concept: the DV-20 headend server; which holds up to 100 hours of MPEG programming and resides in the cable TV headend; the DV-100 program server, which resides at a regional headend or corporate MSO office; the DV-1000 master server, which sits at the program provisioning point, and the DV-300 commercial insertion server, which stores up to 12,000 30-second MPEG-1 encoded commercials.

The DV-20 can internally store up to 100 hours of video programming itself and is configured to handle up to 1,000 consumers. A 150 Mbps ATM interface allows the DV-20 to communicate real-time with the DV-1000 master server.

Deals weren't finalized at the show, however, Digital Video President Tom Engdahl said the company is working with Silicon Graphics Inc. and Standard Communications to develop the first application for the server-based architecture: a commercial insertion system.

Although a working model wasn't shown in New Orleans, Engdahl said ANTEC is also working on a video gateway, intended to transport video server images on and off existing cable or telephone networks. The gateway line of product, which is still under development, collects and processes analog and digital video inputs, then hands the signals off to the distribution plant for carriage to analog or digital set-tops, Engdahl said.

Standard Communications will develop NTSC/MPEG modulators for the commercial insertion portion of that gateway and network, pending finalization of its agreement with Antec, said Clayton Dore, director of sales and marketing for Standard.

"The idea is to deploy a series of affordable video servers, to intelligently insert commercials or programs into the existing cable TV or public switched telephone network," said Engdahl, who noted that cable operators currently tap just $3.8 billion of the $40 billion national spot advertising market. "With this architecture, operators can literally customize their advertising markets based on demographics and locations, down to the smallest node sizes."

S-A announces BIG news

Scientific-Atlanta also used SuperComm to introduce its Broadband Integrated Gateway (BIG) product line, which collects, converts and delivers a variety of MPEG-packet-based video, associated audio and data communication signals. It's BIG product line serves as an interface between data network formats, such as SONET, ATM switches, MPEG transport layer video servers, cable satellite distribution networks and other local area networks.

"With digital video compression, we'll now see headends connected to SONET rings and other highly sophisticated configurations," said Steve Havey, VP and GM of analog and digital headend products for S-A. "We need a way to interconnect those signals, into the network and into the home. That's why we developed the broadband integrated gateway."

During a press conference at SuperComm, Havey explained the broadband integrated gateway as a system that "provides a translation and interconnect function, that allows digital video to be mixed at a cable headend and delivered in analog or digital formats to homes and businesses."

The S-A BIG accepts MPEG data packets and formats them into multiple interfaces, including DS-1, DS-3, FDDI, OC-1 and OC-2. Further, it allows for add/drop capability between multiple data inputs. "For example," said Havey, "individual video channels for multiple inputs could be combined into a single data stream."

In a traditional cable satellite delivery system, the add/drop feature means operators receiving multiple programming feeds (i.e., an Eastern and Western feed) can drop the duplicated feed and use that space for other services.

In a telephony environment, the BIG offers advantages such as multiplexing of several compressed videos onto a DS-3, which could then be handed off to any provider of DS-3 service, such as a local telephone company, long distance provider or private carrier. The BIG system would then be used on the receive end of the network to convert the DS-3 transmission back to baseband data outputs for decoding, to store onto a local file server or to modulate onto a broadband delivery network.

The gateways will sell for $10,000 to $25,000, Havey said, and will be available in the third quarter of this year.

Meanwhile, C-COR Electronics introduced

a new, 10-bit digital video encoder/decoder to its family of Comlux digital fiber optics products. The new product was touted as a method for telephone companies to offer broadcast television services.

The uncompressed video codec provides signals that exceed the RS250C short-haul specs, and accepts either scrambled or unscrambled signals. Video bandwidth of 8 MHz allows PAL and MAC signal formats to be transmitted, as well as signal formats with audio subcarriers located above video carriers. Baseband audio can also be accommodated via a companion audio codec.

First Pacific Networks unveiled the first in a series of voice interface units (VIUs) for its FPN 1000 integrated cable/telephone system. The first VIU was designed to be located inside the home or business, and includes an option for 4-hour battery backup. VIUs, explain FPN officials, are microprocessor-based devices that serve as the intelligent connection between a subscriber's telephone and the coaxial cable drop.

"There is no one-size-fits-all solution for network operators who are integrating telephone service into their cable television plants," says Verne Anderson, VP of marketing for FPN. "This new family of VIUs will provide operators with a variety of options." A multiple line version of the internal VIU will be available next year. Other modules will likely include off-premise devices powered from the cable television network.

FPN has also announced an enhancement to its FPN 1000 cable telephony product series, originally designed to provide network operators with telephone service delivery over hybrid fiber/coaxial networks. The system includes three microprocessor-based pieces of equipment: a subscriber device to connect telephones, fax machines and computer modems in the home or small business to the hybrid fiber/coax network; a central office or headend-based device to connect the hybrid fiber/coax network to the public switched telephone network; and a computer workstation, to provide network management for the system.

The enhancements to the system include increased call capacity to more than 850 subscribers in a single, 6 MHz upstream/downstream channel pair. The use of two channel pairs expands service levels to more than 1,900 residential customers, say FPN officials. Also, the system is now supported by a reduced size, all-digital trunk interface unit which serves as the intelligent connection to the public switched telephone network for connections of up to 20 T-1 or E-1 circuits.

Further, FPN has added its NMS1000 Unix-based network management system, which allows large scale implementation of customer, business or network operations support systems. The NMS-1000 employs a graphical user interface and communicates with up to 64 trunk interface units over and Ethernet network.

Digital Sound news

Also at SuperComm, Digital Sound announced availability of its InfoMail Express, a voice, fax and test mailbox server designed for individuals who rely primarily on public communications networks. InfoMail Express enables telephone service providers and PC hardware and software vendors to offer enhanced voice/fax messaging services to mobile professionals, telecommuters and businesses/home offices. CED

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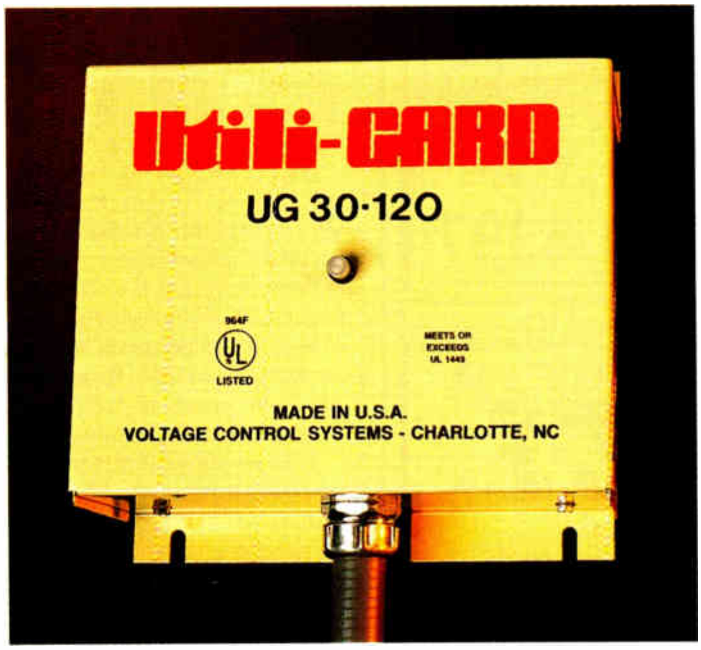

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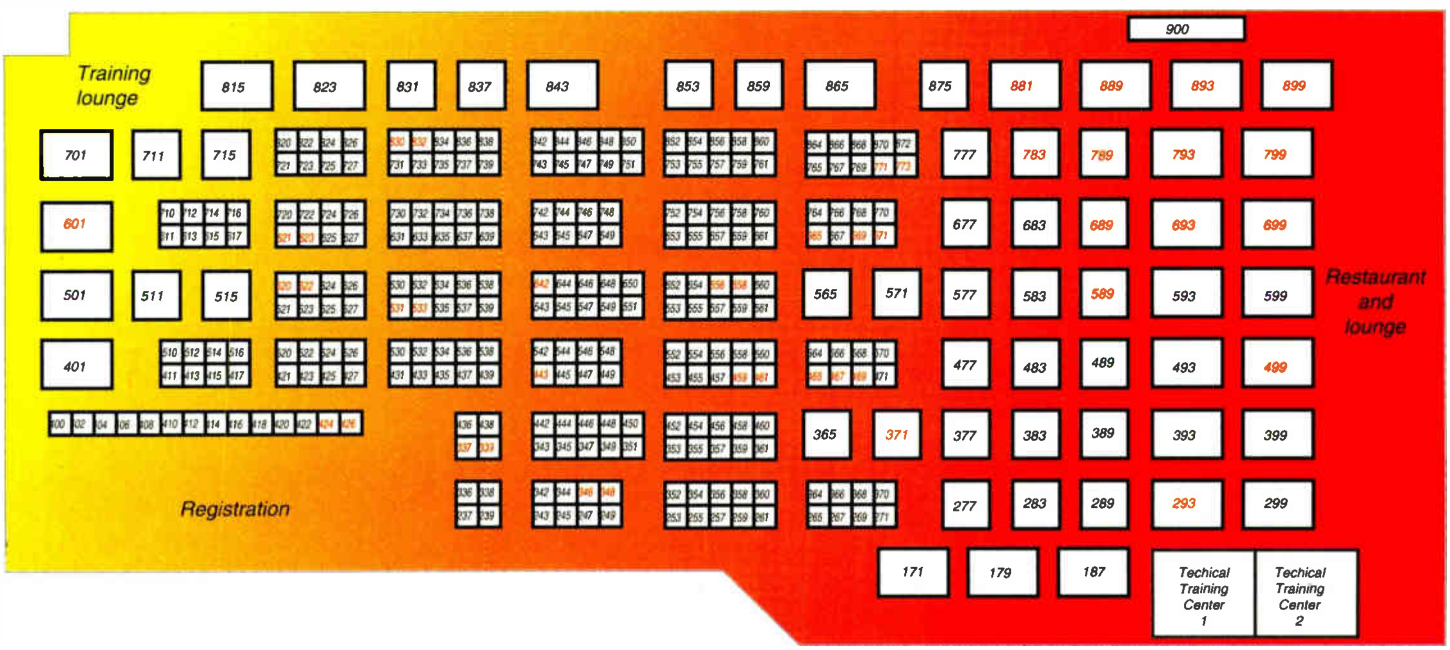

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Time Manufacturing Company 847
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Trilithic, Inc. 483

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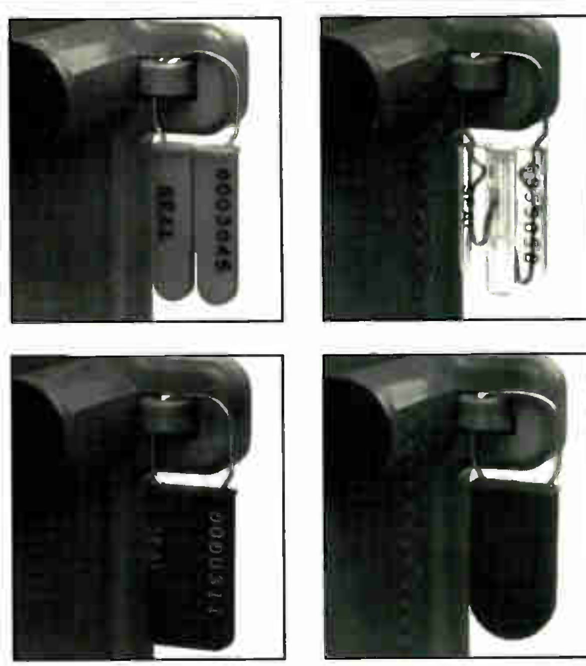

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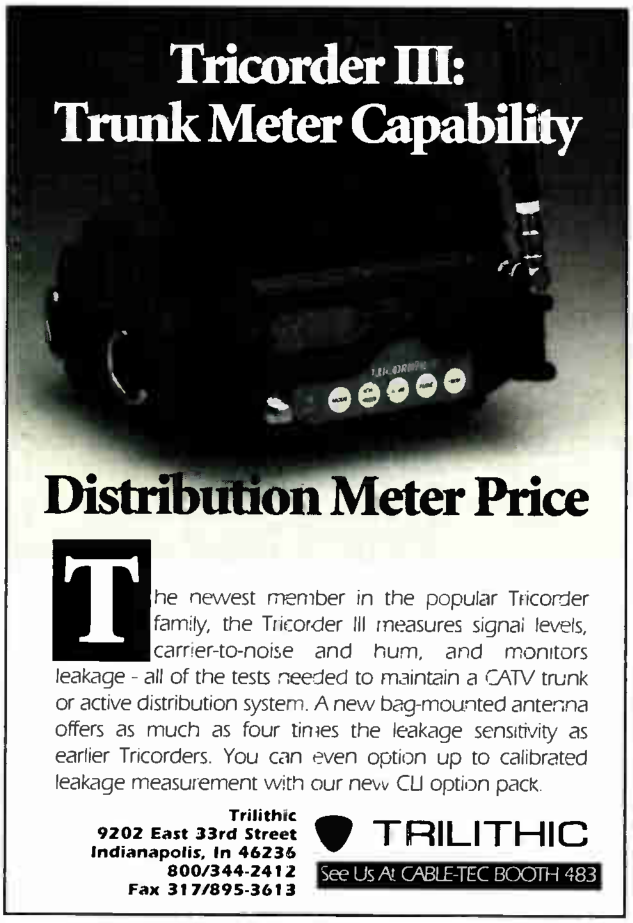

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The issue: Training and education

As the Society of Cable Television Engineers settles into St. Louis this month for its annual Cable-Tec Expo and Engineering Conference, the spotlight will once again be thrust upon the value of training. Many say education will become increasingly important as the industry moves forward and begins to deploy new, complex network systems. What do you think?

The questions:

1. Does your system offer formal, in-house training in customer contact skills for installers and technicians?

☐ Yes ☐ No ☐ Don't know

2. Does your system offer formal, in-house training for installers and technicians to actually sell cable services to customers?

☐ Yes ☐ No ☐ Don't know

3. If you chose to enroll in an outside course teaching these subjects, would your company reimburse you for the tuition cost?

☐ Yes ☐ No ☐ Don't know

4. Does your system offer formal, in-house training for (check all that apply):

☐ Installers ☐ Service techs ☐ Headend techs ☐ Line techs

5. Does your system offer in-house training in fiber optics?

☐ Yes ☐ No ☐ Don't know

6. Does your system offer in-house training in digital technology?

☐ Yes ☐ No ☐ Don't know

7. If you enrolled in an outside course in cable TV technology, would your company reimburse you for the tuition cost?

☐ Yes ☐ No ☐ Don't know

8. If you chose to pursue college or vocational training in electronics, would your company pay at least a portion of the tuition?

☐ Yes ☐ No ☐ Don't know

9. Does your system allow you time away from your job to attend SCTE meetings?

☐ Yes ☐ No ☐ Don't know

10. Does your system pay for you to take SCTE BCT/E certification exams?

☐ Yes ☐ No ☐ Don't know

11. Do you believe you've received adequate formal training to do your job effectively?

☐ Yes ☐ No ☐ Don't know

12. Is there a dedicated, full-time trainer at your system?

☐ Yes ☐ No ☐ Don't know

13. Do you think there's a need to overhaul your system's training program?

☐ Yes ☐ No ☐ Don't know

Your comments:

FAX US

303-393-6654

Make a copy of this page and fax it back to us at the number above or mail it to CED, 600 South Cherry Street, Suite 400, Denver, Colo. 80222.

We will tally the results and print it in a future issue. Your suggestions for future questions are always welcome.

We also want some written comments from you on this subject. Names won't be published if you request your name to be withheld, but please fill out the name and job information to ensure that only one response per person is tabulated.

Your name and title

____

____

____

System name:

____

Your MSO:

____

Location:

____

Your job function:

____

RESULTS

The issue: DBS competition

Last month, Hughes' DirecTV video service was scheduled to begin beaming about 150 channels of video to homeowners who purchase a small receiving antenna and an in-home decoder. Some predict DBS will gain a wide following quickly while others say cable's narrowcast and interactive ability will beat back the DBS assault. Will DBS be able to effectively take away market share from established cable operators? This survey recaps your thoughts about competition coming from high-power DBS.

Eight of every 10 persons who responded to our survey about DBS give the service either an excellent or good chance of success in the long-run, but most believe DBS will garner its subscribers in rural areas that have never been wired by cable operators.

Most who responded said DBS has just a "poor" chance to take away their ensconced cable subscribers, and most said it would take several years before that happened. Nearly 80 percent expect to lose no more than 10 percent of their subscribers to the service.

Those who responded pointed to DBS' high hardware costs, lack of return path and inability to "narrowcast" programming to localities as the weakness in the DBS armor. Others noted it's incompatibility with consumer electronics and the need for an additional antenna to receive local broadcast television.

Consequently, few cable systems say their network rebuild and upgrade plans were affected significantly by the arrival of this new competitor, but 60 percent admitted it will have some affect on the deployment of interactivity over cable, as operators attempt to differentiate themselves.

Finally, most said they fear telco competition much more than DBS, even though one person admitted that telco competition is another three to four years away.

The results:

1. How would you rate DBS' long term chances of success nationally?

Excellent	Good	Poor
18%	**64%**	**18%**

2. How would you rate DBS' chances of success at taking away customers who reside in your cable system?

Excellent	Good	Poor
4%	**39%**	**57%**

3. How soon do you think DBS will have a measurable impact on your system, in terms of number of subscribers served?

Within 2 years	2-5 years	6 years or more
29%	**36%**	**36%**

4. Do you think consumers will view DBS as a better investment in the long run?

Yes	No	Don't know
11%	**68%**	**21%**

5. To what degree has the anticipated launch of DBS affected your system's rebuild or upgrade schedule?

A lot	Some	Very little
4%	**29%**	**64%**

6. In your opinion, what is DBS' "weak link" when compared to a cable system?

Hardware cost	Programming cost	
61%	**11%**	
No return path	Broadcast-only	Other
21%	**25%**	**14%**

(Multiple answers allowed)

7. What percentage of your current subscribers are likely to subscribe to DBS services just because it's an available competitor?

10% or less	10%-20%	More than 20%
79%	**18%**	**4%**

8. How likely is it that the advent of DBS will hasten your system to upgrade to more channels and/or interactivity?

Very likely	Somewhat likely	Not at all
21%	**39%**	**39%**

9. Do you think most DBS subscribers will be rural residents who haven't been wired for cable?

Yes	No	Don't know
79%	**18%**	**4%**

10. Which do you think is a more formidable competitor to your system–DBS or the telcos?

DBS	Telcos	Don't know
32%	**57%**	**11%**

11. Is any portion of your system's franchise area currently being served by an MMDS operator?

Yes	No	Don't know
25%	**71%**	**4%**

Your comments:

"DBS won't hit half its 10 million (subs) projected by the year 2000–these guys are deluded!"
– Rich Penkert, Country Cable, Morton, Minn.

"We need competition to make managers understand that we need to upgrade our systems, educate personnel and enforce service standards."
– Bruce Brunner, Marcus Cable, Wautoma, Wis.

"I believe DBS will ultimately be a niche business. Interactivity will be the major factor preventing its serious competition with cable TV."
– Ron Peterson, Post-Newsweek Cable, Bisbee, Ariz.

"DBS will be just as incompatible with consumer electronics devices as most cable converters."
– Neal McLain, Communication Technologies, Middleton, Wis.

JUNE

4 Chaparral SCTE Chapter Technical Seminar and Testing Session. "Digital Compression," with Michael Gorin of General Instrument. BCT/E and installer exams to be administered. Location: Sandi Prep School, Albuquerque, N.M. Call Bob Wiseman, (505) 761-6273

6-9 Digital Networks Training. Hosted by ANTEC. Location: Washington, D.C. area. Call (800) FIBER ME.

7 Hawaii SCTE Chapter Technical Seminar. "Data Communications." Location: IBEW Union Hall, Honolulu. Call Fred Gerstl, (808) 625-8412.

7 West Virginia Mountaineer SCTE Chapter Technical Seminar. "Proof of Performance." Call Steve Johnson, (614) 894-3886.

8 Badger State SCTE Chapter Technical Seminar. "Safety." Location: Holiday Inn, Fond du Lac, Wisc. Call Brian Revak, (608) 372-2999.

8 Central Florida SCTE Chapter Technical Seminar. "Data Networking and Architectures," "Lightning–Preparing Your Plant and Associates," "Safety Training" with Jim Janus, Cablevision Industries and "Industry Update," with Ken Hisle, Jones Intercable. Location: Holiday Inn, Lakeland, Fla. Call Pam Kernodle, (813) 371-3444.

9 SCTE Satellite Tele-Seminar Program "Coaxial Cable Transmission Basics, Part I." First of a 14-tape series on broadband technology with Bill Grant, GWG Associates. To be transmitted on Galaxy IR, Transponder 14, 2:30–3:30 p.m., EDT. Call SCTE Headquarters, (610) 363-6888.

Trade Shows

June

2-4 Multimedia Conference. Location: Moscone Convention Center, San Francisco, Calif. Call (800) 243-3238.

15-18 SCTE Cable-Tec Expo. Location: St. Louis, Mo. Call (610) 363-6888.

20-31 European and Fibre Optic Markets and Opportunities. Location: Heidelberg, Germany. Call (617) 232-3111.

20-23 Wireless Cable '94. Location: Las Vegas Hilton, Las Vegas, Nev. Call (319) 752-8336.

July

25-28 Fiber Optics Installers Conference. Hosted by Fotec, Inc. Location: Long Beach, Calif. Call (800) 527-8254.

9 Gateway SCTE Chapter Technical Seminar. "Installation Techniques and Products." Location: Overland Community Center, Overland, Mo. Call Duane Johnson, (314) 272-2020.

9 Music City SCTE Chapter Technical Seminar. "Customer Contact Skills," with Ron Elliott, Viacom Cablevision. Location: Ramada Inn, Nashville, Tenn. Call Bill Goodwin, (615) 244-7462, ext. 406.

9-10 Commercial Building Cabling Standards Seminar. Hosted by the Telecommunications Industry Association. Location: Marriott's Hunt Valley Inn, Hunt Valley, Md. Call (410) 785-7000.

10 Magnolia and Mississippi/Louisiana SCTE Chapters Technical Session. "Digital Compression," with Michael Gorin of Jerrold/General Instrument. Location: Mississippi Cable TV Association Show, Treasure Bay (formerly Royal D'lberville), Biloxi, Miss. Call Bob Marsh, (601) 932-3172.

16 Southern California SCTE Chapter Technical Session. "Distribution Systems" and "Trunking Systems: Bridger to Headend." Location: Crown Cable, Alhambra, Calif.

16 Southern California SCTE Chapter Technical Seminar. "Trunk Systems: Bridger to Headend," with Juan Castro, TCI and Jim Messall, Crown Cable. Location: Alhambra, Calif. Call Tom Colegrove, (805) 252-6177.

20-22 Digital Transmission for Cellular Telephone–Continuing Education Class. Location: The George Washington University, Washington, D.C. Cost: $975. Call (800) 424-9773.

21 Cable TV Measurements Course. Hosted by Hewlett Packard. Location: Fullerton, Calif. Cost: $250. Call (800) HPCLASS.

22 Smokey Mountain SCTE Chapter Technical Seminar. "First Aid" with Bobby Olinger, American Red Cross and Sammons Communications. Location: Days Inn, Kingsport, Tenn. Call Roy Tester, (615) 878-5502.

23 Cable TV Measurements Course. Hosted by Hewlett Packard. Location: Van Nuys, Calif. Cost: $250. Call (800) HPCLASS.

23-24 High Definition Television–Continuing Education Class. Location: The George Washington University. Cost: $790. Call (800) 424-9773

27-29 New York State Commission on Cable Television. Location: Roaring Brook Ranch, Lake George, N.Y. Technical sessions sponsored by SCTE. Call Albert Richards, (518) 474-1324.

30 New Jersey SCTE Chapter Technical Seminar. "Vendor Fair." Location: TKR Training Center, Wayne, N.J. Call Linda Lotti, (908) 446-3612.

CableLabs begins HDTV transmission tests

CableLabs has begun field testing the transmission subsystem of the Grand Alliance high-definition television system over a group of cable networks in the Charlotte, N.C. area. The transmission subsystem is the portion of the system responsible for delivery of the digital bit stream to the home.

The series of tests will last roughly 30 days, wrapping up sometime this month, and will test two modulation techniques (8-VSB and 16-VSB), which represent part of the HDTV system presently under consideration by the FCC's Advisory Committee on Advanced TV Service. The field tests will evaluate off-air reception at cable headend sites and the subsequent transmission over cable plant of the digitally-modulated RF signal. The results of the field tests will be delivered to the Advisory Committee for its review, and will likely confirm the results of earlier, laboratory-based tests which resulted in the selection of modulation techniques.

The tests are expected to demonstrate that the digital vestigial sideband HDTV signal can be received off-air at cable system headends (in the 8-VSB format) and, after error correction processing, be combined with a second high definition signal for carriage to cabled homes within a single, 6 MHz channel (in the 16-VSB format).

Wegener to supply Buenos Aires application

Wegener Communications has signed a multiple year, multi-million dollar contract to supply several thousand addressable digital audio satellite receivers to Buenos Aires-based Hilo Musical S.A.

The products will be used by Hilo Musical in Argentina to deliver business music via satellite. Multiple program channels will be encoded, multiplexed with control data, and transmitted from Hilo Musical's studio in Buenos Aires to locations throughout Argentina. Until the agreement, Wegener officials said, programming was distributed over telephone lines.

Distance learning network installed in Oregon

Chemeketa Community College in Salem, Ore. is transmitting live distance education and teleconferencing programs over ED-NET, Oregon's satellite-based education network, though an agreement with VideoCube. As the only origination studio located within Salem, Chemeketa provides government and outside agencies access to the delivery system for their live teleconferencing programs. The online editing capabilities of the VideoCube system have enabled Chemeketa to produce high-quality graphics and special effects for its distance education classes as well as for the live teleconferences, college officials said.

"Our department was already using Macintosh computers," said Steve Vincent, media systems technologist for the college. "That's what we like about VideoCube–it lets us edit within the Mac environment. "

Chemeketa broadcasts an average of 10 hours of live, for-credit classes daily to five outreach centers, located in a three-county area. Students who go to the centers, located up to 30 miles away from the main campus, can attend the televised classes that are in-session at the main campus.

"The system is like a giant mixer," said Tim Herpel, product/director at the college. "I dump footage in and rearrange it any way I like. It's very effective."

PacTel spinoff AirTouch establishes San Francisco headquarters

AirTouch Communications, a cellular telephony operator that was recently spun off from Pacific Telesis Group, has established headquarters in San Francisco, marking the largest relocation in San Francisco since 1991. With the move, scheduled to begin at the end of this year, AirTouch will consolidate 250 employees from throughout the Bay Area, into roughly 175,000 square feet. It has already initiated a multi-million dollar renovation of the building's public areas and plaza, which encompasses the entire city block of One California Street.

RMS adds 750 MHz, 1 GHz taps, splitters to product line

RMS Electronics announced it has added 750 MHz taps and 1 GHz in-house splitters and directional couplers to its line of cable television equipment.

ISO-9000, 9001 notifications

Belden Wire and Cable announced that its administrative offices, distribution center, engineering center and all U.S. manufacturing facilities have been registered to the ISO-9000 series, a set of uniform standards that provide quality management guidance and quality assurance requirements.

Registered under ISO-9001 are Belden's engineering center, cable development and OEM customer service facility and the administrative offices and distribution centers.

Also, Optical Cable Corp. announced it has received ISO-9001 approval, marking companywide efforts from the manufacturing, sales and administrative departments.

GI, DSC sign video and telephony alliance

General Instrument Corp. and DSC Communications Corp. have officially signed a definitive agreement to jointly create Cablespan, a broadband telecommunications system capable of providing video, telephony and data services. The agreement was announced during last year's Western Cable Show.

The Cablespan system combines DSC's Litespan-2000/Starspan product line, which is a SONET-based fiber optic access system, with GI's broadband telecommunications architecture for hybrid fiber/coax applications.

To date, more than 2.5 million lines of DSC's Litespan have been deployed in local exchange access networks, DSC officials said. With the system integration between the two companies, the resultant Cablespan product will enable service providers to expand their service ranges to both homes and businesses over hybrid/coax networks.

The agreement follows the signing of a letter of intent last November.

CLT receives patent for leakage monitoring system

Cable Leakage Technologies announced it has received a U.S. patent (number 5,294,937) for its Wavetracker digital RF tracking and mapping system. The system enables high-speed data collection and signal leakage data interpretation through the use of global positioning satellites.

Ripley Co. acquires K. Miller & Tool Co.

The Ripley Company announced it has acquired the K. Miller Tool and Manufacturing Co., based out of West Springfield, Mass. The K. Miller Co. manufactures wire strippers, cutters and specialty tools for the electrical, electronic, cable television and telecommunications industries.

The tools will be sold in conjunction with the Ripley Company's product line.

Lodgenet picks Apple with PowerPC for hotel shopping

LodgeNet Entertainment Corp. will use a new, digital interactive multimedia platform based on the Apple Macintosh with PowerPC and Apple AV Technologies to deliver virtual shopping and other interactive information services to up to 7 million hotel guests, nationwide, by the end of this year.

LodgeNet's new "Travelers Video Mall" will transform hotel TVs into a digital, interactive multimedia kiosk, company officials said. The in-room mall will allow guests to use a standard, in-room TV and remote control to shop, access video-based information directories for the hotel or city they're in, retrieve classified ads and participate in other interactive programs.

LodgeNet already supplies the hotel industry with video check-out and in-room guest surveys.

CableLabs, Pioneer announce digital project

Cable Television Laboratories and Pioneer Electronic Corp. will jointly develop a "feasible method for digital signal transmission technology for North American cable systems" officials from both companies said in a press release.

Pioneer will take part in the technical development of transmission technology and special, large-scale integration (LSI) chips. CableLabs will provide technical facilitation and testing assistance.

Results will likely be announced next spring, the companies said.

The method under development, 16-VSB, is suitable for high-volume data transmission, Pioneer officials said. It will also study quadrature amplitude modulation (QAM) techniques.

C-COR to build new manufacturing facility

In response to growing demand for its products, C-COR Electronics will construct a new building, adjacent to its State College, Pa.-based world headquarters facilities. The property for the new facility is currently owned by C-COR, and will later this year house an 80,000-square-foot building where the company's manufacturing functions and service groups. Included under the new roof will be C-COR's equipment service center, network design and technical customer service groups, say C-COR company officials.

Upon completion of the new facility, C-COR will renovate its existing building to enlarge the engineering laboratory. It wilso also add an environmental test chamber and expand its administrative offices. The full project will cost over $10 million, and will be completed in the December, 1994 time frame.

Motorola, Tandem, DSC announce network platform

Motorola's Cellular Infrastructure Group announced the formation of a wireless intelligent network solution center, called the IN². Joining Motorola in the effort are Tandem Computers Inc. and DSC Communications. Other participants in the IN² Center include Centigram Communications Corp., Logica, Motorola's Computer Group, SAFCO Corp. and Vicorp Interactive Systems.

The IN² solution center, which stands for INnovation and INtegration, will be located at Motorola's cellular headquarters in Arlington Heights, Ill., a Chicago suburb.

The solution center will use open architecture and industry standards to bring new advanced intelligent network services to the cellular market.

It plans to attract and work with software and platform vendors in their development and certification by the Center of intelligent network services and features. Integration and network management of intelligent network elements will also be supported.

"The mission of the IN² Solution Center will be to drive the wireless combinations industry toward and open architecture and to ensure the success of industry standards in the advancing intelligent network," said Jack Scanlon, senior VP and GM of Motorola's Cellular Infrastructure Group.

DSC and Tandem have also agreed to join Motorola in promoting an open wireless applications programming interface (API) which will allow independent software application providers to develop to one wireless standard.

One of the first IN² products will be the Motorola Cellular Home Location Register (HLR), based on Tandem's Himalaya intelligent network server, for management of mobile subscriber information.

The HLR/intelligent network platform will be delivered this summer to AirTouch Communications (formerly PacTel Corp. See related relocation announcement, p.134), a global wireless provider.

AirTouch will use the system to create intelligent network services such as a personal number and enhanced call management system for its cellular operations. It will also use the technology to deploy virtual private networking services and to further enhance its fraud prevention capabilities.

In a related announcement, Tandem Computers and Vicorp Interactive Systems announced support of the analog display services interface (ADSI) telephone standard, which enables interactive information services such as visual voice mail to be offered to consumers via screen-based telephones. The first consumers to benefit from the combined technological support of ADSI are the Chicago-area Ameritech customers, Tandem officials said.

Ameritech plans to offer those residents new interactive services and capabilities in a pilot program with Citibank, using screen-based phones and technology from Tandem, Vicorp and Octel.

The pilot program will begin this month. Services that will be available include enhanced calling features and electronic white pages, as well as banking and bill payment services. Visual voice mail will be added as the first ADSI-based service.

ADSI allows voice and data services to be delivered over standard telephone lines. The combination of voice and on-screen presentation of information presents new interactive services including customer calling, directory assistance and gateways to information services such as home banking and shopping.

Northern Telecom to supply Republic of Tunisia

Northern Telecom has announced a contract, valued at more than $40 million, to supply telecommunications equipment to the Republic of Tunisia. The contract implementation will expand the public telephone network there by more than 30 percent.

In the agreement, Northern Telecom will install 58 digital multiplex switching (DMS) central office switches over the next three years.

The majority of the contract is for DMS-10 central office switches. In addition, Northern Telecom's GSM cellular switch will provide an initial trial, for 500 subscribers. The company's African Business Center, established in Tunisia, will provide training support, marketing and sales operations and a center for distribution and technical assistance, Northern Telecom officials said.

THE BIGGEST PROBLEM W
A SIGNAL IS THAT Y
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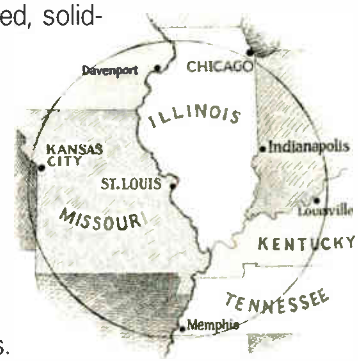

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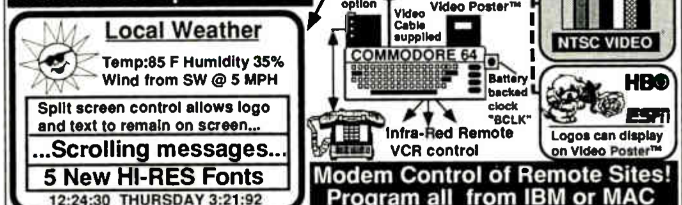

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CED CLASSIFIED SECTION

It Makes Sense.

The radio spectrum: what's up there?

By Jeffrey Krauss, independent telecommunications policy consultant and President of Telecommunications and Technology Policy of Rockville, Md.

While the most familiar uses of the radio spectrum are for broadcasting and mobile communications, some of the most interesting uses are for radar. There are a large number of different radar applications. For example, the spectrum around 1300 MHz is where the FAA operates its network of aeronautical en-route radars. Weather radars operate at 2800 MHz.

There are both ground-based and airplane-mounted AWACS national security radars operating throughout much of the 3 GHz band. At 4300 MHz, airplane-mounted radio altimeters (a type of radar) are widely used. If you encounter interference from radars into C-band satellite receive dishes, which operate at 3.7-4.2 GHz, it's probably caused by either the radars or the radio altimeters. Install a bandpass filter to eliminate this problem.

Police speed-measuring radars operate at 10,525 MHz (X-band). Hughes makes an obstacle detection radar in this band that is mounted on school buses and prevents the bus from moving if children are detected near the perimeter of the bus. Around 15 GHz, there is a band for surface radars used at airports to locate planes on the ground.

K-band police radars operate at 24,125 MHz. VORAD makes a vehicle-mounted collision avoidance radar at 24 GHz that is used on intercity buses and trucks. It originally used exactly the same frequency as police radars, but it would set off the radar detectors so the truckers refused to use it. As a result, VORAD got special FCC approval to move it up in frequency slightly. New Ka-band police radars are beginning to see some use around 34 GHz.

The most recent development is a request by General Motors to use 77 GHz for collision avoidance radars. These would be installed in private cars and might be integrated with the cruise control system to cut back automatically on the throttle when closing on the vehicle ahead.

Mobile communications

Traditionally, most mobile communication systems operate in the VHF or UHF range. But experiments have shown that mobile and portable Personal Communications Services will work at around 2 GHz; this led to the FCC decision to kick out the fixed point-to-point users from that band.

Mobile satellite communications systems have operated on microwave frequencies for many years. INMARSAT uses 1600 MHz frequencies, and other mobile satellite systems are planned in the same frequency range, and also around 2400 MHz.

One other notable mobile service is mobile video, used for electronic newsgathering and surveillance. In addition to broadcaster ENG use, police employ cameras mounted on helicopters to monitor traffic and crowds, and microwave to relay the video signal to the ground. Frequencies are available at 2450 MHz and 6500 MHz.

But watch out for 2450 MHz; that's where the millions of microwave ovens operate. This frequency is also used by medical diathermy equipment, and industrial heat sealing and curing equipment. Wireless data networks employing spread spectrum techniques also use this band.

Fixed communications

There are numerous microwave bands used for commercial fixed point-to-point communications, including 2, 4, 6, 7, 11, 13 (CARS band), 18, 23 and 39 GHz. The 39 GHz band will eventually see heavy use for interconnecting PCS cell sites. The military has fixed communications bands at 1.7, 4, 8 and 15 GHz.

Some of these bands are shared with satellite systems. For example, the 4 and 6 GHz microwave bands are also used as the C-band satellite allocations, and frequency coordination is the process that assures that transmitters are geographically separated to prevent interference. The Ku-band satellite allocations (12 and 14 GHz) are not shared with terrestrial microwave, so coordination is not needed and large networks of very small aperture earth stations (VSATs) can be deployed quickly, without coordination or licensing delays.

The next satellite bands, Ka-band (19 GHz and 29 GHz), may see some commercial activity early in the next century; these are the bands that Bill Gates proposes to use for Teledesic, a network of 840 satellites constantly orbiting the earth in low altitude orbits.

Digital audio broadcasting may start later in the decade in Canada at 1500 MHz, but that band has been reserved in the U.S. for telemetry for the flight testing of military aircraft and missles. So digital audio broadcasting, if it goes forward in the U.S., will have to use 2300 MHz.

Wireless cable video distribution, also known as Multichannel Multipoint Distribution Service (MMDS), operates around 2600 MHz. A newer version of this, called Local Multichannel Distribution Service (LMDS) and employing cellular reuse of frequencies every 3 to 6 miles, is planned for the 28 GHz range. And the long-awaited Direct Broadcast Satellite service will soon operate at 12 GHz.

If you have an idea for a new service or technology to use the radio spectrum, will there be capacity available? Maybe. You might have to get existing users kicked out, which happened with PCS. But that is a tough, time consuming fight. A better idea, if it fits your needs, is to try to find an unused or lightly used band, as did LMDS at 28 GHz or vehicle collision avoidance radars at 77 GHz. CED

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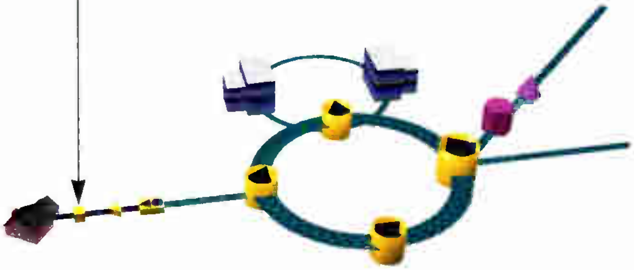

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