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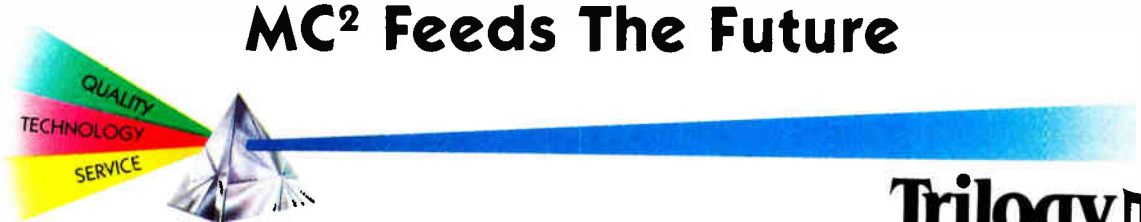

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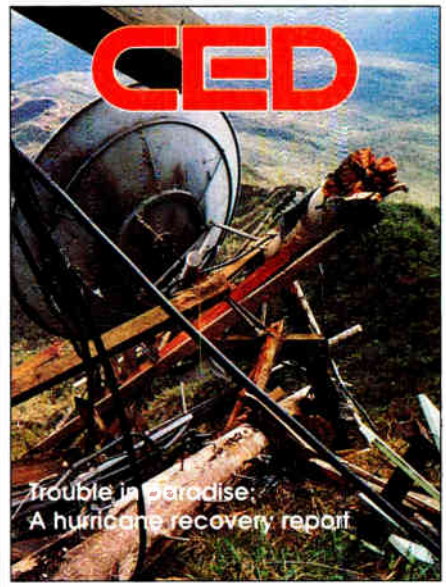

About the Cover:
A demolished antenna site in Hawaii shows Iniki's force. Photo by David Large.

DEPARTMENTS

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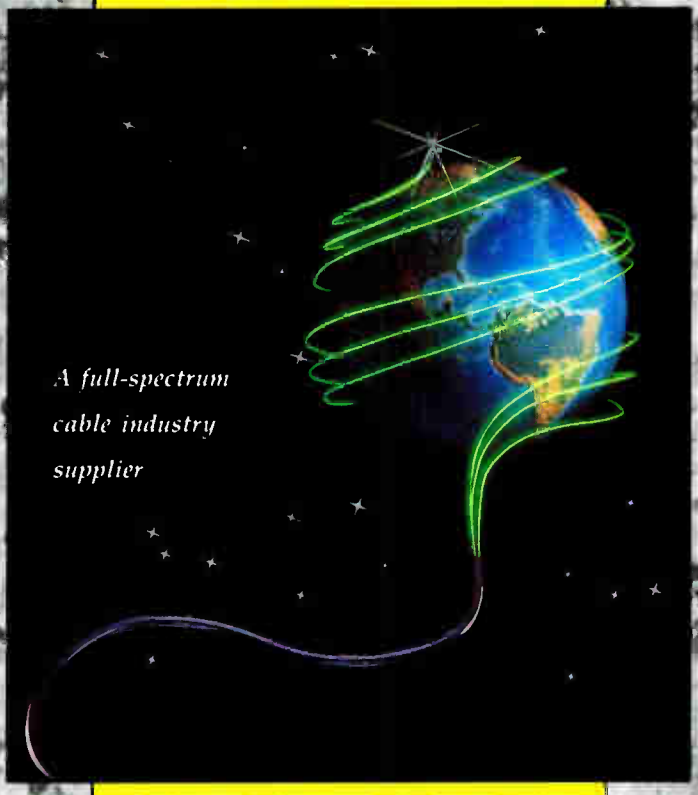

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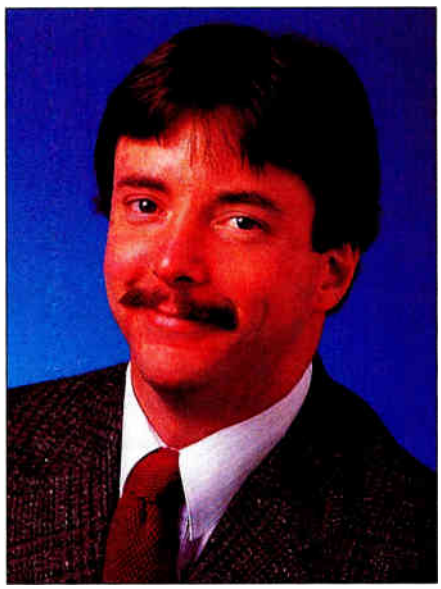
CED

The cable bill's silver lining

With most of the early trade press coverage of the newly enacted cable re-regulation bill centered around the politics that led to its passage, the lawsuits that were filed in response and what the new law will mean for cable operators' bottom line, cable technologists will be most concerned with the provision that calls for compatibility between cable convertors and consumer electronics gear.

Apparently (I have not yet seen the final document), the bill directs the Federal Communications Commission to explore solutions to the compatibility conundrum and provides the commission 18 months to issue rules to which cable companies and electronics manufacturers will have to adhere. In the words of one FCC insider: "No way." After all, what made lawmakers think the FCC will find a solution when CATV engineers have been unsuccessful for several years?



But there is a silver lining to this new law. Cable engineers will certainly demand a review of the laughable term "cable-ready" as it is used by the consumer electronics industry.

Walt Ciciora, vice president of technology for Time-Warner Cable, wrote an enlightening technical paper for the 1992 NCTA convention. In that paper, he prescribes a range of technical requirements that would have to be met before a television or VCR could correctly be labeled "cable-ready." These include:

- the ability to tune *all* channels on a cable system,
- better tuners with improved noise figures that eliminate distortions,
- adequate shielding to reduce direct pick-up interference,
- a MultiPort (or similar) plug to accommodate signal scrambling and allow full use of tuners and remote controls,
- a seamless way for consumers to order pay-per-view events on impulse.

In short, sums Ciciora: "Without more discipline in the use of terms such as 'cable ready' and 'cable compatible,' there is the potential for continued consumer anger, confusion and losses as money is spent on product features erroneously thought to be usable when directly connected to cable."

If these are the guidelines, there's never been a truly cable-ready TV or VCR built in this country.

That's the point. People should not forget how the incompatibility between descrambling set-top convertors and TVs began: by the consumer electronics vendors as they sought to market new televisions in a multichannel CATV environment. It's odd, but if you talk to a representative of the consumer electronics industry, he'd have you believing the whole problem was started by cable operators who apparently want to make it difficult for him to sell new TVs. Let's face it—if cable television hadn't become so popular, receiver suppliers would never have dreamed up the notion of being cable compatible.

But all that is water under the bridge. Cable engineers need to rally their forces and speak in a unified voice to arrive at an interface solution.

Roger J. Brown

Roger Brown
Editor

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WAVETEK

System sends 4 video signals 1,000 feet over twisted pair

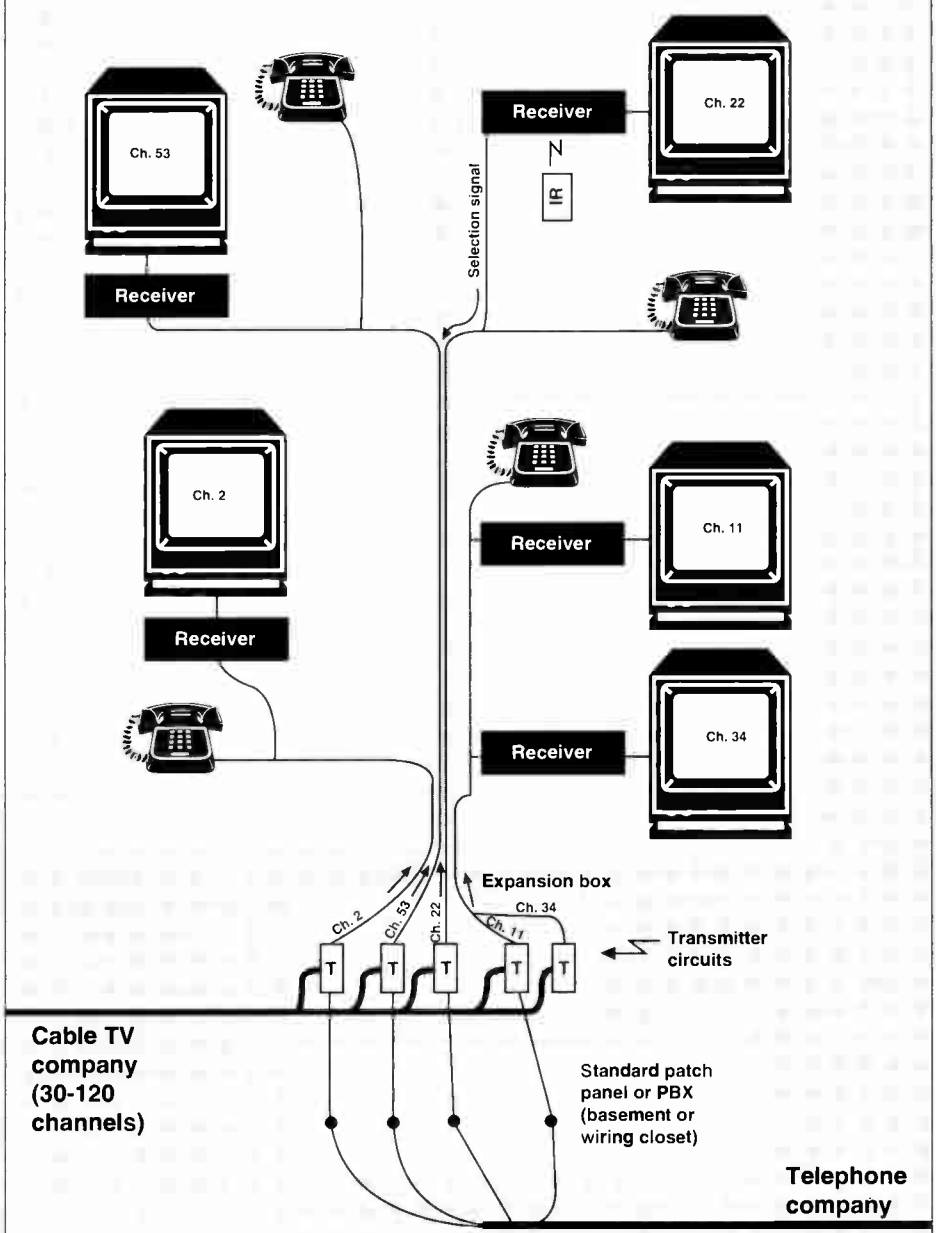
For those engineers who love to hear about what's going on in the nation's skunkworks, here's one you might enjoy:

Inline Connection Corp. has invented an inexpensive non-digital, uncompressed system that can transport at least four standard NTSC video signals over twisted pair telephone wiring for short distances (up to 1,000 feet) without interfering with voice traffic.

Inline Connection President David Goodman, a hobbyist with a background in signal processing, developed the concept and was issued a patent for his work.

The concept allows video to be distributed throughout an apartment building, office building or house without installing any new wires, says Goodman, who also sees his invention as the final link in a fiber-to-the-curb video system.

Distribution through an apartment building



Goodman's favorite example of a possible application by cable operators is to use the system in a basement of an apartment building. There, the signals are fed to the telephone wires where they converge. Other possible applications include: transmission of a video signal from a VCR in one room of a house to a TV in another room; distribution of video signals in an office building for videoconferencing; delivery of signals from a fiber node to TV set-tops.

The system is actually quite simple: A transmitter converts a video signal to an RF frequency below 30 MHz for delivery across the wiring. The signal is then amplified, balanced and impedance matched to the telephone line and sent through a high-pass filter to prevent interference with the voiceband. It is then applied to the wiring.

At the receiver, the signal is sent through a filter to prevent interference with voice signals and then it is upconverted for delivery to the television.

Of course, the key to the system is overcoming signal attenuation. Inline reportedly has tested a transmitter that produces a 40 dBmV signal with center frequency of 22.45 MHz, which meets FCC emission requirements. "With a small amount of R&D, Inline believes it can meet the same (emission) limit with devices whose signal output is 50 dBmV, or even higher," an Inline document reads. At an attenuation rate of about 4.5 dB per 100 feet, a 40 dBmV signal could travel at least 900 feet and still be output at 0 dBmV.

Oak, Philips team on MPEG

Oak Communications and Philips Broadband Networks will team to submit to CableLabs a joint recommendation for an MPEG digital compression standard, further solidifying MPEG as an apparent de facto standard.

Both companies' systems support an open architecture standards-based approach using MPEG as its foundation.

Oak President and CEO Henk Henselaar predicted that MPEG would become the standard of choice. "MPEG will be to digital television what NTSC has been to analog television," he said. Furthermore, he said a standard would stimulate the development and implementation of new services, including multimedia, by having multiple vendors as sources for equipment.

The Oak/Philips agreement brings yet another MPEG proponent to the attention of CableLabs during its RFP

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process. Scientific-Atlanta recently decided to pursue the MPEG standard instead of Vector Quantization.

Cablevision makes PCS push

In an effort to spur additional research into cable-based personal communications networks, Cablevision Systems, in conjunction with Nexus Engineering, has funded and developed the first cable-powered pole- and strand-mounted Remote Antenna Drivers (RADs) and strand-mounted Remote Antenna Signal Processors (RASPs).

RADs and RASPs are devices that allow wireless networks such as PCNs to extend their coverage area by sharing basestations.

RAD technology is seen as being especially effective to provide telephone service in residential areas where cable distribution plant is already deployed and where additional basestations would be cost prohibitive.

In addition, Cablevision has purchased Omnipoint spread spectrum PCN equipment for deployment in its Roslyn, N.Y. test site. That equipment will be used to test interference. Finally, Cablevision plans to deploy a wireless PBX in Lynbrook, N.Y. in order to research the internal switching and intelligence requirements of cable-based PCN.

The switching trial in Lynbrook is being undertaken to determine the capacity and location of network intelligence needed to operate cable-based PCNs. Cablevision will interface a WPABX with the existing PABX located in its corporate headquarters in Woodbury, N.Y. via fiber optic backbone.

Wilt Hildenbrand, vice president of technology at Cablevision, said the RAD that's under development at Nexus will support multiple modulation techniques so base stations from multiple manufacturers can be tested. Andrew Beasley, vice president of PCS microcell at Nexus, said the microprocessor-based RAD will eventually be made addressable to manipulate remote coverage areas and monitor its performance.

Voice-powered remote debuts

California-based Voice Powered Technology Inc. is marketing a new VCR programmer and universal remote control that controls those devices by voice commands.

At the record prompt, the user simply tells the handheld programming unit which channel to tune, the day and the program's beginning and ending times.

The system can be programmed to recognize up to four different voices.

Polaris Award to be presented

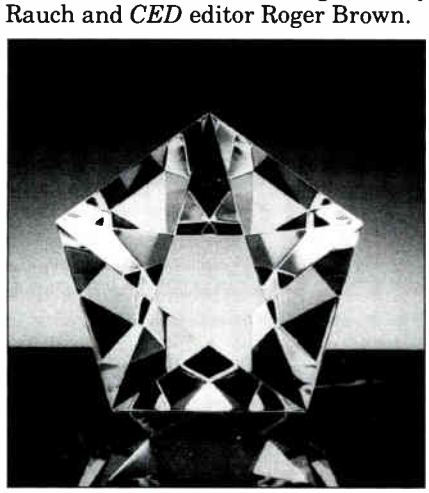
The Society of Cable Television Engineers, Corning Inc. and *CED* magazine have announced the creation of a new engineering award, which will be presented during the Society's Conference on Emerging Technologies, scheduled for Jan. 6-7, 1993 in New Orleans.

The annual "Polaris Award" will be used to honor individual achievement in the deployment of optical fiber for cable television applications. It will be presented to a "next generation" engineering manager at a cable system, MSO, or vendor level who recognizes the strategic benefits of optical fiber and components. All national SCTE members are eligible to win the award.

The name Polaris was chosen because it serves as a reference point for lightwave transmission. Polaris, also known as the "North Star," is a navigational standard as well as the brightest star in the night sky.

The winner of the award will be presented with a piece of Steuben crystal called "Rising Star." Also, a $2,000 donation will be made by Corning Inc. to the SCTE to fund additional training in fiber-optic technology.

The award winner will be selected by a three-person committee consisting of SCTE President Bill Riker, Corning cable television market manager Kathy Rauch and *CED* editor Roger Brown.



"Rising Star," a Steuben crystal piece to be awarded to the Polaris winner.

U.K. charts too dark

Because of a printing error, some copies of the October 1992 issue of *CED* contained United Kingdom Frequency Charts that were printed too dark. Readers who would like to receive a new copy of the chart are asked to write or fax a request for a new chart. Send your request to:

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Jottings

As of October 8, the cable industry was still awaiting final word from the FCC regarding the **reimposition of technical standards**. Insiders say the documents are "in circulation" among the commissioners and should have emerged by the middle of October. Those close to the proceeding also say most of the requests made by cable operators will be granted, but a couple of compromises had to be made. In the meantime, cable operators need to prepare for their first proof tests, which are due at the FCC by the end of January 1993 . . . **General Instrument** has developed a new remote control for its Digital Cable Radio service that also controls the TV, VCR, cable convertor and CD player. The Song I.D. Remote features an LCD window that displays the song title, artist and record label for songs played on DCR . . . **Teleport Communications Group** subsidiary TC Systems-Illinois has received a Certificate of Service Authority from the Illinois Commerce Commission, which will allow Teleport to offer enhanced local switched services to businesses in the greater Chicago area via digital switching equipment. . . . **Ortel Corp.** has announced the availability of a high performance laser transmitter designed for European applications. The new laser features a patented predistortion compensation circuit that extends the performance of a standard 550-MHz laser to 860 MHz . . . WRC-TV in Washington, D.C. became the first television station to simulcast HDTV and NTSC on September 30. The live simulcast took place during a local newscast. The system used was designed by the **Advanced Television Research Consortium.** CED

Compiled by Roger Brown

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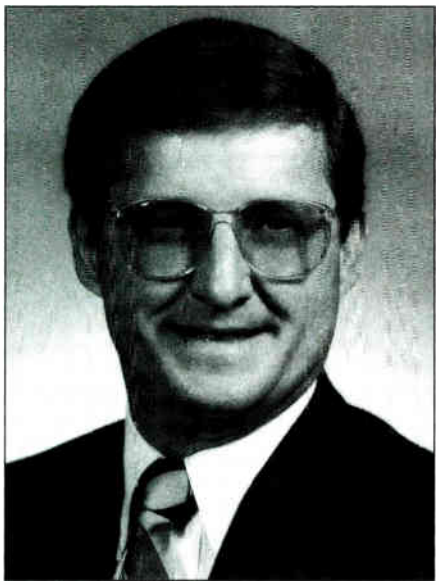

Tom Staniec

Immersed in learning

Most people dread having to go to the unemployment office. Back in 1971, Tom Staniec dreaded it, too. After all, he wanted a *vacation*, not a job.

Staniec, the newly promoted director of engineering for Newchannels Corp., found a job immediately after leaving the U.S. Air Force 21 years ago. You see, he left with a "cured leave," which meant he never took any vacation time during his military stint. Therefore, he had the option of taking a month off with a plump check. "What I really wanted to do at the time—I was 21—was to take 30 days and just bum around," Staniec recalls.

But the Air Force told Tom to immediately report to the unemployment office in his home state of New York. "Just a formality," they told him. Within days of his initial visit to the unemployment office, they found him a job at HTV Systems (which later became Magnavox CATV Systems, then Philips Broadband Networks). "I never did get to bum around," Staniec now laments.

Indeed he didn't. His career has been a whirlwind of hertz, bits and topologies ever since. He stayed with HTV for one year, then made the switch to Newchannels, where he's been ever since.

Immersion learning

Once at Newchannels, Tom quickly put into place a theory he now calls "immersion learning." Although Staniec earned an associates degree in engineering technology from Onondaga Community College, he feels that work is only a learning foundation. Since his degree, for example, Staniec has participated in several specialized courses—like a fiber optics course at Arizona State University, a telecommunications course at the University of Wisconsin and a data communications course via the American Institute for Professional Education.

"It all ties in with my theory of immersion learning," Staniec explains. "And that is, when you need to know something, you do three things. First, you read everything that is readable on the subject. That's where the coursework comes in. Then, you talk to professionals who already know about what you're trying to do. Then, you do it."

This immersion theory of learning has helped Staniec through countless Newchannels projects. He first used it to design and implement microwave antenna systems.. More recently, he's applied it to developing Newchannels "flexible CAN" network architecture, and in the implementation of the company's existing digital transmission system. And, that doesn't include Staniec's work in telephony, FDDI and SONET—all assisted in one way or another by his enrichment technique.

Staniec credits Newchannels for allowing him to sharpen his immersion learning skills. He thinks very highly of the company he's been with for 20 years, mostly because "it's a good thing to work for a company that is willing to let you make the mistakes along the road," in some cases. Also, Staniec says, Newchannels gives him plenty of opportunity to think about the big picture.

That big picture, for Staniec, started developing some 10 years ago, when he got involved with the company's first data communications project. He calls his decade of datacom implementation in the New York area his "most rewarding, from an engineering perspective." It has also taught him a valuable lesson: Avoid the finger-pointing routine as the easy way out.

Staniec learned the finger-pointing lesson during his first data communications job at Newchannels. The company had been contracted to provide the means for data transportation at a small university in upstate New York. Two other companies were involved.

As it turned out, a problem developed—and all heads (and fingers) immediately pointed at Staniec. "I was still in the thick of the immersion learning process then," Staniec laughs. "I didn't know the first thing about data communications, and there I was. I didn't know what it would look like if it looked good, or what it would look like if it looked bad."

To make a long story short, the problem surfaced within the interface equipment that connected the digital system and the RF system—not on the cable network.

Because of that experience, Staniec has never since opted to point fingers. "When a customer contracts you for a service, they don't want to get a bunch of finger pointing. They want to get the problem solved. I had the opportunity to learn that early on."

Staniec is one of those kinds of engineers who has a theory about almost everything—and they're all pretty interesting. One of those theories involves his concern about future services in an environment that's not exactly rich in return bandwidth.

"We're looking at so many different things right now: Multimedia, ATM (asynchronous transfer mode), wireline phone to the home vs. PCN-style service to the home, real-time interactive learning. My question is, what do I do if I get to the point someday where I want to put something on, so I do—then realize it's a bandwidth hog? That's what I'm working to figure out," Staniec claims.

He also holds an interesting theory on the future of cable television. "That we're going to provide entertainment is a given. So the question becomes, what is the environment?" Staniec asks.

Along those lines, Staniec thinks it's important for operators to take a close look at local communities before finalizing on a future services mix. For example, he suggests, if an operator serves mostly rural subscribers, why not offer real-time, interactive distance learning? "That way, geographic location no longer becomes a liability in learning," Staniec explains.

A scuba diver

When not daydreaming about how to take cable to its next level of capability, Staniec takes to the water. A trained scuba diving instructor, he has taught individually and at universities in the Syracuse area. He and his wife, Sandy, have four children, two of whom are in college.

All of the Staniec kids are avid soccer players—in fact, Staniec says he's coached soccer for most of his adult life.

So let's see: With his achievements at Newchannels coupled with his current rebuild and upgrade schedule, and coaching, and scuba diving, and golf, did Staniec ever get to take that 30-day "bum around" hiatus?

Fat chance. CED

By Leslie Ellis

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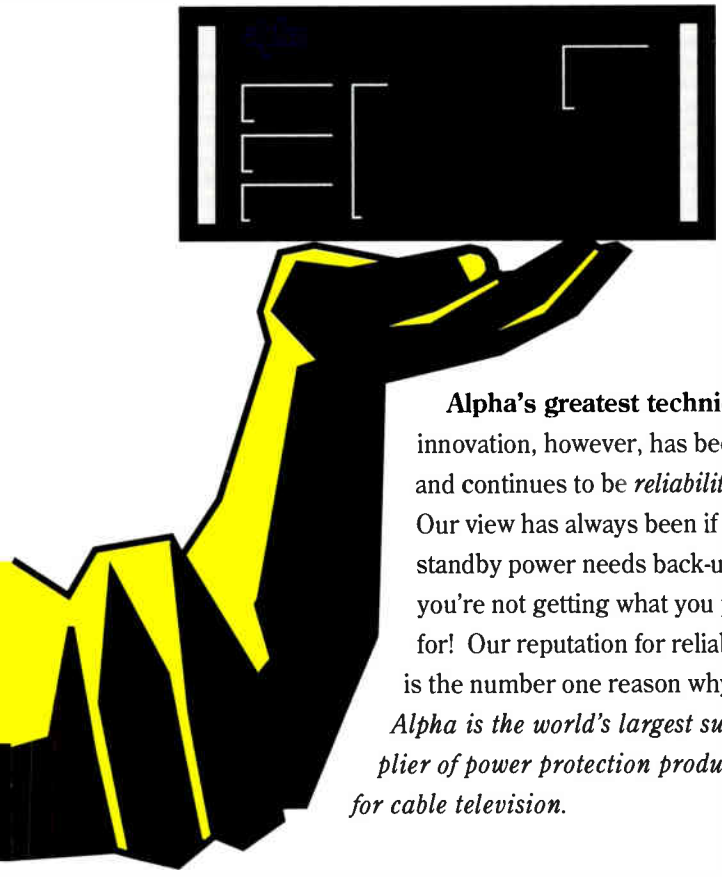

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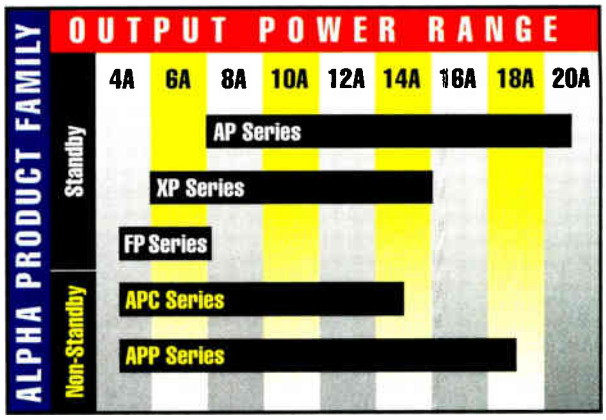

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Headhunters revisited

Several years ago, when I first began writing this column, I wrote an article about the "brain drain" affecting the engineering ranks of the cable community ("Cable can't afford to lose any more top statesmen," *CED*, April 1988).

At the time, I was concerned about the number of senior engineering professionals at MSOs, major vendors or programmers who were being let go not through lack of performance or direct need but because of mergers, consolidations and corporate relocations.

I distinctly remember lamenting the short-sightedness of losing this particular segment of an industry that already had too few people to tackle all of the issues and jobs that had to be done. Perhaps I was compelled to write that article because I saw the specter of my own career in the fates that were befalling those people who I most respected.

I took a lot of heat from MSO chiefs over that article.

Several suggested I was accusing them of being less than intelligent about how to manage their senior staffs. I tried patiently to point out that I did not believe that intelligence had much to do with the question. Rather, I explained that perhaps a bigger question was whether or not foresight had been properly mixed into the equation—specifically, foresight on how our industry would evolve without the leadership of this type of individual.

By Wendell Bailey, Vice President, Science and Technology, NCTA

Self-fulfilling prophecy

Well, it's amazing how times have changed and how prophetic that article turned out to be. All of the people (or at least those who I knew) whose fates were in jeopardy at the time I wrote that article have since come back into the cable industry in senior-level positions. And, as expected, they are again providing leadership and guidance that is second to none.

Hardly a day or week goes by that I don't receive multiple calls from both professional recruiters and companies in need of personnel. All of them seek either mid- or senior-level engineering executives.

The calls I receive are not only from cable television companies and equipment vendors. A surprisingly large number of them are from other industry segments in the telecommunications field.

I have rarely seen a 12-month period that has produced more astounding technological innovations and challenges. As if digital television and how the industry will react to it isn't enough, we already have debates on the technology's uses in multichannel environments.

And before a standard has even been adopted by the various groups working on digital matters, changes are being sought by the engineers and operators who have ideas about how best to utilize these technologies for their business plans. This does not even address the issue of high definition television, which is likely to be a digital signal after all. Nor does it address whether cable will be the industry to provide this service to the American public—when the FCC finally chooses a proponent system.

Along with the FCC decision comes the regulations that will require the cessation of NTSC transmissions in about 15 years. This means chaos and upheaval in the consumer marketplace. It also means a great change in our headends from the old familiar equipment to devices not yet designed.

The cost of these changes could be great. The implementation of them in an economical and efficient manner will fall squarely on the shoulders of the senior engineering talent of this industry.

Regulatory factors

Whether the cable industry gets a shot at being a service provider in the PCS market depends to a large extent on regulatory rules adopted by the FCC. But the input to those rules which provide the fodder for the FCC's decision have come primarily from technical types.

But regardless of how the regulators rule and what decisions are made about whether an individual cable system will become a player in personal communications services, at some point someone will ask the chief engineer what has to be done to do it, how much it costs, and whether or not it can be accomplished.

There is also significant interest in the industry on program guides. Given the fact that we are likely to have a large number of digital bit streams on our systems in the not-too-distant future, there seems to be great interest in the programming and receiver manufacturing worlds in encoding television signals so that programming information is available as part of the transmission.

While this sounds like a simple enough technical task, there are many, many decisions to be made. Chief engineers in major MSOs are once again in the thick of the deliberations.

All of these issues raise the issue of cable television and consumer electronic compatibility to new levels of discomfort. This was a sticky enough problem before digital and HDTV became hot issues, and it's likely to be an even more difficult problem when those services arrive.

Only the most experienced and articulate engineers can represent cable television's interest in this proceeding, particularly if the cable industry is to come out of it with regulations that allow us to accomplish compatibility with the least amount of disruption to our service.

All of this is on our plate. There will be more helpings of new things placed there soon enough, and those will be things we cannot imagine at this time. It's good we have the talent we have in this industry.

It will better if we can continue to grow and train and nurture this talent, because I both fear and hope that the world will get more technical rather than less. Hopefully, the interface between technology and regulation and business will continue to blur until hardly any decision in any one area doesn't produce repercussions in the other two areas.

While a chief engineer isn't the only one who can navigate through this maze in the future, he is in a uniquely well-placed role to not only navigate but help pilot us into that future. CED

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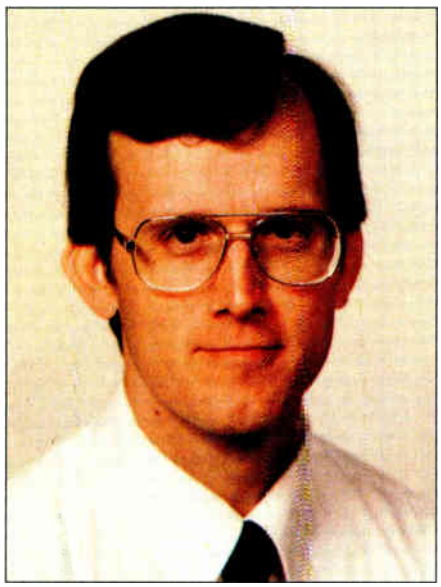

Ghost cancellation

I can hear it now. Somewhere out there today, one of our subscribers is turning to his spouse saying: "Honey, I'm tellin' ya, we can put a man on the moon, but we just can't get rid of those damn ghosts . . . ." And to an extent, it's true—or at least it has been until now.

In August of this year, however, the membership of the Advanced Television Systems Committee voted to support the adoption of a Ghost Canceling Reference (GCR) Signal developed by Philips Labs, to be carried in the NTSC vertical interval of a standard broadcast channel.

Once the vote was in, in fact, the ATSC immediately filed a petition for rulemaking with the FCC seeking the use of line 19 of the vertical interval for the exclusive use of the GCR signal, replacing the Vertical Interval Reference Signal (VIRS) which is no longer being used. This new development could spell the end of ghosting as we know it today, and put an end to the inevitable comparisons between CATV and aerospace technologies.

Ghosts, for the purposes of this article, can be defined as any signal that is delayed (or advanced) in time relative to the primary signal, and which therefore show up on the television picture as a leading or lagging "echo."

One interesting characteristic of a ghost is that it can tell you a little about the propagation path that it took relative to the primary signal path. In fact, the distance that the echo or ghost is displaced from the primary signal on the actual television screen can be used to determine the difference in length between the primary signal's transmission path, and the length of the transmission path for the ghost.

For example, we know that a single scan line for an NTSC television picture is about 63.6 μsec in duration (1/15,734). If we eliminate sync and blanking intervals from this number (11.1 μsec), we'll find that the active portion of the video line is on the order of 52.5 μsec in duration. On a 26-inch diagonal TV screen, (which has a picture width of about 20.8 inches), it can be shown that a ghost which is displaced from the primary signal by 0.40 inch must somehow have been delayed by about 1.0 μsec (20.8 in/52.4 μsec = 0.4 in/μsec) somewhere between the transmitter and the receiver.

If we assume that the ghost was delayed as a result of a reflection off a building or other structure while propagating through air, and we know that the propagation velocity of radio waves through free space is 984 million feet per second, then we can calculate that the ghost signal actually traveled 984 feet farther than the primary signal (1 μsec x 984 million ft/sec) while traveling to the TV set.

Traditional methods

As Uwe Trode[1] points out in an excellent article on the subject, for years we have been using any one of several techniques for the elimination of such ghosts. Prior to cable TV, when all we had was a set of rabbit ears on the back of the set, we would twist and turn them in order to minimize ghosting.

In our headends, on occasion, we've used a more scientific approach, using similar techniques to those described in earlier columns for the elimination of co-channel[2,3]. Here, an additional off-air antenna is used, and is pointed at the ghost's source of reflection. The output of this second antenna is then summed with the output from the primary antenna through a series of variable attenuators.

Through trial-and-error in antenna positioning and variable attenuator settings, we find an optimum point at which, hopefully, the ghost is canceled. The problem with this technique is that it's tedious, it may not be 100 percent effective, it really doesn't work if there are multiple ghosts, and if the ghost and primary signal are coming generally from the same direction, the antennas will not be capable of separating the two.

But all of that has now changed and the ghost cancellation process can be done automatically and with great precision. The new technique, which must be accomplished in cooperation with your local broadcast station, involves the transmission of a ghost canceling reference signal in the vertical interval of the broadcast signal.

The GCR is a signal that has flat amplitude and linear group delay characteristics over the full video bandwidth of 4.2 MHz. Because the GCR is an integral part of the video waveform, any ghosting or other propagation problems that affect the video performance will also perturb the GCR in precisely the same manner.

In essence, because the ghost cancellation system knows what the GCR signal is supposed to look like, it simply monitors the signal at your prescribed location (typically the headend) and, through a series of digital filtering techniques, puts the GCR, and therefore the entire video signal on which it rides, back in its original condition. Using this kind of technique, pre-echoes (leading ghosts) of about 1 μsec, and post-echoes (lagging ghosts) of up to 58 μsec (almost an entire video line) can be eliminated automatically.

The technique is accomplished at video baseband, which means that the off-air signal must first be demodulated prior to input to the ghost cancellation system—which seems a small price to pay for the elimination of a particularly annoying ghost.

In the future, manufacturers hope to incorporate such ghost cancellation techniques within the actual TV sets. In fact, there are already set-top ghost cancellation systems available on the market in Japan. Until then, and especially in particularly annoying situations, an automatic ghost cancellation system might make sense for use in the headend. CED

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

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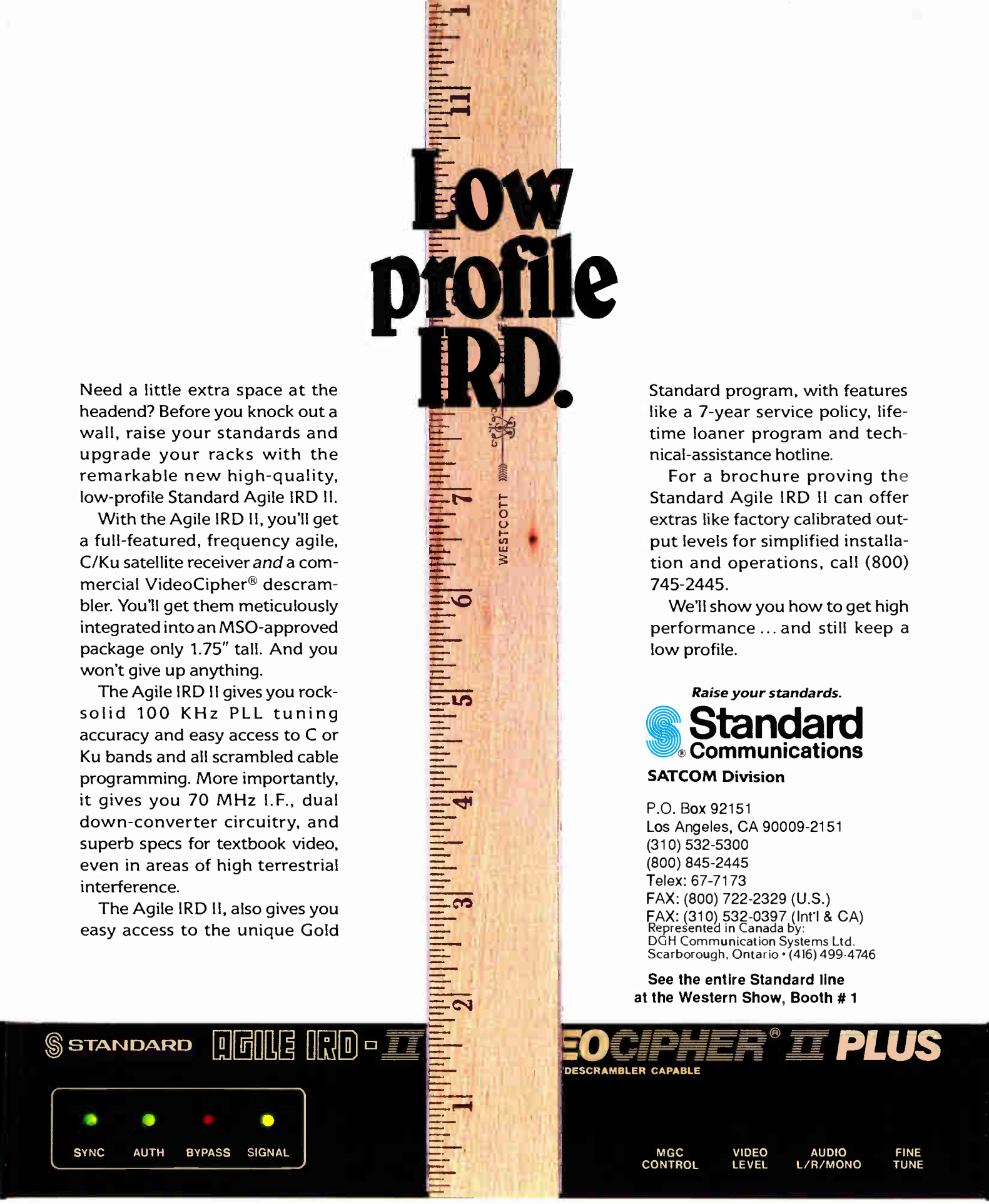

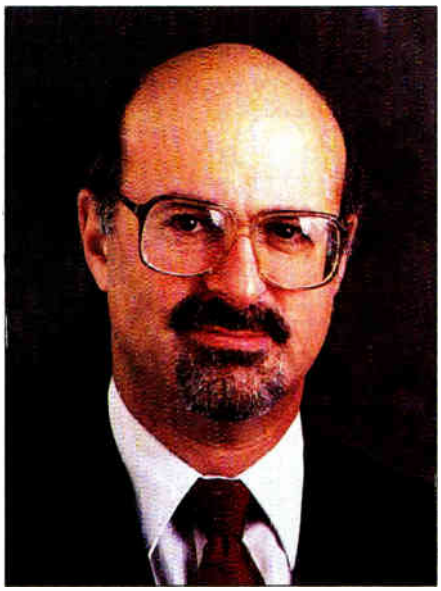

Telephone access competition

In September, the FCC took several steps that could lead to more competition in the "interstate access" telephone service market. Cable companies that want to compete in the voice telephone business could benefit from these actions. But don't overestimate the impact of FCC policies. These FCC actions do not create competition in the wireline local exchange telephone business, although they are a step in that direction.

Interstate access vs. local exchange

Pick up your telephone and dial a local call. The call goes from your phone to the telephone company central office (CO) over a local loop. At the CO, the call passes through a switching machine, which makes a connection to an interoffice trunk to the CO that serves the location of the called party. At that CO it goes through another switching machine, and then over a local loop to the called party's telephone.

Now dial an interstate long distance call. The call goes over the same local loop to the same CO, and through the same switching machine, but then it goes over an access trunk to the "point of presence" of an interexchange carrier (IXC) like AT&T, Sprint or MCI.

The recent FCC decisions deal with the access trunks, which are the interconnecting links from the telco central office to the IXC. They do not deal with the local loops or the local switching machines. These are still monopolies, owned and operated by the local exchange telephone companies.

Most access trunks are supplied by the telcos, but access trunks can also be supplied competitively. New York Teleport, Metropolitan Fiber and other "competitive access providers" have built local fiber optic networks to do this.

Because the FCC has jurisdiction over interstate communications, and most long distance calling is interstate, the FCC controls the policies for access trunks. But local telephone service does not cross state lines, and wireline local telephone service (including service that might be offered on cable TV facilities) is under the jurisdiction of individual state public utilities commissions. They have jurisdiction over both entry (who can enter the business and offer the service) and rates. While some of the state commissions have favored competition, none of them have approved competition in wireline local exchange telephone service.

Radio-based or wireless local exchange service, such as cellular or PCS, is different because the FCC has jurisdiction over entry for radio-based services; the PUCs have jurisdiction only over rates. But neither cellular nor PCS is likely to be a true competitor for wireline local telephone service, at least not anytime soon.

The problem faced now by competitive access providers is interconnection with the telcos. The local loops and local switching machines are bottlenecks. For most customers, the only way they can reach a competitive access provider is by going through the telephone network. Most customers do not generate enough telephone traffic to justify access trunks that bypass the telco network and go directly to the customer's premises.

But until recently, telcos had only a limited obligation to interconnect with competitive access providers. The purpose of the recent FCC decision was to require telcos to interconnect, and to require that the interconnection take place at the telco CO.

Special access vs. switched access

Currently, the FCC decision only applies to a subset of access trunks, called "special access," although in about a year it will be expanded to cover "switched access" as well. The FCC adopted new policies for special access, but for now has merely proposed similar policies for switched access.

Special access trunks are used to connect with leased lines and WATS lines. A special access trunk is typically dedicated to a single business customer. It may connect from the customer's PBX to the IXC's point of presence, transiting through the telco's CO.

Switched access trunks are used for switched long distance service, and they are shared by all the customers (both business and residential) who subscribe to the same long distance carrier. As you can imagine, switched access is a much bigger part of the pie than special access. If local loop competition evolves, switched access trunks will become even more important, since they will be the means of interconnection if a telco customer wants to make a local call to a subscriber who has discontinued his telco service and gets local loop service from a competitor.

An important part of the FCC decision deals with where the interconnection must take place. The FCC has ruled that telcos must lease space in their COs to competitive access providers, and interconnection must take place at the telco CO. This is called "physical co-location." The competitors will be able to install their fiber and microwave terminals on telco property. Although a few telcos had previously voluntarily agreed to allow this, most telcos made interconnection as difficult as possible.

Local loop competition

You can see where this is leading. If access competitors can terminate their access trunks at the telco CO, local loop competitors might be allowed to terminate their local loops at the telco CO. The telco monopoly control over local loops would begin to evaporate. Telcos would still hold a monopoly over the local switching machines, but any local loop supplier would be allowed to terminate their loops on the switch.

The FCC decision does not go this far. In fact, local loop competition isn't a part of the FCC decision at all. The decision is limited to access trunks for interstate long distance service. The FCC does not have the jurisdiction to create competition in the wireline local loop business. That power is given to the state PUCs. But breaking down the interconnection barrier, and forcing telcos to interconnect at the CO switch, is an important step that is necessary (but not sufficient) if we ever hope to achieve competition in local exchange telephone service. CED

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

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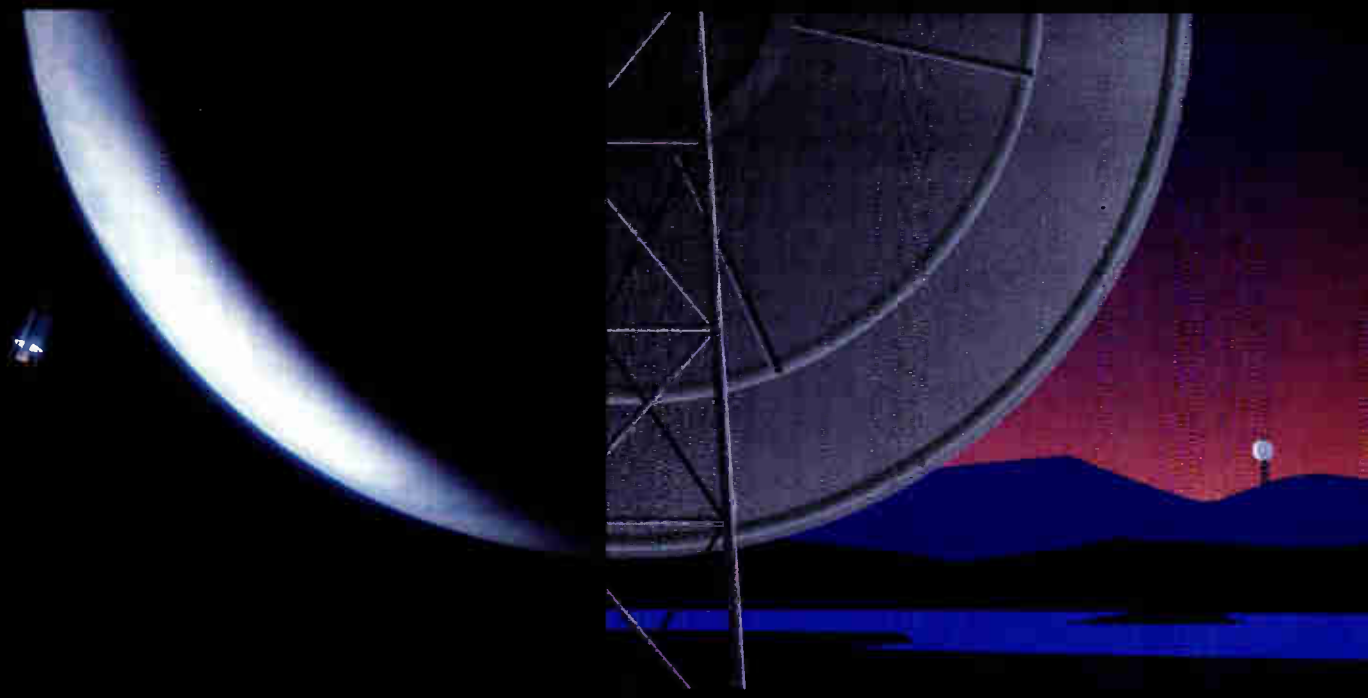

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Automated coupler manufacturing

The implementation of fiber in public telephone and CATV networks has placed greater scrutiny on the manufacturers of fiber components. As with every leading-edge technology, reliability, quality and cost drive its acceptance. The widespread installation of fiber optic components will be contingent on several factors beyond the implementation by the telecommunication and CATV industries. These include high reliability and quality, the ability to produce mass quantities of key network components such as couplers and a low, sustainable pricing structure.

All these conditions are met with a very basic solution: automated manufacturing. Without automated manufacturing capability, coupler manufacturers will not be able to meet ever-increasing market demand.

Reliability at an affordable price can only be achieved through efficient manufacturing techniques. Lower prices will be the result of increased production volume and the ability to maintain a sustainable cost reduction over time without compromising quality—an inherent benefit of automated manufacturing techniques.

As the fiber industry undergoes technical evaluation, careful decisions must be made when choosing passive optical network (PON) components such as couplers. Couplers are intrinsically highly reliable devices when carefully designed and manufactured under strict process control.

By Dr. Scott Rashleigh, President, AOFR Inc. and managing director, AOFR, Pty. Ltd.

Volume and demand

What volume will the market demand in the future as fiber optic networks continue to grow and how will large volumes impact reliability? If coupler demand moves from its current volume of tens of thousands a year to several hundred thousand or a few million annually, a coupler manufacturer without automated techniques will be left behind. Without automation, it is nearly impossible to manually produce one million couplers in one year at an acceptable price with consistency, reliability and high quality.

Numerous coupler manufacturing techniques have been developed over the years. These include fused biconic taper (FBT) and planar waveguide fabrication. This article will focus on the former technology. The FBT coupler is well-suited for fabrication in large numbers, can be made environmentally stable and is flexible in that it can be adapted to numerous applications and specifications.

While the fundamental process in FBT coupler production is similar throughout the industry, a coupler's internal packaging often determines its long-term reliability.

A basic process in fabricating an FBT coupler includes stripping a length of coating from the fibers, then fusing two or more fibers and drawing to form a taper while actively monitoring the optical characteristics of the coupler. This produces the basic coupler—but to be usable, the coupler must subsequently be packaged to protect it from the environment. Next, the coupler should be proof tested and tensioned prior to sealed encapsulation and final packaging, all in a clean-room environment. These processes are fundamental to manufacturing reliable couplers.

Quality packaging and design techniques, of course, play a critical part in extending the product's reliability. Automatic encapsulation into a sealed silica primary package is usually performed on the coupler production machine immediately after proof testing. The coupler is then affixed in the package, which is sealed in a dry nitrogen atmosphere to eliminate the damaging effects of contamination.

In an automated environment, a software program dictates all the processes that repeatedly produce high performance couplers.

Reliability

Reliability will be enhanced further if the FBT manufacturing process is performed on the same production machine. This eliminates any errors than may occur when transferring the coupler from location to location and removes individual operator dependencies. Each device is fabricated, fully sealed and packaged on the machine without interrupting the process and without manual intervention—again, in a clean-room environment.

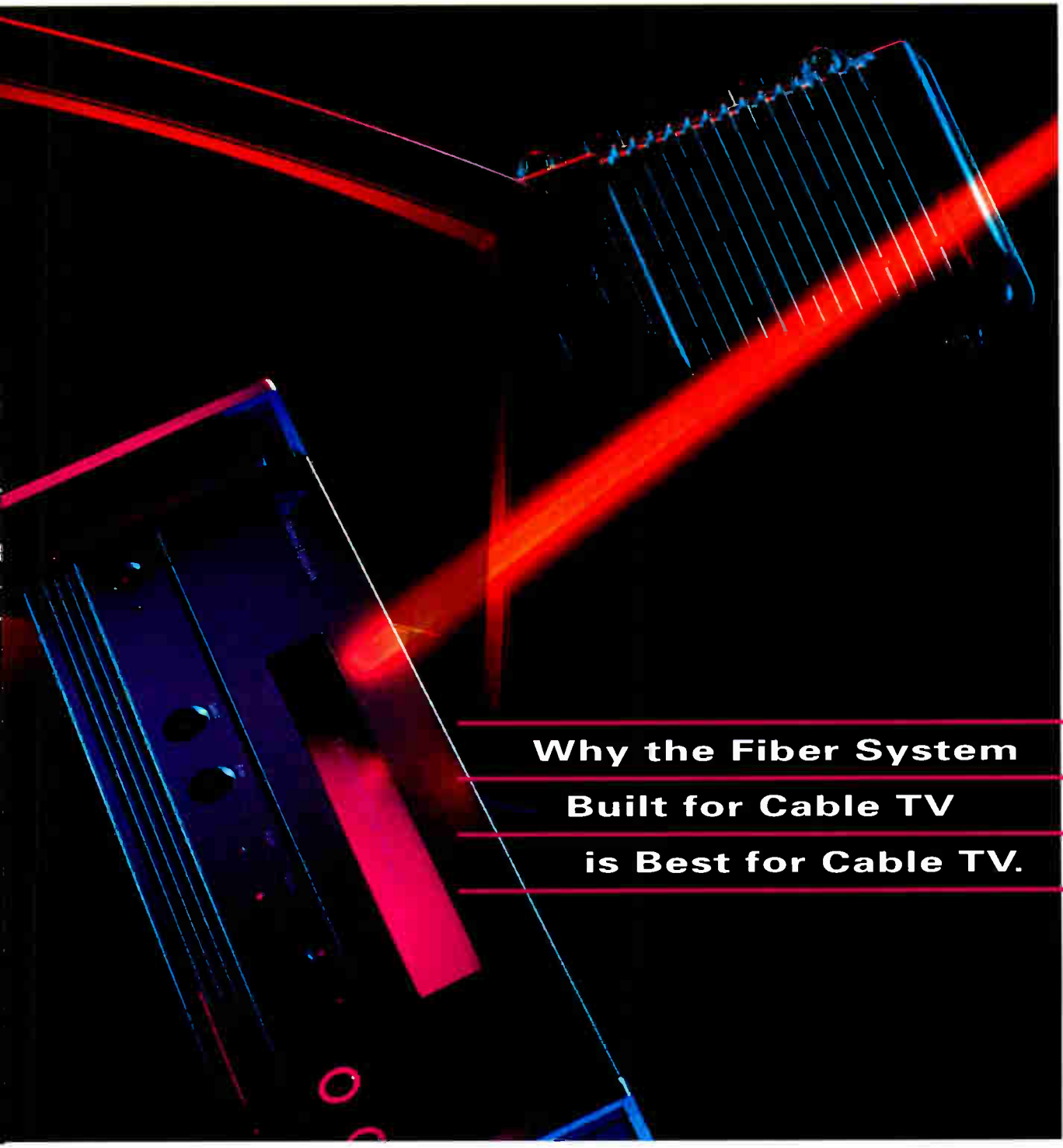
Because the entire process is automatically monitored in real time, each device is tested and qualified on-line with a complete history of its manufacture recorded including statistical process control. Production capacity can be increased by installing additional production machines.

The fiber industry as a whole has the capability of providing high reliability, which is one of its main attractions. The industry requires that a fiber network last 20 to 40 years or more. For reliability indicators such as mean time between failure (MTBF), much is yet to be determined as fiber technology is still relatively new. Fiber-to-the-home (FTTH) and fiber-to-the-curb (FTTC) trials began in the 1980s and continue with constant monitoring by the industry. Efforts are currently underway to test the long-term reliability and coupler manufacturers should be prepared to work toward these goals.

Although some testing will attempt to simulate conditions over time, no test will equal real world conditions over long periods of time. The industry itself must demonstrate coupler reliability over the long term. Until recently, reliability data has been interpreted from qualification tests and accelerated environmental testing. No reliability standards have yet been developed, however, initial standards are expected soon.

Long-term testing and reliability must be defined relative to short-term testing and reliability. Most current testing is short term, such as temperature and humidity cycling, thermal and mechanical shock, water immersion and flex, twist and vibration.

Couplers will likely emerge successfully from aggressive force-to-failure testing. Testing that includes rigorous temperature cycling, heat aging, humidity cycling, vibration, bump, impact and fiber retention parameters will aid in determining a coupler's long-term reliability. CED



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Half-full, or half-empty?

The report in your September issue on the "Cable Poll" conducted by Midwest CATV, *CED* and *Cablevision* seems to be a case of saying the glass is half empty when it's likely more than half full. The finding that 20 percent of the systems polled are using fiber seems to me to be impressive.

Using the *Television and Cable Factbook* as a database, the top 20 percent of the systems pass 90 percent of the subscribers! The 20 percent from the survey may not be entirely the largest systems, but in any event this implies that over 2,200 systems are using fiber only three years after widespread availability of the product!

Since almost half of the *Factbook* respondents report system sizes of less than 100 miles (where amplifier cascades are short enough that fiber is less necessary), you can conclude that almost 40 percent of the systems that ought to be using fiber are, again, only a few years into the rebuild/upgrade cycle. Also note that a large MSO can be comprised of many small systems—TCI is an example. Finally, the system managers polled in the survey may not be as familiar with fiber as their chief technicians, especially if the system is not facing a rebuild/upgrade/conversion decision.

In summary, if the numbers do not sound believable, it is because they seem on the high side, not the low side.

David Fellows
President, Transmission Systems
Scientific-Atlanta

Union slam?

In the September issue of *CED* Spotlight article, I read with displeasure your slam at unions in New York City.

No, it's not necessary to have a surly accent to get things done in New York. Personal integrity and a respectful attitude in the abilities of Union employees will accomplish more than "Big Apple machismo."

Local #3, I.B.E.W. (the elected representative of the technicians of Brooklyn Queens Cable TV) was in the forefront of recognizing the need for trained technicians in the cable industry.

Mr. Ellis, before venturing into unknown waters, whether they be technical or labor relations, it is best to have a clue as to what you are writing about. For your information, relations between Union employees and management at Brooklyn Queens Cable TV are excellent.

Perhaps your publication should confine itself to what it has a grasp of: technical training, not labor relations in New York City.

Raymond V. Massey
General Foreman
Time-Warner Queens/Brooklyn Div.

I am sorry you took such offense to a piece that is, by its very nature, designed to provide a light and sometimes humorous look into the lives of cable's top engineers. Ms. Ellis's mention of an "on-demand surly accent" and "Big Apple machismo" was not intended as a slam at the union nor its efforts; it was merely the way she chose to describe Mr. Ludington. We apologize for any unintentional slights on Local #3.—**Editor**

Rebuilding Florida and Hawaii

Hurricanes Andrew and Iniki wreak havoc on cable TV

Hurricane Andrew's decorative touches on a dish in Florida. Photo courtesy Martin Suter.

It's been a busier than usual autumn for cable operators Tele-Communications Inc., Rifkin & Associates, Adelphia Communications and Intermedia Partners, among others. Besides the typical flurry to complete budgets and finalize year-end plans, these operators were hit with a completely unexpected crisis: hurricanes.

In South Florida, the fury of Hurricane Andrew left more than 10,000 families without homes and half a million without power. A short two weeks later, Hurricane Iniki ripped through Hawaii, leaving little behind intact.

Most operators who occupy, have visited or are working to rebuild the ruined areas say the extent of the damages viewed on nationwide news coverage was "nothing" compared to a first-hand view.

"On the airplane flying in (to Kauai Island in Hawaii), we could tell which areas had been hit the worst by the color of the roofs," recalls Pete Smith, VP of engineering for Rifkin & Associates, the only operator who suffered damage in both storms. "The houses worst hit were covered with blue tarp. I remember commenting that I hadn't known there were so many homes on the island. Before the hurricane, most of the rooftops had been obscured by foliage."

In Florida, TCI's area manager Mor-

Andrew's hurricane-force winds wreaked havoc on this antenna in Florida. Photo courtesy Martin Suter.

An engineer investigates the damages on top of Mt. Kahili, Kauai. Photo courtesy David Large.

gan McChesney recalls his first priority: Finding his staff. "We have about 400 employees in the area between the four systems (we operate)," says McChesney. "About 20 lost everything. Finding our employees is what put the whole thing into perspective for me. We started by calling, and within about three days we managed to find everyone. A few times we'd get to a house that one of our employees had lived in but couldn't live in anymore, and the neighbors would come out and tell us whether or not they were all right. Within about a day, we'd hear from those people."

Cable television vendors who responded to the Florida disaster by sending truckloads of basic necessities and equipment say the devastation was so complete, it was almost eerie. "It made the hair on the back of your neck stand up," says Midwest CATV Account Executive Martin Suter. "The entire area was flattened. The roads into the damaged areas were narrow and unmarked, because they had been created shortly before our arrival by bulldozers. On the radio, people traveling into the area were asking the survivors to put anything, even a hand-written sign, on their streets."

Hardest hit

Adelphia's systems in Florida seem to have taken the most comprehensive hit,

This mound of debris used to be an Intermedia Partners' microwave site. Photo courtesy David Large.

although company representatives couldn't comment extensively about the damages for insurance reasons. "We plan to rebuild it, certainly," says Adelphia's Dan Liberatore. "All 700 miles of our aerial plant is down. We'll most likely not put it up the way it was before it came down. We'll put it up with fiber, at 550 MHz."

Vendors and other sources familiar with the area say more than half of Adelphia's employees lost their homes. McChesney says some Adelphia employees are working out of TCI's Miami system office. "Adelphia's office was severely damaged, as was its headend," McChesney says. "They've gotten the headend working, so a few of their employees are working out of our offices to take payments."

Morale booster

"There's been a real community effort here," McChesney continues. "Locally, they're calling it a glazing of the community—whatever, it's a real good feeling. As awful as it was, it really did pull a lot of people together. I got calls from the folks up in Continental, Jones and Telecable (all in northern areas of Florida) almost immediately. Morale is at an all-time high."

> "It's hard at this point to even call them `vendors.' They're more like friends."

McChesney says the assistance from vendors including Anixter, Comm/Scope, CableData, Midwest CATV and others has been "overwhelming."

"It's hard at this point to even call them `vendors,' " McChesney says. "They're more like friends. I know at some point we'll go back to a normal business relationship, but during this event, they became more friends than anything else. They really, really came through."

Intermedia's Director of Engineering David Large, whose company's Kauai, Hawaii system was severely damaged during Hurricane Iniki, agrees. "As we speak, there's 70,000 pounds of supplies on the way," Large says. "The ven-

dors came through."

Florida damages

TCI, which manages three Storer systems and operates a fourth in Miami, lost about 350 total miles of plant—30 in its Miami system, and 300 in its system in Kendall, Fla. (south of Miami). The 300-mile portion of its Kendall system will likely be upgraded from a current 400 MHz coaxial topology to 550 MHz fiber-to-the-feeder. McChesney says TCI is considering putting in fiber to feed the areas damaged in its Miami system, but at press time the outcome was uncertain. "A lot of that 30-mile loss was just several spans of cable," McChesney explains. "We'll probably just put those spans back up and be done with it."

Rifkin's Smith says his Florida system, located in Miami Beach, suffered minimal damage. "I suspect the ruggedness of the buildings in that area had a lot do to with it," Smith muses. "The height and structure probably meant that the winds went over top a bit more than in other areas."

At press time, Smith said most of the damage in the Miami Beach system had been corrected. "We shipped in a bunch of generators to get power. We had areas where there was power, but in between us and that area there wasn't. So we had to run six or 10 generators so that we could get cable to those folks."

Hawaiian damages

No sooner had Smith returned from a review of his Florida system when the second hurricane hit, this time brutalizing Rifkin's Kauai, Hawaii system. "In that one, we lost both dishes to the headend. Also, we have about a 15-mile fiber run that goes to a hub, and about half of that is on the ground. My guess is that most of it is salvageable. But, the poles aren't up yet. So, if we need to we'll run it on the ground."

> "(The Mt. Kahili site) is history. It's pretty dramatic–just a pile of telephone poles and what used to be antennas."

Smith says he has moderate upgrade plans, thanks to Iniki: "There are a couple areas where I have to put in new pieces of fiber, so I'm going to increase the count. But we don't have enough damage to say there's an opportunity to make a huge increase in channel capacity, or anything like that." Smith adds that because about 70 percent of his plant is underground, the distribution portion of the system is in fairly good shape.

Large says the damage to Intermedia's Kauai system relates mostly to a microwave relay site on the north side of the island. "That site is pretty much history," Large explains. The tower, which sat atop the jagged Mt. Kahili, was demolished during the hurricane. "It's very dramatic—just a pile of telephone poles and what used to be antennas," says Large.

Because the location can only be

reached by helicopter, Large says he's considering alternate methods of rebuilding the site. "We're researching the best recovery method now," Large explains.

"There's a number of approaches we could take, such as running it as two separate systems (Intermedia's subscribers are located at the northern and southern ends of the island), doing something with fiber, or rebuilding the antenna site. "It's a terrible site," Large continues, "because it's virtually inaccessible. Because the Hawaiian mountains are very recent geological foundations, they're truly knife-edged ridges. The landing pad for the helicopter, for example, is so narrow that the helicopter's skids extend from one side of the mountain to the other."

> "After having lived through something like this, I learned one thing: Never stick around for a hurricane. Get the hell out of Dodge."

Also, Large says he lost one seven-meter antenna and half the roof covering the headend in Intermedia's Princeville system. "That's already replaced, however, and the internal damages aren't too bad," he says.

In assessing the extent of the damage, Large says he toured the island and captured the devastation on film. There was so much destruction that his processing bill was $900. "Several of the communities we served were extremely hard hit. The folks in Hanalei, who are mostly native Hawaiians, took an awful beating," Large adds.

At press time, Large reported that all subscribers within the system are without service, mostly because the majority of the island is lacking electricity. "Aside from that, I'm guessing about 90 percent of the overhead drops are down. Even in areas that were lightly hit, the drops are gone."

Only 5.6 percent of Kauai had power as late as early October—"with no electricity, you work dawn to dusk," Smith says. "What we're waiting for is power."

Because the island has one power plant and most poles are down, the wait for electricity may range anywhere from early November to next March. "The first priority of the power companies is to service the hospitals and other strategic places," Smith explains.

Both Large and Smith agree that the hurricane served to engage a strong spirit of cooperation. In many cases, Smith reports, his staffers are working closely with telephone and power company crews to restore services. "Spirits are high down there, because of the cooperation," Smith says.

All the engineers interviewed say things are slowly getting back to normal. "Miami will never look the same," McChesney laments. "After having lived through something like this, and having seen all the damage, I learned one thing: Never stick around for a hurricane. Get the hell out of Dodge." CED

By Leslie Ellis

Upgrades vs. rebuilds: Evaluating plant performance

Today is a time of options for cable operators. Which architecture to use, which technologies are the most advantageous, how reliable will the plant ultimately be—these are pertinent issues to be considered as the '90s roll in. The technological advances over the past decade are astonishing, to say the least, and long term planning has become the key.

Evaluating existing plant

The first step in performing an evaluation process is to compile a construction history of the system. Age, original and maintenance construction practices used, high service call activity areas, and active, passive, tap and connector types are all determining factors.

These factors, when combined, will comprise the different lot samples of cable, equipment, connectors and construction practices. This allows the plant to be evaluated more quickly on a lot-sampling basis, which usually generates very accurate assumptions that can be applied to the entire plant.

Generally, we use a total sampling footage of approximately five to 10 percent of the total plant footage. Table 1 is a sample grouping from a prior evaluation.

Plant age	10 years (approximate)
Cable type	P3 .750" jacketed flooded trunk P3 .500" jacketed flooded feeder
Connector type	90% LRC pin and feed-thru connectors
Active type	Sylvania
Passive type	S-A
Tap type	Antronix
Plant type	Underground-direct burial-trailer park
Footage	6,036

Table 1

Manufacturer	CaLan
Model	Transmitter : 1777 Receiver : 1776
Calibration	N/A
Set up parameters	Transmitter : start frequency 30 MHz stop frequency 600 MHz

Table 2

Physical evaluation

The next step in the evaluation process is to perform a detailed physical evaluation of the test area. The purpose is two-fold: First, to analyze the effects of age and weathering; second, to identify any problems with the construction practices used, and apply them to future planning.

Our experience has shown that to best determine the effects aging has had on aerial plant, it helps to drive out the system and observe the amount of cable splices. Cable is very prone to cracking at the expansion loops, and if a high percentage of splices are in place, random checking for stress cracks at or near the loops should be performed. Also, checking under straps, lashing wire clamps and drop clamps is recommended. The mid-span portions of the cable are generally well preserved, because damage most often occurs at the poles.

Underground plant, if installed properly, is in a protected environment. The method of construction and type of cable used can play important roles in the overall lifespan of the cable. Cable that is plowed-in suffers a greater chance of installation damage, especially when a non-armored cable is used. We have found that once the jacket is damaged, the soil will eventually break down the flooding compound and destroy the aluminum. These defects can be detected during the electrical testing portion of the evaluation.

All locations in the test areas should be inspected physically. Cable should be checked for any signs of stress-related fractures, abnormal wear and general signs of aging. Also, the mating of cable to connectors should be inspected, and the cable itself should be checked for fitting tightness. All abnormalities should be documented for trend evaluation.

The following excerpt from a recently conducted system evaluation indicates the type of information obtained during the physical evaluation process:

"...The majority of the plant was installed using strand and cable, with approximately 30 percent self-support, messenger-type cable. The aerial cable sizes vary from 0.750-inch with some 0.500-inch, while the trunk run going south is mostly mixed 0.500-inch and 0.412-inch. In the places where strand was installed, very few 3-bolt clamps were used, the majority clamp type being a single hole self-support clamp.

"The system is not grounded. The only location vertical grounds were placed is the first several amplifiers generating from the headend. Most required anchors were in place; however, some were missing.

"Locations in which 0.750-inch was overlashed on existing strand and/or self-support, had no expansion loops placed on the thru-poles. It would appear that expansion loops were utilized only at equipment locations.

"The loops that did exist were of a swag loop type; approximately six inches across. Equipment did have both input and output loops. The majority of straps were of the plastic strap / spacer type. Many poles did not have straps, and the cable was

By Ted Grycel, VP of Engineering, TCS Cable Inc.

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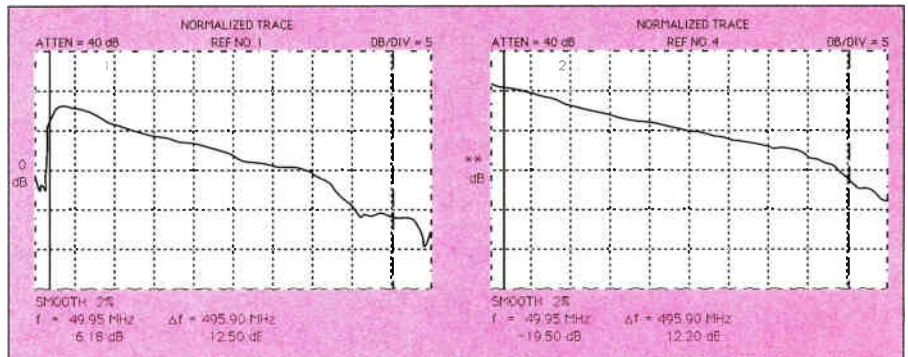
rubbing against the lashing wire clamps as well as the suspension clamps. In many places, the lashing wire came directly off the cable.

"The single, most apparent characteristic of the aerial plant was the type of expansion loop used. Many poles had been reworked—the loops cut out and straight splices placed. The narrow radius of the expansion loops lend themselves to early fatigue and stress-related cracks. Some of the loops visited showed signs of this type at both the center of the loop and, when the strap was removed, kinks were formed during splicing. The system personnel, as part of their CLI program, cut out the cracks as they developed, lending some explanation to the large amount of straight splices. Additionally, because of the lack of expansion loops at thru-poles, the movement of the cable at the loop site is more pronounced, thereby causing early fatigue.

"Missing straps at lashing wire clamps, and at suspension clamp locations, are causing premature wearing of the cable at these points. In addition to this, having such large amounts of unsupported cable is creating stress-related failure of the cable at the equipment fittings. Bends going into the equipment are quite sharp, and most show signs of rippling and kinks..."



Sweep response with existing tap plates

Sweep response with modified tap plates

Figure 1

Electrical testing

The next phase in the evaluation process is to perform electrical testing on the plant. Testing is performed prior to any corrections, so a reference can be established.

The CLI testing is performed during the physical evaluation driveout. All leaks are recorded and investigated. Stress cracks not found during the physical inspection process can be detected using this method.

Frequency response testing

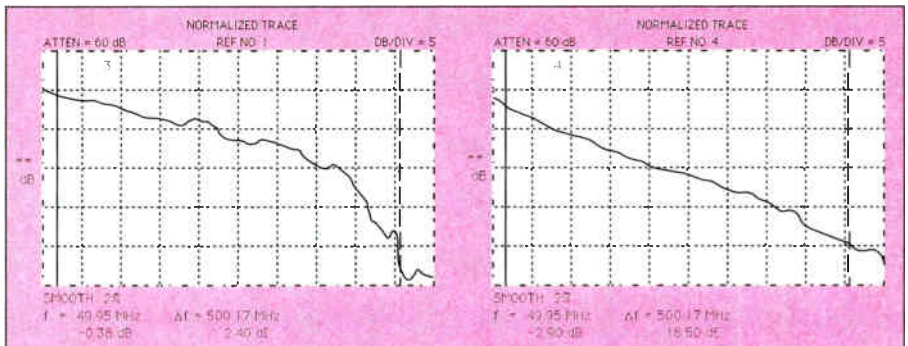
The first test we perform is frequency response testing. The specific testing procedures vary for each evaluation, based mainly on the integrity of the existing connectors. If the connector integrity is good, then continuous spans of cable may be tested without having to resplice or test span by span. If the connector integrity is poor, then it becomes necessary to resplice or test individual spans.

Table 2 shows an example of test equipment used for sweep response testing. The trunk is tested by injecting the sweep into the output port of the amplifier and checking the response at the input of the next amplifier in cascade. This allows testing of the trunk cable to 600 MHz.

A sweep source is injected at the trunk/bridger and line extender locations to allow for testing of the distribution. Response photographs are taken from tap seizure screw mechanisms by using a housing-to-F-connector adapter. Response traces are taken with and without a tilt correction network, in order to check cable loss at 550 MHz. The tilt correction network provides a means to measure peak-to-valley without the necessity to compensate for tilt.

Modified tap plates can be installed at those locations where tap plate bandwidth limitations prevent testing to 600 MHz. This is accomplished by removing the electronic components of the plate, and installing a jumper wire. All results are documented before and after any changes (see Figure 1).

In the case of poor connector integrity, the above procedures are followed, and in addition, the taps are respliced with new connectors. Before and after response traces are taken



Sweep response with existing taps

Sweep response with re-spliced taps

Figure 2

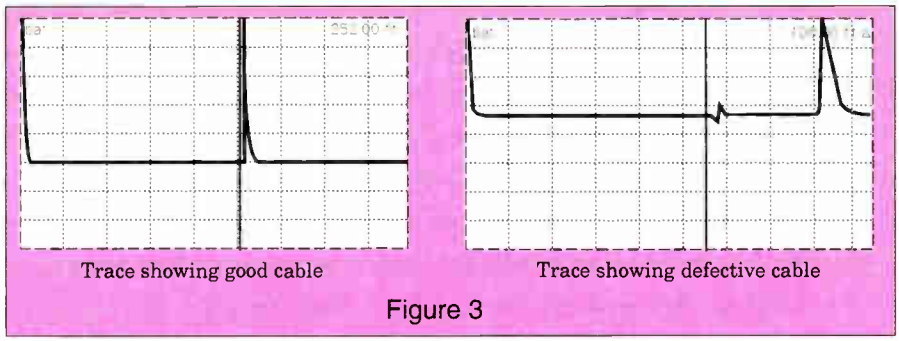
(see Figure 2).

TDR testing is performed on the cable runs having sweep response testing performed. The testing is performed using the modified faceplates as mentioned earlier. Traces that show any abnormalities are tested span by span, wherein the cable is removed from the fittings and "cable only" tested. TDR testing will show abnormalities which do not yet show up in frequency response testing. This is particularly valuable in evaluating underground cable, where potential cable damage can be detected (see Figure 3).

When the trunk and feeder portions of the plant are being sweep response tested, it is also a good idea to randomly sample the return loss of individual spans. A spectrum analyzer, tracking generator, return loss bridge and precision terminator are used for this test. The cable is removed from the connectors and "cable-only tested." The results are compared to the manufacturers' specifications at the time of manufacture.

Conclusion

The evaluation procedures we've



Trace showing good cable

Trace showing defective cable

Figure 3

discussed are general in nature. Each evaluation must be performed on a case by case basis, because many different variables exist. System as-built information is key to putting together different areas of the system to be tested as lot samples. The sampling percentage can also vary from system to system.

If the results from each area are consistent, it can generally be assumed that the rest of the untested plant will follow the assumptions. If the results vary from area to area, additional testing should be performed until a specific pattern can be established for the entire plant.

The physical evaluation is instrumental in future construction planning, because it affords a means to analyze the effects of age and environment. The physical integrity of the cable is the determining factor of what lifespan can be expected after an upgrade. If good construction practices were used during the original build, and stress cracks are not apparent during the inspection, then the life expectancy can be expected to be high. Alternately, if stress marks are visible in the loops, serious consideration should be given to replacing the cable.

The cable-to-fitting tightness is also important in the case of a potential upgrade. If the cable can be rotated in the existing fittings, response problems will eventually develop—and consideration should be given to a resplice.

Underground plant is considerably harder to fully evaluate.

During our evaluations, we visit with the technicians in the system and try to develop a history of underground-related problems. Once specific problem areas can be defined, aspects including construction standards used, backfill methods and erosion rates can be analyzed, along with specific problems unique to each system. TDR testing can help identify some of the marginal spans.

Sweep response testing has been very accurate in determining defective cable, based on our prior experience. It allows cascaded spans of cable to be tested, and best simulates the actual operating conditions.

Also, it allows more cable to be tested at one time—as opposed to span by span testing. We have found sweep response testing to be generally 95 percent more accurate as compared to return loss testing. Random return loss testing should be performed, however, on cable that has acceptable sweep response measurements.

In some cases, sweep testing to 600 MHz is not possible because of connectorization and bandwidth limitations of the equipment. One option is to do a test area resplice, then retest the plant upon completion of the resplice. This works well in most circumstances.

Table 3 summarizes a previously performed evaluation and provides cable replacement assumptions for cable operators to consider.

As demonstrated in the table, the economies of re-using cable as opposed to 100 percent cable replacement can be considerable. The evaluation process makes it possibly not only to maximize cost effectiveness, but also to assist in the financial planning of the project. CED

Underground cable analysis

Map #	Footage	Bad cable	%
118/109/108	5,000	568	11.36%
119	3,490	0	0%
153	568	0	0%
117	6,644	204	3.07%
153/152	6,451	201	3.12%
83/84	8,176	180	2.20%
1212	1,928	75	3.89%
197	628	0	0%
196	593	0	0%
157	1,095	400	36.53%
195	9,830	655	6.66%
104/103	6,036	370	6.13%
158	3,287	402	12.23%
201	1,158	0	0%
198	1,967	0	0%
203	3,942	0	0%
124	2,449	0	0%
Totals - testing/analysis			
Feet Miles	63,242 11.98	3,055 0.58	4.83% 4.83%

Table 3

Cable replacement assumptions

If above findings are applied to entire underground portion of system, the following miscellaneous cable replacement assumptions can be utilized.

Feet Miles	184,800 35.00	8,925.84 1.69	4.83% 4.83%

Safety programs: Organizing for prevention

Since giving lip service is what politicians do best, if the safety of cable television system workers was a political issue in this election year, safety would be on everybody's lips. It's a "mom and apple pie" issue. Who can deny safety is important?

But for those charged with implementing organized safety programs for cable systems, it's not always as easy as lip service would lead one to assume. But how should a commitment from management be translated into action?

One way to gauge the need for management commitment, professional action and funds is bare facts. Reportedly, the cable industry doesn't fare very well. Comparing 1990 injury statistics from the cable industry with those of similar industries, according to the U.S. Department of Labor, out of every 100 full-time employees 11.7 cable workers suffered injuries—while just 2.3 radio/television workers and 2.4 telephone workers were injured.

When a worker is injured, he or she is off the job. Per 100 workers, cable lost 96.2 workdays in 1990 while radio/television lost 11.3 days and telephone 37.3. Lost workdays by experienced and well-paid employees means lost productivity. The worker must be replaced by another worker or contract labor. If the injury results in permanent disability, the worker may have to be reassigned and retrained—or he may not be able to return to work at all.

As Jake Tamse, risk manager for Frederick, Md.-based Great Southern Printing and Manufacturing, a small three-system MSO with a total of 57,000 subscribers, points out, "It's very easy in this industry to do something stupid and cause yourself injuries. You could be on workman's compensation for life, if you survive the fall."

It's both a tragedy and a financial loss. And the injury must be investigated and documented. That means management and supervisory time and effort. "It does affect the bottom line," says Tom Hill, director of engineering and safety coordinator for Sammons Communications. "You can buy a lot of safety equipment for what a major injury or litigation will cost. It's extremely expensive."

By George Sell, Contributing Editor

First objectives

"I know of no safety organizations within the cable industry," Hill laments. "In practically every major industry there are groups that deal with safety in that particular field. In cable, you go to a national show and you see very little comment or interest, few displays of safety devices and there are no papers presented. The trades seldom ever have any safety information or safety articles. It's beginning to change, but it's way overdue."

What's going to make the cable industry come around? What must MSO corporate offices and systems do? According to Jim Toth, safety administrator for Comcast Corporation, "The most important element is having upper management cooperation and backing. If you don't have that you really don't have a safety program. They have to buy into it lock, stock and barrel."

Jones Intercable discovered the same thing. "We knew we had to have buy-in from the management at the corporate side as well as from the systems. We really had to sell it," reports Saconna Blair, manager of FCC compliance and quality assurance for Jones. Jones' newly revitalized safety program is just a year and a few months old.

Then the commitment of management must be obtained at the system level. "One of the first things we did was to put together a two-day safety forum for every Jones system," said Blair. "We brought in general managers and engineering managers. It was a training session where we gave out information on what we've got now and where we are going."

Organized programs

Putting a structure in place is another initial step in implementing a safety policy. "We have what is known as the core safety committee," Blair explains. "Our direction is to take subjects and topics that are at the top of everyone's concern and come up with a solution for them. We pull in people from the systems to gather information on the true problem and then get suggestions from our secondary safety committee, which is field personnel, and they make recommendations. Our goal is to have results."

Blair stresses that this new committee is not just cosmetic. "We've really pushed for results. I'm real excited about what we've accomplished. We see a trend but we don't have real numbers (related to cost savings) in hand. A year is not a significant amount of time to add dollars to it."

Many MSOs and systems have an administrative structure for safety programs already in place. "We established what we call safety officers and safety committees in everyone of our cable systems," says Hill of Sammons. "They conduct regular safety meetings and report to me the minutes of those meetings, accident statistics, the first reports of injuries, and the OSHA 200 information." That's been in place for seven years.

Comcast breaks its structure into regional safety coordinators, system safety coordinators, and system safety supervisors, Toth explains. "The duty of a coordinator is more like a consultant as opposed to someone who gets in there and gets everything going."

"Our objective is to provide a safe workplace for employees," states Brian Gray at the Warner cable system in Houston. Gray is responsible for safety, technical training and facilities at the system. "Probably the centerpiece to it is the fact that the employees themselves are involved."

Jones Intercable is providing structure at the system level as well. "Every system has a safety coordinator," says Blair. "Part of the problem we are finding is at the smaller systems you wear several different hats. And safety takes a secondary priority. That's a real issue."

Roger Paul, at Cox Cable's Spokane, Wash. system, says, "The first thing we got was a complete buy-in from the system general manager and vice president. We have a safety policy statement that's posted. We posted a description of what the safety committee is and when it meets. People are welcome to attend.

"As an adjunct to the safety committee, we have an accident review committee which is made up of two management personnel, two supervisors and two craft personnel. They review every

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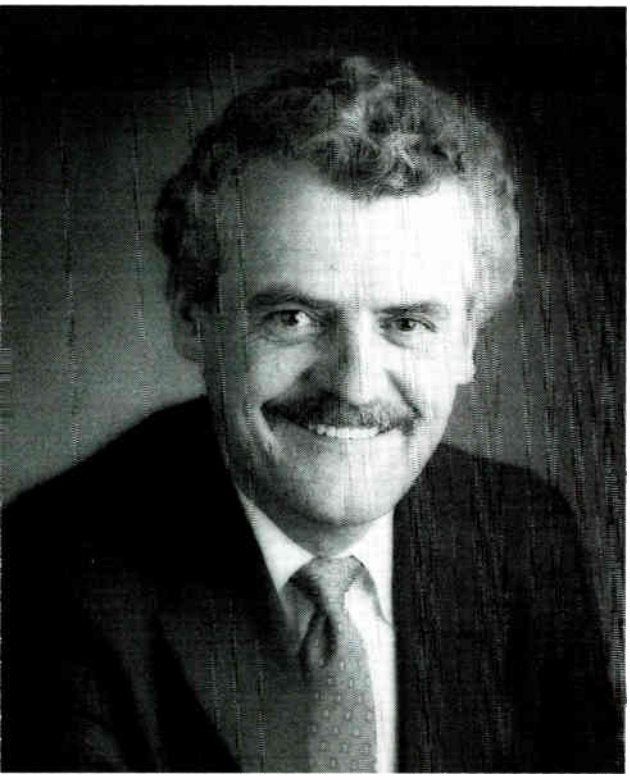

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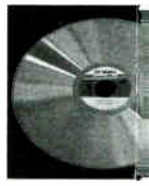

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accident, no matter how large or small," Paul reports.

Training trainers

"We have an objective, first of all, to train the trainers," Toth says. The second phase of Comcast's program, which is still under development, will train individuals on all aspects of safety, including workman's compensation, hazard identification, how to be a good leader, responsibilities and accountability.

Toth says it will be presented during a two-and-a-half-day lecture combined with case study class work. "Everywhere I go among my systems, I find people record everything with no idea of the right criteria and that's something that OSHA (Occupational Safety and Health Administration) will really hop on," Toth cautions.

Toth knows OSHA, because he was trained by OSHA—and he recommends them as an outside resource for training. "I'm a certified trainer in occupational safety and health. I was at the OSHA Training Institute and I'm certified to train trainers. I can do from 10- to 30-hour training sessions. At the end of the training session, I send the agenda that I've used to OSHA and they send certificates to each participant."

Jones Intercable has an advantage in having implemented it's laserdisk-based interactive training system over the past year. Safety training is a part of it. But, as Blair points out, there are many other resources. "In this forum, one of the parts of it was to go over the training that's available right now in the different media, what the systems can do themselves, what's available through audio/video libraries, organizations that can come in and do safety training for them and any outside schools."

Gray says Warner's Houston system covers all the bases by centralizing its approach. With four offices, one supervisor becomes the defensive driving instructor who keeps records of all the people in his district and who needs training. Then he trains them, tests them and certifies them through the National Safety Council.

A different supervisor handles first-aid and CPR and keeps records of who is current and when their expiration date is coming up. Trainers get certified CPR training from the American Heart Association and first-aid training by the American Red Cross.

Aerial safety has instructors in all the districts. Everyone sends their records to Gray, who keeps a centralized files. Generally," Gray concludes, "I don't have to do a lot of reminding. For the most part they keep up with it themselves."

From day one

What's in the life of a new technician as he comes aboard? Gray puts him through a "new-hires skills and safety class" that teaches basic (technical) skills and also covers hazard communications, OSHA, employee rights and employer responsibilities. "We go through all the tools he is issued and talk about how to use each of them safely."

The impact on employees is immediate and continues throughout his or her career. Each work center holds a monthly safety meeting that covers required training. Each of the four work centers has at least one defensive driving instructor certified through the National Safety Council.

Also, employees are required to recertify on aerial safety. If they are issued a pair of gaffs, they have to show us that they can physically inspect the gaffs (and the supervisor inspects them,

also). If they are issued a bucket truck they go through the same process and have to show they know where the emergency shut-off switches are.

Local resources

Cable systems can learn a lot about training from outside sources—often at little or no cost.

Cox's Paul notes that his system is a member of the National Safety Council and the Evergreen Safety Council. He works with the NCTA and the SCTE for safety information. Paul personally works with local safety people from the telephone company to the other cable companies in this area.

Gray, with Warner's Houston system, has also used outside sources. "At least quarterly, we try to get an outside source to come in and do some classes. The bucket truck manufacturers come in and do aerial lift safety for us. Our ladder vendors will do ladder training for us.

"The insurance company is very helpful," says Tamse in the Frederick, Maryland system. "When it found out we had our own safety manual and a safety committee set up, they came in and looked at it. Then they came in and did a fire safety program for us. They come here every18 months and do an OSHA-like inspection. And they give helpful hints."

Tamse prefers the flexibility you have with an insurer as opposed to an OSHA visit. "Even if it's a voluntary visit they (OSHA) leave you a report which may not assess you any penalties but they will come back in six months or a year and validate it. If you haven't taken their suggestions and are not able to present a good argument, you could end up with a citation," Tamse cautions.

OSHA reforms

And OSHA is going to get tougher. New reforms are soon to be released by the federal government. Toth believes they could have an impact on the cable industry not unlike the way the FCC's CLI (Cumulative Leakage Index) requirements hit, except there has been little warning. Many operators may get caught by surprise.

"We think that with the new OSHA reforms, a lot of these things are going to be released and it's going to hit people all at once. The best way to see that it has teeth is to make some examples. And that's what they did with CLI. You saw cable systems on the way to being shut down." But Toth points out, "OSHA doesn't have the right to shut your operations down but it can make it so you can't get within a hundred yards of it."

The new reforms include a citations-issuing approach designed to spur establishment of safety programs. Operators might not pay a fine because OSHA often turns non-compliance into something proactive. Instead of giving a monitary fine, OSHA may specify adherence to a program it designs and approves.

"According to the (OSHA) trainer we had," says Toth, "they can adjust citations up to 95 percent. And they *will* make some examples once this reform comes out because they want to show that they mean business."

And what happens if you remain in non-compliance? "If you are not in full compliance with OSHA's rules, they can cite you to the fullest extent," Toth says.

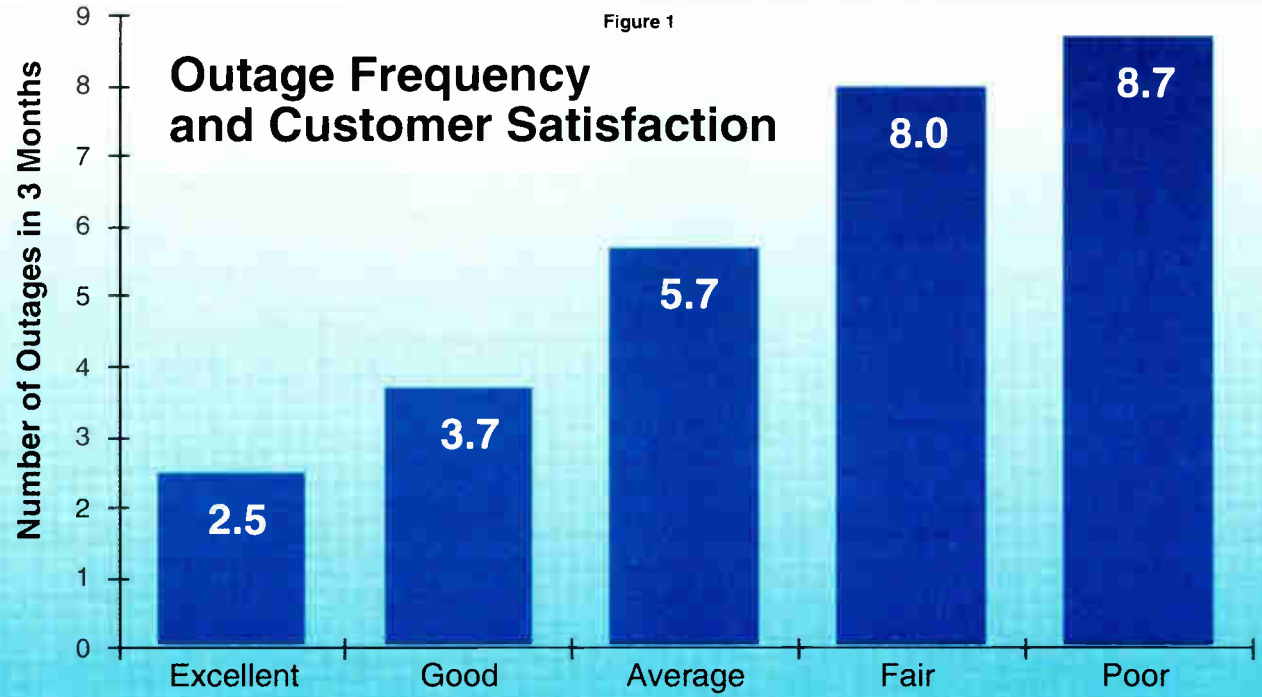
The Bush Administration has had a moratorium on the OSHA Reform Act for some time, but Toth expects the new OSHA reforms to be released by the second quarter of next year. CED

Outages: A CableLabs update, Part 1

Service outages are frequently cited as one of the top reasons for customer dissatisfaction, according to many MSO customer service surveys. Because the industry needs to focus on outage reduction techniques, Cable Television Laboratories Inc. (CableLabs) in conjunction with several of its member companies, formed the Outage Reduction Task Force. In this first of two articles, the findings of two of the task force's four working groups are summarized:

1) Outage Definition, Detection/Tracking and Customer Acceptability Working Group,

Figure 1



2) System Reliability Modeling Working Group.

Outages and customers

There has developed a body of understanding about customers which suggests service interruptions (outages) are a very significant detractor to customer satisfaction. The well published outages caused by AT&T's network failure and the SS7 (Signalling System 7) problems experienced by several RBOCs in 1991 not only enraged telephone customers but also set off a flurry of regulatory activity.

Unfortunately, the telephone companies aren't the only service providers which have angered customers with outages. Satisfaction with cable TV, according to *Consumer Reports* 1990 annual questionnaire, is the lowest the magazine has found in 16 years of rating services[1]. In particular *Consumer Reports* goes on to say:

"Some 60 percent of the respondents had suffered service outages—typically four in the past year—that affected all channels and usually lasted less than half a day. One-tenth of those who had such problems said that the most recent blackout had gone on for two days or longer."

It is unlikely that consumer satisfaction with cable TV in the *Consumer Reports* survey was solely affected by service interruptions. Other factors such as price increases and billing questions also were involved in shaping these consumer attitudes about their local cable provider. However, most MSO customer satisfaction surveys indicate that outages tend to be one of the top three negative marks against a cable company's service record.

CATV parameters

The local cable TV system has many parameters that can create outages. These include the reliability of the local power utility, cable equipment reliability, weather, soil conditions, cable system design and configuration, and system operating practices.

Our members recognized that a multi-company task force was needed to attack this outage issue. Therefore, in 1990 the CableLabs Outage Reduction Task Force was organized. Led by Brad Johnston (then with Warner Cable Communications Inc.), the task force developed a set of recommended practices it feels

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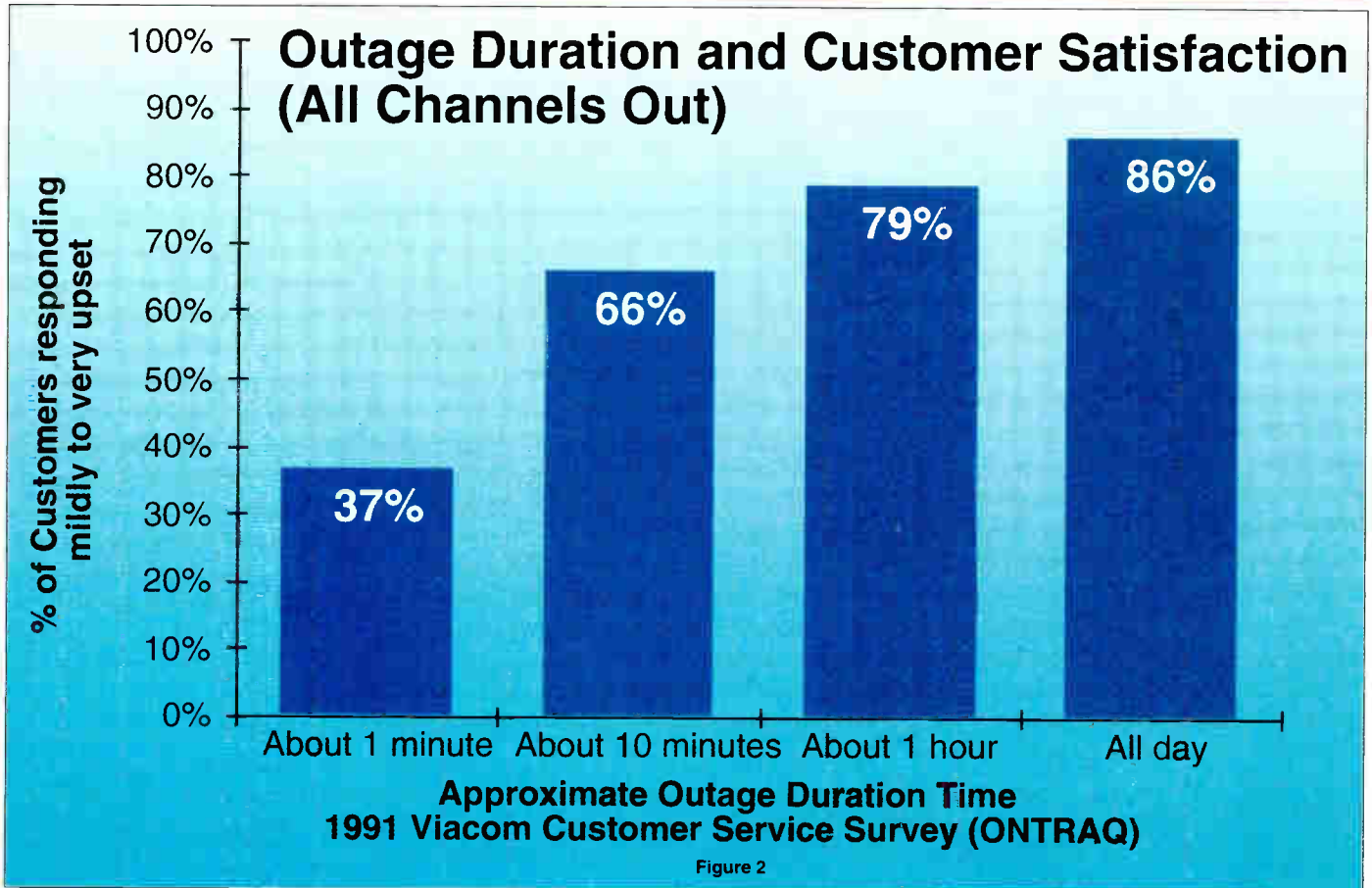

Figure 2

can significantly reduce outages while not requiring major capital or expense expenditures.

Outage task groups

The Outage Definition, Detection /Tracking, and Customer Acceptability Working Group, led by Mike Miller of Viacom Cable Inc., was tasked with the responsibility to develop recommendations on the following:

1) definition of an outage,
2) what is acceptable to the customer (today's video entertainment-based customer),
3) how to cost-effectively deploy an early warning outage detection system, and
4) how to consistently and accurately track outage performance data.

In his 1991 NCTA paper titled, "Outages: The Issue of the '90s," Brad Johnston of Warner Cable Communications Inc., points out the difficulty this industry has when it comes to defining an outage. He states:

"There are many definitions of outages varying from `all channels to 20 or more customers, not counting loss of power or maintenance outages,' to `one or more channels out to more than one customer for any reason.' However, the def-

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inition must come from a customer's point of view."[2]

Because it was important to develop a definition from a customer's point of view, the members of this working group reviewed data from member MSO customer service surveys and developed the following outage definition recommendation:

"An outage is defined as any event in which two or more customers experience loss of reception on one or more channels arising from a common cause. This outage is defined as a situation in which the customer experiences loss of signal, regardless of the cause. Loss is defined as an interruption rather than degradation of signal. Loss of a single channel at the headend or hub site is included."

There are many factors which influence a customer's perception of value, but certainly service outages are major contributors to the customer's satisfaction rating of cable. Figure 1 shows results of a study performed by Viacom in 1989 (also independently confirmed by Warner Cable surveys) that links the frequency of outages to customer satisfaction levels. The Viacom and Warner surveys indicate that outage frequency would have to be kept down to less than two in a three-month period of time or else customers would begin to devalue their perception of cable service.

It was also important to get customer satisfaction information as it related to outage duration. Intuitively, we knew that as outage duration increased, customer satisfaction ratings would decrease. However, we were surprised to see how intolerant the customers were to even one-minute outages!

The 1991 Viacom survey had a rating scale of 1-very upset to 5-not upset at all. The data presented in Figures 2 and 3 show the percentage of customers who responded between 1-very upset, and 3-mildly upset. It is also noteworthy to point out that customers indicated they were just as intolerant of all-channel outages as they were with single-channel outages (single-channel outages were defined as the channel they were watching at the time of the outage—in other words, how upset were they if they had a choice to select another channel).

Outage detection & tracking

The urgency of attacking the outage problem is underscored by the new data from the Viacom customer service survey conducted in the fall of 1991. For an operator to effectively manage outages, two key capabilities are needed. The first is an outage detection program that tells the operator an outage has occurred. This program should be easy for the cable operator to use since it will be accessed frequently in daily operations. The second is a program that provides reports managers can use to count outage frequency, identify causes, and evaluate the benefit of outage reduction programs.

Therefore, removing outages as a major customer issue cannot be accomplished without an on-line, reliable and accurate outage detection and tracking system which would be most logically embodied in the billing, ARU, or standalone (interfaced) PC system.

In December 1991, this working group, in conjunction with several MSO MIS/operations departments, met with subscriber management system providers to review a draft of an outage detection and tracking specification. In this document, the Outage Reduction Task Force has elected to delineate the key functional attributes desired to satisfy the requirement for on-line, accurate and reliable detection and tracking. The objective was not to sponsor tests of specific equipment/software but rather to ensure the industry's subscriber management system providers had a comprehensive agreement on the requirement.

The full text of the final Outage Detection and Tracking Functional Specification has been distributed to CableLabs members as part of a complete set of documentation concerning outage reduction recommendations.

System reliability modeling

Cable designers have, for years, used modeling equations to predict the end-of-line performance of television signals. A typical performance model includes calculations of carrier-to-noise, second-order distortion, third-order distortions, and hum. In addition, this type of model usually calculates the combinatorial affects of different devices placed in cascade between the signal source and the customer. While the use of these models is crucial for designing viable plant, they should not be the only criteria used to predict signal quality and hence customer satisfaction.

As was mentioned in the previous section on customer acceptability standards, outage frequency and outage duration affect customers' attitudes and it was shown that outage occurrences greater than 0.6 per customer per month (more than two in a three-month pe-

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riod) would decrease the customer's satisfaction rating significantly. Therefore, it is highly desirable for a cable designer to be able to predict the reliability performance of the system before it is installed and be sure its reliability performance will be better than this critical threshold. To do this, the designer must be equipped with a battery of design tools.

Basic terms

A fundamental measure of reliability is the mean-time-between-failure, or MTBF, denoted by the Greek letter μ. Mean time between failures are calculated by observing similar items over a predetermined time period and by making the following calculation:

$\mu = nt/k$

where n is the total number of devices, t is the total observed time, and k is the total of failed devices.

Another fundamental measure of reliability is the failure rate λ. Because of the way cable systems are built and maintained, we can assume the failure rate is constant over time. As a consequence of this assumption, μ and λ have the following simple relationship:

$\mu = 1/\lambda$

The reliability function describes what percentage of devices are working after time t. For constant failure rates, the function is defined as:

$R(t) = e^{-\lambda t}$

When a system is composed of several devices in cascade, the failure rate of the system is equal to the sum of the failure rates of the individual components making up the system, or:

$\lambda_{system} = \lambda_1+\lambda_2+\lambda_3...+\lambda_n$

and

$\mu_{system} = 1/\lambda_{system}$

Cable TV reliability

With these basic concepts we can now construct a cable television reliability model. A customer in the system is fed by a series of trunk amplifiers, power supplies, line extenders and cables. While the power supply is physically placed in the middle of the amplifiers it powers, from a reliability perspective it is the first device in series. The model does not include the drop or the convertor, since it focuses on multi-customer (two or more) as opposed to single customer service interruptions.

The reliability of an individual amplifier or other device is called its intrinsic reliability. To find the intrinsic reliability of the trunk amplifiers in the system, first count the total number of the same trunk amplifiers in the system. Then, over a period of time (say, one month) count the number of trunk outages that are caused by this type of amplifier. For example, in a system that has 1,200 trunk amplifiers, 25 failed in one month due to various causes. The MTBF in years for each amplifier is, on average:

(1,200 amplifiers * 1/12 years)/25 amplifiers

or four years. The reliability at a specific point in the system is called the structural or perceived reliability. Customers positioned in the network at the same cascade point have the same structural reliability. The structural reliability is a function of all device intrinsic reliabilities. Let's assume that a customer is fed by 30 of these amplifiers and that these were the only failure prone items in the system. The customer's perceived MTBF is:

4 years/30

or 1.6 months between outages. In effect, at 30 amplifiers in cascade a customer will, on average, experience 0.63 outages per month. Clearly, one can cascade highly reliable components and still provide poor service if the system

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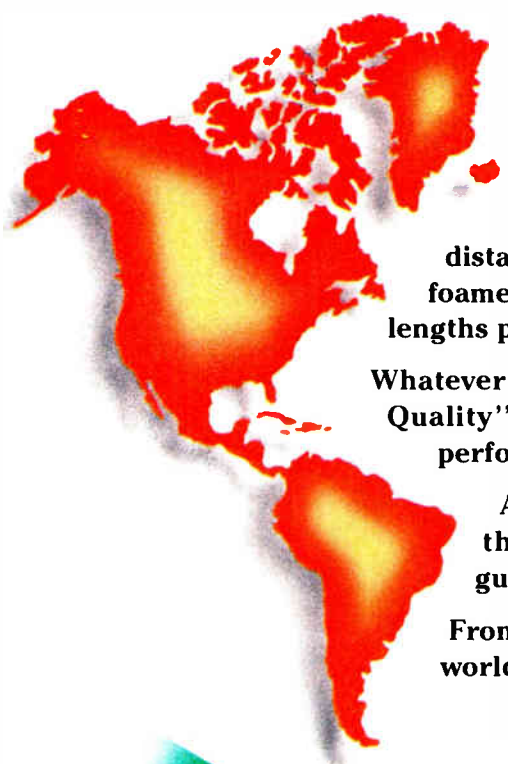

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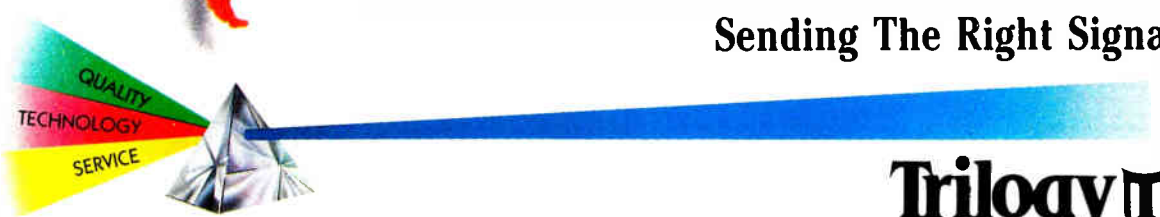

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structure is wrong. Because a device's reliability may vary seasonally, it is wise to make the measurement during the most outage prone time of the year (in most cases during the summer). For best results, the measurements should be carried out over at least a three-month period.

The model's next job is to take a basic network architecture, like cascade, channel capacity and number of amplifiers per power supply, and determine the system's performance at various iso-cascade points in the system. The CableLabs model takes the input information and calculates system reliability at successive cascade points in the system. In addition, the model can substitute a device's calculated MTBF with other values to perform "what-if" analysis.

Model validation

The model (PC-based Lotus 123®) was tested using data

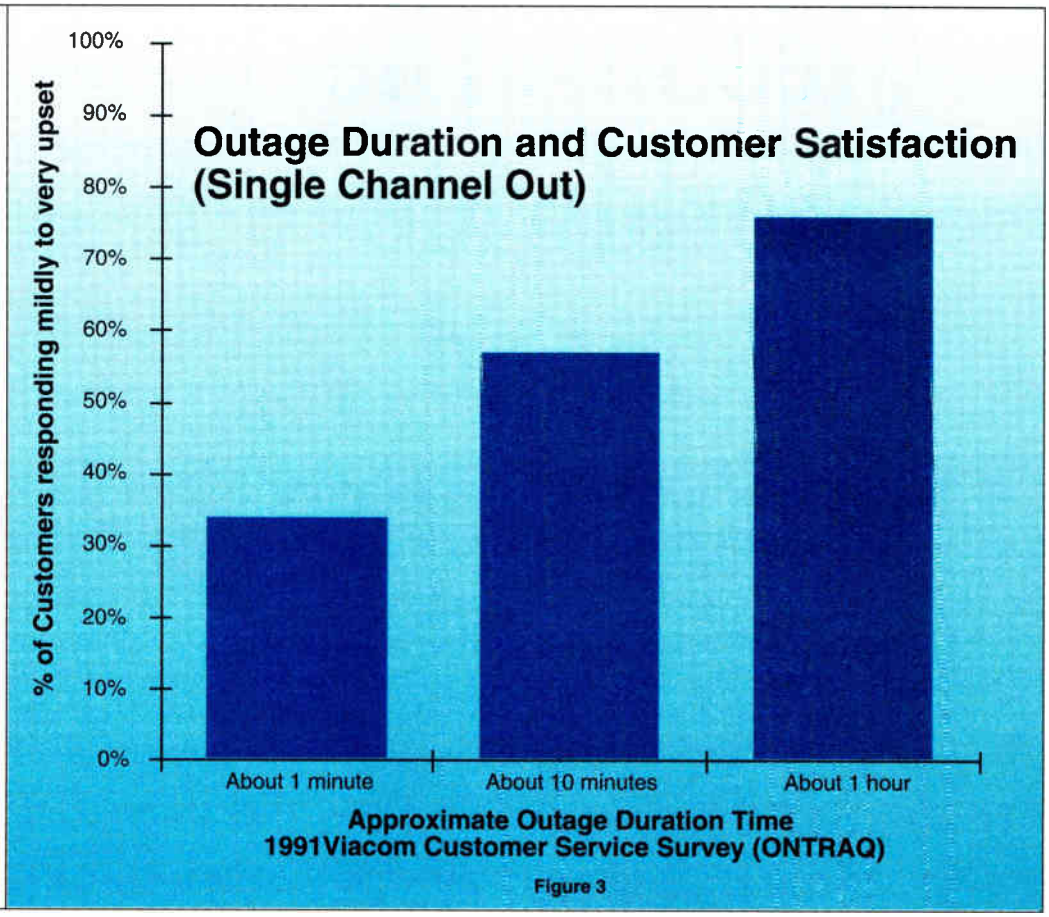

Figure 3

Ad Index

from Warner Cable systems located in Houston, Columbus, Ohio, Nashua, NH, and Pittsfield, Mass. The results showed a high degree of correlation between what the model predicts and actual system results. The model identified situations that lead to differences in reliability performance.

Basic questions

Cable design is concerned with several basic questions. First, how long in cascade should the plant be to achieve less than or equal to 0.6 outages per customer per month at any iso-cascade? Second, how should the system be powered to achieve these results? Finally, how high can an amplifier's failure rate be and still be useful in design?

All things being equal, a system with more than 25 amplifiers in cascade will not achieve 0.6 outages per month per customer. While systems with more than this number in cascade may make traditional performance criteria (C/N, CTB, etc.), these systems cannot provide the desired reliability performance.

Following amplifier cascade, power supply cascade is the next most important influence on overall reliability performance. In general there is a two-to-one relationship between power supply cascades and outages. A 50 percent reduction in power supply cascade to any one customer was found to result in a 25 percent reduction in outages compared to a hypothetical base case. This is not to say that the overall number of power supplies was reduced. In fact, by repowering the system so that trunk powering is isolated from feeder powering to reduce power supply cascades, the overall number of supplies in the system may increase.

Standby power

One question that is often raised is whether or not standby supplies should be used to improve reliability. Standby supplies are more technically complex and hence are more error prone. Furthermore, standby supplies must have sufficient reserve to power the plant for a time equal to or less than a high percentage of power company outages. Despite these short falls the model indicates that using 33 percent standbys in combination with a 50 percent power supply cascade reduction yielded a 32 percent reduction in outages over the base case. This further indicates if standby supplies could be made more reliable their utility would significantly increase.

Finally and most obviously, intrinsic amplifier reliability has a major effect on system reliability, particularly at longer cascades. For a 25-amplifier cascade every 5-percent improvement in intrinsic reliability yielded a 16-percent reduction in outages. At 40 amplifiers the effect is even more dramatic. Every 5-percent improvement in intrinsic reliability yielded a 30-percent reduction in outages per month. CED

Next month's installment will detail the two remaining working groups in the Outage Reduction Task Force, namely, the Plant Powering Working Group and the Outside Plant Protection Working Group.

References

1. Rana Arons, "Consumer Reports Readers: Satisfaction with Cable TV Lowest in Survey History," *Consumers Union Newsletter*, August 21, 1991.

2. Bradley Johnston, "Outages: The issue of the '90s," 1990 NCTA Papers.

The commercial insertion renaissance

There's an evolution going on in the commercial insertion business.

Like the Renaissance some 400 years ago, which marked a period of scientific discovery and change, today's ad insertion business is undergoing a similar rebirth. Huge banks of tape players are being (or will be) replaced by digital storage devices. Big and somewhat formidable players—like Scientific-Atlanta, General Instrument and Digital Equipment Corp.—are adding their wares to the technological marketplace. And, CableLabs has set out to recommend a "technical vision" for the ad business that far supersedes anything commercially available today.

These facts combine to make the cable ad sales segment a business to watch over the next few years.

"The be all and end all (for ad insertion) is not just digital compression of ad spots," says Chris Bowick, group vice president of technology for Jones Intercable and chairman of CableLabs' Advertising Technology Task Force. "The be all and end all will be the day the national agencies feel comfortable working with the cable industry."

Digital storage

At the forefront of technological development today is digital storage of video advertisements, a move that could leapfrog even laser video storage. Simply put, operators are tired of the maintenance and general mechanical failures associated with video tape machines—and they don't want to spend the money for laser play-and-record machines when a digital solution is seemingly so close.

"Obviously, the first thing is to get rid of the tape machines," Bowick asserts. "The way to do that is to employ digital storage media."

Those media currently include MPEG (the Motion Pictures Experts Group), JPEG (the Junior Photographers Experts Group) and General Instrument's DigiCipher compression technique. Predictably, manufacturers working on storage media have varying views on which algorithm works the best.

Channelmatic, for example, has put its eggs in the MPEG compression basket. At the Western Show next month, the company will show off its new AdCart/D system, which includes a digital encoding and playback system.

The system will offer selectable degrees of picture quality, from U-matic resolution to Betacam quality. It will also offer a failsafe the company calls "dynamic memory management," which in essence shares spot files across all insertion channels via multiple disk drives. "The idea is, if any one disk drive fails, the spots on that drive are backed up on other drives. So you can substitute a spare drive that will automatically load those spots," explains Tom Walsh, VP of business development for Channelmatic.

Indeed, the heart of most insertion compression schemes under development is a network which essentially replaces existing banks of VTRs with modified personal computers. Whatever compression technology is used is housed on a circuit board that slides into the insertion controller/PC for a given channel. Insertion controllers, instead of switching VTR outputs to the system, will simultaneously decompress and switch the digitally stored commercials out to the system in an analog format.

Up front costs will be high, Walsh says, generally because of the technology used to encode and store the digital spots. "Initially, the encoding end will probably require a minicomputer, because of the storage and speed requirements to compress the spots," Walsh says. As opposed to microcomputers, minis can cost anywhere from $20,000 to $60,000.

The process

To digitally compress and encode video spots, Walsh explains, a master spot reel is played (via VTR) directly into a computer. The computer converts the NTSC video from analog to digital, then compresses the signal. "Using MPEG, you can squish a 30-second spot from about 800 megabytes down to around 10 megabytes," Walsh says. MPEG technology offers in the range of 180:1 compression, depending on motion content.

"The only drawback (to MPEG) at this point is that compression does not happen real-time," Walsh offers. However, he says, real-time MPEG compression should be available next year.

Most commercial insertion manufacturers vying to edge forward in this new, compressed advertising world are opting to buddy up with existing companies knowledgeable in compression methodologies. Channelmatic, Telecommunication Products Corp. (TPC) and new entrant Digital Equipment Corp. (DEC), for example, are all acting as systems integrators in the development of compressed digital systems.

In addition to DEC, which recently acquired Basys/LaKart and Jefferson Pilot under the auspices of an independent business unit called "Digital Cable Television," there are other non-traditional manufacturers also keeping a close eye on the marketplace—like General Instrument and Scientific-Atlanta.

CableLabs' Director of Technical Operations Projects Scott Bachman says this of the new entrants: "These aren't `small potato' companies. I think it's key for the existing developer community to recognize that. Clearly, this isn't a discussion that's going on just with the traditional vendors in the commercial insertion marketplace."

DEC's new business unit, for example, sees the ad insertion business as a small step toward its somewhat larger goal—to team with cable to provide multimedia solutions. "We've been installing local area networks in buildings and campuses for over 10 years," explains Jim Albrycht, a senior consultant for DEC. "Now we'd like to extend that into the community by using cable's existing physical infrastructure. To do that, we'd overlay a digital logical topology onto cable's point-to-multipoint topology, ultimately making it multipoint-to-multipoint."

DEC has embraced JPEG as its compression scheme, citing a desire to shift to the more powerful but as yet unavailable MPEG-2 standard once it's ready. "The advantage of JPEG is that we can get high quality output, and we can compress real-time," Albrycht says.

Scientific-Atlanta's foray into ad insertion happened seven months ago, when it signed an agreement with Chicago-based Mediatech, an ad duplication and distribution company. The

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agreement enabled S-A to provide an end-to-end satellite digitally compressed system, including storage and insertion capability. Initially, S-A announced it would deploy its vector quantization scheme to compress the multiple ads. Since then, S-A has instead opted to use MPEG.

And in New York, General Instrument signed an agreement with Cablevision Systems Corp. to supply digital compression encoders and decoders to feed four different groups of ads to the New York interconnect. Under terms of the agreement, GI will install its DigiCipher compression equipment to deliver up to 10 channels of video on one satellite transponder.

Why are these big companies nudging their way into the ad insertion business? Probably because if CableLabs efforts come to fruition, and a recommended platform for the ad business is embraced by the industry, there's a big dollar potential. *Really* big. Like $800 million big, or 5 percent of the total U.S. video ad market, if Bachman's calculations are correct—and a cohesive industrywide plan is put into motion.

CableLabs' white paper

While the road to that payday may seem long and curved, at least there's a map—or there soon will be. Last month, as part of its continuing quest to sort out the ad insertion conundrum, CableLabs sponsored a meeting attended by more than 70 persons who make their living via commercial insertion.

The group, which consisted of ad salespeople, manufacturers and programmers, arrived in Denver with an 89-page document draft titled "Cable Ad Sales: Business Goals, Objectives, Strategy and Technical Vision" tucked in their briefcases.

The document will ultimately become what Bachman calls a "white paper" on the business of ad insertion. It's main technical focus is figuring out how to create a "cable ad sales integrated, multimarket, multilevel electronic highway."

"Last January, we got several ad sales people together to discuss the business of ad sales," Bachman explains. "This document is the culmination of that effort. Now, we want the other participants within the industry to examine it as kind of a `course correction.' "

Bachman emphasizes that the outcome will be a set of CableLabs recommendations on how to best go forward: "The paper is the current stage. The next level is specific protocol development, again, as a guideline or recommendation from the task force."

In the technology portion of the draft, the task force outlined several system outputs it would like to see from insertion hardware and software, including, among others:

- automatic spot inventory management (software),
- real-time, automatic make-good capability (software),
- cross-channel promotion capability (hardware),
- transmission encoding to accommodate storage medium (hardware),
- enhanced verification ability (hardware).

Bowick, who has led the Task Force since its formation in January, says the software will be the largest obstacle to overcome. "I don't think a big technical hurdle is going to be what compression system is used. Rather, it's the platform itself—the software. The actual development of protocol at these various interface points is going to be a huge, huge software task."

Of course, that's probably similar to what Michelangelo said when he first set eyes on the Sistine Chapel . . . CED

By Leslie Ellis

Cable's role in telecommunications

Confab examines operators' efforts to deploy new services

Editor's Note: *This month,* CED *kicks off a new department, called Horizons. The purpose of this feature is to stay abreast of developments affecting the evolving broadband pipeline to the home. In future issues, this department will examine cable operators' efforts to deploy new services like multimedia, telephony (PCS, competitive access, etc.) and video-on-demand. You'll also be exposed to telco efforts to deploy video services and quell competition for voice traffic, among other subjects. Readers are encouraged to contact* CED *editors with comments. Persons wishing to contribute articles are also invited to contact the editors.*

Set before a Washington, D.C. background that threatened to re-regulate the cable television industry (an event that has since taken place), Telecommunications Reports and The Yankee Group hosted Telco-Cable IV, a two-day conference in September that reviewed CATV's potential role as a provider of interactive television, video-on-demand and telephony services via competitive access.

While telephone company representatives were conspicuous in their absence from the podium, a quick read of name badges provided ample evidence they were in attendance in large numbers.

What they heard was cable's new attitude—that cable TV, via and evolutionary network upgrade strategy that embraces both fiber optics and video compression, is the one most likely to be sought after by computer firms and others who want to distribute interactive full-motion video to the American public.

Extending the olive branch

But the real message that came straight from the lips of the cable operators who took the dais was that MSOs are apparently prepared to abandon a longstanding policy of keeping telcos at arm's lengths and are instead exploring ways to ally with telephony providers to offer new services to businesses and yes, even consumers.

"Despite the public portrayal of bitter telco and cable rivalry, we are seeing the development of cooperation between these two industries," said Michael Ritter, president and COO of Continental Cablevision. Examples include TCI's video-on-demand test with US West and AT&T in Denver; Continental's experiment with GTE in Newton, Mass.; and various partnerships in the U.K. and other countries that combine cable-TV and telephony services.

Similar comments were made by cable operators who have either tested the alternate access markets or jumped in with both feet. Jim Krejci of Jones Lightwave, Bruce Ravenel of Tele-communications Inc. and Gaylynn Lankford of AlterNet all said they would welcome discussions with telcos regarding partnerships.

Krejci asked: "Why not joint plant?" His presentation showed that one economic model comparing the cost of constructing an integrated CAP (competitive access provider) and CATV fiber network would be 34 percent less expensive to build than separate CAP and CATV fiber networks serving the same area. Jones, which has already partnered with PacBell in the U.K., claims that cable will soon have the required plant capacity for high-speed data communications at low cost in most large urban and suburban areas.

A similar theme was sounded by Ravenel. "I think this is going to be a decade filled with alliances" between cable and local exchange carriers and cable and interexchange carriers, he said. From TCI's perspective, it's partnerships with US West have been primarily successful, he said.

For example, during the trial of VCTV (Viewer Controlled Television—a market test of video-on-demand), "we learned we're more alike than differ-

Network topology economic analysis

	Network			
	Twisted pair	PON POTS	FTTC	Hybrid
Costs (month/sub)				
POTS distribution	$14	$18	$15	$8
POTS switch	$2	$2	$2	$0.40
ADSL transport	$29	$5	$110	$1.60
Network maintenance	$20	$15	$15	$10
Revenue (month/sub)				
Local voice	$25	$25	$25	$25
Video	$30	$30	$30	$30
Total	-$10	+$15	-$87	+$35

Note: Model assumes 100% penetration for voice services and 20% penetration for video services.
Source: First Pacific Networks

ent," he said. "The key to a successful alliance is relationship building," added Ravenel. The idea to form alliances between cable and telephone companies goes back several years, but Ravenel says cable companies were highly suspicious of such arrangements.

Competitive aspects

But along with alliances will come competition—if legislators allow cablecos and telcos full and fair entry into each other's core business, said Ritter. "The cable industry must be prepared to engage in a full discussion of the telco TV entry issue," he noted. "We must engage in a genuine debate over reciprocal entry for both telco *and* cable." The key will be a national public policy that fosters open competition instead of a series of regulations that maps the future according to government guidelines, Ritter said.

In the open and unregulated market, Continental has spent more than $600 million to upgrade its physical plant, Ritter said. Furthermore, the cable industry has increased its investment in fiber optics by 400 percent since 1988, and within five years, the majority of Continental's trunk system will be fiber, he added. "Our industry is not waiting for the government to diagram what the future should look like or to promise us rewards for our investment."

In addition, Regional Bell Operating Companies (RBOCs) are likely to experience competition from their brethren as each RBOC weighs the benefits of venturing outside its present service area, Ritter said. "I would not be surprised to see such competition in place within the next year," he noted.

One keen industry observer believes telephone companies will experience significant competition from cable companies because the entertainment TV market is saturated. Howard Anderson, managing director of The Yankee Group, said cable operators are seeking new markets because their growth is slowing down. He says their primary choice for new business is wireless.

Anderson said wireless is the linchpin for cablecos, because: it may reduce installation costs; it opens the door for "jukebox" services, local and long distance voice services and PCS; and because it "worries the RBOCs."

Anderson predicts that cable operators will leverage their fiber implementation strategy and presence of convertors in the home to develop two-way services using neighborhood base stations. These two-way entertainment services then provide the perfect segue into two-way voice services, he added.

In addition to examining wireless strategies, cable operators expect to leverage their ability to place fiber through business parks in major markets to capture some of the competitive access market. According to Mark Lowenstein of The Yankee Group, the CAP (competitive access provider) market today is already highly active: 32 cities had CAP networks as of the end of 1991 and he estimated that 38 of the top 50 cities would have CAPs by 1993. During that time, The Yankee Group estimates the CAP market will grow from $140 million in 1991 to $235 million in 1993.

However, Lowenstein said the CAP market is at a crossroads: original areas of competitive advantage have eroded, but access, along with route diversity and redundancy, have become a more important issue for businesses. Meanwhile, regulatory changes are providing new opportunities for CAPs, he said.

Lowenstein estimates that cable companies influence 60 percent of CAP revenues—and the figure is rising. (This has happened primarily over the last 12 to 18 months, Lowenstein said and was impacted most with the TCI/Cox purchase of Teleport.) "Just as the telcos are focused on fiber to the home," noted Lowenstein, "cable companies are focused on fiber to the business."

Cable investment in CAPs has resuscitated that industry by injecting new long-term capital into a business that had been funded by venture capitalists, said Lowenstein. Cable investment also encourages MANs and may foster new service classes, including regional LAN interconnections, switched video and PCS, he added.

Cable companies that become CAPs will be faced with several key issues, which could become more important as they seek to increase their level of commitment in telephony-like services. Those issues include: dealing with large business customers, becoming familiar with telecom industry vision and execution, facing an evolving and uncertain regulatory environment and managing the CAP investment.

By 1995, Lowenstein said the CAP industry will have consolidated to where there are perhaps two national CAPs with more than $200 million in revenue and some strong "second-tier city CAPs." These CAPs will focus their business plans as a "business LEC" and will in fact work with LECs and IXCs to offer tiered levels of service.

Building the network

If cable companies are planning on implementing services like video-on-demand, interactive programs and multimedia, what type of network does it need to build? Should it be an all-fiber network like the telcos have advocated for years, or is a hybrid fiber/coax system better?

Tom Gillett, president of Gillett Lehman & Associates (who is also a former GTE engineer as well as a former vice president at CableLabs), said a "fiber to the neighborhood" scheme will easily handle the video/voice/data needs of the American household.

He said 1 GHz of analog bandwidth, the rough equivalent to a 6 Gbit/sec data stream, would provide 3,900 T-1 circuits—or about 94,000 voice channels. If fiber was used to serve neighborhoods of about 400 homes, every house could be given two T-1s and a return channel, and 100 analog video channels would still be available.

"If logic prevails, the right network is a hybrid fiber/coax analog/digital system," said Gillett.

Seconding that motion was Rajib Jaluvia of First Pacific Networks, who presented an economic model comparing four different types of networks (see Table 1), including traditional twisted pair, the passive optical network, fiber-to-the-curb and the hybrid fiber/coax topology.

The model assumed 100 percent penetration for voice services and 20 percent penetration in video services. The results were strongly in favor of the hybrid approach.

Fiber vs coax

Countering that thought was Michael Morrison, manager of advanced operations testing for GTE, who spoke about GTE's heralded Cerritos, Calif. fiber-to-the-home technology test.

Morrison said comparing fiber and coax is analogous to a discussion of electricity's advantages over gas for heating and lighting. "Which one won?" asked Morrison. "We will see the same thing with fiber."

Gillett, who was instrumental in designing the Cerritos test when he worked for GTE, said he supports leading-edge trials such as Cerritos, but notes they should be viewed as experiments—not reality. "Cerritos is distracted by a technology debate" he said. Every service available to customers in Cerritos could be done with the existing cable and telephone infrastructures, he added. "That's why I don't think it should be a political mandate to deploy fiber." CED

By Roger Brown

How to improve your customer service image

Once upon a time, I had a washing machine. Now, this was a *good* washing machine. It did a good job of keeping the clothes clean, and never caused a problem. Then one day it happened.

It broke.

This was a personal catastrophe. How can one survive without a washing machine?!

Frantically, I pulled out the Yellow Pages and flipped through the pages until I found the dealer who had told me service was "no problem." I dialed the number and described my predicament.

"You have to call our service number, but they're only in from nine to five," I was told. Quickly, I scrawled down the number on the back of an envelope and hung up. The clock showed 6:15.

The next morning I called the service number and was informed that the next available appointment was the *following* Wednesday. I begged and pleaded for something a little more timely, but to no avail. Then I was told the repairman would arrive sometime between 8 a.m. and 5 p.m. the following Wednesday. Reluctantly, I agreed and hung up.

Wednesday arrived. I took the day off work to wait for the repairman to show. I waited. And waited. And waited. Finally, at 3 p.m. I phoned the service number to see when the repairman will arrive. I was told there was "no way" to know when he's scheduled to arrive at my home. Finally, at 4:30, I see a truck pull into the driveway. The repairman checks the washer for about 10 minutes, then pokes his head out of the utility room and says, "I'm going to have to order a part. I'll be back on Tuesday."

"Huh?" I answer. "What time will you be here?" He tells me he can't promise a particular time. I was outraged. "You mean I have to take *another* day off work?"

Time is of the essence

The point of this story is that customers place a significant value on time. If we wish to provide good customer service, then we will have to make ourselves available to our customers when it is convenient for *them*, not when it is convenient for *us*. In addition, we must reduce the time the customer is required to wait for us.

Modern lifestyles have inflated the value of time to our customers. Increasingly, we are finding fewer and fewer people who actually spend significant time at home during traditional business hours. Because of these factors, it is becoming increasingly important to mold our customer service activities around the schedules of our customers.

This impacts our business, as well. It is not uncommon to find the single highest "fix" reason for service calls to be that the customer was not home. This wastes a considerable amount of time for our service personnel and requires us to do things like calling ahead to see if someone is home, or to call while the service technician is standing outside the home to see if there is anyone at home. It would be much more productive if we could use that time in providing service to customers while they *are* home.

A solution?

Is there an answer to the "not home" problem? For the last two years, we have been debating this problem. The NCTA customer service standards provided some goals aimed at reducing the overall time period to correct a service problem, but it became clear to us that those recommendations did not go far enough. The problem was not just how soon we respond to the problem, but how much of a time commitment must be made by the customer.

To combat this problem, we established some guidelines around which to mold our service:

- All service calls should be completed within 24 hours.
- Customers with no signal get priority service the same day or—at worst—within 12 hours.
- Customers will be given a relatively short time frame in which we will arrive at their homes.
- Hours will be expanded to allow those customers who cannot be available during the traditional 8 a.m. to 5 p.m. business day.

These guidelines are pretty straightforward. All that was left, then, was to establish procedures to put them into use.

Putting guidelines into action

Confronting this problem required some major rethinking of the logistics of a service call. It was clear we needed to give customers a smaller arrival/duration window to be at their homes. We eventually settled on dividing the day into six time periods of two hours each.

Now, when customers call, they are given a choice of available time slots. After the day is full, there is still a certain amount of overflow available for customers who have lost all pictures.

The schedule for service calls was changed to range from 8 a.m. to 7 p.m., Monday through Friday, and 8 a.m. to 5 p.m. on Saturday. This increased the available hours from 40 per week to 63 per week—more than a 50 percent increase.

The concept of this program was deceivingly simple, but its implementation was much more involved. Accommodating the much narrower time slots and meeting the response time goals required an in-depth look at the mechanism used to take, schedule and complete service calls. By modifying our procedures to take into account these new guidelines, we were ultimately able to provide better service to the customer.

The management of service calls was deemed to be the key to this program. If we could not effectively take the calls, assign them a time slot that was not already full and dispatch them to the field, the program was sure to fail.

As it turned out, our subscriber billing program had many features built in to assist in this process. We found it simple to set up the two-hour time periods in the system, and assign the time slots a quota of calls that cannot be easily overridden.

After the calling slots have filled up for the day, no picture problems are entered as "must do." These would not be given a specific time slot, as they usually are only used in the afternoon. Communication with the customer service department is crucial. Effective communication here assures that we are not making commitments we cannot keep.

Dispatch bears the brunt of the real-time service call management. It must

—*Continued on page 67*

By Jeffrey A. Spence, Director of Engineering, U.S. Cable of Northern Indiana

Digital transmission techniques, Part III

In the first two articles, the digitizing of voice and various multiplexing methods were presented. This article will look at various systems for transmitting the digital signals.

Each level of transmission hierarchy has its own type of transmission system. Remember from previous articles that the hierarchy level refers to the speed of transmission and related protocols, whereas the transmission system is the equipment designed to transmit each level or combination of levels. For example, DS-1s can be transmitted individually or in multiplexed groups up to OC48 rates (2.488 Gb/s).

Transmitting DS-1s

For DS-1 transmission (1.544 mb/s), a pair of fibers and a pair of fiber optic modems (modulator/demodulator) is used. These modems convert the DS-1 electrical information to light (generally at 1310 nm, although some utilize 850 nm), transmit and receive the DS-1 data stream and convert it back to electrical signals. At this point, the signal interfaces with a channel bank or a PBX (private branch exchange) containing an internal channel bank.

Unfortunately, the economics of a single DS-1 transmission are poor considering the cost of installing fiber and low bandwidth utilization. Yet, there are customers who need, and are willing to pay for, this type application.

For multiple DS-1 transmission at rates less than DS-3, there are several companies that provide very good low-rate multiplexers with an optical output. These multiplexers are available in 850 nm multimode systems and 1310 nm multi- and single-mode systems. The economics of these systems are better as the multiplexers are capable of transmitting multiple DS-1s on a pair of fibers, while aggregating or carrying higher levels of traffic for a single user.

Most transmission systems are equipped to handle multiples of four DS-1s per circuit pack, which feeds into an optical transmitter. Some manufacturers' equipment can handle up to 16 DS-1s in this type of multiplexer. However, it is a challenge to transmit high speeds on multimode fiber because of the bandwidth restrictions of multimode. It should be noted that there is no "standard" for multiplexing rates for eight or 16 DS-1s. This lack of standardization results in incompatibility between vendors' equipment, demanding that users have identical equipment on either end of the transmission.

By Randy Reynard, Director of Training, Optical Networks International

Transmitting DS-3s

The next level of transmission is the DS-3 rate (44.736 mb/s). From previous articles this should be recalled as the equivalent of 28 DS-1s. As traffic levels increase above 12 to 16 DS-1s (depending on the multiplexers in use) it becomes more economical to use DS-3 equipment. Most DS-3 transmission equipment is provisioned[1] in groups of four DS-1s with up to seven groups of four per DS-3 time slot.

If fewer than 28 DS-1s are needed, only the necessary packs to carry the required traffic are provisioned. Some manufacturers' equipment requires a "dummy card" in slots that are not provisioned with "low-speed" (DS-1 rate) cards.

Depending on the application, some DS-3 multiplexers have optical and/or electrical outputs, while others may be expandable to handle up to four DS-3s or approximately 180 mb/s or more. There are network management systems available for some DS-3 transmission systems, as well as redundancy capabilities for both the electronics and the optical transmission equipment. It is worthy to note that redundant optical transmission cards do little good if there is not a diverse transmission path. Historically speaking, the fiber cables are cut much more often than the electronics fail.

Beyond DS-3s

Once a system reaches the point where transmission of even larger groups of DS-1s is necessary, it may be valid to consider building a SONET (synchronous optical network) based network. SONET offers considerable flexibility because of the "add/drop" capabilities of SONET multiplexers. Another feature of SONET is the direct interface capabilities with other equipment such as DACS (digital access and cross connect systems), which allow for rerouting and switching of circuits, along with considerable network management. These features are not available in the asynchronous transmission environment of DS-1s and DS-3s.

In any case, there should be cross connect points provided for testing at both the electrical interconnect points and the optical interconnects. This is accomplished with patch panels. There are patch panels specifically designed for DS-1 (DSX1 patch panel), DS-3 (DSX3/4) and optical connections. The patch panels are used for circuit routing, testing and troubleshooting. Optical switching units are also coming onto the market.

At the same time that transmission equipment is being considered, test equipment should also be investigated. A basic DS-1 test set should have the ability to at least look at signaling, framing and bit error rate (BER). Even more desirable is the ability to break out the DS-1 to DS-0 signals and have monitoring and measuring capability at the DS-0 rate.

If DS-3 transmission is to be accomplished, some of the asychronous transmission equipment should have at least rudimentary self-testing capabilities; SONET equipment already has enhanced levels of self-testing. Just as no self-respecting cable television operator would attempt to operate cable systems without some sort of signal level meter, it would be difficult to perform digital transmission without digital test equipment.

Because digital transmission techniques differ so much from the traditional cable television transmission, it is important to train technical personnel in the basics of digital transmission, networking, system design and troubleshooting. CED

References

1. Provisioning refers to the installation and configuration of the individual circuit packs designed to handle the various levels of traffic.

SCTE®

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

November 7 *Rocky Mountain Chapter* Installer exams to be administered. Contact Patrick Kelley, (303) 267-4739.

November 8-9 *Old Dominion Chapter* Annual membership meeting and elections to be held. Installer and BCT/E exams to be administered in all categories at both levels on the 8th. Contact Margaret Davison, (703) 248-3400.

November 9 *Magnolia Chapter* "Cable Basics" with Richard Covell of Texscan. To be held at the Ramada Coliseum, Jackson, Miss. Contact Steve Christopher, (601) 824-0200.

November 10 *Badger State Chapter* "Effective System Sweeping" with Lance Banister of Wavetek and John Boltic of Cable Systems Testing Co. To be held at the Holiday Inn, Fond Du Lac, Wisc. Contact Gary Wesa, (414) 496-2040.

November 10 *Central Indiana Chapter* BCT/E exams to be administered in all categories at both levels. Contact Gregg Nydegger, (219) 583-6467.

November 10 *New York City Chapter* "What's Flying—PCN, Digital Compression and Commercial Insertion" with Ernie Gregory. Contact Rich Fevola, (516) 678-7200.

November 10 *Wheat State Chapter* "New FCC Regulations Affecting Headends and Subscriber Levels." Contact Lisa Hewitt, (316) 262-4270, ext. 191.

November 10 *Delmarva Meeting Group* "Fundamentals of Fiber Optics" with Bob Harris of C-Cor; "Fiber Construction" with Tom Polis of Communications Construction Group; "Signal Level Meters" with Terry Bush of Trilithic. To be held at the Dover Sheraton, Dover, Del. Contact Linc Reed-Nickerson, (215) 825-6400

November 11 *Appalachian Mid-Atlantic Chapter* Annual business meeting with election of officers. To be held at the Holiday Inn, Chambersburg, Pa. Contact Richard Ginter, (814) 672-5393.

November 11 *Great Plains Chapter* "Basic Troubleshooting." To be held at the Knolls Restaurant, Lincoln, Neb. Contact Jennifer Hayes, (402) 334-2336.

November 11 *Greater Chicago Chapter* "Professional Customer Relations: What it Takes." To be held at the Willowbrook Holiday Inn, Willowbrook, Ill. Contact Bill Whicher, (708) 362-6110.

November 11 *Oklahoma Chapter* "First Aid/CPR." Contact Arturo Amaton, (405) 353-2250.

November 11 *Palmetto Chapter* "Audio and Video Signals and Measurements" and "Spectrum Analyzer Usage." To be held at the University of South Carolina, Columbia, S.C. Contact John Frierson, (803) 777-5846.

November 11 *Piedmont Chapter* "Safety" and "Utility Locating Services." Annual membership meeting and election of board to be held. Contact Tod Dean, (919) 662-1489.

November 12 *Lake Michigan Chapter* "Grounding and Powering" and "Safety—MIOSHA." To be held at the Days Inn, Grand Rapids, Mich. Contact Karen Briggs, (616) 531-5710.

Tektronix Television Systems

Tektronix is offering a series of full-day seminars covering baseband and RF measurements. The seminars offer both theory and application-oriented training, with the goal being to give each student a comprehensive understanding of system distortions and their effect on system performance, system proofs and FCC requirements. Each participant receives a workbook including reference information about distortions and signal measurement. Also, participants are eligible to win a video reference library valued at $250. The workbook, related literature and a luncheon are included in a $125 registration fee. The dates and locations are:

November 4
Washington, D.C.
November 6
Philadelphia, Pa.
November 18
New York, N.Y.
November 20
Worcester, Mass.

For more information, call Kathy Richards at (503) 627-1555.

TRADE SHOWS

December 2-4 *The Western Show* To be held at the Anaheim Convention Center, Anaheim, Calif. For registration materials, call (510) 428-2225.

January 6-7 SCTE Emerging Technologies Workshop To be held in New Orleans, La. Contact SCTE headquarters at (215) 363-6888.

February 24-26 *The Texas Show* To be held at the San Antonio Convention Center, San Antonio, Texas.

April 22-24 *SCTE Cable Tec Expo '93* To be held in Orlando, Fla. Call SCTE headquarters at (215) 363-6888.

June 6-8 *The National Show* To be held in San Francisco, Calif.

RETURN PATH

This month, we'd like your thoughts about cable system outages. Most operators say their biggest headache is outages. Industry reviews by such notable publications as Consumer Reports are often filled with complaints about outages at inopportune times. Now we'd like your thoughts on the issue.

To respond to the survey, simply make a copy of this page, fill out the questionnaire and return the survey to our offices (via fax to 303-393-6654 or mail to 600 South Cherry Street, Suite 400, Denver, CO 80222). We'll tally the information and print the overall results in a future issue.

So, if you've ever wanted to add your input to the industry's conventional wisdom surrounding these issues, now is the time to do it.

Please answer the following questions as honestly as you can. Remember, no names will ever be used.

System outages

	Yes	No	Don't know
1. Would your system term a loss of signal for five minutes or less an "outage"?			
2. If not, what is the definition of an "outage" at your system? (Define)			
3. How many outages would you guess your system typically suffers in a month's time?			
4. Has your system taken steps to reduce the number of outages it experiences?			
5. If so, what steps has it taken?			
6. Do you think your system could do more to reduce outages?			
7. Does your system currently use status monitoring devices?			
8. If not, has your system considered purchasing equipment to monitor the outside plant?			
9. What is the source of most of your system's outages? (Electronic failures, traffic accidents, cuts in cable, etc.)			
10. Does your system use devices to protect current and voltages?			
11. Has your system performed surveys to determine subscriber attitudes about outages?			
12. Does your system adequately track the location and cause of outages?			
13. Has your system worked with the local power company to reduce outages?			
14. Would you consider your local power company to be reliable?			
15. Are you familiar with CableLabs' Outage Reduction Task Force?			
16. Do you plan to follow CableLabs' recommendations to reduce outages?			

Please provide the following information:
Your title_____
Your job function (ie. engineering, technical, etc.) _____
The size of your system (# of subs) _____
The length of your CATV career (years) _____
The state in which you work _____
Your MSO (optional) _____

The CABLE POLL

Midwest CATV • CED • Cablevision

1993 rebuild/upgrade plans mirror 1992

Forty-three percent of GMs say they'll upgrade or rebuild next year

Vendors hoping 1993 will herald a boom in operator buying patterns may want to rethink their plans. According to the most recent edition of Cable Poll©, 1993 forecasts parallel what GMs said they'd do this year.

In all, 43 percent of the 200 general managers interviewed say they'll rebuild or upgrade next year. Fifty-two percent say they will not. That compares to a 43/49 percent split last year on the same subject.

Again this year, GMs say the biggest reason they want to improve plant is to offer more new services. That came in as the largest motivator, at 49 percent. Second was improved system reliability, at 26 percent. A handful, at four percent, report franchise renewal as a determining factor.

Of the operators who do plan to upgrade or rebuild plant, most (78 percent) say they'll approve an increase in capacity. Although 68 percent say they won't go as far as to build to 1-GHz, nearly 40 percent say they'll at least deploy 1-GHz product—which may suggest that operators are indeed planning for the future by spacing amplifiers to a gig and deploying 1-GHz passives.

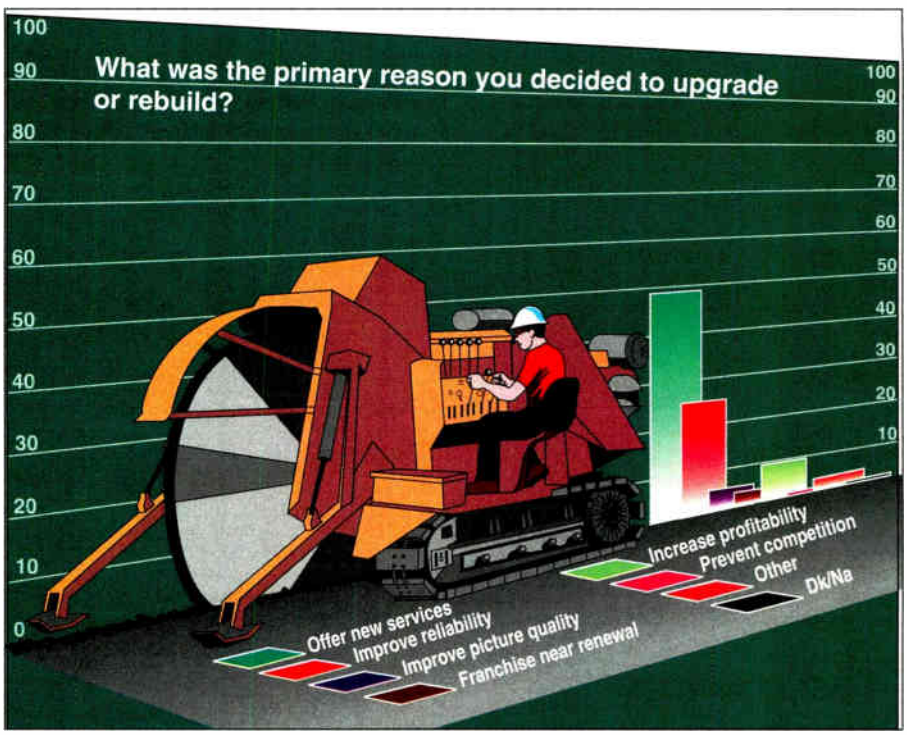
Compression

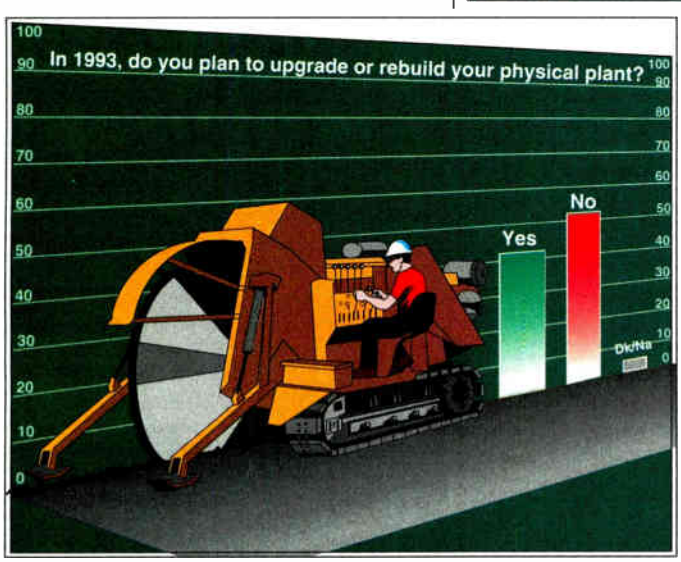
Still, of the 200 GMs polled, more than half (55 percent) say they have little need for expanded bandwidth in the next 12 to 18 months. That leaves 41 percent who say they will need more channels. Four percent aren't sure.

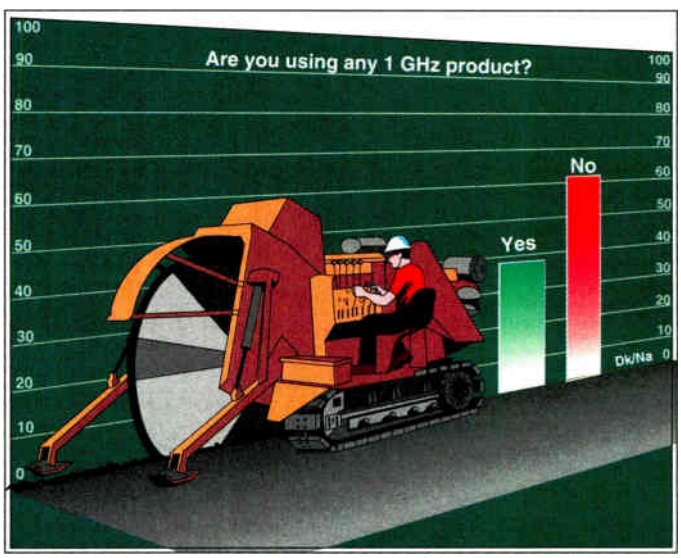
Almost 29 percent of the GMs polled say they plan to utilize compression technologies as a means to extend current architectures, which is up from 25 percent in last year's Poll©.

Are operators simply waiting to see which bandwidth-enhancing technologies shake out of the current technology cornucopia? Perhaps a future Poll© will help to answer that question . . . CED

By Leslie Ellis







SCTE forms Construction and Design Committee; sets four groups

At the 1992 SCTE Cable-Tec Expo, a new subcommittee was formed: The Construction and Design Recommended Practices and Standards group. The committee recently had its first working session in Denver, Colo.

At the meeting, four working groups were established, as follows:

- Basic construction—lead by Paul Wilson of Comm/Scope and Roger Redden of Colony Communications
- Fiber construction—lead by Bernie Czarnecki of Cablemasters Corp. and Patrick Kelley of TCI
- Upgrade/rebuild—lead by Sally Kinsman of Augat Comm. Group, Inc. and Roger Seefeldt of Jones Intercable
- Design—lead by Dale Lutz of Engineering Technologies Group and Joseph Selvage of Adelphia.

The meeting included a goal-setting session, where the groups resolved to develop a generic cable specifications manual for the purpose of recommending standards and practices. Also, the subcommittee will developed recommended standards and practices consistent with the training objectives of both the cable industry and the SCTE. Lastly, the group will try to strengthen cable's overall information dissemination and communication involved construction and design practices.

The group is seeking soliciting written data and input in any of the four working group areas. To do so, contact Keith Burkley at (303) 799-05517.

The subcommittee will reconvene at the Western Show on December 1.

Fiber cleaver

New from **Alcoa Fujikura Ltd.** is its CT-100 series optical fiber cleavers designed for high production single fiber and mass fusion splicing applications in the field. Company officials submit the cleavers can accurately score and cleave singlemode or multimode optical fibers with average cleave angles of less than 0.5 percent.

A redesigned base unit (CT-100) offers a new style scriber blade and improved anvil for cleaves of individual fibers or up to 12-fiber cables in a single operation. Also, a new switch allows instant positioning of the blade for cleaving normal silica fibers or titanium coated silica fibers.

The 12-position scriber blades provides approximately 1,000 cleaves of single silica fibers in each position, for a total of 12,000 cleaves before blade replacement. When used for mass (12-fiber) cleaves of normal silica fiber, the blade produces a total of 1,000 cleaves.

For more information, call (800) 866-3977 or fax inquiries to (803) 439-1739.

Coring and stripping tool

New from the **Cablematic Division** of the Ripley Co. is a double helix design combination tool for stripping and coring all sizes of **Trilogy** MC² cable. A 45 degree bevel cut of the sheath makes

Ripley Company's Tool / MC² Cable.

connector interfacing easier, and eliminates potential O-ring damage. CST models are available in either fixed "T" handle or ratchet "T" handle versions, for both 0.440 and 1.000 sizes of Trilogy cable. For more information, call (203) 635-2200.

Portable antenna

Comtech Antenna Systems has introduced its new 1.8 meter Ku "flyaway" antenna system, so named because the antenna can be packed in three airline baggage checkable cases. The elevation over azimuth mount case doubles as a wheeled carrier for the two reflector/feed cases, such that one person can maneuver the unit through airports.

The antenna is available with transmit/receive Ku feeds for video, SCPC, or data transmission. An optional C-band transmit/receive feed is also available. For more information, call (407) 892-6111.

Video transmission system

New from **Math Associates** is a fiber optic transmission designed to send wideband video signals up to 30 MHz in bandwidth over a fiber optic cable.

The system, called "Fibervision FX/FR 1560," is compatible with standard video formats including NTSC, PAL and SECAM. It features a 3 dB bandwidth of 30 MHz and is suitable, officials say, for wideband analog video transmissions "of all kinds." For more information, call (516) 226-8950.

Midwest stocks handhelds

Midwest CATV has announced a distribution agreement to supply "every major type" of remote control hand held transmitter for set-top convertors. The stocking agreement enables Midwest to offer units with dual diodes, wider angles of operation and low battery indicators. The company is also offering customized logo overlays so that operators can tailor the remote's look. For more information call (800) MID-CATV.

Tone detection kit

New from **Noyes Fiber Systems** is a tone identification system for use on dark

Noyes' tone identification system.

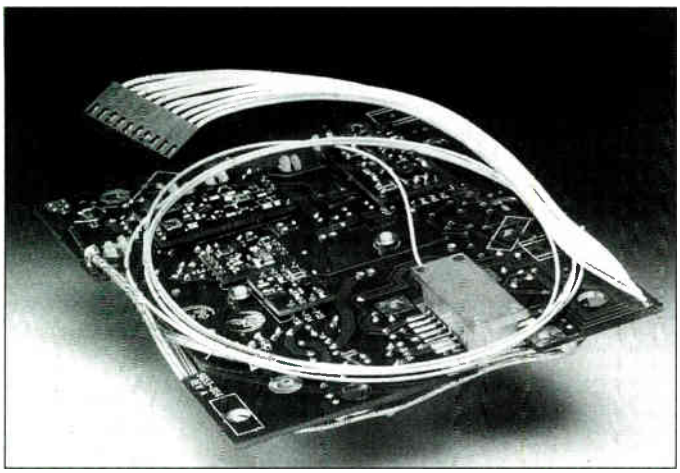
fibers. When its new OLS2-1300 laser source is modulated from a central office (at 2 kHz), the signal is detected by the OFI 200 at remote splice locations or cutover points within the fiber network. For more information, call (603) 528-7780.

DFB transmitter

New from **Ortel Corp.** is its Model 3610C, 860 MHz DFB transmitter board for cable television applications. "There are two ways to transmit at 860 MHz. One is to use to lasers and split the frequency band in two," explains Larry Stark, director of marketing for Ortel. "The other method is to use a single, high performance laser."

The board uses a patented pre-distorter compensation circuit that extends the performance of standard 550 MHz production lasers to meet the 860 MHz performance.

For more information, call Ortel at



Ortel's 860 MHz DFB transmitter board.

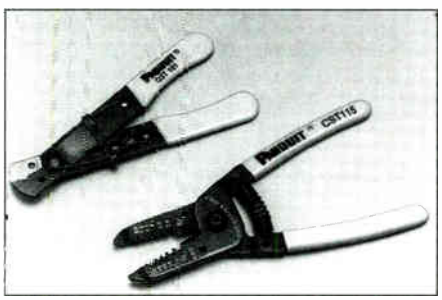
(818) 281-3636.

Wire stripping tool

Panduit Corp. has announced development of two tools used to strip and cut wire. The CST115 tool is designed with ground strip pockets and cutter blade, and has a plier nose for pulling wire. Paint-filled legends allow easy identification of wire sizes.

The CST101 tool features a track adjustment for repeated stripping of a particular wire size. A cutter blade ensure a clean scissor cut, and a return spring and slide lock to provide tool manageability.

Both tools cut and strip wire sizes in American Wire Gauge (20-10 AWG) and in metric sizes. Also, both tools have a loop hole for hooking wire. For more information, call (800) 777-3300, ext. 2310.



Panduit Corporation's wire stripping tools.

Satellite software

A new software program designed by **Superior Satellite Engineers** allows users to calculate look angles of geosynchronous satellites.

The program features ZIP-code lookup of latitude and longitude for all U.S. domestic locations. The user enters the zip code of the antenna location, and the program then finds the site's latitude and longitude in a master data file. The program then uses this information to calculate the look angles to all satellites listed in a file of satellites.

In addition to latitude and longitude, the data file also contains magnetic declination information about the ZIP code locations. Because of that, the listing of lock angles contains magnetic azimuth information as well as true azimuth and elevation to the satellite.

For locations not covered by ZIP code data, the user can enter latitude and longitude and declination information, and the program will calculate the look data.

The price of the program is $149.95. For more information, call (916) 624-8214. CED

Continued from page 61

keep a constant eye on the calls coming in, and the location and status of all of the technicians in the field. Service calls are routed on a constant basis and dispatched to the field over the radio. It requires that the department look ahead to see what is coming in and try to minimize drive time and still get the proper call done in the proper time frame. In most cases, it is dispatching calls to the field to be completed within a few hours after the call comes in.

The technicians, of course, are the ones who have to be at a certain place at a certain time and correct the problem in time to be at the next place on schedule. We did not want the quality of the work to suffer because of the time constraints, as this would not be doing the customer any real service.

Wasted time

A major concern was wasting time in the field. We felt that with the restrictive time slots, there would be time wasted for the next call, or driving from one call to another over a wide area. The drive time problem would have to be resolved by careful routing of the calls. This would eliminate part of the drive time problem, but not all of it. There is still considerable driving back and forth between areas as calls come in.

To combat the problem of technicians waiting for the next job, we assigned unscheduled work to fill in the time. Rather than having line technicians and service technicians, we have technicians who perform both duties. This provides us with more technicians in the service area to spread the calls around, and also gives them unscheduled work to fill in the gaps.

Of course, the other problem—not having time to complete the call—was an ever-present fear. To resolve this problem, we assigned two lead technicians. These technicians would generally not be assigned calls until they were specifically needed. Their primary purpose was to assist technicians on lengthy or difficult problems, thus allowing us to meet the schedule we set for ourselves. In addition, they perform many plant maintenance procedures and handle most of the outages.

There are times when we cannot meet the guidelines we've set for ourselves. However, by managing pro-actively, we are able to put extra resources into the program for a short time and get back on track quickly. We have generally found that getting help from other areas, such as maintenance at the beginning of a problem, takes less help than waiting for a problem to mushroom. It also provides better service to the customer.

It is hard to quantify the results of this type of program without conducting extensive surveys before, during and after the program implementation. We can, however, examine several factors that did occur during the implementation of this program.

The most significant of these is the total number of service calls to the field—this number has dropped by more than 30 percent! Granted, there were other things going on that had an effect on this dramatic drop, but we feel the most significant factor was the implementation of this program. The number of "not home" service calls has dropped to about five percent.

The quality of service used to be a serious liability to the system in the political and public relations arena. With this program, we have reversed this and put service quality forward as a major asset when dealing with local government and the media.

We feel this program has been a tremendous success. We have very few customers we cannot satisfy with this program. Continued fine tuning will only make it work better. We plan to extend this type of scheduling to installation in the near future. CED

The following companies have paid a fee to have their listing appear in the Upgrade & Rebuild Construction Callbook.

Anchors

A. B. CHANCE COMPANY

A.B. Chance Co.....(314) 682-5521
FAX.....(314) 682-8475
210 North Allen
Centralia, MO 65240
PERSONNEL: Dick Erdel
DESCRIPTION: When it's time to construct, expand or maintain your cable system, rely on Chance anchors and pole line hardware. We've been manufacturing both since 1907 at Centralia, Mo., USA. We're one of the largest manufacturers of anchors and hardware to the telecommunications industry. We have the products, experience and quality you want from a manufacturer.

Foresight Products Inc.....(800) 325-5360
FAX.....(303) 287-3866
6430 East 49th Drive
Commerce City, CO 80022
PERSONNEL: Craig Warnimont, National Sales Manager; David Chandler, President
DESCRIPTION: Manta Ray® utility anchor system anchors are driven into the ground (not screwed). Each anchor proof-tested to insure exact holding capacity. Excellent for hard-to-reach places inaccessible to digger derrick trucks. No digging, no mess, no expensive equipment, and a proof-loaded anchor every time. Approved by major utility companies and contractors worldwide.

Bucket Trucks

Time Manufacturing Co. ....(817) 776-0900
FAX:.....(817) 776-7531
PO Box 20368
Waco, TX 76702-0368
PERSONNEL: Charles Wiley, President; Jack Evans, National Marketing Director; Mike Hermansen, Western Region Sales Mgr.Lee Taylor, Central Region Sales Mgr.; Terry Harrison, Eastern Region Sales Mgr.
DESCRIPTION: Manufacturers of Versalift aerial lifts, telescopic and elbow types, trunk or van-mounted, with working heights up to 65 feet. Sold internationally, through distributors.

Contractors

Bigham Cable Construction Inc. .....(904) 932-6869
PO Box 903
Gulf Breeze, FL 32561
PERSONNEL: Harold Bigham, President
DESCRIPTION: Bigham Cable offers aerial construction, underground construction and fiber optic construction, installs, splicing and balancing for the CATV industry.

Cable Services Co., Inc. ....(717) 323-8518
WATS (National).....(800) 326-9444
WATS (In-State) .....(800) 332-8545
FAX.....(717) 322-5373
2113 Marydale Ave.
Williamsport, PA 17701
PERSONNEL: John M. Roskowski, President; George Ferguson, Vice President
DESCRIPTION: Fiber optic and coaxial turnkey construction which includes aerial and underground, strand mapping, design, material supply, fusion splicing, splicing and engineering.

Kennedy Cable Construction, Inc. .....(912) 557-4751
FAX.....(912) 557-6545
PO Box 760
Highway 280 West
Reidsville, GA 30453
PERSONNEL: Roger Kennedy Jr., President; Deno Jones, Operations Manager
DESCRIPTION: Kennedy Cable Construction, Inc. provides full construction services for aerial and underground cable construction including splicing, upgrades, sweep, balance and fiber optic installation.

NaCom.....(614) 895-1313
WATS (National).....(800) 669-8765
WATS (California).....(800) 767-6772
1900 East Dublin-Granville Rd. #100A
Columbus, OH 43229
PERSONNEL: Joe Govern, VP; Larry Linhart, President
DESCRIPTION: Full service communication contractor providing CAD strand mapping; drafting & RF design; make ready engineering; aerial & underground plant construction; fiber optic installation & splicing; residential installations; CLI detection & correction; pre- and post-wire MDUs, DBSs; traps, audits; converter exchanges; SMATV; and LANs throughout the continental United States.

Schenck Construction.....(206) 668-1300
FAX.....(206) 668-1400
8602 Maltby Road
PO Box 1530
Woodinville, WA 98072
PERSONNEL: Edward A. Schenck, President; Bud Longnecker, VP/Aerial; Imel L. Wheat, Jr., VP/Underground
DESCRIPTION: Aerial and underground cable TV construction; turnkey, fiber optic construction.

Couplers

BT&D Technologies.....(800) 545-4306
500 N. Walnut Road
Kennett Square, PA 19348
PERSONNEL: Ken Miller, Sales Engineer; Ray Taylor, Passive Business Manager
DESCRIPTION: BT&Ds new 1x6 broadband monolithic coupler offers a small footprint, low cost, second sourcing. Enhanced single mode multiport coupler arrays for multichannel splitting and

combining, single window 1x2/2x2 fused couplers, broadband 1x2/2x2 fused couplers, feature a wider industry standard temperature range and excellent temperature stability.

Directional Taps

Eagle Comtronics, Inc.....(315) 622-3402
WATS .....(800) 448-7474
FAX.....(315) 622-3800
4562 Waterhouse Rd.
Clay, NY 13041
PERSONNEL: Alan Devendorf, President; Joseph Ostuni, Vice President Sales and Marketing; Chester Syp, National Sales Manager
DESCRIPTION: Micro Series traps and decoding filters, encoders with extra pre-emphasis, channel droppers, metal shields, directional taps and addressable trap switches with impulse Pay-Pay-View.

Philips Broadband
Networks, Inc. .....(315) 682-9105
WATS (National) .....(800) 448-5171
WATS (In NY .....(800) 522-7464
FAX.....(315) 682-9006
100 Fairgrounds Drive
Manlius, NY 13104
PERSONNEL: Alan Kernes, Vice President of Sales; Roy Schultz, Product Specialist
DESCRIPTION: **Philips Broadband Networks'** 9000 Series Taps and passives are operational to 1 GHz and feature a 90 degree seizure mechanism for easy installation. Dual gaskets keep RF signals pure and protect the housing from extreme environments. A special environmental coating provides excellent corrosion resistance, and brass SCTE F-ports offer galvanic compatability.

RMS Electronics, Inc. .....(800) 223-8312
(201) 601-9191
FAX.....(201) 601-0011
41-51 Hartz Way
Secaucus, NJ 07094
PERSONNEL: Gary Napolitano, President; Fred Mucciardi, EVP; Bernadette Bishop, VP
DESCRIPTION: A full line manufacturer and supplier for passive devices. Products include: Taps, Splitters, Filters, Connectors, Couplers, Standby Power Supplies, Regulated Power Supplies, Transformers, Security Products, Headend Equipment, Coaxial Cable, Installation Supplies and Pedestals.

Dist./Suppliers/Reps

Anixter Cable TV.....(708) 437-5777
WATS (National: .....(800) 854-0443
FAX.....(708) 439-8531
2850 W. Golf Rd.
Rolling Meadows, IL 60008
PERSONNEL: Marty Ingram, President; Peter Wagener, VP/Product Management and Marketing
DESCRIPTION: Anixter Cable TV is a full line supplier of products and operational services for the CATV industry. With stocking locations throughout the country, Anixter Cable TV provides 24-hour delivery and after-hours service for emergencies. Anixter Cable TV stocks everything required to build, operate, and maintain a cable system, including satellite receiving equipment, headend equipment, fiber optics, subscriber devices, distribution electronics, coaxial cable and connectors, aerial and underground construction material, system passives, drop and installation material, tools and safety equipment, and test equipment. Anixter Cable TV offers a variety of custom services backed by superior technical support, training and customer service.

Cable Services Co., Inc. ....(800) 233-8452
WATS (State).....(800) 332-8545
FAX.....(717) 322-5373
2113 Marydale Ave.
Williamsport, PA 17701
PERSONNEL: George Ferguson, Vice President
DESCRIPTION: Distributor of all major manufacturers. Fiber optic and coaxial products for the CATV industry.

Jerry Conn
Associates, Inc. .....(800) 233-7600
PO Box 444
130 Industrial Drive
Chambersburg, PA 17201
PERSONNEL: Bob Sollenberger (813) 753-5127, Bradenton, FL; Bob Glass (704) 732-7637, Lincolnton, NC
DESCRIPTION: **Stocking distributor** offering Diamond, Cable Maid, Alphatrim, Multilink, Tyton, Viewsonics, National Strand, Trilogy LRC, Sterling, Tap-It, Label-Lock, Insulation Systems, Sachs, Cable Prep, Cablematic, Klein, Lemco, Sargent, D'Versibit, Irwin, Radiodetection, PTI Aerial, Telecommunication Products Corporation and EEG Control Locks.
Manufacturer's Representative offering AT&T Fitel Fiber Optic Cable, Moore Diversified Enclosures, Tektronix (CATV Analyzers, Sweep systems, *CMP 500 Automated FCC Test Package*), Federal Telecom, and Control Technology, Inc. Standby Power Supplies.

Drop and Cable

Belden

Belden Wire and Cable .....(800) 235-3362
FAX.....(317) 983-5503
2200 U.S. Highway 27 South
Richmond, IN 47375
PERSONNEL: Nish Teshoian, President; Mike Murphy, Director, Sales; John Valentine, Director, Marketing; Jim Hughes, National CATV Sales Manager; Craig Snyder, CATV Product Manager; Doris Nichols, Customer Service Administrator
DESCRIPTION: Quality manufacturer of CATV coaxial drop cables including Belden Super Drop™ 1 GHz drop cable. Products include RG-59, RG-6, RF-7 and RG-11 in aerial, burial and indoor designs with UL/NEC ratings. Fiber optic trunk cable available in multi-fiber per tube design in armored and all dielectric products. Other cables include headend, plenum, riser and audio products.

Comm/Scope, Inc. .....(704) 324-2200
WATS (National).....(800) 982-1708
FAX.....(704) 328-3400

PO Box 1729
Hickory, NC 28603
PERSONNEL: Mark Manning, VP/Sales and Marketing; Elaine Jones, Customer Service Manager
DESCRIPTION: Manufacturer of quality coaxial and fiber optic cables featuring: PIII, Quantum Reach®, CableGuard®, and Extended Reach® 1 GHz Trunk and Distribution coaxial cables, Optical Reach®, central core and stranded loose tube fiber optic cables, and a full line of coaxial drop cables, including NEC rated and corrosion resistant products.

CORNING

Corning Incorporated.....(800) 525-2524
Opto-Electronics Group
MP-RO-03
Corning, NY 14831
PERSONNEL: Kathy S. Rauch, Market Development Manager - Cable TV; Amy L. Kennedy, Senior Applications Engineer - Components; Curt Weinstein, Senior Sales Engineer - Components; Douglas E. Wolfe, Senior Applications Engineer
DESCRIPTION: Corning Incorporated manufactures a full line of optical fiber and components to meet today's demanding cable TV applications. Optical fiber products include: Corning™ single-mode fiber, and Corning™ dispersion-shifted fiber. Fiber-optic components include: Corning™ couplers and the Corning FiberGain™ module.

TFC TIMES FIBER COMMUNICATIONS, INC.® an LPL company

Times Fiber
Communications, Inc. .....(203) 265-8500
WATS.....(800) 677-CATV
FAX.....(203) 265-8422
358 Hall Avenue
Wallingford, CT 06492
PERSONNEL: John P. Forde, President and COO; Sanford D. Lyons, Director, Sales and Marketing; Frederic N. Wikenloh, Director, Engineering
DESCRIPTION: Times Fiber Communications, the only coaxial cable supplier standardized on GHz bandwidth for trunk feeder and drop cables, is committed to: Quality, service and technology. With over 40 years of experience we continue to lead the industry in product advancement and innovation. Times Fiber Communications is proud to be a part of bringing information and entertainment into the homes of your customers in the United States and in over 30 countries around the world. Times Fiber Communications...where technology meets the bottom line.

Trilogy COMMUNICATIONS INC.

Trilogy
Communications, Inc. .....(800) 874-5649
FAX.....(601) 939-6637
2910 Highway 80 East
Pearl, MS 39208
PERSONNEL: S. Shinn Lee, President; John A. Kaye, Executive Vice President Engineering; James Oldham, Vice President Sales; Boa Kun Liu, Vice President International Operations
DESCRIPTION: Manufacturer of the highest quality air-dielectric coaxial cables MC2. Plus a full line of drop cables, which include X and V UL ratings, along with corrosion resistant compound. Trilogy Communications also manufactures air-dielectric coaxial cables for plenum installations, dual-drop for combined telephone and TV application, and 50 ohm cables for antenna downlink transmissions.

Ground Rod Driving Equip.

FORESIGHT® PRODUCTS INC.

Foresight Products Inc.....(800) 325-5360
FAX.....(303) 287-3866
6430 East 49th Drive
Commerce City, CO 80022
PERSONNEL: Craig Warnimont, National Sales Manager; David Chandler, President
DESCRIPTION: Sidewinder® Ground Rod Driver, a simple, lightweight, easy to use tool that makes ground rod driving safer. Ground rods are installed from ground level, using a standard jackhammer. Does not mark or scar ground rods. Field maintenance is easily performed. Used by major utility companies and contractors worldwide.

Microwave Equipment

HUGHES AML

Hughes AML.....(204) 949-2400
FAX.....(204) 889-1268
260 Saulteaux Crescent

PERSONNEL: Ron Giumond, General Manager; Cliff Gorby, Sales/Marketing
DESCRIPTION: Hughes AML offers a complete line of both broadband and channelized multichannel microwave distribution equipment used to deliver channels of programming to CATV hubs. Hughes also provides a full line of support services such as system design, field engineering assistance, applications engineering, product support (1-800-663-7902) and training seminars.

WESTEC COMMUNICATIONS, INC.

Westec Communications, Inc.
Microwave Sales
and Service.....(800) 666-4441
(602) 948-4484
FAX.....(602) 998-8701
14405 N. Scottsdale Road
Scottsdale, AZ 85254
PERSONNEL: Bob O'Hara, President; Dick Patterson, Customer Service Manager; Chris Radicke, Applications Supervisor
DESCRIPTION: Microwave repair, modifications, upgrades and parts for AML systems. New and refurbished (AM & FM) equipment for sale. Purchase and brockerage of used equipment.

Pedestals & Enclosures

CHAMPION PRODUCTS INC.

Champion Products .....(417) 736-2135
FAX.....(417) 736-2662
Route 1, Box 422
Strafford, MO 65757
PERSONNEL: Rick Huggins, VP Sales and Marketing; Carl Tiedt, VP Operations
DESCRIPTION: Products for OSP buried distribution and building entrance. Products include steel pedestals, apartment boxes, stakes, signs, and

miscellaneous hardware. A complete line of fiber distribution products are also available as well as custom design and fabrication of products to meet specific customer needs.

Reliance Comm/Tec
Reliable Electric Co. Div. ...(708) 455-8010
FAX.....(708) 451-5516
11333 Addison St.
Franklin Park, IL 60131
PERSONNEL: Tom Coyne, Product Manager, CATV Products; Paul Zoba, Product Manager, Fiber Optics
DESCRIPTION: Reliance Comm/Tec, a manufacturer of CATV products for three decades, offers the industry's widest range of high quality, high performance outdoor enclosures for CATV/Fiber optic equipment such as nodes, lasers, repeaters, amplifiers, and other electronic equipment requiring protection. Enclosures are available in both PVC and metal versions. Additionally, the Access 360 degree pedestals permit complete access to internal components.

Powering

Alpha Technologies.....(206) 647-2360
FAX.....(206) 671-4936
3767 Alpha Way
Bellingham, WA 98226
PERSONNEL: Bob Bridge, National Sales Manager
DESCRIPTION: **To expedite emergency orders, contact your local Alpha Sales Representative or call 1-800-32-ALPHA and ask for disaster relief assistance. We are waiting to respond to your emergency needs, let us help.** Alpha Technologies has designed and manufactured innovative and reliable Broadband power products since 1974. Alpha has responded to the latest industry need for UPS, *interference-free* power with the "new" FP Series uninterruptible power supplies. The modular FP Series is designed for small-area traditional AC and dedicated fiber node DC powering applications. Alpha also offers a full line of 60Vac standby and non-standby power for pole, ground, shelf, wall and rack mount applications. The company continues to provide office and headend uninterruptible power with UPS's from 400VA to 15KVA in 120VAC, 208VAC and 240VAC input/output variations. Alpha also provides the industry standard Johnson Controls, Dynasty series, Gel Cell™ batteries. All Alpha power products are available in international voltages and frequencies.

Lectro Products, Inc.....(800) 551-3790
FAX.....(706) 548-5493
420 Athena Dr.
Athens, GA 30601
PERSONNEL: Michael R. Filkins, President; Mike Kearns, National Sales Manager; Alabama (205) 826-2809; Connecticut (203) 875-8805; California (805) 251-8054; Pennsylvania (703) 273-5322
DESCRIPTION: Lectro manufactures a complete line of single ferro and dual redundant standby power systems and a full range of ferroresonant power supplies with outputs of 2 to 18 amps. A wide range of high quality products for conventional and fiber powering for the USA and international markets are available including dual output units for combined CATV and telephone nodes. NEMA rated uninterruptible power supplies and line conditioners available in a range from 300VA to 5KVA.

Scrap Cable Recovery

Midwest Cable.....(219) 892-5537
Services, Inc.
FAX.....(219) 892-5624
PO Box 96
16095 Linden Road
Argos, IN 46501
PERSONNEL: Ken Howard, Accounts Manager
DESCRIPTION: Nationwide buyers of scrap CATV cable and used line gear. Dispatched mobile units. On-site pick up.

Test Equipment

Avantron Communications Inc.(514) 725-6652
FAX.....(514) 725-5637
8596 Pie IX Blvd.
Montreal, Qc H1Z 4G2
PERSONNEL: Roger Plourde, President
DESCRIPTION: Avantron manufactures a non-interfering 600 MHz sweep/analyzer system. The microprocessor-controlled system uses the company's patented low-level sweep technology. Compatible with AM fiber, low-level sweeping is a proven non-interfering method that responds to future requirements of safely sweeping networks carrying data information and digital video compression. The AVANTRON SWEEP/ANALYZER has a built-in frequency counter and can be programmed via RS-232 to facilitate new FCC measurements. Avantron is strongly committed to customer support and will provide on-site hands on demonstrations and training on our products.

CALAN, Inc.....(717) 828-2356
WATS.....(800) 544-3392
FAX.....(717) 828-2472
1776 Independence Drive
Dignmans Ferry, PA 18328
PERSONNEL: Syd Fluck, President
DESCRIPTION: CALAN provides fiber-ready test and measurement systems that perform sweep, spectrum analysis, signal level metering and remote line monitoring. In addition, fiber optic light source, test sets and accessories are available for complete support of CATV and LAN systems.

Laser Precision.....(315) 797-4449
FAX.....(315) 798-4038
109 North Genesee St.
Utica, NY 13502

UPGRADE & REBUILD CONSTRUCTION CALLBOOK

PERSONNEL: James Nerschook, Product Mgr. (OTDR Products); Mark Jensen, Product Mgr. (Hand Held Products)
DESCRIPTION: Laser Precision manufactures a wide variety of portable fiber optic test equipment. Products range from the industry leading TD-2000 optical time domain reflectometer (OTDR) and craftsman style FF-1000 series Feature Finders to our rugged, hand held LP-5000 series optic power meters and LED and laser light sources.

MATRIX TEST EQUIPMENT INCORPORATED

Matrix Test Equip. Inc. .....(908) 469-9510
FAX.....(908) 469-0418
200 Wood Ave.
Middlesex, NJ 08846
PERSONNEL: Jack Kouzoujian, President; Nancy Ketseas, Sales Manager
DESCRIPTION: Manufacturer of test equipment primarily cross modulation and inter-modulation. All equipment is available either manual or full automated.

Tektronix / Television Systems

Tektronix, Inc. .....(800) TEK-WIDE
FAX.....(503) 627-1137
PO Box 500
DS 58-699
Beaverton, OR 97077
PERSONNEL: Rick Jaworski, Product Marketing Manager
DESCRIPTION: Tektronix is the world's largest manufacturer of video test and measurement equipment. Products for the cable industry include sweep systems, spectrum analyzers, video measurement sets, waveform monitors and vectorscopes, sync and test signal generators, fiber optic cable testers, precision demodulators, tunable down converters, and other equipment.

WAVETEK

Wavetek Communications Division
Indiana .....(317) 788-5965
WATS (National .....(800) 622-5515
Customer Service .....(800) 851-1198
FAX.....(317) 782-4607
5805 Churchman Bypass
Indianapolis, IN 46203-6109
PERSONNEL: Mike Richardson, National Sales Manager; Tony Shortt, Key Accounts Manager; Steve Windle, CATV Product Manager
DESCRIPTION: A full line manufacturer of CATV & LAN test equipment for use on fiber optic and coaxial cable. Products include signal level and analysis meters, optical signal level meters, system analyzers, optical power meters, laser sources and fault locators, system sweep equipment, frequency agile leakage detection and bench sweep gear.

CLASSIFIEDS

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Computerized Inventory Locater system –

CONTEC
INTERNATIONAL

800-382-2723

FOR SALE

Videocipher II Plus single thread uplink scrambling system (USS) for sale. Includes scrambler, CATV descrambler, D.E.C. Microvax-2 with terminal and printer.

Phone 616/676-5041
Fax 616/676-7504

COAST CATV SUPPLY

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Fax your used/excess list
714-272-2360 Fax: 714-272-3032

REFURBISHED /BOUGHT / SOLD

- G.I. Video Cipher II - $475
- Eagle Traps - $1
- Magnavox 5-330 Trunks - $375
- JLE / 400 with Housing - $80
- Jerrold SJ Trunk - $250
- SA 6650 Receiver - $250
- 3700 - 5900 Taps - $3
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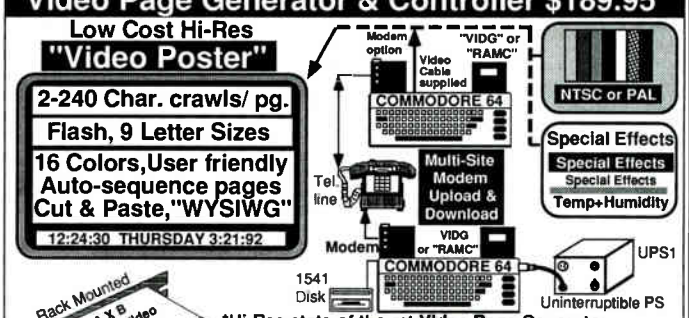

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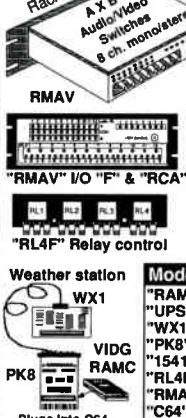

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ENGINEERING/DESIGN/CONSTRUCTION

HDTV warnings

At the FCC meeting on September 17, 1992, three of the five commissioners sounded warnings about the likely success of HDTV. Commissioner Duggan warned that FCC could face a "digital Da Nang" if it does not have a retreat strategy in the event HDTV fails. Commissioner Marshall is increasingly convinced that the future of broadcasting lies not in crisper pictures, but in the potential of digital compression for spectrum efficient multiplexing. Commissioner Quello (a former broadcaster) is concerned about consumer acceptance of HDTV, and encourages slowing the process. Chairman Sikes rejects the underlying premise that HDTV might fail.

Broadcasters are not happy about the cost of developing a second transmitting plant. Their problem is not only the cost of creating an entirely new and separate HDTV facility. HDTV set and VCR suppliers are satisfied with only a small share of the upscale market at prices expected to be in the $3,000 range. Broadcasters need a mass market, based on HDTV set prices preferably less than $1,000, in order to sell the advertising needed to pay for the HDTV plant.

They are understandably nervous about investing in HDTV in the face of lingering doubt that the public will buy the new TV sets in sufficient numbers, and soon enough, to attract advertising revenue. Moreover, the powerful AMST (Association of Maximum Service Telecasters) is not likely to agree to surrender the VHF channels in 15 years without a bloody fight.

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

Transmission

The ATTC (Advanced TV Test Center) has completed testing the video and audio characteristic of the five candidate ATV systems. However, testing the transmission phase under field conditions still lies ahead. We already know that reflections ("micro" or "macro") can be bad news for high speed digital transmission. Over-the-air broadcasting and cable TV are both vulnerable to reflections. Will the added cost to the consumer for the circuitry needed to control transmission impairments be so great as to discourage sales of advanced TV sets?

Screen size

Moreover, the fact is that unless the height of the television viewing screen is greater than about 18 inches (30-inch diagonal at 4:3 aspect ratio; 36.7-inch at 16:9 aspect ratio), the crispness of the picture and invisibility of scan lines on HDTV at a nine-foot viewing distance will be almost indistinguishable from the picture quality available on modern NTSC TV sets. For larger screens, HDTV is clearly superior to NTSC. However, with picture height greater than about 30 inches (61-inch diagonal at 16:9) scan lines will be resolvable even with HDTV.

> ...three of the five commissioners sounded warnings about the likely success of HDTV.

One of the principal, although arguable, advantages of the advanced TV (ATV) standards is the 16:9 wide-screen aspect ratio. Wide-screen PAL displays at recent consumer electronic shows in Europe were widely acclaimed, and may foreshadow wide-screen 525-line NTSC quality displays in the U.S. However, wide-screen display presumes not only special TV receiving sets, but also noncompatible transmission facilities only slightly less costly than full HDTV. If broadcasters hesitate to adopt the advanced TV standards, is it possible that cable TV and videodiscs could generate enough demand to create a market for wide-screen TV sets, whether HDTV or not?

Large flat panel display

Throughout the history of television, the public has demonstrated a desire for increasingly large display screens—providing they are not too expensive. In the 1950s, magnifying lenses were provided because the screens were so small. A decade ago, the 17-inch diagonal screen was the best seller; now it is the 24- to 27-inch. Continuation of this trend is cited as evidence of potential demand for large screen TV with sharper images and less visible scan lines than is possible with NTSC. Besides, TV set dealers need a new product such as wide-screen flat panel HDTV to push some 200 million TV sets into obsolescence.

But cathode-ray tube (CRT) displays greater than 30 or 33 inches diagonal are much too heavy, and too big even to go through the front door. Projection screens are not bright enough, even on center line, and nearly impossible off center in daylight. This is why conventional wisdom says that demand for HDTV depends on development of a large, flat-panel display at affordable price, that can be hung on the wall in the family room.

Unfortunately, development of active or passive matrix, LCD, plasma or other technologies is still not far enough advanced to predict success, probable prices, or a timetable for the introduction of acceptable flat panel displays. According to a study of Japanese flat-panel technology, sponsored by the National Science Foundation, HDTV that hangs on the wall is not likely to be economically feasible until after the year 2000.

The concern expressed by the three commissioners may not be unreasonable.

Compression for broadcasting

Commissioner Marshall sympathizes with broadcasters who suggest keeping their extra channel for multichannel broadcasting instead of HDTV. If cable, MMDS, DBS, and telcos with ADSL (asymmetric digital subscriber line) can deliver four or more compressed TV programs in a 6-MHz channel, why not terrestrial broadcasters? Think about it. That *would* be competition. CED

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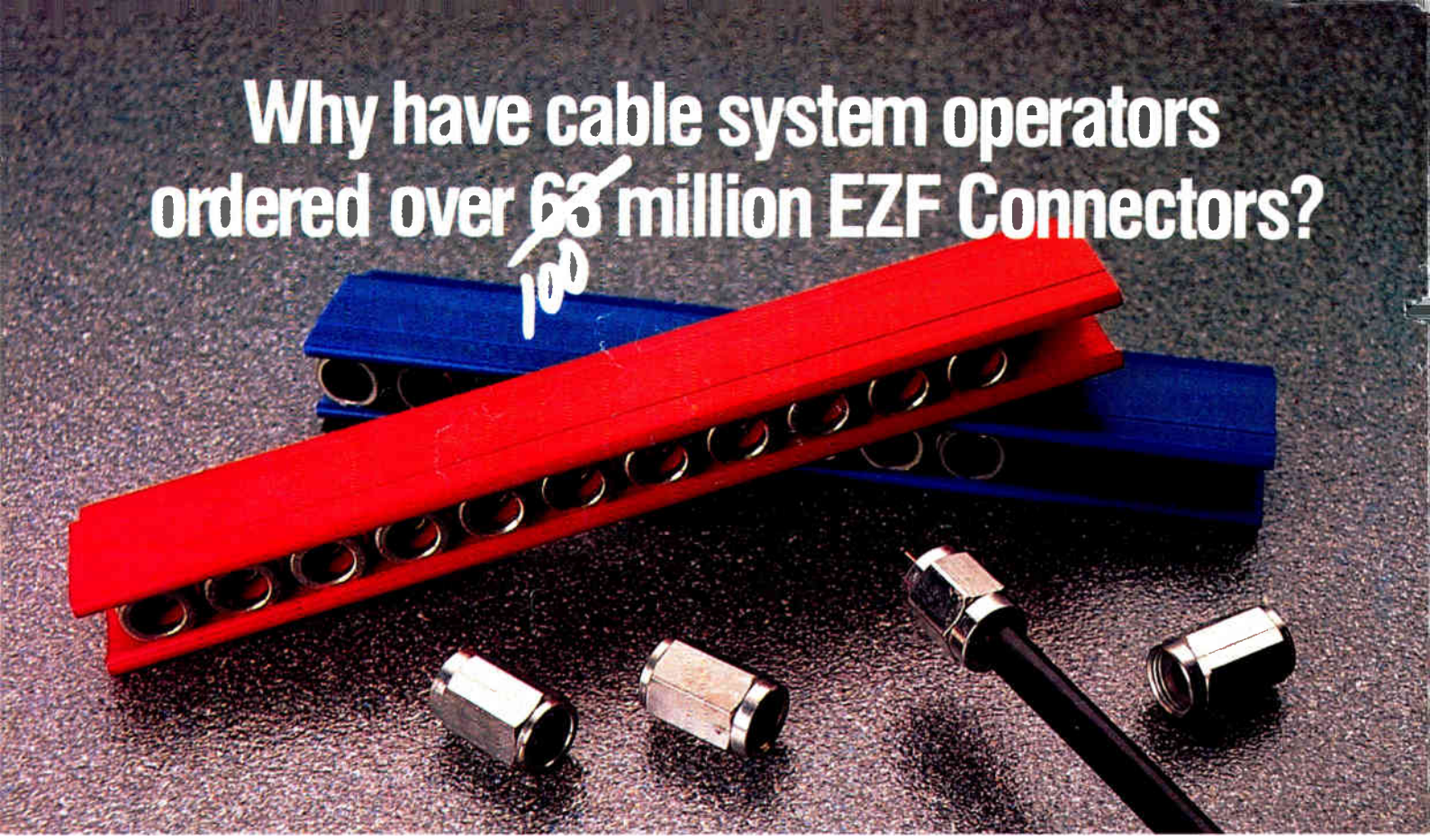

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