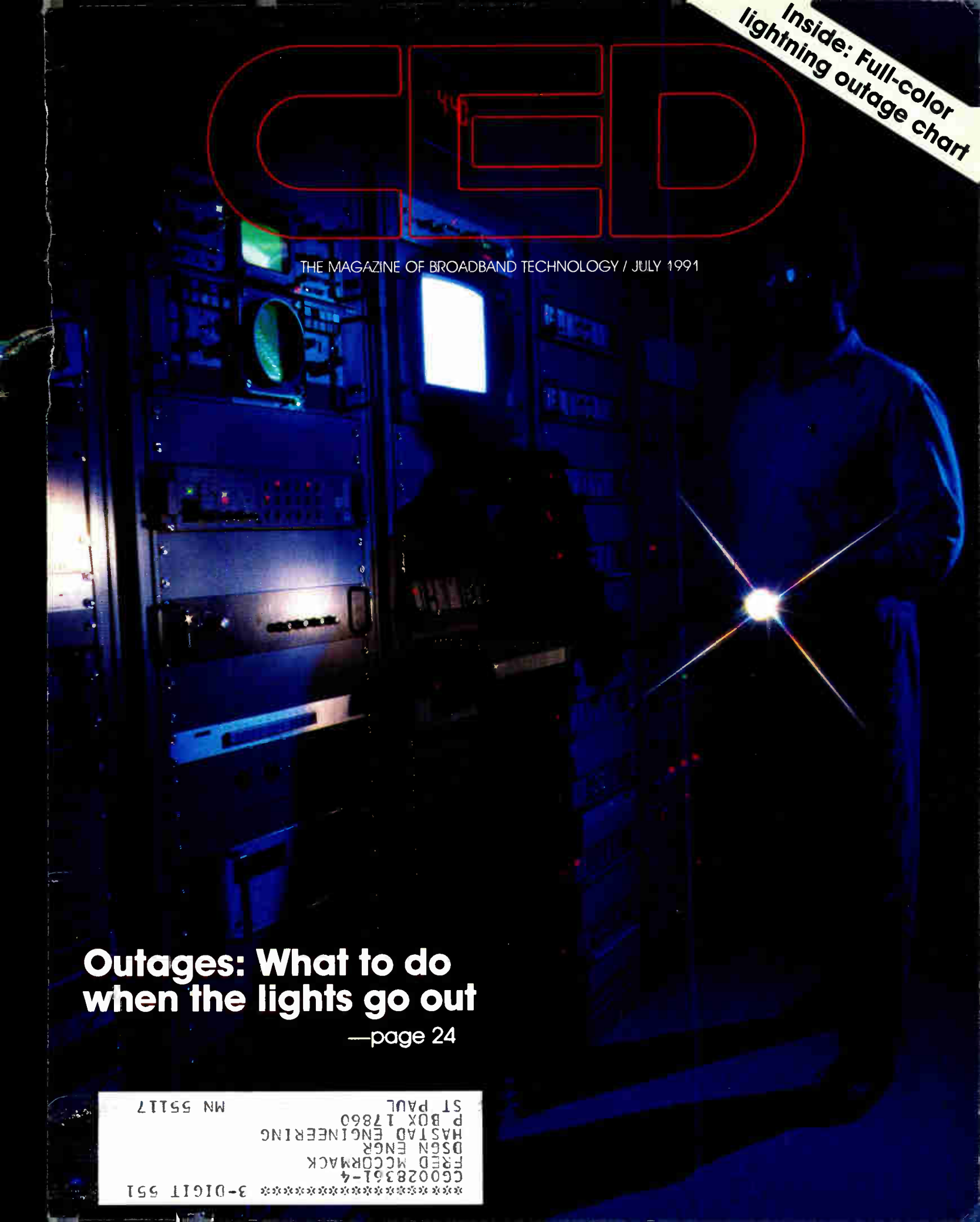

CED

THE MAGAZINE OF BROADBAND TECHNOLOGY / JULY 1991

Inside: Full-color lightning outage chart

Outages: What to do when the lights go out

—page 24

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July 1991

CED

Volume 17, Number 8

Outages: It was a dark and stormy night... 24
It's that time of year again—time for thunderstorms and other weather-related phenomena to wreak outage-havoc across the country. Jones Intercable's Roy Ehman, a recognized expert in outage-related issues, explains how to effectively plan for and survive outages in this first of a three-part series.

Coupler reliability: How is it gauged? 30
As fiber optic components reach deeper into the cable system, a key concern is component reliability. Corning's James E. Matthews defines the parameters to look for when making optical coupler decisions.

SCTE Expo wrap-up 35
The SCTE Expo in June was upbeat, well-attended and packed with enough information to make your head swim. Once again, you'll read about the three-day event first in *CED*. Complete coverage was compiled by Roger Brown, Gary Kim and Leslie Ellis.

Special pull-out chart 43
July marks the pinnacle of the summer storm season—how much do *you* know about lightning, tornado and storm-related outage patterns? *CED*, Alpha Technologies and Jones Intercable's Roy Ehman deliver this pull-out wall map, highlighting weather-related outage patterns.

Cumulative leakage revisited 62
One year ago, operators scurried to comply with the Federal Communications Commission's cumulative leakage index deadline. How are operators doing, to date? *CED*'s George Sell and Roger Brown re-examine the leakage issue and track operator progress.

A look at the HDTV testbed and schedule 78
This month marks the beginning of HDTV testing in Alexandria, Va.'s Advanced Television Test Center. *CED*'s Leslie Ellis describes the test procedure for each proponent.

Measuring system availability 82
What percentage of the time are systems "on?" And how is that calculated? ONI's Andy Paff and Antec's Kathy Berlin examine methods of calculating system availability—an important statistic for business customers.

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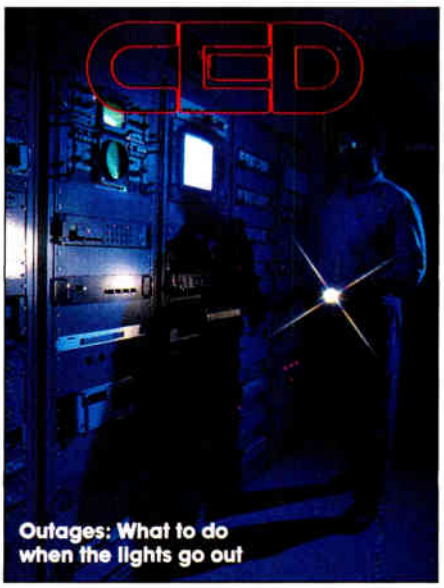


About the Cover:
Is this a familiar scene in your headend? Photo by Don Riley.

DEPARTMENTS

In Perspective 8
Between the line

Color Bursts 10
Consumer Electronics Show

Spotlight 14
Dr. Aleksander Futro, CableLabs

Frontline 16
Dealing with ignorance

From the Headend 18
QPSK and 4-QAM

Capital Currents 20
HDTV and simulcasting

My View 22
PCN: The rest of the story

CLI Callbook 69

What's Ahead 81

Cable Poll 86
Tiering

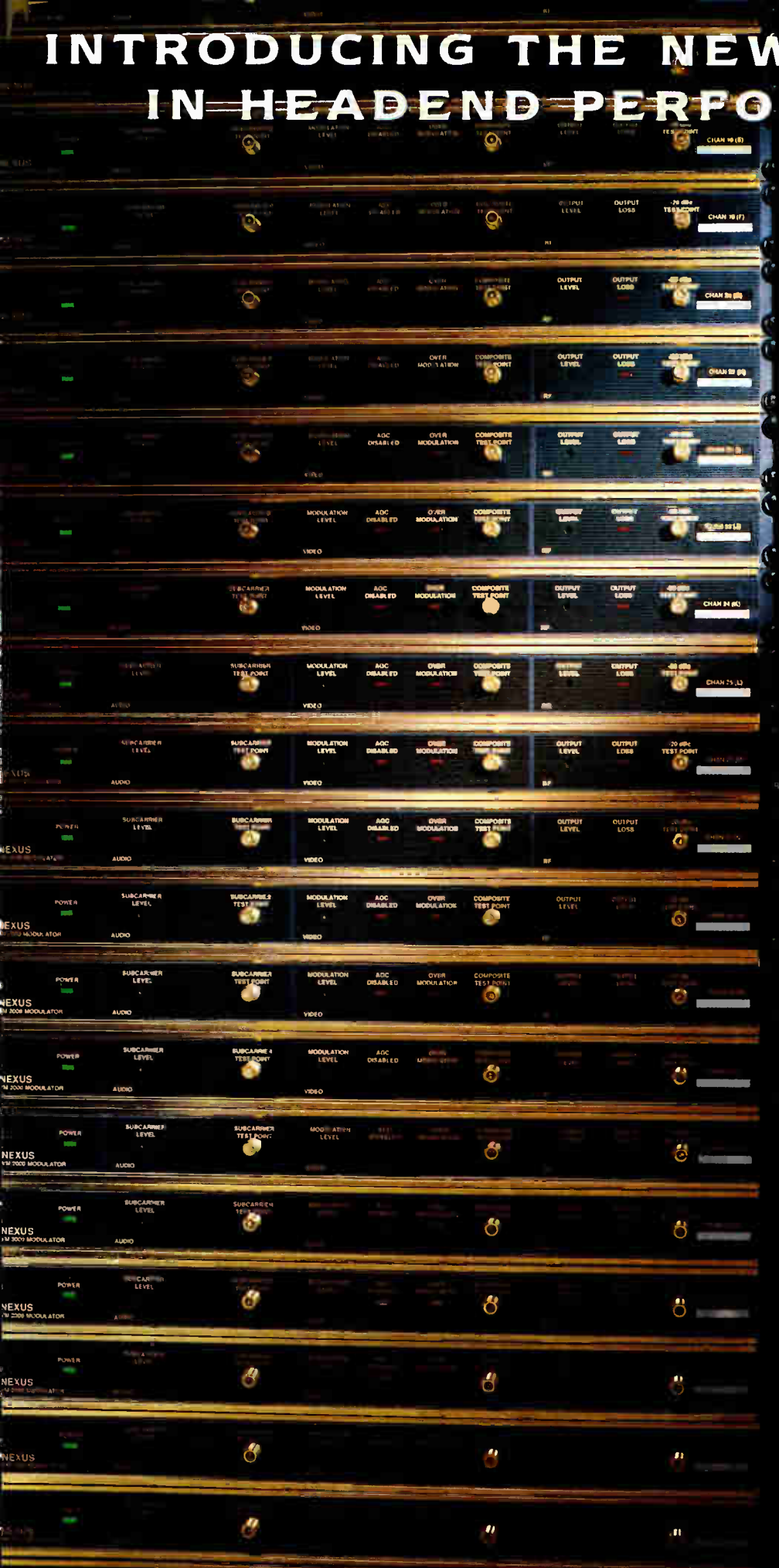
In the News 88

Ad Index 94

Classifieds 95

Ciciora's Page 98
Interface complexity sources

INTRODUCING THE NEW STANDARD IN HEADEND PERFORMANCE



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DEFINITELY AHEAD OF OUR TIME

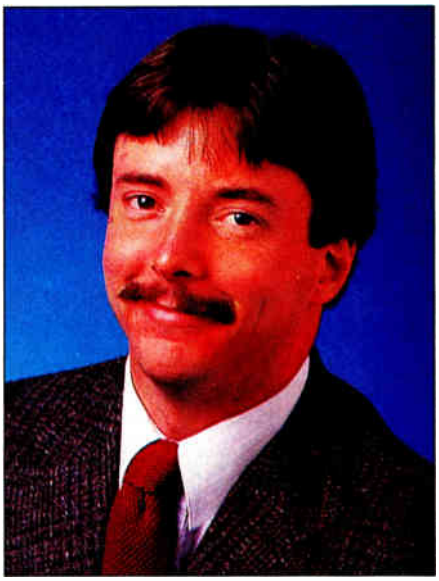
Reader Service Number 3

HDTV after the tests: Then what?

I stole the headline above from the title of a panel discussion that was held last month at the International Conference on Consumer Electronics. The discussion was entirely off-the-record, so I can't report who said what, but I can tell you it was an eye-opening and lively discussion of advanced television and what it will take to make a business out of it.

It was unusual (to say the least) to see and hear engineers talking about market forces and what will be necessary for the American public to embrace the new technology. With little exception, the forecast was surprisingly gloomy.

One panel member pointed out that better resolution and picture quality probably won't translate into sales because the public has always chosen *more* over *better* and prefers 100 channels of good ol' NTSC vs. five channels of HDTV. But much of the time was spent discussing the merits of enhanced definition TV and the impact it could have on spurring HDTV interest.



The argument is that EDTV could be implemented sooner and more cheaply by broadcasters and without taxing the spectrum allotted to them. Receivers could be built with the 16x9 widescreen aspect ratio but wouldn't cost as much as full-blown HDTV, another important factor in determining market success.

In fact, early indications are that European broadcasters may adopt a "PAL Plus" scheme that would be roughly similar to ACTV's proponent system for this country. This is viewed as the initial step of a long-range strategy to introduce widescreen TVs to the market. The plan calls for 1 million such receivers to be sold in Europe by 1995 and 10 million to 20 million by the end of the decade. From there, the transition to HDTV would be little more than better resolution.

However, another panel member said the idea of multiple standards would only confuse the consumer and would provide a chilling effect on new receiver purchases.

Given the widely noted failure of AM stereo radio and other services as a result of inaction on standards making by the FCC, it's unlikely the Commission will choose to allow more than one standard for what is being considered television's new era. Many would argue it's too late—after all, the testing begins this month. (It's scheduled to be completed by this time next year. I'll go out on a limb and predict that those tests won't be finished on time; remember, you read it here first.)

Roger J. Brown

Roger Brown
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CED

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Reader Service Number 5

gaining acceptance in the consumer marketplace has been offered by International Cablecasting Technologies, originators of the 30-channel Digital Music Express compact-disc quality service.

ICT and Scientific-Atlanta jointly announced their intention to increase production of DM-2000 tuners to 60,000 units per month and expectations are that more than 200,000 units will be in distribution by the end of the year. These tuners are placed in subscribers' homes and allows them access to the service.

According to Jerold Rubinstein, ICT chairman, the increase in production rate was necessitated because of expanding launch plans by ICT affiliates. "Early consumer research is indicating even higher subscriber take rates for the service than anticipated," he said.

In a related announcement, ICT said several new affiliates plan to launch the DMX service, including: Adelphia Communications; Bresnan Communications; Cencom Cable Associates; Colony Communications; Post-Newsweek Cable; United Artists Cablesystems and Western Communications.

The cart before the horse?

Local governing bodies may not be getting any easier to deal with, but they are getting smarter.

Last month, New York City became the second local government to establish franchising procedures for companies experimenting with personal communications networks and services. That action, as well as the ordinance requiring similar procedures in St. Petersburg, Fla. will have a significant impact on cable operators. Time Warner has experimental licenses in both locations, while Cox Enterprises and Cablevision Systems have licenses in New York.

Both ordinances require PCS companies to remit a portion of their revenues to the city. The New York measure would only regulate those service providers who construct their own fiber optic facilities to connect cell sites. In St. Petersburg, the ordinance spells out an application process and a per-cell fee structure.

Indications from city officials in St. Petersburg show significant interest by other municipalities in similar legislation.

However, PCS companies and the FCC have shown concern over the impact of such rules on the development of PCS technology.

NIST supercomputer tracks compression

No one's really sure of the significance of the announcement of high definition television, but the National Institute of Standards and Technology has acquired a $1.5 million computer that will help in the development of digital video compression technology.

NIST officials are reportedly actively recruiting scientists and engineers from universities and companies interested in research on fundamental aspects of high definition systems.

The video supercomputer was funded by the Department of Defense's Defense Advanced Research Projects Agency. It's heart consists of a "Princeton Engine" developed by the David Sarnoff Research Center.

DARPA contractors are expected to be among the first users of the computer. It is primarily interested in developing better imaging systems for the military.

CES highlights interactive home

This year's summer Consumer Electronics Show video-related offerings seemed to parallel the lackluster year many equipment vendors are suffering through. There were a few new "universal" remote controls (designed to reduce coffee table clutter) and even some 16x9 widescreen versions of traditional NTSC televisions (conceived to get consumers excited about widescreen HDTV, no doubt), but the show was generally devoid of breakthroughs considered important to cable operators.

The show was generally devoid of breakthroughs considered important to cable operators.

There was one major exception, however: Home automation.

The fledgling industry, which has been talked about for years and is being spurred by the SmartHouse and Consumer Electronics Bus projects, is spawning new entries from companies that have grown tired of the seemingly endless meetings designed to establish standards and instead want to go to market immediately.

One that has immediate impact on operators is the Elan Advanced Home Network system from Square D and International Jensen (the system was shown during the NCTA Show this year in Antec's booth). Intended for new construction only, the system consists of an audio distribution amplifier and wiring scheme intended to tie together the TV, telephone and audio equipment.

Other entrants include Heath Company, which has published a *Home Automation by Heath* catalog of products designed for the do-it-yourselfer and "electronics innovator." Products offered include whole house automation and security systems, security camera, wireless video broadcasters and a host of other devices to control energy and resource usage.

Thomson Consumer Electronics is active in the fray, and showed a modified RCA television attached to the first CEBus demonstration home. A small computer placed inside the television allows it full control of electronic products located throughout the house.

In addition, less sophisticated devices are finding a niche. Vidicraft, Gemini and Recoton all recently filed approval requests with the FCC for second-generation wireless video broadcasting units. The new approvals were necessary because the devices have gone to FM instead of AM signals.

Initially, these devices operated in the 900 MHz band but are now moving toward using several bands, including UHF and FM.

And finally, other companies, including NAD, have introduced a custom-installed multiroom/multisource control system that distributes both audio and video signals. The NAD system offers individual 25-watt-per-channel zone amplifiers that provide two local inputs as well as a zone volume control. ■

—Roger Brown

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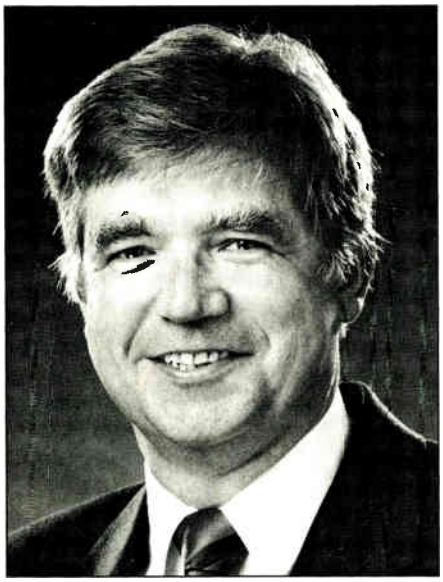

Dr. Aleksander Futro

Cable's horizon-watcher

While the rest of the cable industry goes about its daily business, a Boulder, Colo.-based physicist named Dr. Aleksander Futro is paid to think about one thing: Tomorrow.

Like a military "point man" who sits high atop naval vessels watching the horizon for enemies, Futro watches instead for new technologies. "My job is to work with both operators and vendors to find technologies that will advance the industry," Futro explains. Although for "strategic" reasons Futro can't say *exactly* what projects are under his umbrella, some of the categories proposed to the Labs' Technical Advisory Committee include: Advanced display systems and technologies; fiber optic technologies; components; signal compression technologies and conditional access.

Indeed, Aleksander Futro has a fascinating job—and an equally fascinating background. Born and raised in Poland, Futro received his master's and Ph.D. degrees in Warsaw. "And like most people, once you get your Ph.D., you want to go somewhere and try it out," Futro explains. So, in 1978, Futro crossed "the big pond," as he calls it, to Massachusetts, where he was hired to do semiconductor research for MIT.

One year later, Futro decided to stay in the States for good—and his path slowly lead him toward cable television, almost as if by design. After a brief stint at the Colorado School of Mines, where he picked up the chalk for the school's Physics Department, Futro made a left turn that pointed him even closer to cable.

"I started to get very curious about the balance between pure science and the application of pure science. I wanted to know more about the business side of things," Futro recalls.

So, Futro returned to college—this time, the University of Denver—to pick up an MBA. Interestingly, his thesis for U. of D. was to develop a business plan for U S West. "It was not hypothetical. It was real," Futro explains. "In a sense, that was my first exposure to cable television. Because as I researched how to deliver video telco-style, I naturally had to compare how cable television operates."

Futro is pleased with his decision to join CableLabs over one year ago, he says, because there exists a healthy balance of his two primary interests: Science and business. "Technology excites me, and the dollar sign cools me off, when necessary," Futro smiles, "depending which hat I put on—scientist or businessman.

Balance: Greatest challenge

It is this unique science/business balance that Futro calls his greatest engineering challenge. "The challenge is how to successfully choose from the many technological options which exist today, to bring specific technologies into a product."

Futro feels that the current plethora of technological choices warrants immediate attention from cable's marketing minds. "It's no longer an issue of technology push. It's now an issue of marketing pull," Futro explains. "What do we, as human beings, want to buy?"

To that end, Futro believes that more industry people who are "responsible for the bottom line" need to get involved in technological decisions. "The life cycles of everything we do, technologically, are getting shorter. That's because technology is moving, and because of competition.

Futro's Eastern European roots also weigh heavily on his thinking. "Take digital compression, for example. My question is, how *much* compression? I am biased on this one, because where I come from, it's 'quality first, quantity second.' I am still adjusting to the marketing studies we are receiving which say that we want 'more' before 'better.'"

That is not to say that I am against compression," Futro quickly adds. "I'm not. Actually, I am a true advocate of fiber in the system, and a true advocate of quality images to be passed to the home. As for compression, I am for a reasonable amount that will not compromise image quality."

When asked what "hot buttons" make him want to get up on the soapbox, Futro is specific: "My personal crusade, if you will, is the image problem cable currently has," Futro says.

"The general public often blames cable as being 'low tech.' That is the most incorrect statement there is. When you consider that today, as an industry, we are installing the first 1 GHz system..." Futro's voice trails off. "If I go back to my years in the research lab, if I needed to do some measurements on 1 GHz, I got my best students to do the experiments. As an industry, now, we're filled with examples of what a leading-edge group we are."

And along those lines, Futro is also concerned with the current lack of industry-wide strategic planning. "We need to get away from a 'firefighting' approach to a more strategic style," Futro says. "This industry is not doing enough integrated strategic planning."

Indeed, the nature of Futro's job requires quite a bit of strategy in and of itself. "CableLabs is a consortium of operators," Futro explains. "Managing this, in the sense of technology and innovation, translates into influence. (Mine) is a management style that includes some kind of interplay between technology and strategy."

Strategy and science aren't all Futro is made of, however. When not thinking about the future of cable television, he and wife Susie can be found enjoying Their three-year old son, Alexander John (A.J. for short). "Send in breakfast, lunch and dinner. Then we'll have enough time to talk about hobbies," Futro laughs.

The list is long—but sailing clearly tops the list. "I wish there would be more cable-related business outings held on a sailboat—instead of on the golf course," Futro says. "I was planning to learn how to play golf for my retirement. I'm finding that I may have to revise my priorities. Unless, of course, I can influence more people to do more sailing when they want to get away and talk about business."

Any takers? ■

—Leslie Ellis

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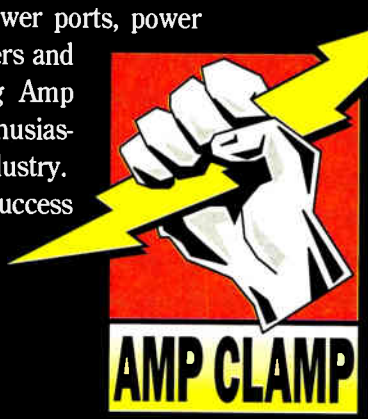

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Reader Service Number 8

Dealing with ignorance

I don't know about you, but when I was a small kid growing up there were several things that pushed my hot button—things that made me silently seethe at the unfairness and indignity of it all.

The one that used to really get my goat was when my parents would tell me to do something that I was either already doing or was *about* to do, without their prompting. Now, what really hurt wasn't so much that I was told to do something. It was the fact that any protestation in my own defense brought with it polite disbelief and suspicion of my motives.

Each of us undoubtedly has similar recollections, and if you are a parent today no doubt you commit the same injustices and inflict the same unfairness on your own offspring.

Nag, nag, nag

Well, as Yogi Bear once said, "It's deja vu all over again." In my office, I frequently entertain visitors from other industries, as well as representatives of regulatory agencies from around the country and, indeed, around the world.

All too often, I find that it is all I can do to withhold a sharp retort when some person or another says to me "Why doesn't the cable industry do more with technology? Why don't the cable guys, for instance, stop fooling around with this television entertainment stuff and use that infrastructure for something truly valuable (that is to say, delivering two-way interactive services)? And oh, when are you guys going to get on the fiber optic bandwagon, and when are you going to stop using single mode fiber," and on, and on and on.

By Wendell Bailey, Vice President Science & Technology, NCTA

> The problem is not, nor has it ever been, our *inability* to conceive of or instigate these (interactive) services.

Surely you get the picture. I find myself faced with only a few possibilities for ending these interviews without resorting to childish tantrums that (I am told) characterized the end of these situations in bygone days. Both of the two most obvious approaches leave something to be desired and are likely to cause me heartburn while raising my already borderline blood pressure to unacceptable levels.

Option one: Be polite

First, I can patiently offer a careful and erudite explanation to rebut each of the uninformed statements or questions. I can, for instance, explain the details about cable's involvement in a myriad of two-way interactive experiments dating back many, many years and continuing to this very day. I can explain that the problem is not now, nor has it ever been, our *inability* to conceive of or instigate these services.

> We have a history of advancing the art of telecommunications technology. Let's let outsiders know that we're proud of that fact.

Our problems have all been related to an inability to find customers who cared about what we were doing.

I don't for one minute believe this will always be the case. I remain optimistic about the future of two-way services. The additional effort required to rebut the charges of ignorance on fiber optic and other technological issues requires patience and some amount of pandemic recourse.

All of this, needless to say, takes up a large amount of my time, and I, like any of you, have other—certainly more interestingthings to do.

Option two: Defer

The other path I could take would be to smile knowingly, nod my head and say "Yes, of course, we'll get right on it," all the while knowing that I am only saying this in order to get these people out of my office—while thinking to myself that anyone ignorant enough not to understand cable's business or know anything of its history is not deserving any more of my time.

In either case, I feel all of the same emotions I used to feel as a young kid. What I need is some help in dealing with this crush of the uninformed. I would count it as a personal favor if all of you out there do something to help me lower my blood pressure.

Brag

For example, make sure that you as engineers and technicians understand all you can about our industry and its capabilities.

More importantly, be nosy. Find out what plans and aspirations your own company has for the services and use of these technologies. Convince your superiors to invest in our future capabilities, talk with and be able to be helpful to your public relations officials as well as community leaders.

Don't assume that because your job is engineering that this does not directly relate to community relations or that you have any less of an obligation than those professionals whose job descriptions include that contact. If you want the cable industry to be successful, you not only have to understand technology and invest in it—you also have to let people know what you're doing and what its benefits are.

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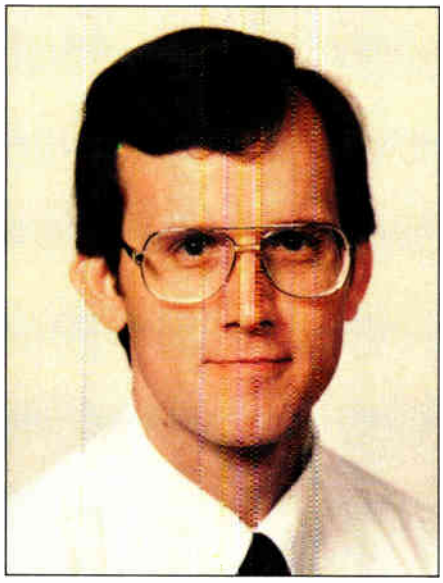


QPSK and 4-QAM

In last month's column, we discussed the concept of quadrature modulation—specifically with regard to how such a signal is generated and recovered, and without regard for whether the signal transmitted is analog or digital. We learned that quadrature modulation, the same technique that is used to modulate both the I and Q Color components on the NTSC 3.58 MHz color subcarrier, could theoretically be used to transmit twice the information in a given RF bandwidth, at the expense of some additional complexity in the demodulator.

This month, we'll focus on how quadrature modulation can be put to good use in the efficient transmission of *digital* information. We'll discuss a modulation technique called Quadrature Phase Shift Keying (QPSK), and we'll see that, for the types of digital modulation that we are interested in, it is really indistinguishable from Quadrature Amplitude Modulation (QAM).

Future compression modulation

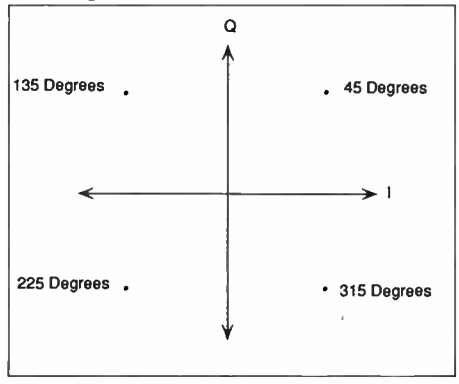
QPSK is an important digital modulation technique to understand because there is an excellent chance that it will be the modulation technique of choice in the transmission of compressed digital video over the satellite.

By Chris Bowick, Vice President Engineering for Headend Equipment, Scientific-Atlanta, Inc.

QPSK, as its name implies, is a phase modulation technique where the RF carrier has four different phase states, each separated by 90 degrees. This is shown in the constellation or phase state diagram of Figure 1 where the I axis is plotted horizontally, and the Q axis is plotted vertically. Each of the four points on the diagram represents the carrier's magnitude and phase during each symbol period, where each symbol can take on the values 00, 01, 10 or 11. The carrier's magnitude during each symbol period is represented by the radial distance from the origin, and its phase is represented by the angle.

Two plus two

QPSK can be generated by the creation of two Bi-Phase Shift Keyed (BPSK) carriers, each operating in quadrature, and then summed together. In this manner, the in-phase or I-channel will have two phase states, 0 and 180 degrees, and the quadrature or Q-channel will also contain two phase states, 90 and 270 degrees.



The constellation diagram of Figure 1 is generated when the I and Q carriers are summed together. Here we see, for example, that if I-channel were at a phase state of 0 degrees, representing a logical 1, and the phase of the Q-channel were at 90 degrees, also representing a logical 1, then the amplitude of the resulting combined RF carrier would be at a level of 1.41, and its resulting phase would be 45 degrees. This point is represented on the constellation diagram in the upper right corner, and would therefore represent the phase state for the digital symbol for 11.

One interesting thing about QPSK is that if the input digital data to both the I and Q channels is an unfiltered, balanced, binary data stream, then the resulting modulation and system performance is actually indistinguishable from 4-level QAM[1]. Four-level QAM is created by operating two 2-level double sideband (DSB), suppressed carrier (SC), AM modulators in quadrature.

The two quadrature channels are then combined creating the QAM RF carrier which is capable of attaining any one of four (2x2) possible states.

Theoretically, QPSK and 4-QAM modulation should offer a modulation efficiency of 2 bits/hertz, meaning, for example, that we would be able to cram 72 Mb/s of digital information into a 36 MHz bandwidth transponder. Unfortunately, the real world dictates a practical efficiency somewhat less than that, depending upon data rate and application, because of the necessity of realizing ideal filters in order to realize ideal spectrum efficiencies.

In the real world, for example, you might expect an operational efficiency of anywhere from 1.3 to 1.7 bits/Hz for QPSK or 4-QAM, depending upon the noise and distortion expected in the intended application, and also depending upon how much money you are willing to spend on practically realizing the ideal filters that would be required.

QPSK or 4-QAM is an economical modulation technique in applications where the transmission path is a very hostile environment, such as over the satellite, but where bandwidth efficiency is only a secondary consideration. It seems obvious, that in less hostile environments, where bandwidth is at a premium, these modulation techniques could be expanded to include more phase or amplitude states in each quadrature carrier. This is, in fact, the case and will be the subject of next month's column where we investigate a 4-level AM technique for each quadrature channel, resulting in the modulation technique called 16-QAM. ■

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2. Montreuil, Leo and Wall, William, 'Performance of Digital Modulation Methods in Cable Systems,' NCTA Technical Papers, 1991.

3. Robinson, Gerald, 'A Cable Perspective on Digital Transmission', *Communications Technology*, May 1991.

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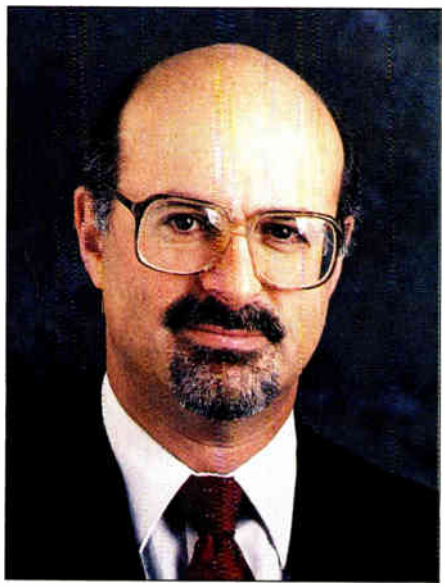

HDTV and simulcasting

In 1990, the FCC decided that it would adopt a "simulcast" HDTV format. People are now asking just what that means. As we shall see, this simple question hides some important legal and operational consequences.

The 1990 FCC decision

In its First Report and Order in Docket No. 87-268, the Commission decided to reject the "augmentation" approach to HDTV. With an "augmentation" approach, a broadcaster would be given an additional 3 MHz or 6 MHz and this additional bandwidth would carry the "side panels" needed to achieve a 16 x 9 aspect ratio, as well as the additional picture resolution information. An NTSC receiver would not receive these additional signals, while an HDTV receiver would integrate the NTSC information plus the "augmentation" information into an HDTV picture.

Instead, the FCC chose the "simulcast" approach, where a broadcaster would continue to transmit an NTSC picture on one 6 MHz channel and would simultaneously transmit an HDTV picture on a separate 6 MHz channel. The FCC decision defined "simulcast" to mean the broadcast of one program over two channels to the same area at the same time.

By Jeffrey Krauss, Independent Telecommunications Policy Consultant and President of Telecommunications and Technology Policy of Rockville, Md.

Questions about the FCC definition

Seems simple, doesn't it? One program broadcast over two channels to the same area at the same time.

Suppose the program is football; we could probably agree that "simulcast" means that the same game must be covered on both NTSC and HDTV stations. But suppose the broadcaster uses NTSC cameras to feed the NTSC broadcast transmitter and HDTV cameras to feed the HDTV transmitter. Do NTSC and HDTV cameras have to be located side-by-side, so that they can show the same view? Does the program director have to use shots from cameras that are side-by-side, or can he select an NTSC shot from the end zone while the HDTV shot is from the goal line? Or maybe "simulcast" means that only HDTV cameras can be used, and the signal must be "down-converted" to NTSC format for broadcast on the NTSC transmitter.

Must the NTSC and HDTV stations carry the same programming all the time? Or is 90 percent of the time sufficient? What about 70 percent? Do the commercials have to be the same?

What about coverage area? If the licensee of channel 4 is given an assignment for channel 53 to use as his HDTV channel, the laws of physics almost guarantee that some of the area served by the NTSC transmitter will not receive an acceptable HDTV picture.

In addition, because of co-channel interference, HDTV stations in congested areas are not likely to have the same coverage area as NTSC stations.

Are these questions important? The lawyers think they are.

Legal implications

The precise meaning of "simulcast" is important because of a Supreme Court decision known as the Asbacker Radio decision, 326 U.S. 327 (1971). Simply put, the court said that when the FCC creates a new radio service, everybody should have the right to apply for a license.

That won't be the case with HDTV, of course. Only existing TV broadcasters will be eligible to get licenses for HDTV stations. Well, no, the FCC hasn't actually made this decision yet, but can you imagine the administrative chaos that would result if people like you or me could apply for these new HDTV stations?

The trick here is that HDTV broadcasting will not be defined as a new service. It will be defined as an extension or enhancement of the existing TV broadcast service. In that way, only existing broadcasters will be eligible to apply for these new licenses.

But clearly this little trick will only hold up in court if the new HDTV station carries the same programming as the NTSC station. If the programming is going to be different, then it would be contrary to the FCC's policies on "ownership diversity" to give the licenses to existing broadcasters.

Operational implications

The "simulcast" definition will have certain operational implications for broadcasters, in terms of program production, cameras and microwave links.

The football game, discussed above, is an example of the more general case. The broadcaster can either shoot a scene with two cameras—NTSC and HDTV—or with a single camera. If the single camera is HDTV, then the image must be "down-converted" to NTSC quality for the NTSC transmitter. If the single camera is NTSC, then it must be "up-converted" to HDTV quality, presumably using some sort of line-doubling technique.

If the broadcaster uses both NTSC and HDTV cameras, then he needs a complete "double thread" of studio equipment, plus two separate microwave links to carry the programming from the studio to the transmitter.

As a less expensive alternative, at least for some period of time, the broadcaster could use the HDTV station to transmit a mix of "true HDTV" programming that is delivered by the network plus "NTSC up-converted to HDTV" for locally-originated programing.

While the FCC will wait until late 1992 to review the test data and mid-1993 to pick the HDTV standard, there is no need to wait until then to answer these questions about "simulcasting." Watch for the FCC to take up the issue late this year, with a decision in mid-1992. The decision will have to contain the FCC's rationale for awarding HDTV licenses only to existing broadcasters, and excluding you and me. Then we will see whether the lawyers and the courts will demand their turn. ■

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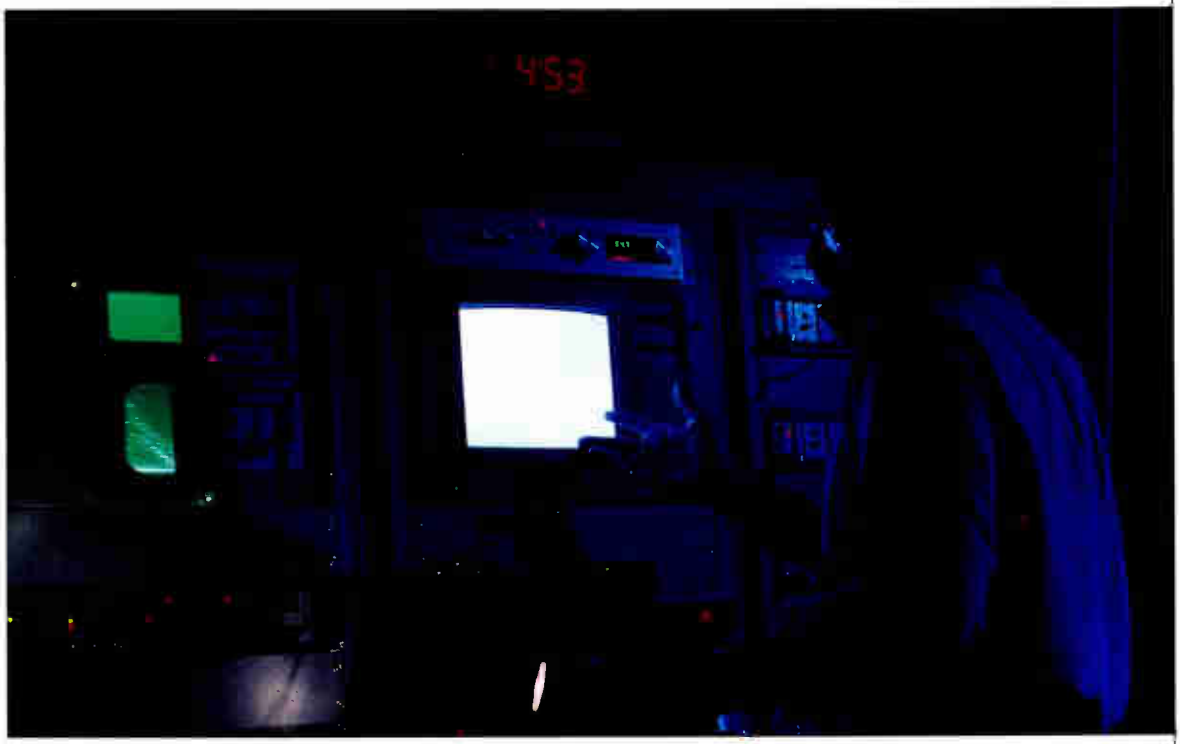
Reader Service Number 11

Organizing for outages



Given that it is relatively easy, with the technology available to us, to provide pictures of highly acceptable quality covering ever wider areas, we now need to focus more attention on customer service and a drastic reduction of outages.

Confirmation of this was provided some three years ago by a third party survey funded by Jones Intercable which revealed that outages—*not* picture quality—that exceeded certain duration and frequency limits were the number one cause of customer dissatisfaction. We were, in some cases, exceeding the average customer's threshold of outage tolerance by up to 50 percent.

That study is shown in Figure 1. Even though dramatic improvements in outage control have since been made, outages are still at the top of the graph in current surveys. Indeed, the cable industry as a whole is being obliged to focus strongly on the areas of outage control and customer service.

Hitherto many operators and their staff have had an attitude of Stoicism, or Que Sera Sera! Stoicism, you will recall, was a principle put forward by the Greek philosopher Zeno, circa 308 BC, whereby all men should be free from passion, unmoved by joy or grief, and able to submit without complaint to the unavoidable necessity by which all things are governed.

Webster describes Stoicism as "uncomplaining endurance." There is certainly no longer any room for Stoicism when considering outages. They can be controlled, and unlike the stoics, we should get very passionate about outages—especially long ones.

Outages have two obvious parameters. They are the *number* of outages and their *duration*. A subsequent article in *CED* (slated for September publication) will clearly delineate the latest and best methods for reducing outages based on research and testing currently in progress.

This month, however, we will review some procedures for reducing outage durations by organizational methods.

Extended hours

Let's look at dispatch. The importance of the dispatcher and the dispatch function tend to be greatly underestimated. When you stop and think about who is actually running your system (plant) from minute to minute, it is clearly the dispatcher. This is especially true after the office closes.

As an industry, our principle assets consist of our plant and our customers. Even a small system of 5,000 subs at, say, $2,000 per sub is worth $10 million. Can we afford to walk away from these assets at five in the afternoon—and leave matters in the hands of a possibly underpaid, undertrained or part-time dispatcher? Or, worse yet, in the hands of an answering service?

Certainly not. There is nothing quite as irritating as calling a company, posing a reasonable question and then being told "I don't know, sir—I'm just the answering service."

Happily, many systems are getting the message and are moving to extended hours to a greater or lesser degree. Small systems need to be available to do business and handle outages expeditiously until at least six or seven PM. Larger systems have the flexibility to stagger some shifts or deploy part-timers so that the public can get an informed response any time up until the late evening news.

Although we like to think of ourselves as "high tech engineering folks," we are actually a service-oriented industry and our customers want to do business and get an intelligent response to their problems when it is convenient to them, not us.

Sometimes you will hear a senior person say that they tried keeping the office open from, say, five to six PM and found that there were little or no calls. The reason is usually that subscribers on that system have been "trained"

By Roy Ehman, Director of Engineering, Jones Intercable

over the years to know that the office will be closed after five and therefore do not call. If they were advised through the local paper, the alpha/numeric channel or bill stuffers, they will certainly appreciate the extended hours and will use the opportunity to conduct their cable business at a time convenient to themselves.

Bear in mind too, that calls properly dealt with "after hours" will help to unload peaks that might have occurred during the day. If the calls-per-hour are clocked for a few days, the result will be a series of well-defined and fairly constant peaks which can be dealt with by optimizing staff deployment.

Hiring for dispatch

For a dispatcher to handle a technical operation including outages, it is only fair to expect that he/she will have at least some technical background. For this reason, when hiring new or replacement dispatchers it is prudent to look for some background technology. Amateur radio operators (hams), for instance, make good dispatchers, not only because they can handle the radio but also because they have usually taken an interest in RF technology. Other good candidates are hobbyists such as short wave listeners, CBers, audio buffs, etc. A cable technician that is recuperating from an injury also may make a good dispatcher. All techs should be rotated through dispatch at least once to get the "feel" from the other side of the base mike.

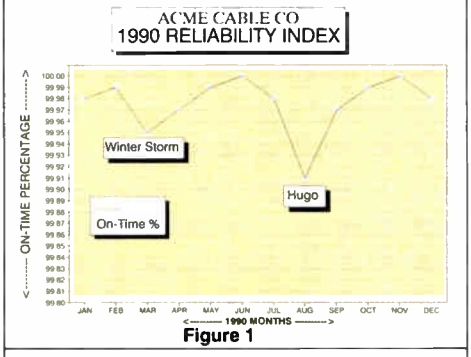


Figure 1

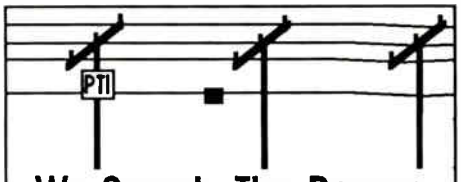
The outage plan

In the past many systems would "wing it"or "play it by ear" regarding outages. That is not good enough if we are to get outages under real control. We need a plan! This plan should be written and should deal with such items as:

- How to handle incoming calls (What are the priorities? Should hundreds of calls be answered or should he just take the three or four phone numbers and addresses nearest the headend to localize the problem and for later call back to verify restoration, and let an answering machine handle further calls?)
- Who to call
- When to call in extra help (day vs. night)
- Does overtime need authorization?
- If the outage is too long, who to call and when (Examples: After one hour call chief tech, after 1.5 hours call system engineering manager, after two hours advise system manager).
- Logging the outage (Can it be done manually, or should a spreadsheet be used?)

These parameters will vary from system to system depending on size and style, but whatever is adopted should be in writing for all involved to see —and understand. If the procedures don't meet the situations they can be tightened up, slacked off or amended as needs change and the system and it's personnel grow.

Of course you can't control something you don't measure. It is therefore



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Reader Service Number 14

How to examine coupler specifications

Now that fiber optic couplers have become a standard component in cable television distribution systems, reliable service under field conditions is—or should be—an important selection criterion. Not paying attention to component dependability could mean an invitation to trouble in the months or years following system start-up.

Specifiers may find, however, that the data needed to pass judgment on lasting service functionality often is sketchy. The cable television industry's own experience, from application of limited numbers of couplers, does not provide the assurances required for large-scale implementation.

Ideally, system designers should have access to verifiable data that reflects many different aspects of functionality. Demonstrating that couplers will resist failure as a result of unforeseen events or prolonged environmental exposure in cable systems should draw on the results of a broad range of tests under controlled and repeatable conditions.

Performance factors to consider

New fiber optic cable television architectures rely on passive optical couplers to share expensive system resources, thereby reducing system cost per subscriber. Uneven tap ratios allow directional couplers to compensate for fiber legs of different path length, providing overall optical power balancing and consistent performance throughout a system.

By James E. Matthews III, Product Engineering Manager, Corning Inc.

In order to ensure system integrity, couplers must be fully qualified for extended service under conditions that simulate real life environments. Familiarity with the principles behind qualification programs and the test methods themselves will help users identify the information needed to evaluate couplers. And, an understanding of how the information is obtained makes it easier to sort out and compare performance data offered by different coupler manufacturers.

The initial concern in qualifying couplers is their ability to meet the immediate optical and mechanical requirements of the fiber optic network. Basic specifications usually are supplied by manufacturers in terms of insertion loss, backscatter and directivity, in accordance with typical operating conditions.

Judgments about lasting quality are best when they are based on the quantification of as many aspects of service functionality as possible. They should reflect changes in optical performance after exposure to extremes of temperature, humidity, mechanical stresses and other adverse factors.

Comparative data that measures insertion loss, backscatter and directivity before, during and after testing can be used to identify incremental loss of performance that results from environmental transients and aging.

Predictions about longevity in standard usage are based on extended tests that accelerate environmental conditions to simulate long periods of time, in order to determine coupler life expectancy. Experience from testing devices under exaggerated conditions is proving to be useful for understanding and eliminating potential failure mechanisms.

Certified dependability

A substantive body of knowledge that addresses the concerns of cable system operators has been developed by Corning Incorporated at its laboratory test facilities in upstate New York and in France.

Laboratory studies at both locations have established that coupler performance indeed remains stable during and after exposure to adverse conditions typical of cable television applications, and that extensive useful service lifetimes can be expected. Data was obtained from tests involving multiple-index couplers, an enhanced fiber-fusion technology developed by Corning for the cable television industry.

Test programs can be handled in different ways. The selection of test methods determines how accurately

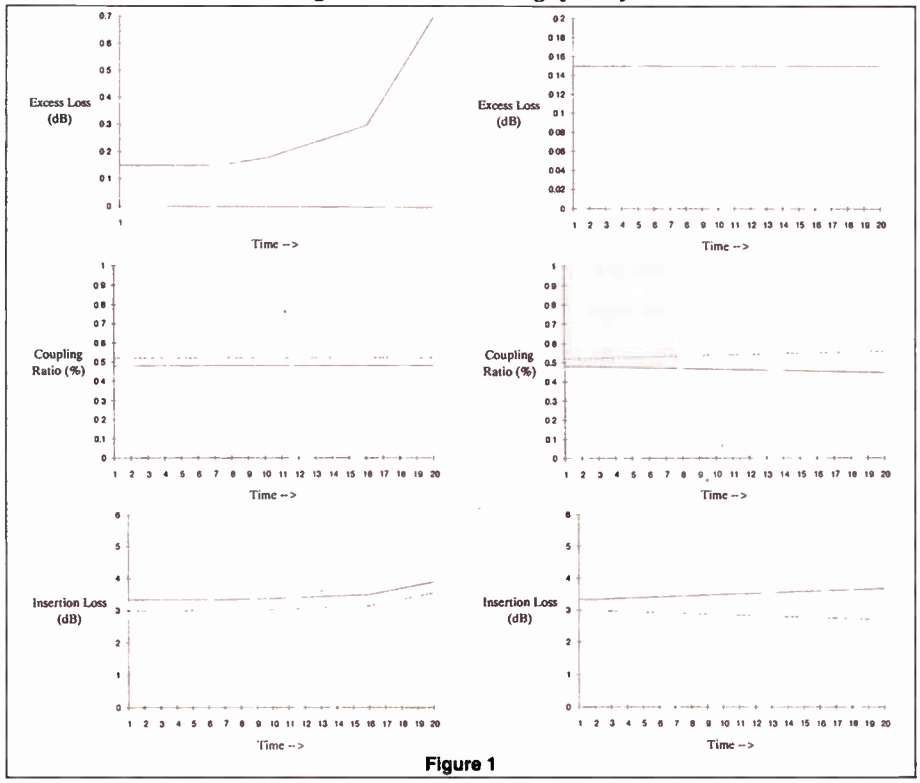
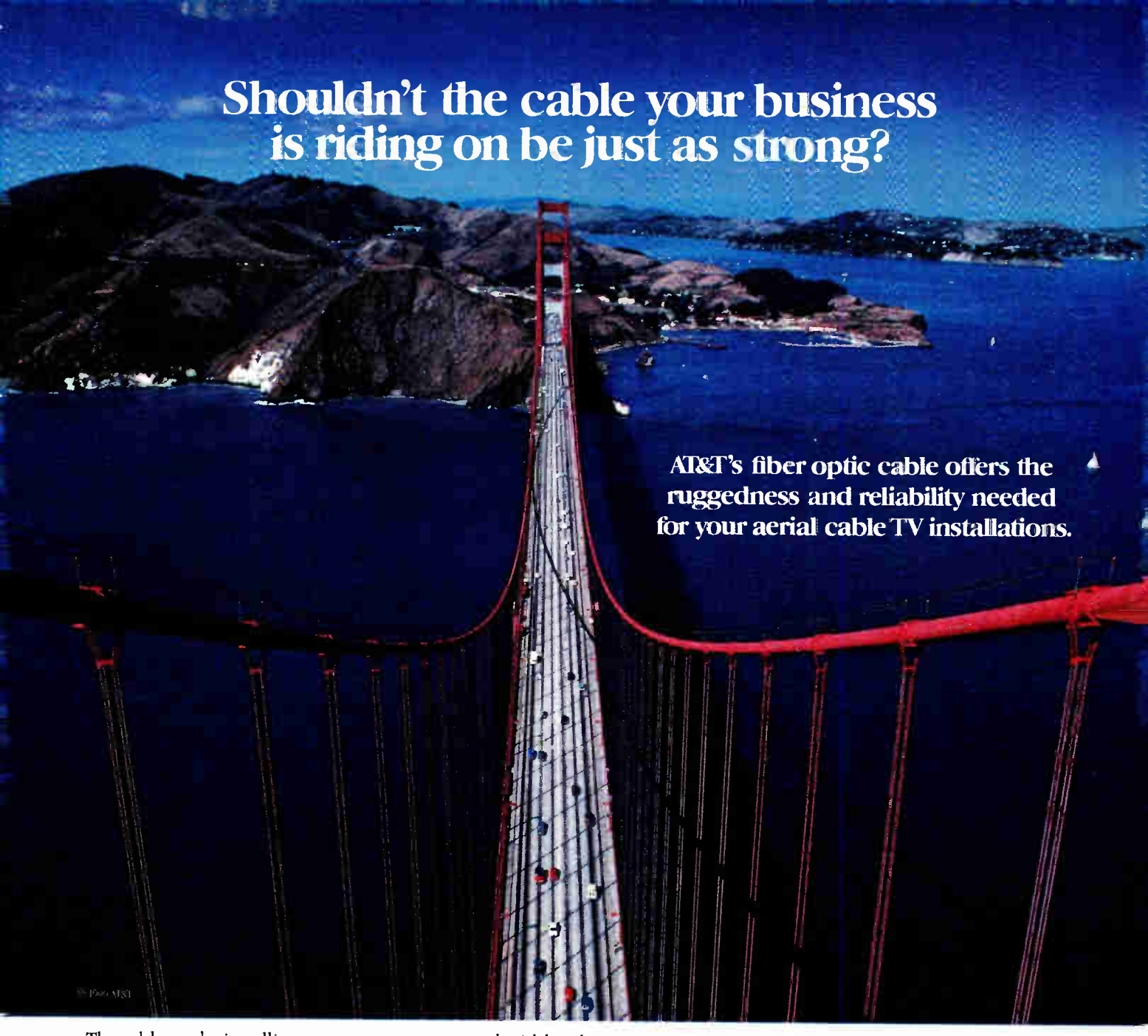


Figure 1

Shouldn't the cable your business is riding on be just as strong?



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Reader Service Number 17

the conclusions are able to predict device performance and identify problems.

The more variables that are involved in the design of a program—such as sample selection, conditions of exposure, observed parameters, recording equipment and data analysis techniques—the better. In fact, these factors validate the findings. Therefore, when evaluating test program results, a critical perspective should be adopted, relative to the facility's capacity to supply meaningful observations on a comprehensive scope of inquiry.

Active monitoring of multiple devices in a wide variety of representative environments is fundamental to a comprehensive coupler qualification program. Meaningful performance data over the full operating wavelength band is best provided by a computerized multi-channel recording system that allows simultaneous insertion loss readings from many couplers at multiple discrete wavelengths.

A qualification program should be as broadly based as possible. Data on mechanical stress and non-optical procedures also is required. Computer analysis techniques are useful in organizing and interpreting the results in a way that predicts typical device behavior.

Environmental resilience

The impact of environmental factors on optical performance can be quantified by:

- the nature and duration of the influence (temperature, humidity) and
- the change in performance caused by exposure.

Fluctuations in optical losses should be monitored actively, as they occur. Accurate measurements of backscatter and directivity also should be reported, as this may influence overall system performance if of sufficient magnitude.

The effects of mechanical stress similarly can be determined by measuring the change in optical performance resulting from certain defined physical events. They include pulling the fiber pigtails, dropping the device, vibration and other tests.

A large number of environmental tests have shown that 1x2 couplers show excursions (increase in insertion loss during testing) typically less than 0.2 dB for the operating windows in both the 1310 nm and 1550 nm regions. This performance stability conforms to cable television industry limits for environmental testing.

Coupler resilience also is measured by environmental drift, or non-reversible insertion loss change from beginning to end of test. While no specific industry guidelines exist, general good engineering practices should limit environmental drift to −0.1 dB.

Minimal increases in coupler insertion loss are required for power-sensitive cable television applications where optical loss budgets are tightly calculated. Manufacturer's products and testing should meet or exceed requirements to safeguard long-term device performance within established guidelines.

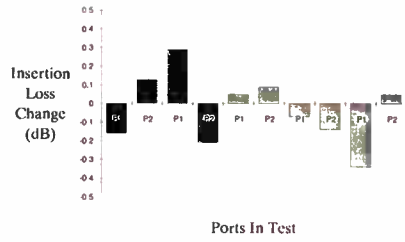

Figure 2

Multiple Index Process

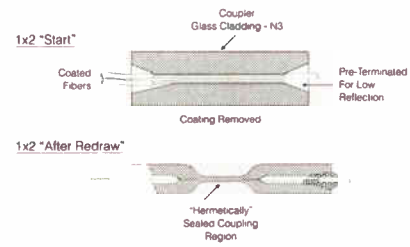

Figure 3

It always is best to specify optical performance primarily in terms of maximum or worst-case insertion loss over a given wavelength passband. As the most useful parameter for system designers, insertion loss represents what the system actually "sees" for a given path through a device.

Although coupling ratio is easier to measure than insertion loss, it does not adequately characterize power loss incurred by a specific device path. The magnitude of the power loss is apparent only by calculating coupling ratio in conjunction with excess loss (see Figure 1). Excess loss, while serving as a calculated figure of merit for couplers, can hide potential instability. By reporting change in insertion loss, test results identify device dependent as well as port-dependent failure.

The environmental test programs expose components to a series of constant stresses, normally over a two-week period. A typical sequence may include:

- 14 days of damp heat with a temperature of 60° Celsius and the relative humidity at 90 to 95 percent
- 1 day at room temperature and normal humidity
- 14 days of dry heat at 85° Celsius
- 1 day at room temperature
- 14 days of thermal cycling, where the temperature is changed every eight hours from −40° Celsius to +85° Celsius
- 1 day at room temperature
- intermittent vibration ranging from 10 Hz to 55 Hz
- repeated exposure to thermal shock, where the temperature is quickly changed from +85° Celsius to −40° Celsius and vice versa.

Field experience indicates that both vibration and thermal shock can degrade optical performance and should be included in an environmental test sequence. Passing rail or auto traffic, or movement of aerial cable is simulated by vibrations through the entire frequency range of 10 Hz to 55 Hz. Thermal shock simulates effects such as opening and closing equipment housings in adverse conditions.

Extended performance

After couplers have passed through an environmental cycle, additional performance measurements taken during and after lengthy heat and temperature cycling are very useful in predicting component life-expectancy under field conditions.

Since a typical outside-plant installation might subject couplers to only a few hours a year of *extreme* environmental exposure, continuous testing at high temperatures and humidity levels simulated many decades of field exposure. Open-ended testing under such "accelerated" conditions is therefore another important aspect of coupler qualification.

Results of heat aging tests by Corning thus far have shown an increase in coupler insertion loss of less than 0.25 dB after nearly a thousand hours at +85° Celsius (see Figure 2).

Another test exposed planar couplers to a thousand hours of thermal cycling between −40° Celsius and +85° Celsius, with an insertion loss increase of less than 0.2 dB.

Mechanical robustness

A sequence of mechanical tests that

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subjects devices to pulling, flexing, twisting and impact determines how routine physical stress affects coupler optical performance. Standard laboratory procedures and performance criteria for these tests have been defined by industry consensus.

A pulling force on the fiber pigtails is used to determine cable retention strength. Testing measures a coupler's change in optical performance after the application of an externally applied 2.2 lb. force on the loose tubes and cables, with 1.1 lb. force on the exposed fiber itself, for one minute.

Another important mechanical procedure is flex testing, which subjects coupler pigtails to bending about a 5-inch mandrel for 300 cycles using a 1.1 lb. force. A twist test applies 10 cycles of a 1.1 lb twisting force three inches from the coupler housing. An impact test drops a coupler from a height of a few feet on its top, sides and ends eight times each.

Insertion loss increases of less than 0.2 dB are reported after these mechanical tests, conforming with standard industry guidelines. Active monitoring during thermal cycling throughout the entire operating temperature range (– 40° to + 85° Celsius) indicates generally consistent optical performance in all climates with changes in insertion loss no greater than 0.2 dB.

Multiple-index couplers achieve increased mechanical robustness by inserting optical fibers into a specially fabricated capillary tube prior to fusing. the resulting composite glass structure, which has a coupling cross-section 100 times thicker than the coupling region of a typical fusion device, provides enhanced optical and mechanical performance (see Figure 3.)

Dependability through technology

Although testing can accurately forecast the dependability of a component, fundamental soundness must be imparted at the manufacturing stage. Advanced coupler technologies rely on good design, automation, statistical process control and quality assurance process control and quality assurance procedures to optimize product quality.

Fused-fiber couplers are typically produced by a piece-by-piece process that can introduce inconsistency and variation. Since the extremely thin, fragile coupling region takes on a somewhat unique configuration in every device, it is difficult to characterize the dependability of coupler performance, thereby requiring 100 percent testing of all units.

Corning's multiple-index process is a highly-controlled, automated technology that eliminates the threat of conventional fusion devices. Because the fragility of the fused biconic taper (FBT) filiment region prohibits full automation, coupler characteristics are highly dependent on the dynamics of the individual operator. The more robust multiple-index coupling region facilitates computer control of the fabrication process, ensuring uniformity from one component to the next.

Demonstrating the service functionality of couplers for deployment in critical fiber optic cable systems requires information that cannot be provided by the industry's current limited field experience. A comprehensive laboratory qualification program that simulates a broad range of environmental conditions under controlled and repeatable circumstances is needed to supply credible performance data.

By understanding and applying these results, cable operators and systems designers can select reliable components that will ensure network integrity. ■

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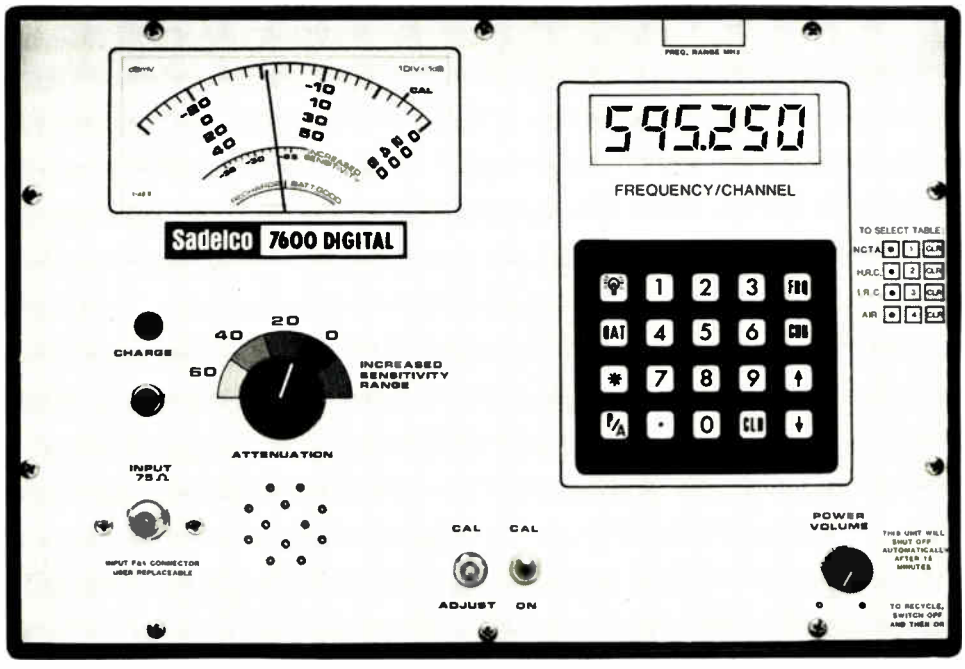

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Reader Service Number 19

SCTE plays winning hand

Reno Expo upbeat, focuses on applications

The cable television hardware community was given a much-needed dose of medicine during last month's Cable-Tec Expo, sponsored by the Society of Cable Television Engineers. Exhibitors unanimously had high praise for the level of interest shown by the plentiful amount of attendees who swarmed through booths looking at the latest in digital compression, fiber optics components, 1-GHz gear and other hardware.

The mood was decidedly upbeat, buoying the hearts of equipment vendors, who have suffered through months of a drastically downsized market created by the nationwide capital crunch. While it remains to be seen if the interest translates into entries in order books, several people said the Expo could be seen as an economic watershed.

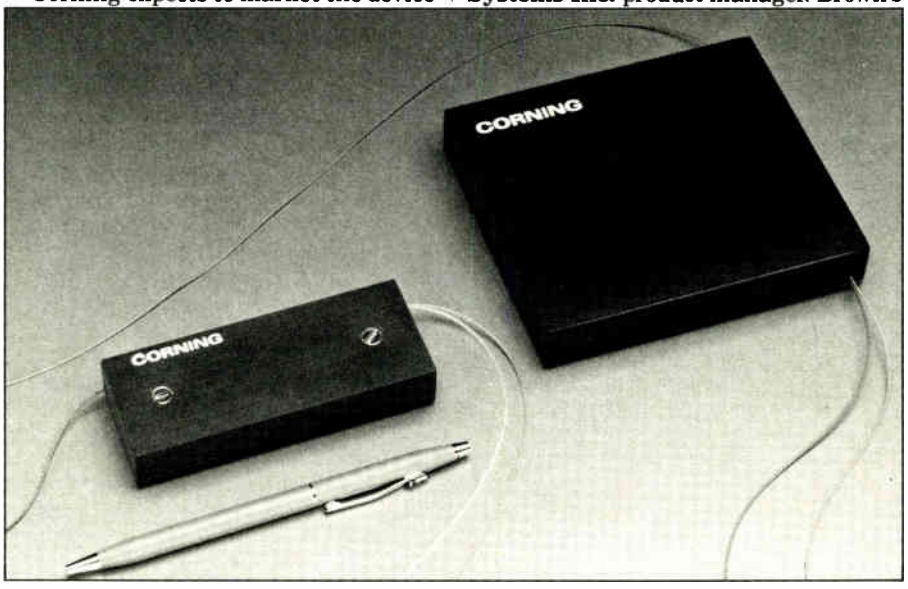
The Expo continued its tradition as a "working show," with vendors concentrating on showing how their products can be used, as opposed to introducing a slate of new products.

However, **Corning Inc.** introduced at the Expo its erbium-doped fiber amplifier product, trademarked as the "FiberGain" module. A plug-in device that currently provides 13 dB to 35 dB of optical gain, the FiberGain is being initially targeted as a post-amplifier to boost the output of a laser diode in a headend.

When used with currently-available 1550-nanometer distributed feedback lasers and a 1x8 coupler, eight separate 12-kilometer AM fiber links can be supported, said Jon Chester, CATV market manager. The product initially will be priced at about $20,000 and provides 10 dBm to 13 dBm output. The gain module measures four inches by 1.6 inches by 0.75 inch in size and houses a 980-nm pump laser and wave division multiplexer.

Corning expects to market the device to original equipment manufacturers and anticipates that cable operators will use them in longer-range point-to-point trunking applications or as a means for sharing a single laser's output among a number of optical receivers. The product is available for delivery now, the company said.

Meanwhile, the outlook for optical amplifiers working at the 1310-nm optical window aren't far from reality, said Larry Brown, **Magnavox CATV Systems Inc.** product manager. Brown's



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Woody re-elected SCTE president

Wendell Woody of Anixter Cable TV was re-elected president of the Society of Cable Television Engineers during the board meeting election held at the Expo.

Other officers voted into office for one-year stints were Michael Smith, Adelphia Communications, eastern vice president; Ted Chesley, CDA Cablevision, western vice president; Jim Farmer, Scientific-Atlanta, secretary; and Leslie Read, Sammons Communications, treasurer.

Each of the new officers will serve as members of the board's executive committee as well. Victor Gates, Metrovision, also was named to the executive committee. It is believed that the presidential race pitted Woody against Gates.

Woody reportedly changed his mind about running for re-election (when he was elected last year, Woody suggested a one-year limit to presidential terms), noting that a single year simply isn't enough time to get everything he started completed.

During the awards luncheon, he told the audience he plans to continue along the same path as the previous year, in which he has restructured the board's committees, begun extensive work internationally and a number of other important projects.

Allen named Member of the Year

Steve Allen, engineering manager for Jones Intercable's Roseville, Calif. system, was named SCTE Member of the Year during the Society's annual awards luncheon. Allen, who has risen through the technical ranks from installer to his current management position, was selected for the coveted honor in recognition of his efforts at the system level.

1990 SCTE Member of the Year Richard Covell (left) presents this year's award to Steve Allen of Jones Intercable.

Specifically, Allen, who is the son of industry pioneer Edward Allen, has been active in the Golden Gate Chapter and helped found the Sierra Chapter last year. Richard Covell, last year's award winner, presented the award and was joined on the stage by Allen's father Edward, who is an industry pioneer and former NCTA chairman.

Also, SCTE president Wendell Woody presented CableLabs with the prestigious President's Award in recognition of the Boulder, Colo.-based consortium's funding of a training tape for the BCT/E category 7 exam and its efforts to help create and document technical standards. Brian James and J. Scott Bachman accepted the award and pledged CableLabs support to SCTE's training efforts.

In addition, two new awards were presented for the first time this year. Thomas Brown of Staten Island Cable was given the Field Operations Award as a result of his devising a power inserter to prevent planned outages. Ron Hranac of Coaxial International became the first SCTE member to be elevated to Fellow Member status.

Other awards and their recipients were as follows: Hall of Fame Award, Len Ecker; Senior Member Award, Steve Allen; and Personal Achievement Awards went to Jennifer Hays, Rikkie Lee, Rob Marshall and Mark Wilson.

Keynote targets leakage, safety

Signal leakage and safety measures were the focus of Richard M. Smith's keynote speech titled "It's Noontime: Do you know where your signals are?" "As the FCC's top cop, I am responsible for all compliance activities across the United States," said Smith, who is chief of operations for the FCC's Field

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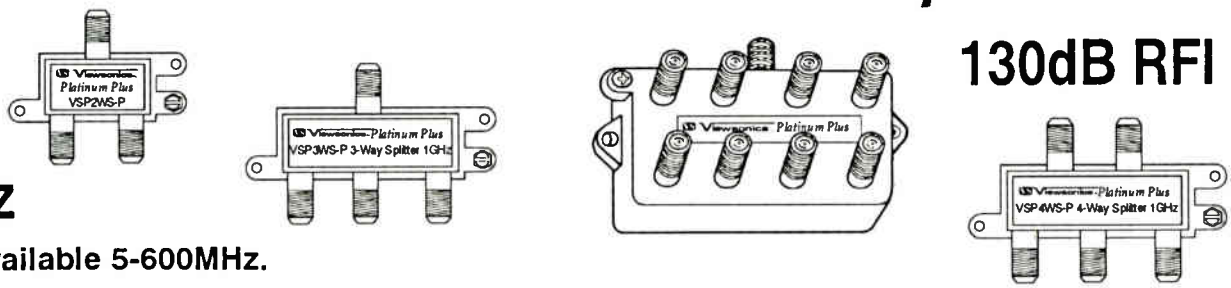

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CED *Publisher, Robert Stuehrk (left) and CPG Vice President, William McGorry (center) present SCTE President Wendell Woody with a check for $20,000. The sum represents SCTE's portion of the revenue from this year's Membership Directory and Yearbook.*

Operations Bureau. "Our 35 offices are continuously tracking down interference sources, and quite often that source is cable television."

Smith also cautioned operators to "get some lights and some paint" on any towers taller than 200 feet or located within five miles of an airport. "Last November, the Field Operations Bureau surveyed 1,037 (tower) sites, and 160 didn't have towers properly lit or painted.

"As a result, we've already levied over $300,000 in fines," Smith said. It's important for operators to know that those fines can go as high as $250,000.

Smith also encouraged operators to get more involved with Emergency Broadcast System (EBS) equipment. National EBS service has been available on a local level since 1975. With cable television available in some 60 million homes, it's important that cable get EBS services implemented, Smith emphasized.

In closing, Smith commented that cable television is the centerpoint of the convergence of several typically independent communications industries, such as telephony and broadcast. "Cable television has arrived at just the right place and just in the nick of time," Smith said.

SCTE seeks management boost

Although it has gotten firm support from all levels of technology management, the Society of Cable Television Engineers still faces an uphill battle to win the hearts and minds of local managers, according to Woody. As a result, technicians often find their requests to attend local SCTE chapter meetings denied.

In an attempt to alleviate the problem, about 10 executives of state cable TV associations were invited to attend their first SCTE Expo to get a taste of the value of SCTE. Among those in attendance included: Bill Arnold, Texas Cable TV Association; Jerry Yanowitz, California Cable TV Association; and Susan Bittersmith, Arizona Cable TV Association. Woody hopes the exposure will prod local GMs to allow their techs to attend more meetings. ■

—Roger Brown, Leslie Ellis and Gary Kim

hints came several weeks before researchers at Nippon Telephone & Telegraph and Rutgers University announced a breakthrough in optical amplification in a recent edition of *The Wall Street Journal.*

Reportedly, researchers were able to use fluoride fibers doped with the rare earth element praseodymium. Researchers at Rutgers believe the technology could be commercialized within three years, providing an economically-efficient pump laser can be found.

Several new products related to the advent of full 1-GHz bandwidth made their debut as well. **C-Cor Electronics** had a working wideband 1-GHz amplifier, featuring its proprietary custom-built hybrid. C-Cor officials expressed confidence in its ability to deliver the units to ATC for its Queens, N.Y. upgrade to 150 channels by this autumn.

Also supporting the move to 1 GHz was **Lindsay**, which offered a 1-GHz passive; **Augat Communications Group**, which unveiled its two-way house amplifier; and **Times Fiber Communications**, which upgraded its trunk and feeder cable to a 1-GHz rating and unwrapped a new indoor connector which a special coupling nut designed to avoid breaking F-ports on consumer equipment.

Interdiction technology was a source of interest during the show, despite the advent of digital video compression, which has cast a cloud over the viability of interdiction. **Scientific-Atlanta** introduced its new eight-port interdiction unit aimed at the MDU market. Also new is a 450-MHz module controlling up to 48 individual channels. The eight-port unit is aimed at outdoor garden apartments that represent 80

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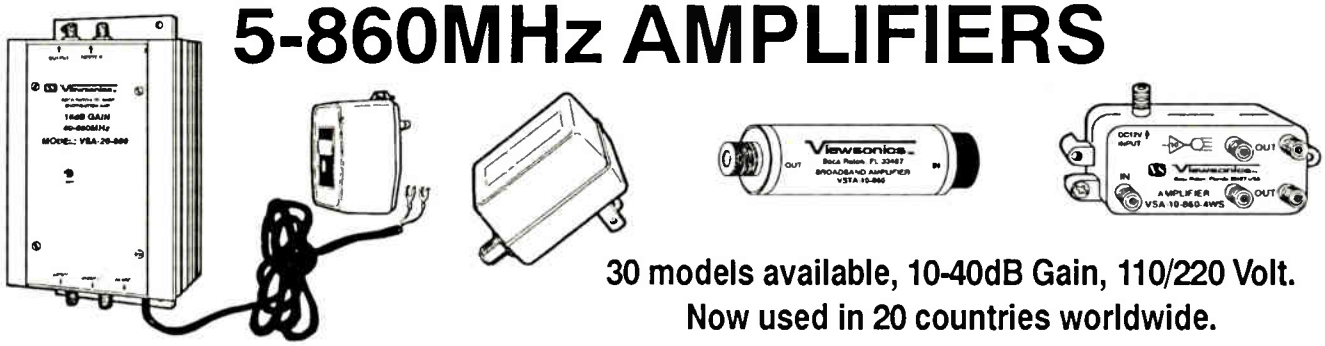

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percent of the MDU market.

Company international sales manager Michael Hayashi said the new MDU version was definitely linked to S-A's new concentration on pocket deployment of interdiction technology to high-density subscriber concentrations. The new unit will be available in August. Also new is a cascade seizure board that increases tap efficiency and slices insertion loss. The new seizure board allows one unit to pass power to another unit that might be located on the other side of the building, Hayashi suggested.

During the Canadian cable show, which ran concurrently with the Expo in Reno, Nev., S-A, its Canadian distributor **Comlink** and **Cogeco Inc.**, the fifth-largest Canadian MSO, announced a test of interdiction and set-top signal control as well as fiber-to-service area fiber architectures in Cogeco's Trios-Rivieres system near Montreal.

One portion of the service area will trial 450-MHz addressable interdiction technology; the other portion will use 8600 addressable set-tops. The "Showcase" project will provide a real-world operating test of the two signal control technologies.

In other news,

Belden's new cables

Cooper Industries Inc., Belden Division has announced a new line of RG-11 cables designed to lengthen drop installations. The new line is designed with lower attenuation characteristics and includes messengered, non-messengered and underground cable. The RG-11 cables are available from stock in 1,000 foot reels.

Magnavox intros optical receiver

New from **Magnavox** is the 7OR optical receiver, priced at under $1,000. The receiver operates in line extender housings with a switching power supply and is designed for use in fiber backbone applications and to shorten cascades. The 7OR offers up to 80 channels on a single strand and includes an optical test point, RF output test point, LED status indicator and splice organizer. A future version expected later this year will allow up to two receivers and a return transmitter, said Magnavox's John Caezza.

Magnavox also took the wraps off its new Quad Output Bridger, used in fiber-to-the-feeder (FTF) designs to provide four dedicated hybrid outputs and enables up to 8 dB of additional reach from a fiber node. According to a series of system design surveys performed by Magnavox, the new unit reduces plant cost by as much as $200 per mile. At 46 dBmV output over four outputs, company officials say, the unit provides composite triple beat (CTB) of better than -66 dB. This news is particularly important in light of operator's desires for additional bandwidth, Magnavox officials said.

AM shows monitoring software

AM Communications exhibited its new ChannelScan software designed for use with all of the company's associated LANguard end-of-line status monitors. ChannelScan is PC-based and utilizes an EGA monitor to display up to 100 channels simultaneously.

On the color screen, operators can examine "minor" and "major" digital and graphic signal threshold alarm points—including channel name, frequency, channel level, alarm limits and alarm status. AM officials submit that the software allows operators to lessen truck rolls and enables staffers to investigate and pinpoint bad signals phoned in from subscribers.

Also announced by AM Communications is its new Dual Protocol technique, which operators use the AM Communications LanGuard status monitoring system with proprietary transponders manufactured by Jerrold Communications and C-COR Electronics. Dual-Protocol capability is available for Jerrold JN, X and SX amplifiers and all C-COR amps as well, the company said.

Fiber/coax plug unveiled

New from **Signal Vision** at the Expo was a fiber/coax polyethylene plug, designed to prevent freezing of interior conduit and/or polyethylene duct, and to keep extraneous substances out of the conduit. The plug has been used in the telephony business for over five years, company officials said. It is available exclusively from Signal Vision.

Viewsonics facility

Boca Raton, Fla.-based Viewsonics has increased its technical/data facilities to include a 12-station Novell network to permit computer aided design and computer aided engineering of new products, announced Abram Ackerman, president.

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Viewsonics officials also announced its new Platinum series splitters with bandpass to 600 MHz. Now available from Viewsonics Inc., the Platinum Plus line passes 1-GHz signals, the company said. Both boast RFI shielding of 130 dB, the company reported.

Sachs acquires poleline firm

Sachs Communications Inc. has acquired all the operating assets of Best Process Co., a Cartersville, Ga. manufacturer of poleline hardware for the telephone industry. Terms of the agreement weren't disclosed. The acquisition will aid the firm's expansion into the telephone market, the company said.

In related news, the Sachs Communications SC51 Meter Panel Bonding connector has been approved by Underwriters Laboratories. The SC51 is recommended when standard grounding procedures as specified as the National Electrical Code aren't possible, requiring grounding of drop cable to the metal frame of a meter panel. Typical situations requiring the SC51 are underground installs where the number-6 copper wire is inaccessible or where the conduit is made of PVC. In aerial installs, the SC51 can be used whenever the local utility forbids bonding to masts or risers. The product also can be used where cold water pipe is made of PVC.

Alpha replaces batteries

Alpha Technologies has announced it will offer operators a new "Dynasty" battery offering 10 years service life and 20 pounds less weight. The smaller-sized Johnson Controls packages offer about 75 percent of the capacity of the older 100-amp batteries.

Alpha also introduced a new pedestal support system that eliminates the need for concrete form construction, pouring and curing. The PS series pedestals can be modified on site, if needed, using standard drill bits and saws, the company said.

Zenith offers Event Center headend

The Pay-Master add-on decoder designed for use with the Olympics Triplecast offers operators a way to upgrade to addressability for less than $40 a sub, said **Zenith Electronics Corp.** The matching Event Center headend is available for as little as $2,500.

Zenith also announced that opera-

Bolstering the tap-to-TV connection

In one of the Expo's many "hands-on" technical sessions, Comm-Scope's Bob Glass and Jones Intercable's Pam Nobles showed attendees how to strengthen drop-related knowledge. Glass kicked off the session, titled "Tap to TV: Strengthening the weakest link," by examining pre-wiring, underground and aerial cable characteristics.

Citing shielding effectiveness as a key factor in signal egress problems, Glass explained that "if you subtract the desired leakage level of, say, -60 dBmV—that equates to something like 3 μV/m, which is a nice, quiet signal—from an amplifier output of +40 dBmV, you'll get the necessary shielding effectiveness. In this example, it's 100 dB of shielding that's necessary."

'People have surrounded the twin lead with tin foil, effectively shielding against direct pickup. That's not recommended.'

"Ingress is another problem caused by shielding ineffectiveness, particularly for homes built directly under a television transmitter. We've seen levels as high as 40 dBmV. So, the shielding effectiveness has to be great enough to prevent co-channel interference. In this particular case, which we discovered in Georgia, we had to use quad-shielding," Glass continued. "In some cases, people have even taken the back of the television set off and surrounded the twin lead with tin foil, effectively shielding against direct pickup. That's not highly recommended, though," Glass laughed.

After a discussion of NEC fire ratings and their implications to cable television ("Ask Comcast corporate about CATV-R rated cable," Glass emphasized when explaining CATV-R, the second-highest NEC rated flame-retardant cable, referring to the fire in that MSO's Philadelphia headquarters several months ago), Glass explained old and new methods of grounding.

"The old way," Glass explained, "was that everybody—power, telephone, cable television, antennas—had an individual ground situation. That's not good, because current can be carried through soil, and a significant current can be measured with a regular voltage meter.

"If you take the voltage meter out of that circuit and put an installer in it's place," Glass continued, "that's a *bad* situation. In fact, it's a potentially lethal situation."

A better way to ground cable, Glass continued, is to integrate the ground with the others (power and telephone, for example). "Because of the conductivity of the different drop shields, as shield levels increase and cable size increases, the need to ground the system increases," Glass said.

Glass concluded the presentation with a description of the different elements used in underground and aerial cable to prevent damage. "For underground cable, the key concern is abrasion from rodents and moisture ingress. You need to select a cable that has a flow element, so that should it be chewed or a nick appears, a substance within the cable flows to kind of seal the wound," Glass explained.

Moisture ingress a concern

Moisture ingress remains a concern for aerial cable. "In that situation, use a cable that does not flow. You don't want to be paying for car paint jobs. Instead, use a cable with a silicon dioxide powder inside the jacket, so you get that gooey moisture protection—without the mess."

Jones' Pam Nobles rounded out the session with a demonstration of the company's laser disc-based interactive training session, with attendees gathered around the computer screen in two teams to take an interactive "quiz."

In the quiz, each team took turns selecting a correct hook-up procedure from an interactive diagram of choices, in an effort to successfully blend cable's signal with a variety of consumer electronic devices. When a diagram was successfully created, the computer offered a compliment—"Congratulations. You've met your customer's needs." ■

tors could split Triplecast revenues on a 50/50 basis with NBC if the Pay-Masters are ordered by Dec. 31, 1991.

The new "Shadow" decoder made by Zenith is a Z-TAC compatible decoder that can be mounted in a closet, in a basement or behind a TV. Designed to decode a single pay channel and then remodulate it with the basic signal stream before delivery to a cable-compatible TV, the Shadow offers the advantages of a broadband delivery system with the addressability and security of a Z-TAC decoder, said Vito Brugliera, Zenith vice president.

Comsonics' hand-held SLM

Comsonics Inc. introduced the WindowLite full-function hand-held signal level meter. Priced at $1,595 and weighing in at 40 ounces, the WindowLite provides "80 percent of the value of a system sweep" at a fraction of the cost, said Comsonics president Dennis Zimmerman. The super-twist LCD display provides a full spectrum viewing of 126 channels as well as audio and video signal strength of single channels.

In the "tune" mode, WindowLite examines, at intervals of 125 kHz, the spectrum between carriers. Five preset channels can be programmed as well. In addition, stored reference references can be compared against current readings.

NCTI revamps courses

Three upper-level courses offered by the **National Cable Television Institute** have been revamped. Affected are the Service Technician, System Technician and Advanced Technician courses. As part of the revision, 43 new lessons have been added to the courses, said Tom Brooksher, NCTI general manager. The three updated courses are part of a cluster of five now offered by NCTI as part of its basic offerings for cable TV technical personnel.

In related NCTI news, **Kenneth Glass** has joined the company as director of multimedia training, a newly-created position. In his new role, Glass will spearhead NCTI's development of electronic training programs and computer-based enhancements to the existing NCTI course offerings, said Byron Leach, NCTI president. Glass most recently was director of video production for Quantum Communications, a Denver-based video production house.

Wavetek announces LineSam

Wavetek Corp. has introduced its

FCC plans to reimpose CATV technical standards

The Federal Communications Commission has issued a notice of proposed rulemaking to once again create technical standards for local cable television systems. According to John Wong, assistant chief of the cable branch, those standards will include several guidelines designed to improve the quality of the pictures seen by the public. Wong unveiled the proposal during the SCTE Cable-Tec Expo.

Since 1985, the FCC has not regulated video signals, opting instead to let the marketplace apply pressure for improved signal quality. This notice proposes to reinstitute rules that would cover all classes of video signals, continue pre-emption of local attempts to set standards more stringent than those proposed by the FCC and adopt, with modifications, its current technical guidelines as standards.

Specifically, the FCC has proposed: Annual proof-of-performance tests taken from six points in the cable system, instead of three; a signal level of 6 dBmV at the subscriber/cable system interface point; a carrier-to-noise minimum of 43 dBmV—an improvement of 7 dB over the old guideline; and a variety of other standards.

Wong said the FCC will now seek public comment on the proposal and predicted it would be late winter, at the earliest, before the proposals became rules. The National Cable Television Association and the National League of Cities has been meeting behind closed doors for several months trying to hammer out their own set of technical guidelines without success.

Systems with fewer than 1,000 subscribers will be exempted from the federal rules, but will be subject to local regulation.

FCC database now on-line

A new relational database will allow the Federal Communications Commission to better track and identify potential violators of signal leakage rules, according to Wong. The database allows for several tables of information to be cross-referenced to help the Commission detect trends. Wong said it will be used to help in enforcement, which has been severely hampered because of a lack of resources. Wong added that he's seen a lot of "sloppiness" in the Form 320 filings and reports that his office has logged more than 5,000 telephone calls requesting more information or clarification from operators. He also said random inspections will continue, in light of Commission chairman Al Sikes' request for 90 percent compliance by 1993. While Wong refused to speculate about the current level of compliance, it is believed to be significantly less than 90 percent.

Cable participation in EBS

Representatives from the FCC's Emergency Broadcast System and the Federal Emergency Management Agency are actively seeking widespread cable system participation in the program. EBS officials said the FCC has issued a notice of inquiry into upgraded technology to bolster the system.

More than 90 percent of all broadcast stations participate in the EBS and several cable programmers, including CNN, ESPN, HBO and others, also take part, according to EBS officials. However, only about 10 percent of local cable operators take part in the system. A certified EBS decoder/receiver that serves one EBS Operational Area can be purchased for $550 to $800 or operators can build the equipment themselves.

Other methods of participation include EBS message recording to feed the system, installation of override devices that automatically inject emergency messages and installation of radio equipment for two-way communication with emergency operations centers.

How to win at CLI

Proper training, test equipment maintenance and use of proper tools and materials are three major keys to passing the annual Cumulative Leakage Index test, said Les Read of Sammons Communications during a technical workshop. Read suggested that technical supervisors spend at least two days training personnel on proper equipment operation and then follow-up on that training at regular intervals and with new hires. Equipment calibration should be checked at least once a month, he added.

—Roger Brown

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Wavetek's LineSAM

new LineSAM signal analysis meter that automates SLM measurements and stores the results in memory. The LineSAM can be "taught" to run test procedures automatically and then store the results for later analysis, the company said.

The new FiberSAM combines an RF signal analysis meter with a built-in optical power meter operating at either the 1310-nm or 1550-nm optical windows. In other news, Wavetek announced a price cut on its 1882A system sweep analyzer from $10,995 to $8,995. Also, the SAM 2000 now is available in a rack mount, company officials said.

Jerrold unveils audio tuner

Jerrold Communications will unveil this month (June) the industry's first 800 MHz digital audio tuner, designed for use with Digital Cable Radio, the premium cable audio service. The new tuner operates from 50 MHz up to 800 MHz and allows carriage of DCR signals in unused 600-kHz blocks of spectrum not used for video signals, said Dan Moloney, director of product marketing.

DCR currently offers 17 channels of commercial-free digital audio and was launched in May 1990. DCR is owned by Digital Cable Radio Associates, a consortium including GI, Cox Cable, Comcast and Continental Cablevision.

Wegener rolls out IRD

Wegener Communications has introduced its new compact VideoCipher II Plus commercial descrambler. The low-profile unit is about one-fourth the size of comparable VC II Plus descramblers.

Sencore intros Channelizer Senior

Sencore can ship immediately its new FS74A Channelizer Senior signal analyzer featuring a microprocessor-

Continued on page 59

Cable loses $3 billion a year to thieves

It doesn't pay to steal cable services, SCTE attendees learned. In the SCTE Expo session titled "Interdiction and Other Signal Security Techniques," panelist Leonard Falter of Continental Cablevision revealed that one offender recently spent 90 days in jail, paid more than $200 in fines, and received a three-year probationary period—all for stealing his MTV. "Any security system will only keep honest people honest," Falter said.

Falter's objective for Continental, as he explained to the Expo audience, was to reduce the total number of unauthorized connections and to educate the community about Continental's theft of service policy.

Federal prison

Next, Jim Allen of the NCTA's Office of Cable Signal Theft offered some interesting piracy-related facts: For example, each illegal decoder sold to a subscriber costs the industry more than $3,000 in lost revenues over its useful life expectancy. Likewise, sentences for theft of service have ranged from probation to three years in federal prison, with fines and restitution ranging from several hundred dollars to $1.3 million.

Allen offered the following suggestions to operators concerned with active theft prevention: "Number one, obtain references on those wishing to buy used or old equipment. Then, develop an aggressive publicity campaign, in which you clearly mention the penalties associated with theft of cable service. And when there is an offense—file suit."

The session, moderated by Continental Cablevision's Terry Mast, closed with a discussion by Scientific-Atlanta's Paul Harr on signal security technologies. In his presentation, Harr reviewed the pros and cons of traps, sync suppression, video inversion, interdiction and digital video compression. "We're all real familiar with the first three methods (traps, sync suppression and video inversion)," Harr said in a question-and-answer period following the session. "As for interdiction and digital compression—they're both emerging technologies that can co-exist. What interdiction has going for it is it's user-friendliness. You could have all your basic channels at NTSC, then put digital compression technologies into play for premium services such as NVOD, HDTV or PPV. In that way, they co-exist," Harr concluded. ■

—Leslie Ellis

Voice provision will alter network design

Possible demand for voice customers is changing cable TV network design on both sides of the Atlantic. In a significant move, US West, which up to this point has been building dual cable TV and telephony networks in Birmingham, Camden and London, England, will switch to a single network, multiple services model this year, said Earl Langenberg, vice president, engineering and technology, US West Cable Communications Division, during last month's SCTE Engineering Conference.

To date, US West had been integrating both networks at pedestal locations and delivering signals to homes using siamese drop cable containing both coaxial and twisted-pair wire. No longer will this be the case. Instead, the company will use the First Pacific Networks broadband voice modem technology to deliver entertainment video and telephony services over a single fiber backbone network using standard drop cable.

As part of the move, AM fiber receiver nodes, now passing 4,000 homes, will be shrunk to perhaps 500 homes passed.

On the western side of the pond, Jones Intercable Chief Technical Officer Bob Luff, who's investigating personal communications network technology, said PCN considerations would change the ways cable engineers design their systems. While matters are still quite murky today, it was safe to assume the signal formats carried would be digital, he said. Significantly, the standard 5 MHz to 30 MHz return bandwidth operators traditionally have had access to might not be sufficient, Luff suggested. Indeed, a symmetrical network capable of 550 MHz in both directions might ultimately be needed, Luff said.

Without question, network reliability would have to improve significantly, because PCNs would carry emergency traffic that couldn't be dis-

Continued on page 61

DID YOU KNOW...

A typical storm is thought to produce 1-3 cloud to ground flashes each minute. There are perhaps 30-100 flashes to the ground, throughout the world, every second.

One of the most devastating tornado outbreaks occurred on March 18, 1925. The twister levelled four towns in southeast Missouri and southern Illinois, killing 625 people and injuring 2,000.

Lightning's peak temperature is more than 50,000° F, or more than four times hotter than the surface of the sun.

The rocket Apollo 12, carrying the second party to land on the moon, was twice struck by lightning initiated by the rocket itself.

An approaching thunderstorm emits low-frequency sound waves that only animals can perceive.

An automobile is one of the safest places to be during a lighting storm because its surrounding metal acts like a Faraday shield, keeping the electricity on the outside of the vehicle.

Roughly 2,000 thunderstorms are in progress in the world at any one time.

LEGEND
LIGHTNING DAYS PER YEAR

	100		40
	90		30
	80		20
	70		10
	60		5
	50		0-5

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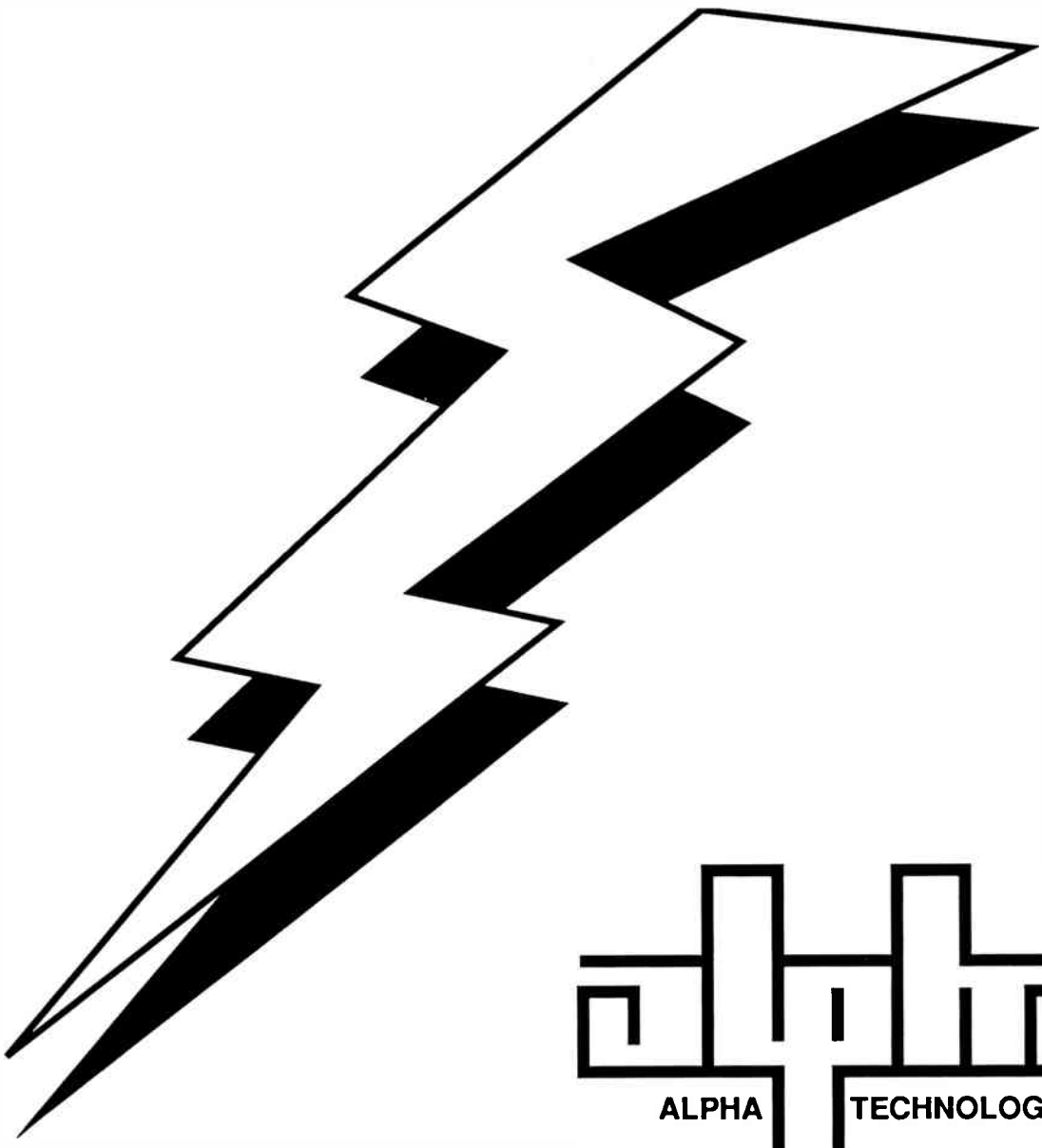

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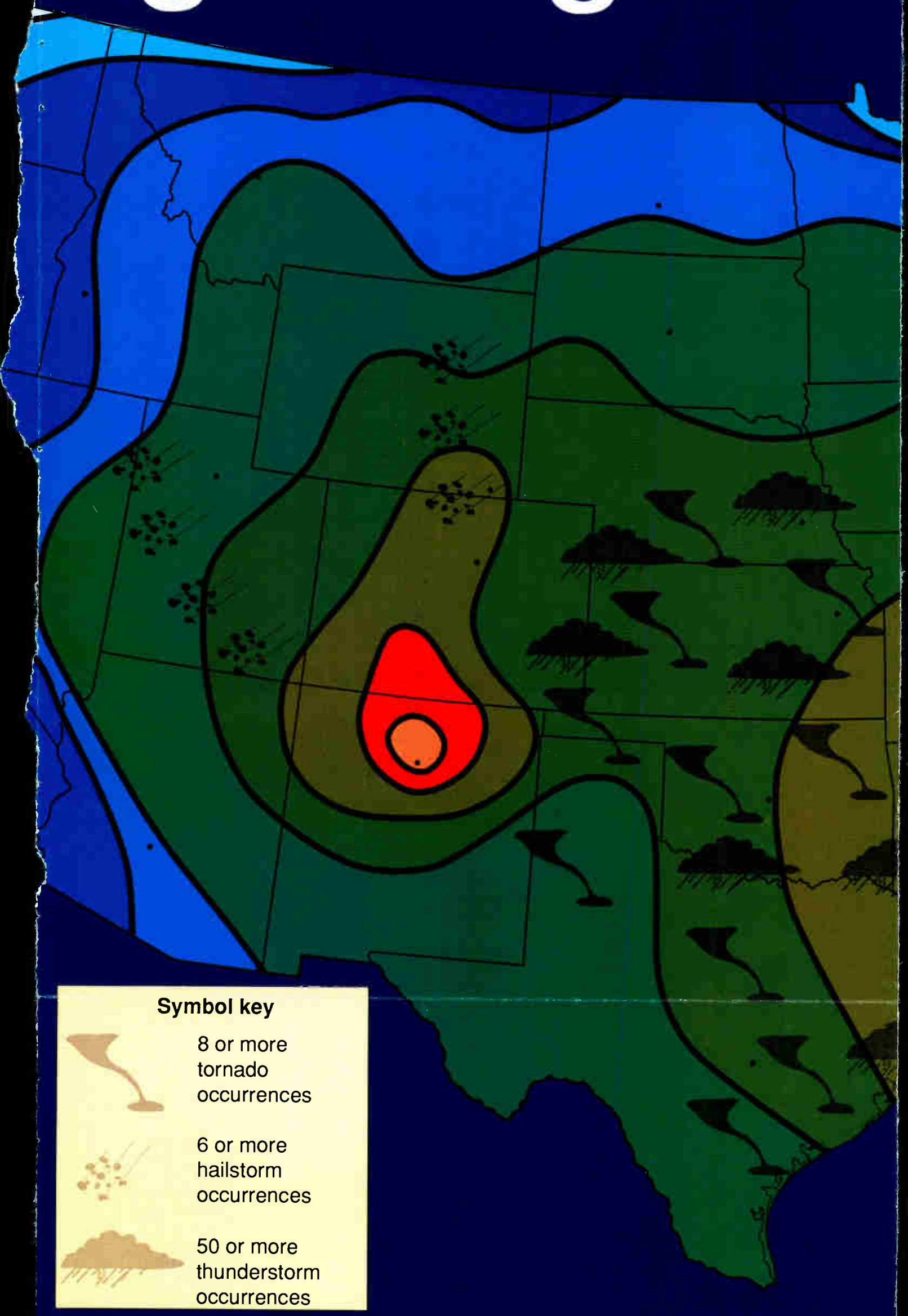

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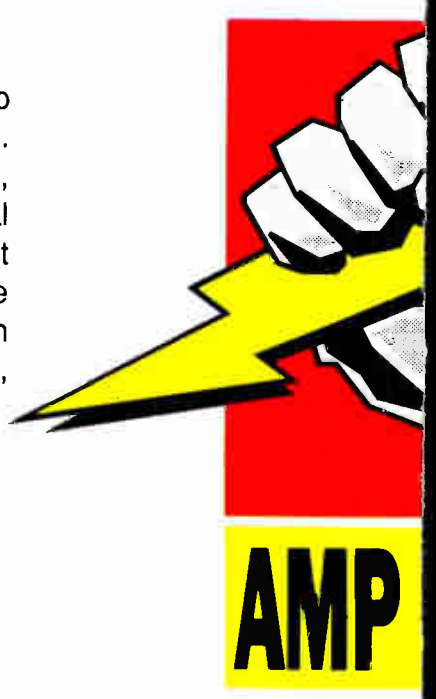

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Outage Chart

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DID YOU KNOW...

Electromagnetic detection systems have discovered that because of interference with sound waves, between 22% and 40% of all lightning occurs without observers hearing the thunder that follows.

A 1,000 foot tower in a region of moderate thunderstorm activity is struck by lightning 10 times per year.

The average square mile of U.S. land receives between 40 and 80 lightning strikes per year.

Lightning bolts are classified as "hot" and "cold." A hot bolt lasts up to one-tenth of a second, has a high amperage, and sets fire to flammable materials in its path. A cold bolt strikes much faster, has a high voltage in relation to amperage, and has an explosive rather than inflammable effect.

Lightning moves about 30,000 times faster than a bullet, with an average stroke length of 4,000 feet.

The average roof-top television antenna, even though grounded and equipped with a lightning arrester, does not offer lightning protection to the home, and instead often attracts lightning.

Lightning strokes to ground at distances of between 25m and 3,000m in overhead telephone lines will generally induce more than 1,000 volts.

Early lead-sheathed coaxial cables with steel tape armoring were more prone to lightning crushing faults due to the explosion of the volatile material between the lead and the armoring.

The average lightning strike measures in at 20,000 amperes; however, strikes have been measured as high as 400,000 amperes.

If its total energy were available, a single lightning flash would run an ordinary lightbulb for only a few months.

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Continued from page 42
controlled tuner with displays of video or audio signal levels displayed in microvolts and dBmV. The unit also measures hum on any channel, AC and DC voltage, and shows picture quality and sync compression problems on a video monitor. The portable unit uses two batteries that are rechargeable in the field, the company said.

Applied Instruments' digital SLM

Applied Instruments Inc. has announced availability of a digital signal level meter featuring synthesized tuning, variable tuning speed and up to eight field-programmable frequencies. The dual amplitude reading display shows video carrier amplitude in dBmV on the left and relative audio carrier amplitude in dB difference on the right of the display, the company said.

The company also has available a PC-1 RF power source used to calibrate SLMs or spectrum analyzers. In other news, Jerry Conn Associates was named an Applied Instruments sales representative.

Advantest OTDR

The new **Advantest America Inc.** Q8460A optical time domain reflectometer comes complete with an optical return loss function that measures loss at connection points, the company said. The unit features accurate fault detection at 15, 50 and 100 kilometers with five-meter resolution.

Falcone upgrades insertion gear

Falcone International's advertising spot compiler (COMED) now can control the operations of as many as 31 separate videotape decks, a feature especially suited for use by large advertising interconnects, the company said. The latest version of the system can keep separate spot and network histories for more than 75 headends as well as access more than 25,000 spots.

Using COMED, multiple source decks can be used to provide as many as 2,300 active spots on-line while multiple record decks allow the making of as many as 10 duplicate copies at the same time.

Trilithic's new TVI tool

A new tool for locating the source of power line interference now is available from **Trilithic Inc.** The PLI-150 power line interference locater, priced

NewChannels reveals its approach to alternate access

Like it or not, the cable industry is hurtling toward a new future, said Malarkey-Taylor Associates Senior Vice President Archer Taylor. "There's a 60 to 70-percent probability that cable TV networks will continue to evolve into telecommunications areas that go beyond video entertainment," he said to the audience gathered at the SCTE's Engineering Conference in Reno, Nev. last month.

Meanwhile, competition for the core video entertainment business will sizzle. "There's a 90-percent chance that within five years cable will face direct competition from MMDS or DBS," Taylor predicted. Add to that an 80-percent chance that telephone companies will be allowed into video distribution within the next two to three years, he added. On the other hand, it's almost certain that telco entry into cable will carry stipulations prohibiting cross subsidies and control over programming, Taylor said. Those ground rules in place, telcos would almost certainly find that the only expedient avenue would be to acquire, merge with or joint venture with cable operators.

Indeed, NewChannels Corp. Director of Engineering Tom Staniec posed the question starkly to those gathered: "Are you an entertainment provider or a telecommunications company?" For NewChannels, the answer is the latter. The firm, which has quietly been providing bypass and alternate access services for 10 years, has built fiber ring networks to provide protected, direct private links between different facilities for its business customers. That same philosophy serves when NewChannels hauls voice and data traffic from a business customer's premises to a long-distance carrier's "point-of-presence." At the POP, the local traffic is handed off to the long-distance network.

Cable operators looking at the business will need to keep some vital points in mind, Staniec said. Be prepared to answer some very blunt questions about your network, he said. "Your expectations need to be at least as high as the customer's," he added, recounting the story of one potential client who bluntly asked how NewChannels could keep his telecommunications network up when he had two outages the previous night.

Being an alternate access provider means being able to guarantee service calls "within 30 minutes" and "mean time to repair any outage of no more than 1.5 hours," said Staniec. In all probability, that means a break from the traditional tree-and-branch network. In fact, even a simple star topology historically used by telephone companies won't do. "We've found that a dual, redundant, self-healing loop was needed to provide such a level of service," Staniec noted. Operatorss may also find themselves doing some signal switching and signal multiplexing as well. Hot standby capability and standby powering is a virtual prerequisite, Staniec said. All of which implies some sort of network control and monitoring center, he added.

Overall, customers will expect a level of network reliability and responsiveness at least equal to what a local exchange carrier (local telco) would provide. And frankly, "you have to do it better," Staniec emphasized. Inevitably, operators will find themselves intertwined more closely with public service commissions. In some cases, they may find themselves filing "informational tariffs" in the early going. In later stages a more elaborate "certificate of convenience and necessity," already required of telephone companies, may be required, Staniec said.

And don't expect the competition to sit still with their arms folded while you do all this, Staniec warned. "The LECs will lower their tariffs once competition heats up," he pointed out. "They won't like it and your relationships with them may change." And it will be a hard sell. Still, it's a business a cable operator can successfully tackle. But operators "may have to pick your spots; polish your image; and understand that it's a long-term business," Staniec said.

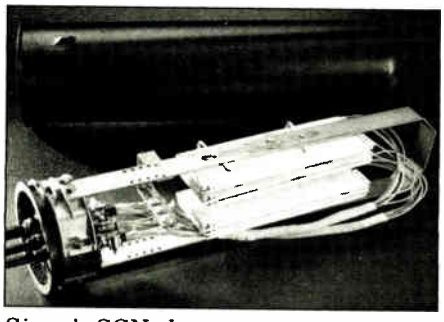
Paradoxically, rocketing developments in digital video compression may help improve system performance. VideoCipher Vice President Bob Rast suggested that a hybrid cable system running analog video signals at lower frequencies and digital signals at higher frequencies would result in composite triple beat performance "about 5 dB better" for the analog signals. That's what Jerrold engineers have found in initial tests of the DigiCable compressed video system, Rast reported. ■

—Gary Kim

between $1,500 and $1,600, is used to find the source of any utility power problems (such as cracked insulators) that interfere with TV pictures, typically causing sparkling lines running across the screen and rolling from the bottom of the screen to the top, the company said.

Channelmatic's disc interface

The **Channelmatic Inc.** Adcart commercial insertion system now interfaces with the Panasonic LQ-4000 rewritable optical disc recorder, the company said. The Adcart CCU-402A Channel Control Unit handles all insertion functions for two satellite networks, controlling from one to four video source machines per network.



Siecor's SCN closure

Siecor adds closure

Siecor Corp.'s emergency restoration kit now includes a new SCN splice closure. The kit contains two closures as well as 30 meters of spare loose tube optical cable, two tool kits and a no-epoxy CamSplice, the firm said.

Regal's new MDU amplifier

Regal Technologies Ltd. has a new low-gain, 18 dB MDU 550-MHz amplifier featuring adjustable power gain from 10 to 18 dB, the company said. The new amp can accept input levels greater than 20 dBmV at 83-channel loading and still maintain "excellent" distortion performance, the company said.

ONI adds strand-mount interface

Optical Networks International has developed a new low-cost strand-mounted optical interface unit providing 15 dBmV and 44 dBmV output. Return data capability is an option.

Power Guard's new standby

A new, smaller-sized standby power supply available in 24-volt and 36-volt versions now is available from **Power Guard Inc.** Available in 3-, 6-, 9-, 12-and 15-volt models, the "Small, Simple Standby" supply is designed for flexible use with conventional or fiber systems, the company said. Company President Curt Cope said the new supply would offer capital investment as well as operating savings.

Lectro debuts power supplies

Two battery and three-battery versions of the **Lectro** Products Uni-Max modular standby power supply now are available, the company said. The units can be outfitted with LED or digital displays, RF transponder interfaces, input and output circuit breakers as well as input and output surge arrestors. The Duo-Max is a combination unit designed to provide standby powering for cable TV and telephone switches. U.S. units come in 60-volt, 12-amp as well as 48-volt, 8.5-amp versions, the company said. Status monitoring and metered output power are built-in features.

MDU enclosures

Moore Diversified Products Inc. has developed a new line of MDU enclosures designed for use in settings requiring low to medium security. The

Cable-Tec Games winners announced

Sounds of sporting events permeated through Bally's Hotel ballroom during the first national Cable-Tec Games, a competition pitting the nation's best technicians head-to-head in four events.

While the audience munched on hot dogs, hamburgers and pizza, took batting practice, threw basketballs and putted golf balls, 30 contestants from cable systems all over the U.S. tested their knowledge and abilities in four events: splicing; test equipment; fiber optics; and safety and terminology.

Medals were awarded to the top three finishers in each category as well as to the top three finishers overall. The overall winners (who win national boasting rights as the industry's best techs) are as follows:

- First place: Jeff Sommers of United Artists Cable in Santa Cruz, Calif.
- Second place: Robert Hagan of Longview Cable in Longview, Texas.
- Third place: Tom Mack of Tekstar Cablevision of Perm, Minn.

In order to win the Games overall, each contestant had to take part in each of four events. Those events and their descriptions are as follows:

1. **Splicing**. Contestants prepared cables and installed F-connectors. Results were based on proper dimensions of stripping and cutting, center conductor cleanliness and a 40-pound pull test. Also, a distribution connector was installed on .500-inch cable and judged on quality and dimension. The top three finishers in this category were:

- Steve Drummond, Storer Cable, Richmond, Va.
- Robert Hagan, Longview Cable, Longview, Texas.

Brett Hughes, Illini Cablevision, Many, La.

2. **Test equipment**. Here, the ability to identify and locate faults using a cable fault locator and measurements of signal strength and carrier-to-noise using a signal level meter were tested. Accuracy and speed were keys. The winners were:

- Merl Morrow, Quality Cable, Eau Claire, Wis.
- Tom Mack, Tekstar Cablevision, Perm, Minn.
- Paul Valiante, Cox Cable, Harahan, La. (tie)
- David Kirkpatrick, Continental Cable, Stockton, Calif.

3. **Fiber optics**. The contestants prepared fiber cable ends for splicing and then using a fusion splicer to make the splice. And the winners were:

- Jeff Sommers, United Artists Cable, Santa Cruz, Calif.
- John Kero, TCI, Helena, Mont.
- Robert Hagan, Longview Cable, Longview, Texas.

4. **Safety and terminology**. A complete safety inspection of a safety belt and climbers was performed and definitions and descriptions were matched with common cable TV abbreviations, acronyms and formulas. The winners here were:

- Lloyd Stewart, TCI, Marysville, Wash.
- Kris Wallace, Sacramento Cable, Sacramento, Calif.
- Chris Alexander, B&L Cable, Auburn, Wash.

The event was refereed by Pam Nobles of Jones Intercable and emceed by Ron Wolfe of the ATC National Training Center and Eric Himes of Magnavox CATV Systems. ■

new line costs about 25 percent less than the current line of Moore enclosures and comes in two versions, including a standard lid and hinged lid form. The "shallow lid" box costs less primarily because of its less-complicated design, the company said.

Superior Electronics names distribution agents

RF Technologies, Dacom, Microsat, R. Alan Communications, Spectrum, Patterson Communications, Communications Supply Group and Avantron have been named manufacturers' representatives for the "Cheetah" status monitoring system, said **Superior Electronics Group Inc.**

VDS shows crawl inserters

A new low-cost crawl inserter now is available from **Video Data Systems**. The 800-CI features a 5,000 character memory and a NOAA version allowing insertion of the weather service crawl.

New tools

Ben Hughes/Cable Prep unveiled a new stripping and coring tool producing a beveled edge on the outer conductor, preventing O-ring damage. Also new is an EZ Squeeze tool used to fasten Raychem EZF connectors. ■

Compiled by Roger Brown, Leslie Ellis and Gary Kim

Continued from page 42

rupted even for routine maintenance activities, Luff noted. Another corollary: PCNs would create a need for hundreds—perhaps thousands—of base stations that would have to be status monitored.

That noted, the good news is that optical fiber plant is increasingly cost-effective, said Jay Vaughn, American Television & Communications senior project engineer. In recent modeling of 550-MHz, all-fiber, trunk plant in low-density areas of perhaps 50 homes a mile, Vaughn said costs should run about $13,000 a mile, including the cost of a 14-mile AM optical supertrunk.

In Vaughn's model, three lasers at a primary optical receive node retransmitted signals to five secondary optical nodes each. Four distribution amplifiers then were run in cascade, using a tapped trunk design. Compared to a traditional architecture, the fiber-rich design is 15 percent cheaper, Vaughn said. ■ *—Gary Kim*

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Reader Service Number 25

One year and counting

Complying with leakage constraints: How is CATV doing?

The cable industry was just not going to take the situation seriously. A full eight years after Section 76.610 of Title 47 was put in place and under pressure from the FAA, in the spring of 1985 the FCC issued Docket 21006 which called for strengthening the rules on signal leakage compliance because "cable operators (cannot) be relied on to maintain their systems sufficiently free from leakage...."

Patience and trust in voluntary compliance had not been rewarded. Given their well-founded cynicism, the FCC urged universal offsetting of CATV frequencies that conflicted with aeronautical frequencies as opposed to so-called "negotiated offsets," which the FCC felt were unmanageable. Operators would be required to use standardized offset frequencies since the industry could not be trusted to plug the leaks.

Then in 1989, with the approaching end of grandfathering, the FCC kicked out the jams and went into high gear. Using whatever means they could muster to get the word out—speechmaking, seminars, trade press articles and interviews, executive presentations, directives—the FCC, led by John Wong, assistant chief of the Video Services Division, began the laborious process of bringing operators into compliance.

The FCC had the authority, come July 1, 1990, to fine systems heavily and shut them down. With firmness, but not hostility, Wong always preferred to leave the threat of such actions merely implied.

Actions

July 1, 1990 has come and gone. And to date, only five systems have had direct action taken against them, and no forfeitures have been issued yet. They were TCI Cablevision of Elkton, Md., TCI's system in Boulder, Colo., Triad Communication Co.'s Hastings, Mich. system, Falcon Cable of Mojave, Calif., and Multivision's operation in Hermosa Beach, Calif.

According to published reports, Triad/Hastings darkened three channels, TCI/Boulder turned off 15 channels for four hours, and Falcon/Mojave also darkened its channels shared with aeronautical frequencies.

By George Sell, Contributing Editor

The FCC forced the TCI/Elkton system to shut down 20 of its 35 channels for leaks of weather related origin. However, the system was able to continue full operation of all channels by reducing the signal level 10 dB in those sections of the distribution plant where expansion loops were found to be cracked. Reportedly, few customers complained about the snowy picture quality.

Falcon/Mojave was forced to turn off 13 of its 36 channels for two days in April. During a radio survey unrelated to CLI monitoring, several leaks were discovered; including one that exceeded 7,500 μV/m. Reportedly, the system's cumulative leakage index total was 78, 14 above the FCC's CLI limit of 64.

While more cease and desist orders may be expected from the FCC—as many as 24 or more potential "worst offenders" are slated for close monitoring—so far the industry has dodged the bullet remarkably well.

"With as much acrimony as there was at the outset, the industry has really buckled down and done a superlative job of compliance" says Ted Hartson, VP of engineering for Post-Newsweek Cable and a long-time advocate of the CLI program. "To the extent that there have been a half dozen shutdowns in the last year, I don't think that's anything out of the ordinary. I would have honestly expected more. I think they probably could find more."

Direct actions are but the tip of the iceberg. The small number of direct punitive actions against violators is not the only measure of success. Cease and desist orders have been issued by the FCC only when gross violations or failures to comply with minimum standards have been the case. While the actual number of systems nearly failing compliance are not known, there may be many.

Says Hartson, "In reality, I think a lot of people are reporting numbers—I don't mean that they are lying, an important distinction—but it is quite possible that people have a bit more or quite a bit more leakage than they think they do because it is rather complicated to make the measurements accurately. And unless you make those measurements carefully you will always understate the amount of leakage from a source. There is virtually no way to overstate the leakage. Consequently, if somebody is reporting a number that's up in the low 60s and the Commission was to take the time to make a careful examination, they might find that it crosses over 64."

Slacking off?

"It was the FCC that prompted us" to monitor leakage, points out Victor Gates, regional VP for Metrovision in Livonia, Mich. "In my opinion, it is rather unfortunate that not all systems are taking advantage of the tremendous tool that the Federal Communications Commission has given us, as an industry. We all stand to gain from monitoring leakage."

But the FCC's mission in all this is to ensure that cable systems do not leak signals into the air that are strong enough to interfere with the communications of other users of the spectrum, especially aeronautical frequencies.

"My major concern is recognition and understanding of the issues and responsibilities on the part of the cable operator," says John Wong. "Even during our national inspections, several times we did not amass enough information to establish a full blown case because it is our first priority to eliminate that potential (of aeronautical frequency interference).

"The CLI program that the FCC brought to the industry has been a gift, apart from the goal of the mission of the FCC, since it has resulted in improved system performance and positive impacts to the bottom line in terms of system performance, customer satisfaction and truck rolls," Wong continues.

"What it did was establish not only a technical maintenance structure for the cable plant, it also established a certain framework for the paper flow of the reporting structure between the engineering, the managerial and the corporate levels," Wong says. "The FCC has its mission and that's unrelated to improving a cable system's

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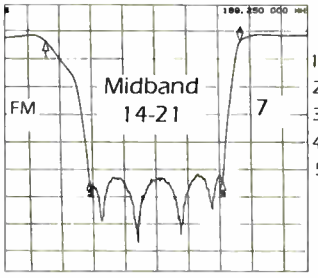

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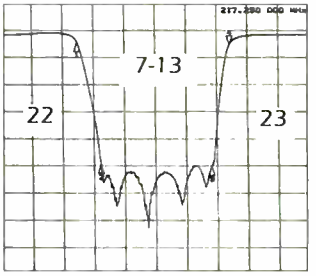

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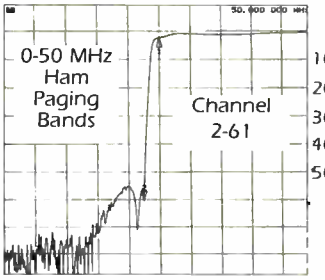

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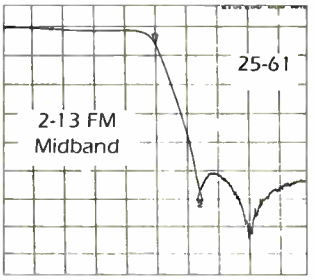

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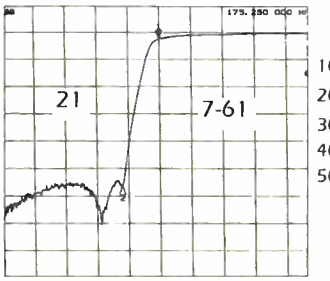

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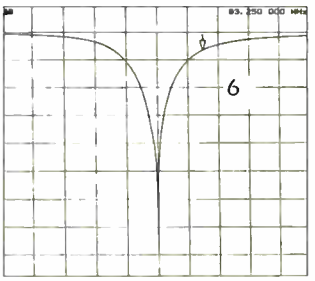

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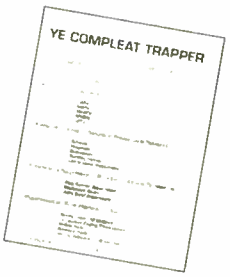

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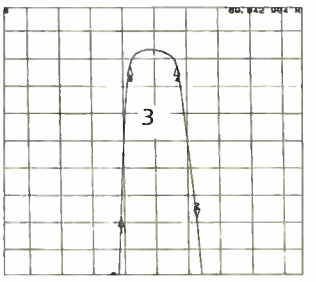

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bottom line."

However, by virtue of following its mission, the FCC has introduced this program—and it's up to cable systems to separate its importance and make use of it as a tool for their own benefit. "It may sound like I'm saying the FCC should be out there kicking systems in the butt. That's not what I mean," says Gates. "I mean we should take advantage of the CLI program for what it's worth, not for what the repercussions from the FCC might be if we don't do it."

A regular routine

"Now we're to the point where we're hopefully settling down to a procedure and implementing it," says Bob Saunders, VP of engineering for Sammons Communications. "Those who have truthfully tried to follow our procedures have seen tangible results in reduced service calls, better system performance and the ability to actually to find problems before customers see them, in some cases.

"The other thing we found," continues Saunders, "was once you get a handle on the system and you get this large backlog of leaks under control, it's not as difficult as you might have thought it would be (to maintain). There's a big hump that you've got to get past before you get the system down to a manageable level."

For most smart cable operators, CLI surveilance has become standard operating procedure. It is just part of the lifestyle of the technical and maintenance staff. "We are all now one-year-old in the CLI compliance business and maybe after awhile we will become a little smarter and adroit at managing our leaks," Hartson projects. "That's probably a good idea, because all the traffic cops are one-year-old, too. As the Commission starts to look a little harder, maybe we will get a little smarter."

True benefits

Many MSOs have found that by systematizing their nationwide gathering of data and reporting procedures, they have compiled a comprehensive aggregate of information about their systems. "If you run thousands of miles of plant all across the country, as many MSOs do," Gates relates, "one system could be doing one hell of a job. They may have tuned right in on a particular fitting problem, or how you tie the drop off, or something simple that would have no other means of being communicated to anyone else—not other systems or the industry. This program has tied that information together and now (an operator can) look at 'fix codes' for leaks. It's been the only cohesive program that has brought that information together so that people can look at the same information."

Saunders finds the statistical data useful, too. He says the first thing he sees in the reports, which is quite surprising, is who is taking this program seriously versus a system that is just going through the motions. He can also detect which systems have assigned only one or two guys to the compliance task. He says systems that don't have the majority working on leakage are symptomatic of bigger problems.

"The second thing that helps us," continues Saunders, "is to really de-

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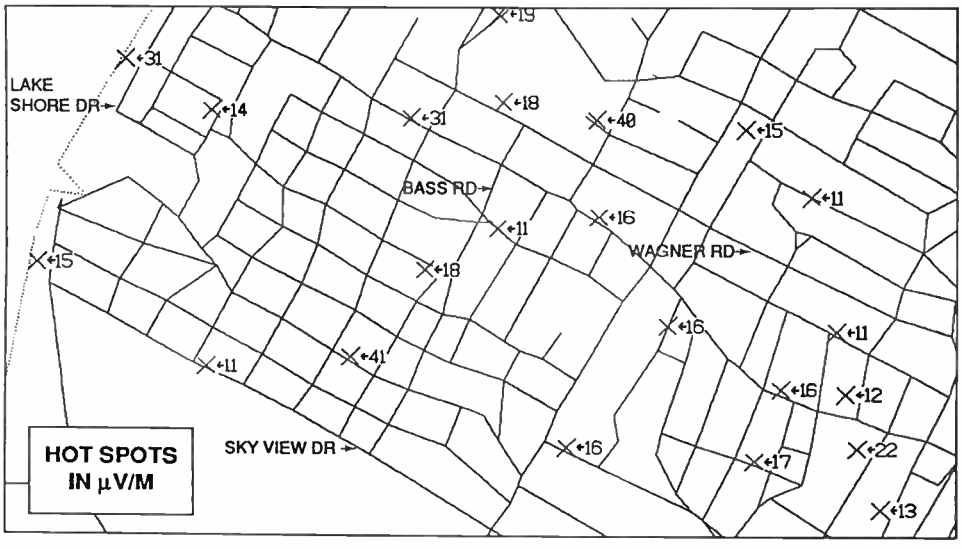

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Reader Service Number 27

Peaks and valleys along the FCC paper trail

The most fundamental number in the Federal Communications Commission's database relating to the cable industry is the count of registered cable systems in the country. This number, rounded to 33,000, is based on "community units" served by systems. And Cumulative Leakage Index reporting has helped the Video Services Division's Cable Television Branch improve that database.

According to John Wong, assistant chief, the FCC is trying to straighten out its database. In the process, last year it added more than 3,000 community units [i.e., non-registered systems] based upon the filing of Form 320.

"We have every community accounted for except for 140 communities out of 33,000," adds Michael Lance, staff engineer with the Cable TV Branch. "And of those 140, a lot probably don't exist anymore or have been merged—things that we just can't track down. But everyone else has sent in a form and we have gotten them straightened out."

In early June, Lance started entering the 1991 CLI reporting data. The 1990 paper flow at the FCC was anything but steady. "Starting March, it began flowing in pretty well and it peaked at about July 1 and through July," Lance reports.

Since the deadline for grandfathering fell on July 1, that was when the cycle peaked. And, at least for the next couple of years, that spike will be repeated. "Since they have to do it according to when they did it last year, I imagine that it is going to be about the same. And up to right now it looks that way."

But from now on there will be no significance to the July 1 date, and that there will be a peak in the paper flow in July will be merely coincidental. The deadline for filing by a system will now become whatever date was previously filed. "I think it should spread out as time goes on because it is a once a year (report). Some people were doing their testing in January," says Lance, "but not filing it until July 1. Now they will do it in January and file it shortly after that."

The FCC will not establish any different procedures for the scheduling of filing to adjust for the irregularities in the paper flow. "No, I don't see it. Just by the nature of the way it is done, I think it will stagger itself. It's going to take a couple of years. New systems that are going to use the aeronauticals for the first time are required to do CLI before they start up. So, those will be whenever they start. And some systems will change their date."

Have there been any patterns of problems in the filings that have affected the work load? "A lot of it's just people who left out things. And that's a lot of staff time for just one submission," Lance laments. "We have some form letters drawn up to deal with the most frequent problems to make it easier on us."

While some problems are caused by things left out, others are created by including too much. "Attaching leakage logs isn't a good idea. To us, it's just a big stack of leakage repairs for the year. I would like to see the leaks over 50 μV/m, their location and an estimated time of repair," Lance offers. "But not a single piece of paper for each repair. I wouldn't want them to repair each leak as they are doing the testing because then it wouldn't be a test." ■ *—George Sell*

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termine if they are finding leaks in the trunk and feeder plant as opposed to drops. That tells me what stage they are in their effort to clean up. If they are still working on problems in the aluminum plant, they aren't as far along in their repair process as they need to be. If they are working on house drops, that tells me they've got a pretty good handle on the problem, especially if they are working on 'customer creativity.'"

And it appears more leaks occur in drop cable, which is, on average, about half of the total system mileage. "The drop problem is more than double than in the aluminum plant," says Saunders. "Aluminum plant, except for the occasional squirrel or lawnmower that hits a riser, is pretty easy to keep in compliance. Especially if you have done a good job of preventing rubbing on poles, or leaks from lines swinging in the wind or using extended connectors that end up putting torque on ports. Most of those problems are avoidable.

"The drops, on the other hand, are a function of a much weaker system. Fortunately, it's at a lower level. But the connection on drop cable is prone to developing leaks either from being misapplied, loose or from corrosion if you have not done a good job of keeping moisture out of them."

The problem of squirrels gnawing on cable sheath and shielding is a bigger problem than previously assumed. "It's unbelievable, but squirrels chew the heck out of cable,' says Gates. "So we've ended up with a program of squirrel pervention. We have watched the statistics and we actually can spend a great deal of money to prevent squirrels from chewing our cable and in the end come out ahead."

Saunders sees other problems: "Another area of weakness may be multidwelling complexes. In many systems, large condominium and apartment buildings have been connected using preexisting MDU wiring which may become leaky.

And in many cases, levels have been boosted in order to pump the signal through long stretches of drop cable. Such complexes may need to be rewired and each unit reinstalled with homerun drop cables.

"We have had a history where we would try to service these MDUs by just connecting our cable systems to an existing distribution system. And generally, this requires pretty high levels to accomplish," Saunders explains.

"They usually are a loop system. We should beware of doing that. That's just a large leakage problem waiting to happen." And the best way to correct that problem? "You just don't treat that part of the distribution plant any differently than you do the rest of your system. Build it the same way. If you are going to require feeder cable in there, you hard cable and homerun these units the same as you would in your normal plant. You keep your levels on drop cable at a reasonable signal level. You don't use drop cable for a feeder system."

Vendors say CLI fight maturing

With at least 12 months of leakage-fighting experience under their tool belts, cable system technicians in most cases have integrated the detection and monitoring practices into their daily routines. Judging from the input from several equipment and service vendors, it appears that efforts to battle leakage have entered the mature stage.

"CLI definitely was a business," recalls Greg Marx of Trilithic Inc. "It was huge a year ago. Then it slowed dramatically after July 1 last year." Since January 1, the market has rebounded to roughly 70 percent of last year's level, Marx says. "It's still a significant part of our business," he adds.

He says operators are still purchasing roughly the same mix of measurement and monitoring equipment, however, they're beginning to explore the need for calibration equipment—to make sure their measurements are the same ones a visiting FCC field inspector would get.

Marx believes many operators are now trying to *prevent* signal leakage, not just battle the fires. His evidence? The growing use of small, inexpensive detectors that can be given to installers and service techs and used during routine system maintenance. "I consider that proactive instead of reactive," says Marx. "That's a growing portion of the market."

Meanwhile, other vendors are actively working to reduce the amount of labor needed to detect, locate and log leakage. These methods focus on automation.

For example, CaLan is fine-tuning its ALAN (Auto Leak and Navigation) system for a planned mid-summer roll-out, according to Ian Jones, product manager. This system allows any system employee—even non-technicians—to ride out the system at legal street speeds. A phased array antenna is mounted on the vehicle to record signal strength, direction and azimuth. Meanwhile, a navigation module uses computerized maps to generate location information. A computer writes the leakage info to a disk and combines the leakage information with street locations, giving system techs a look at leakage levels and location.

Intercontinental Cable Services recently unveiled its ICS Leak Finder System—a sophisticated automated system that combines a data recorder and U.S. Department of Defense polar-orbit satellites to produce leakage maps that are said to be accurate within 40 feet, says ICS' Gil Becker.

Becker estimates that the cost of doing CLI can be reduced from more than $5 per mile (they require a lot of time and skilled personnel) to just 83 cents per mile with the ICS system.

From the air, it's clear that many cable operators are cleaning up their systems, according to Dom Stasi, president of Flight Trac, a national flyover service. The Chicago-based company flew 100,000 miles of cable plant in the first four months of the year, utilizing four different aircraft, according to Stasi.

Although business has slacked off since then, cable operators are doing "a lot better" this year than in 1990, says Stasi. "We're seeing 85 percent to 90 percent compliance across the board," he reports.

However, flyover companies often have to make their clients believers because data collected 1,500 feet above a system often tells a more surprising story than the ground-based drive-outs do, says Stasi. For example, a crew may drive a system and find little or no leakage while a flyover would collect enough leaks to make a system fail.

For this reason, Stasi believes the ground-based method of data collection and measurement is inherently flawed. "A good CLI doesn't mean you're leak proof," notes Stasi. He adds that more operators are choosing to do flyovers because they directly correlate to the root of CLI—aeronautical interference. "We've seen vast improvement in several systems. The panic is over," Stasi says. ■

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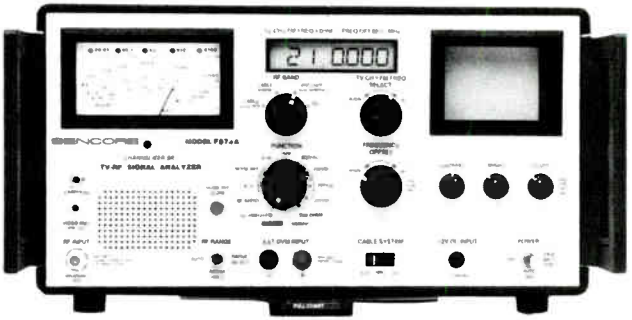

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Reader Service Number 29

However, this solution is not an inexpensive one. It involves, most of the time, rewiring the complex—which is expensive. But it's very easy to fall into this trap and just connect onto what's already there and start selling pictures, Saunders says.

And there have been other benefits of CLI compliance, some intangible. "We have seen a correlation between the efforts to keep the system tight and the reduction of service calls," Saunders reports. "There is also the intangible result of better retention, because you are providing a better picture."

Saunders suggests that CLI requirements have justified the purchase of better hardware. "The one thing that I think is universal is that signal leakage compliance rules have allowed us to do things we may have wanted to do in the past, but didn't have the justification for it. It's allowed us to buy better passive devices, better connectors and better drop cable or to buy better equipment to allow our systems to run better. If the rule had not been in place, we may not have been able to convince the powers that be that this is the right thing to do for our system."

Helpful hints

Perhaps the most helpful suggestion for completing the paper work for submission to the FCC is to closely follow instructions. John Wong cites a case in point: "We're still trying to resolve issues with regard to offsets. For example, in the Exhibit A we ask for the offset frequencies that they use. They will say, 'I'm using channels 2 through 39.' We send a letter and ask them to give us the exact frequencies. [They respond,] 'A through QQ.' And in each letter we say 'For example, if you positively offset Channel A, it should look like this...' Often it takes three or four letters to get information like that."

"Another pattern of problems," Wong continues, "is the way that people view how to test their system, how they break it out and how to recalculate. And we have to get back to them on how they do it."

As far as tips for the actual measuring of leaks, Hartson offers, "You have to measure individual leaks. Do your patrolling by getting really close to the plant. For ground-based measurements, if you are driving down a street and the cable is in the back lot 250 feet away, you're probably risking that there are bigger leaks back there than you think there are."

Hartson believes management should be out there, too. "I've always encouraged the guys in the white shirts to ride around in white trucks. That includes the local level management people, the general manager and the chief tech. Those folks should find the time at least every few months to get out and have a clear understanding of what it is their people are doing."

For management to be visible in the field, "It reinforces the ethic that this is something really important and it helps management focus their attention on the real complexity of the issue. You can't run a leakage program between reconnects and disconnects," Hartson urges.

"It can't be like a throwaway. The people who are throwing it away are the people who are running a risk," Hartson says. "I heard an expression the other day: 'It's not what's expected—it's what's inspected.' "■

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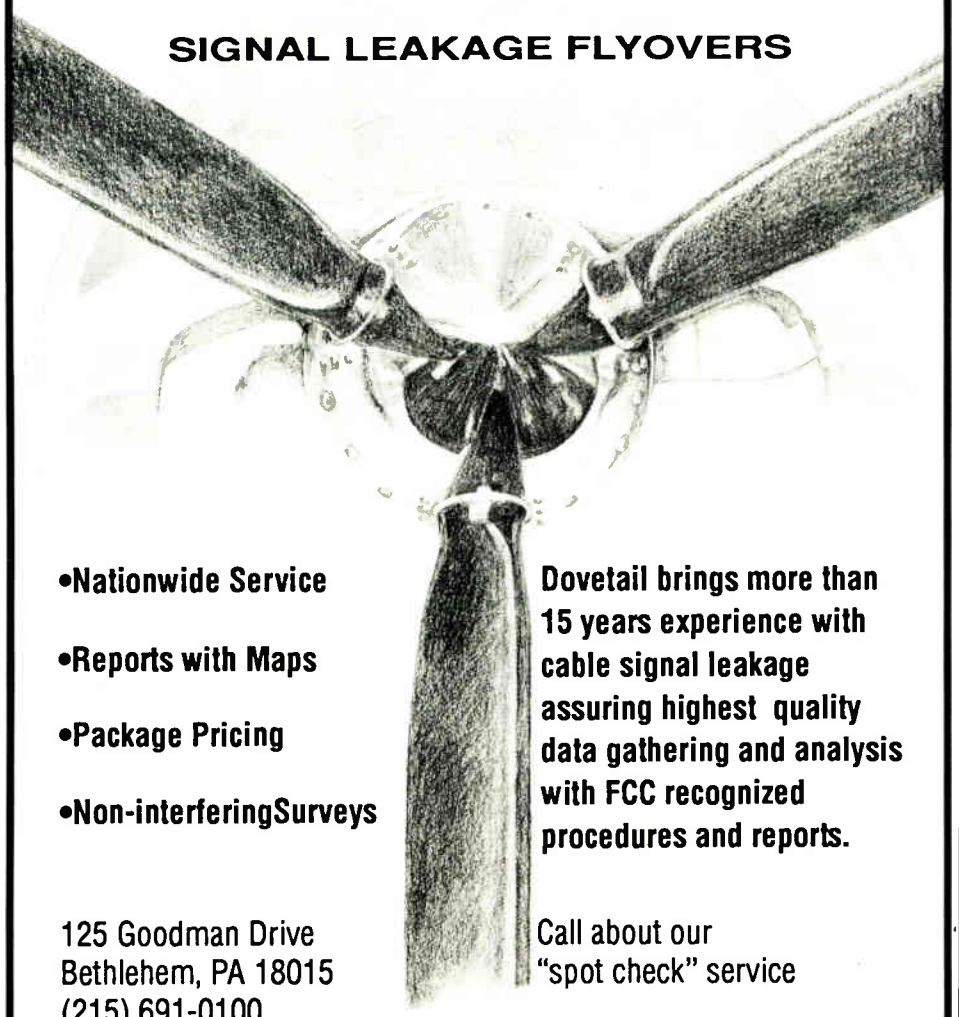

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Measuring system availability

Even in this age of technological evolution, reliability can be thought of simply as "that which can be depended on." In the cable industry, this "simple" concept is becoming of critical concern. In survey after survey, cable operators have found reliability to be the single key factor in the customers perception of good service. To the customer, 80 channels at 49 dB doesn't do a bit of good if he can't receive the signal.

It is this very emphasis on reliability that challenges the cable industry to take a more universal approach to the issue. In the data world, reliability is a key variable. System reliability performance is measured in terms of an "availability" specification that describes the percentage of time a particular circuit is operational, or available for use over a given period of time.

If we were to equate such a specification to the cable industry, it would enable operators, and possible business customers, to look at the time a system is available for use by a typical home in the system. This gives a quantitative measure which can be used as a baseline—last year our availability was 97.8 percent, let's put as a strategic goal to get that to 98.9 percent. This would allow the cable industry to replace individual prejudices with quantitative, measurable data.

What to do

If improved system reliability is a worthwhile objective, how do we in the cable television business define and measure it in a meaningful, consistent way? The cable system architecture presents some interesting complications to an "availability" measure. In the classic "tree and branch" configuration, a trunk station outage near the headend will have different ramifications than a trunk outage further out. (This, of course, in terms of the number of homes affected.)

Many of the evolving fiber overlay architectures minimize the total outage effect while maintaining the same number of active components in the system. The fiber trunking architectures change the equation in a fundamental way, moving from a tree and branch to a star/bus network and further containment of the affect of an active component failure.

These complications will not disappear in the short term as there are likely to be a number of "correct" distribution designs associated with cable television networks. Every system has unique marketing, political and physical considerations that drive the technical configuration of the network.

The measure of "availability" for a cable television network should involve an average across the system over a given period of time. The time component is the easy part—most networks look at a one year period as a meaningful standard. To arrive at a per-home average availability measure, we will have to record three critical factors:

- time outage occurs
- time network reactivated
- number of homes affected by outage

The third factor is the most difficult from a practical, operational standpoint. However, a system could be developed that would indicate affected homes by active component or location of break. For example, it would be known that amplifier #201 serves 1,534 subscribers or power supply #PS02 affects three line extenders serving 293 subscribers.

The advantage of tracking outages by duration and the number of homes affected is to simplify the quantitative measure of overall network reliability.

If an acceptable measure of system reliability is to look at the average availability of cable television to the home over a one year period, then the formula might look as depicted in Figure 1.

Setting a specification

The model described in Figure 1 is not all encompassing and is primarily intended to spark discussion. In the industry, there are many independent com-

Determine Average Number of Subscribers:

Month	Basic Subscribers
Jan	22,132
Feb	22,101
March	22,500
April	22,550
May	22,602
June	22,643
July	22,824
August	22,758
September	22,805
October	22,876
November	22,921
December	23,023
Total	271,735
Divide by	12
Avg. # of Subscribers	22,645

Determine Network Possible Service Minutes

Days	Hours	Minutes	Total Minutes in Year
365	24	60	525,600

Average Number of Subscribers		Possible Service Minutes		Network Possible Service Minutes
22,645	×	525,600	=	11,901,993,000

Determine Network Service Outage Minutes

Outage	Duration (minutes)	Homes Affected	Network Service Outage Minutes
1/23	90	1,500	135,000
2/15	120	5,687	682,440
2/22	20	823	16,460
3/23	240	2,500	600,000
5/3	240	2,100	504,000
6/25	129	2,134	275,286
8/19	120	3,213	385,560
8/20	90	1,008	90,720
9/22	120	2,134	256,080
10/24	180	765	137,700
11/22	67	2,345	157,115
12/25	120	1,234	148,080
		Total	3,388,441

Determine Network Availability

	11,901,993,000	Network Possible Service Minutes
Minus		
	3,388,441	Network Service Outage Minutes
	11,898,604,559	Network Availability
Divide		
	11,901,993,000	Network Possible Service Minutes
=	0.99972 × 100	
=	99.97153 % Network Availability to Home	

Figure 1

By Andy Paff, President, Optical Networks International

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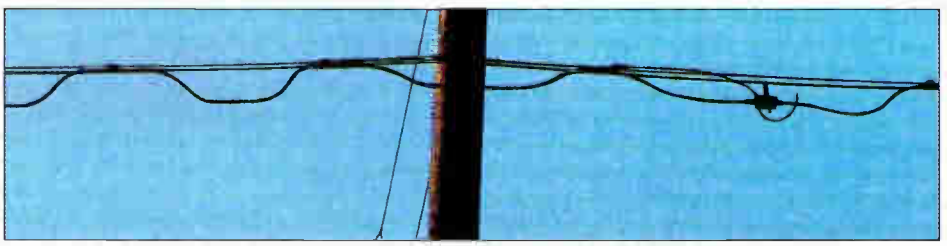

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The point here is simple. If Quantum Reach will do the job for Northern Cable under the worst conditions when every other cable failed, think what it could mean for your system. We even have a comprehensive article detailing the QR installation in Sudbury. It's free for the asking. Simply contact your nearest Comm/Scope representative or call us at (800) 982-1708 or (704) 324-2200.

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Reader Service Number 31

Using Cox Cable's reliability index

By Kathy Berlin, Technical Writer, Antec

Cox Cable Communications is one company that has endorsed an internal standard, the Reliability Index (CR%), as a means to "drive plant reliability improvement without burdening the cable operations manager with a mountain of data collection," says Paul Workman, corporate staff engineer for Cox.

"In order to address reliability," he continues, "we needed to do more than track outages. So many times we get caught up talking about the average time a system is off, the amount of outage hours any customer might panies who have taken it on themselves, as part of customer satisfaction and quality performance, to minimize down time. (An example of such a model is described in the accompanying sidebar.)

However, the growing importance placed on product quality certainly points toward a need to identify empirically what we are shooting for. Outage tracking, determination of cause and repair are essential to the inclusive re[illegible]ability of a system. But perhaps it's ti[illegible]e to look at reliability in another way.

We need to quantify reliability logically, in order to get a consensus definition on how to view a network. Up to now, few have really perceived cable television plant as a network. But times are changing. New integrated technologies and business opportunities will further drive the need to measure performance in an objective and universally understood way. Such a measure for reliability in the core business application—cable television—might be a logical first step.

> How do we in the cable business define and measure system reliability in a meaningful, consistent way?

This is not to say there will not be limitations with a quantitative definition of network reliability. How do we deal with degraded performance as opposed to outage? What happens when the overall network availability is acceptable as defined through the methodology example described in Figure 1, but the Mayor's house suffers disproportionately more downtime?

The key importance of objective data is that it can become a measurable element in the overal context of improving our service. We start with a baseline and we improve. It also becomes a resource in the ongoing political battles by replacing the subjective perceptions of our critics with measurable results.

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Reader Service Number 32

experience, it doesn't really address any one person at any one place in the cascade. What we needed to do was to make sure we established a minimum benchmark for ourselves with regards to outage performance."

In order to use the CR% formula, there are several assumptions which must be understood. CR% takes into consideration trunk component failure rate and cascade depth. The first assumption is that the outages in a feeder are typical from one trunk station to another and there are an average number of feeder components per trunk station. The next assumption is to define trunk outages as any interruption in the trunk signal, for any reason.

A trunk unit is defined as a trunk amplifier and all the components between that amplifier and the next one, which includes power supplies, connectors, splices, splitters, power inserters, cable and so on. The way the formula works is to project a performance index considering trunk unit failure rate and cascade depth. (The formula itself is based on a reliability formula for serially connected devices.)

All that said, the formula is as follows:

Failure rate related to reliability:

$R(t) = e^{-\lambda(t)}$, where R(t) = the probability a device will operate without failure for a given time, (t);

e = the base of natural logarithms, roughly equal to 2.71828;

λ = device failure rate for a given period for given stress conditions; and

t = time period.

Serially connected devices

For serially connected devices, the equation is:

$R_s(t) = R_1(t)R_2(t)...R_n(t)$, where $R_s(t)$ = series reliability, and

$R_1(t)...R_n(t)$ = reliability of each block, respectively.

Simplified, the equation is:

$R(t) = e^{-(\lambda 1t + \lambda 2t...\lambda nt)}$, where $\lambda_{1...N}$ = failure rate of device(s) for a period and conditions, or

$R(t) = e^{-(\lambda 1 + \lambda 2...\lambda n)t}$, when $\lambda 1 = \lambda 2 = \lambda n$.

$R(t) = e^{-\lambda nt}$, where n = the number of serial devices. By substitution, $CR\% = 100e^{-(12TO/TT) \times TC \times t}$, where CR% = reliability of cascade expressed as a percent. For example, 100 percent reliable would mean no outages for the time and conditions stated.

TO = trunk outage, or any interruption of the trunk signal for any reason;

TT = total active trunk stations in the system (12TO/TT) establishes (an aggregate) trunk station failure rate annualized;

TC = total cascade depth in question.

Using this formula, Table 1 demonstrates the Cox average results over 24 months of activity.

"It is very clear to us," continues Workman, "that reliability of the plant with respect to outages is an extremely sore point; extremely important to our customers. I don't profess that the method we developed is the only way, or the ideal way, but it's had a substantial impact on our business from a technical perspective.

Another internal standard set by Cox is outage hours for basic subscribers. This standard basically demonstrates that the number of outages do not decrease when fiber is deployed, but rather, that the number of subscribers affected by an outage is less, as well as

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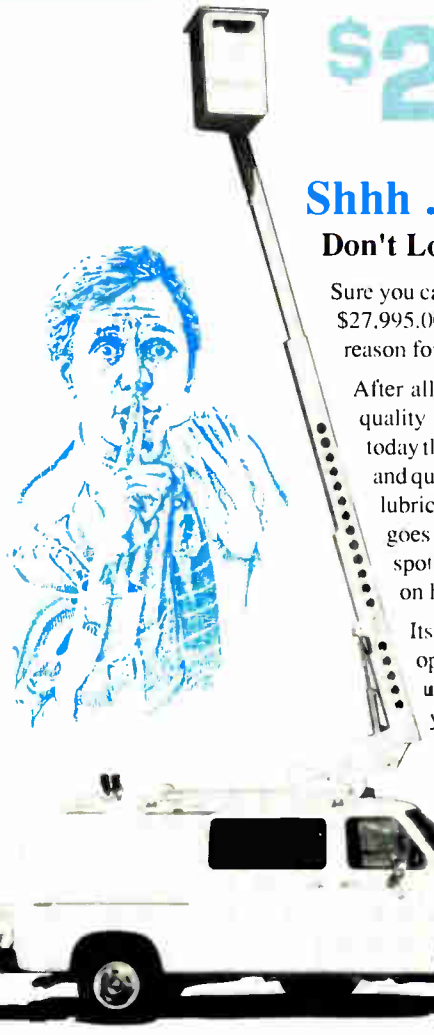

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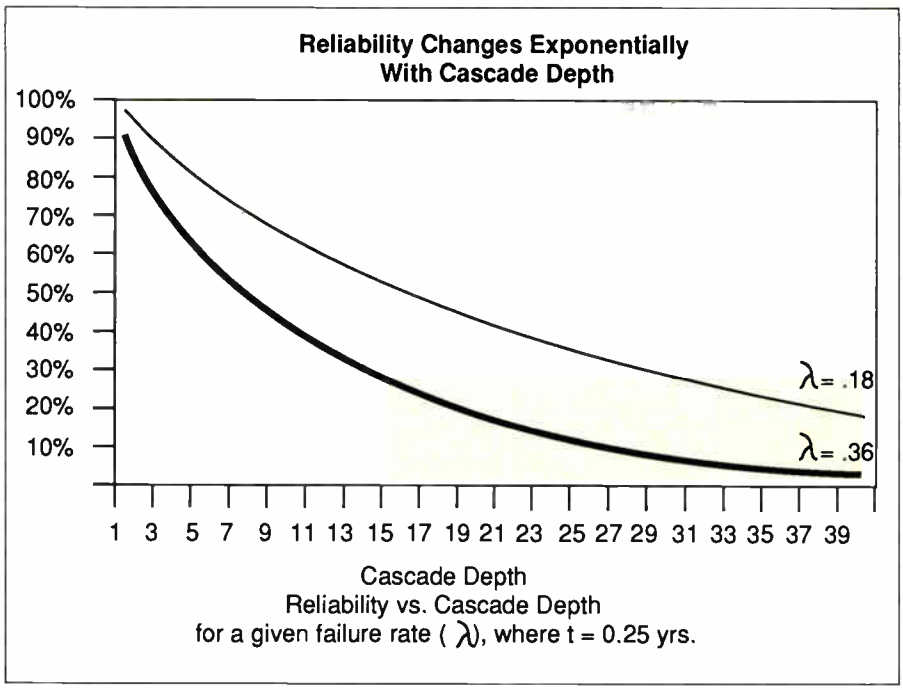

the duration of an outage being shorter.

"For example," says Ken Williams, plant operations manager for Cox Cable University Inc. in Gainesville, Fla., "we had 32 amplifiers for the longest cascade, and on the average, 20 outages a month. After we put fiber in, we still had 20 outages a month. But it's not the fiber that's failing—it's the same old cut cables, power packs and the same old problems in the same quantity. What fiber did for us was to reduce cascade, and therefore outages affected far fewer people." (see Figure 2)

Cox Cable is not alone in its effort to reduce and document outages. Not only are there many other cable systems with an outage reduction standard, but the establishment of the CableLabs committee on outage reduction further supports industry awareness of the need to maintain a reliable system.

Bill Spies, corporate engineer for Warner Cable and also a member of the outage definition and acceptable levels subcommittee, sees the formation of

Cox Cable Communications CR% Results

	1989	1990	1991
Jan		39.5	51.6
Feb		41.2	50.9
Mar		40.3	45.1
Apr	31.3	39.4	38.5
May	28.5	38.1	
Jun	25.6	35.6	
Jul	27.9	34.8	
Aug	31.3	37.5	
Sep	33.8	39.9	
Oct	34.1	46.0	
Nov	35.9	46.7	
Dec	39.1	51.1	

Table 1

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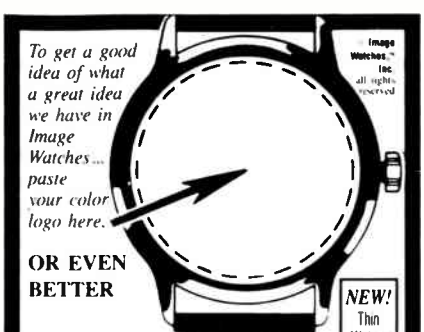

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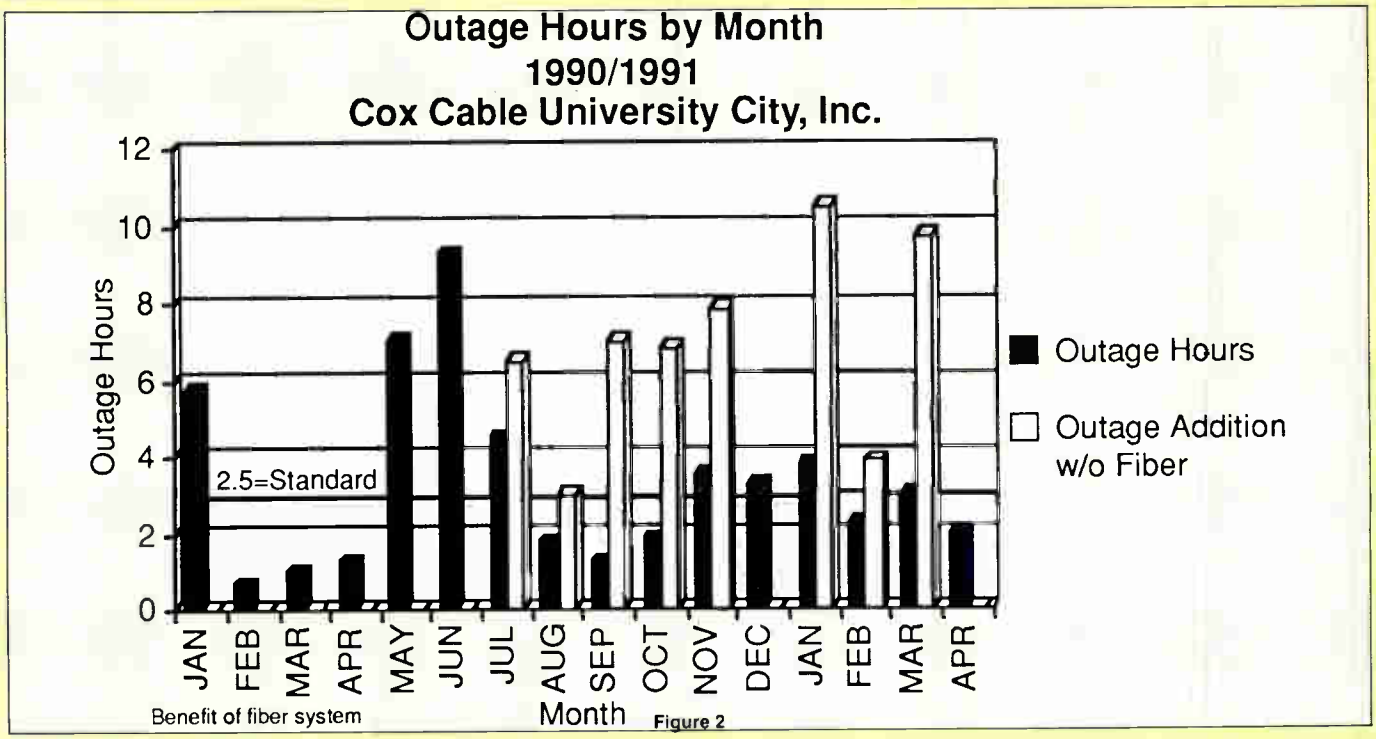

Figure 2

the committee as being very necessary. "People have been doing things on their own," says Spies, "it seems like each company was left to reinvent the wheel and that doesn't really help the industry that much.

"The issue of outages is very important," adds Spies. "Warner has been very active in surveying customers to find out what's going on. But those who don't survey may not know how big an issue outages are." ■

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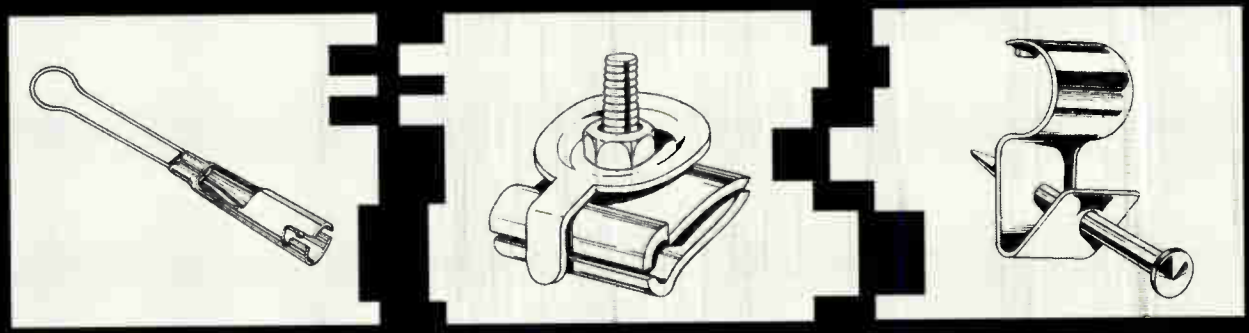

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test period is the cable-related testing. "This is when we get to play our games," James laughs. The cable tests were defined again by a specific working committee. "The general philosophy in developing the tests was to simulate the cable system as closely as possible," says Ciciora, "with fiber links, amplifier cascades, and for the most part, coaxial-related equipment.

"The upshot is," Ciciora continues, "most proponents use lower power—so the resulting system, whichever it turns out to be, will likely have little impact on other signals. We will likely be able to build cable plant that will accommodate the HDTV system nicely."

CableLabs gets five full test days to perform cable-specific tests on the proponent equipment, including:

- Composite Triple Beat (CTB),
- Composite Second Order (CSO),
- hum modulation,
- low frequency noise, and
- phase noise.

"Then we take a look at the quality of the picture going through a distribution system to see if there's any degradation. We also look at the quality going through fiber," says James. "We'll also insert different types of summation sweep signals into the system, to see if that creates anything visible.

"Next, we'll flip through the channels to determine the access time," James continues. "These are quite elaborate systems that require a whole lot of memory. We're worried that when subscribers switch channels, it make take a second or more to produce a picture. People will probably find that annoying, if they start stepping through channels and have to pause for a second to get a picture before they decide they don't want to watch it and move on. "And lastly, we put a signal through some ancillary data channels, to see when we start getting errors in various impairments," says James.

Testing Timetable

Test Period	Proponent	No. Scanning Lines	Interlaced (1:1)	Progressive (2:1)	Cycles Per-second
July 12-Sept. 3, 1991	ACTV: Advanced Compatible Television, David Sarnoff Research Center / ATRC	525	x		59.94
Sept. 10-Oct. 24, 1991	Narrow Muse, NHK, Japan Broadcasting Corp.	1125		x	60
Nov. 14-Jan. 7, 1992	Digicipher, General Instrument Corp. / ATVA	1050		x	59.94
Jan. 14-Mar. 2, 1992	DSC-TV: Digital Spectrum Compatible HDTV, Zenith Electronic Corp. / AT&T	787.5	x		59.94
March 9-April 22, 1992	ADTV: Advanced Digital Television, North American Philips Consumer Electronics Co. / ATRC	1050		x	59.94
April 29-June 15, 1992	ATVA Progressive System, Massachusetts Institute of Technology / ATVA	787.5	x		59.94

After CableLab's tests, the proponent signal is returned to the terrestrial side of the Center for a series of non-viewing tests on basic system characteristics. "They'll measure things like RF bandwidth, luminance, transient and temporal response—they'll essentially put the HDTV signal on a piece of test equipment and read the results," James says.

Following the measurements, a brief period of time is set aside for system specific tests. For example, James offers, "the Sarnoff system is NTSC-compatible. They put additional information on the edges of each line. So we may look at the NTSC sets and see if any of that information is getting into the picture.

"Basically, this time is for further consideraton of anything that the committee looks at and says, 'Hmmm, this is a little strange. I think we better take a look at it,'" James explains.

To round out the test period, the now-weary proponent equipment is put through a series of audio co-channel and random noise tests.

Interestingly, satellite tests are suspiciously missing in the testing timetable—although at press time, the NCTA Engineering Committee's HDTV subcommittee and CableLabs were finalizing a satellite test plan. This is obviously a key link for cable, DBS and other network providers.

After the tests: Then what?

When the exhaustive testing is completed for all six proponent systems, the process starts all over again, on a much smaller scale. Although the actual site has not yet been selected, the final two months (July and August, 1992) will be set aside for field testing.

Then the real fun begins: Trying to make a decision between the six proponent systems. "This is the part that concerns me the most, actually," says Ciciora. "No formal voting procedure has been established. That's scary. It's almost an impossible problem.

"In any scheme like this, the voting is generally the biggest problem. It's particularly tough in such a political environment. My thinking is that we're likely to have a crisis there," surmises the usually unflappable Ciciora. "Because after it's all said and done, my guess is that there will be three or four proponents that reasonable people could debate about.

"I'll be very surprised if there's one proponent that winds up head and shoulders above the rest. "The best hope, then, for an amicable solution," Ciciora muses, "would be to have a merge situation. If it doesn't turn out that one proponent is clearly ahead of the rest, a merge of (technological) solutions would be the next best thing."

Stay tuned. ■

—Leslie Ellis

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WHAT'S AHEAD

SCTE

Following is a list of SCTE technical seminars with contact name. If known, location and seminar topic are listed.

July 11 *Wheat State Chapter* Contact Mark Wilson, (316) 262-4270.

July 13 *Cascade Range Chapter* BCT/E testing to be conducted in categories III, IV, V and VII. To be held at Paragon Cable TV facilities, Portland, Ore. Contact Tom Hansen, (503) 265-2263.

July 13 *Great Plains Chapter* "Basic CATV concepts and design" with Marshall Borchert and Tom Coleman. To be held at The Knolls, Lincoln, Neb. Contact Jennifer Hays, (402) 333-6484.

July 17 *Golden Gate Chapter* BCT/E Category VI, "Terminal devices." Contact Mark Harrigan, (415) 785-6077.

July 17 *Razorback Chapter* To be held at Howard Johnson's, Little Rock, Ark. Contact Jim Dickerson, (501) 777-4684.

July 17 *Penn-Ohio Meeting Group* "New business technologies in CATV" and "PCN's digital audio box." To be held at the Cranberry Motor Lodge, Warrendale, Pa. Contact Bernie Czarnecki, (814) 838-1466.

July 19 *"A day at the races"* to be held in conjunction with Women In Cable at the Arlington Race Track, Arlington Heights, Ill. Proceeds to be donated to the Illinois Cable TV Association to be applied to the Illinois PAC (lobbying) fund. Contact Bill Whicher, (708) 438-4423.

July 20-21 *Big Sky Chapter* "SCTE family fun" campout to be held at the Kalispell, Mont. campgrounds. Contact Marla DeShaw, (406) 632-4300.

July 20 *Cactus Chapter* "Customer equipment." Contact Harold Mackey Jr., (602) 352-5860, extension 135. To be held at Dimension Cable offices, Phoenix, Ariz.

July 20 *Southeast Texas Chapter* To be held at Warner Cable of Houston. Contact Tom Rowan, (713) 580-7360.

July 21 *Old Dominion Chapter* "You're appreciated" membership party. To be held at King's Dominion, Ashland, Va. Contact Margaret Davison-Harvey, (703) 248-3400.

July 24 *Great Lakes Chapter* "Fiber optics." Contact Marv Nelson, (313) 553-2109.

July 25 *Lake Michigan Meeting Group* BCT/E Categories IV, "Distribution Systems," and VI, "Terminal devices." BCT/E testing to be conducted. Contact Grant Pearce, (616) 247-0575.

July 31 *Appalachian Mid-Atlantic Chapter* Annual pig roast and golf tournament. To be held at the Scotland Community Center, Scotland, Pa. Contact Richard Ginter, (814) 672-5393.

July 31 *Greater Chicago Chapter* "Signal processing." Contact Bill Whicher, (708) 438-4423.

August 7 *Ark-La-Tex Chapter* "Test equipment sweeps." BCT/E testing to be conducted. Contact Robert Hagan II, (214) 758-9991.

August 8 *New Jersey Chapter* "Installation practices," "Grounding and bonding" and the "Installer certification program." Contact Jim Miller, (201) 446-3612.

August 13-14 *Great Plains Chapter* To be held in conjunction with Nebraska Cable Communications meeting in Scottsbluff, Neb. BCT/E testing, board meeting and seminar on fiber optics and alternate access with Herb Dougall III. Contact Jennifer Hays, (402) 333-6484.

NCTI

The following training courses have been announced by the National Cable Television Institute (NCTI):

July 9 Fundamentals of Supervision Seminar for CATV Personnel, Seattle, Wash.

July 10-11 OSHA Compliance Seminar for CATV Operators, Seattle, Wash.

For more information on NCTI's new training seminars, contact Michael J. Wais at (303) 761-8554, or fax inquiries to (303) 761-8556.

SIECOR

Siecor Corp. will sponsor a four-day, hands-on fiber optic training program designed for craftsmen and contractors who install, splice and test fiber optic cable in a cable television environment. Following is the date for the program "Fiber Optic Installation, Splicing, Maintenance and Restoration for Cable TV Applications." For info call (800) 634-9064.

July 9-12
August 20-23

Trade Shows

Wireless Cable Show **July 21-23** Denver, Colo. Contact the Wireless Cable Association, (202) 452-7823.

Eastern Show **August 25-27** Atlanta, Ga. Contact Nancy Horne, Southern Cable Television Association, (404) 255-1608.

International Society for Optical Engineering Symposium **September 3-6** Boston, Mass. Contact SPIE at (206) 676-3290.

The importance of uniform trunk amplifier spacing

The performance of cable distribution plants are generally calculated by applying standard cascading formulas to data provided by equipment suppliers on the performance of single stations. These formulas assume the ideal situation in which the loss between amplifiers is identical and equal to the gain of each station. Because exceptions inevitably arise in practical construction and as a result of aging, it is important to understand the effects on overall performance and the alternatives for improving the situation.

Trunk cascade noise performance

In an optimum trunk cascade, the input level to each amplifier is identical. To that input, each amplifier adds an identical, small amount of noise. This noise is due to the irreducible noise in any 75-ohm coaxial system, plus the noise due to the active devices in the amplifier itself. To be precise, the added noise power is -59.7 dBmV + NF, where NF is the noise figure of the amplifier, expressed in decibels (dB). The noise added at the input of a typical trunk amplifier with an 8-dB noise figure, for instance is -59.7 + 8 = -51.7 dBmV.

If this amplifier is fed a noiseless input signal at a +14 dBmV level, for instance, (assuming no pad or equalizer losses) the output carrier-to-noise ratio (C/N) will be +14 -(-51.7) = 65.7 dB. In general:

$C/N_0 = 59.7 - NF + S$ [1]

where: C/N_0 is the C/N at the output of the amplifier. NF is the noise figure of the amplifier in dB. S is the amplifier input level in dBmV.

Since each subsequent amplifier in the cascade will contribute an equal amount of noise power, the C/N will decrease logarithmically as a function of cascade length. Specifically at the nth amplifier:

$C/N = C/N_0 - 10 \log n$ [2]

where: C/N_0 is the C/N at the output of the first amplifier as calculated above (or taken from the manufacturer's data sheets) n is the number of amplifiers.

Thus, the C/N degrades by 3 dB for each doubling of the cascade, *provided that all amplifiers in the cascade operate at identical input level.*

Cable systems are designed to deliver a certain minimum noise and distortion performance at the end of the longest cascades. Knowing the noise performance of individual amplifiers, the above formula will tell how many amplifiers can be cascaded and still exceed the standard for a given system. An equivalent formula for distortions (CTB, for instance) will give a similar result, based on identical output levels, as opposed to input levels.

Knowing the loss of the cable used, this puts an upper limit on the length of any trunk run. Specifically:

$L = n_{max} \times G/(52.8 \times A)$ [3]

where: L is the maximum length in miles; n_{max} is the maximum number of cascaded amplifiers that will deliver the required C/N (determined from the formula above); G is the operational gain of each amplifier; and A is the attenuation of the trunk cable used in dB/100 feet.

The only options for increasing this length are to use lower noise figure amplifiers (thus increasing the number of amplifiers that can be cascaded for a given C/N), increase the gain of each amplifier, or use lower loss cable.

Figure 1: Effect of Overspacing On C/N

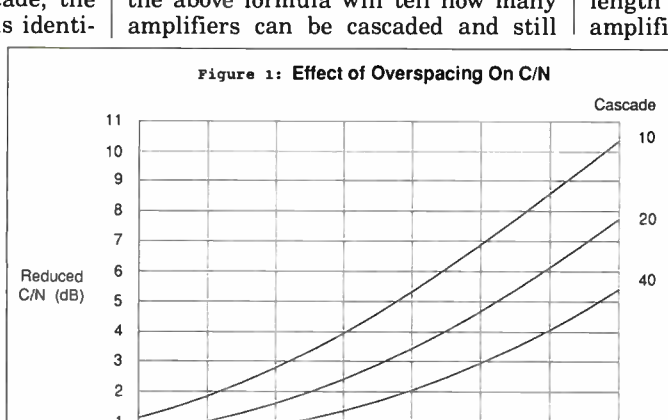

Figure 1

Figure 2: Effect of Overspacing on System Size

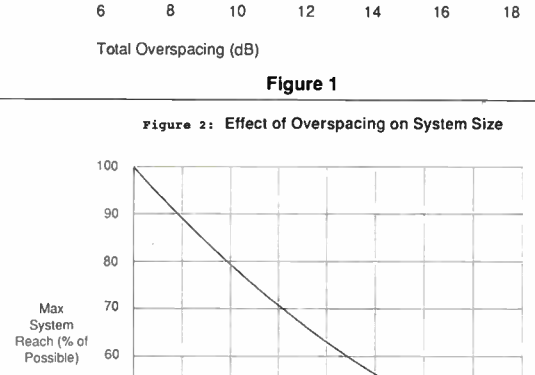

Figure 2

Practical considerations

In real life, of course, there are a lot of good reasons why amplifiers aren't uniformly spaced:

- Old cable spans may become lossy due to water ingress or too many splices.
- Odd spacings may be designed in to get amplifiers out of awkward easements or to make feeder design easier.
- System bandwidth may have been increased without re-spacing amplifiers.
- Or, of course, it may simply be due to sloppy design or poor maintenance.

Whatever the cause, it is important to know what the impact on system performance is so that it can be determined what corrections are worth making.

Effect of non-uniform spacings

So much for the ideal. What happens when spacings are not uniform?

By David J. Large, Director of Engineering, Intermedia Partners

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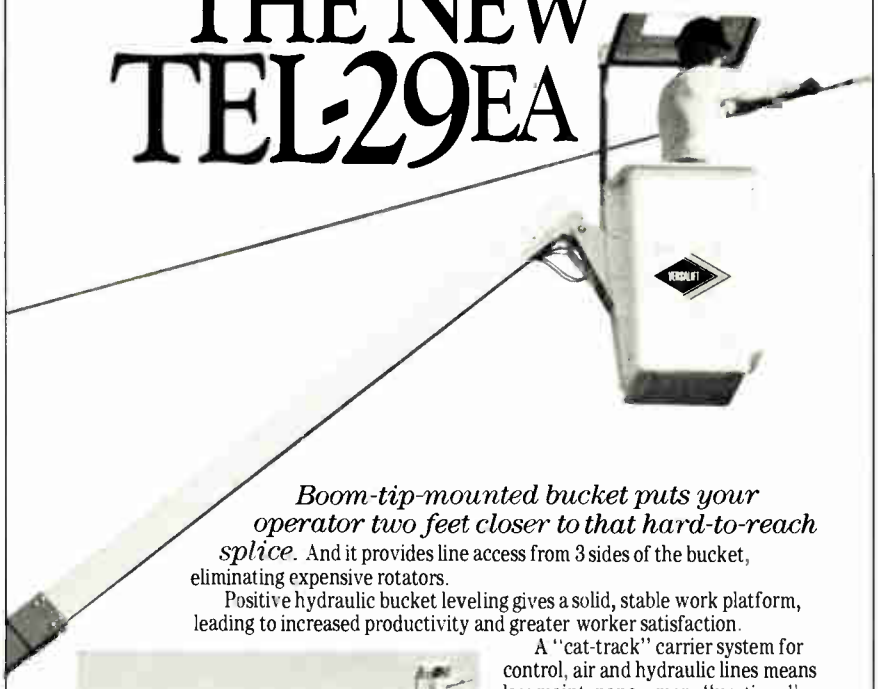

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BACK TO BASICS

The effect of close-spaced amplifiers is simple. When the input level to an amplifier station is too high, a pad is simply inserted to use up the excess level. The problem is that the power dissipated in the pad cannot be used to extend the cascade. In fact, input padding limits the maximum length of the trunk by:

$$L' = P/(52.8 \times A) \quad [4]$$

where: L' is the loss of the potential trunk length;
P is the total amount of trunk amplifier input padding in all amplifiers in the cascade;
A is the loss of the trunk cable in dB/100 feet.

What about overspacing? When amplifiers are overspaced, the loss between two amplifiers, from whatever cause, is greater than the gain of the amplifiers. When that is the case, either the input to the second amplifier is below specifications or the output of the first amplifier must be increased to overcome the extra loss.

Increasing the level of the first amplifier is poor practice for two reasons: First, because amplifier distortion (particularly CTB) is a very sensitive function of amplifier level (increasing 2 dB for every 1 dB of amplifier level) and, second, because of the practical difficulties of having one orphan amplifier operating at an odd level and making sure that all trunk techs and sweep crews remember to set it that way.

Assuming that output levels are consistent, then amplifiers following long spacings will operate with abnormally low levels.

What does that mean to system performance? Very simply, it means that the ratio of noise to input signal is higher and therefore, the noise degradation is abnormally high. This can be thought of in two ways: degraded performance or limitations of total available cascade reach.

The degradation in performance is exactly the same as if additional amplifiers had been inserted at that point. Specifically, the noise addition is the equivalent of adding:

$$n' = 10^{(S'/10)} - 1 \quad [5]$$

where: n' is the equivalent number of "added amplifiers";
S' is the amount that the input level is low in dB.

For example, if the input is 6 dB low, it has the same effect as lengthening the cascade by three amplifiers more than the actual cascade, while 10 dB low is equivalent to adding nine amplifiers.

Reader Service Number 39

The effect on end-of-line performance is the same whether the overspaced amplifier is right at the headend or at the end of the line. The only difference is that if it is earlier in the cascade, more customers will be affected by the degraded performance.

The total end-of-line degradation can be calculated by performing this calculation for each location where the input level is below specifications, adding up the "excess amplifiers" and then calculating the system performance as if this were the actual number of amplifiers in cascade using formula [2], above.

Figure 1 shows the cumulative effect on cascade C/N of overspacing for cascades of 10, 20 and 40 amplifiers. Let us assume, as an example, that the bandwidth of a 10-amplifier trunk is to be increased from 220 MHz to 270 MHz. If the original spacing was 22 dB, it will now be a little over 24 dB. Let us further assume the new electronics operate at the same output levels as the old, but have higher gain so as to overcome the wider spacing. In that case, each amplifier will operate at 2 dB lower input levels. If the noise figure is the same as the old amplifiers, Figure 1 shows us that the end-of-line C/N will have degraded by more than 10 dB!

The second way of looking at the effect of the overspaced amplifier(s) is its effect of the maximum reach of the cascade. The maximum reach of the cascade will be shortened by the fact that the excess noise will cause the minimum acceptable C/N to occur earlier in the cascade than it would otherwise have. If the all amplifiers have equally low input levels:

$$L'' = L/10^{(S'/10)} \quad [6]$$

where: L" is new maximum system reach;
L is the maximum reach under ideal conditions (formula [3] above);
S' is the average amount by which amplifier input levels are low.

Figure 2 shows graphically the loss of potential trunk line reach as a function of deficiency in input levels.

As can be seen from the formulas above, either under- or over-spacing results in a shortening of maximum system size and degraded C/N.

Possible corrective measures

Now that the performance degradation has been calculated, the options to correct the situation can be evaluated to see if the cost and/or complexity justifies implementing them.

The obvious options are:

- Respace one or more amplifiers to use excess input level at another location. This can be complicated if it requires extensive redesign of feeder plant fed from the relocated positions. It can also result in amplifiers in awkward locations (mid-span over a freeway, perhaps!)
- Add additional amplifiers in span where input levels are low. This will correct individual input level problems, but will also limit the cascade by adding more amplifiers, with their attendant noise and distortion. Usually, this is only a solution if isolated input levels are very low. If the original spacing was only slightly long, the added noise from the new amplifier may be more than the original excess noise and the cascade distortion will be higher because of the additional active device.
- Use high-gain amplifiers at the end of long spacings. This will prevent the low input levels from affecting amplifiers further down the line, but will not do anything for the amplifier positions primarily affected.
- Use lower noise figure amplifiers. This is a good solution, if such amplifiers are available, provided one does not mind having "odd" amplifiers in the system with the problems of stocking spares in all the tech trucks for it.
- Use higher output capability amplifiers (power doubling or feedforward) ahead of the long spacings. These type amplifiers can be operated at increased output levels with no more distortion than conventional amplifiers. Note that if the high-output amplifier is operated at normal input levels, it will also have to have more than normal gain in order to reach the desired output.
- What shouldn't be done, is to use high-gain amplifiers with no increased output capabilities ahead of long spacings. While such amplifiers will have sufficient gain to reach a high output level, they will have an increased distortion as a result.

Summary

In real cable systems, situations frequently occur in which ideal trunk amplifier spacing cannot be maintained. Understanding the amount of performance degradation that results from non-uniform spacing and the trade-offs involved in possible ways of improving performance lets the operator decide if and how to solve the problem. ■

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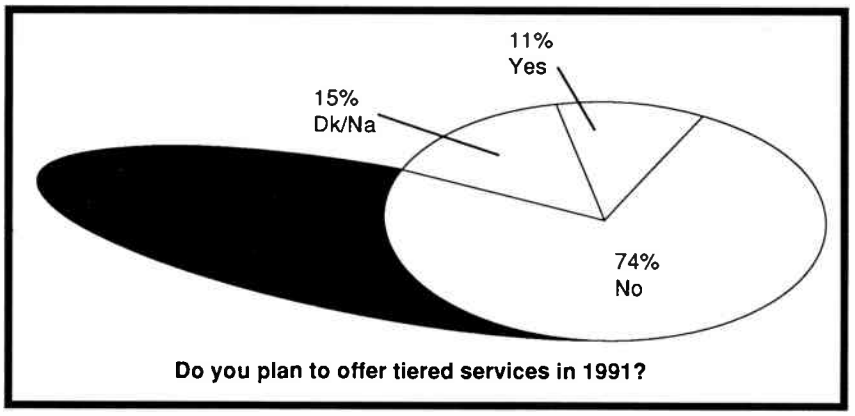
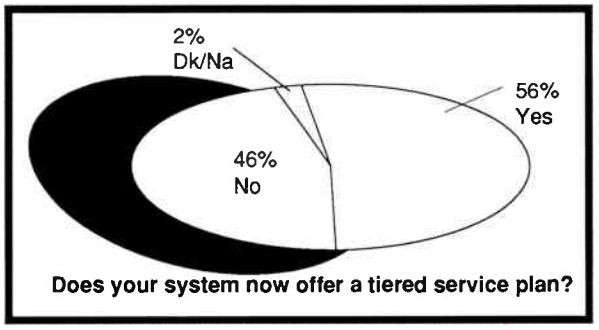
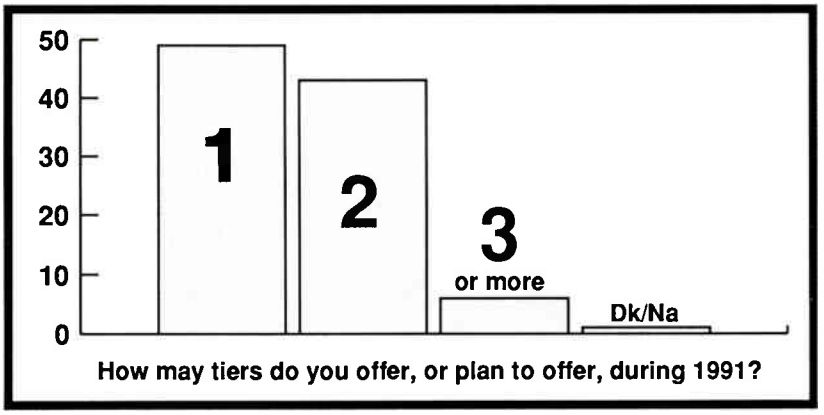


Do you plan to offer tiered services in 1991?



Does your system now offer a tiered service plan?



How may tiers do you offer, or plan to offer, during 1991?

A new vale of tiers?

Tiering, a marketing tactic that has sparked debate for years, may be headed for a rebirth, according to the February 1991 Cable Poll of 400 general managers.

According to the Cable Poll, 52 percent of GMs say they offer a tiered service plan. In addition, of those who don't, 11 percent report they will provide tiered services sometime in 1991.

Indeed, tiering has become a hot topic in boardrooms across the country.

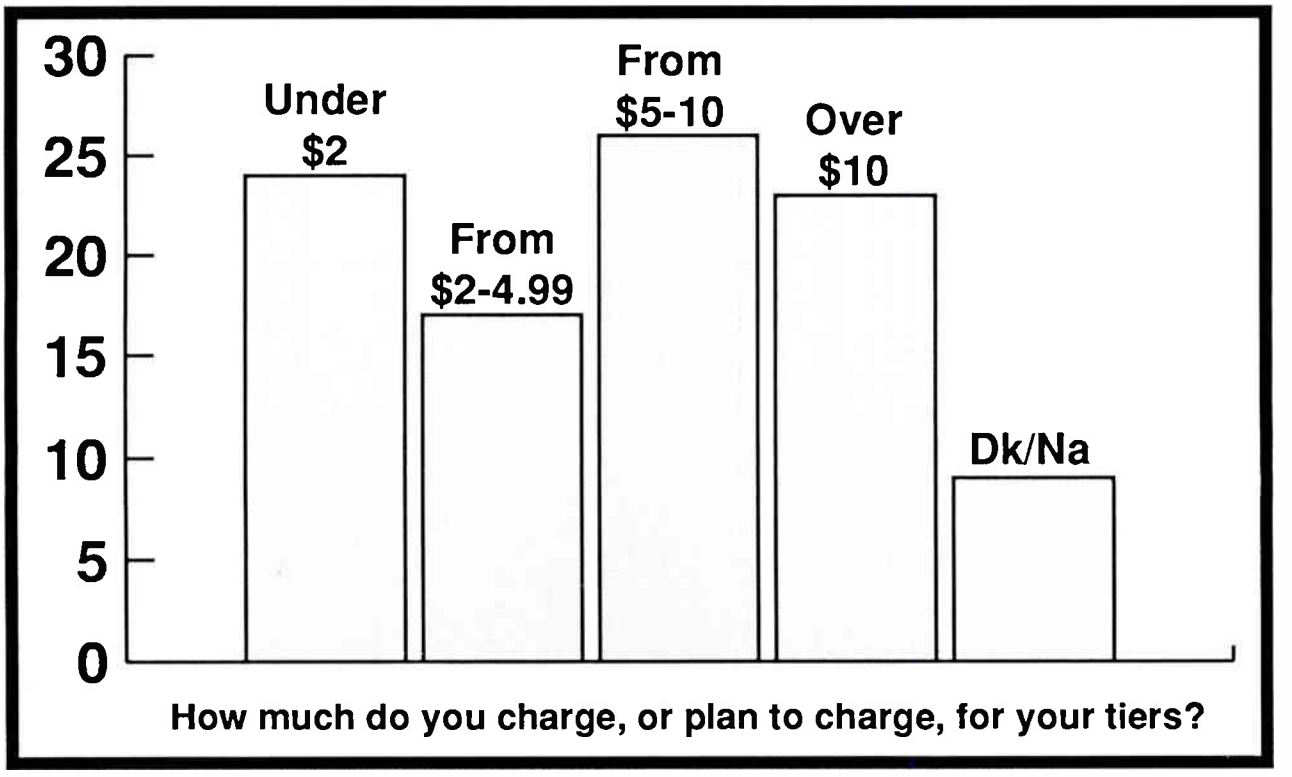
Thanks to new technologies that promise increased channel capacity and old concerns about the re-emergence of rate regulation, operators are giving a long, hard look at the marketing strategy.

Many operators like tiering, believing it permits subscribers to choose only the programming they want. Programmers are less intrigued, because tiering can limit market penetration.

According to the Cable Poll, the type of system that provides tiers appears to depend on the size of the operation. Mid-sized systems—those serving between 10,000 and 50,000 subscribers—are more likely to tier than their smaller or larger counterparts. In addition, MSOs ranked in the top 25 are much more likely to offer some type of tiered services than smaller MSOs.

Even though tiering is a key weapon in a GM's marketing arsenal, executives are hesitant to confuse subscribers by offering too many options.

According to Cable Poll, almost half have only one tier available, and of the remainder, 43 percent offer but two. Six percent have three or more service alternatives from which subscribers



can choose.

Pricing, though, is a different matter. Tiers are priced from less than $2 to more than $10, depending on the programming made available within each group.

Correspondingly, GMs are divided about how much to assess for tiered programming. For example, 24 percent charge less than $2 per month; 17 percent $2 to $4.99; and 26 percent from $5 to $10. Twenty-three percent charge more than $10.

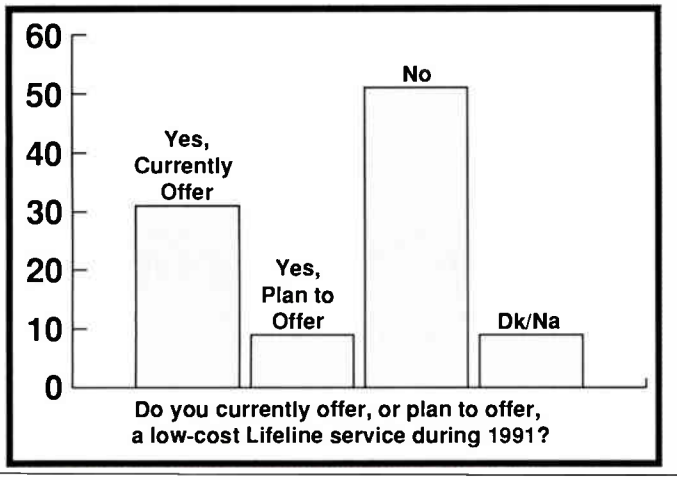
Smaller systems are more likely to charge less for tiers than larger ones, most likely reflecting narrower channel capacities and thus more limited program selections.

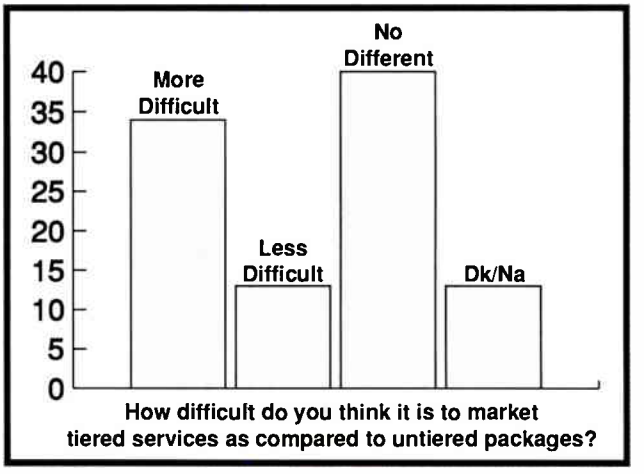
On a related note, the availability of so-called Lifeline services appears to be in a holding pattern. According to the Cable Poll, less than a third currently offer a low-cost programming option. But only 9 percent of GMs report they will launch a Lifeline package during 1991. The remainder have no plans to put together such an option.

In this category, 50,000 subscriber-plus systems are far more likely to provide Lifeline packages than small or mid-sized operations. Of those planning to unveil a low-cost tier, the greatest interest comes from GMs overseeing mid-sized systems.

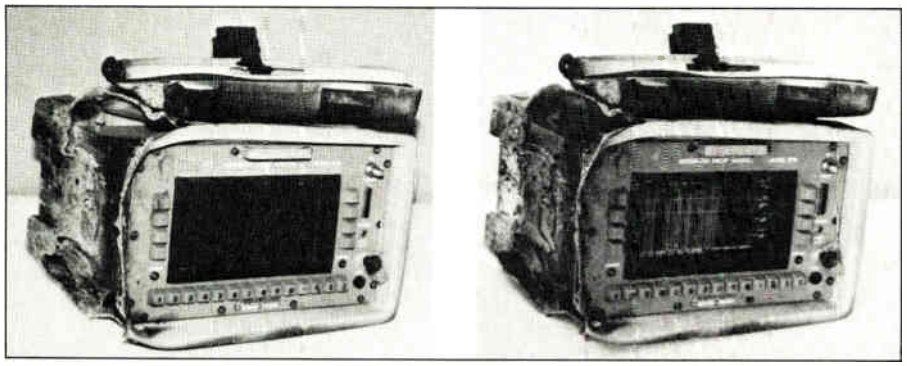
Finally, GMs seem to be divided about how difficult it is to market tiered services. A little more than a third say it is more difficult; 40 percent say it is no different than selling unbundled packages. Of the remainder, 13 percent reported less problems marketing tiers and 13 percent had no opinion. ■

—Chuck Moozakis





If you can't stand the heat...



CALAN's sweep/spectrum analyzer still worked after surviving a truck fire.

A cable truck fire in late February resulted in a big pat on the back for Penn.-based CaLan, Inc. As the story is told, a technician (the cable system has requested anonymity) returned home in the company service truck after his normal graveyard-shift check—and shortly afterward, a fire (cause unknown) started in the vehicle's engine. The truck was quickly enveloped in flames, as was CaLan's Model 1776/1777 Integrated Sweep Receiver/Spectrum Analyzer.

However, the sweep functioned normally after being returned to Calan for repair. Aside from heat and flame damage to the unit's exterior, the unit operated "perfectly" the first time it was powered after surviving the fire. In fact, after a thorough investigation of the internals, CaLan staffers replaced only the case and front panel.

Kudos, CaLan.

Billing software update

New from **Computer Utilities of the Ozarks** is a new release of its Cable/1 CableWorks, an in-house management information, billing and accounts receivable system. Designed for IBM PC, AT and PS/2 environments, the release includes full-screen editing, on-line pick lists, a notepad, perpetual calendar and calculator. Addressable converter and PPV interfaces are included for "major vendors."

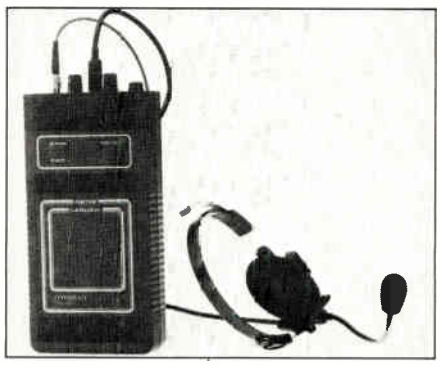
For more information, call (501) 741-1616.

Name change

In a recent announcement, **Flowmole Corp.** has changed its corporate name to **Utilx Corp.** The company, which manufactures trenchless technologies for underground utilities, is also changing its NASDAQ symbol to UTLX from the current MOLE. In addition, the company had relocated its corporate headquarters and manufacturing plant to a new facility at 22404 66th Ave. South, Kent, Wash. 98032-4801.

Fiber optic talkset

Meson Design and Development has released its DB-118 LanTalk fiber optic talkset. Designed to assist field installer who needs to communicate with a co-worker from a remote or shielded location, LanTalk can be voice operated or in a push-to-talk (PTT) mode. With half-duplex operation, the unit can be operated with its headset or through a built-in microphone and speaker.



Meson Design and Development's DB-118 LanTalk fiber optic talkset

For more information, call (800) 45-MESON, or fax inquiries to (607) 722-3945.

Advanced process amplifier

Broadcast Systems Design has released an advanced process amplifier designed specifically for the cable market. The Model 305 amplifier provides bandwidth up to 6.4 MHz with features that include separate chroma and luma gain, independent color correction, variable phase and setup and a luma equalization circuitry.

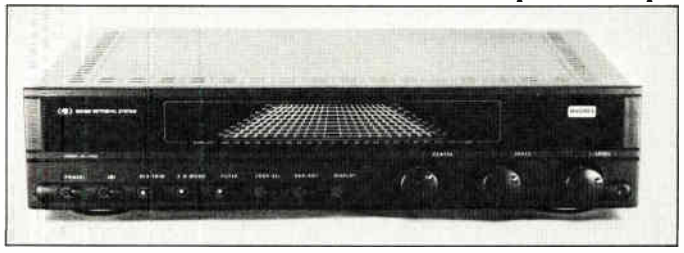
The 305, company officials say, is well suited for scrambled pay services because it provides the pre-emphasis required for a sharper picture. The unit also strips, regenerates and re-inserts sync as well as burst and blanking. European PAL formats are also available.

For more information, contact Broadcast Systems Design at (408) 988-6900 or fax inquiries to (408) 988-7590.

Hughes looks into consumer electronics

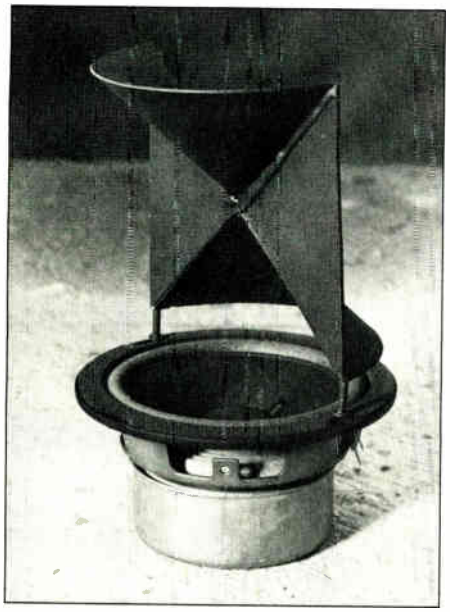
Hughes Aircraft Company has announced diversification into the consumer electronics market with the introduction of two new products, a hi-fi speaker system and a new stand-alone component integrating the company's patented Sound Retrieval System (SRS) technology.

The new speaker concept, called Optimum Radiation Baffle, features a wide dispersion baffle that delivers smooth, 180-degree lateral dispersion of phase coherent sound. It utilizes a vertically-oriented loudspeaker (firing either upward or downward) to which two half-conical reflective sections are affixed. The purpose of the two half-conical baffles it to reflect the sound emanating from the speaker in a pattern centered around a substantially horizontal plane. In so doing, the system lessens the on-axis "hot spot" effect of a conventional speaker setup.



Hughes Aircraft's AK-100, an SRS component

The stand-alone component, Model AK-100, is an SRS component that plugs into any hi-fi, television or home theater system to produce 3-D sound



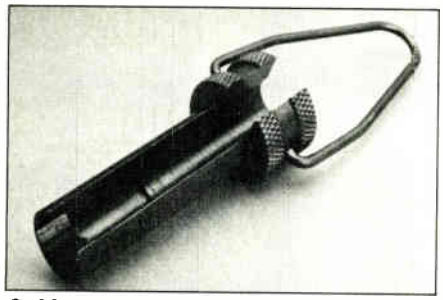
Hughes Microwave's optimum radiation baffle speaker

that appears to emanate from areas outside the physical limits of normal stereo speakers. The suggested retail price is $449.

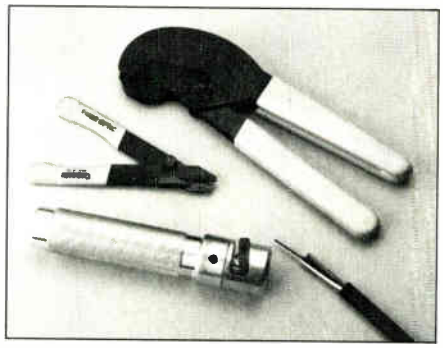
For more information on either product, contact Hughes at (213) 568-6307.

F-connector security shield tool

New from the **Cablematic Division of the Ripley Company** is the Model S-100, an F-connector security shield tool. The S-100 is manufactured from machined, heat-resistant steel with a knurled handle for more secure gripping, even at awkward angles. In addition, a steel belt loop provides additional turning leverage and a convenient carrying method.



Cablematic/Ripley's F-connector security tool



Cablematic/Ripley's new fiber optic tools

For more information on the new tool, contact the Ripley Company at (203) 635-2200 or fax inquiries to (203) 635-3631.

Fiber optic preparation tools

In another announcement from the **Cablematic Division of the Ripley Company**, the group has released a new family of fiber optic tools including a fiber optic jacket stripper, a universal crimp tool and a fiber optic stripping tool. The new fiber optic family of tools is designed for operators working with fiber, in that each of the tools allows technicians to quickly prepare cable for particular applications.

The fiber optic jacket stripper, Model JST-Fiber Optic, is unique in that the blades lift and remove the jacket from underlying material without nicking or scraping. A clockwise rotation of the tool removes the appropriate amount

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of jacket. Bushings are removable and are sized for cable OD and jacket thickness.

Ripley's universal crimp tool, Model CRF01 features four hex cavities for use on SMA connectors of major manufacturers: 0.128, 0.151, 0.178 and 0.213. The tool is available with a full cycle ratchet option and a positive "homing action."

The fiber optic stripping tool, Model F0103-S, features a 0.006 inch diameter hole which is designed to overcome problems in stripping 0.125 micron fiber with coating. The open design allows for easy cleaning of the tool's cutters, thus eliminating accumulated coating material.

For more information, contact Ripley at (203) 635-2200 or fax inquiries to (203) 635-3631.

High resolution feature finder

New from **Laser Precision Corp.** is the FF-1200 high resolution feature finder that automatically locates faults, splices and connectors while measuring the loss and reflectance of those features. The FF-1200 is equipped with 1310 nm single-mode optics optimized for closely spaced features, and as such is ideally suited for CATV and LAN testing, company officials submit.

Laser Precision's FF-1200

The fault locater has two operating modes—a "fault locate" mode and a "maintenance" mode. The fault locate mode locates cable ends that are either reflective (clean break) or non-reflective (crushed). The maintenance mode reports all events that exceed 0.25 dB and/or −60 dB reflectance. Single button control performs either analysis, and results are reported in text and icons on the seven inch LCD display. The fiber trace itself can also be viewed on the display.

The unit detects features and performs measurements over a 64 kilometer distance and is powered either by AC current or rechargeable lead acid batteries.

For more information or a demonstration, contact Laser Precision at (315) 797-4449 or fax inquiries to (315) 798-4038.

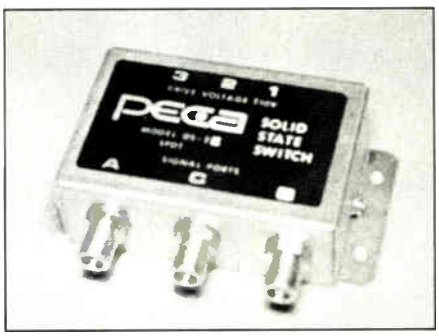
Fiber optic couplers

Aster Corp. has introduced the Unitary 1XN and NXN singlemode couplers, operating at both 1300 and 1550 nm wavelengths. The couplers are polarization insensitive and provide insertion loss change of less than 0.3 dB over a temperature range of −40 to +80° Celsius. The couplers are packaged in a 69 mm by 3 mm stainless steel cylindrical tube, with configurations available in 1x3, 1x7, 3x3 and 4x4.

Aster Corp's unitary coupler

SPDT RF diode switch

New from **PECA Inc.** is a 75-ohm SPDT RF diode switch, the DS-2E. An enhanced version of PECA's DS-2, the new switch has a frequency range of 10 MHz to 500 MHz, and can be used to 800 MHz at reduced specification. The new diode switch specifications, at 600 MHz, include isolation of greater than 65 dB, insertion loss of less than 0.5 dB and return loss of greater than 20 dB (on all ports). The DS-2E can be controlled by a variety of methods, include TTL logic or a DPDT relay.



Peca's RF diode switch

For more information, contact PECA at (215) 245-1550.

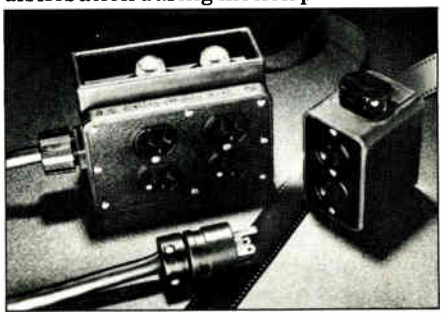
Line interference locator

Trilithic Inc. has introduced a new power line interference location system, the PLI-150, citing that power line TVI is a serious problem for many CATV systems and causes subscriber complaints. As such, the PLI-150 assists cable operators in hunting down all power company structures that interfere with the cable system, whether near the headend or miles away. The system includes a lightweight receiver optimized for TVI measurement, a mobile antenna and vehicle mount for drive-around surveys and a portable directional antenna for pinpointing the TVI source to the nearest pole.

Also included is a step-by-step procedure for locating the power-related TVI sources, written specifically for the cable operator. For more information, contact Trilithic at (800) 344-2412 or fax inquiries to (317) 895-3613.

Duplex receptacle outlet

New from the **Daniel Woodhead Co.** is a portable, fuse-protected two-duplex outlet box, designed specifically to meet the need for reliable power distribution during motion picture filming, television broadcasting, and studio productions. The box has an unobtrusive, textured black surface that blends into background shadows and eliminated random light reflection which could interfere with filming and production.



Daniel Woodhead Co's fuse-protected duplex receptacle outlet box

The box is available in 15 and 20 amp versions, with the customer's name custom-molded on it. As an option, cords and plugs are also available. For more information, call (800) 225-7724.

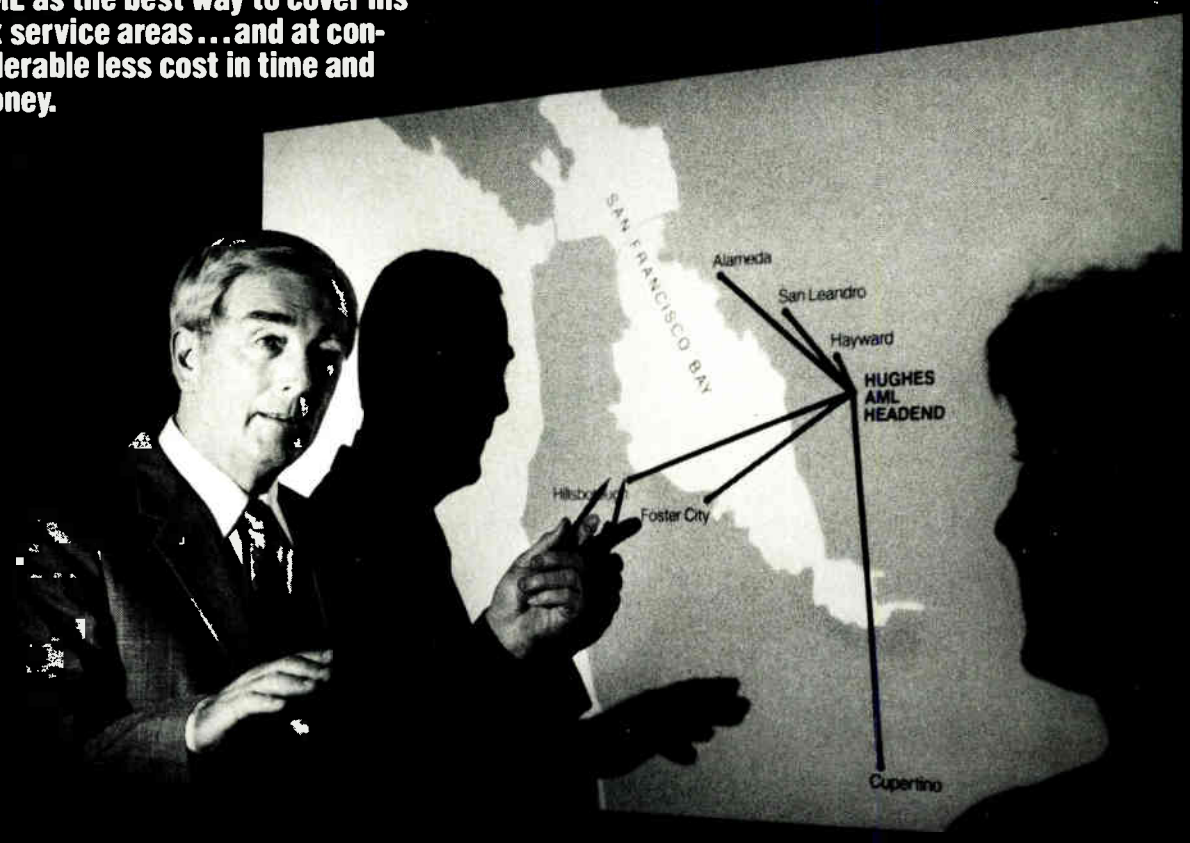
Representative agreement penned

Fitel General has announced the appointment of Chambersburg, Pa.-based **Jerry Conn and Associates (JCA)** to manufacturer's sales representative in the cable television market for the Mid-Atlantic and Southeastern regions of the U.S. To contact Jerry Conn officials regarding Fitel products, call (800) 233-7600 or in Pa., (800) 692-7370.

Enhanced splitters

Viewsonics has announced the release of its new Platinum and Platinum

Like you, this Bay Area CATV operator looked at coax, fiber and microwave. He chose Hughes AML as the best way to cover his six service areas...and at considerable less cost in time and money.



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For more information, contact Hughes Aircraft Company, Microwave Communications Products toll free: (800) 227-7359, ext. 6233. In California: (213) 517-6233. In Canada: COMLINK Systems Inc., Oshawa, Ontario, (416) 436-8888.

Hughes AML is more than hardware.

HUGHES

Reader Service Number 26

Plus series two-way, three-way, four-way and eight-way splitters. The Platinum series offers 5 MHz to 600 MHz bandwidth, while the Platinum Plus series offers 5 MHz to 1 GHz bandwidth.

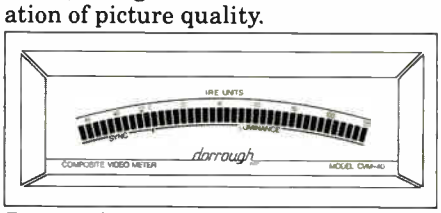
Both lines include 130 dB RFI shielding, with tin plated housings and solder seals.

Viewsonics officials submit that the Platinum Plus series splitters represent the first of a full line of 1 GHz products to be announced in 1991.

For more information, contact Viewsonics at (800) 645-7600, or fax inquiries to (407) 998-3712.

Dynamic video level meter

New from **Dorrough Electronics** is the CVM-40 dynamic video level meter, designed to allow fast evaluation of picture quality.



Dorrough Electronic's CVM-40 video level monitor display

Likening the meter to a photographer's light level meter in that the unit allows quick evaluation of light levels, contrast and "hot spots," the CVM-40 features a single 40-segment bar graph on which sync is displayed on ten of the LED segments as an expanded scale ranging from −50 to −32 IRE units. Peak and average luminance are simultaneously displayed on 30 of the LED segments over a zero to 120 IRE unit range.

Also included is a master fast/slow scale response switch, a 75-ohm termination switch and a separate sync presence indicator. Company officials also liken the new meter to a traditional waveform monitor, in that its peak/average feature allows evaluation of lighting conditions, contrast, drop-outs, sync stability and general picture quality.

The unit is particularly useful to video editors for evaluating scene contrast and segues and for checking sync integrity at scene switching points. The unit weighs under two pounds, can be read from a distance of 20 feet, and is rack-mountable.

For more information, contact Dorrough Electronics at (818) 999-1132 or fax inquiries to (818) 998-1507.

Automatic video analyzer

New from **Rohde and Schwarz** is the UAF Video Analyzer designed for TV monitoring systems. Levels, linear and nonlinear distortions, frequency

Rohde & Schwarz's UAF video analyzer

responses and hum can be measured with the new device, which measures 25 fixed and programmed test line parameters in accordance with nationally recognized standards. Each measurement parameter is assigned its own front-panel push button, which blinks when a parameter selected for measurement exceeds the limit values chosen.

Company officials submit that in addition to being used in the studio or in production, the UAF Video Analyzer can be used on cable networks or at in accessible points in transmitters without the need for a computer or printer to log data.

Using a plug-in memory board, customer-defined test and data-logging programs can be loaded and test results stored on the card.

For more information, contact Rohde and Schwarz at (301) 459-8800 or fax inquiries to (301) 459-2810.

Optical variable attenuators

Laser Precision Corp. has announced its DB-2900 series of optical variable attenuators, designed to measure optical loss margins on fiber systems, optical line build-out selection, optical test set calibration and simulations of system loss. The attenuators are available in two models—the singlemode DB-2900, calibrated at 1310/1550 nm wavelengths, and the multimode DB-2930, calibrated at 850/1300 nm wavelengths.

Laser Precision's DB-2900

For more information, contact Laser Precision at (315) 797-4449 or fax inquiries to (315) 798-4038.

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Promotions and additions

Westec Communications has announced two additions. **Bob Probasco**, formerly with Heritage Communications, has joined the company to run its new Des Moines, Iowa office. Also, **Chris Radicke** has been appointed to the application engineering department, to assist customers in modifications, additions and maintenance of the company's AML systems. Radicke comes to Westec from Cooke Cable, and will be based in Scottsdale, Ariz.

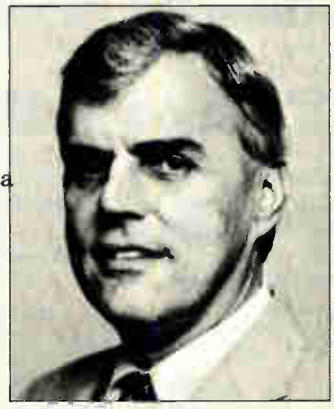
Robert Probasco

Chris Radicke

Jim Pentecost has been elected president of **Power & Telephone Supply Co.** Pentecost succeeds his father, Miller Pentecost, who founded the company and has been its president for the past 28 years. Most recently, the younger Pentecost was executive VP of Power & Tel.

Panduit Corp. has named **Robert Sambor** western regional VP of sales. The promotion will move Sambor from his current location in the company's Central region to Phoenix, Ariz. In his new assignment, Sambor will be responsible for sales of the company's entire line of products in 12 western states.

Jim Pentecost



Robert Sambor

David C. Phillips has been appointed executive VP of **Telecorp Systems Inc.** Phillips was previously the general manager of Cablegraphix in Phoenix, Ariz. Before that, Phillips spent ten years at Scientific-Atlanta as the company's divisional VP of finance, Broadband Communication Division. In his new position at Telecorp, Phillips is responsible for all aspects of finance and operations.

Vyvx has added **Robert Keiper** to its staff as a marketing and sales specialist for the company's videoconferencing product line. Keiper will direct the marketing of Vyvx's portable videoconferencing units. Keiper was formerly president of Keiper Associates, a videoconferencing consulting firm.

U.S.Message has appointed **Edward F. Gorman** to the company's first position of field sales representative. Gorman most recently held the post of special projects coordinator for Comcast Cablevision of Baltimore. Prior to that, Gorman was the director of marketing at Continental Cablevision in Los Angeles, Calif.

Louise A. Harris has been named director of corporate communications for **Century Communications Corp.** In her new role, Harris will be responsible for corporate communications, public and press relations and special assignments. Prior to moving into her corporate position, Harris was director of operations for the company's cable television systems.

Recently hired or promoted? Let us know at CED, *600 S. Cherry St., Ste. 400, Denver, Colo. 80222.*

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Sources of interface complexity

As I made arrangements to attend the Electronic Industries Association (EIA) Consumer Electronics Show in Chicago, I found myself mulling over an old subject that seems to still not have an acceptable solution.

That topic is the interface between consumer electronics hardware and the cable system. I've been pondering the root causes of the complexity we find in that interface and some additional challenges caused by new developments in the cable industry, and I've come up with some interesting conclusions I'd like to share.

Joint engineering committee

I have served as chairman of the EIA/NCTA joint engineering committee for about eight years. It's now someone else's turn. During that time, we have made substantial progress. The engineers from our two industries have learned to appreciate the special needs and problems they both face. While the original meetings were quite adversarial, soon the engineers realized that the consumer electronics consumer and the cable subscriber are one and the same. That person is better off because of our efforts.

By Walter Ciciora, Vice President of Technology, American Television and Communications

When the committee first started it's work, cable boxes and "cable-ready" televisions used different schemes for identifying channels. On some channels, cable used letters, and the consumer electronics industry used numbers. Also, when more channels were added, they weren't always added in the same place.

The first accomplishment resulting from the cooperation between the two parties was to bring these schemes into alignment. Next, the group tackled the direct pickup (DPU) interference problem. While an official standard does not yet exist, most manufacturers have been made aware of DPU and have taken steps to improve their products.

Real progress has been made. The MultiPort standard has been issued. It is now possible for a descrambler to plug into the back of a television or VCR and allow the subscriber to use the tuner and remote control which came with the product. Implementing the standard, however, has been disappointing. But the standard to solve many of these problems has existed for several years.

Friendly conditional access

The challenge of conditional access is to do it in a manner which minimizes any extra burden on the subscribers. There have been two major disappointments: MultiPort and interdiction. There are also four new wrinkles: 1-GHz cable, near video on demand (NVOD), HDTV and video compression.

MultiPort is a technical success, but an implementation failure. The secret to implementation has eluded us. Part of the issues is the "chicken and egg" problem. The television and VCR makers need to make plug-equipped units available in quantity; cable box makers need to make MultiPort descramblers available in quantity and at reasonable prices; and cable operators need to order and support these units. All three parties have insisted they will do their part—as soon as the other two have done theirs.

Interdiction promises to be the most consumer friendly of approaches. However, it has a few hurdles. Initial capital costs have been high; there have been some concerns about the number of channels which are controlled and the degree of video hiding; powering costs and safety are issues, and the impact on outages all need verification.

It is disappointing that there is yet so much work left to do to bring broad acceptance for interdiction. A major problem occurs in the urban environment, where the cable plant cannot be easily audited. When cable signals are carried "in the clear," they are subject to uncontrolled access. This probably makes interdiction, as we know it today, impractical for large markets.

New challenges

Gigahertz cable causes at least two concerns. In a 1-GHz system, there is no such thing as a cable-ready TV or VCR. A further complication is that most of the new channels in a 1-GHz system are likely to be used for near video on demand (NVOD). The preferred method of implementing this involves the cable box's assistance with the time choices. Extensive on-screen display and forced tuning are required. Channel numbers become an unnecessary confusion. The subscriber should choose from a list put up on the screen.

The cable box's microprocessor will select the correct channel for the time slot desired by the subscriber. The subscriber can then browse the other channels until the program is to begin. Then the boxed is force-tuned to the appropriate channel. In principle, a MultiPort or interdiction solution should be possible. As a practical matter, the issue has become complex.

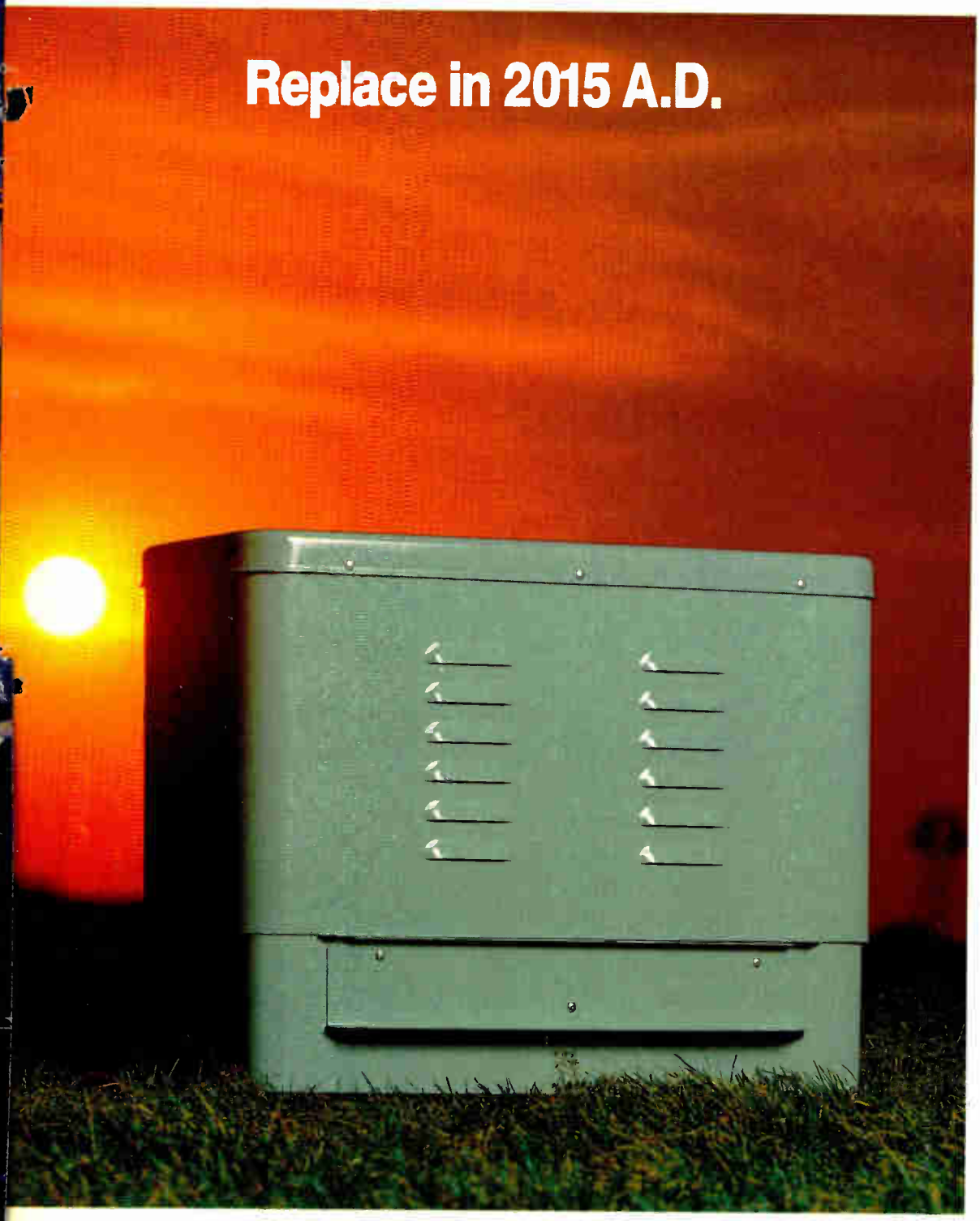
Video compression presents some interesting obstacles. One likely scenario put forth by proponents involves four or more videos multiplexed onto a carrier and occupying a 6 MHz slot. The problem this poses for interdiction is that the jamming signal would obliterate all of the videos on that carrier.

If the videos were time-shifted versions of the same movie, this would not be as serious of a problem. If they were multiple programs, interdicting them all would not likely be acceptable. Since these are digital signals, digital encryption seems to make more sense than an additional interdiction step.

HDTV probably means a separate receiver. The EIA has been addressing the conditional access issue in HDTV through its Advanced Television MultiPort committee. Possibly the most important result of the MultiPort work has been the realization that HDTV receivers must have MultiPort designed in from the start.

Next month we'll continue our discussion of the current state of affairs with the interface between cable and consumer electronics products. ■

U T I L I T Y P R O D U C T S



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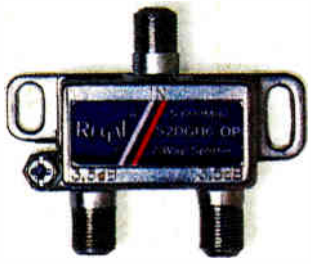

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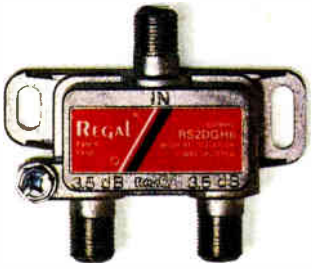

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